DLC pro - Digital Laser Controller

Remote Command Reference

for TCP/IP and USB

Firmware 3.5.4

Userlevel 1

TOPTICA Photonics SE

Contents

1 Introduction **49**

2 Control Language **49**
2.1 Parameters . . . 50
2.1.1 param-ref . . . 51
2.1.2 param-set! . . . 51
2.1.3 param-disp . . . 52
2.2 Commands . . . 52
2.3 Errors and Warnings . . . 53
2.4 Remote Monitoring . . . 53

3 List of all Parameters and Commands **54**
3.1 General Operation . . . 54
emission-button-enabled . . . 54
interlock-open . . . 55
frontkey-locked . . . 55
emission . . . 55
system-health . . . 55
system-health-txt . . . 56
laser1: . . . 56
laser1:type . . . 56
laser1:product-name . . . 58
laser1:label . . . 58
laser1:emission . . . 58
laser1:enabled . . . 58
laser1:enabled-valid . . . 58
laser1:health . . . 58
laser1:health-txt . . . 59
laser1:busy . . . 59
laser1:override-safety-checks . . . 60
laser1:dl: . . . 60
laser1:dl:legacy . . . 60
laser1:dl:type . . . 60
laser1:dl:version . . . 61
laser1:dl:model . . . 61
laser1:dl:serial-number . . . 61
laser1:dl:fru-serial-number . . . 61
laser1:dl:ontime . . . 61
laser1:dl:ontime-txt . . . 62
laser1:dl:cc: . . . 62
laser1:dl:cc:path . . . 62
laser1:dl:cc:variant . . . 62

laser1:dl:cc:enabled . . . 62
laser1:dl:cc:emission . . . 62
laser1:dl:cc:current-set . . . 63
laser1:dl:cc:current-offset . . . 63
laser1:dl:cc:current-set-dithering . . . 63
laser1:dl:cc:external-input: . . . 63
laser1:dl:cc:external-input:signal . . . 64
laser1:dl:cc:external-input:factor . . . 64
laser1:dl:cc:external-input:enabled . . . 64
laser1:dl:cc:output-filter: . . . 64
laser1:dl:cc:output-filter:slew-rate . . . 64
laser1:dl:cc:output-filter:slew-rate-enabled . . . 64
laser1:dl:cc:output-filter:slew-rate-limited . . . 64
laser1:dl:cc:current-act . . . 65
laser1:dl:cc:current-out . . . 65
laser1:dl:cc:positive-polarity . . . 65
laser1:dl:cc:current-clip . . . 65
laser1:dl:cc:current-clip-tuning . . . 65
laser1:dl:cc:use-current-clip-tuning . . . 66
laser1:dl:cc:current-clip-limit . . . 66
laser1:dl:cc:voltage-act . . . 66
laser1:dl:cc:voltage-clip . . . 66
laser1:dl:cc:feedforward-master . . . 66
laser1:dl:cc:feedforward-enabled . . . 66
laser1:dl:cc:feedforward-factor . . . 67
laser1:dl:cc:pd . . . 67
laser1:dl:cc:aux . . . 67
laser1:dl:cc:snubber . . . 67
laser1:dl:cc:status . . . 67
laser1:dl:cc:status-txt . . . 68
laser1:dl:cc:forced-off . . . 68
laser1:dl:tc: . . . 68
laser1:dl:tc:path . . . 68
laser1:dl:tc:enabled . . . 68
laser1:dl:tc:temp-act . . . 69
laser1:dl:tc:temp-set . . . 69
laser1:dl:tc:external-input: . . . 69
laser1:dl:tc:ready . . . 69
laser1:dl:tc:fault . . . 69
laser1:dl:tc:status . . . 69
laser1:dl:tc:status-txt . . . 70
laser1:dl:tc:t-loop: . . . 70
laser1:dl:tc:t-loop:on . . . 70
laser1:dl:tc:t-loop:p-gain . . . 71

laser1:dl:tc:t-loop:i-gain . . . 71
laser1:dl:tc:t-loop:d-gain . . . 71
laser1:dl:tc:t-loop:ok-tolerance . . . 71
laser1:dl:tc:t-loop:ok-time . . . 71
laser1:dl:tc:c-loop: . . . 71
laser1:dl:tc:c-loop:on . . . 71
laser1:dl:tc:c-loop:i-gain . . . 71
laser1:dl:tc:limits: . . . 72
laser1:dl:tc:limits:temp-min . . . 72
laser1:dl:tc:limits:temp-max . . . 72
laser1:dl:tc:limits:timeout . . . 72
laser1:dl:tc:limits:timed-out . . . 72
laser1:dl:tc:limits:out-of-range . . . 73
laser1:dl:tc:current-set . . . 73
laser1:dl:tc:current-set-min . . . 73
laser1:dl:tc:current-set-max . . . 73
laser1:dl:tc:current-act . . . 73
laser1:dl:tc:voltage-act . . . 74
laser1:dl:tc:resistance . . . 74
laser1:dl:tc:ntc-series-resistance . . . 74
laser1:dl:tc:ntc-parallel-resistance . . . 74
laser1:dl:tc:temp-set-min . . . 74
laser1:dl:tc:temp-set-max . . . 74
laser1:dl:tc:temp-reset . . . 75
laser1:dl:tc:temp-roc-enabled . . . 75
laser1:dl:tc:temp-roc-limit . . . 75
laser1:dl:tc:power-source . . . 75
laser1:dl:tc:drv-voltage . . . 75
laser1:dl:tc:check-peltier . . . 75
laser1:dl:pc: . . . 76
laser1:dl:pc:path . . . 76
laser1:dl:pc:enabled . . . 76
laser1:dl:pc:voltage-set . . . 76
laser1:dl:pc:voltage-min . . . 76
laser1:dl:pc:voltage-max . . . 76
laser1:dl:pc:voltage-set-dithering . . . 76
laser1:dl:pc:external-input: . . . 77
laser1:dl:pc:output-filter: . . . 77
laser1:dl:pc:voltage-act . . . 77
laser1:dl:pc:voltage-out . . . 77
laser1:dl:pc:feedforward-master . . . 77
laser1:dl:pc:feedforward-enabled . . . 77
laser1:dl:pc:feedforward-factor . . . 78
laser1:dl:pc:heatsink-temp . . . 78

laser1:dl:pc:status . . . 78
laser1:dl:pc:status-txt . . . 78
laser1:dl:lock: . . . 79
laser1:dl:lock:type . . . 79
laser1:dl:lock:lock-without-lockpoint . . . 79
laser1:dl:lock:state . . . 79
laser1:dl:lock:state-txt . . . 80
laser1:dl:lock:lock-enabled . . . 80
laser1:dl:lock:hold . . . 80
laser1:dl:lock:di-hold-enabled . . . 81
laser1:dl:lock:spectrum-input-channel . . . 81
laser1:dl:lock:error-channel . . . 81
laser1:dl:lock:error-channel-inverted . . . 81
laser1:dl:lock:pdh-selection . . . 82
laser1:dl:lock:pid-selection . . . 82
laser1:dl:lock:falc-selection . . . 82
laser1:dl:lock:setpoint . . . 82
laser1:dl:lock:relock: . . . 83
laser1:dl:lock:relock:enabled . . . 83
laser1:dl:lock:relock:output-channel . . . 83
laser1:dl:lock:relock:frequency . . . 83
laser1:dl:lock:relock:amplitude . . . 83
laser1:dl:lock:relock:delay . . . 83
laser1:dl:lock:reset: . . . 83
laser1:dl:lock:reset:enabled . . . 83
laser1:dl:lock:window: . . . 84
laser1:dl:lock:window:enabled . . . 84
laser1:dl:lock:window:input-channel . . . 84
laser1:dl:lock:window:level-high . . . 84
laser1:dl:lock:window:level-low . . . 84
laser1:dl:lock:window:level-hysteresis . . . 84
laser1:dl:lock:pid1: . . . 84
laser1:dl:lock:pid1:enabled . . . 85
laser1:dl:lock:pid1:gain: . . . 85
laser1:dl:lock:pid1:gain:all . . . 85
laser1:dl:lock:pid1:gain:p . . . 85
laser1:dl:lock:pid1:gain:i . . . 85
laser1:dl:lock:pid1:gain:d . . . 86
laser1:dl:lock:pid1:gain:i-cutoff . . . 86
laser1:dl:lock:pid1:gain:i-cutoff-enabled . . . 86
laser1:dl:lock:pid1:gain:fc-ip . . . 86
laser1:dl:lock:pid1:gain:fc-pd . . . 86
laser1:dl:lock:pid1:sign . . . 87
laser1:dl:lock:pid1:slope . . . 87

laser1:dl:lock:pid1:setpoint . . . 87
laser1:dl:lock:pid1:input-channel . . . 87
laser1:dl:lock:pid1:output-channel . . . 87
laser1:dl:lock:pid1:outputlimit: . . . 87
laser1:dl:lock:pid1:outputlimit:enabled . . . 87
laser1:dl:lock:pid1:outputlimit:max . . . 88
laser1:dl:lock:pid1:hold . . . 88
laser1:dl:lock:pid1:lock-state . . . 88
laser1:dl:lock:pid1:hold-state . . . 88
laser1:dl:lock:pid1:regulating-state . . . 88
laser1:dl:lock:pid1:hold-output-on-unlock . . . 89
laser1:dl:lock:pid2: . . . 89
laser1:dl:lock:lockin: . . . 89
laser1:dl:lock:lockin:modulation-enabled . . . 89
laser1:dl:lock:lockin:input-channel . . . 89
laser1:dl:lock:lockin:modulation-output-channel . . . 89
laser1:dl:lock:lockin:frequency . . . 90
laser1:dl:lock:lockin:amplitude . . . 90
laser1:dl:lock:lockin:phase-shift . . . 90
laser1:dl:lock:lockin:lock-level . . . 90
laser1:dl:lock:lockin:auto-lir: . . . 90
laser1:dl:lock:lockin:auto-lir:state . . . 90
laser1:dl:lock:lockin:auto-lir:progress . . . 91
laser1:dl:lock:lockin:auto-lir:start . . . 91
laser1:dl:lock:lockin:auto-lir:abort . . . 91
laser1:dl:lock:lockpoint: . . . 91
laser1:dl:lock:lockpoint:position . . . 91
laser1:dl:lock:lockpoint:type . . . 91
laser1:dl:lock:candidate-filter: . . . 92
laser1:dl:lock:candidate-filter:top . . . 92
laser1:dl:lock:candidate-filter:bottom . . . 92
laser1:dl:lock:candidate-filter:positive-edge . . . 92
laser1:dl:lock:candidate-filter:negative-edge . . . 92
laser1:dl:lock:candidate-filter:edge-level . . . 92
laser1:dl:lock:candidate-filter:peak-noise-tolerance . . . 92
laser1:dl:lock:candidate-filter:edge-min-distance . . . 93
laser1:dl:lock:candidate-filter:top-of-fringe-low-pass . . . 93
laser1:dl:lock:candidates . . . 93
laser1:dl:lock:locking-delay . . . 93
laser1:dl:lock:background-trace . . . 94
laser1:dl:lock:lock-tracking . . . 94
laser1:dl:lock:show-candidates . . . 94
laser1:dl:lock:find-candidates . . . 94
laser1:dl:lock:select-lockpoint . . . 94

laser1:dl:lock:close . . . 95
laser1:dl:lock:open . . . 96
laser1:dl:pressure-compensation: . . . 96
laser1:dl:pressure-compensation:enabled . . . 97
laser1:dl:pressure-compensation:air-pressure . . . 97
laser1:dl:pressure-compensation:factor . . . 97
laser1:dl:pressure-compensation:offset . . . 97
laser1:dl:pressure-compensation:compensation-voltage . . . 97
laser1:dl:pd: . . . 98
laser1:dl:pd:seed: . . . 98
laser1:dl:pd:seed:input-channel . . . 98
laser1:dl:pd:seed:photodiode . . . 98
laser1:dl:pd:seed:power . . . 98
laser1:dl:pd:seed:cal-offset . . . 98
laser1:dl:pd:seed:cal-factor . . . 98
laser1:dl:pd:seed-probe: . . . 98
laser1:dl:pd:seed-probe:photodiode . . . 99
laser1:dl:pd:seed-probe:power . . . 99
laser1:dl:pd:seed-probe:cal-offset . . . 99
laser1:dl:pd:seed-probe:cal-factor . . . 99
laser1:dl:pd:fiber: . . . 99
laser1:dl:power-optimization: . . . 99
laser1:dl:power-optimization:ongoing . . . 99
laser1:dl:power-optimization:progress . . . 100
laser1:dl:power-optimization:status . . . 100
laser1:dl:power-optimization:status-string . . . 100
laser1:dl:power-optimization:fiber-advanced . . . 100
laser1:dl:power-optimization:stage1: . . . 100
laser1:dl:power-optimization:stage1:input: . . . 100
laser1:dl:power-optimization:stage1:input:value-calibrated . . . 101
laser1:dl:power-optimization:stage1:progress . . . 101
laser1:dl:power-optimization:stage1:optimization-in-progress . . . 101
laser1:dl:power-optimization:stage1:restore-on-abort . . . 101
laser1:dl:power-optimization:stage1:restore-on-regress . . . 101
laser1:dl:power-optimization:stage1:regress-tolerance . . . 101
laser1:dl:power-optimization:stage1:autosave-actuator-values . . . 102
laser1:dl:power-optimization:stage1:start-optimization . . . 102
laser1:dl:power-optimization:stage2: . . . 102
laser1:dl:power-optimization:stage3: . . . 102
laser1:dl:power-optimization:stage4: . . . 102
laser1:dl:power-optimization:progress-data-seed-probe . . . 102
laser1:dl:power-optimization:progress-data-amp . . . 103
laser1:dl:power-optimization:progress-data-fiber . . . 103
laser1:dl:power-optimization:abort . . . 103

laser1:dl:power-optimization:low-power-threshold . . . 103
laser1:dl:power-optimization:warm-up-active . . . 103
laser1:dl:power-optimization:start-optimization-all . . . 104
laser1:dl:power-optimization:start-optimization-seed-probe . . . 104
laser1:dl:power-optimization:start-optimization-amp . . . 104
laser1:dl:power-optimization:start-optimization-fiber . . . 104
laser1:dl:power-optimization:start-warm-up . . . 104
laser1:dl:power-optimization:stop-warm-up . . . 104
laser1:dl:servo: . . . 104
laser1:dl:servo:probe1-hor: . . . 105
laser1:dl:servo:probe1-hor:display-name . . . 105
laser1:dl:servo:probe1-hor:enabled . . . 105
laser1:dl:servo:probe1-hor:value . . . 105
laser1:dl:servo:probe1-hor:center-servo . . . 105
laser1:dl:servo:probe1-vert: . . . 105
laser1:dl:servo:ta1-hor: . . . 105
laser1:dl:servo:ta1-vert: . . . 106
laser1:dl:servo:ta2-hor: . . . 106
laser1:dl:servo:ta2-vert: . . . 106
laser1:dl:servo:fiber1-hor: . . . 106
laser1:dl:servo:fiber1-vert: . . . 106
laser1:dl:servo:center-probe-servos . . . 106
laser1:dl:servo:center-ta-servos . . . 106
laser1:dl:servo:center-fiber-servos . . . 107
laser1:dl:servo:center-all-servos . . . 107
laser1:dl:servo:enable-all-servos . . . 107
laser1:dl:servo:disable-all-servos . . . 107
laser1:dl:eom: . . . 107
laser1:dl:motor: . . . 107
laser1:dl:motor:position-set . . . 107
laser1:dl:motor:position-act . . . 107
laser1:dl:motor:position-min . . . 108
laser1:dl:motor:position-max . . . 108
laser1:dl:motor:state . . . 108
laser1:dl:motor:state-txt . . . 108
laser1:dl:motor:wavelength-set . . . 108
laser1:dl:motor:wavelength-act . . . 108
laser1:dl:motor:scan: . . . 109
laser1:dl:motor:scan:speed . . . 109
laser1:dl:motor:scan:speed-max . . . 109
laser1:dl:motor:scan:shape . . . 109
laser1:dl:motor:scan:scan-begin . . . 109
laser1:dl:motor:scan:scan-end . . . 109
laser1:dl:motor:scan:progress . . . 109

laser1:dl:motor:scan:remaining-time . . . 109
laser1:dl:motor:scan:continuous-mode . . . 110
laser1:dl:motor:scan:restore-on-end . . . 110
laser1:dl:motor:scan:threshold-trigger: . . . 110
laser1:dl:motor:scan:threshold-trigger:threshold . . . 110
laser1:dl:motor:scan:start . . . 110
laser1:dl:motor:scan:stop . . . 110
laser1:dl:motor:scan:pause . . . 110
laser1:dl:motor:scan:continue . . . 111
laser1:dl:motor:calibration: . . . 111
laser1:dl:motor:calibration:fit-a . . . 111
laser1:dl:motor:calibration:fit-b . . . 111
laser1:dl:motor:calibration:fit-c . . . 111
laser1:dl:motor:calibration:backlash . . . 111
laser1:dl:motor:calibration:wavelength-min . . . 111
laser1:dl:motor:calibration:wavelength-max . . . 111
laser1:dl:motor:calibration:set . . . 112
laser1:dl:motor:cycle-count . . . 112
laser1:dl:motor:perform-referencing . . . 112
laser1:dl:motor:reset-cycles . . . 112
laser1:dl:smc: . . . 112
laser1:dl:smc:enabled . . . 112
laser1:dl:smc:discover . . . 112
laser1:dl:smc:state . . . 113
laser1:dl:smc:state-txt . . . 113
laser1:dl:smc:pc-setpoint . . . 113
laser1:dl:smc:mode-hop-occurred . . . 113
laser1:dl:smc:mode-hop-likely . . . 113
laser1:dl:smc:bandwidth-selection . . . 114
laser1:dl:smc:tuning: . . . 114
laser1:dl:smc:tuning:current-min . . . 114
laser1:dl:smc:tuning:current-max . . . 114
laser1:dl:smc:rescan . . . 114
laser1:dl:smc:reset-mode-hop . . . 114
laser1:dl:factory-settings: . . . 114
laser1:dl:factory-settings:wavelength . . . 115
laser1:dl:factory-settings:threshold-current . . . 115
laser1:dl:factory-settings:power . . . 115
laser1:dl:factory-settings:cc: . . . 115
laser1:dl:factory-settings:cc:feedforward-factor . . . 115
laser1:dl:factory-settings:cc:current-set . . . 115
laser1:dl:factory-settings:cc:current-clip . . . 115
laser1:dl:factory-settings:cc:current-clip-tuning . . . 116
laser1:dl:factory-settings:cc:current-clip-modified . . . 116

laser1:dl:factory-settings:cc:current-clip-last-modified 116
laser1:dl:factory-settings:cc:voltage-clip 116
laser1:dl:factory-settings:cc:positive-polarity 116
laser1:dl:factory-settings:cc:snubber 116
laser1:dl:factory-settings:tc: 116
laser1:dl:factory-settings:tc:temp-min 117
laser1:dl:factory-settings:tc:temp-max 117
laser1:dl:factory-settings:tc:temp-set 117
laser1:dl:factory-settings:tc:temp-roc-enabled 117
laser1:dl:factory-settings:tc:temp-roc-limit 117
laser1:dl:factory-settings:tc:current-max 117
laser1:dl:factory-settings:tc:current-min 117
laser1:dl:factory-settings:tc:p-gain 118
laser1:dl:factory-settings:tc:i-gain 118
laser1:dl:factory-settings:tc:d-gain 118
laser1:dl:factory-settings:tc:c-gain 118
laser1:dl:factory-settings:tc:ok-tolerance 118
laser1:dl:factory-settings:tc:ok-time 118
laser1:dl:factory-settings:tc:timeout 118
laser1:dl:factory-settings:tc:power-source 118
laser1:dl:factory-settings:tc:ntc-series-resistance 119
laser1:dl:factory-settings:tc:ntc-parallel-resistance 119
laser1:dl:factory-settings:tc:output-inverted 119
laser1:dl:factory-settings:pc: 119
laser1:dl:factory-settings:pc:voltage-min 119
laser1:dl:factory-settings:pc:voltage-max 119
laser1:dl:factory-settings:pc:feedforward-enabled 119
laser1:dl:factory-settings:pc:feedforward-factor 119
laser1:dl:factory-settings:pc:capacitance 120
laser1:dl:factory-settings:pc:scan-offset 120
laser1:dl:factory-settings:pc:scan-amplitude 120
laser1:dl:factory-settings:pc:slew-rate 120
laser1:dl:factory-settings:pc:slew-rate-enabled 120
laser1:dl:factory-settings:pc:pressure-compensation-factor 120
laser1:dl:factory-settings:eom: 120
laser1:dl:factory-settings:eom:voltage-min 121
laser1:dl:factory-settings:eom:voltage-max 121
laser1:dl:factory-settings:eom:feedforward-enabled 121
laser1:dl:factory-settings:eom:feedforward-factor 121
laser1:dl:factory-settings:eom:capacitance 121
laser1:dl:factory-settings:eom:scan-offset 121
laser1:dl:factory-settings:pd: 121
laser1:dl:factory-settings:pd:seed: 122
laser1:dl:factory-settings:pd:seed:cal-offset 122

laser1:dl:factory-settings:pd:seed:cal-factor . . . 122
laser1:dl:factory-settings:motor: . . . 122
laser1:dl:factory-settings:motor:position-min . . . 122
laser1:dl:factory-settings:motor:position-max . . . 122
laser1:dl:factory-settings:motor:wavelength-set . . . 122
laser1:dl:factory-settings:motor:speed-max-raw . . . 122
laser1:dl:factory-settings:motor:calibration: . . . 123
laser1:dl:factory-settings:motor:calibration:fit-a . . . 123
laser1:dl:factory-settings:motor:calibration:fit-b . . . 123
laser1:dl:factory-settings:motor:calibration:fit-c . . . 123
laser1:dl:factory-settings:motor:calibration:backlash . . . 123
laser1:dl:factory-settings:motor:calibration:inaccuracy . . . 123
laser1:dl:factory-settings:motor:calibration:wavelength-min . 123
laser1:dl:factory-settings:motor:calibration:wavelength-max . 123
laser1:dl:factory-settings:servo-control: . . . 124
laser1:dl:factory-settings:servo-control:probe1-hor . . . 124
laser1:dl:factory-settings:servo-control:probe1-vert . . . 124
laser1:dl:factory-settings:servo-control:ta1-hor . . . 124
laser1:dl:factory-settings:servo-control:ta1-vert . . . 125
laser1:dl:factory-settings:servo-control:ta2-hor . . . 125
laser1:dl:factory-settings:servo-control:ta2-vert . . . 125
laser1:dl:factory-settings:servo-control:fiber1-hor . . . 125
laser1:dl:factory-settings:servo-control:fiber1-vert . . . 125
laser1:dl:factory-settings:servo-control:probe-pd . . . 125
laser1:dl:factory-settings:servo-control:ta-pd . . . 125
laser1:dl:factory-settings:servo-control:fiber-pd . . . 125
laser1:dl:factory-settings:powerlock-output-channel-override . . . 126
laser1:dl:factory-settings:latest-service . . . 126
laser1:dl:factory-settings:last-modified . . . 126
laser1:dl:factory-settings:modified . . . 126
laser1:dl:factory-settings:apply . . . 126
laser1:dl:factory-settings:retrieve-now . . . 126
laser1:dl:factory-settings:update-service-date . . . 126
laser1:dl:store . . . 127
laser1:dl:restore . . . 127
laser1:ctl: . . . 127
laser1:ctl:fpga-fw-ver . . . 127
laser1:ctl:model . . . 127
laser1:ctl:wavelength-set . . . 127
laser1:ctl:wavelength-act . . . 127
laser1:ctl:wavelength-min . . . 128
laser1:ctl:wavelength-max . . . 128
laser1:ctl:tuning-current-min . . . 128
laser1:ctl:tuning-power-min . . . 128

laser1:ctl:state . . . 128
laser1:ctl:state-txt . . . 129
laser1:ctl:head-temperature . . . 129
laser1:ctl:optimization: . . . 129
laser1:ctl:optimization:progress . . . 129
laser1:ctl:optimization:smile . . . 129
laser1:ctl:optimization:flow . . . 129
laser1:ctl:optimization:abort . . . 130
laser1:ctl:remote-control: . . . 130
laser1:ctl:remote-control:signal . . . 130
laser1:ctl:remote-control:factor . . . 130
laser1:ctl:remote-control:enabled . . . 130
laser1:ctl:mode-control: . . . 130
laser1:ctl:mode-control:loop-enabled . . . 130
laser1:ctl:motor: . . . 131
laser1:ctl:motor:position-accuracy-fullstep . . . 131
laser1:ctl:motor:position-hysteresis-fullstep . . . 131
laser1:ctl:motor:position-accuracy-microstep . . . 131
laser1:ctl:motor:position-hysteresis-microstep . . . 131
laser1:ctl:motor:microsteps . . . 131
laser1:ctl:motor:power-save-disabled . . . 132
laser1:ctl:motor:calibration: . . . 132
laser1:ctl:motor:calibration:wavelength-offset . . . 132
laser1:ctl:motor:calibration:shift-wavelength . . . 132
laser1:ctl:motor:calibration:reset-shift . . . 132
laser1:ctl:motor:status . . . 133
laser1:ctl:motor:status-txt . . . 133
laser1:ctl:power: . . . 133
laser1:ctl:power:power-act . . . 133
laser1:ctl:factory-settings: . . . 133
laser1:ctl:factory-settings:wavelength-min . . . 134
laser1:ctl:factory-settings:wavelength-max . . . 134
laser1:ctl:factory-settings:tuning-current-min . . . 134
laser1:ctl:factory-settings:tuning-power-min . . . 134
laser1:ctl:factory-settings:apply . . . 134
laser1:amp: . . . 134
laser1:amp:legacy . . . 134
laser1:amp:type . . . 135
laser1:amp:version . . . 135
laser1:amp:model . . . 135
laser1:amp:serial-number . . . 135
laser1:amp:fru-serial-number . . . 136
laser1:amp:ontime . . . 136
laser1:amp:ontime-txt . . . 136

laser1:amp:cc: . . . 136
laser1:amp:cc:path . . . 136
laser1:amp:cc:variant . . . 136
laser1:amp:cc:enabled . . . 136
laser1:amp:cc:emission . . . 137
laser1:amp:cc:current-set . . . 137
laser1:amp:cc:current-offset . . . 137
laser1:amp:cc:external-input: . . . 137
laser1:amp:cc:output-filter: . . . 138
laser1:amp:cc:current-act . . . 138
laser1:amp:cc:current-out . . . 138
laser1:amp:cc:current-clip . . . 138
laser1:amp:cc:current-clip-tuning . . . 138
laser1:amp:cc:use-current-clip-tuning . . . 138
laser1:amp:cc:current-clip-limit . . . 139
laser1:amp:cc:current-clip-free-run . . . 139
laser1:amp:cc:using-current-clip-free-run . . . 139
laser1:amp:cc:voltage-act . . . 139
laser1:amp:cc:voltage-out . . . 139
laser1:amp:cc:voltage-clip . . . 139
laser1:amp:cc:potential-load . . . 139
laser1:amp:cc:feedforward-master . . . 140
laser1:amp:cc:feedforward-enabled . . . 140
laser1:amp:cc:feedforward-factor . . . 140
laser1:amp:cc:status . . . 140
laser1:amp:cc:status-txt . . . 140
laser1:amp:cc:forced-off . . . 141
laser1:amp:tc: . . . 141
laser1:amp:pd: . . . 141
laser1:amp:pd:seed: . . . 141
laser1:amp:pd:seed-probe: . . . 141
laser1:amp:pd:amp: . . . 141
laser1:amp:pd:fiber: . . . 142
laser1:amp:power-optimization: . . . 142
laser1:amp:servo: . . . 142
laser1:amp:seed-limits: . . . 142
laser1:amp:seed-limits:power . . . 142
laser1:amp:seed-limits:power-min . . . 142
laser1:amp:seed-limits:power-min-warning-delay . . . 142
laser1:amp:seed-limits:power-min-shutdown-delay . . . 143
laser1:amp:seed-limits:power-max . . . 143
laser1:amp:seed-limits:power-max-warning-delay . . . 143
laser1:amp:seed-limits:power-max-shutdown-delay . . . 143
laser1:amp:seed-limits:detect-pd-removal . . . 143

laser1:amp:seed-limits:status . . . 143
laser1:amp:seed-limits:status-txt . . . 144
laser1:amp:output-limits: . . . 144
laser1:amp:seedonly-check: . . . 144
laser1:amp:seedonly-check:seed . . . 144
laser1:amp:seedonly-check:pump . . . 144
laser1:amp:seedonly-check:warning-delay . . . 145
laser1:amp:seedonly-check:shutdown-delay . . . 145
laser1:amp:seedonly-check:status . . . 145
laser1:amp:seedonly-check:status-txt . . . 145
laser1:amp:factory-settings: . . . 145
laser1:amp:factory-settings:wavelength . . . 145
laser1:amp:factory-settings:power . . . 146
laser1:amp:factory-settings:cc: . . . 146
laser1:amp:factory-settings:cc:feedforward-factor . . . 146
laser1:amp:factory-settings:cc:current-set . . . 146
laser1:amp:factory-settings:cc:current-clip . . . 146
laser1:amp:factory-settings:cc:current-clip-tuning . . . 146
laser1:amp:factory-settings:cc:current-clip-modified . . . 146
laser1:amp:factory-settings:cc:current-clip-last-modified . . . 147
laser1:amp:factory-settings:cc:current-clip-free-run . . . 147
laser1:amp:factory-settings:cc:current-clip-free-run-modified . . 147
laser1:amp:factory-settings:cc:current-clip-free-run-last-modified 147
laser1:amp:factory-settings:cc:voltage-clip . . . 147
laser1:amp:factory-settings:tc: . . . 147
laser1:amp:factory-settings:pd: . . . 148
laser1:amp:factory-settings:pd:seed: . . . 148
laser1:amp:factory-settings:pd:amp: . . . 148
laser1:amp:factory-settings:seed-limits: . . . 148
laser1:amp:factory-settings:seed-limits:power-min . . . 148
laser1:amp:factory-settings:seed-limits:power-min-warning-delay 148
laser1:amp:factory-settings:seed-limits:power-min-shutdown-delay149
laser1:amp:factory-settings:seed-limits:power-max . . . 149
laser1:amp:factory-settings:seed-limits:power-max-warning-delay 149
laser1:amp:factory-settings:seed-limits:power-max-shutdown-delay149
laser1:amp:factory-settings:seed-limits:detect-pd-removal . . . 149
laser1:amp:factory-settings:output-limits: . . . 149
laser1:amp:factory-settings:seedonly-check: . . . 149
laser1:amp:factory-settings:seedonly-check:warning-delay . . . 150
laser1:amp:factory-settings:seedonly-check:shutdown-delay . . . 150
laser1:amp:factory-settings:servo-control: . . . 150
laser1:amp:factory-settings:latest-service . . . 150
laser1:amp:factory-settings:last-modified . . . 151
laser1:amp:factory-settings:modified . . . 151

laser1:amp:factory-settings:warm-up: . . . 151
laser1:amp:factory-settings:warm-up:interval . . . 151
laser1:amp:factory-settings:warm-up:current-set . . . 151
laser1:amp:factory-settings:warm-up:repeats-max . . . 151
laser1:amp:factory-settings:warm-up:gradient-max . . . 151
laser1:amp:factory-settings:warm-up:input-channel . . . 151
laser1:amp:factory-settings:apply . . . 152
laser1:amp:factory-settings:retrieve-now . . . 152
laser1:amp:factory-settings:update-service-date . . . 152
laser1:amp:store . . . 152
laser1:amp:restore . . . 152
laser1:dpss: . . . 152
laser1:dpss:enabled . . . 153
laser1:dpss:status . . . 153
laser1:dpss:status-txt . . . 153
laser1:dpss:tc-status . . . 153
laser1:dpss:tc-status-txt . . . 153
laser1:dpss:error-code . . . 153
laser1:dpss:error-txt . . . 153
laser1:dpss:operation-time . . . 153
laser1:dpss:power-set . . . 154
laser1:dpss:power-act . . . 154
laser1:dpss:power-max . . . 154
laser1:dpss:power-margin . . . 154
laser1:dpss:current-act . . . 154
laser1:dpss:current-max . . . 154
laser1:dpss:temperature-control: . . . 154
laser1:dpss:temperature-control:t1: . . . 154
laser1:dpss:temperature-control:t1:temp-act . . . 155
laser1:dpss:temperature-control:t1:temp-set . . . 155
laser1:dpss:temperature-control:t1:temp-set-min . . . 155
laser1:dpss:temperature-control:t1:temp-set-max . . . 155
laser1:dpss:temperature-control:t1:temp-roc-limit . . . 155
laser1:dpss:temperature-control:t2: . . . 155
laser1:dpss:temperature-control:t3: . . . 155
laser1:dpss:temperature-control:t4: . . . 156
laser1:dpss:temperature-control:t5: . . . 156
laser1:scan: . . . 156
laser1:scan:enabled . . . 156
laser1:scan:hold . . . 156
laser1:scan:signal-type . . . 156
laser1:scan:frequency . . . 157
laser1:scan:phase-shift . . . 157
laser1:scan:output-channel . . . 157

laser1:scan:unit . . . 157
laser1:scan:amplitude . . . 157
laser1:scan:offset . . . 157
laser1:scan:start . . . 157
laser1:scan:end . . . 158
laser1:wide-scan: . . . 158
laser1:wide-scan:state . . . 158
laser1:wide-scan:state-txt . . . 158
laser1:wide-scan:output-channel . . . 158
laser1:wide-scan:scan-begin . . . 158
laser1:wide-scan:scan-end . . . 158
laser1:wide-scan:continuous-mode . . . 159
laser1:wide-scan:restore-on-end . . . 159
laser1:wide-scan:shape . . . 159
laser1:wide-scan:offset . . . 159
laser1:wide-scan:amplitude . . . 159
laser1:wide-scan:speed . . . 159
laser1:wide-scan:speed-min . . . 159
laser1:wide-scan:speed-max . . . 160
laser1:wide-scan:duration . . . 160
laser1:wide-scan:value-set . . . 160
laser1:wide-scan:value-act . . . 160
laser1:wide-scan:value-unit . . . 160
laser1:wide-scan:recorder-stepsize-set . . . 160
laser1:wide-scan:recorder-stepsize . . . 160
laser1:wide-scan:recorder-sample-count . . . 161
laser1:wide-scan:recorder-sampling-rate . . . 161
laser1:wide-scan:recorder-sampling-interval . . . 161
laser1:wide-scan:memory-size . . . 161
laser1:wide-scan:progress . . . 161
laser1:wide-scan:remaining-time . . . 161
laser1:wide-scan:trigger: . . . 161
laser1:wide-scan:trigger:input-enabled . . . 161
laser1:wide-scan:trigger:input-channel . . . 162
laser1:wide-scan:trigger:output-threshold . . . 162
laser1:wide-scan:start . . . 162
laser1:wide-scan:stop . . . 162
laser1:wide-scan:set-output-to-zoom-offset . . . 162
laser1:wide-scan:set-scan-range-to-zoom-range . . . 162
laser1:wide-scan:set-zoom-range-to-scan-range . . . 162
laser1:scope: . . . 163
laser1:scope:variant . . . 163
laser1:scope:update-rate . . . 163
laser1:scope:channel1: . . . 163

laser1:scope:channel1:signal . . . 163
laser1:scope:channel1:enabled . . . 164
laser1:scope:channel1:unit . . . 164
laser1:scope:channel1:name . . . 164
laser1:scope:channel2: . . . 164
laser1:scope:channelx: . . . 164
laser1:scope:channelx:xy-signal . . . 164
laser1:scope:channelx:scope-timescale . . . 165
laser1:scope:channelx:spectrum-range . . . 165
laser1:scope:channelx:spectrum-omit-dc . . . 165
laser1:scope:channelx:unit . . . 165
laser1:scope:channelx:name . . . 165
laser1:scope:timescale . . . 166
laser1:scope:data . . . 166
laser1:recorder: . . . 166
laser1:recorder:state . . . 166
laser1:recorder:state-txt . . . 166
laser1:recorder:enabled . . . 166
laser1:recorder:trigger-mode . . . 167
laser1:recorder:inputs: . . . 167
laser1:recorder:inputs:channel1: . . . 167
laser1:recorder:inputs:channel1:signal . . . 167
laser1:recorder:inputs:channel1:low-pass-filter: . . . 167
laser1:recorder:inputs:channel1:low-pass-filter:enabled . . . 168
laser1:recorder:inputs:channel1:low-pass-filter:cut-off-frequency 168
laser1:recorder:inputs:channel2: . . . 168
laser1:recorder:inputs:channelx: . . . 168
laser1:recorder:inputs:channelx:signal . . . 168
laser1:recorder:recording-mode . . . 168
laser1:recorder:recording-time . . . 169
laser1:recorder:sample-count-limit . . . 169
laser1:recorder:sample-count-set . . . 169
laser1:recorder:sample-count . . . 169
laser1:recorder:sampling-interval . . . 169
laser1:recorder:sampling-rate . . . 170
laser1:recorder:memory-size . . . 170
laser1:recorder:data: . . . 170
laser1:recorder:data:channel1: . . . 170
laser1:recorder:data:channel1:signal . . . 170
laser1:recorder:data:channel1:unit . . . 170
laser1:recorder:data:channel1:name . . . 170
laser1:recorder:data:channel2: . . . 171
laser1:recorder:data:channelx: . . . 171
laser1:recorder:data:zoom-data . . . 171

laser1:recorder:data:zoom-offset . . . 171
laser1:recorder:data:zoom-amplitude . . . 171
laser1:recorder:data:recorded-sampling-interval . . . 171
laser1:recorder:data:recorded-sample-count . . . 172
laser1:recorder:data:last-recorded-sample . . . 172
laser1:recorder:data:last-valid-sample . . . 172
laser1:recorder:data:memory-size . . . 172
laser1:recorder:data:zoom-out . . . 172
laser1:recorder:data:get-data . . . 172
laser1:recorder:data:show-data . . . 173
laser1:recorder:data:clear-data . . . 173
laser1:scan-aux: . . . 173
laser1:daq-connected . . . 174
laser1:nlo: . . . 174
laser1:nlo:servo: . . . 174
laser1:nlo:servo:ta1-hor: . . . 174
laser1:nlo:servo:ta1-hor:display-name . . . 174
laser1:nlo:servo:ta1-hor:enabled . . . 174
laser1:nlo:servo:ta1-hor:value . . . 175
laser1:nlo:servo:ta1-hor:center-servo . . . 175
laser1:nlo:servo:ta1-vert: . . . 175
laser1:nlo:servo:ta2-hor: . . . 175
laser1:nlo:servo:ta2-vert: . . . 175
laser1:nlo:servo:shg1-hor: . . . 175
laser1:nlo:servo:shg1-vert: . . . 175
laser1:nlo:servo:shg2-hor: . . . 176
laser1:nlo:servo:shg2-vert: . . . 176
laser1:nlo:servo:fhg1-hor: . . . 176
laser1:nlo:servo:fhg1-vert: . . . 176
laser1:nlo:servo:fhg2-hor: . . . 176
laser1:nlo:servo:fhg2-vert: . . . 176
laser1:nlo:servo:fiber1-hor: . . . 177
laser1:nlo:servo:fiber1-vert: . . . 177
laser1:nlo:servo:fiber2-hor: . . . 177
laser1:nlo:servo:fiber2-vert: . . . 177
laser1:nlo:servo:uv-outcpl: . . . 177
laser1:nlo:servo:uv-cryst: . . . 177
laser1:nlo:servo:uv-lens: . . . 177
laser1:nlo:servo:comp-hor: . . . 178
laser1:nlo:servo:comp-vert: . . . 178
laser1:nlo:servo:etalon: . . . 178
laser1:nlo:servo:center-ta-servos . . . 178
laser1:nlo:servo:center-shg-servos . . . 178
laser1:nlo:servo:center-fhg-servos . . . 178

laser1:nlo:servo:center-fiber-servos . . . 178
laser1:nlo:servo:center-all-servos . . . 179
laser1:nlo:servo:enable-all-servos . . . 179
laser1:nlo:servo:disable-all-servos . . . 179
laser1:nlo:pd: . . . 179
laser1:nlo:pd:dl: . . . 179
laser1:nlo:pd:amp: . . . 179
laser1:nlo:pd:fiber: . . . 179
laser1:nlo:pd:fiber:power . . . 180
laser1:nlo:pd:fiber:photodiode . . . 180
laser1:nlo:pd:fiber:cal-offset . . . 180
laser1:nlo:pd:fiber:cal-factor . . . 180
laser1:nlo:pd:shg: . . . 180
laser1:nlo:pd:shg-input: . . . 180
laser1:nlo:pd:shg-int: . . . 180
laser1:nlo:pd:shg-int:photodiode . . . 181
laser1:nlo:pd:shg-int:cal-offset . . . 181
laser1:nlo:pd:shg-pdh-dc: . . . 181
laser1:nlo:pd:shg-pdh-rf: . . . 181
laser1:nlo:pd:shg-pdh-rf:photodiode . . . 181
laser1:nlo:pd:shg-pdh-rf:gain . . . 181
laser1:nlo:pd:fhg: . . . 181
laser1:nlo:pd:fhg-int: . . . 182
laser1:nlo:pd:fhg-pdh-dc: . . . 182
laser1:nlo:pd:fhg-pdh-rf: . . . 182
laser1:nlo:pd:pump: . . . 182
laser1:nlo:pd:pump-dep: . . . 182
laser1:nlo:pd:sig: . . . 183
laser1:nlo:power-optimization: . . . 183
laser1:nlo:power-optimization:ongoing . . . 183
laser1:nlo:power-optimization:progress . . . 183
laser1:nlo:power-optimization:status . . . 183
laser1:nlo:power-optimization:status-string . . . 183
laser1:nlo:power-optimization:last-time-optimized . . . 184
laser1:nlo:power-optimization:shg-advanced . . . 184
laser1:nlo:power-optimization:stage1: . . . 184
laser1:nlo:power-optimization:stage1:input: . . . 184
laser1:nlo:power-optimization:stage1:input:value-calibrated . 184
laser1:nlo:power-optimization:stage1:progress . . . 184
laser1:nlo:power-optimization:stage1:optimization-allowed . . . 184
laser1:nlo:power-optimization:stage1:optimization-in-progress . . 185
laser1:nlo:power-optimization:stage1:restore-on-abort . . . 185
laser1:nlo:power-optimization:stage1:restore-on-regress . . . 185
laser1:nlo:power-optimization:stage1:regress-tolerance . . . 185

laser1:nlo:power-optimization:stage1:autosave-actuator-values . 185
laser1:nlo:power-optimization:stage1:start-optimization 185
laser1:nlo:power-optimization:stage2: 186
laser1:nlo:power-optimization:stage3: 186
laser1:nlo:power-optimization:stage4: 186
laser1:nlo:power-optimization:stage5: 186
laser1:nlo:power-optimization:low-power-threshold 186
laser1:nlo:power-optimization:progress-data-amp 186
laser1:nlo:power-optimization:progress-data-shg 187
laser1:nlo:power-optimization:progress-data-fiber 187
laser1:nlo:power-optimization:progress-data-fhg 187
laser1:nlo:power-optimization:abort 187
laser1:nlo:power-optimization:warm-up-active 187
laser1:nlo:power-optimization:start-optimization-all 187
laser1:nlo:power-optimization:start-optimization-amp 188
laser1:nlo:power-optimization:start-optimization-shg 188
laser1:nlo:power-optimization:start-optimization-fiber 188
laser1:nlo:power-optimization:start-optimization-fhg 188
laser1:nlo:power-optimization:start-warm-up 188
laser1:nlo:power-optimization:stop-warm-up 188
laser1:nlo:auto-nlo: 188
laser1:nlo:auto-nlo:automatic-mode 189
laser1:nlo:auto-nlo:laser-on 189
laser1:nlo:auto-nlo:emission 189
laser1:nlo:auto-nlo:operation-time-master 189
laser1:nlo:auto-nlo:operation-time-amplifier 189
laser1:nlo:auto-nlo:operation-time-cavity 189
laser1:nlo:auto-nlo:operation-time-cavity-fhg 189
laser1:nlo:auto-nlo:amplifier-current-margin 190
laser1:nlo:auto-nlo:amplifier-current-margin-alo 190
laser1:nlo:auto-nlo:conversion-efficiency 190
laser1:nlo:auto-nlo:conversion-efficiency-fhg 190
laser1:nlo:auto-nlo:wavelength-set 190
laser1:nlo:auto-nlo:wavelength 190
laser1:nlo:auto-nlo:temp-act-baseplate 190
laser1:nlo:auto-nlo:wavemeter: 190
laser1:nlo:auto-nlo:wavemeter:serial-number 191
laser1:nlo:auto-nlo:wavemeter:status 191
laser1:nlo:auto-nlo:wavemeter:status-txt 191
laser1:nlo:auto-nlo:wavemeter:wavelength-before-optimization . 191
laser1:nlo:auto-nlo:wavemeter:wavelength-after-optimization . . 191
laser1:nlo:auto-nlo:wavemeter:wavelength-temp-coeff 192
laser1:nlo:auto-nlo:wavemeter:exposure-time 192
laser1:nlo:auto-nlo:perform-single-mode-optimization 192

laser1:nlo:auto-nlo:perform-auto-align . . . 192
laser1:nlo:auto-nlo:reset-operation-time-cavity . . . 192
laser1:nlo:auto-nlo:reset-operation-time-cavity-fhg . . . 192
laser1:nlo:warm-up: . . . 192
laser1:nlo:warm-up:activated . . . 192
laser1:nlo:warm-up:start . . . 193
laser1:nlo:warm-up:stop . . . 193
laser1:nlo:shg: . . . 193
laser1:nlo:shg:tc: . . . 193
laser1:nlo:shg:cavity-tc: . . . 193
laser1:nlo:shg:pc: . . . 193
laser1:nlo:shg:scan: . . . 193
laser1:nlo:shg:scan:enabled . . . 194
laser1:nlo:shg:scan:frequency . . . 194
laser1:nlo:shg:scan:amplitude . . . 194
laser1:nlo:shg:scan:offset . . . 194
laser1:nlo:shg:scope: . . . 194
laser1:nlo:shg:scope:variant . . . 194
laser1:nlo:shg:scope:update-rate . . . 195
laser1:nlo:shg:scope:channel1: . . . 195
laser1:nlo:shg:scope:channel1:signal . . . 195
laser1:nlo:shg:scope:channel1:enabled . . . 195
laser1:nlo:shg:scope:channel1:unit . . . 195
laser1:nlo:shg:scope:channel1:name . . . 195
laser1:nlo:shg:scope:channel2: . . . 196
laser1:nlo:shg:scope:channelx: . . . 196
laser1:nlo:shg:scope:channelx:xy-signal . . . 196
laser1:nlo:shg:scope:channelx:scope-timescale . . . 196
laser1:nlo:shg:scope:channelx:spectrum-range . . . 196
laser1:nlo:shg:scope:channelx:spectrum-omit-dc . . . 196
laser1:nlo:shg:scope:channelx:unit . . . 197
laser1:nlo:shg:scope:channelx:name . . . 197
laser1:nlo:shg:scope:timescale . . . 197
laser1:nlo:shg:scope:data . . . 197
laser1:nlo:shg:lock: . . . 197
laser1:nlo:shg:lock:state . . . 197
laser1:nlo:shg:lock:state-txt . . . 197
laser1:nlo:shg:lock:lock-enabled . . . 198
laser1:nlo:shg:lock:pid-selection . . . 198
laser1:nlo:shg:lock:setpoint . . . 198
laser1:nlo:shg:lock:continuous-calc-pid . . . 198
laser1:nlo:shg:lock:relock: . . . 198
laser1:nlo:shg:lock:relock:enabled . . . 198
laser1:nlo:shg:lock:relock:frequency . . . 199

laser1:nlo:shg:lock:relock:amplitude . . . 199
laser1:nlo:shg:lock:relock:delay . . . 199
laser1:nlo:shg:lock:window: . . . 199
laser1:nlo:shg:lock:window:input-channel . . . 199
laser1:nlo:shg:lock:window:threshold . . . 199
laser1:nlo:shg:lock:window:level-hysteresis . . . 199
laser1:nlo:shg:lock:window:calibration: . . . 200
laser1:nlo:shg:lock:window:calibration:power-min . . . 200
laser1:nlo:shg:lock:window:calibration:power-max . . . 200
laser1:nlo:shg:lock:window:calibration:threshold-min . . . 200
laser1:nlo:shg:lock:window:calibration:threshold-max . . . 200
laser1:nlo:shg:lock:calibration: . . . 200
laser1:nlo:shg:lock:calibration:power-min . . . 200
laser1:nlo:shg:lock:calibration:power-max . . . 201
laser1:nlo:shg:lock:calibration:power-hysteresis . . . 201
laser1:nlo:shg:lock:calibration:pid2-all-min . . . 201
laser1:nlo:shg:lock:calibration:pid2-all-max . . . 201
laser1:nlo:shg:lock:calibration:pid2-p-min . . . 201
laser1:nlo:shg:lock:calibration:pid2-p-max . . . 201
laser1:nlo:shg:lock:calibration:pid1-all-min . . . 201
laser1:nlo:shg:lock:calibration:pid1-all-max . . . 202
laser1:nlo:shg:lock:calibration:pid1-p-min . . . 202
laser1:nlo:shg:lock:calibration:pid1-p-max . . . 202
laser1:nlo:shg:lock:calibration:analog-p-min . . . 202
laser1:nlo:shg:lock:calibration:analog-p-max . . . 202
laser1:nlo:shg:lock:calibration:shg-pdh-rf-gain-min . . . 202
laser1:nlo:shg:lock:calibration:shg-pdh-rf-gain-max . . . 202
laser1:nlo:shg:lock:calibration:lo-amplitude-min . . . 203
laser1:nlo:shg:lock:calibration:lo-amplitude-max . . . 203
laser1:nlo:shg:lock:calibration:threshold-min . . . 203
laser1:nlo:shg:lock:calibration:threshold-max . . . 203
laser1:nlo:shg:lock:pid1: . . . 203
laser1:nlo:shg:lock:pid1:gain: . . . 203
laser1:nlo:shg:lock:pid1:gain:all . . . 203
laser1:nlo:shg:lock:pid1:gain:p . . . 203
laser1:nlo:shg:lock:pid1:gain:i . . . 204
laser1:nlo:shg:lock:pid1:gain:d . . . 204
laser1:nlo:shg:lock:pid1:gain:i-cutoff . . . 204
laser1:nlo:shg:lock:pid1:gain:i-cutoff-enabled . . . 204
laser1:nlo:shg:lock:pid2: . . . 204
laser1:nlo:shg:lock:analog-dl-gain: . . . 204
laser1:nlo:shg:lock:analog-dl-gain:p-gain . . . 204
laser1:nlo:shg:lock:local-oscillator: . . . 205
laser1:nlo:shg:lock:local-oscillator:enabled . . . 205

laser1:nlo:shg:lock:local-oscillator:coupled-modulation 205
laser1:nlo:shg:lock:local-oscillator:use-fast-oscillator 205
laser1:nlo:shg:lock:local-oscillator:use-external-oscillator . . . 205
laser1:nlo:shg:lock:local-oscillator:amplitude 205
laser1:nlo:shg:lock:local-oscillator:attenuation-raw 206
laser1:nlo:shg:lock:local-oscillator:phase-shift 206
laser1:nlo:shg:lock:local-oscillator:auto-pdh-state 206
laser1:nlo:shg:lock:local-oscillator:auto-pdh 206
laser1:nlo:shg:lock:local-oscillator:auto-pdh-abort 206
laser1:nlo:shg:lock:cavity-fast-pzt-voltage 207
laser1:nlo:shg:lock:cavity-slow-pzt-voltage 207
laser1:nlo:shg:lock:background-trace 207
laser1:nlo:shg:lock:candidates 207
laser1:nlo:shg:factory-settings: 207
laser1:nlo:shg:factory-settings:modified 207
laser1:nlo:shg:factory-settings:tc: 208
laser1:nlo:shg:factory-settings:tc:temp-min 208
laser1:nlo:shg:factory-settings:tc:temp-max 208
laser1:nlo:shg:factory-settings:tc:temp-set 208
laser1:nlo:shg:factory-settings:tc:temp-roc-enabled 208
laser1:nlo:shg:factory-settings:tc:temp-roc-limit 208
laser1:nlo:shg:factory-settings:tc:current-max 208
laser1:nlo:shg:factory-settings:tc:current-min 208
laser1:nlo:shg:factory-settings:tc:p-gain 209
laser1:nlo:shg:factory-settings:tc:i-gain 209
laser1:nlo:shg:factory-settings:tc:d-gain 209
laser1:nlo:shg:factory-settings:tc:c-gain 209
laser1:nlo:shg:factory-settings:tc:ok-tolerance 209
laser1:nlo:shg:factory-settings:tc:ok-time 209
laser1:nlo:shg:factory-settings:tc:timeout 209
laser1:nlo:shg:factory-settings:tc:power-source 209
laser1:nlo:shg:factory-settings:tc:ntc-series-resistance 210
laser1:nlo:shg:factory-settings:cavity-tc: 210
laser1:nlo:shg:factory-settings:pc: 210
laser1:nlo:shg:factory-settings:pc:voltage-min 210
laser1:nlo:shg:factory-settings:pc:voltage-max 210
laser1:nlo:shg:factory-settings:pc:feedforward-enabled 210
laser1:nlo:shg:factory-settings:pc:feedforward-factor 210
laser1:nlo:shg:factory-settings:pc:capacitance 211
laser1:nlo:shg:factory-settings:pc:scan-offset 211
laser1:nlo:shg:factory-settings:pc:scan-amplitude 211
laser1:nlo:shg:factory-settings:pc:scan-frequency 211
laser1:nlo:shg:factory-settings:pd: 211
laser1:nlo:shg:factory-settings:pd:shg: 211

laser1:nlo:shg:factory-settings:pd:shg:cal-offset 211
laser1:nlo:shg:factory-settings:pd:shg:cal-factor 212
laser1:nlo:shg:factory-settings:pd:shg-input: 212
laser1:nlo:shg:factory-settings:pd:fiber: 212
laser1:nlo:shg:factory-settings:pd:int: 212
laser1:nlo:shg:factory-settings:pd:int:cal-offset 212
laser1:nlo:shg:factory-settings:pd:pdh-dc: 212
laser1:nlo:shg:factory-settings:pd:pdh-rf: 212
laser1:nlo:shg:factory-settings:pd:pdh-rf:gain 213
laser1:nlo:shg:factory-settings:lock: 213
laser1:nlo:shg:factory-settings:lock:pid-selection 213
laser1:nlo:shg:factory-settings:lock:setpoint 213
laser1:nlo:shg:factory-settings:lock:calibration: 213
laser1:nlo:shg:factory-settings:lock:relock: 213
laser1:nlo:shg:factory-settings:lock:relock:enabled 213
laser1:nlo:shg:factory-settings:lock:relock:frequency 214
laser1:nlo:shg:factory-settings:lock:relock:amplitude 214
laser1:nlo:shg:factory-settings:lock:relock:delay 214
laser1:nlo:shg:factory-settings:lock:window: 214
laser1:nlo:shg:factory-settings:lock:window:input-channel . 214
laser1:nlo:shg:factory-settings:lock:window:threshold . . . 214
laser1:nlo:shg:factory-settings:lock:window:level-hysteresis 214
laser1:nlo:shg:factory-settings:lock:pid1-gain: 214
laser1:nlo:shg:factory-settings:lock:pid1-gain:all 215
laser1:nlo:shg:factory-settings:lock:pid1-gain:p 215
laser1:nlo:shg:factory-settings:lock:pid1-gain:i 215
laser1:nlo:shg:factory-settings:lock:pid1-gain:d 215
laser1:nlo:shg:factory-settings:lock:pid1-gain:i-cutoff 215
laser1:nlo:shg:factory-settings:lock:pid1-gain:i-cutoff-enabled215
laser1:nlo:shg:factory-settings:lock:pid2-gain: 215
laser1:nlo:shg:factory-settings:lock:analog-p-gain 216
laser1:nlo:shg:factory-settings:lock:local-oscillator: 216
laser1:nlo:shg:factory-settings:lock:local-oscillator:enabled 216
laser1:nlo:shg:factory-settings:lock:local-oscillator:use-fast-oscillator 216
laser1:nlo:shg:factory-settings:lock:local-oscillator:coupled-modulation 216
laser1:nlo:shg:factory-settings:lock:local-oscillator:attenuation-shg-raw 216
laser1:nlo:shg:factory-settings:lock:local-oscillator:attenuation-fhg-raw 216
laser1:nlo:shg:factory-settings:lock:local-oscillator:phase-shift-shg 217

laser1:nlo:shg:factory-settings:lock:local-oscillator:phase-shift-fhg . . . 217
laser1:nlo:shg:factory-settings:auto-nlo: . . . 217
laser1:nlo:shg:factory-settings:auto-nlo:optimization-settings: 217
laser1:nlo:shg:factory-settings:auto-nlo:optimization-settings:pressure-compensation-enabled . . . 217
laser1:nlo:shg:factory-settings:auto-nlo:optimization-settings:auto-align-amplifier-enabled . . . 217
laser1:nlo:shg:factory-settings:auto-nlo:optimization-settings:auto-align-cavity-enabled . . . 217
laser1:nlo:shg:factory-settings:auto-nlo:optimization-settings:auto-align-advanced-enabled . . . 218
laser1:nlo:shg:factory-settings:apply . . . 218
laser1:nlo:shg:factory-settings:retrieve-now . . . 218
laser1:nlo:shg:store . . . 218
laser1:nlo:shg:restore . . . 218
laser1:nlo:fhg: . . . 218
laser1:nlo:fhg:tc: . . . 219
laser1:nlo:fhg:cavity-tc: . . . 219
laser1:nlo:fhg:pc: . . . 219
laser1:nlo:fhg:scan: . . . 219
laser1:nlo:fhg:scope: . . . 219
laser1:nlo:fhg:lock: . . . 219
laser1:nlo:fhg:lock:state . . . 220
laser1:nlo:fhg:lock:state-txt . . . 220
laser1:nlo:fhg:lock:lock-enabled . . . 220
laser1:nlo:fhg:lock:pid-selection . . . 220
laser1:nlo:fhg:lock:setpoint . . . 220
laser1:nlo:fhg:lock:relock: . . . 220
laser1:nlo:fhg:lock:window: . . . 221
laser1:nlo:fhg:lock:pid1: . . . 221
laser1:nlo:fhg:lock:pid2: . . . 221
laser1:nlo:fhg:lock:local-oscillator: . . . 221
laser1:nlo:fhg:lock:local-oscillator:enabled . . . 221
laser1:nlo:fhg:lock:local-oscillator:coupled-modulation . . . 221
laser1:nlo:fhg:lock:local-oscillator:use-fast-oscillator . . . 222
laser1:nlo:fhg:lock:local-oscillator:amplitude . . . 222
laser1:nlo:fhg:lock:local-oscillator:attenuation-raw . . . 222
laser1:nlo:fhg:lock:local-oscillator:phase-shift . . . 222
laser1:nlo:fhg:lock:local-oscillator:auto-pdh-state . . . 222
laser1:nlo:fhg:lock:local-oscillator:auto-pdh . . . 223
laser1:nlo:fhg:lock:local-oscillator:auto-pdh-abort . . . 223
laser1:nlo:fhg:lock:cavity-fast-pzt-voltage . . . 223
laser1:nlo:fhg:lock:cavity-slow-pzt-voltage . . . 223

laser1:nlo:fhg:lock:background-trace . . . 223
laser1:nlo:fhg:lock:candidates . . . 223
laser1:nlo:fhg:factory-settings: . . . 224
laser1:nlo:fhg:factory-settings:modified . . . 224
laser1:nlo:fhg:factory-settings:tc: . . . 224
laser1:nlo:fhg:factory-settings:cavity-tc: . . . 224
laser1:nlo:fhg:factory-settings:pc: . . . 224
laser1:nlo:fhg:factory-settings:pd: . . . 224
laser1:nlo:fhg:factory-settings:pd:fhg: . . . 224
laser1:nlo:fhg:factory-settings:pd:int: . . . 225
laser1:nlo:fhg:factory-settings:pd:pdh-dc: . . . 225
laser1:nlo:fhg:factory-settings:pd:pdh-rf: . . . 225
laser1:nlo:fhg:factory-settings:lock: . . . 225
laser1:nlo:fhg:factory-settings:apply . . . 225
laser1:nlo:fhg:factory-settings:retrieve-now . . . 225
laser1:nlo:fhg:store . . . 225
laser1:nlo:fhg:restore . . . 226
laser1:nlo:opo: . . . 226
laser1:nlo:opo:crystal: . . . 226
laser1:nlo:opo:crystal:tc: . . . 226
laser1:nlo:opo:cavity: . . . 226
laser1:nlo:opo:cavity:tc: . . . 226
laser1:nlo:opo:cavity:pc: . . . 226
laser1:nlo:opo:cavity:pc-fast: . . . 227
laser1:nlo:opo:cavity:pc-fast:voltage-set . . . 227
laser1:nlo:opo:cavity:pc-fast:voltage-min . . . 227
laser1:nlo:opo:cavity:pc-fast:voltage-max . . . 227
laser1:nlo:opo:cavity:pc-fast:external-input: . . . 227
laser1:nlo:opo:cavity:pc-fast:voltage-act . . . 227
laser1:nlo:opo:cavity:pc-fast:status . . . 227
laser1:nlo:opo:cavity:pc-fast:status-txt . . . 228
laser1:nlo:opo:cavity:fast-pzt-voltage-set . . . 228
laser1:nlo:opo:cavity:slow-pzt-voltage-set . . . 228
laser1:nlo:opo:cavity:motor: . . . 228
laser1:nlo:opo:cavity:motor:enabled . . . 228
laser1:nlo:opo:cavity:motor:position-set . . . 228
laser1:nlo:opo:cavity:motor:position-act . . . 228
laser1:nlo:opo:cavity:motor:position-min . . . 228
laser1:nlo:opo:cavity:motor:position-max . . . 229
laser1:nlo:opo:cavity:motor:recalibrate . . . 229
laser1:nlo:opo:factory-settings: . . . 229
laser1:nlo:opo:factory-settings:modified . . . 229
laser1:nlo:opo:factory-settings:crystal-tc: . . . 229
laser1:nlo:opo:factory-settings:cavity-tc: . . . 229

laser1:nlo:opo:factory-settings:cavity-pc: . . . 229
laser1:nlo:opo:factory-settings:pd: . . . 230
laser1:nlo:opo:factory-settings:pd:pump: . . . 230
laser1:nlo:opo:factory-settings:pd:pump-dep: . . . 230
laser1:nlo:opo:factory-settings:pd:sig: . . . 230
laser1:nlo:opo:factory-settings:pd:fiber: . . . 230
laser1:nlo:opo:factory-settings:apply . . . 230
laser1:nlo:opo:factory-settings:retrieve-now . . . 231
laser1:nlo:opo:store . . . 231
laser1:nlo:opo:restore . . . 231
laser1:nlo:ssw-ver . . . 231
laser1:uv: . . . 231
laser1:uv:pump: . . . 231
laser1:uv:eom: . . . 231
laser1:uv:eom:tc: . . . 231
laser1:uv:cavity: . . . 232
laser1:uv:cavity:tc: . . . 232
laser1:uv:cavity:pc: . . . 232
laser1:uv:crystal: . . . 232
laser1:uv:crystal:tc: . . . 232
laser1:uv:crystal:optics-shifters: . . . 232
laser1:uv:crystal:optics-shifters:current-spot . . . 233
laser1:uv:crystal:optics-shifters:remaining-spots . . . 233
laser1:uv:servo: . . . 233
laser1:uv:servo:shg1-hor: . . . 233
laser1:uv:servo:shg1-vert: . . . 233
laser1:uv:servo:shg2-hor: . . . 233
laser1:uv:servo:shg2-vert: . . . 233
laser1:uv:servo:hwp: . . . 234
laser1:uv:servo:lens: . . . 234
laser1:uv:servo:outcpl: . . . 234
laser1:uv:servo:cryst: . . . 234
laser1:uv:servo:comp-hor: . . . 234
laser1:uv:servo:comp-vert: . . . 234
laser1:uv:pd: . . . 235
laser1:uv:pd:shg: . . . 235
laser1:uv:pd:pdh-rf: . . . 235
laser1:uv:pd:pdh-dc: . . . 235
laser1:uv:power-optimization: . . . 235
laser1:uv:power-optimization:ongoing . . . 235
laser1:uv:power-optimization:status . . . 235
laser1:uv:power-optimization:status-string . . . 236
laser1:uv:power-optimization:cavity: . . . 236
laser1:uv:power-optimization:progress-data . . . 236

laser1:uv:power-optimization:abort . . . 236
laser1:uv:power-stabilization: . . . 236
laser1:uv:power-stabilization:enabled . . . 236
laser1:uv:power-stabilization:gain: . . . 236
laser1:uv:power-stabilization:gain:all . . . 236
laser1:uv:power-stabilization:gain:p . . . 237
laser1:uv:power-stabilization:gain:i . . . 237
laser1:uv:power-stabilization:gain:d . . . 237
laser1:uv:power-stabilization:power-set . . . 237
laser1:uv:power-stabilization:power-act . . . 237
laser1:uv:power-stabilization:power-min . . . 237
laser1:uv:power-stabilization:power-max . . . 237
laser1:uv:power-stabilization:state . . . 238
laser1:uv:power-stabilization:update-strategy . . . 238
laser1:uv:optimization-settings: . . . 238
laser1:uv:optimization-settings:single-mode-optimization . . . 238
laser1:uv:optimization-settings:automatic-optics-shift . . . 238
laser1:uv:scan: . . . 239
laser1:uv:scope: . . . 239
laser1:uv:lock: . . . 239
laser1:uv:factory-settings: . . . 239
laser1:uv:factory-settings:eom-tc: . . . 239
laser1:uv:factory-settings:crystal-tc: . . . 239
laser1:uv:factory-settings:cavity-tc: . . . 239
laser1:uv:factory-settings:pc: . . . 240
laser1:uv:factory-settings:pd: . . . 240
laser1:uv:factory-settings:pd:shg: . . . 240
laser1:uv:factory-settings:pd:pdh-rf: . . . 240
laser1:uv:factory-settings:pd:pdh-dc: . . . 240
laser1:uv:factory-settings:lock: . . . 240
laser1:uv:factory-settings:modified . . . 241
laser1:uv:factory-settings:apply . . . 241
laser1:uv:factory-settings:retrieve-now . . . 241
laser1:uv:status-parameters: . . . 241
laser1:uv:status-parameters:baseplate-temperature-limit . . . 241
laser1:uv:status-parameters:temperature-settle-time . . . 241
laser1:uv:status-parameters:pump-lock-settle-time . . . 241
laser1:uv:status-parameters:settle-down-delay . . . 242
laser1:uv:status-parameters:power-margin-tolerance-time . . . 242
laser1:uv:status-parameters:power-margin-threshold . . . 242
laser1:uv:status-parameters:cavity-lock-settle-time . . . 242
laser1:uv:status-parameters:cavity-lock-tolerance-factor . . . 242
laser1:uv:status-parameters:power-lock-settle-time . . . 242
laser1:uv:status-parameters:cavity-scan-duration . . . 242

laser1:uv:status-parameters:power-stabilization-strategy 243
laser1:uv:status-parameters:power-stabilization-level-low-factor . . 243
laser1:uv:status-parameters:power-output-relative-error-max 243
laser1:uv:status-parameters:power-output-relative-deviation-max . 243
laser1:uv:status-parameters:operational-pump-power 243
laser1:uv:status-parameters:degradation-detection-slope-threshold . 243
laser1:uv:status-parameters:degradation-detection-measurement-interval244
laser1:uv:status-parameters:degradation-detection-number-of-measurements244
laser1:uv:status-parameters:idle-alignment-option 244
laser1:uv:power-margin 244
laser1:uv:hwp-transmittance 244
laser1:uv:status 244
laser1:uv:status-txt 245
laser1:uv:specs-fulfilled 245
laser1:uv:error 245
laser1:uv:error-txt 245
laser1:uv:operation-time 245
laser1:uv:remaining-optics-spots 245
laser1:uv:baseplate-temperature 245
laser1:uv:ssw-ver 246
laser1:uv:store 246
laser1:uv:restore 246
laser1:uv:perform-optimization 246
laser1:uv:perform-optics-shift 246
laser1:uv:clear-errors 246
laser1:pd-ext: 246
laser1:pd-ext:input-channel 247
laser1:pd-ext:photodiode 247
laser1:pd-ext:power 247
laser1:pd-ext:cal-offset 247
laser1:pd-ext:cal-factor 247
laser1:power-stabilization: 247
laser1:power-stabilization:enabled 247
laser1:power-stabilization:gain: 247
laser1:power-stabilization:sign 248
laser1:power-stabilization:input-channel 248
laser1:power-stabilization:setpoint 248
laser1:power-stabilization:window: 248
laser1:power-stabilization:window:enabled 248
laser1:power-stabilization:window:level-low 248
laser1:power-stabilization:window:level-hysteresis 249
laser1:power-stabilization:hold-output-on-unlock 249
laser1:power-stabilization:output-channel 249
laser1:power-stabilization:input-channel-value-act 249

laser1:power-stabilization:state . . . 249
laser1:power-stabilization:feedforward-enabled . . . 250
laser1:power-stabilization:feedforward-factor . . . 250
laser1:hf-cavity: . . . 250
laser1:hf-cavity:tc1: . . . 250
laser1:hf-cavity:tc2: . . . 250
laser1:hf-cavity:factory-settings: . . . 250
laser1:hf-cavity:factory-settings:tc1: . . . 251
laser1:hf-cavity:factory-settings:tc2: . . . 251
laser1:hf-cavity:factory-settings:last-modified . . . 251
laser1:hf-cavity:factory-settings:modified . . . 251
laser1:hf-cavity:factory-settings:apply . . . 251
laser1:hf-cavity:factory-settings:retrieve-now . . . 251
laser1:hf-cavity:store . . . 251
laser1:hf-cavity:restore . . . 252
laser1:config: . . . 252
laser1:config:source . . . 253
laser1:config:product-name . . . 253
laser1:config:date . . . 253
laser1:config:caption . . . 253
laser1:config:pristine . . . 253
laser1:config:load . . . 253
laser1:config:save . . . 254
laser1:config:import . . . 254
laser1:config:export . . . 254
laser1:config:retrieve . . . 254
laser1:config:apply . . . 255
laser1:config:show . . . 255
laser1:config:list . . . 255
laser1:diagnosis: . . . 255
laser1:diagnosis:ready . . . 255
laser1:diagnosis:options: . . . 255
laser1:diagnosis:options:servo-test . . . 256
laser1:diagnosis:options:servo-stepsize . . . 256
laser1:diagnosis:options:motor-test . . . 256
laser1:diagnosis:options:piezo-test . . . 256
laser1:diagnosis:start . . . 256
laser1:diagnosis:print-result . . . 256
laser1:diagnosis:execute . . . 256
laser1:diagnosis:generate-to-usb . . . 257
laser1:components: . . . 257
laser1:save . . . 257
laser1:load . . . 257
laser1:load-head . . . 257

laser2: . . . 257
laser3: . . . 257
laser4: . . . 258
laser-common: . . . 258
laser-common:scan: . . . 258
laser-common:scan:sync-laser1 . . . 258
laser-common:scan:sync-laser2 . . . 258
laser-common:scan:sync-laser3 . . . 258
laser-common:scan:sync-laser4 . . . 258
laser-common:scan:frequency . . . 259
laser-common:scan:sync . . . 259
laser-common:scan:save . . . 259
laser-common:scan:load . . . 259
laser-common:ampcc-load: . . . 259
laser-common:ampcc-load:potential-load-total . . . 259
laser-common:ampcc-load:potential-load-enabled . . . 260
laser-common:ampcc-load:load-max . . . 260
laser-common:ampcc-load:load-ok . . . 260
laser-common:save-all . . . 260
laser-common:load-all . . . 260
laser-common:store-all . . . 260
laser-common:restore-all . . . 260
laser-common:apply-all . . . 261
laser-common:retrieve-all . . . 261
uv: . . . 261
uv:laser-on . . . 261
uv:emission . . . 261
uv:status . . . 261
uv:status-txt . . . 262
uv:specs-fulfilled . . . 262
uv:error . . . 262
uv:error-txt . . . 262
uv:operation-time-pump . . . 262
uv:operation-time-uv . . . 262
uv:pump-power-margin . . . 263
uv:remaining-optics-spots . . . 263
uv:power-set . . . 263
uv:power-act . . . 263
uv:baseplate-temperature . . . 263
uv:idle-mode . . . 263
uv:idle-alignment-option . . . 263
uv:optimization-settings: . . . 264
uv:perform-optimization . . . 264
uv:perform-optics-shift . . . 264

uv:clear-errors . . . 264
auto-nlo: . . . 264
auto-nlo:automatic-mode . . . 264
auto-nlo:serial-number . . . 264
auto-nlo:fw-ver . . . 264
auto-nlo:fw-ver-valid . . . 265
auto-nlo:customer . . . 265
auto-nlo:laser-on . . . 265
auto-nlo:emission . . . 265
auto-nlo:status . . . 265
auto-nlo:status-txt . . . 266
auto-nlo:error . . . 266
auto-nlo:error-txt . . . 266
auto-nlo:locked-cavity . . . 266
auto-nlo:locked-cavity-fhg . . . 266
auto-nlo:operation-time-master . . . 266
auto-nlo:operation-time-amplifier . . . 266
auto-nlo:operation-time-cavity . . . 267
auto-nlo:operation-time-cavity-fhg . . . 267
auto-nlo:current-set-master . . . 267
auto-nlo:current-act-master . . . 267
auto-nlo:current-set-amplifier . . . 267
auto-nlo:current-act-amplifier . . . 267
auto-nlo:power-act-master . . . 267
auto-nlo:power-act-amplifier . . . 267
auto-nlo:power-act-shg . . . 268
auto-nlo:power-act-fhg . . . 268
auto-nlo:temp-set-master . . . 268
auto-nlo:temp-act-master . . . 268
auto-nlo:temp-set-amplifier . . . 268
auto-nlo:temp-act-amplifier . . . 268
auto-nlo:temp-set-crystal . . . 268
auto-nlo:temp-act-crystal . . . 268
auto-nlo:temp-set-cavity . . . 269
auto-nlo:temp-act-cavity . . . 269
auto-nlo:temp-set-crystal-fhg . . . 269
auto-nlo:temp-act-crystal-fhg . . . 269
auto-nlo:temp-set-cavity-fhg . . . 269
auto-nlo:temp-act-cavity-fhg . . . 269
auto-nlo:temp-act-baseplate . . . 269
auto-nlo:voltage-set-master . . . 270
auto-nlo:voltage-act-master . . . 270
auto-nlo:voltage-act-shg . . . 270
auto-nlo:air-pressure . . . 270

auto-nlo:amplifier-current-margin . . . 270
auto-nlo:amplifier-current-margin-alo . . . 270
auto-nlo:conversion-efficiency . . . 270
auto-nlo:conversion-efficiency-fhg . . . 270
auto-nlo:master-noise . . . 271
auto-nlo:power-set . . . 271
auto-nlo:power-act . . . 271
auto-nlo:wavelength-set . . . 271
auto-nlo:wavelength-set-min . . . 271
auto-nlo:wavelength-set-max . . . 271
auto-nlo:wavelength . . . 271
auto-nlo:idle-mode . . . 271
auto-nlo:wavemeter: . . . 272
auto-nlo:power-stabilization-settings: . . . 272
auto-nlo:power-stabilization-settings:power-min . . . 272
auto-nlo:power-stabilization-settings:power-max . . . 272
auto-nlo:power-stabilization-settings:amplifier-initial-current . . . 272
auto-nlo:power-stabilization-settings:gain: . . . 272
auto-nlo:optimization-settings: . . . 272
auto-nlo:optimization-settings:pressure-compensation . . . 273
auto-nlo:optimization-settings:auto-align-amplifier . . . 273
auto-nlo:optimization-settings:auto-align-cavity . . . 273
auto-nlo:optimization-settings:auto-align-include-advanced . . . 273
auto-nlo:optimization-settings:single-mode-optimization . . . 273
auto-nlo:optimization-settings:optimize-after-standby . . . 273
auto-nlo:optimization-settings:power-balance-optimization . . . 273
auto-nlo:optimization-settings:cbc-lockpoint-optimization . . . 273
auto-nlo:optimization-progress . . . 274
auto-nlo:last-time-auto-align . . . 274
auto-nlo:last-time-single-mode-optimization . . . 274
auto-nlo:single-mode-optimization-valid . . . 274
auto-nlo:single-mode-algorithm . . . 274
auto-nlo:perform-optimization . . . 275
auto-nlo:perform-warm-up . . . 275
auto-nlo:abort-warm-up . . . 275
auto-nlo:reset-operation-time-cavity . . . 275
auto-nlo:reset-operation-time-cavity-fhg . . . 275
auto-nlo:clear-errors . . . 275
cc1: . . . 275
cc1:slot . . . 276
cc1:serial-number . . . 276
cc1:revision . . . 276
cc1:fpga-fw-ver . . . 276
cc1:board-temp . . . 276

cc1:variant . . . 276
cc1:parallel-mode . . . 276
cc1:smc-support . . . 277
cc1:status . . . 277
cc1:status-txt . . . 277
cc1:channel1: . . . 277
cc1:channel2: . . . 278
cc2: . . . 278
cc3: . . . 278
cc4: . . . 278
ampcc1: . . . 278
ampcc1:slot . . . 278
ampcc1:serial-number . . . 278
ampcc1:revision . . . 279
ampcc1:fpga-fw-ver . . . 279
ampcc1:board-temp . . . 279
ampcc1:variant . . . 279
ampcc1:parallel-mode . . . 279
ampcc1:inverter-temp . . . 279
ampcc1:inverter-temp-fuse . . . 279
ampcc1:regulator-temp . . . 280
ampcc1:regulator-temp-fuse . . . 280
ampcc1:power-15v . . . 280
ampcc1:status . . . 280
ampcc1:status-txt . . . 280
ampcc1:channel1: . . . 281
ampcc1:channel1:path . . . 281
ampcc1:channel1:variant . . . 281
ampcc1:channel1:enabled . . . 281
ampcc1:channel1:emission . . . 281
ampcc1:channel1:current-set . . . 282
ampcc1:channel1:current-offset . . . 282
ampcc1:channel1:external-input: . . . 282
ampcc1:channel1:output-filter: . . . 282
ampcc1:channel1:current-act . . . 282
ampcc1:channel1:current-out . . . 282
ampcc1:channel1:current-clip . . . 283
ampcc1:channel1:current-clip-tuning . . . 283
ampcc1:channel1:use-current-clip-tuning . . . 283
ampcc1:channel1:current-clip-free-run . . . 283
ampcc1:channel1:using-current-clip-free-run . . . 283
ampcc1:channel1:current-clip-limit . . . 283
ampcc1:channel1:voltage-act . . . 284
ampcc1:channel1:voltage-out . . . 284

ampcc1:channel1:voltage-clip . . . 284
ampcc1:channel1:potential-load . . . 284
ampcc1:channel1:feedforward-master . . . 284
ampcc1:channel1:feedforward-enabled . . . 284
ampcc1:channel1:feedforward-factor . . . 285
ampcc1:channel1:aux . . . 285
ampcc1:channel1:status . . . 285
ampcc1:channel1:status-txt . . . 286
ampcc1:channel1:forced-off . . . 286
ampcc2: . . . 286
hcc1: . . . 286
hcc1:slot . . . 286
hcc1:serial-number . . . 286
hcc1:revision . . . 286
hcc1:fpga-fw-ver . . . 287
hcc1:board-temp . . . 287
hcc1:variant . . . 287
hcc1:inverter-temp . . . 287
hcc1:regulator-temp . . . 287
hcc1:status . . . 287
hcc1:status-txt . . . 288
hcc1:channel1: . . . 288
hcc1:channel1:path . . . 288
hcc1:channel1:variant . . . 288
hcc1:channel1:enabled . . . 288
hcc1:channel1:emission . . . 288
hcc1:channel1:current-set . . . 289
hcc1:channel1:current-offset . . . 289
hcc1:channel1:external-input: . . . 289
hcc1:channel1:output-filter: . . . 289
hcc1:channel1:polarity-txt . . . 290
hcc1:channel1:current-act . . . 290
hcc1:channel1:current-out . . . 290
hcc1:channel1:current-clip . . . 290
hcc1:channel1:current-clip-tuning . . . 290
hcc1:channel1:use-current-clip-tuning . . . 290
hcc1:channel1:current-clip-free-run . . . 290
hcc1:channel1:using-current-clip-free-run . . . 291
hcc1:channel1:current-clip-limit . . . 291
hcc1:channel1:voltage-act . . . 291
hcc1:channel1:voltage-out . . . 291
hcc1:channel1:voltage-clip . . . 291
hcc1:channel1:potential-load . . . 291
hcc1:channel1:feedforward-master . . . 292

hcc1:channel1:feedforward-enabled . . . 292
hcc1:channel1:feedforward-factor . . . 292
hcc1:channel1:status . . . 292
hcc1:channel1:status-txt . . . 293
hcc1:channel1:forced-off . . . 293
hcc2: . . . 293
cbc: . . . 293
cbc:node-id . . . 293
cbc:serial-number . . . 293
cbc:revision . . . 294
cbc:fw-ver . . . 294
cbc:cbc-scheme . . . 294
cbc:status . . . 294
cbc:status-txt . . . 294
cbc:board: . . . 294
cbc:board:pid: . . . 294
cbc:board:pid:enabled . . . 294
cbc:board:pid:relock-enabled . . . 295
cbc:board:pid:setpoint . . . 295
cbc:board:pid:output-value . . . 295
cbc:board:pwm-tim1: . . . 295
cbc:board:pwm-tim1:phase1 . . . 295
cbc:board:pwm-tim1:neg-polarity1 . . . 295
cbc:board:polarization: . . . 295
cbc:board:polarization:pd-inputs: . . . 295
cbc:board:polarization:pd-inputs:offset-pd1 . . . 296
cbc:board:polarization:pd-inputs:offset-pd2 . . . 296
cbc:board:polarization:value-pd1 . . . 296
cbc:board:polarization:value-pd2 . . . 296
cbc:board:scope: . . . 296
cbc:board:scope:enabled . . . 296
cbc:board:scope:channel1: . . . 296
cbc:board:scope:channel1:enabled . . . 296
cbc:board:scope:channel1:input . . . 297
cbc:board:scope:channel2: . . . 297
cbc:board:scope:channel3: . . . 297
cbc:board:scope:timescale . . . 297
cbc:board:scope:data . . . 297
cbc:board:temp-act-baseplate . . . 297
cbc:power-balance: . . . 297
cbc:power-balance:current-factor-taper1 . . . 298
cbc:power-balance:current-factor-taper2 . . . 298
cbc:power-balance:ongoing . . . 298
cbc:power-balance:optimize . . . 298

cbc:lock-track: . . . 298
cbc:lock-track:tracking-enabled . . . 298
cbc:lock-track:disable-current-jump . . . 298
cbc:lock-search: . . . 299
cbc:lock-search:settings: . . . 299
cbc:lock-search:settings:inverted-phase . . . 299
cbc:lock-search:settings:target-channel . . . 299
cbc:lock-search:settings:cbc-time . . . 299
cbc:lock-search:settings:power-time . . . 299
cbc:lock-search:settings:increase-current . . . 300
cbc:lock-search:searching . . . 300
cbc:lock-search:execute . . . 300
cbc:lock-search:abort . . . 300
pc1: . . . 300
pc1:slot . . . 300
pc1:serial-number . . . 301
pc1:revision . . . 301
pc1:variant . . . 301
pc1:channel-count . . . 301
pc1:fpga-fw-ver . . . 301
pc1:status . . . 301
pc1:status-txt . . . 301
pc1:channel1: . . . 301
pc1:channel2: . . . 302
pc2: . . . 302
pc3: . . . 302
tc1: . . . 302
tc1:slot . . . 302
tc1:serial-number . . . 302
tc1:revision . . . 303
tc1:fpga-fw-ver . . . 303
tc1:channel-count . . . 303
tc1:board-temp . . . 303
tc1:channel1: . . . 303
tc1:channel1b: . . . 303
tc1:channel2: . . . 304
tc1:channel2b: . . . 304
tc2: . . . 304
mc: . . . 304
mc:serial-number . . . 304
mc:revision . . . 304
mc:fpga-type . . . 304
mc:fpga-fw-ver . . . 305
mc:board-temp . . . 305

mc:relative-humidity . . . 305
mc:air-pressure . . . 305
io: . . . 305
io:serial-number . . . 305
io:revision . . . 305
io:fpga-fw-ver . . . 306
io:fine-1: . . . 306
io:fine-1:value-act . . . 306
io:fine-2: . . . 306
io:fast-3: . . . 306
io:fast-4: . . . 306
io:out-a: . . . 306
io:out-a:voltage-set . . . 306
io:out-a:voltage-act . . . 307
io:out-a:voltage-offset . . . 307
io:out-a:voltage-enabled . . . 307
io:out-a:voltage-min . . . 307
io:out-a:voltage-max . . . 307
io:out-a:signal-monitor: . . . 307
io:out-a:signal-monitor:signal . . . 308
io:out-a:signal-monitor:operating-point . . . 308
io:out-a:signal-monitor:factor . . . 308
io:out-a:signal-monitor:enabled . . . 308
io:out-a:output-filter: . . . 308
io:out-a:linked-laser . . . 308
io:out-a:feedforward-master . . . 308
io:out-a:feedforward-enabled . . . 309
io:out-a:feedforward-factor . . . 309
io:out-a:status . . . 309
io:out-a:status-txt . . . 309
io:out-b: . . . 309
io:digital-in0: . . . 310
io:digital-in0:value-act . . . 310
io:digital-in1: . . . 310
io:digital-in2: . . . 310
io:digital-in3: . . . 310
io:digital-out0: . . . 310
io:digital-out0:value-act . . . 310
io:digital-out0:value-set . . . 311
io:digital-out0:mode . . . 311
io:digital-out0:linked-laser . . . 311
io:digital-out0:invert . . . 311
io:digital-out1: . . . 311
io:digital-out2: . . . 311

io:digital-out3: . . . 312
io:save . . . 312
io:load . . . 312
si: . . . 312
si:serial-number . . . 312
si:revision . . . 312
si:si1-input-signal . . . 312
si:si2-enabled . . . 313
power-supply: . . . 313
power-supply:type . . . 313
power-supply:serial-number . . . 313
power-supply:revision . . . 313
power-supply:board-temp . . . 313
power-supply:heatsink-temp . . . 313
power-supply:current-5V . . . 313
power-supply:current-15V . . . 314
power-supply:current-15Vn . . . 314
power-supply:voltage-5V . . . 314
power-supply:voltage-15V . . . 314
power-supply:voltage-15Vn . . . 314
power-supply:voltage-3V3 . . . 314
power-supply:load . . . 314
power-supply:status . . . 314
power-supply:status-txt . . . 315
buzzer: . . . 315
buzzer:welcome . . . 315
buzzer:sounds: . . . 315
buzzer:sounds:on-connection . . . 315
buzzer:play-welcome . . . 315
buzzer:play . . . 316
buzzer:save . . . 316
buzzer:load . . . 316
display: . . . 316
display:brightness . . . 316
display:auto-dark . . . 316
display:idle-timeout . . . 316
display:state . . . 317
display:save . . . 317
display:load . . . 317
display:update-state . . . 317
standby: . . . 317
standby:enabled . . . 317
standby:state . . . 318
standby:laser1: . . . 318

standby:laser1:dl: . . . 318
standby:laser1:dl:disable-pc . . . 318
standby:laser1:dl:disable-cc . . . 318
standby:laser1:dl:disable-tc . . . 318
standby:laser1:dl:disable-eom . . . 319
standby:laser1:amp: . . . 319
standby:laser1:amp:disable-cc . . . 319
standby:laser1:amp:disable-tc . . . 319
standby:laser1:ctl: . . . 319
standby:laser1:ctl:disable . . . 319
standby:laser1:nlo: . . . 319
standby:laser1:nlo:disable-pc . . . 319
standby:laser1:nlo:disable-tc . . . 320
standby:laser1:nlo:disable-servo-subsystem . . . 320
standby:laser1:nlo:disable-power-stabilization . . . 320
standby:laser1:nlo:disable-cavity-lock . . . 320
standby:laser2: . . . 320
standby:laser2:dl: . . . 320
standby:laser2:amp: . . . 320
standby:laser3: . . . 321
standby:laser3:dl: . . . 321
standby:laser4: . . . 321
pdh1: . . . 321
pdh1:slot . . . 321
pdh1:serial-number . . . 321
pdh1:revision . . . 321
pdh1:fpga-fw-ver . . . 321
pdh1:board-temp . . . 322
pdh1:status . . . 322
pdh1:status-txt . . . 322
pdh1:channel1: . . . 322
pdh1:channel1:label . . . 322
pdh1:channel1:modulation-enabled . . . 322
pdh1:channel1:use-fast-oscillator . . . 322
pdh1:channel1:modulation-amplitude-dbm . . . 323
pdh1:channel1:modulation-amplitude-vpp . . . 323
pdh1:channel1:lo-output-amplitude-dbm . . . 323
pdh1:channel1:lo-output-amplitude-vpp . . . 323
pdh1:channel1:lo-output-enabled . . . 323
pdh1:channel1:phase-shift . . . 323
pdh1:channel1:input-level-max . . . 323
pdh1:channel1:lock-level . . . 324
pdh1:channel1:auto-pdh: . . . 324
pdh1:channel2: . . . 324

pdh1:save . . . 324
pdh1:load . . . 324
pdh2: . . . 324
falc1: . . . 325
falc1:node-id . . . 325
falc1:serial-number . . . 325
falc1:label . . . 325
falc1:model . . . 325
falc1:revision . . . 325
falc1:boot-ver . . . 325
falc1:fw-ver . . . 326
falc1:mcu-temp . . . 326
falc1:status . . . 326
falc1:status-txt . . . 326
falc1:input: . . . 326
falc1:input:gain . . . 327
falc1:input:offset . . . 327
falc1:mon: . . . 327
falc1:mon:config . . . 327
falc1:unlim: . . . 327
falc1:unlim:enabled . . . 327
falc1:unlim:hold . . . 327
falc1:unlim:sign . . . 328
falc1:unlim:slew-rate . . . 328
falc1:unlim:gain . . . 328
falc1:unlim:output-range . . . 328
falc1:unlim:input-offset . . . 328
falc1:unlim:lock-state . . . 328
falc1:unlim:hold-state . . . 329
falc1:unlim:regulating-state . . . 329
falc1:main: . . . 329
falc1:main:enabled . . . 329
falc1:main:gain: . . . 329
falc1:main:gain:all . . . 329
falc1:main:gain:use-external-input . . . 329
falc1:main:gain:i1-enabled . . . 329
falc1:main:gain:i1 . . . 330
falc1:main:gain:i2-enabled . . . 330
falc1:main:gain:i2 . . . 330
falc1:main:gain:i3-enabled . . . 331
falc1:main:gain:i3 . . . 331
falc1:main:gain:d1-enabled . . . 331
falc1:main:gain:d1 . . . 331
falc1:main:gain:d2-enabled . . . 332

falc1:main:gain:d2 . . . 332
falc1:main:gain:ramp-up-rate . . . 332
falc1:main:lock-state . . . 332
falc1:path-selection . . . 332
falc1:hold-state . . . 333
falc1:save . . . 333
falc1:load . . . 333
falc2: . . . 333
falc3: . . . 333
falc4: . . . 333
servo-control1: . . . 334
servo-control1:node-id . . . 334
servo-control1:serial-number . . . 334
servo-control1:revision . . . 334
servo-control1:fw-ver . . . 334
servo-control1:mcu-temp . . . 334
servo-control1:status . . . 334
servo-control1:status-txt . . . 335
servo-control2: . . . 335
servo-control3: . . . 335
servo-control4: . . . 335
mot1: . . . 335
mot1:node-id . . . 336
mot1:serial-number . . . 336
mot1:revision . . . 336
mot1:fw-ver . . . 336
mot1:board-temp . . . 336
mot1:status . . . 336
mot1:status-txt . . . 336
mot1:channel1: . . . 336
mot1:channel2: . . . 337
mot1:io: . . . 337
mot1:io:digital-in0: . . . 337
mot1:io:digital-in0:value-act . . . 337
mot1:io:digital-in1: . . . 337
mot1:io:digital-in2: . . . 337
mot1:io:digital-in3: . . . 338
mot1:io:digital-out0: . . . 338
mot1:io:digital-out0:value-act . . . 338
mot1:io:digital-out0:value-set . . . 338
mot1:io:digital-out0:mode . . . 338
mot1:io:digital-out0:invert . . . 338
mot1:io:digital-out1: . . . 339
mot1:io:digital-out2: . . . 339

mot1:io:digital-out3: . . . 339
mot2: . . . 339
pfd1: . . . 339
pfd1:node-id . . . 339
pfd1:serial-number . . . 340
pfd1:label . . . 340
pfd1:revision . . . 340
pfd1:fw-ver . . . 340
pfd1:status . . . 340
pfd1:status-txt . . . 340
pfd1:external-clock-detected . . . 340
pfd1:external-clock-locked . . . 340
pfd1:rf-path . . . 341
pfd1:reference-path . . . 341
pfd1:dds-output-enabled . . . 341
pfd1:phase-out-filter-enabled . . . 341
pfd1:aux-out1-signal . . . 341
pfd1:aux-out2-signal . . . 342
pfd1:frequency-counters: . . . 342
pfd1:frequency-counters:gating-time . . . 342
pfd1:frequency-counters:reference-frequency . . . 342
pfd1:frequency-counters:lf-frequency . . . 342
pfd1:frequency-counters:counter-output-frequency . . . 342
pfd1:frequency-counters:phase-output-frequency . . . 342
pfd1:frequency-plan: . . . 343
pfd1:frequency-plan:mode . . . 343
pfd1:frequency-plan:center-frequency . . . 343
pfd1:frequency-plan:scan: . . . 343
pfd1:frequency-plan:scan:amplitude . . . 343
pfd1:frequency-plan:scan:frequency . . . 343
pfd1:frequency-plan:scan:ramp-rate . . . 344
pfd1:frequency-plan:hopping: . . . 344
pfd1:frequency-plan:hopping:frequency1 . . . 344
pfd1:frequency-plan:hopping:frequency2 . . . 344
pfd1:frequency-plan:hopping:frequency3 . . . 344
pfd1:frequency-plan:hopping:frequency4 . . . 344
pfd1:frequency-plan:hopping:feed-forward-offset . . . 344
pfd1:frequency-plan:hopping:feed-forward-factor . . . 344
pfd1:reference-frequency: . . . 345
pfd1:reference-frequency:center-frequency . . . 345
pfd1:reference-frequency:scan: . . . 345
pfd1:reference-frequency:scan:amplitude . . . 345
pfd1:reference-frequency:scan:ramp-rate . . . 345
pfd1:reference-frequency:hopping: . . . 345

pfd1:reference-frequency:hopping:frequency1 . . . 345
pfd1:reference-frequency:hopping:frequency2 . . . 345
pfd1:reference-frequency:hopping:frequency3 . . . 346
pfd1:reference-frequency:hopping:frequency4 . . . 346
pfd1:reference-frequency:hopping:feed-forward-offset . . . 346
pfd1:reference-frequency:hopping:feed-forward-factor . . . 346
pfd1:cavity-bridge: . . . 346
pfd1:cavity-bridge:output-enabled . . . 346
pfd1:cavity-bridge:external-trigger-enabled . . . 346
pfd1:cavity-bridge:output-frequency . . . 346
pfd1:cavity-bridge:scan-enabled . . . 347
pfd1:cavity-bridge:end-frequency . . . 347
pfd1:cavity-bridge:step-size . . . 347
pfd1:cavity-bridge:ramp-rate . . . 347
pfd1:lf: . . . 347
pfd1:lf:r-divider . . . 347
pfd1:lf:n-divider . . . 347
pfd1:lf:input-filter-enabled . . . 347
pfd1:lf:input-level . . . 348
pfd1:lf:input-gain . . . 348
pfd1:lf:signal-level . . . 348
pfd1:lf:current-gain . . . 348
pfd1:lf:polarity . . . 348
pfd1:lf:tunable-filter-enabled . . . 348
pfd1:lf:tunable-filter-center-frequency . . . 348
pfd1:lf:agc: . . . 349
pfd1:lf:agc:enabled . . . 349
pfd1:lf:agc:set-level . . . 349
pfd1:lf:agc:p-gain . . . 349
pfd1:lf:agc:i-gain . . . 349
pfd1:lf:agc:d-gain . . . 349
pfd1:lf:frequency-deviation: . . . 349
pfd1:lf:frequency-deviation:value . . . 349
pfd1:lf:frequency-deviation:analog-output-scaling . . . 350
pfd1:hf: . . . 350
pfd1:hf:r-divider . . . 350
pfd1:hf:n-divider . . . 350
pfd1:hf:rfdiv2-enabled . . . 350
pfd1:hf:current-gain . . . 350
pfd1:hf:polarity . . . 350
pfd1:event-detector: . . . 351
pfd1:event-detector:phase-error . . . 351
pfd1:event-detector:counter . . . 351
pfd1:event-detector:indicator . . . 351

pfd1:event-detector:indicator-auto-reset-enabled . . . 351
pfd1:event-detector:indicator-auto-reset-time . . . 351
pfd1:event-detector:reset-counter . . . 351
pfd1:event-detector:reset-indicator . . . 351
pfd1:digital-io: . . . 352
pfd1:digital-io:in0 . . . 352
pfd1:digital-io:in1 . . . 352
pfd1:digital-io:in2 . . . 352
pfd1:digital-io:in3 . . . 352
pfd1:digital-io:out0 . . . 352
pfd1:digital-io:out1 . . . 353
pfd1:digital-io:out2 . . . 353
pfd1:digital-io:out3 . . . 353
pfd1:user-led-mode . . . 353
pfd1:save . . . 353
pfd1:load . . . 353
pfd2: . . . 354
pfd3: . . . 354
pfd4: . . . 354
3.2 Maintenance . . . 354
time . . . 354
time-iso . . . 354
tan . . . 355
system-messages: . . . 355
system-messages:count . . . 356
system-messages:count-new . . . 356
system-messages:latest-message . . . 356
system-messages:mark-as-read . . . 356
system-messages:show-all . . . 356
system-messages:show-new . . . 357
system-messages:show-log . . . 357
system-messages:show-persistent . . . 358
licenses: . . . 358
licenses:options: . . . 358
licenses:options:lock: . . . 358
licenses:options:lock:enabled . . . 358
licenses:options:lock:valid-until . . . 359
licenses:options:dual-laser-operation: . . . 359
licenses:options:quad-laser-operation: . . . 359
licenses:options:automatic-nlo-operation: . . . 359
licenses:options:pfd1-hf-port: . . . 359
licenses:options:pfd2-hf-port: . . . 359
licenses:options:pfd3-hf-port: . . . 359
licenses:options:pfd4-hf-port: . . . 360

licenses:installed-keys . . . 360
licenses:get-key . . . 360
licenses:install . . . 360
fw-update: . . . 360
fw-update:upload . . . 360
fw-update:show-log . . . 361
fw-update:show-history . . . 361
system-service-report: . . . 361
system-service-report:ready . . . 361
system-service-report:service-report . . . 361
system-service-report:request . . . 362
system-service-report:add-info . . . 362
system-service-report:print . . . 362
system-service-report:save-to-usb . . . 362
system-connections . . . 362
debug-log . . . 363
error-log . . . 363
service-log . . . 363
service-script . . . 363
service-script-from-usb . . . 363
service-report . . . 363
output-signals-report . . . 363
3.3 Device Information . . . 364
uptime . . . 364
uptime-txt . . . 364
fw-ver . . . 364
ssw-ver . . . 364
decof-ver . . . 364
boot-ver . . . 364
echo . . . 365
serial-number . . . 365
revision . . . 365
system-type . . . 365
system-model . . . 365
system-label . . . 366
vcs-id . . . 366
ssw-vcs-id . . . 367
build-information: . . . 367
build-information:build-number . . . 367
build-information:build-id . . . 367
build-information:build-tag . . . 367
build-information:job-name . . . 367
build-information:build-node-name . . . 367
build-information:build-url . . . 367

build-information:cxx-compiler-version . . . 368
build-information:c-compiler-version . . . 368
build-information:cxx-compiler-id . . . 368
build-information:c-compiler-id . . . 368
system-summary . . . 368
system-summary-ontimes . . . 368
component-list . . . 368
3.4 Network Configuration . . . 369
net-conf: . . . 369
net-conf:ip-addr . . . 369
net-conf:net-mask . . . 369
net-conf:gateway . . . 369
net-conf:hostname . . . 369
net-conf:mac-addr . . . 370
net-conf:dhcp . . . 370
net-conf:cmd-port . . . 370
net-conf:mon-port . . . 370
net-conf:set-dhcp . . . 370
net-conf:set-ip . . . 370
net-conf:set-ip-gateway . . . 371
net-conf:apply . . . 371
3.5 Userlevel . . . 372
ul . . . 372
change-ul . . . 372
change-password . . . 373
change-password-service . . . 373

4 Appendix 374
4.1 Signal Channel IDs . . . 374
4.2 Scope, Lock and Recorder Binary Data . . . 378
4.2.1 Data Blocks . . . 378
4.2.2 Floating Point Format . . . 380
4.2.3 Integer Format . . . 380
4.2.4 Candidate Type . . . 381
4.2.5 BASE64 . . . 381
4.2.6 Processing Binary Data . . . 381
4.3 USB Connection . . . 382
4.4 Ethernet Connection . . . 382
4.4.1 Telnet Server: Command Console and Monitoring Line . . . 382
4.4.2 Identification Server . . . 383

Index 384

1 Introduction

DLC pro devices can be completely controlled by remote commands sent via USB (virtual serial RS232C line) or via a TCP/IP network. The instruction set, the instruction syntax, as well as the responses, are identical in both cases. Instructions and responses consist of printable ASCII characters only. Any standard terminal or TELNET software can be used to operate the device. See appendix 4.3 and 4.4 for explanations on how to establish connections between a PC and a DLC pro.

2 Control Language

The device's control language is based on the *Scheme*[1] programming language.

Scheme instructions always have the same simple syntax. The instructions are enclosed by parentheses and use prefix notation. The function/instruction name is always the first text within the parentheses. If the instruction requires arguments, these are separated by whitespaces (spaces, tab, or linefeed):

```
(cmd arg1 arg2)
```

Instructions are terminated by a linefeed character (ASCII code 10 decimal, 0xA hexdecimal). Execution is finished when a *prompt* is received. The prompt consists of the "> " (larger than and space)characters at the beginning of a new line.

Each instruction returns a value of some type that can be used by other instructions, or, for example, can be assigned to a variable. The return value always is the last item before the prompt. Example:

```
> (+ 13 7 5)
25
>
```

Instructions can be nested, i.e. each element of an instruction can be the result of another instruction:

```
> (+ 13 (/ 21 3) (* 2.5 2))
25
>
```

Errors are indicated by the "Error: " string at the beginning of a new line:

```
> (/ 1 0)
Error: /: division by zero
>
```

Some instructions print out additional text preceding the return value:

[1] There is plenty of information about Scheme in the Internet, as well as some tutorials.

```
> (display "Hello World\n")
Hello World
#t
>
```

Here, the boolean value #t is the return value which could be used, for example, in nested instructions, while the"Hello World" string is printed out only.

All details of a DLC pro are controlled by *parameters* and *commands*. Parameters represent certain properties of the device like a laser power level, the serial number, or an enable/disable flag etc. Commands are used to execute specific tasks like a recalibration or a firmware update.

2.1 Parameters

Each parameter is characterized by a specific name, a specific type, and a specific mode. For each available parameter, the following chapters provide all parameter information in detail.

Parameter names start with a letter and can contain letters, numerical digits, and special characters like hyphens, underscores, or alike.

The following parameter types are used:

integer - integer numbers, e.g. -10, 0, or 1998

real - floating point numbers, using decimal points, e.g. 3.1415 or 6.625e-34

string - text enclosed in quotation marks, e.g. "TOPTICA Photonics". The string content is stored as a bytestream[2].

boolean - true/false values, #t = true, #f = false

tuples - a set set of several values of the parameter types listed above in a fixed order, enclosed by parentheses, e.g. a pair of XY coordinates: (100 200).

The mode of a parameter provides information about accessing the parameter:

read-only - these parameters can not be modified but can only be read out.

read-write - these parameters can be modified. The new value immediately takes effect and is returned when the parameter is read out.

There are three different Scheme instructions for accessing parameters:

- param-ref
- param-set!
- param-disp

[2] `https://en.wikipedia.org/wiki/Bytestream`

2.1.1 param-ref

The value of a parameter can be retrieved with the *param-ref* instruction. Its return value is the value of the parameter being queried.

The following examples show queries for different parameter types:

```
> (param-ref 'int-param)
8375309
> (param-ref 'str-param)
"this is a string"
> (param-ref 'bool-param)
#t
> (param-ref 'real-param)
3.141592
> (param-ref 'tuple-param)
(0.8 15)
>
```

Note that parameter names must be quoted with the single, straight quotation mark (').

Reading the parameter value is possible for all parameters modes.

2.1.2 param-set!

To change a parameter value, use the *param-set!* instruction. Its return value is zero or a positive integer in case of success and an error message in case of an error.

Here are a few examples for parameters of different type:

```
> (param-set! 'label "Example Device")
0
> (param-set! 'int-param 50)
0
> (param-set! 'bool-param #f)
0
> (param-set! 'tuple-param '(15 0.8))
0
>
```

Modifying a parameter value is only possible for parameters of *read-write* mode. Tuple-type arguments have to be quoted with the single, straight quotation mark. Please remember that nesting of instructions is possible. The following example shows a way to toggle a boolean parameter:

```
> (param-set! 'bool-param (not (param-ref 'bool-param)))
0
>
```

2.1.3 param-disp

While the *param-ref* instruction is the way to choose for software implemented parameter queries, there is a more human readable alternative for manual queries on the command console: the *param-disp* instruction.

In contrast to the *param-ref* instruction it *displays* the parameters values together with their names while its return value always is zero[3].

While *param-disp* can be used with single parameters, it is most useful when used with parameter sections:

```
> (param-disp 'laser1)
laser1
  :serial-number = "11092"
  :model = "DLCpro"
...
0
>
```

To get a complete list of all parameters, you can use the `(param-disp)` instruction without a parameter name .

2.2 Commands

Commands are used differently than parameters. They are called by the *exec* instruction as in the following example:

```
> (exec 'dummy-command)
()
>
```

Please note that command names, like parameter names, must be quoted by a single, straight quotation mark ('). As in the example, commands often don't return a specific return value but an empty tuple instead[4].

Some commands require one or more additional arguments, which are included in the parentheses and separated by whitespaces.

```
> (exec 'buzzer:play "A   A A   A A   A E   E H   E H   E AAAA")
()
> (exec 'net-conf:set-ip "192.168.1.1" "255.255.255.0")
()
```

Other commands return a result value. For all commands, the type of the return value is provided in this manual.

[3] i.e. it cannot be used reasonably in nested instructions or variable assignments

[4] Since all Scheme instructions must return a result value, these commands return an empty tuple `()`.

2.3 Errors and Warnings

When a parameter value is changed using the *param-set!* instruction, an error message with a negative number is returned in case of an error. A positive number returned indicates a warning condition.
For error indications, "Error:" is displayed at the beginning of a line, followed by a specific, negative-number error code and a brief error description.
Examples of indicated errors:

```
> (param-set! 'laser1:dl:lock:spectrum-input-signal 555)
Error: -3 no such parameter
> (param-set! 'laser1:dl:lock:spectrum-input-channel 555)
Error: -1 invalid argument
> (param-set! 'laser1:dl:cc:current-act 5000)
Error: -11 parameter not settable
>
```

A positive number returned at the beginning of a line indicates a warning condition.
For numerical parameters, a return value of *2* indicates *"parameter value clipped"*. That is, the specified value has exceeded the valid data range limit and the parameter was set to the minimum or maximum allowed value, respectively.
Use the *param-ref* instruction to retrieve the actually set value. Example:

```
> (param-set! 'laser1:dl:cc:current-set 5000)
2
> (param-ref 'laser1:dl:cc:current-set)
234
>
```

2.4 Remote Monitoring

The Monitoring line enables automatic remote monitoring of device parameters. This feature can be especially valuable for GUI programming. It drastically reduces the traffic between PC and device.

The idea is to *subscribe* for certain parameter updates, rather than polling them frequently. After submitting a subscription, the monitoring line will automatically send a telegram with the newest value of that parameter whenever it has changed. Subscriptions are per connection. For opening a monitoring line, a dedicated telnet connection on the reserved monitoring line port 1999 is necessary.

The syntax for the monitoring line is similar to scheme commands, see Sec. 2. The structure for a monitoring command is:

```
(cmd_name ['{param_name}|userlevel] [period|stringvalue] [threshold])
```

cmd_name Possible commands are:

add Adds a param for monitoring, e.g.
"`(add 'laser1:dl:cc:current-act 100 0.1)`"

remove Removes the parameter from monitoring, e.g.
"`(remove 'laser1:dl:cc:current-act)`

remove-all Removes all parameters from monitoring line, e.g. "`(remove-all)`"

change-ul Changes the userlevel of the monitoring line. For more information, please read the acccording section about the use level in this manual. Syntax example: "`(change-ul 0 "secret")`"

param_name The name of the parameter to be monitored.

userlevel Integer value representing the userlevel.

period Update interval in ms. Every "period" ms, an update value is sent if the parameter is changed. The change must be above the "threshold" value. This allows to reduce traffic for parameters that change too often.

stringvalue Password that is needed for changing the userlevel.

threshold A threshold value for sending updates. If a parameter changes and the change does not exceed the threshold, no update will be sent. This allows to reduce traffic for floating point parameters where too small changes are not of interest.

If an error occurs, an empty list, `()`, is returned. Otherwise the current values of the registered parameter is returned. A value looks like:

```
(timestamp 'param_name value)
```

Example:

```
(2013-07-15T13:58:59.123Z 'laser1:dl:cc:current-act 98.354201)
(2013-07-15T13:59:00.842Z 'laser1:dl:cc:enabled #t)
```

timestamp A timestamp for the value in ISO 8601 format.

param_name The name of the monitored parameter

value The current value of the parameter.

3 List of all Parameters and Commands

3.1 General Operation

Commands and parameters for general device operation
emission-button-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the state of the laser emission button.
#t - the emission button is enabled, laser emission is allowed
#f - the laser emission button is switched off
This parameter is writable only if the controller is qualified for system-integration. For DLC pros with "SI" module at the back side of the DLCpro this means the SI2 switch must be switched on. If no SI module is present, only DLCpros with "SI" type on their identification label are qualified if a single DFB pro laser heads is connected.

interlock-open

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether the interlock circuit is open.
#t - interlock circuit open, no laser emission possible.
#f - interlock circuit closed

frontkey-locked

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether the key switch on the DLCpro front panel is locked.
#t - key switch locked, no laser emission possible
#f - key switch unlocked

emission

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether laser emission is switched on.
#t - at least one laser diode (in any of the attached laser heads) is switched on.
#f - all laser heads are switched off.
This parameter reflects the state of the white laser emission LEDs at the DLCpro front panel and laser head.

system-health

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating system health problems.
Returns *0* if the system has no problems. If a non-zero value is returned, each bit represents a specific failure.

bit 0 - main FPGA fault

bit 1 - power supply fault
bit 2 - laser 1 problem
bit 3 - laser 2 problem
bit 4 - laser 3 problem
bit 5 - laser 4 problem
bit 8 - problem with module in M-slot 1
bit 9 - problem with module in M-slot 2
bit 10 - problem with module in M-slot 3
bit 11 - problem with module in M-slot 4
bit 12 - problem with module in S-slot 1
bit 13 - problem with module in S-slot 2
bit 14 - problem with module in S-slot 3
bit 15 - problem with module in S-slot 4
bit 16 - problem with IO board
bit 20 - CAN bus problem
bit 21 - problem with a Motor pro
bit 22 - problem with a servo board
bit 23 - problem with a FALC pro

system-health-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter providing a text representation of the system's health problem(s).

laser1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the first laser head attached to the DLCpro. It provides many commands and parameters, for example:

- switching on and off
- controlling laser diode temperature
- reading back status information
- etc.

laser1:type

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the type of connected laser, e.g. "DLpro", "TApro".
Possible values are:
- BoosTApro
- BoosTAproXP
- TA-SHGproXP
- CTL
- CTL+BoosTApro
- CTL+BoosTAproXP
- DFB-FHGpro
- DFB-MOPA
- DFB-TA-TOPOsmart
- DFB-TA-TOPOsmartXP
- DFB-OPOpro
- DFB-SHGpro
- DFB-TA-FHGpro
- DFB-TA-SHGpro
- DFB-TA-SHGproXP
- DFB-TApro
- DFB-TAproXP
- DFB
- DFBpro
- DFBpro+BoosTApro
- DFBpro+BoosTAproXP
- DL-FHGpro
- DL-SHG
- DL-SHGpro
- DLpro
- DLproBFY
- DLpro+BoosTApro
- DLproBFY+BoosTApro
- DLpro+BoosTAproXP
- DLproBFY+BoosTAproXP
- DPSS-SHGpro
- ECDL-MOPA
- ECDL
- OPOpro
- TA-FHGpro
- TA-SHGpro
- TApro
- TAproXP
- TopWave405

- TopWaveXP
- TopWaveUV

laser1:product-name

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the model name of the laser head hardware.
For a legacy laser head - without factory settings stored in EEPROM - this parameter returns *"legacy ECDL"*. Basically, the value of this parameter is the type of the laser head followed by its serial number.

laser1:label

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter providing a user-configurable string that can be used to easily identify the laser.

laser1:emission

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the laser head emission status.
#t - laser is switched on
#f - laser is switched off

laser1:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable or disable all CCs for the laser.
#t - at least one CC is enabled
#f - all CCs is disabled

laser1:enabled-valid

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating all CCs have the same state.
#t - all CCs are enabled or disabled
#f - CCs have different state

laser1:health

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating laser health problems.
Returns *0* if the system has no problems. If a non-zero value is returned, each bit represents a specific failure.

bit 0 - diode laser TC problem

bit 1 - diode laser CC problem

bit 2 - ECDL PC problem

bit 3 - CTL communication problem

bit 4 - CTL PC problem

bit 5 - CTL problem

bit 6 - DPSS problem

bit 7 - master replacement problem

bit 8 - Motor pro problem

bit 12 - amplifier TC problem

bit 13 - amplifier CC problem

bit 14 - amplifier seed problem

bit 15 - amplifier power problem

bit 16 - amplifier replacement problem

bit 20 - NLO communication problem

bit 21 - SHG crystal TC problem

bit 22 - SHG cavity PC problem

bit 23 - FHG crystal TC problem

bit 24 - FHG cavity PC problem

bit 25 - SHG cavity TC problem

bit 26 - OPO crystal TC problem

bit 27 - OPO cavity TC problem

bit 28 - OPO PC problem

laser1:health-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter providing a text representation of the system's health problem(s).

laser1:busy

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether the laser is busy with procedures like optimizations or diagnosis.
#t - laser is busy with optimization or diagnosis
#f - laser can be regularly operated

laser1:override-safety-checks

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter to disable laser safety checks for seed and output.

laser1:dl:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the laser head.

laser1:dl:legacy

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether a legacy laser head - without factory settings stored in EEPROM - is connected to the DLCpro.
#t - legacy laser head connected; factory settings cannot be identified
#f - TOPTICA laser head factory settings identified in EEPROM

laser1:dl:type

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the type of laser head, e.g. "DLpro".
For a legacy laser head - without factory settings stored in EEPROM - this parameter returns *"legacy laser"*. Possible values are:
- CTL
- DFB-FHGpro/master
- DFB-TA-TOPOsmart/master
- DFB-OPOpro/master
- DFB-SHGpro/master
- DFB-TA-FHGpro/master
- DFB-TA-SHGpro/master
- DFB-TA-SHGproXP/master
- DFB-TApro/master
- DFB-TAproXP/master

- DFBpro
- DL-FHGpro/master
- DL-SHGpro/master
- DLpro
- DLproBFY
- TA-FHGpro/master
- TA-SHGpro/master
- TA-SHGproXP/master
- TApro/master
- TAproXP/master
- TopWave405/master
- TopWaveXP/master
- TopWaveUV/master
- legacy laser

laser1:dl:version

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the version of the laser head hardware, e.g. "3V1".
For a legacy laser head - without factory settings stored in EEPROM - this parameter returns *"unknown"*.

laser1:dl:model

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the model of the laser head hardware, e.g. "DFB pro BFY".
May return an empty string for some laser heads.

laser1:dl:serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the serial number of the laser head, e.g. "020000".
For a legacy laser head - without factory settings stored in EEPROM - this parameter returns *"unknown"*.

laser1:dl:fru-serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the serial number of the laser-diode unit.

laser1:dl:ontime

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the accumulated time (in seconds) the laser has been emitting. For a legacy laser head - without factory settings stored in EEPROM - this parameter returns *0*.

laser1:dl:ontime-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Formatted string for the accumulated laser emission time:
hours:minutes:seconds
For a legacy laser head - without factory settings stored in EEPROM - this parameter returns *"0:00:00"*.

laser1:dl:cc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Current driver for laser 1

laser1:dl:cc:path

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter describing the hardware location of the current control (CC) channel.
Example: "cc1:channel1" indicates the first channel of the first current controller

laser1:dl:cc:variant

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter describing the hardware variant of the current control (CC) channel. For example, "250 mA" or "500 mA"

laser1:dl:cc:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to switch the laser emission on/off:
#t - laser emission on
#f - laser emission off

laser1:dl:cc:emission

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the laser emission status.
#t - all criteria for laser emission are fulfilled. Laser radiation should be emitted from this channel's laser.
#f - if laser emission is not possible for one of the following reasons:
- interlock circuit is open.
- the front panel key swicth is "off".
- the laser emission push button on the frontpanel is not pressed.
- laser emission is disabled by the software.

laser1:dl:cc:current-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to set the desired laser diode current in mA.
If **laser1:dl:cc:feedforward-enabled** is #t, **laser1:dl:cc:current-set** is determined as follows:

laser1:dl:cc:current-set = **laser1:dl:cc:current-offset** + **laser1:dl:cc:feedforward-factor** * (**laser1:dl:pc:voltage-set** - *voltage-pivot*)
where *voltage-pivot* is the value of **laser1:dl:pc:voltage-set** at the time the feedforward gets enabled.
The **laser1:dl:cc:current-set** parameter setting affects the **laser1:dl:cc:current-offset** value.

laser1:dl:cc:current-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the laser diode current without Feed Forward contribution (in mA).
This parameter setting affects the **laser1:dl:cc:current-set** value.

laser1:dl:cc:current-set-dithering

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable resolution enhancement for the laser diode current.
#t - resolution enhancement enabled
#f - resolution enhancement disabled

laser1:dl:cc:external-input:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to configure the current control by an external, analog voltage input.

laser1:dl:cc:external-input:signal

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

ID for the input signal to be routed to this laser channel.
For possible values, refer to the "Signal Channel IDs" section in appendix 4.1 on page 374.

laser1:dl:cc:external-input:factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Factor to be applied to the input signal.

laser1:dl:cc:external-input:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the control by external analog input.
#t - channel controlled by external analog input specified in **:external-input:signal**
#f - channel control by external analog input disabled

laser1:dl:cc:output-filter:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to configure output filters such as slew rate.

laser1:dl:cc:output-filter:slew-rate

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to configure the maximum rate of change of the output channel in physical unit per second.

laser1:dl:cc:output-filter:slew-rate-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable rate of change limit
#t - rate of change limited #f - output not limited

laser1:dl:cc:output-filter:slew-rate-limited

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether the signal change of the output channel is currently limited by the slew rate.
#t - output channel is modulated too fast. Modulation is limited by slew rate filter
#f - no limitation by slew rate filter

laser1:dl:cc:current-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the measured value of the laser diode current in mA. Usually, this is the current flowing through the laser diode. However, if the safety circuitry shorts the current output, this is not true.

laser1:dl:cc:current-out

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current value in mA, as applied to the digital-to-analog converter. The value should be close to the **current-act** value, but with higher resolution and without measurement noise.

laser1:dl:cc:positive-polarity

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter to specify the laser diode polarity setting
IMPORTANT:
To be specified only for legacy laser heads (without factory settings stored in EEPROM; **:legacy** = #t).
To be modified only if the channel is disabled (**:enabled** = #f).
#t - positive laser diode polarity
#f - negative laser diode polarity

laser1:dl:cc:current-clip

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the maximum allowed current (in mA) for this channel's laser diode.

laser1:dl:cc:current-clip-tuning

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the maximum allowed tuning current (in mA) for this channel's laser diode.

laser1:dl:cc:use-current-clip-tuning

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify if the maximum tuning current **:current-clip-tuning** should be taken into account for limiting the laser diode current. If set to #t the current gets limited to the maximum tuning current **:current-clip-tuning** or the maximum current **:current-clip**, depending on which one is smaller.

laser1:dl:cc:current-clip-limit

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the maximum value for the **:current-clip** parameter (in mA). IMPORTANT: To be specified only for legacy laser heads (without factory settings stored in EEPROM; **:legacy** = #t).
.

laser1:dl:cc:voltage-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the measured value of the voltage applied to the laser diode (in V).

laser1:dl:cc:voltage-clip

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the maximum allowed voltage (in V) for this channel's laser diode. Can be changed only for legacy laser heads (without factory settings stored in EEPROM).

laser1:dl:cc:feedforward-master

(INTEGER parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to specify the master channel the feed forward.

laser1:dl:cc:feedforward-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable Feed Forward for this current control channel.
#t - Feed Forward enabled
#f - Feed Forward disabled
If enabled, a current proportional to another channel's output is added to this channel. The other channel is defined by the **laser1:feedforward-master** parameter.

laser1:dl:cc:feedforward-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control how much of the piezo channel's output is to be added to the current channel (in mA/V).

laser1:dl:cc:pd

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the measured monitor diode current in μA.
Please note that not every laser diode features an internal monitor photodiode.

laser1:dl:cc:aux

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the measured voltage at the AUX input (in V).

laser1:dl:cc:snubber

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Snubber setting depending on the connected laser head
#t - Mandatory snubber setting if a legacy TOPTICA diode laser head - without EEPROM-stored factory settings - is connected.
#f - Snubber setting indication only if a new TOPTICA diode laser head - with factory settings stored in EEPROM - is connected.

laser1:dl:cc:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter providing channel status information. Each bit of the integer value provides specific channel status information.

bit 0 - emission

bit 1 - enabled
bit 2 - positive polarity
bit 3 - snubber enabled (frequency low pass)
bit 4 - crowbar enabled (protective short circuit)
bit 5 - DAC enabled
bit 6 - current clip
bit 7 - voltage clip
bit 8 - command error
bit 12 - DAC not initialized
bit 13 - channel forced to be off by health monitoring
bit 15 - laser diode current at lower limit
bit 16 - laser diode current at upper limit
bit 17 - laser diode current limited by slew rate

laser1:dl:cc:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter providing a brief text version of the **:status** parameter.

laser1:dl:cc:forced-off

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

For internal use. Parameter indicating if the channel is forced off by health monitoring.
#t - channel is forced to be off
#f - channel can be switched on
IMPORTANT: Set **:forced-off** to *#f* only if you accept the risk of operating the laser diode in undefined health.

laser1:dl:tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides parameters related to the temperature controller for **laser1**.

laser1:dl:tc:path

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter describing the hardware location of the TEC channel.

laser1:dl:tc:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable temperature stabilization.
#t - enable temperature stabilization
#f - disable temperature stabilization

laser1:dl:tc:temp-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the temperature of the laser diode in °C.

laser1:dl:tc:temp-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the laser diode target temperature in °C.

laser1:dl:tc:external-input:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to configure the temperature control by an external, analog voltage input.

For usage see **laser1:dl:cc:external-input:** on page 63.

laser1:dl:tc:ready

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether the temperature of the laser diode is settled at the target temperature.
#t - laser diode temperature settled at the target temperature
#f - laser diode temperature not settled

laser1:dl:tc:fault

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether the temperature controller reports a problem.
#t - problem reported by the temperature controller
#f - no temperature controller problem report

laser1:dl:tc:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter providing a flag register with status information. Each bit in the register represents a specific information:

bit 0 - temperature regulation enabled
bit 1 - ready (same as **:ready** parameter)
bit 2 - TEC or heater is cooling (i.e. not heating)
bit 3 - TEC or heater is heating
bit 4 - output driver operating at maximum output
bit 5 - TEC or heater missing (i.e. too high resistance)
bit 6 - TEC or heater short circuit (i.e. too low resistance)
bit 7 - leakage current deteted
bit 8 - output driver overcurrent
bit 9 - output driver overtemperature
bit 10 - output driver missing
bit 11 - temperature probe missing
bit 12 - temperature probe short circuit
bit 13 - regulation timed out
bit 14 - output current operating at minimum or maximum limit
bit 15 - *unused*
bit 16 - measured temperature outside allowed temperate range
bit 17 - timeout, output driver or current were operating at limit for too long
bit 18 - cable detached (i.e. found no probe, no TEC/heater, no EEPROM and no GPIOs)

laser1:dl:tc:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter providing a brief description of the status register.

laser1:dl:tc:t-loop:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for configuring the temperature controller performance.
Temperature control loop access.

laser1:dl:tc:t-loop:on

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to enable/disable the temperature control loop.
#t - temperature control loop enabled
#f - temperature control loop disabled

laser1:dl:tc:t-loop:p-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Proportional gain in dB.

laser1:dl:tc:t-loop:i-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Integral gain in dB.

laser1:dl:tc:t-loop:d-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Differential gain in dB.

laser1:dl:tc:t-loop:ok-tolerance

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Temperature tolerance for "ready" status in Kelvin.

laser1:dl:tc:t-loop:ok-time

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Minimum time (in seconds) the temperature must be within the **:ok-tolerance** temperature range before the "ready" status is confirmed.

laser1:dl:tc:c-loop:

(parameter section)
(reading requires userlevel 2, writing requires userlevel 2)

Parameters for configuring the current controller performance.
Current control loop access.

laser1:dl:tc:c-loop:on

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to enable/disable the current control loop.
#t - current control loop enabled
#f - current control loop disabled

laser1:dl:tc:c-loop:i-gain

(REAL parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Integral gain in dB.

laser1:dl:tc:limits:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter handling temperature conditions for monitoring.

laser1:dl:tc:limits:temp-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify/indicate the minimum laser diode temperature in °C. You cannot operate the laser if the laser diode temperature is below **:temp-min**.
Note: **:temp-min** can be specified only for legacy laser heads (without factory settings stored in EEPROM; **:legacy** = #t) and the TCs for nonlinear crystals in frequency-converted diode laser systems.

laser1:dl:tc:limits:temp-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify/indicate the maximum laser diode temperature. You cannot operate the laser if the laser diode temperature is higher than **:temp-max**.
Note: **:temp-max** can be specified only for legacy laser heads (without factory settings stored in EEPROM; **:legacy** = #t) and the TCs for nonlinear crystals in frequency-converted diode laser systems.

laser1:dl:tc:limits:timeout

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify/indicate the time the system accepts the non-settled laser diode temperature (in seconds). If it takes longer than the **:timeout** time for the laser diode temperature to settle, or if the TEC current is at its limit for longer than the **:timeout** time, the laser and TEC are switched off.
Note: **:timeout** can be specified only for legacy laser heads (without factory settings stored in EEPROM; **:legacy** = #t)) and the TCs for nonlinear crystals in frequency-converted diode laser systems.

laser1:dl:tc:limits:timed-out

(BOOLEAN parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating whether a timeout has occurred.
#t - timeout has occurred
#f - no timeout
To reset the laser after a timeout, switch the temperature control loop (**:t-loop**) off and on.

laser1:dl:tc:limits:out-of-range

(BOOLEAN parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating whether the laser diode temperature is out of range.
#t - laser diode temperature out of range
#t - laser diode temperature within range

laser1:dl:tc:current-set

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to read the TEC current (in A). In open loop operation, you can use the parameter to manually set a specific current.
Note: During closed loop operation the **:current-set** value indicated can exceed the limits given by **:current-min** and **current-max**. The actual current whoever will not exceed the limts.

laser1:dl:tc:current-set-min

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify the minimum limit for the TEC current (in A).
Note: This parameter specifies the current limit that should not be exceeded for the TEC oder heater hardware. Depending on the selected **:power-source** the limit might not be reached though.

laser1:dl:tc:current-set-max

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify the maximum limit for the TEC current (in A).
Note: This parameter specifies the current limit that should not be exceeded for the TEC oder heater hardware. Depending on the selected **:power-source** the limit might not be reached though.

laser1:dl:tc:current-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter to read the TEC current (in A).

laser1:dl:tc:voltage-act

(REAL parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the voltage applied to the Peltier elements (in V)

laser1:dl:tc:resistance

(REAL parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Reads and sets the TEC resistance (in Ω).
This value is required to use current mode for (**:c-loop:enabled = #t**.

laser1:dl:tc:ntc-series-resistance

(REAL parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter to indicate/specify the actual resistance value (in Ω) of the series resistor connected to the NTC.
IMPORTANT: To be specified only for legacy laser heads (without factory settings stored in EEPROM; **:legacy** = #t) and the TCs for nonlinear crystals in frequency-converted diode laser systems.

laser1:dl:tc:ntc-parallel-resistance

(REAL parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter to indicate/specify the actual resistance value (in Ω) of the parallel resistor connected to the NTC.
IMPORTANT: To be specified only for legacy laser heads (without factory settings stored in EEPROM; **:legacy** = #t) and the TCs for nonlinear crystals in frequency-converted diode laser systems.

laser1:dl:tc:temp-set-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the minimum limit for the target temperature (in °C).

laser1:dl:tc:temp-set-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the maximum limit for the target temperature (in °C).

laser1:dl:tc:temp-reset

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Reset tec driver hw**tc:temp-reset**.

laser1:dl:tc:temp-roc-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter to enabled/disable the rate-of-change limitation.

laser1:dl:tc:temp-roc-limit

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter to limit the temperature rate of change (in °C per second).
IMPORTANT: To be specified only for legacy laser heads (without factory settings stored in EEPROM; **:legacy** = #t) and the TCs for nonlinear crystals in frequency-converted diode laser systems.

laser1:dl:tc:power-source

(INTEGER parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter to set the power source for this channel.
Can be changed only for legacy laser heads (without factory settings stored in EEPROM) and the TCs for nonlinear crystals in frequency-converted diode laser systems.
Possible values are:

- 0 = channel off
- 1 = low voltage
- 2 = high voltage

laser1:dl:tc:drv-voltage

(REAL parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the channels input voltage and should be around 5V for **:power-source** = 1 and around 15V for **power-source** = 2.

laser1:dl:tc:check-peltier

(command, no arguments, returns REAL)
(execution requires userlevel 2)

Command to apply a small PWM signal to measure voltage and current.
The result is used to calculate and return the resistance of the Peltier element (in Ω).

laser1:dl:pc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Piezo driver for laser 1

laser1:dl:pc:path

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the hardware location of the piezo channel.

laser1:dl:pc:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable piezo HV output:
#t - enable HV output
#f - disable HV output

laser1:dl:pc:voltage-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to set the desired piezo voltage in V.

laser1:dl:pc:voltage-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the minimum piezo voltage in V.

laser1:dl:pc:voltage-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the maximum piezo voltage in V.

laser1:dl:pc:voltage-set-dithering

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable resolution enhancement for the piezo voltage
#t - resolution enhancement enabled
#f - resolution enhancement disabled

laser1:dl:pc:external-input:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to configure the piezo voltage control by an external, analog voltage input.

For usage see **laser1:dl:cc:external-input:** on page 63.

laser1:dl:pc:output-filter:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to configure output filters such as slew rate.

For usage see **laser1:dl:cc:output-filter:** on page 64.

laser1:dl:pc:voltage-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the measured voltage of **:channel1** in V.

laser1:dl:pc:voltage-out

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the calculated output voltage of **:channel1** in V, as it is handed to the digital to analog converter, i.e. including all PID, feedforward, scan and ARC contributions.

laser1:dl:pc:feedforward-master

(INTEGER parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to specify the master channel for the feed forward.

laser1:dl:pc:feedforward-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable Feed Forward for this channel
#t - enable Feed Forward
#f - disable Feed Forward
If Feed Forward is enabled, a voltage proportional to another channel's output is added to this channel's piezo voltage. The other channel is defined by the **laser1:feedforward-master** parameter.

laser1:dl:pc:feedforward-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control how much of the **laser1:feedforward-master** channel's output is to be added to this channel's piezo voltage (in V/X, where X is the unit of ther feedforward master channel).

laser1:dl:pc:heatsink-temp

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the PC-channel's heat sink temperature in °C.

laser1:dl:pc:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating channel status information. Each bit of the integer value provides specific channel status information.

bit 0 - enabled

bit 3 - HV fault

bit 4 - current fault

bit 5 - current limit

bit 7 - voltage at lower limit

bit 8 - voltage at upper limit

bit 9 - voltage slew-rate limited

laser1:dl:pc:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating a brief text version of the **:status** parameter.

laser1:dl:lock:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the DLCpro's lock module. The lock module provides the following features:

- two PID regulators for controlling two independent output channels.
- Lock-In detection
- automatic ReLock and reset.
- easy-to-use click-and-lock functionality

Access to the lock module is available only if the TOPTICA Lock License option is installed.

laser1:dl:lock:type

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to determine the lock type:
1 - "Top of Fringe" - lock to an extremum; requires a reasonable Lock-In parameter configuration.
2 - "Side of Fringe" - lock to an edge (slope).
3 - "Top of Fringe PDH" - lock to an edge (slope) with PDH module.

laser1:dl:lock:lock-without-lockpoint

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the mode for activating the lock.
#t - lockpoint and lockpoint candidates are not used. When the lock gets activated, the scan will stop in its center (at scan-offset) and the PIDs get enabled. Use the PIDs **:sign** parameter to select which slope of the Signal is to be used.
#f - the lock can only be enabled if a lockpoint is selected. If the lock gets activated, the scan will stop and PIDs will be enabled when the lockpoints X and Y conditions are met. The PIDs **:sign** parameter should be set to #t and the slope is configured automatically.

laser1:dl:lock:state

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current operational mode of the lock module. Possible values are:

0 - "Idle": no scan, no lock

1 - "Scanning": scan controller enabled

2 - "Selecting": "Scanning" plus an additional evaluating signal to find the lockpoint candidates

3 - "Selected": "selecting" plus one lockpoint candidate selected as actual lockpoint

4 - "Locking": start of locking procedure; scanning to the lockpoint and activating the PID controller(s).
The scope engine is paused for a moment to show the start process of the lock. The background-data contains the last trace before the start of the lock.

5 - "Locked": scan controller deactivated and PID lock(s) closed

6 - "On Hold": PIDs on hold, waiting for being activated again

7 - "Resetting": PIDs are being reset

8 - "Reset": PIDs reset and on hold, waiting for being actived again

9 - "Relocking": relock engine is scanning, trying to relock the PIDs

laser1:dl:lock:state-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current operational mode of the lock module as a short text. Possible values are: "Idle", "Scanning", "Selecting", "Selected", "Locking", "Locked", "On Hold", "Resetting", "Reset", and "Relocking".

laser1:dl:lock:lock-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the lock module's operational mode (**:state**).
Read mode:
#t - operational mode is "Locking", "Locked", "On Hold", "Resetting", "Reset" or "Relocking".
#f - operational mode is "Idle", "Scanning", "Selecting" or "Selected".
Write mode:
#t - same effect as submitting the **:close** command.
#f - same effect as submitting the **:open** command.

laser1:dl:lock:hold

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter for pausing the PID controller(s).
#t - pause the PID controller(s)
#f - do not pause the PID controller(s)

laser1:dl:lock:di-hold-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable pausing/holding the PID controller(s) by the digital input.
#t - link PID controller(s) to digital input and hold on high signal
#f - let PID(s) ignore digital input
Laser 1 uses digital input 0, laser 2 uses digital input 1 etc.

laser1:dl:lock:spectrum-input-channel

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the channel of the lock input signal.
For possible values, see the "Signal Channel IDs" section in appendix 4.1 on page 374.
This parameter will automatically set:
the input channels for the PIDs
the input channel for Lock-In demodulation
the first channel for the scope engine

laser1:dl:lock:error-channel

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to indicate the channel fed into the PIDs for locking.
For possible values see the "Signal Channel IDs" section in appendix 4.1 on page 374.
For "Side of Fringe" locks this parameter returns the same value as the **:spectrum-input-channel**.
For "Top of Fringe" locks this parameter returns 30, i.e. "Lock-In Out" signal.
If a "Top of Fringe PDH" lock is selected and the **:spectrum-input-channel** is 41 ("PDH In 1") or 43 ("PDH In 2"), this parameter returns 40 ("PDH Error 1") or 42 ("PDH Error 2"), respectively.
If a "Top of Fringe PDH" lock is selected and the **:spectrum-input-channel** is not a PDH signal, this parameter needs to be set manually to either "PDH Error 1" or "PDH Error 2".

laser1:dl:lock:error-channel-inverted

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify whether the **:error-channel** signal is inverted compared to the **:spectrum-input-channel** signal.
The value is always #f for "Side of Fringe" locks and "Top of Fringe" locks. It can only be set to #t for "Top of Fringe PDH" locks.
The DLC pro click-and-lock feature assumes that the error-signal for "Top of Fringe

PDH" locks is the derivative of the spectrum input signal, meaning that a peak in the spectrum comes with a falling edge in the error signal and a trough in the spectrum comes with a rising edge in the error signal. Furthermore the auto-PDH feature optimizes the PDH phase for this assumption. If this relation is inverted in your setup, this parameter needs to be set manually to #t.

laser1:dl:lock:pdh-selection

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the PDH channel to be used by the lock engine:
0 - no PDH
1 - PDH 1 Channel 1
2 - PDH 1 Channel 2
3 - PDH 2 Channel 1
4 - PDH 2 Channel 2
This parameter will be automatically set to 1 or 2, if **:error-channel** is set to 40 ("PDH Error 1") or 42 ("PDH Error 2"), respectively. It will be 0 if no PDH module is available.

laser1:dl:lock:pid-selection

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the PID controllers to be used by the lock engine:
0 - no PID controller
1 - PID1
2 - PID2
3 - PID1 and PID2

laser1:dl:lock:falc-selection

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the FALC module to be used by the lock engine:
0 - no FALC
1 - FALC 1
2 - FALC 2
3 - FALC 3
4 - FALC 4

laser1:dl:lock:setpoint

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the setpoint for the PID controllers. Typically, the **:setpoint** is automatically set by the **laser1:dl:lock:select-lockpoint** command, depending on the settings of **:lock:type**, **:lock:candidate-filter**, and so on.

laser1:dl:lock:relock:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for automatic ReLock.

laser1:dl:lock:relock:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Set this parameter to #t to enable the ReLock engine.

laser1:dl:lock:relock:output-channel

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the output channel for the ReLock scan to return to the in-lock state (described by the **:lock:window** parameters).
For possible values, refer to the "Signal Channel IDs" section in appendix 4.1 on page 374.

laser1:dl:lock:relock:frequency

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the frequency of the ReLock scan (in Hz).

laser1:dl:lock:relock:amplitude

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the amplitude of the ReLock waveform (in V).

laser1:dl:lock:relock:delay

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to determine the waiting time before the ReLock procedure starts after the out-of-lock condition is signaled by **:lock:window**.

laser1:dl:lock:reset:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for automatic PID reset.

laser1:dl:lock:reset:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the PID reset engine
#t - PID reset engine enabled
#f - PID reset engine disabled.

laser1:dl:lock:window:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for out-of-lock detection for ReLock and triggering the PID controller reset.

laser1:dl:lock:window:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Set this parameter to #t to enable the ReLock window supervision engine.

laser1:dl:lock:window:input-channel

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the signal that monitors the ReLock window.
For possible values, refer to the "Signal Channel IDs" section in appendix 4.1 on page 374.

laser1:dl:lock:window:level-high

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to determine the upper limit of the outer ReLock window (in V).

laser1:dl:lock:window:level-low

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to determine the lower limit of the outer ReLock window (in V).

laser1:dl:lock:window:level-hysteresis

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to determine the inner ReLock window by a voltage difference to the outer ReLock window limits (in V).

laser1:dl:lock:pid1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the PID1 controller.

laser1:dl:lock:pid1:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the PID controller.
#t - PID controller enabled
#f - PID controller disabled

laser1:dl:lock:pid1:gain:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Gain parameters for PID controller(s).

laser1:dl:lock:pid1:gain:all

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the overall gain. This parameter has no physical unit.

laser1:dl:lock:pid1:gain:p

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the proportional gain.
The unit of **:gain:p** is A/B.

A - unit of the **laser1:dl:lock:pid1:output-channel** parameter

B - unit of the **laser1:dl:lock:spectrum-input-channel** parameter

Example: The unit of the **:gain:p** parameter for a typical lock of the laser current to the *Fine In 1* input is mA/V.

laser1:dl:lock:pid1:gain:i

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the integral gain.
The unit of **:gain:i** is $\frac{A}{B \cdot ms}$.

A - unit of the **laser1:dl:lock:pid1:output-channel** parameter

B - unit of the **laser1:dl:lock:spectrum-input-channel** parameter

Example: The unit of the **:gain:i** parameter for a typical lock of the laser current to the *Fine In 1* input is $\frac{mA}{V \cdot ms}$.

laser1:dl:lock:pid1:gain:d

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the differential gain.
The unit of **:gain:d** is $\frac{A \cdot \mu s}{B}$.

A - unit of the **laser1:dl:lock:pid1:output-channel** parameter

B - unit of the **laser1:dl:lock:spectrum-input-channel** parameter

Example: The unit of the **:gain:d** parameter for a typical lock of the laser current to the *Fine In 1* input is $\frac{mA \cdot \mu s}{V}$.

laser1:dl:lock:pid1:gain:i-cutoff

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to determine the frequency limit (*I-cutoff*) for the integral PID gain (in Hz).

laser1:dl:lock:pid1:gain:i-cutoff-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable a frequency limit (*I-cutoff*) for the integral PID gain (**:lock:pid1:gain:i-cutoff**).
#t - I-cutoff enabled
#f - I-cutoff disabled

laser1:dl:lock:pid1:gain:fc-ip

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the transition frequency where the integral behavior of a PID controller changes to proportional behavior for lower frequencies (in Hz).

laser1:dl:lock:pid1:gain:fc-pd

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the transition frequency where the proportional behavior of a PID controller changes to differential behavior (in Hz).

laser1:dl:lock:pid1:sign

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Sign of PID controller action. Usually set automatically when using the **laser1:dl:lock:select-lockpoint** command.

laser1:dl:lock:pid1:slope

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Slope of the signal to lock to. Usually set automatically when using the **laser1:dl:lock:select-lockpoint** command.

laser1:dl:lock:pid1:setpoint

(REAL parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Setpoint parameter for the PID controller in units of the selected PID output channel (**laser1:dl:lock:pid[1/2]:output-channel**). Usually set automatically when using the **laser1:dl:lock:select-lockpoint** command.

laser1:dl:lock:pid1:input-channel

(INTEGER parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to select the input channel for the PID controller.
For possible values, refer to the "Signal Channel IDs" section in appendix 4.1 on page 374.

laser1:dl:lock:pid1:output-channel

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the signal channel to be controlled by the PID controller.
For possible values, refer to the "Signal Channel IDs" section in appendix 4.1 on page 374.

laser1:dl:lock:pid1:outputlimit:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to specify limits for the PID output.

laser1:dl:lock:pid1:outputlimit:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable PID output limits
#t - PID output limits enabled
#f - PID output limits disabled

laser1:dl:lock:pid1:outputlimit:max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the maximum PID output value,
in units of the selected PID output channel (**laser1:dl:lock:pid[1/2]:output-channel**).
The output limit is symmetrical, ie, the PID output is limited to a range $-max \ldots + max$.

laser1:dl:lock:pid1:hold

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter for pausing/holding the PID controller(s).
#t - hold the PID controller
#f - do not hold the PID controller

laser1:dl:lock:pid1:lock-state

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether the PID controller is in In-Lock state.
#t - The PID controller is enabled and the selected window signal is within the specified range.
#f - The PID controller is enabled and the selected window signal is out of the specified range.
Note: The parameter is set to *#f* if the PID controller is disabled.

laser1:dl:lock:pid1:hold-state

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether the PID controller is on hold.
#t - The PID controller is enabled but is set on hold. The PID controller can be set on hold via a software parameter or via the corresponding hardware line.
#f - The PID controller is enabled and no hold criterion (software parameter or hardware line) is set.
Note: The parameter is set to *#f* if the PID controller is disabled.

laser1:dl:lock:pid1:regulating-state

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether the PID controller is actually regulating.
#t - The PID controller algorithm is currently executed (**:lock-state**=#t; **:hold-state**=#f).
#f - The PID controller algorithm is not executed.
Note: The parameter is set to *#f* if the PID controller is disabled.

laser1:dl:lock:pid1:hold-output-on-unlock

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to determine the PID output if the out-of-lock state is detected.
#t - on "out-of-lock", the PID output retains its current value.
#f - on "out-of-lock", the PID output is set to *0*.

laser1:dl:lock:pid2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the PID2 controller.

For usage see **laser1:dl:lock:pid1:** on page 84.

laser1:dl:lock:lockin:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the Lock-In detection engine.

laser1:dl:lock:lockin:modulation-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable modulation of the output channel signal (**:output-channel**).
#t - apply modulation to the channel selected by **:output-channel**
#f - no modulation of the output channel signal

laser1:dl:lock:lockin:input-channel

(INTEGER parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to specify the input channel for the signal to be demodulated.
For possible values, see the "Signal Channel IDs" section in the appendix 4.1 on page 374.

laser1:dl:lock:lockin:modulation-output-channel

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the output channel the modulation is applied to.
For possible values, see the "Signal Channel IDs" section in appendix 4.1 on page 374.

laser1:dl:lock:lockin:frequency

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the modulation/demodulation frequency (in Hz).

laser1:dl:lock:lockin:amplitude

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the modulation amplitude.
Unit according to the **:modulation-output-channel** setting

laser1:dl:lock:lockin:phase-shift

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the phase difference between modulation and demodulation (in °). Used to optimize the demodulated Lock-In signal.

laser1:dl:lock:lockin:lock-level

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the setpoint level for top-of-fringe locks to compensate for an eventual DC offset in lock-in output signal.

laser1:dl:lock:lockin:auto-lir:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the automatic adjustment of the LIR phase-shift.

laser1:dl:lock:lockin:auto-lir:state

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the state of the auto-lir algorithm.

0 - idle

1 - active

2 - aborting

laser1:dl:lock:lockin:auto-lir:progress

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the auto-lir progress in %.

laser1:dl:lock:lockin:auto-lir:start

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to automatically set the phase difference between the modulation and the error signal for the master lock-in.

laser1:dl:lock:lockin:auto-lir:abort

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to abort the automatic phase optimization and to return to the previous phase value.

laser1:dl:lock:lockpoint:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the selected lock point.

laser1:dl:lock:lockpoint:position

(COORDINATE parameter, read-only)
(reading requires userlevel 4)
Type COORDINATE is defined as a tuple (x y) of types (REAL REAL).

Parameter indicating the X/Y position of the currently selected lock point.
X value: unit of the scan output channel (**:scan:output-channel**).
Y value: unit of the lock input channel (**:lock:spectrum-input-channel**).

laser1:dl:lock:lockpoint:type

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the lock point position on the lock input signal:

none - no lock point selected

top - selected lock point is a peak

bottom - selected lock point is a trough

positive-edge - selected lock point is on a rising edge

negative-edge - selected lock point is on a falling edge

laser1:dl:lock:candidate-filter:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Filter settings for searching for lock point candidates. The settings are changed automatically if the **:lock:type** setting is changed.

laser1:dl:lock:candidate-filter:top

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

#t - Search for lock point candidates shall find peaks.

laser1:dl:lock:candidate-filter:bottom

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

#t - Search for lock point candidates shall find troughs.

laser1:dl:lock:candidate-filter:positive-edge

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

#t - search for lock point candidates shall find rising edges.

laser1:dl:lock:candidate-filter:negative-edge

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

#t - search for lock point candidates shall find falling edges.

laser1:dl:lock:candidate-filter:edge-level

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the level for edge detection.
Value range according to the lock input channel (**:lock:spectrum-input-channel**) in V.

laser1:dl:lock:candidate-filter:peak-noise-tolerance

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the noise tolerance for peak detection.
Specify the maximimum expected signal modulation caused by noise in the lock input signal (in V).
Lock input signal modulation below the **:peak-noise-tolerance** threshold is ignored for peak detection.
0 - enables automatic noise detection.

laser1:dl:lock:candidate-filter:edge-min-distance

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the minimum distance of adjacent signal cross-overs of the lock input signal and the edge detection level.
Signal cross-overs within the **:edge-min-distance** are considered a single lockpoint.
Unit: number of signal sampling points

laser1:dl:lock:candidate-filter:top-of-fringe-low-pass

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify whether a low-pass filter should be applied to the "Lock Input" signal (Signal Channel ID 100) in Top-of-Fringe mode. If this parameter is set to #t, the low-pass filter will automatically be enabled and disabled together with the lock-in modulation and the filter's cut-off frequency will be tuned to 10% of the lock-in modulation frequency. If the **:top-of-fringe-low-pass** parameter is set to #f, the filter will stay disabled.
Note: The filter gets applied only to the "Lock Input" signal for Signal Display an alike, in order to reduce the influence of the lock-in modulation on the lock-candidate detection. It will not influence the signals used by PIDs, ARC etc.

laser1:dl:lock:candidates

(BINARY parameter, read-only)
(reading requires userlevel 4)

Parameter indicating lock point candidate data for display in the DLCpro GUI (in binary format).
The parameter value is provided in the format decribed in Appendix 4.2. It contains data blocks with IDs *'s'*, *'l'*, *'c'* and *'t'*.

laser1:dl:lock:locking-delay

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to set the locking delay time (in ms). After a **:lock:close** command, the lock module stays in the LOCKING state for the specified time. During the locking delay time, the scope engine is paused and shows the signal trace at the locking time.

laser1:dl:lock:background-trace

(BINARY parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the X/Y coordinate data for the background trace in the DLCpro GUIs. The parameter provides the last scan trace before the lock was closed. The parameter value is provided in the format decribed in Appendix 4.2. It contains data blocks with IDs *'x'* and *'y'*.
If the lock is not closed, **:background-trace** is empty.

laser1:dl:lock:lock-tracking

(COORDINATE parameter, read-only)
(reading requires userlevel 4)
Type COORDINATE is defined as a tuple (x y) of types (REAL REAL).

Parameter indicating the X/Y position of the center-of-mass of the acquired X and Y trace.
X value: unit of the scan output channel (**:scan:output-channel**).
Y value: unit of the lock input channel (**:lock:spectrum-input-channel**).
The center-of-mass is only available while the lock is closed and while the scope is working in XY mode. In all other cases this parameter returns (0 0).

laser1:dl:lock:show-candidates

(command, no arguments, returns INTEGER)
(execution requires userlevel 3)

Command to print a list of lock point candidates to the console and display the number of lock point candidates.

laser1:dl:lock:find-candidates

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to put the autolock module into *Selecting* mode. For each scan, the lock point candidates are determined according to the settings in **:lock:candidate-filter**.

laser1:dl:lock:select-lockpoint

(command, 3 arguments, returns empty tuple)
(execution requires userlevel 3)

Arguments:

1. *x* of type REAL
2. *y* of type REAL
3. *type* of type INTEGER

Command to put the lock module into *Selected* mode. The given x/y coordinates and the given lock type are set as lock point settings.
The x-coordinate is in units of the signal selected by **laser1:scan:output-channel**.
The y-coordinate is in units of the signal selected by **laser1:dl:lock:spectrum-input-channel**.
The lock type must comply with the lock mode selected in **laser1:dl:lock:type**.
For the "Top of Fringe" lock mode, the following lock types can be specified:

0 - candidate (set lockpoint to the closest extremum, according to candidate filter)

1 - top (set lockpoint to the closest peak)

2 - bottom (set lockpoint to the closest trough)

For the "Side of-Fringe" lock mode, the following lock types can be specified:

0 - candidate (set lockpoint to the closest edge, according to candidate filter)

3 - positive-edge (set lockpoint to the closest rising edge)

4 - negative-edge (set lockpoint to the closest falling edge)

The point of the specified lock type, that is closest to the given x-coordinate in the spectrum input trace, is selected as lockpoint.
For "Side of Fringe" lockpoints, the y-coordinate provides the new setpoint for the PID controllers and the new **:edge-level** for the candidate filter.
For "Top of Fringe" lockpoints, the y-coordinate is ignored.

laser1:dl:lock:close

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to close the lock. The command can be successfully executed only if one of the following conditions is fullfilled:
1. **:lock-without-lockpoint** is #f and the lock module is in *Selected* state.
2. **:lock-without-lockpoint** is #t and the lock module is in *Scanning* state.

If :lock-without-lockpoint is #f, the command initiates the following steps:

1. The PID controllers are configured (slope, setpoint) according to the currently selected lockpoint.
2. A trace of the spectrum input signal is acquired and stored as **:background-trace** for the signal display.

3. A trigger mechanism is configured: When the scan reaches the lockpoint position (scan generator and input signal) during the next scan period, the PID controllers are automatically enabled.
4. The lock module is set to the *"Locking"* state.
5. The trigger is activated and shortly later, the PID controllers lock to the desired lockpoint. The scan is disabled automatically.
6. Another trace of the spectrum input signal is acquired, showing how the scan module scans up to the desired lockpoint and how the PID controllers subsequently lock the laser.
7. The command finishes.

If **:lock-without-lockpoint** is #t, PID setpoint and sign must have been configured reasonably before. The **:close** command initiates the following steps:

1. If the scope is in XY mode, a trace of the spectrum input signal is acquired and stored as **:background-trace** for the signal display.
2. A trigger mechanism is configured: When the scan generator reaches the center position (**laser1:scan:offset**) during the next scan period, the PID controllers are automatically enabled.
3. The lock module is set to the *"Locking"* state.
4. The trigger is activated and shortly later, the PID controllers are enabled and the scan is disabled automatically.
5. Another trace of the spectrum input signal is acquired, showing how the scan module scans up to the scan center and how the PID controllers subsequently lock the laser.
6. The command finishes.

To better visualize the brief interval when the lock is closed, the scope engine is paused and the last trace is returned in **laser1:scope:data** for a time period specified in **laser1:dl:lock:locking-delay**. After the locking delay time has expired, the lock module is automatically set to the *"Locked"* state.

laser1:dl:lock:open

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to open the lock. The command is ignored if the lock module is not in *locked* state.
Otherwise, the command disables the PID controllerss and sets the lock module back to the state before the **:close** command was executed.
Also, the command re-enables the scan generator.

laser1:dl:pressure-compensation:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Linear air pressure compensation.
The pressure compensation allows to adapt the geometrical ECDL cavity length to changes in the laser wavelength, resulting from pressure change induced variation of the refractive index of the air. For this the voltage of the cavity piezo is changed (dU) linearly with air pressure changes (dp) according to $dU = \frac{dU}{dp} \cdot dp$. The factor $\frac{dU}{dp}$ must be given by the parameter **laser1:dl:pressure-compensation:factor**.

laser1:dl:pressure-compensation:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enabled/disable automatic pressure compensation.
#t - enable pressure compensation
#f - disable pressure compensation.

laser1:dl:pressure-compensation:air-pressure

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the averaged air pressure measured by the pressure sensor (in hPa).

laser1:dl:pressure-compensation:factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the factor for linear air pressure compensation in units of $\frac{V}{hPa}$.

laser1:dl:pressure-compensation:offset

(REAL parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating the reference air pressure, relative to which pressure changes will be used to calculate the **:compensation-voltage**. When the compensation is enabled by setting the **:enabled** parameter to #t, the offset gets initialized with the air pressure, measured in this moment. The unit of **:offset** is hPa.

laser1:dl:pressure-compensation:compensation-voltage

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the overall voltage difference in V applied to the PC channel by the pressure compensation.

laser1:dl:pd:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the calibration of the internal master laser power. (Only available for certain laser heads.)

laser1:dl:pd:seed:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the calibration of the internal master laser power. (Only available for certain laser heads.)

laser1:dl:pd:seed:input-channel

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the input channel the photodiode is connected to.

laser1:dl:pd:seed:photodiode

(REAL parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the photodiode voltage in V.

laser1:dl:pd:seed:power

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the power level in mW.

laser1:dl:pd:seed:cal-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the calibration offset for the photodiode in V.

laser1:dl:pd:seed:cal-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the calibration factor for the photodiode in mW/V.

laser1:dl:pd:seed-probe:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the calibration of the internal master laser power. (Only available for certain laser heads.)

laser1:dl:pd:seed-probe:photodiode

(REAL parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the photodiode voltage in V.

laser1:dl:pd:seed-probe:power

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the power level in mW.

laser1:dl:pd:seed-probe:cal-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the calibration offset for the photodiode in V.

laser1:dl:pd:seed-probe:cal-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the calibration factor for the photodiode in mW/V.

laser1:dl:pd:fiber:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the calibration of the internal master laser power. (Only available for certain laser heads.)

For usage see **laser1:dl:pd:seed-probe:** on page 98.

laser1:dl:power-optimization:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the power optimization routine of frequency-converted diode laser systems (use with AutoAlign option only).

laser1:dl:power-optimization:ongoing

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the power optimization routine:
#t: An optimization routine is in progress.
#f: No optimization routine is in progress.

laser1:dl:power-optimization:progress

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the overall progress of the power optimization routines depending on the selected stages:

0 : Optimization routine is starting.

100 : Optimization routine has finished.

laser1:dl:power-optimization:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Status of the optimization for internal purposes.

laser1:dl:power-optimization:status-string

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the power optimization routine as a status string as displayed in the TOPAS DLC PC-GUI.

laser1:dl:power-optimization:fiber-advanced

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the Advanced mode of the power optimization routine:
#t: Advanced mode selected.
#f: Advanced mode deselected.

laser1:dl:power-optimization:stage1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the seed-probe power optimization routine of diode laser systems.

laser1:dl:power-optimization:stage1:input:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters concerning the photo diode input of the power optimization routine.

laser1:dl:power-optimization:stage1:input:value-calibrated

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the calibrated photo diode voltage used in the power optimization routine.

laser1:dl:power-optimization:stage1:progress

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the progress of the power optimization routine as a percentage:

0 : Optimization routine is starting.

100 : Optimization routine has finished.

laser1:dl:power-optimization:stage1:optimization-in-progress

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the power optimization routine:
#t: The optimization routine is in progress.
#f: The optimization routine is not in progress.

laser1:dl:power-optimization:stage1:restore-on-abort

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the return of the servo motors to their previous positions after the power optimization routine is aborted.

laser1:dl:power-optimization:stage1:restore-on-regress

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the return of the servo motors to their previous positions after the power optimization routine has decreased the stage power. This may happen for an already optimized system.

laser1:dl:power-optimization:stage1:regress-tolerance

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the failure margin (as a percentage) that is tolerated if the power optimization routine leads to a power decrease. This may happen for an already optimized system.

laser1:dl:power-optimization:stage1:autosave-actuator-values

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to specify whether actuator values are to be automatically saved when the new power value is greater than before optimization.

laser1:dl:power-optimization:stage1:start-optimization

(command, no arguments, returns INTEGER)
(execution requires userlevel 3)

Command to start the power optimization routine of the stage.

laser1:dl:power-optimization:stage2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the amplifier power optimization routine of diode laser systems (use with amplifier only).

For usage see **laser1:dl:power-optimization:stage1:** on page 100.

laser1:dl:power-optimization:stage3:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the fiber power optimization routine of diode laser systems using the amplifier servo motors.

For usage see **laser1:dl:power-optimization:stage1:** on page 100.

laser1:dl:power-optimization:stage4:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the advanced fiber power optimization routine of diode laser systems (use with amplifier only).

For usage see **laser1:dl:power-optimization:stage1:** on page 100.

laser1:dl:power-optimization:progress-data-seed-probe

(BINARY parameter, read-only)
(reading requires userlevel 4)

Parameter array indicating the amplifier power after the various iteration steps of the amplifier power optimization routine, as displayed in the TOPAS DLC PC-GUI Power Optimization Monitor (use with amplifier only). The values are represented as a BASE64-encoded sequence of 4-byte long floating point numbers in *little endian* byte order.

laser1:dl:power-optimization:progress-data-amp

(BINARY parameter, read-only)
(reading requires userlevel 4)

Parameter array indicating the amplifier power after the various iteration steps of the amplifier power optimization routine, as displayed in the TOPAS DLC PC-GUI Power Optimization Monitor. The values are represented as a BASE64-encoded sequence of 4-byte long floating point numbers in *little endian* byte order.

laser1:dl:power-optimization:progress-data-fiber

(BINARY parameter, read-only)
(reading requires userlevel 4)

Parameter array indicating the fiber monitor power after the various iteration steps of the fiber power optimization routine, as displayed in the TOPAS DLC PC-GUI Power Optimization Monitor (use with external photodiode only). The values are represented as a BASE64-encoded sequence of 4-byte long floating point numbers in *little endian* byte order.

laser1:dl:power-optimization:abort

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter specifying whether to abort the power optimization routine.

laser1:dl:power-optimization:low-power-threshold

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Threshold for low power detection at seed-probe and fiber power inputs (in V). If the photo diode voltage is below this threshold, power-optimization gets refused to be started.

laser1:dl:power-optimization:warm-up-active

(BOOLEAN parameter, read-only)
(reading requires userlevel 1)

Parameter indicating whether the laser warm-up routine is currently active. #t: Warm-up routine is active. #f: No warm-up routine is active.

laser1:dl:power-optimization:start-optimization-all

(command, no arguments, returns INTEGER)
(execution requires userlevel 3)

Command to start the power optimization routine for all stages. This command returns 0 if the power optimization routine could be successfully started or an error message otherwise.

laser1:dl:power-optimization:start-optimization-seed-probe

(command, no arguments, returns INTEGER)
(execution requires userlevel 3)

Command to start the power optimization routine of the seed-probe stage. This command returns 0 if the power optimization routine could be successfully started or an error message otherwise.

laser1:dl:power-optimization:start-optimization-amp

(command, no arguments, returns INTEGER)
(execution requires userlevel 3)

Command to start the power optimization routine of the amplifier stage. This command returns 0 if the power optimization routine could be successfully started or an error message otherwise.

laser1:dl:power-optimization:start-optimization-fiber

(command, no arguments, returns INTEGER)
(execution requires userlevel 3)

Command to start the power optimization routine of the fiber stage. This command returns 0 if the power optimization routine could be successfully started or an error message otherwise.

laser1:dl:power-optimization:start-warm-up

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to start the laser warm-up routine.

laser1:dl:power-optimization:stop-warm-up

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to stop the laser warm-up routine.

laser1:dl:servo:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the servo motors for systems with servo control.

laser1:dl:servo:probe1-hor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the first mirror/horizontal axis servo of the probe stage.

laser1:dl:servo:probe1-hor:display-name

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the name of the servo motor, used in error messages.

laser1:dl:servo:probe1-hor:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the servo motor.

laser1:dl:servo:probe1-hor:value

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the position of the servo motor.

laser1:dl:servo:probe1-hor:center-servo

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to set the servo motor to its center position.

laser1:dl:servo:probe1-vert:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the first mirror/vertical axis servo of the probe stage.

For usage see **laser1:dl:servo:probe1-hor:** on page 105.

laser1:dl:servo:ta1-hor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the first mirror/horizontal axis servo of the amplifier stage.

For usage see **laser1:dl:servo:probe1-hor:** on page 105.

laser1:dl:servo:ta1-vert:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the first mirror/vertical axis servo of the amplifier stage.

For usage see **laser1:dl:servo:probe1-hor:** on page 105.

laser1:dl:servo:ta2-hor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the second mirror/horizontal axis servo of the amplifier stage.

For usage see **laser1:dl:servo:probe1-hor:** on page 105.

laser1:dl:servo:ta2-vert:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the second mirror/vertical axis servo of the amplifier stage.

For usage see **laser1:dl:servo:probe1-hor:** on page 105.

laser1:dl:servo:fiber1-hor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the first mirror/horizontal axis servo of the fiber stage.

For usage see **laser1:dl:servo:probe1-hor:** on page 105.

laser1:dl:servo:fiber1-vert:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the first mirror/vertical axis servo of the fiber stage.

For usage see **laser1:dl:servo:probe1-hor:** on page 105.

laser1:dl:servo:center-probe-servos

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to set all the probe servo motors to their center positions.

laser1:dl:servo:center-ta-servos

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to set all the amplifier servo motors to their center positions.

laser1:dl:servo:center-fiber-servos

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to set all the fiber servo motors to their center positions.

laser1:dl:servo:center-all-servos

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to set all the servo motors in the system to their center positions.

laser1:dl:servo:enable-all-servos

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to enable all servos.

laser1:dl:servo:disable-all-servos

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to disable all servos.

laser1:dl:eom:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the intra cavity EOM.

For usage see **laser1:dl:pc:** on page 76.

laser1:dl:motor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the dl-motor.

laser1:dl:motor:position-set

(INTEGER parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to specify the target position of the motor in step counts.

laser1:dl:motor:position-act

(INTEGER parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the actual position of the motor.

laser1:dl:motor:position-min

(INTEGER parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter to specify the minimum position.

laser1:dl:motor:position-max

(INTEGER parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter to specify the maximum position.

laser1:dl:motor:state

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the motor.

-100 Error: Motor is stuc, no calibration available, ...

-5 Motor is referencing

0 Ready to move or scan

1 Moving to new wevelength

2 Moving to start position

3 Motor is scanning

4 Returnig to previous position

5 Scan paused

laser1:dl:motor:state-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the motor.

laser1:dl:motor:wavelength-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the wavelength of the laser in nanometers.

laser1:dl:motor:wavelength-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual wavelength of the laser in nanometers.

laser1:dl:motor:scan:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to control the scan of the motor.

laser1:dl:motor:scan:speed

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the speed for the scan.

laser1:dl:motor:scan:speed-max

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the maximum set-speed for the scan.

laser1:dl:motor:scan:shape

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Paramter for setting the shape for the scan:

0 - Triangle.

1 - Sawtooth.

laser1:dl:motor:scan:scan-begin

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the wavelength for the scan at the beginning.

laser1:dl:motor:scan:scan-end

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the wavelength for the scan at the end.

laser1:dl:motor:scan:progress

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the progress of the scan in

laser1:dl:motor:scan:remaining-time

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Paramter indicating the remaining time of the scan in seconds.

laser1:dl:motor:scan:continuous-mode

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the scan to continuous mode.

laser1:dl:motor:scan:restore-on-end

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify, if at the end of the scan the motor position should be restored to the set value it had before the scan.

laser1:dl:motor:scan:threshold-trigger:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to control the threshold trigger of the scan.

laser1:dl:motor:scan:threshold-trigger:threshold

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the threshold wavelength for setting the trigger output.

laser1:dl:motor:scan:start

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to start the scan.

laser1:dl:motor:scan:stop

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to stop the scan.

laser1:dl:motor:scan:pause

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to pause the scan.

laser1:dl:motor:scan:continue

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to continue a paused scan.

laser1:dl:motor:calibration:

(parameter section)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to specify the wavelength calibration for the motor.

laser1:dl:motor:calibration:fit-a

(REAL parameter, read-only)
(reading requires userlevel 2)

Coefficient for quadratic component of fit.

laser1:dl:motor:calibration:fit-b

(REAL parameter, read-only)
(reading requires userlevel 2)

Coefficient for linear component of fit.

laser1:dl:motor:calibration:fit-c

(REAL parameter, read-only)
(reading requires userlevel 2)

Coefficient for constant component of fit.

laser1:dl:motor:calibration:backlash

(INTEGER parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter defining the backlash of motor on direction change.

laser1:dl:motor:calibration:wavelength-min

(REAL parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the minimum settable wavelength.

laser1:dl:motor:calibration:wavelength-max

(REAL parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the maximum settable wavelength.

laser1:dl:motor:calibration:set

(command, 5 arguments, returns empty tuple)
(execution requires userlevel 2)

Arguments:

1. *fit-a* of type REAL
2. *fit-b* of type REAL
3. *fit-c* of type REAL
4. *wavelength-min* of type REAL
5. *wavelength-max* of type REAL

Command to activate all calibration parameters.

laser1:dl:motor:cycle-count

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the count of motor rotations.

laser1:dl:motor:perform-referencing

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to start the referencing for the motor.

laser1:dl:motor:reset-cycles

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to reset the cycle-counts.

laser1:dl:smc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters controlling the smc module.

laser1:dl:smc:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the SMC mode.

laser1:dl:smc:discover

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the SMC plateau discovery.

laser1:dl:smc:state

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the state of the SMC unit:

0 - disabled

1 - preparing

2 - busy

3 - locked

4 - locked, but mode-hop likely (actuator close to limit)

5 - locked, but mode-hop occurred

6 - lock lost (actuator at limit)

7 - failed (no single-mode plateau found)

8 - internal error

laser1:dl:smc:state-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating a short text representation of the SMC state.

laser1:dl:smc:pc-setpoint

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the voltage setpoint for the single mode control.

laser1:dl:smc:mode-hop-occurred

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether a mode-hop occurred since last reset.

laser1:dl:smc:mode-hop-likely

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether a mode-hop is likely to occur due to actuator limitations.

laser1:dl:smc:bandwidth-selection

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the bandwidth for smc.

0 0.01 Hz - very slow

1 0.1 Hz - slow

2 1 Hz - medium

3 10 Hz - fast

Note: The higher the bandwidth, the higher the laser's SMC induced relative intensity noise (RIN).

laser1:dl:smc:tuning:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the SMC current tuning.

laser1:dl:smc:tuning:current-min

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the minimum current of SMC current tuning range.

laser1:dl:smc:tuning:current-max

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the maximum current of SMC current tuning range.

laser1:dl:smc:rescan

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to start a new scan, if smc is active.

laser1:dl:smc:reset-mode-hop

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to reset the mode-hop indicator.

laser1:dl:factory-settings:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the most important laser parameters.
These settings are only available for non-legacy laser heads with an EEPROM (**laser1:dl:legacy** = #f)

laser1:dl:factory-settings:wavelength

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the specified laser wavelength (in nanometer).

laser1:dl:factory-settings:threshold-current

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the threshold current as determined during production (in mA).

laser1:dl:factory-settings:power

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the output power measured under factory settings during production (in mW).

laser1:dl:factory-settings:cc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the current controller (CC).

laser1:dl:factory-settings:cc:feedforward-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the setting for parameter **laser1:dl:cc:feedforward-factor** used for measurements during production.

laser1:dl:factory-settings:cc:current-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the setting for parameter **laser1:dl:cc:current-set** used for measurements during production.

laser1:dl:factory-settings:cc:current-clip

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the factory setting for the parameters **laser1:dl:cc:current-clip** and **laser1:dl:cc:current-clip-limit**.

laser1:dl:factory-settings:cc:current-clip-tuning

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the factory setting for the maximum allowed current used for tuning.

laser1:dl:factory-settings:cc:current-clip-modified

(BOOLEAN parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating if the user has modified the current clip factory settings.
#t - current clip factory settings parameters was modified
#f - current clip factory settings have not been modified after reading from EEPROM

laser1:dl:factory-settings:cc:current-clip-last-modified

(STRING parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating when the latest change of the current clip factory settings took place.

laser1:dl:factory-settings:cc:voltage-clip

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:dl:cc:voltage-clip**.

laser1:dl:factory-settings:cc:positive-polarity

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the factory setting for parameter **laser1:dl:cc:positive-polarity**.

laser1:dl:factory-settings:cc:snubber

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:dl:cc:snubber**.

laser1:dl:factory-settings:tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the temperature controller (TC).

laser1:dl:factory-settings:tc:temp-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the factory setting for parameter **tc:temp-set-min**.
The parameter **tc:limits:temp-min** is set to 2K below this value if this result is below 15°C. Otherwise **tc:limits:temp-min** is set to 15°C.

laser1:dl:factory-settings:tc:temp-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the factory setting for parameter **tc:temp-set-max**.
The parameter **tc:limits:temp-max** is set to 2K above this value if this result is above 30°C.Otherwise **tc:limits:temp-max** is set to 30°C.

laser1:dl:factory-settings:tc:temp-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:temp-set**.

laser1:dl:factory-settings:tc:temp-roc-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:temp-roc-enabled**.

laser1:dl:factory-settings:tc:temp-roc-limit

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the factory setting for parameter **tc:temp-roc-limit**.

laser1:dl:factory-settings:tc:current-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:current-set-max**.

laser1:dl:factory-settings:tc:current-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:current-set-min**.

laser1:dl:factory-settings:tc:p-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:t-loop:p-gain**.

laser1:dl:factory-settings:tc:i-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:t-loop:i-gain**.

laser1:dl:factory-settings:tc:d-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:t-loop:d-gain**.

laser1:dl:factory-settings:tc:c-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:c-loop:i-gain**.

laser1:dl:factory-settings:tc:ok-tolerance

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:t-loop:ok-tolerance**.

laser1:dl:factory-settings:tc:ok-time

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:t-loop:ok-time**.

laser1:dl:factory-settings:tc:timeout

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:limits:timeout**.

laser1:dl:factory-settings:tc:power-source

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:power-source**.

laser1:dl:factory-settings:tc:ntc-series-resistance

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:ntc-series-resistance**.

laser1:dl:factory-settings:tc:ntc-parallel-resistance

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:ntc-parallel-resistance**.

laser1:dl:factory-settings:tc:output-inverted

(BOOLEAN parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the factory setting for parameter **tc:output-inverted**.

laser1:dl:factory-settings:pc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the piezo controller (PC).

laser1:dl:factory-settings:pc:voltage-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:dl:pc:voltage-min**.

laser1:dl:factory-settings:pc:voltage-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:dl:pc:voltage-max**.

laser1:dl:factory-settings:pc:feedforward-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for **laser1:dl:pc:feedforward-enabled**.

laser1:dl:factory-settings:pc:feedforward-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for **laser1:dl:pc:feedforward-factor**.

laser1:dl:factory-settings:pc:capacitance

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the piezo capacitance, measured during production (in μF).

laser1:dl:factory-settings:pc:scan-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:scan:offset** used for measurements during production.

laser1:dl:factory-settings:pc:scan-amplitude

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:scan:amplitude** used for measurements during production.

laser1:dl:factory-settings:pc:slew-rate

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the setting for parameter **laser1:dl:pc:output-filter:slew-rate** recommended by TOPTICA.

laser1:dl:factory-settings:pc:slew-rate-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the setting for parameter **laser1:dl:pc:output-filter:slew-rate-enabled**.

laser1:dl:factory-settings:pc:pressure-compensation-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the setting for parameter **laser1:dl:pressure-compensation:factor**.

laser1:dl:factory-settings:eom:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the eom controller (PC).

laser1:dl:factory-settings:eom:voltage-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:dl:pc:voltage-min**.

laser1:dl:factory-settings:eom:voltage-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:dl:pc:voltage-max**.

laser1:dl:factory-settings:eom:feedforward-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for **laser1:dl:pc:feedforward-enabled**.

laser1:dl:factory-settings:eom:feedforward-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for **laser1:dl:pc:feedforward-factor**.

laser1:dl:factory-settings:eom:capacitance

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the piezo capacitance, measured during production (in μF).

laser1:dl:factory-settings:eom:scan-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:scan:offset** used for measurements during production.

laser1:dl:factory-settings:pd:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the laser power calibration. (Only available for certain laser heads)

laser1:dl:factory-settings:pd:seed:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the laser power calibration. (Only available for certain laser heads)

laser1:dl:factory-settings:pd:seed:cal-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the factory setting for the photodiode's calibration offset in V.

laser1:dl:factory-settings:pd:seed:cal-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the factory setting for the photodiode's calibration factor in mW/V.

laser1:dl:factory-settings:motor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the dl-motor. (Only available for certain laser heads)

laser1:dl:factory-settings:motor:position-min

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the minimum position.

laser1:dl:factory-settings:motor:position-max

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the maximum position.

laser1:dl:factory-settings:motor:wavelength-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter to specify the wavelength of the laser in nanometers.

laser1:dl:factory-settings:motor:speed-max-raw

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the maximum set-speed for the scan.

laser1:dl:factory-settings:motor:calibration:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the factory-settings of the calibration of position-wavelength dependency.

laser1:dl:factory-settings:motor:calibration:fit-a

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Coefficient for quadratic component of fit.

laser1:dl:factory-settings:motor:calibration:fit-b

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Coefficient for linear component of fit.

laser1:dl:factory-settings:motor:calibration:fit-c

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Coefficient for constant component of fit.

laser1:dl:factory-settings:motor:calibration:backlash

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter defining the backlash of motor on direction change.

laser1:dl:factory-settings:motor:calibration:inaccuracy

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter defining the maximum error of the calibration fit against the wavemeter data.

laser1:dl:factory-settings:motor:calibration:wavelength-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the minimum settable wavelength.

laser1:dl:factory-settings:motor:calibration:wavelength-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the maximum settable wavelength.

laser1:dl:factory-settings:servo-control:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the servo control board.

The parameters are used to connect a servo-motor or photodiode to a specific item on a servo control board. The item is a servo for the parameters **probe1-hor, probe1-vert, ta1-hor, ta1-vert, ta2-hor, ta2-vert, fiber1-hor, fiber1-vert** and a photodiode for **probe-pd, ta-pd, fiber-pd**.
The format is *servo-board-serialnumber:item-number*. Item-number can be 1-8 for servos and 1-3 for photodiodes. For ta-photodiode item-number 3 is used.
The serialnumber can be replaced by a servo control board parameter name, if no serialnumber is available.

Examples:

Parameter	Value	Result
probe1-hor	test1:1	probe1-hor servo is connected to servo number 1 of servo control board with serialnumber *test1*
probe1-hor	servo-control2:1	probe1-hor servo is connected to servo number 1 of servo control board connected to the DeCoF parameter **:servo-control2**
prode-pd	test1:1	probe-pd photodiode is connected to photodiode number 1 of servo control board with serialnumber *test1*

laser1:dl:factory-settings:servo-control:probe1-hor

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the horizontal servo for the probe component.

laser1:dl:factory-settings:servo-control:probe1-vert

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the vertical servo for the probe component.

laser1:dl:factory-settings:servo-control:ta1-hor

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the first horizontal servo for the ta component.

laser1:dl:factory-settings:servo-control:ta1-vert

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the first vertical servo for the ta component.

laser1:dl:factory-settings:servo-control:ta2-hor

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the second horizontal servo for the ta component.

laser1:dl:factory-settings:servo-control:ta2-vert

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the second vertical servo for the ta component.

laser1:dl:factory-settings:servo-control:fiber1-hor

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the horizontal servo for the fiber component.

laser1:dl:factory-settings:servo-control:fiber1-vert

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the vertical servo for the fiber component.

laser1:dl:factory-settings:servo-control:probe-pd

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the photodiode for the probe component.

laser1:dl:factory-settings:servo-control:ta-pd

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the photodiode for the for the ta component.

laser1:dl:factory-settings:servo-control:fiber-pd

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the photodiode for the fiber component.

laser1:dl:factory-settings:powerlock-output-channel-override

(INTEGER parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to set the output-channel for the power-stabilization.
Use a value of -3 (None) if the default channel for this type of laser head should be used.

laser1:dl:factory-settings:latest-service

(STRING parameter, read-only)
(reading requires userlevel 1)

Parameter indicating when the latest service took place.

laser1:dl:factory-settings:last-modified

(STRING parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating when the latest change of the factory settings took place.

laser1:dl:factory-settings:modified

(BOOLEAN parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating if the user has modified any factory settings.
#t - at least one of the factory settings parameters was modified
#f - factory settings have not been modified after reading from EEPROM

laser1:dl:factory-settings:apply

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

This command applies to all factory settings for the respecive CC, PC, TC channels etc.

laser1:dl:factory-settings:retrieve-now

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

This command sets the factory settings according to the currently active parameter values.

laser1:dl:factory-settings:update-service-date

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

This command updates the last-service parameter.

laser1:dl:store

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Stores current laser head parameters in the laser head's EEPROM.
If factory settings have been modified before, this command has to be executed twice. The first time it will return with an error which is only intended to make you aware of the fact that changing certain factory settings may void your warranty. When executed for the second time, this command will finally write the changes to the EEPROM.

laser1:dl:restore

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Restores all laser head parameters from the laser head's EEPROM.

laser1:ctl:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the CTL head.

laser1:ctl:fpga-fw-ver

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the firmware version of the CTL head FPGA.

laser1:ctl:model

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the model of the CTL hardware.
May return an empty string for some laser heads.

laser1:ctl:wavelength-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to set the desired wavelength in nm.
Changing the value of this parameter will start the motor. The motor will then move with maximum velocity to the posititon attributed to the desired wavelength, according to the internal calibration.

laser1:ctl:wavelength-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual wavelength in nm.
The value indicated here is calculated from the motor position, according to the internal calibration.

laser1:ctl:wavelength-min

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the minimum wavelength in nm.

laser1:ctl:wavelength-max

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the maximum wavelength in nm.

laser1:ctl:tuning-current-min

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the minimum current in mA, required for proper mode-hope free operation of the CTL.
The value is only informative. It's still possible to choose lower laser currents.

laser1:ctl:tuning-power-min

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the minimum power in mW, required for proper mode-hope free operation of the CTL. It is also the lower limit for the setvalue of the power stabilization.

laser1:ctl:state

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current state of the CTL scan engine:

-100 - ERROR

-90 - Standby

-8 - Motor referencing and FLOW initialization in progress

-7 - FLOW initialization in progress

-6 - Motor not referenced, yet

-5 - Motor referencing in progress
-4 - Motor referenced
-3 - Drift compensation in progress
-2 - FLOW optimization in progress
-1 - SMILE optimization in progress
0 - Ready
1 - Remotely controlled

laser1:ctl:state-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the state of the CTL scan engine as a text.

laser1:ctl:head-temperature

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the temperature inside the CTL laser head in $°C$.

laser1:ctl:optimization:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

CTL SMILE (Single Mode Intelligent Loop Engine) and FLOW (Feedback Light Optimization Wizard) optimization control.

laser1:ctl:optimization:progress

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the progress of the SMILE or FLOW optimization in percent.

laser1:ctl:optimization:smile

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to start optimization of SMILE parameters. Updates CTL state in **:ctl:state**. Abort with **:ctl:optimization:abort**.

laser1:ctl:optimization:flow

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to start FLOW optimization followed by an optimization of SMILE parameters. Updates CTL state in **:ctl:state**. Abort with **:ctl:optimization:abort**.

laser1:ctl:optimization:abort

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to abort currently running SMILE or FLOW optimization procedure.

laser1:ctl:remote-control:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to configure CTL analog remote control.
With analog remote control it's possible to control the wavelength of the laser with a voltage applied to one of the DLC pro's frontpanel inputs.

laser1:ctl:remote-control:signal

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the input signal to be used for CTL analog remote control.
For possible values, refer to the "Signal Channel IDs" section in appendix 4.1 on page 374.

laser1:ctl:remote-control:factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter specifying the factor to be applied to the input signal in nm/V.
The factor specified with parameter is only valid around the currently set wavelength.

laser1:ctl:remote-control:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enabled/disabled analog remote control.

laser1:ctl:mode-control:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters and commands related to SMILE.

laser1:ctl:mode-control:loop-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable SMILE.

laser1:ctl:motor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

CTL motor control parameters.

laser1:ctl:motor:position-accuracy-fullstep

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter for setting the motor position accuracy (in arbitrary units) for full-step operation. Default value is 8. When approaching its set wavelength, the motor stops when the measured position differs from the set position by less than the accuracy in arbitrary units. If this value is too small, the motor might jump back and forth between two positions instead of stopping.

laser1:ctl:motor:position-hysteresis-fullstep

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter for setting the motor position hysteresis (in arbitrary units)for full-step operation. Once the motor stopped, it will not start moving again before the measured position differs from the set position by more than position-accuracy+position-hysteresis. In unsteady environment, the laser might show small drifts. This is compensated by changing the motor position until the configured accuracy is again reached. By increasing this value, unwanted motor steps can be prevented.

laser1:ctl:motor:position-accuracy-microstep

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter for setting the motor position accuracy (in arbitrary units) for micro-step operation. Default value is 2. See **:position-accuracy-fullstep** for details.

laser1:ctl:motor:position-hysteresis-microstep

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter for setting the motor position hysteresis (in arbitrary units) for micro-step operation. See **:position-hysteresis-fullstep** for details.

laser1:ctl:motor:microsteps

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Paramter to specify whether microstepping should be used when possible.
Microstepping leads to smoother scans for low scan speeds. If this parameter is set

to #t, microstepping will be used for speeds up to about 50% of the maximum speed specified by **:speed-max**. If this parameter is set to #f microstepping will not be used.

laser1:ctl:motor:power-save-disabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter for enabling/disabling a "dead zone" around the target position inside which the motor is automatically disabled to save power and avoid heat generation.
#t - dead zone is deactivated, motor is always on
#f - dead zone is activated, motor is switched off after having reached the target position
Note: When **:power-save-disabled** is set to #f motor microsteps are disabled automatically and can not be activated unless power-save-disabled is set to #t.

laser1:ctl:motor:calibration:

(parameter section)
(reading requires userlevel 2, writing requires userlevel 2)

Parameters for specifying the motor-wavelength relationship.

laser1:ctl:motor:calibration:wavelength-offset

(REAL parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 1)

Parameter specifying a wavelength offset, in nm, relative to the calibrated look-up table.
Accepted values are between -0.5 nm and +0.5 nm.

laser1:ctl:motor:calibration:shift-wavelength

(command, 1 argument, returns empty tuple)
(execution requires userlevel 2)

Arguments:

1. *target-wavelength* of type REAL

Command to shift the wavelength calibration linearly to a certain target wavelength. The command calculates the difference between the given wavelength argument and the internal wavelength calibration for the current motor position and applies the result to the **:wavelength-offset** parameter. If the calculated difference exceeds the range of -0.5nm to +0.5nm, an error message is returned and the the wavelength shift is denied.

laser1:ctl:motor:calibration:reset-shift

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to reset the wavelength shift by setting the **:wavelength-offset** parameter to 0.0nm.

laser1:ctl:motor:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating status information about the CTL motor.
Each bit of the integer value provides specific status information.

bit 0 - arrived at set wavelength (distance to static set wavelength below tolerance value)

bit 1 - on track (distance to dynamic wavelength target below tolerance value)

bit 2 - motor switched off (for debugging only)

bit 3 - motor got stuck

bit 4 - dynamic wavelength target at lower limit

bit 5 - dynamic wavelength target at upper limit

NOTE: The tolerance for the "arrived" and "on track" bits is calculated from the hysteresis and accuracy parameters.

laser1:ctl:motor:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating a brief text version of the **:status** parameter.

laser1:ctl:power:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the output power level of the CTL as measured by an CTL head internal photodiode.

laser1:ctl:power:power-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the approximate output power level of the CTL in mW.

laser1:ctl:factory-settings:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for CTL operation.

laser1:ctl:factory-settings:wavelength-min

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the setting for parameter **laser1:ctl:wavelength-min**.

laser1:ctl:factory-settings:wavelength-max

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the setting for parameter **laser1:ctl:wavelength-max**.

laser1:ctl:factory-settings:tuning-current-min

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the setting for parameter **laser1:ctl:tuning-current-min**.

laser1:ctl:factory-settings:tuning-power-min

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the setting for parameter **laser1:ctl:tuning-power-min**.

laser1:ctl:factory-settings:apply

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to apply factory settings (originally read from EEPROM) to active CTL parameters in DLC pro.

laser1:amp:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the laser power amplifier stage.

laser1:amp:legacy

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether a legacy laser head - without factory settings stored in EEPROM - is connected to the DLCpro.
#t - legacy laser head connected; factory settings cannot be identified
#f - TOPTICA laser head factory settings stored in EEPROM

laser1:amp:type

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the type of amplifier head, e.g. "TApro".
For a legacy laser head - without factory settings stored in EEPROM - this parameter returns *"legacy amplifier"*. Possible values are:
- BoosTApro
- BoosTAproXP
- TA-SHGproXP
- DFB-TA-SHGproXP
- DFB-TA-FHGpro/amplifier
- DFB-TA-SHGpro/amplifier
- DFB-TApro/amplifier
- TA-FHGpro/amplifier
- TA-SHGpro/amplifier
- TApro/amplifier
- TAproXP/amplifier
- TopWave405/amplifier
- TopWaveXP/amplifier
- TopWaveUV/amplifier
- legacy amplifier

laser1:amp:version

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the version of the laser head hardware, e.g. "3V1".
For a legacy laser head - without factory settings stored in EEPROM - this parameter returns *"unknown"*.

laser1:amp:model

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the model of the amplifier hardware.
May return an empty string for some laser heads.

laser1:amp:serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the serial number of the laser head, e.g. "020000".
For a legacy laser head - without factory settings stored in EEPROM - this parameter returns *"unknown"*.

laser1:amp:fru-serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the serial number of the laser-diode unit.

laser1:amp:ontime

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the accumulated time (in seconds) the laser has been emitting. For a legacy laser head - without factory settings stored in EEPROM - this parameter returns *0*.

laser1:amp:ontime-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Formatted string for the accumulated laser emission time:
hours:minutes:seconds
For a legacy laser head - without factory settings stored in EEPROM - this parameter returns *"0:00:00"*.

laser1:amp:cc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Current control channel of power amplifier.

laser1:amp:cc:path

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter describing the hardware location of the current control channel.
Example: "ampcc1:channel1" indicates the current channel of the first CC-5000 current controller.

laser1:amp:cc:variant

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter describing the hardware variant of the current control channel channel. For example, it returns "5000 mA" or "10000 mA" for CC5000 or CC10000 channel, respectively.

laser1:amp:cc:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to switch the amplifier current on/off:
#t - laser emission on
#f - laser emission off

laser1:amp:cc:emission

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the amplifier emission status.
#t - all criteria for laser emission are fulfilled. Laser radiation should be emitted from this channel's amplifier.
#f - if laser emission is not possible for one of the following reasons:
- interlock circuit is open.
- the front panel key swicth is "off".
- the laser emission push button on the frontpanel is not pressed.
- laser emission is disabled by the software.

laser1:amp:cc:current-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to set the desired amplifier current in mA.
If **laser1:amp:cc:feedforward-enabled** is #t, **laser1:amp:cc:current-set** is determined as follows:

laser1:amp:cc:current-set = **laser1:amp:cc:current-offset** + **laser1:amp:cc:feedforward-factor** * (**laser1:dl:pc:voltage-set** - *voltage-pivot*) where *voltage-pivot* is the value of **laser1:dl:pc:voltage-set** at the time the feedforward gets enabled.
The **laser1:amp:cc:current-set** parameter setting affects the **laser1:amp:cc:current-offset** value.

laser1:amp:cc:current-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the amplifier current without Feed Forward contribution (in mA). This parameter setting affects the **laser1:amp:cc:current-set** value.

laser1:amp:cc:external-input:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to configure the current control by an external, analog voltage input.

For usage see **laser1:dl:cc:external-input:** on page 63.

laser1:amp:cc:output-filter:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to configure output filters such as slew rate.

For usage see **laser1:dl:cc:output-filter:** on page 64.

laser1:amp:cc:current-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the measured value of the amplifier chip current in mA. Usually, this is the current flowing through the amplifier chip. However, if the safety circuitry shorts the current output, this is not true.

laser1:amp:cc:current-out

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current value in mA, as applied to the digital-to-analog converter. The value should be close to the **current-act** value, but with higher resolution and without measurement noise.

laser1:amp:cc:current-clip

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the maximum allowed current (in mA) for this channel's amplifier chip.

laser1:amp:cc:current-clip-tuning

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the maximum allowed tuning current (in mA) for this channel's amplifier chip.

laser1:amp:cc:use-current-clip-tuning

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify if the maximum tuning current **:current-clip-tuning** should be taken into account for limiting the amplifier current. If set to #t the current gets limited to the maximum tuning current **:current-clip-tuning** or the maximum current **:current-clip**, depending on which one is smaller.

laser1:amp:cc:current-clip-limit

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the maximum value for the **:current-clip** parameter (in mA).
IMPORTANT: To be specified only for legacy laser heads (without factory settings stored in EEPROM; **:legacy** = #t).
.

laser1:amp:cc:current-clip-free-run

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the maximum value for the **:current-clip** parameter (in mA) in case of seedless operation.
The maximum parameter value is limited with **:current-clip**.

laser1:amp:cc:using-current-clip-free-run

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating if current of amplifier was changed due to amplifier's seedless operation.

laser1:amp:cc:voltage-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the measured value of the voltage applied to the amplifier chip (in V).

laser1:amp:cc:voltage-out

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the measured value of the voltage at the voltage fuse (in V).

laser1:amp:cc:voltage-clip

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the maximum allowed voltage (in V) for this channel's amplifier chip.
Can be changed only for legacy laser heads (without factory settings stored in EEPROM).

laser1:amp:cc:potential-load

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the approximate electrical load in W this current channel can potentially exert on the power supply if the maximum diode current is used. The sum of all amplifier channel loads must not exceed 40W.

laser1:amp:cc:feedforward-master

(INTEGER parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to specify the master channel for the feed forward.

laser1:amp:cc:feedforward-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable Feed Forward for this current control channel.
#t - Feed Forward enabled
#f - Feed Forward disabled
If enabled, a current proportional to another channel's output is added to this channel. The other channel is defined by the **laser1:feedforward-master** parameter.

laser1:amp:cc:feedforward-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control how much of the piezo channel's output is to be added to the current channel (in mA/V).

laser1:amp:cc:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter providing channel status information. Each bit of the integer value provides specific channel status information. The meaning of the individual bits depends on the type of amplifier current channel.
For CC-5000 type channels please refer to **ampcc1:channel1:status** for more details.
For HCC type channels please refer to **hcc1:channel1:status** for more details.
For CBC type channels please refer to **cbc:cc:status** for more details.

laser1:amp:cc:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter providing a brief text version of the **:status** parameter.

laser1:amp:cc:forced-off

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

For internal use. Parameter indicating if the channel is forced off by health monitoring.
#t - channel is forced to be off
#f - channel can be switched on
IMPORTANT: Set **:forced-off** to *#f* only if you accept the risk of operating the amplifier in undefined health.

laser1:amp:tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

The **laser1:amp:tc** section provides parameters related to the temperature controller for laser's power amplifier.

For usage see **laser1:dl:tc:** on page 68.

laser1:amp:pd:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Amplifier monitoring photodiodes.

laser1:amp:pd:seed:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the calibration of the amplifier's seed power monitoring photodiode (only available for certain laser heads.)

For usage see **laser1:dl:pd:seed:** on page 98.

laser1:amp:pd:seed-probe:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the calibration of the internal master laser power. (Only available for certain laser heads.)

For usage see **laser1:dl:pd:seed-probe:** on page 98.

laser1:amp:pd:amp:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the calibration of the amplifier's output power monitoring photodiode (only available for certain laser heads.)

For usage see **laser1:dl:pd:seed:** on page 98.

laser1:amp:pd:fiber:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the calibration of the internal master laser power. (Only available for certain laser heads.)

For usage see **laser1:dl:pd:seed-probe:** on page 98.

laser1:amp:power-optimization:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the power optimization routine of frequency-converted diode laser systems (use with AutoAlign option only).

For usage see **laser1:dl:power-optimization:** on page 99.

laser1:amp:servo:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the servo motors for systems with servo control.

For usage see **laser1:dl:servo:** on page 104.

laser1:amp:seed-limits:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

The amplifier's seed power is measured with a photodiode inside the TApro and the ADC of the CC-500 SMB input ch1. The seed power must be within a certain range of power levels to ensure proper operation and long lifetime for the amplifier.

laser1:amp:seed-limits:power

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the power level in mW.

laser1:amp:seed-limits:power-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the minimum required seed power in mW.

laser1:amp:seed-limits:power-min-warning-delay

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the time in seconds, the seed power is tolerated to be below **:power-min** before a warning message is issued.

laser1:amp:seed-limits:power-min-shutdown-delay

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the time in seconds, the seed power is tolerated to be below **:power-min** before a warning the amplifier is switched off.

laser1:amp:seed-limits:power-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the minimum required power in mW.

laser1:amp:seed-limits:power-max-warning-delay

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the time in seconds, the seed power is tolerated to be above **:power-max** before a warning message is issued.

laser1:amp:seed-limits:power-max-shutdown-delay

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the time in seconds, the seed power is tolerated to be above **:power-max** before a warning the amplifier is switched off.

laser1:amp:seed-limits:detect-pd-removal

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to specify whether photodiode removal-detection should be applied.
If activated, the photodiode inputs for seed power and amplifier power are periodically evaluated. If their input voltage drops below 50% of the calibration offset (**:cal-offset**) the photodiode is considered "detached". (In case of a negative calibration factor (**:cal-factor**) the logic is inverted.).
NOTE: This parameter can only be modified for BoosTA systems.

laser1:amp:seed-limits:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating status information about the power monitoring. Each bit provides specific information.

bit 0 - actual power below minimum

bit 1 - minimum power warning

bit 2 - minimum power shutdown

bit 3 - actual power exceeds maximum

bit 4 - maximum power warning

bit 5 - maximum power shutdown

bit 6 - photodiode detached

laser1:amp:seed-limits:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter providing a brief text version of the **:status** parameter.

laser1:amp:output-limits:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

The amplifier's output power is measured with a photodiode inside the TApro and the ADC of the CC-5000 SMB input ch1. The output power must be within a certain range of power levels to ensure proper operation and long lifetime for the amplifier.

For usage see **laser1:amp:seed-limits:** on page 142.

laser1:amp:seedonly-check:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

The amplifier must not be seeded while it is switched off (*seed without pump*). The parameters in this section configure when the seed is switched off in such a case.

laser1:amp:seedonly-check:seed

(BOOLEAN parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the enabled state of the seed laser.

laser1:amp:seedonly-check:pump

(BOOLEAN parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the enabled state of the amplifier.

laser1:amp:seedonly-check:warning-delay

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the time in seconds, the seed laser is tolerated to be on with the amplifier being off before a warning message is issued.

laser1:amp:seedonly-check:shutdown-delay

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the time in seconds, the seed laser is tolerated to be on with the amplifier being off before a warning the seed laser is switched off.

laser1:amp:seedonly-check:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating status information about the power monitoring. Each bit provides specific information.

bit 0 - emission conflict

bit 1 - emission conflict warning

bit 2 - emission conflict shutdown

laser1:amp:seedonly-check:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter providing a brief text version of the **:status** parameter.

laser1:amp:factory-settings:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the most important amplifier parameters.
These settings are only available for non-legacy amplifier heads with an EEPROM (**laser1:amp:legacy** = #f)

laser1:amp:factory-settings:wavelength

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the specified laser wavelength of the amplifier (in nanometer).

laser1:amp:factory-settings:power

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the amplifier output power measured under factory settings during production (in mW).

laser1:amp:factory-settings:cc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the amplifier current controller (CC).

laser1:amp:factory-settings:cc:feedforward-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the setting for parameter **laser1:amp:cc:feedforward-factor** used for measurements during production.

laser1:amp:factory-settings:cc:current-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the setting for parameter **laser1:amp:cc:current-set** used for measurements during production.

laser1:amp:factory-settings:cc:current-clip

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the factory setting for the parameters **laser1:amp:cc:current-clip** and **laser1:amp:cc:current-clip-limit**.

laser1:amp:factory-settings:cc:current-clip-tuning

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the factory setting for the maximum allowed current used for tuning.

laser1:amp:factory-settings:cc:current-clip-modified

(BOOLEAN parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating if the user has modified the current clip factory settings.
#t - current clip factory settings modified
#f - current clip factory settings have not been modified after read-out from EEPROM

laser1:amp:factory-settings:cc:current-clip-last-modified

(STRING parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating when the latest change of the current clip factory settings took place.

laser1:amp:factory-settings:cc:current-clip-free-run

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the factory setting for the maximum allowed current used during amplifier's seedless operation. The maximum allowed value that can be set is capped to the value of **:current-clip**

laser1:amp:factory-settings:cc:current-clip-free-run-modified

(BOOLEAN parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating if the user has modified the current clip free run factory settings.
#t - current clip free run factory settings modified
#f - current clip free run factory settings have not been modified after read-out from EEPROM

laser1:amp:factory-settings:cc:current-clip-free-run-last-modified

(STRING parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating when the latest change of the current clip free run factory settings took place.

laser1:amp:factory-settings:cc:voltage-clip

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:amp:cc:voltage-clip**.

laser1:amp:factory-settings:tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the amplifier temperature controller (TC).

For usage see **laser1:dl:factory-settings:tc:** on page 116.

laser1:amp:factory-settings:pd:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the Amplifier monitoring photodiodes.

laser1:amp:factory-settings:pd:seed:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the calibration of the amplifier's seed power monitoring photodiode (only available for certain laser heads.)

For usage see **laser1:dl:factory-settings:pd:seed:** on page 122.

laser1:amp:factory-settings:pd:amp:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the calibration of the amplifier's output power monitoring photodiode (only available for certain laser heads.)

For usage see **laser1:dl:factory-settings:pd:seed:** on page 122.

laser1:amp:factory-settings:seed-limits:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the seed laser power monitoring.

laser1:amp:factory-settings:seed-limits:power-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:amp:seed-limits:power-min**.

laser1:amp:factory-settings:seed-limits:power-min-warning-delay

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:amp:seed-limits:power-min-warning-delay**.

laser1:amp:factory-settings:seed-limits:power-min-shutdown-delay

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:amp:seed-limits:power-min-shutdown-delay**.

laser1:amp:factory-settings:seed-limits:power-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:amp:seed-limits:power-max**.

laser1:amp:factory-settings:seed-limits:power-max-warning-delay

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:amp:seed-limits:power-max-warning-delay**.

laser1:amp:factory-settings:seed-limits:power-max-shutdown-delay

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:amp:seed-limits:power-max-shutdown-delay**.

laser1:amp:factory-settings:seed-limits:detect-pd-removal

(BOOLEAN parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating the factory setting for parameter **laser1:amp:seed-limits:detect-pd-removal**.

laser1:amp:factory-settings:output-limits:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the amplifier output power monitoring.

For usage see **laser1:amp:factory-settings:seed-limits:** on page 148.

laser1:amp:factory-settings:seedonly-check:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the amplifier *seed-without-pump* check.

laser1:amp:factory-settings:seedonly-check:warning-delay

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:amp:seedonly-check:warning-delay**.

laser1:amp:factory-settings:seedonly-check:shutdown-delay

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:amp:seedonly-check:shutdown-delay**.

laser1:amp:factory-settings:servo-control:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the servo control board.

The parameters are used to connect a servo-motor or photodiode to a specific item on a servo control board. The item is a servo for the parameters **probe1-hor, probe1-vert, ta1-hor, ta1-vert, ta2-hor, ta2-vert, fiber1-hor, fiber1-vert** and a photodiode for **probe-pd, ta-pd, fiber-pd**.
The format is *servo-board-serialnumber:item-number*. Item-number can be 1-8 for servos and 1-3 for photodiodes. For ta-photodiode item-number 3 is used.
The serialnumber can be replaced by a servo control board parameter name, if no serialnumber is available.

Examples:

Parameter	Value	Result
probe1-hor	test1:1	probe1-hor servo is connected to servo number 1 of servo control board with serialnumber *test1*
probe1-hor	servo-control2:1	probe1-hor servo is connected to servo number 1 of servo control board connected to the DeCoF parameter **:servo-control2**
prode-pd	test1:1	probe-pd photodiode is connected to photodiode number 1 of servo control board with serialnumber *test1*

For usage see **laser1:dl:factory-settings:servo-control:** on page 124.

laser1:amp:factory-settings:latest-service

(STRING parameter, read-only)
(reading requires userlevel 1)

Parameter indicating when the latest service took place.

laser1:amp:factory-settings:last-modified

(STRING parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating when the latest change of the factory settings took place.

laser1:amp:factory-settings:modified

(BOOLEAN parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating if the user has modified any factory settings.
#t - at least one of the factory settings parameters was modified
#f - factory settings have not been modified after read-out from EEPROM

laser1:amp:factory-settings:warm-up:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

TBD

laser1:amp:factory-settings:warm-up:interval

(INTEGER parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

TBD

laser1:amp:factory-settings:warm-up:current-set

(INTEGER parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

TBD

laser1:amp:factory-settings:warm-up:repeats-max

(INTEGER parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

TBD

laser1:amp:factory-settings:warm-up:gradient-max

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

TBD

laser1:amp:factory-settings:warm-up:input-channel

(INTEGER parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

TBD

laser1:amp:factory-settings:apply

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to apply all factory settings for the respective CC, PC, TC channels etc.

laser1:amp:factory-settings:retrieve-now

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to set all the factory settings according to the currently active parameter values.

laser1:amp:factory-settings:update-service-date

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

This command updates the last-service parameter.

laser1:amp:store

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to store current amplifier head parameters in the amplifier head's EEPROM. If factory settings have been modified before, this command has to be executed twice. The first time it will return with an error which is only intended to make you aware of the fact that changing certain factory settings may void your warranty. When executed for the second time, this command will finally write the changes to the EEPROM.

laser1:amp:restore

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to restore all amplifier parameters according to values in the amplifier EEPROM.

laser1:dpss:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the diode-pumped solid state (DPSS) laser.

laser1:dpss:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the DPSS laser on/off state.

laser1:dpss:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the DPSS laser status.

laser1:dpss:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the Cobolt LED status in a textual form.

laser1:dpss:tc-status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the DPSS' TECs.

1 - TECs have reached the set temperature

0 - TECs are regulating and have reached the set temperature yet

-1 - Temperature error

laser1:dpss:tc-status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the DPSS' TECs in a textual form.

laser1:dpss:error-code

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the DPSS laser fault status.

laser1:dpss:error-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the DPSS laser fault status in a textual form.

laser1:dpss:operation-time

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the DPSS laser operation time (in hours).

laser1:dpss:power-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the output power of the DPSS laser (in mW).

laser1:dpss:power-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual output power of the DPSS laser (in mW).

laser1:dpss:power-max

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the maximum power output of the DPSS laser (in mW).

laser1:dpss:power-margin

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the fractional power-margin for the DPSS laser.

laser1:dpss:current-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual drive current of the DPSS laser (in mA).

laser1:dpss:current-max

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the maximal drive current of the DPSS laser (in mA).

laser1:dpss:temperature-control:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for controlling the temperatures of the dpss

laser1:dpss:temperature-control:t1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters controlling the temperature t1

laser1:dpss:temperature-control:t1:temp-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parametern indicating the actual temperature

laser1:dpss:temperature-control:t1:temp-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parametern to specify the set temperature

laser1:dpss:temperature-control:t1:temp-set-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parametern to specify the minimum set temperature

laser1:dpss:temperature-control:t1:temp-set-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parametern to specify the maximum set temperature

laser1:dpss:temperature-control:t1:temp-roc-limit

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parametern to specify the maximum change rate of the temperature

laser1:dpss:temperature-control:t2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters controlling the temperature t2

For usage see **laser1:dpss:temperature-control:t1:** on page 154.

laser1:dpss:temperature-control:t3:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters controlling the temperature t3

For usage see **laser1:dpss:temperature-control:t1:** on page 154.

laser1:dpss:temperature-control:t4:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters controlling the temperature t4

For usage see **laser1:dpss:temperature-control:t1:** on page 154.

laser1:dpss:temperature-control:t5:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters controlling the temperature t5

For usage see **laser1:dpss:temperature-control:t1:** on page 154.

laser1:scan:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the laser's main scan signal generator. It is closely coupled to the laser's scope and locking features.

laser1:scan:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the signal generator
#t - signal generator enabled
#f - signal generator disabled

laser1:scan:hold

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to hold the signal generator
#t - signal generator held
#f - signal generator not held

laser1:scan:signal-type

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the waveform of the scan signal.
0: sine
1: triangle
2: triangle rounded

laser1:scan:frequency

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the scan frequency (in Hz).

laser1:scan:phase-shift

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Phase difference in degrees with respect to the trigger output

laser1:scan:output-channel

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

This parameter controls the output channel for applying the modulation. For possible values, see the "Signal Channel IDs" section in appendix 4.1 on page 374.

laser1:scan:unit

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the physical unit for **:offset** and **:amplitude**.
Please note that string values might contain UTF-8 encoded characters like the small circle in $°C$.

laser1:scan:amplitude

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the peak-to-peak amplitude of the scan. Provided in physical units of the signal selected by the **:output-channel**.

laser1:scan:offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the offset/center of the scan. Provided in physical units of the signal selected by the **:output-channel**.

laser1:scan:start

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the start value of the scan period. Provided in physical units of the signal selected by the **:output-channel**.

laser1:scan:end

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the end value of the scan. Provided in physical units of the signal selected by the **:output-channel**.

laser1:wide-scan:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the single-shot wide-scan.

laser1:wide-scan:state

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current state of the wide-scan:

0 - disabled

1 - waiting for start condition to be reached

2 - scan active

3 - waiting for stop condition to be reached

laser1:wide-scan:state-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current state of the wide-scan as string.

laser1:wide-scan:output-channel

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the output channel for the scan. For possible values, refer to the "Signal Channel IDs" section in appendix 4.1 on page 374.

laser1:wide-scan:scan-begin

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the start value for the scan in $°C$.

laser1:wide-scan:scan-end

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the stop value for the scan in $°C$.

laser1:wide-scan:continuous-mode

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable wide-scan repeat mode.
#t - repeat mode on, scan runs continuously until **:stop** command is executed.
#f - repeat mode off, scan stops when **:scan-end** is reached.

laser1:wide-scan:restore-on-end

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify, if at the end of the scan the output channel should be restored to the set value it had before the scan.

laser1:wide-scan:shape

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter defining the scan type.
0 = Sawtooth, 1 = Triangle

laser1:wide-scan:offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the center value of the scan in $°C$.

laser1:wide-scan:amplitude

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the peak-to-peak amplitude of the scan in $°C$.

laser1:wide-scan:speed

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the scan speed in K/s.

laser1:wide-scan:speed-min

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the minimum possible scan speed in K/s.

laser1:wide-scan:speed-max

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the maximum possible scan speed in K/s.

laser1:wide-scan:duration

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the scan duration in s.

laser1:wide-scan:value-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the value of the parameter for the wide-scan x-axis.

laser1:wide-scan:value-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the value of the parameter for the wide-scan x-axis.

laser1:wide-scan:value-unit

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the unit of the parameter for the wide-scan x-axis.

laser1:wide-scan:recorder-stepsize-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify step size for x-axis.
If set to 0, **laser1:recorder:sample-count-limit** is used, to calculate **:recorder-stepsize**.

laser1:wide-scan:recorder-stepsize

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the next possible step size for x-axis.

laser1:wide-scan:recorder-sample-count

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the expected number of recorded samples.

laser1:wide-scan:recorder-sampling-rate

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the expected sampling rate.

laser1:wide-scan:recorder-sampling-interval

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the expected sampling interval.

laser1:wide-scan:memory-size

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the memory size in bytes needed to record all enabled channels.

laser1:wide-scan:progress

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the wide-scan progress in %.

laser1:wide-scan:remaining-time

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the approximate remaining time of the wide-scan in s.

laser1:wide-scan:trigger:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to configure the wide-scan's input and output trigger.

laser1:wide-scan:trigger:input-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the wide-scan input trigger. Use **:input-channel** for input channel configuration.

laser1:wide-scan:trigger:input-channel

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the wide-scan trigger input channel on the Digital I/O Connector:

2 - Digital Input 2

3 - Digital Input 3

laser1:wide-scan:trigger:output-threshold

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the trigger threshold in physical units of the selected output-channel. Trigger output level on the selected Digital Output pin is high if the actual value of the output channel is higher than this parameter and low otherwise.

laser1:wide-scan:start

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to start the wide scan. It has an effect only if **laser1:scan:enabled** is #f.

laser1:wide-scan:stop

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to stop the wide scan.

laser1:wide-scan:set-output-to-zoom-offset

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to set the value for the x-axis-parameter to the center of the zoom window.

laser1:wide-scan:set-scan-range-to-zoom-range

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to set the range for the next scan to the current zoom range.

laser1:wide-scan:set-zoom-range-to-scan-range

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to set the zoom range to the full scan range.

laser1:scope:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the data traces for the DLCpro diagram.

laser1:scope:variant

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control which kind of data is exported to the **:data** parameter:

0 - *xy* - This variant is typically used to find the lock point. The input signals are shown as function of the scan output-channel. Use the **:scope:channelx:xy-signal** parameter to define the signal for the x-axis.
The acquisition time for the scope engine is automatically set to half the scan period.

1 - *scope* - This variant shows the input signals as function of the time.
Use the **:scope:channelx:scope-timescale** parameter to define the total acquisition time for the traces (in ms). The acquisition time for the scope engine is set to the **:scope:channelx:scope-timescale** value.

2 - *spectrum* - This variant shows a Fast Fourier Transform of the signals as function of the frequency.
Use the **:scope:channelx:spectrum-range** parameter to define the maximum frequency you want to resolve.
The acquisition time for the scope engine is set to the $500/f_{max}$, with f_{max} = **:channelx:spectrum-range**.

laser1:scope:update-rate

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Sets the diagram update rate (in Hz).
Please note that, the trace acquisition time may influence the real diagram update-rate.

laser1:scope:channel1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for channel1 of the scope engine. For most lock applications, this channel's **:input-signal** is set to [100], that is, to the **:lock:spectrum-input-channel**.

laser1:scope:channel1:signal

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the signal channel to be acquired by the scope engine.
For possible values, refer to the "Signal Channel IDs" section in appendix 4.1 on page 374.

laser1:scope:channel1:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to enable/disable data acquisition for the scope channel.
#t - data acquisition enabled
#f - data acquisition disabled

laser1:scope:channel1:unit

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the physical unit of the selected signal.
Please note that string values might contain UTF-8 encoded characters like the small circle in $°C$.

laser1:scope:channel1:name

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the name of the signal.

laser1:scope:channel2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for channel2 of the scope engine. You can freely configure this channel.

For usage see **laser1:scope:channel1:** on page 163.

laser1:scope:channelx:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for the x-axis of the scope engine.
The x-axis is treated differently, depending on the **:scope:variant** setting.

laser1:scope:channelx:xy-signal

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to define the signal channel to be acquired for the x-axis values.
Applied if the **:scope:variant** parameter is set to "0" (xy) .
In most cases, this parameter is set to "101" - the scope acquiring signals from the **:scan:output-channel** channel.

laser1:scope:channelx:scope-timescale

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to define the timescale (in ms).
Applied if the **:scope:variant** parameter is set to "1" (scope).

laser1:scope:channelx:spectrum-range

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to define the full frequency range (in kHz).
Applied if the **:scope:variant** parameter is set to "2" (spectrum).

laser1:scope:channelx:spectrum-omit-dc

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

To help with autoscaling in the diagrams, the DC-components of the Fast Fourier Transform traces can be omitted.
Applied if the **:scope:variant** parameter is set to "2" (spectrum).
#t - the DC-components of the Fast Fourier Transform traces (that is, the 3 lowermost frequency components) are omitted.
#f - The DC-components of the Fast Fourier Transform traces can be seen.

laser1:scope:channelx:unit

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the physical unit of the signal.
"scope": ms
"spectrum": kHz
"xy": unit of the signal defined by **:channelx:xy-signal**
Please note that string values might contain UTF-8 encoded characters like the small circle in $°C$.

laser1:scope:channelx:name

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the name of the signal.

laser1:scope:timescale

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the data trace acquisition time in ms.

laser1:scope:data

(BINARY parameter, read-only)
(reading requires userlevel 4)

Parameter indicating trace data for all enabled channels. The parameter value is provided in the format decribed in Appendix 4.2.
It always contains a block of IDs *'x'* and, depending on which scope channels are enabled, contains IDs *'y'* and/or *'Y'*.

laser1:recorder:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the real-time data acquisition.
The recorder allows to simultaneously acquire 3 traces of data, with up to about 200 kHz sampling rate and up to 5 Mio. data points per trace.

laser1:recorder:state

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current state of the single-shot data acquisition:

0 - disabled

1 - armed, waiting for trigger

2 - recording

laser1:recorder:state-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current state of the data acquisition as string.

laser1:recorder:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the data acquisition.
Set this parameter to #t to arm the data acquisition. Set the parameter to #f in order to stop running data acquisition.

laser1:recorder:trigger-mode

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the trigger mode for the data acquisition:

0 - immediate, data acquisition will start immediately when the **:enabled** Parameter is set from #f to #t

2 - wide-scan/scan-aux triggered, data acquisition will start when the wide-scan is started, or with the next period of the scan-aux signal generator

4 - digital input 0, rising edge

5 - digital input 0, falling edge

6 - digital input 1, rising edge

7 - digital input 1, falling edge

laser1:recorder:inputs:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to configure the channels to be recorded.

laser1:recorder:inputs:channel1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to configure the signal for channel1.

laser1:recorder:inputs:channel1:signal

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the signal channel to be acquired for this channel of the single-shot scope engine.
For possible values, refer to the "Signal Channel IDs" section in appendix 4.1 on page 374.

laser1:recorder:inputs:channel1:low-pass-filter:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to configure the input low-pass filter for this channel.

laser1:recorder:inputs:channel1:low-pass-filter:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the low-pass filter for this signal.

laser1:recorder:inputs:channel1:low-pass-filter:cut-off-frequency

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the cut off frequency for the low-pass filter in Hz.

laser1:recorder:inputs:channel2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to configure the signal for channel2.

For usage see **laser1:recorder:inputs:channel1:** on page 167.

laser1:recorder:inputs:channelx:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to configure the signal for channelx.

laser1:recorder:inputs:channelx:signal

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the signal channel to be acquired for this channel of the single-shot scope engine.
For possible values, refer to the "Signal Channel IDs" section in appendix 4.1 on page 374.

laser1:recorder:recording-mode

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the recording mode:

0 - reset: resets all data on start.

1 - overwrite: overwrites old data.

2 - continuous: overwrites old data periodically.

In *reset mode* the data acquisition automatically stops when the configured amount of samples (see **:sample-count**) was recorded. In *continuous mode* data acquisition does not stop automatically. It uses a buffer of size **:sample-count** and starts overwriting it from the beginning, every time the end of the buffer was reached. Set **:enabled** to #f in order to stop data acquisition.
The *overwrite mode* is only used for internal purposes.

laser1:recorder:recording-time

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the recording time in ms.

laser1:recorder:sample-count-limit

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the maximum total number of samples to be set.
This value is also used to calculate **laser1:wide-scan:recorder-stepsize**, if **laser1:wide-scan:recorder-stepsize-set** is set to 0.

laser1:recorder:sample-count-set

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the desired, minimum total number of samples to be recorded.
From this value and the given **:recording-time**, the required sampling interval is calculated. This calculated interval has to be rounded to the next smaller possible value, supported by the digital sampling electronics. If this supported sampling interval is smaller than the original one, more sampling points are needed to cover the specified **recording-time**. If there is no supported smaller sampling interval, the targeted sample count cannot be reached. The number of actually required sampling points is returned by the **:sample-count** parameter.

laser1:recorder:sample-count

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the total number of samples to be recorded.
See **:sample-count-set** for a description.
When recording is started this number will be used to allocate internal memory for the data to be recorded.

laser1:recorder:sampling-interval

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the sampling interval in ms.

laser1:recorder:sampling-rate

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the sampling rate in Hz.

laser1:recorder:memory-size

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the memory size in bytes needed to record all enabled channels.

laser1:recorder:data:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to retrieve the recorded data.

laser1:recorder:data:channel1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Properties of channel1 of the recorded data.

laser1:recorder:data:channel1:signal

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the signal channel acquired by the single-shot scope engine.
For possible values, refer to the "Signal Channel IDs" section in appendix 4.1 on page 374.

laser1:recorder:data:channel1:unit

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the physical unit of the selected signal.
Please note that string values might contain UTF-8 encoded characters like the small circle in $°C$.

laser1:recorder:data:channel1:name

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the name of the signal.

laser1:recorder:data:channel2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Properties of channel2 of the recorded data.

For usage see **laser1:recorder:data:channel1:** on page 170.

laser1:recorder:data:channelx:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Properties of the x channel of the recorded data.

For usage see **laser1:recorder:data:channel1:** on page 170.

laser1:recorder:data:zoom-data

(BINARY parameter, read-only)
(reading requires userlevel 4)

Parameter indicating trace data for all enabled channels. The parameter value is provided in the format described in appendix 4.2.
It always contains a block of IDs *'x'* and, depending on which scope channels are enabled, additionally *'a'* and *'A'* and/or *'b'* and *'B'*.

laser1:recorder:data:zoom-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the center of the data range to be zoomed into, in units of the x-axis signal.

laser1:recorder:data:zoom-amplitude

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the full length of the data range to be zoomed into, in units of the x-axis signal. The amplitude must be positive.

laser1:recorder:data:recorded-sampling-interval

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the sampling interval in the traces for being retrieved with the `:get-data` and `:show-data` commands.

laser1:recorder:data:recorded-sample-count

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the number of recorded samples per channel, i.e. the number of samples available in the traces for being retrieved with the `:get-data` and `:show-data` commands.

laser1:recorder:data:last-recorded-sample

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the last recorded sample count.
This is useful when using the **:recording-mode** continuous. All samples beyond last-recorded-samples are recorded at the previous scan.

laser1:recorder:data:last-valid-sample

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating if data acquisition was corrupted, eg, due to too high sampling rate.
If no corruption was detected this parameter returns **:recorded-sample-count** - 1. If data corruption was detected this parameter returns index of the last sample that has been recorded before the first corruption was detected.
Please note that sometimes data corruption may occur without being detected.

laser1:recorder:data:memory-size

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the memory size in bytes currently used.

laser1:recorder:data:zoom-out

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to adjust **:zoom-offset** and **:zoom-amplitude** to the full width of the x-axis data range.

laser1:recorder:data:get-data

(command, 2 arguments, returns BINARY)
(execution requires userlevel 3)

Arguments:
1. *start-index* of type INTEGER

2. *count* of type INTEGER

Command to get part of the recorded data.
Argument *start-index* specifies the index of the first sampling point to be returned. Argument *count* specifies the number of sampling points to be returned. If *start-index* is greater than or equal to **:recorded-sample-count**, no sampling points will be returned. If *count* is greater than 1024 it will be clipped to 1024. If *start-index*+*count* is greater than **:recorded-sample-count** only **:recorded-sample-count** − *start-index* samples will be returned.
The binary return value is provided in the format described in Appendix 4.2.
It always contains a block of ID *i*, consisting of two 32bit integer values. The first integer value is the value of *start-index* and the second one is the number of sampling points returned (may be less than specified by *count*). Depending on which recorder channels are enabled, the data furthermore contains IDs *'x'*, *'y'* and/or *'Y'* with arrays of floating point values.

laser1:recorder:data:show-data

(command, 2 arguments, returns empty tuple)
(execution requires userlevel 3)

Arguments:

1. *start-index* of type INTEGER
2. *count* of type INTEGER

Command to print of the recorded data to the console.
Argument *start-index* specifies the index of the first sampling point to be returned. Argument *count* specifies the number of sampling points to be returned. If *start-index* is greater than or equal to **:recorded-sample-count**, no sampling points will be returned. If *count* is greater than 1024 it will be clipped to 1024. If *start-index*+ *count* is greater than **:recorder-sample-count** only **:recorder-sample-count**−*start-index* samples will be returned.
The data will be printed to the console as comma separated table of decimal numbers. The table always has 4 columns: *index*, *channel-x value*, *channel 1 value* and *channel 2 value*. It is recommended to use the `:get-data` for obtaining recorded data as there are no precision loses and the data is collected faster.

laser1:recorder:data:clear-data

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to clear the recorded data.

laser1:scan-aux:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the laser's auxilliary scan signal generator. It can be used independently of scan-and-lock and is not synchronous to the laser's scope."

For usage see **laser1:scan:** on page 156.

laser1:daq-connected

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to connect one of the DLCpros data acquisition (DAQ) engines (aka scope engine) to this laser. The data acquisition engine is necessary for viewing scope traces or using recorder and wide-scan etc. However, there are only two DAQ engines available in the DLCpros hardware. If more than two lasers are in use, this parameter must therefore be used to specify which lasers can make use of the DAQ engines at a time. Set this parameter to #t if this lasers scope traces are to be used. If set to #f the scope still can be configured, but the **:scope:data** parameter will not return any result. If the DLCpro's two DAQ engines are in use by other lasers, setting this parameter to #t will result in an error. It's then necessary to disconnect one of the other lasers from their DAQ engine.

laser1:nlo:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters relevant for the operation of frequency-converted diode laser systems.

laser1:nlo:servo:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the servo motors in frequency-converted diode laser systems.

laser1:nlo:servo:ta1-hor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the first mirror/horizontal axis servo of the amplifier stage.

laser1:nlo:servo:ta1-hor:display-name

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the name of the servo motor, used in error messages.

laser1:nlo:servo:ta1-hor:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the servo motor.

laser1:nlo:servo:ta1-hor:value

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the position of the servo motor.

laser1:nlo:servo:ta1-hor:center-servo

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to set the servo motor to its center position.

laser1:nlo:servo:ta1-vert:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the first mirror/vertical axis servo of the amplifier stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:ta2-hor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the second mirror/horizontal axis servo of the amplifier stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:ta2-vert:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the second mirror/vertical axis servo of the amplifier stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:shg1-hor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the first mirror/horizontal axis servo of the SHG stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:shg1-vert:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the first mirror/vertical axis servo of the SHG stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:shg2-hor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the second mirror/horizontal axis servo of the SHG stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:shg2-vert:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the second mirror/vertical axis servo of the SHG stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:fhg1-hor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the first mirror/horizontal axis servo of the FHG stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:fhg1-vert:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the first mirror/vertical axis servo of the FHG stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:fhg2-hor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the second mirror/horizontal axis servo of the FHG stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:fhg2-vert:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the second mirror/vertical axis servo of the FHG stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:fiber1-hor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the first mirror/horizontal axis servo of the fiber stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:fiber1-vert:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the first mirror/vertical axis servo of the fiber stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:fiber2-hor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the second mirror/horizontal axis servo of the fiber stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:fiber2-vert:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the second mirror/vertical axis servo of the fiber stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:uv-outcpl:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the servo of the UV cavity's output coupling mirror.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:uv-cryst:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the servo of the UV cavity's crystal.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:uv-lens:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the servo of the UV cavity's.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:comp-hor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the horizontal axis of the compensation mirror.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:comp-vert:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the vertical axis of the compensation mirror.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:etalon:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the servo of the OPO intra-cavity etalon.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:nlo:servo:center-ta-servos

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to set all the amplifier servo motors to their center positions.

laser1:nlo:servo:center-shg-servos

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to set all the SHG servo motors to their center positions.

laser1:nlo:servo:center-fhg-servos

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to set all the FHG servo motors to their center positions.

laser1:nlo:servo:center-fiber-servos

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to set all the fiber servo motors to their center positions.

laser1:nlo:servo:center-all-servos

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to set all the servo motors in the system to their center positions.

laser1:nlo:servo:enable-all-servos

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to enable all servos.

laser1:nlo:servo:disable-all-servos

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to disable all servos.

laser1:nlo:pd:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for values and calibration of the photo diodes within frequency-converted diode laser systems.

laser1:nlo:pd:dl:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for value and calibration of the seed photo diode within frequency-converted diode laser systems.

For usage see **laser1:dl:pd:seed:** on page 98.

laser1:nlo:pd:amp:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for value and calibration of the amplifier photo diode within frequency-converted diode laser systems.

For usage see **laser1:dl:pd:seed:** on page 98.

laser1:nlo:pd:fiber:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for value and calibration of the fiber photo diode within frequency-converted diode laser systems (use with FiberMon option only).

laser1:nlo:pd:fiber:power

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the power level in mW.

laser1:nlo:pd:fiber:photodiode

(REAL parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the photo diode voltage in V.

laser1:nlo:pd:fiber:cal-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the calibration offset for the photodiode in mW.

laser1:nlo:pd:fiber:cal-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the calibration factor for the photodiode in mW/V.

laser1:nlo:pd:shg:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for value and calibration of the SHG photo diode within frequency-converted diode laser systems.

For usage see **laser1:nlo:pd:fiber:** on page 179.

laser1:nlo:pd:shg-input:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for value and calibration of the SHG input photo diode within frequency-converted diode laser systems.

For usage see **laser1:dl:pd:seed:** on page 98.

laser1:nlo:pd:shg-int:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for value and calibration of the SHG intra-cavity photo diode within frequency-converted diode laser systems.

laser1:nlo:pd:shg-int:photodiode

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the photo diode voltage in V.

laser1:nlo:pd:shg-int:cal-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the calibration offset for the photodiode in V.

laser1:nlo:pd:shg-pdh-dc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for value and calibration of the SHG cavity-rejection photo diode within frequency-converted diode laser systems.

For usage see **laser1:nlo:pd:shg-int:** on page 180.

laser1:nlo:pd:shg-pdh-rf:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for value and gain of the SHG PDH photo diode within frequency-converted diode laser systems.

laser1:nlo:pd:shg-pdh-rf:photodiode

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the photo diode voltage in V.

laser1:nlo:pd:shg-pdh-rf:gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the gain factor for the photodiode in V/V.

laser1:nlo:pd:fhg:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for value and calibration of the SHG photo diode within frequency-converted diode laser systems.

For usage see **laser1:nlo:pd:fiber:** on page 179.

laser1:nlo:pd:fhg-int:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for value and calibration of the FHG intra-cavity photo diode within frequency-converted diode laser systems.

For usage see **laser1:nlo:pd:shg-int:** on page 180.

laser1:nlo:pd:fhg-pdh-dc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for value and calibration of the FHG cavity-rejection photo diode within frequency-converted diode laser systems.

For usage see **laser1:nlo:pd:shg-int:** on page 180.

laser1:nlo:pd:fhg-pdh-rf:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for value and gain of the FHG PDH photo diode within frequency-converted diode laser systems.

For usage see **laser1:nlo:pd:shg-pdh-rf:** on page 181.

laser1:nlo:pd:pump:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for value and calibration of the pump output power photo diode in an OPO system.

For usage see **laser1:nlo:pd:fiber:** on page 179.

laser1:nlo:pd:pump-dep:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for value and calibration of the pump depleted output power photo diode in an OPO system.

For usage see **laser1:nlo:pd:fiber:** on page 179.

laser1:nlo:pd:sig:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for value and calibration of the *signal* output power photo diode in an OPO system.

For usage see **laser1:nlo:pd:fiber:** on page 179.

laser1:nlo:power-optimization:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the power optimization routine of frequency-converted diode laser systems (use with AutoAlign option only).

laser1:nlo:power-optimization:ongoing

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the power optimization routine:
#t: An optimization routine is in progress.
#f: No optimization routine is in progress.

laser1:nlo:power-optimization:progress

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the overall progress of the power optimization routines depending on the selected stages:

0 : Optimization routine is starting.

100 : Optimization routine has finished.

laser1:nlo:power-optimization:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Status of the optimization for internal purposes.

laser1:nlo:power-optimization:status-string

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the power optimization routine as a status string as displayed in the TOPAS DLC PC-GUI.

laser1:nlo:power-optimization:last-time-optimized

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating when the latest power optimization took place.

laser1:nlo:power-optimization:shg-advanced

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the Advanced mode of the power optimization routine for the SHG stage:
#t: Advanced mode selected.
#f: Advanced mode deselected.

laser1:nlo:power-optimization:stage1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the amplifier power optimization routine of frequency-converted diode laser systems (use with amplifier only).

laser1:nlo:power-optimization:stage1:input:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters concerning the photo diode input of the power optimization routine.

laser1:nlo:power-optimization:stage1:input:value-calibrated

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the calibrated photo diode voltage used in the amplifier power optimization routine.

laser1:nlo:power-optimization:stage1:progress

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the progress of the power optimization routine as a percentage:

0 : Optimization routine is starting.

100 : Optimization routine has finished.

laser1:nlo:power-optimization:stage1:optimization-allowed

(BOOLEAN parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to enable/disable the optimization for this servo motors.

laser1:nlo:power-optimization:stage1:optimization-in-progress

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the power optimization routine:
#t: The optimization routine is in progress.
#f: The optimization routine is not in progress.

laser1:nlo:power-optimization:stage1:restore-on-abort

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the return of the servo motors to their previous positions after the power optimization routine is aborted.

laser1:nlo:power-optimization:stage1:restore-on-regress

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the return of the servo motors to their previous positions after the power optimization routine has decreased the stage power. This may happen for an already optimized system.

laser1:nlo:power-optimization:stage1:regress-tolerance

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the failure margin (as a percentage) that is tolerated if the power optimization routine leads to a power decrease. This may happen for an already optimized system.

laser1:nlo:power-optimization:stage1:autosave-actuator-values

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to specify whether actuator values are to be automatically saved when the new power value is greater than before optimization.

laser1:nlo:power-optimization:stage1:start-optimization

(command, no arguments, returns INTEGER)
(execution requires userlevel 3)

Command to start the power optimization routine of the stage.

laser1:nlo:power-optimization:stage2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the SHG power optimization routine of frequency-converted diode laser systems.

For usage see **laser1:nlo:power-optimization:stage1:** on page 184.

laser1:nlo:power-optimization:stage3:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the SHG power optimization routine of frequency-converted diode laser systems using the amplifier servo motors (use with amplifier only).

For usage see **laser1:nlo:power-optimization:stage1:** on page 184.

laser1:nlo:power-optimization:stage4:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the fiber power optimization routine of frequency-converted diode laser systems.

For usage see **laser1:nlo:power-optimization:stage1:** on page 184.

laser1:nlo:power-optimization:stage5:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the FHG power optimization routine of frequency-converted diode laser systems.

For usage see **laser1:nlo:power-optimization:stage1:** on page 184.

laser1:nlo:power-optimization:low-power-threshold

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Threshold for low power detection at the fiber power input (in V). If the photo diode voltage is below this threshold, power-optimization gets refused to be started.

laser1:nlo:power-optimization:progress-data-amp

(BINARY parameter, read-only)
(reading requires userlevel 4)

Parameter array indicating the amplifier power after the various iteration steps of the amplifier power optimization routine, as displayed in the TOPAS DLC PC-GUI Power Optimization Monitor (use with amplifier only). The values are represented as a BASE64-encoded sequence of 4-byte long floating point numbers in *little endian* byte order.

laser1:nlo:power-optimization:progress-data-shg

(BINARY parameter, read-only)
(reading requires userlevel 4)

Parameter array indicating the SHG power after the various iteration steps of the SHG power optimization routine, as displayed in the TOPAS DLC PC-GUI Power Optimization Monitor. The values are represented as a BASE64-encoded sequence of 4-byte long floating point numbers in *little endian* byte order.

laser1:nlo:power-optimization:progress-data-fiber

(BINARY parameter, read-only)
(reading requires userlevel 4)

Parameter array indicating the fiber monitor power after the various iteration steps of the fiber power optimization routine, as displayed in the TOPAS DLC PC-GUI Power Optimization Monitor (use with FiberMon option only). The values are represented as a BASE64-encoded sequence of 4-byte long floating point numbers in *little endian* byte order.

laser1:nlo:power-optimization:progress-data-fhg

(BINARY parameter, read-only)
(reading requires userlevel 4)

Parameter array indicating the FHG power after the various iteration steps of the FHG power optimization routine, as displayed in the TOPAS DLC PC-GUI Power Optimization Monitor. The values are represented as a BASE64-encoded sequence of 4-byte long floating point numbers in *little endian* byte order.

laser1:nlo:power-optimization:abort

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter specifying whether to abort the power optimization routine.

laser1:nlo:power-optimization:warm-up-active

(BOOLEAN parameter, read-only)
(reading requires userlevel 1)

Parameter indicating whether the laser warm-up routine is currently active or not. #t: Warm-up routine is active. #f: Warm-up routine is not active.

laser1:nlo:power-optimization:start-optimization-all

(command, no arguments, returns INTEGER)
(execution requires userlevel 3)

Command to start the power optimization routine for all stages. This command returns 0 if the power optimization routine could be successfully started or a negative error code otherwise.

laser1:nlo:power-optimization:start-optimization-amp

(command, no arguments, returns INTEGER)
(execution requires userlevel 3)

Command to start the power optimization routine of the amplifier stage. This command returns 0 if the power optimization routine could be successfully started or a negative error code otherwise.

laser1:nlo:power-optimization:start-optimization-shg

(command, no arguments, returns INTEGER)
(execution requires userlevel 3)

Command to start the power optimization routine of the SHG stage. This command returns 0 if the power optimization routine could be successfully started or a negative error code otherwise.

laser1:nlo:power-optimization:start-optimization-fiber

(command, no arguments, returns INTEGER)
(execution requires userlevel 3)

Command to start the power optimization routine of the fiber stage (use with FiberMon option only). This command returns 0 if the power optimization routine could be successfully started or a negative error code otherwise.

laser1:nlo:power-optimization:start-optimization-fhg

(command, no arguments, returns INTEGER)
(execution requires userlevel 3)

Command to start the power optimization routine of the FHG stage. This command returns 0 if the power optimization routine could be successfully started or a negative error code otherwise.

laser1:nlo:power-optimization:start-warm-up

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to start the laser warm-up routine.

laser1:nlo:power-optimization:stop-warm-up

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to stop the laser warm-up routine.

laser1:nlo:auto-nlo:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for controlling the AutoNLO feature of frequency-converted diode laser systems.

laser1:nlo:auto-nlo:automatic-mode

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter to enable the Auto-Pilot feature.

laser1:nlo:auto-nlo:laser-on

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable the NLO laser head.

laser1:nlo:auto-nlo:emission

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the emission status for the NLO laser head.
#t - laser emits light
#f - laser emission is switched off

laser1:nlo:auto-nlo:operation-time-master

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the operation time of the master laser in hours.

laser1:nlo:auto-nlo:operation-time-amplifier

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the operation time of the amplifier in hours.

laser1:nlo:auto-nlo:operation-time-cavity

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the operation time of the SHG resonator in hours.

laser1:nlo:auto-nlo:operation-time-cavity-fhg

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the operation time of the FHG resonator in hours.

laser1:nlo:auto-nlo:amplifier-current-margin

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the fractional current-margin for the amplifier.

laser1:nlo:auto-nlo:amplifier-current-margin-alo

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the fractional current-margin after last optimize for the amplifier.

laser1:nlo:auto-nlo:conversion-efficiency

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the conversion efficiency of the SHG resonator.

laser1:nlo:auto-nlo:conversion-efficiency-fhg

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the conversion efficiency of the FHG resonator.

laser1:nlo:auto-nlo:wavelength-set

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter indicating the target wavelength for the single-mode optimization (in nm).

laser1:nlo:auto-nlo:wavelength

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the wavelength (in vacuum) in nanometer.

laser1:nlo:auto-nlo:temp-act-baseplate

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current temperature of the baseplate on a TopWave405 system.

laser1:nlo:auto-nlo:wavemeter:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Parameters concerning the wavelength meter.

laser1:nlo:auto-nlo:wavemeter:serial-number

(STRING parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter specifying the serial-number of the wavelength meter to use during single-mode optimization. If a connection to the given wavelength meter cannot be established, the AutoNLO system will switch into an error state. Set this parameter to an empty string if no wavelength meter should be used.

laser1:nlo:auto-nlo:wavemeter:status

(INTEGER parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the wavemeter status. Each bit of the integer value provides specific information.

bit 0 - not connected

bit 1 - underexposed

bit 2 - overexposed

bit 3 - calibration ongoing

bit 4 - blackbody signal and CCD correction ongoing

bit 5 - wavelength meter is powering down

bit 6 - wavelength meter is powering up

laser1:nlo:auto-nlo:wavemeter:status-txt

(STRING parameter, read-only)
(reading requires userlevel 1)

Parameter indicating a textual representation of the wavelength meter status.

laser1:nlo:auto-nlo:wavemeter:wavelength-before-optimization

(REAL parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the wavelength (in nm), measured immediately before the latest single-mode optimization was started. If no optimization has yet been performed, this parameter returns zero.

laser1:nlo:auto-nlo:wavemeter:wavelength-after-optimization

(REAL parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the wavelength (in nm), measured immediately after the latest single-mode optimization has finished successfully. If no optimization has yet finished successfully, this parameter returns zero.

laser1:nlo:auto-nlo:wavemeter:wavelength-temp-coeff

(REAL parameter, read-only)
(reading requires userlevel 1, writing requires userlevel 0)

Parameter indicating the value of the temperature tuning factor.

laser1:nlo:auto-nlo:wavemeter:exposure-time

(INTEGER parameter, read-only)
(reading requires userlevel 1, writing requires userlevel 0)

Parameter specifying the exposure time in milliseconds.

laser1:nlo:auto-nlo:perform-single-mode-optimization

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to optimize the single-mode performance of the NLO system.

laser1:nlo:auto-nlo:perform-auto-align

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to start the AutoAlign optimization routine.

laser1:nlo:auto-nlo:reset-operation-time-cavity

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to reset the **:operation-time-cavity** parameter to zero in case of a cavity replacement.

laser1:nlo:auto-nlo:reset-operation-time-cavity-fhg

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to reset the **:operation-time-cavity-fhg** parameter to zero in case of a cavity replacement.

laser1:nlo:warm-up:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Parameters for controlling the warm-up routine of frequency-converted diode laser systems.

laser1:nlo:warm-up:activated

(BOOLEAN parameter, read-only)
(reading requires userlevel 1)

Parameter indicating if the warm-up routine is active.

laser1:nlo:warm-up:start

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to start the NLO laser warm-up routine.

laser1:nlo:warm-up:stop

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to stop the NLO laser warm-up routine.

laser1:nlo:shg:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the control of the SHG cavity.

laser1:nlo:shg:tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

The **laser1:nlo:shg:tc** section provides parameters related to the temperature controller for the nonlinear crystals in frequency-converted diode laser systems.

For usage see **laser1:dl:tc:** on page 68.

laser1:nlo:shg:cavity-tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

The **laser1:nlo:shg:cavity-tc** section provides parameters related to the temperature controller for the cavity in frequency-converted diode laser systems.

For usage see **laser1:dl:tc:** on page 68.

laser1:nlo:shg:pc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters the Temperature Control (TC) board.

For usage see **laser1:dl:pc:** on page 76.

laser1:nlo:shg:scan:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides access to the SHG cavity scan signal generator.

laser1:nlo:shg:scan:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the SHG cavity signal generator
#t - signal generator enabled
#f - signal generator disabled

laser1:nlo:shg:scan:frequency

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the SHG cavity scan frequency (in Hz).

laser1:nlo:shg:scan:amplitude

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the peak-to-peak amplitude of the SHG cavity scan generator (in Vpp).

laser1:nlo:shg:scan:offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the offset/center of the SHG cavity scan generator (in V).

laser1:nlo:shg:scope:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides access to the data traces for the SHG signal display.

laser1:nlo:shg:scope:variant

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

This parameter controls which kind of data should be exported in the **:data** parameter:

0 - *xy* - This variant will typically be used for finding the lock point. The input signals are then shown as a function of the scan output-channel. Use the **:scope:channelx:xy-signal** to define the signal for the x-axis. The acquisition time for the scope engine is automatically set to half the scan period.

1 - *scope* - This variant shows the signals as a function of time.
Use the **:scope:channelx:scope-timescale** parameter to define the total acquisition time for the traces in ms. The acquisition time for the scope engine is set to the **:scope:channelx:scope-timescale** value.

2 - *spectrum* - This variant shows a Fast Fourier Transform of the signals as a function of frequency.
Use the **:scope:channelx:spectrum-range** parameter to define the maximum frequency you want to resolve. The acquisition time for the scope engine is set to the $500/f_{max}$, with f_{max} = **:channelx:spectrum-range**.

laser1:nlo:shg:scope:update-rate

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Sets the diagram update-rate (in Hz).
Please note that, the trace acquisition time may influence the real diagram update-rate.

laser1:nlo:shg:scope:channel1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for channel1 of the scope engine. For most lock applications you may want to set this channel's **:input-signal** to 100, meaning the **:lock:spectrum-input-channel**.

laser1:nlo:shg:scope:channel1:signal

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Use this parameter to set the signal channel you want to be acquired by the scope engine.

laser1:nlo:shg:scope:channel1:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Set this parameter to #t to enable data acquisition for this channel.

laser1:nlo:shg:scope:channel1:unit

(STRING parameter, read-only)
(reading requires userlevel 4)

Returns the physical unit of the selected signal.

laser1:nlo:shg:scope:channel1:name

(STRING parameter, read-only)
(reading requires userlevel 4)

Returns the name of the signal.

laser1:nlo:shg:scope:channel2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for channel2 of the scope engine. You can freely configure this channel.

For usage see **laser1:nlo:shg:scope:channel1:** on page 195.

laser1:nlo:shg:scope:channelx:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for the x-axis of the scope engine. Depending on the **:scope:variant** setting the x-axis is treated differently and different parameters of this sections apply.

laser1:nlo:shg:scope:channelx:xy-signal

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

This parameter is only used if the **:scope:variant** is set to "XY mode". It then defines the signal channel to be acquired for the x-axis values. In most cases this parameter should be set to 101 will make the scope acquiring the signals from the channel defined as **:scan:output-channel**.

laser1:nlo:shg:scope:channelx:scope-timescale

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

This parameter is only used if the **:scope:variant** is set to "scope". It then defines the timescale (in ms).

laser1:nlo:shg:scope:channelx:spectrum-range

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

This parameter is only used if the **:scope:variant** is set to "spectrum". It then defines the full frequency range (in kHz).

laser1:nlo:shg:scope:channelx:spectrum-omit-dc

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

If this parameter is set to #t, the lowest 3 frequency components (i.e. the DC components) of the Fast Fourier Transform traces will be omitted. This is intended to help with autoscaling in the diagrams. Set this parameter to #f if you need to see the DC components.

laser1:nlo:shg:scope:channelx:unit

(STRING parameter, read-only)
(reading requires userlevel 4)

Returns the physical unit of the signal. For the "scope" case it will return "ms", for the spectrum case "kHz" and for the "xy" case it will return the unit of the signal defined by **:channelx:xy-signal**.

laser1:nlo:shg:scope:channelx:name

(STRING parameter, read-only)
(reading requires userlevel 4)

Returns the name of the signal.

laser1:nlo:shg:scope:timescale

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Returns the data trace acquisition time (in ms).

laser1:nlo:shg:scope:data

(BINARY parameter, read-only)
(reading requires userlevel 4)

Returns trace data for all enabled channels. The data format is described in the appendix (to be done).

laser1:nlo:shg:lock:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides access to the SHG cavity's lock engine. It has two PID regulators for controlling two independent output channels. Furthermore it provides modules for lock-in detection, automatic relock or reset, as well as for easy to use click-and-lock functionality.

laser1:nlo:shg:lock:state

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current operational mode of the lock module. Possible values are:
0 - lock off
1 - locking
2 - locked

laser1:nlo:shg:lock:state-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current operational mode of the lock module as a short text. Possible values are: "idle", "locking" and "locked".

laser1:nlo:shg:lock:lock-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

This parameter returns #t if the lock engine's **:state** is "locking" or "locked". Setting this parameter to #t has the same effect as submitting the command **:close** and setting this parameter to #f has the same effect as submitting the command **:open**.

laser1:nlo:shg:lock:pid-selection

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the PID controllers to be used by the SHG cavity lock engine:
0 - no PID controller active.
1 - "PID Slow" (PID2) on, "PID Fast" (PID1) off, analog PID off.
2 - "PID Slow" (PID2) on, "PID Fast" (PID1) off, analog PID on.
3 - "PID Slow" (PID2) on, "PID Fast" (PID1) on, analog PID off.
4 - All PID controllers on.

laser1:nlo:shg:lock:setpoint

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the setpoint for the PID Slow controller (in V).

laser1:nlo:shg:lock:continuous-calc-pid

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable continuous calculation of PIDs for SHG lock.

laser1:nlo:shg:lock:relock:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for automatic SHG cavity ReLock.

laser1:nlo:shg:lock:relock:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Set this parameter to #t to enable the ReLock engine.

laser1:nlo:shg:lock:relock:frequency

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the frequency of the ReLock scan (in Hz).

laser1:nlo:shg:lock:relock:amplitude

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the amplitude of the ReLock waveform (in V).

laser1:nlo:shg:lock:relock:delay

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to determine the waiting time before the ReLock procedure starts after the out-of-lock condition is signaled by **:lock:window**.

laser1:nlo:shg:lock:window:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for out-of-lock detection for SHG cavity ReLock and triggering the PID controller reset.

laser1:nlo:shg:lock:window:input-channel

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the input signal for the lock detection window.

laser1:nlo:shg:lock:window:threshold

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to determine the threshold of the ReLock window (in V).

laser1:nlo:shg:lock:window:level-hysteresis

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to determine the inner ReLock window by a voltage difference to the outer ReLock window limits (in V or mW).

laser1:nlo:shg:lock:window:calibration:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Parameters for the automatic calibration of the lock supervision window. The parameters for the SHG stage refer to amplifier power, the parameters for the FHG stage refer to SHG power.

laser1:nlo:shg:lock:window:calibration:power-min

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

The expected minimum input beam intensity (in mW). This parameter is used only to calculate **the threshold of the ReLock window** by means of a linear interpolation. The parameter for the SHG stage refers to amplifier power, the parameter for the FHG stage refers to SHG power.

laser1:nlo:shg:lock:window:calibration:power-max

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

The expected maximum input beam intensity (in mW). This parameter is used only to calculate **the threshold of the ReLock window** by means of a linear interpolation. The parameter for the SHG stage refers to amplifier power, the parameter for the FHG stage refers to SHG power.

laser1:nlo:shg:lock:window:calibration:threshold-min

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Lower limit (in V) for **the threshold of the ReLock window**.

laser1:nlo:shg:lock:window:calibration:threshold-max

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Upper limit (in V) for **the threshold of the ReLock window**.

laser1:nlo:shg:lock:calibration:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for continuous calculation of PIDs for SHG lock.

laser1:nlo:shg:lock:calibration:power-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter specifying minimum power of amplifier

laser1:nlo:shg:lock:calibration:power-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter specifying maximum power of amplifier

laser1:nlo:shg:lock:calibration:power-hysteresis

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter specifying hysteresis value in percent for power. Setting 0 disables hysteresis.

laser1:nlo:shg:lock:calibration:pid2-all-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control minimum of the overall gain. This parameter has no physical unit.

laser1:nlo:shg:lock:calibration:pid2-all-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control maximum of the overall gain. This parameter has no physical unit.

laser1:nlo:shg:lock:calibration:pid2-p-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control minimum of the proportional gain (in V/V).

laser1:nlo:shg:lock:calibration:pid2-p-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control maximum of the proportional gain (in V/V).

laser1:nlo:shg:lock:calibration:pid1-all-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control minimum of the overall gain. This parameter has no physical unit.

laser1:nlo:shg:lock:calibration:pid1-all-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control maximmum of the overall gain. This parameter has no physical unit.

laser1:nlo:shg:lock:calibration:pid1-p-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control minimum of the proportional gain (in V/V).

laser1:nlo:shg:lock:calibration:pid1-p-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control maximum of the proportional gain (in V/V).

laser1:nlo:shg:lock:calibration:analog-p-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control minimum of the proportional gain (in V/V).

laser1:nlo:shg:lock:calibration:analog-p-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control maximum of the proportional gain (in V/V).

laser1:nlo:shg:lock:calibration:shg-pdh-rf-gain-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control minimum of the gain for SHG PDH photo diode.

laser1:nlo:shg:lock:calibration:shg-pdh-rf-gain-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control maximum of the gain for SHG PDH photo diode.

laser1:nlo:shg:lock:calibration:lo-amplitude-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control minimum of the gain for peak-to-peak local oscillator amplitude for the cavity lock (in V).

laser1:nlo:shg:lock:calibration:lo-amplitude-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control maximum of the gain for peak-to-peak local oscillator amplitude for the cavity lock (in V).

laser1:nlo:shg:lock:calibration:threshold-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Lower limit (in V) for **the threshold of the ReLock window**.

laser1:nlo:shg:lock:calibration:threshold-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Upper limit (in V) for **the threshold of the ReLock window**.

laser1:nlo:shg:lock:pid1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the PID Fast controller.

laser1:nlo:shg:lock:pid1:gain:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Gain parameters for the PID controller.

laser1:nlo:shg:lock:pid1:gain:all

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the overall gain. This parameter has no physical unit.

laser1:nlo:shg:lock:pid1:gain:p

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the proportional gain (in V/V).

laser1:nlo:shg:lock:pid1:gain:i

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the integral gain (in V/V/ms).

laser1:nlo:shg:lock:pid1:gain:d

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the differential gain (in V/V*μs).

laser1:nlo:shg:lock:pid1:gain:i-cutoff

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to determine the frequency limit (I-cutoff) for the integral PID gain (in Hz).

laser1:nlo:shg:lock:pid1:gain:i-cutoff-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable a frequency limit (I-cutoff) for the integral PID Fast gain (**:lock:pid1:gain:i-cutoff**). Possible values are:
#t - I-cutoff enabled
#f - I-cutoff disabled

laser1:nlo:shg:lock:pid2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the PID Slow controller.

For usage see **laser1:nlo:shg:lock:pid1:** on page 203.

laser1:nlo:shg:lock:analog-dl-gain:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the parameters of the analog lock path.

laser1:nlo:shg:lock:analog-dl-gain:p-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the proportional gain of the analog lock path (in V/V).

laser1:nlo:shg:lock:local-oscillator:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the parameters of the local oscillator for the SHG cavity lock.

laser1:nlo:shg:lock:local-oscillator:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the local oscillator for the SHG cavity lock.
#t - Local oscillator is enabled.
#f - Local oscillator is disabled.

laser1:nlo:shg:lock:local-oscillator:coupled-modulation

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Enable coupling between the local oscillator for the SHG and FHG stages.

laser1:nlo:shg:lock:local-oscillator:use-fast-oscillator

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Use fast PDH modulation frequency.

laser1:nlo:shg:lock:local-oscillator:use-external-oscillator

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify if the internal local oscillator tries to phase-lock onto an external signal at the "extLO" plug.
#t - Phase-lock to external signal is enabled.
#f - Phase-lock to external signal is disabled.
This parameter is necessary in the context of PDH locks of the master oscillator to an external reference. For details, see the TA/DL-SHG pro manual.

laser1:nlo:shg:lock:local-oscillator:amplitude

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the peak-to-peak local oscillator amplitude for the cavity lock (in V). Only discrete values are possible, and the user is recommended to set the local oscillator amplitude via the parameter **laser1:nlo:shg:lock:local-oscillator:attentuation-raw**.

laser1:nlo:shg:lock:local-oscillator:attenuation-raw

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the peak-to-peak amplitude of the cavity local oscillator. Possible values are:
0 - 0.65 Vpp
2 - 0.58 Vpp
4 - 0.52 Vpp
6 - 0.46 Vpp
9 - 0.39 Vpp
12 - 0.33 Vpp
16 - 0.26 Vpp
21 - 0.19 Vpp
28 - 0.13 Vpp
40 - 0.065 Vpp
63 - 0.017 Vpp

laser1:nlo:shg:lock:local-oscillator:phase-shift

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the phase difference between the local oscillator for the cavity lock and the PDH RF photo diode signal of the SHG cavity (in °).

laser1:nlo:shg:lock:local-oscillator:auto-pdh-state

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the state of the auto-pdh algorithm.

0 - idle

1 - active

2 - aborting

laser1:nlo:shg:lock:local-oscillator:auto-pdh

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to automatically set the phase difference between the local oscillator for the cavity lock and the PDH RF photo diode signal of the SHG cavity for an optimized SHG cavity error signal.

laser1:nlo:shg:lock:local-oscillator:auto-pdh-abort

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to abort auto-PDH.

laser1:nlo:shg:lock:cavity-fast-pzt-voltage

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Alias for single-value-main-out.

laser1:nlo:shg:lock:cavity-slow-pzt-voltage

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Alias for single-value-aux-out.

laser1:nlo:shg:lock:background-trace

(BINARY parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the X/Y coordinate data for the background trace in the DLCpro GUIs. The parameter provides the last scan trace before the lock was closed. The parameter value is provided in the format decribed in Appendix 4.2. It contains data blocks with IDs *'x'* and *'y'*.
If the lock is not closed, **:background-trace** is empty.

laser1:nlo:shg:lock:candidates

(BINARY parameter, read-only)
(reading requires userlevel 4)

Parameter indicating lock point tracking data for display in the DLCpro GUI (in binary format).
The parameter value is provided in the format decribed in Appendix 4.2. It contains a single data block with IDs *'t'*.

laser1:nlo:shg:factory-settings:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the most important parameters related to the SHG cavity and power optimization.

laser1:nlo:shg:factory-settings:modified

(BOOLEAN parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating if the user has modified the factory settings.

laser1:nlo:shg:factory-settings:tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the temperature controller (TC) of the SHG nonlinear crystal.

laser1:nlo:shg:factory-settings:tc:temp-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the factory setting for parameter **tc:temp-set-min**.
The parameter **tc:limits:temp-min** is set to 2K below this value if this result is below 15°C. Otherwise **tc:limits:temp-min** is set to 15°C.

laser1:nlo:shg:factory-settings:tc:temp-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the factory setting for parameter **tc:temp-set-max**.
The parameter **tc:limits:temp-max** is set to 2K above this value if this result is above 30°C.Otherwise **tc:limits:temp-max** is set to 30°C.

laser1:nlo:shg:factory-settings:tc:temp-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:temp-set**.

laser1:nlo:shg:factory-settings:tc:temp-roc-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the factory setting for parameter **tc:temp-roc-enabled**.

laser1:nlo:shg:factory-settings:tc:temp-roc-limit

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the factory setting for parameter **tc:temp-roc-limit**.

laser1:nlo:shg:factory-settings:tc:current-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:current-set-max**.

laser1:nlo:shg:factory-settings:tc:current-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:current-set-min**.

laser1:nlo:shg:factory-settings:tc:p-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:t-loop:p-gain**.

laser1:nlo:shg:factory-settings:tc:i-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:t-loop:i-gain**.

laser1:nlo:shg:factory-settings:tc:d-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:t-loop:d-gain**.

laser1:nlo:shg:factory-settings:tc:c-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:c-loop:i-gain**.

laser1:nlo:shg:factory-settings:tc:ok-tolerance

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:t-loop:ok-tolerance**.

laser1:nlo:shg:factory-settings:tc:ok-time

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:t-loop:ok-time**.

laser1:nlo:shg:factory-settings:tc:timeout

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:limits:timeout**.

laser1:nlo:shg:factory-settings:tc:power-source

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:power-source**.

laser1:nlo:shg:factory-settings:tc:ntc-series-resistance

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **tc:ntc-series-resistance**.

laser1:nlo:shg:factory-settings:cavity-tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the temperature controller (TC) of the SHG cavity.

For usage see **laser1:nlo:shg:factory-settings:tc:** on page 208.

laser1:nlo:shg:factory-settings:pc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the piezo controller (PC) of the slow SHG cavity piezo element.

laser1:nlo:shg:factory-settings:pc:voltage-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:pc:voltage-min**.

laser1:nlo:shg:factory-settings:pc:voltage-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:pc:voltage-max**.

laser1:nlo:shg:factory-settings:pc:feedforward-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:pc:feedforward-enabled**.

laser1:nlo:shg:factory-settings:pc:feedforward-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:pc:feedforward-factor**.

laser1:nlo:shg:factory-settings:pc:capacitance

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the piezo capacitance, measured during production (in μF).

laser1:nlo:shg:factory-settings:pc:scan-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:scan:offset** used for measurements during production.

laser1:nlo:shg:factory-settings:pc:scan-amplitude

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:scan:amplitude** used for measurements during production.

laser1:nlo:shg:factory-settings:pc:scan-frequency

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:scan:frequency** used for measurements during production.

laser1:nlo:shg:factory-settings:pd:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the SHG photodiodes.

laser1:nlo:shg:factory-settings:pd:shg:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the SHG photo diode.

laser1:nlo:shg:factory-settings:pd:shg:cal-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:pd:dl:cal-offset**.

laser1:nlo:shg:factory-settings:pd:shg:cal-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:pd:dl:cal-factor**.

laser1:nlo:shg:factory-settings:pd:shg-input:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the SHG input photo diode.

For usage see **laser1:nlo:shg:factory-settings:pd:shg:** on page 211.

laser1:nlo:shg:factory-settings:pd:fiber:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the fiber monitor photo diode.

For usage see **laser1:nlo:shg:factory-settings:pd:shg:** on page 211.

laser1:nlo:shg:factory-settings:pd:int:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the SHG's intra-cavity photo diode.

laser1:nlo:shg:factory-settings:pd:int:cal-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:pd:int:cal-offset**.

laser1:nlo:shg:factory-settings:pd:pdh-dc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the SHG cavity-rejection photo diode.

For usage see **laser1:nlo:shg:factory-settings:pd:int:** on page 212.

laser1:nlo:shg:factory-settings:pd:pdh-rf:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the SHG PDH photo diode.

laser1:nlo:shg:factory-settings:pd:pdh-rf:gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:pd:shg-pdh-rf:gain**.

laser1:nlo:shg:factory-settings:lock:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the lock engine.

laser1:nlo:shg:factory-settings:lock:pid-selection

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:pid-selection**.

laser1:nlo:shg:factory-settings:lock:setpoint

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:setpoint**.

laser1:nlo:shg:factory-settings:lock:calibration:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for continuous calculation of PIDs for SHG lock.

For usage see **laser1:nlo:shg:lock:calibration:** on page 200.

laser1:nlo:shg:factory-settings:lock:relock:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the automatic SHG cavity ReLock.

laser1:nlo:shg:factory-settings:lock:relock:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:relock:enabled**.

laser1:nlo:shg:factory-settings:lock:relock:frequency

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:relock:frequency**.

laser1:nlo:shg:factory-settings:lock:relock:amplitude

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:relock:amplitude**.

laser1:nlo:shg:factory-settings:lock:relock:delay

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:relock:delay**.

laser1:nlo:shg:factory-settings:lock:window:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for out-of-lock detection for SHG cavity ReLock and triggering the PID controller reset.

laser1:nlo:shg:factory-settings:lock:window:input-channel

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:window:input-channel**.

laser1:nlo:shg:factory-settings:lock:window:threshold

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:window:threshold**.

laser1:nlo:shg:factory-settings:lock:window:level-hysteresis

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:window:level-hysteresis**.

laser1:nlo:shg:factory-settings:lock:pid1-gain:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory Settings for the PID Fast controller.

laser1:nlo:shg:factory-settings:lock:pid1-gain:all

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:pid1:gain:all**.

laser1:nlo:shg:factory-settings:lock:pid1-gain:p

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:pid1:gain:p**.

laser1:nlo:shg:factory-settings:lock:pid1-gain:i

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:pid1:gain:i**.

laser1:nlo:shg:factory-settings:lock:pid1-gain:d

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:pid1:gain:d**.

laser1:nlo:shg:factory-settings:lock:pid1-gain:i-cutoff

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:pid1:gain:i-cutoff**.

laser1:nlo:shg:factory-settings:lock:pid1-gain:i-cutoff-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:pid1:gain:i-cutoff**.

laser1:nlo:shg:factory-settings:lock:pid2-gain:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory Settings for the PID Slow controller.

For usage see **laser1:nlo:shg:factory-settings:lock:pid1-gain:** on page 214.

laser1:nlo:shg:factory-settings:lock:analog-p-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:analog-dl-gain:p-gain**.

laser1:nlo:shg:factory-settings:lock:local-oscillator:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the local oscillator of the cavity lock.

laser1:nlo:shg:factory-settings:lock:local-oscillator:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:local-oscillator:enabled**.

laser1:nlo:shg:factory-settings:lock:local-oscillator:use-fast-oscillator

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:local-oscillator:use-fast-oscillator**.

laser1:nlo:shg:factory-settings:lock:local-oscillator:coupled-modulation

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:local-oscillator:coupled-modulation**

laser1:nlo:shg:factory-settings:lock:local-oscillator:attenuation-shg-raw

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:local-oscillator:attenuation-raw**.

laser1:nlo:shg:factory-settings:lock:local-oscillator:attenuation-fhg-raw

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:local-oscillator:attenuation-raw**.

laser1:nlo:shg:factory-settings:lock:local-oscillator:phase-shift-shg

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:local-oscillator:phase-shift**.

laser1:nlo:shg:factory-settings:lock:local-oscillator:phase-shift-fhg

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **laser1:nlo:shg:lock:local-oscillator:phase-shift**.

laser1:nlo:shg:factory-settings:auto-nlo:

(parameter section)
(reading requires userlevel 2, writing requires userlevel 2)

Factory settings for the AutoNLO parameters.

laser1:nlo:shg:factory-settings:auto-nlo:optimization-settings:

(parameter section)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **auto-nlo:optimization-settings:pressure-compensation**.

laser1:nlo:shg:factory-settings:auto-nlo:optimization-settings:pressure-compensation-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **auto-nlo:optimization-settings:pressure-compensation**.

laser1:nlo:shg:factory-settings:auto-nlo:optimization-settings:auto-align-amplifier-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **auto-nlo:optimization-settings:auto-align-amplifier**.

laser1:nlo:shg:factory-settings:auto-nlo:optimization-settings:auto-align-cavity-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **auto-nlo:optimization-settings:auto-align-cavity**.

laser1:nlo:shg:factory-settings:auto-nlo:optimization-settings:auto-align-advanced-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter indicating the factory setting for parameter **auto-nlo:optimization-settings:auto-align-include-advanced**.

laser1:nlo:shg:factory-settings:apply

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

This command applies all factory settings for the SHG cavity and power optimization.

laser1:nlo:shg:factory-settings:retrieve-now

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

This command sets the factory settings according to the currently active parameter values.

laser1:nlo:shg:store

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Stores current laser head parameters related to the SHG cavity, power optimization, and power stabilization in the laser head's flash memory.

laser1:nlo:shg:restore

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Restores laser head parameters related to the SHG cavity, power optimization, and power stabilization from the laser head's flash memory.

laser1:nlo:fhg:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the control of the FHG cavity.

laser1:nlo:fhg:tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

The **laser1:nlo:fhg:tc** section provides parameters related to the temperature controller for the nonlinear crystals in frequency-converted diode laser systems.

For usage see **laser1:dl:tc:** on page 68.

laser1:nlo:fhg:cavity-tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

The **laser1:nlo:fhg:cavity-tc** section provides parameters related to the temperature controller for the cavity in frequency-converted diode laser systems.

For usage see **laser1:dl:tc:** on page 68.

laser1:nlo:fhg:pc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters the Temperature Control (TC) board.

For usage see **laser1:dl:pc:** on page 76.

laser1:nlo:fhg:scan:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides access to the scan signal generator.

For usage see **laser1:nlo:shg:scan:** on page 193.

laser1:nlo:fhg:scope:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides access to the data traces for the DLCpro diagram.

For usage see **laser1:nlo:shg:scope:** on page 194.

laser1:nlo:fhg:lock:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides access to the DLCpro's lock engine. It has two PID regulators for controlling two independent output channels. Furthermore it provides modules for lock-in detection, automatic relock or reset, as well as for easy to use click-and-lock functionality.

laser1:nlo:fhg:lock:state

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current operational mode of the lock module. Possible values are:
0 - lock off
1 - locking
2 - locked

laser1:nlo:fhg:lock:state-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current operational mode of the lock module as a short text. Possible values are: "idle", "locking" and "locked".

laser1:nlo:fhg:lock:lock-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

This parameter returns #t if the lock engine's **:state** is "locking" or "locked".
Setting this parameter to #t has the same effect as submitting the command **:close** and setting this parameter to #f has the same effect as submitting the command **:open**.

laser1:nlo:fhg:lock:pid-selection

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the PID controllers to be used by the FHG cavity lock engine:
0 - no PID controller active.
1 - "PID Slow" (PID2) on, "PID Fast" (PID1) off, analog PID off.
2 - "PID Slow" (PID2) on, "PID Fast" (PID1) off, analog PID on.
3 - "PID Slow" (PID2) on, "PID Fast" (PID1) on, analog PID off.
4 - All PID controllers on.

laser1:nlo:fhg:lock:setpoint

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the setpoint for the PID Slow controller (in V).

laser1:nlo:fhg:lock:relock:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for automatic FHG cavity ReLock.

For usage see **laser1:nlo:shg:lock:relock:** on page 198.

laser1:nlo:fhg:lock:window:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for out-of-lock detection for FHG cavity ReLock and triggering the PID controller reset.

For usage see **laser1:nlo:shg:lock:window:** on page 199.

laser1:nlo:fhg:lock:pid1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the PID Fast controller.

For usage see **laser1:nlo:shg:lock:pid1:** on page 203.

laser1:nlo:fhg:lock:pid2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the PID Slow controller.

For usage see **laser1:nlo:shg:lock:pid1:** on page 203.

laser1:nlo:fhg:lock:local-oscillator:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Access to the parameters of the local oscillator for the FHG cavity lock.

laser1:nlo:fhg:lock:local-oscillator:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the local oscillator for the FHG cavity lock.
#t - Local oscillator is enabled.
#f - Local oscillator is disabled.

laser1:nlo:fhg:lock:local-oscillator:coupled-modulation

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Enable coupling between the local oscillator for the SHG and FHG stages.

laser1:nlo:fhg:lock:local-oscillator:use-fast-oscillator

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Use fast PDH modulation frequency.

laser1:nlo:fhg:lock:local-oscillator:amplitude

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the peak-to-peak local oscillator amplitude for the cavity lock (in V). Only discrete values are possible, and the user is recommended to set the local oscillator amplitude via the parameter **laser1:nlo:fhg:lock:local-oscillator:attenuation-raw**.

laser1:nlo:fhg:lock:local-oscillator:attenuation-raw

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the peak-to-peak amplitude of the cavity local oscillator. Possible values are:
0 - 0.65 Vpp
2 - 0.58 Vpp
4 - 0.52 Vpp
6 - 0.46 Vpp
9 - 0.39 Vpp
12 - 0.33 Vpp
16 - 0.26 Vpp
21 - 0.19 Vpp
28 - 0.13 Vpp
40 - 0.065 Vpp
63 - 0.017 Vpp

laser1:nlo:fhg:lock:local-oscillator:phase-shift

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the phase difference between the local oscillator for the cavity lock and the PDH RF photo diode signal of the FHG cavity (in °).

laser1:nlo:fhg:lock:local-oscillator:auto-pdh-state

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the state of the auto-pdh algorithm.

0 - idle

1 - active

2 - aborting

laser1:nlo:fhg:lock:local-oscillator:auto-pdh

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to automatically set the phase difference between the local oscillator for the cavity lock and the PDH RF photo diode signal of the FHG cavity for an optimized FHG cavity error signal.

laser1:nlo:fhg:lock:local-oscillator:auto-pdh-abort

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to abort auto-PDH.

laser1:nlo:fhg:lock:cavity-fast-pzt-voltage

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Alias for single-value-main-out.

laser1:nlo:fhg:lock:cavity-slow-pzt-voltage

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Alias for single-value-aux-out.

laser1:nlo:fhg:lock:background-trace

(BINARY parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the X/Y coordinate data for the background trace in the DLCpro GUIs. The parameter provides the last scan trace before the lock was closed. The parameter value is provided in the format decribed in Appendix 4.2. It contains data blocks with IDs *'x'* and *'y'*.
If the lock is not closed, **:background-trace** is empty.

laser1:nlo:fhg:lock:candidates

(BINARY parameter, read-only)
(reading requires userlevel 4)

Parameter indicating lock point tracking data for display in the DLCpro GUI (in binary format).
The parameter value is provided in the format decribed in Appendix 4.2. It contains a single data block with IDs *'t'*.

laser1:nlo:fhg:factory-settings:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the most important parameters related to the FHG cavity, power optimization.

laser1:nlo:fhg:factory-settings:modified

(BOOLEAN parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating if the user has modified the factory settings.

laser1:nlo:fhg:factory-settings:tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the temperature controller (TC) of the FHG nonlinear crystal.

For usage see **laser1:nlo:shg:factory-settings:tc:** on page 208.

laser1:nlo:fhg:factory-settings:cavity-tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the temperature controller (TC) of the FHG cavity.

For usage see **laser1:nlo:shg:factory-settings:tc:** on page 208.

laser1:nlo:fhg:factory-settings:pc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the piezo controller (PC) of the slow FHG cavity piezo element.

For usage see **laser1:nlo:shg:factory-settings:pc:** on page 210.

laser1:nlo:fhg:factory-settings:pd:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the FHG photodiodes.

laser1:nlo:fhg:factory-settings:pd:fhg:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the FHG photo diode.

For usage see **laser1:nlo:shg:factory-settings:pd:shg:** on page 211.

laser1:nlo:fhg:factory-settings:pd:int:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the FHG's intra-cavity photo diode.

For usage see **laser1:nlo:shg:factory-settings:pd:int:** on page 212.

laser1:nlo:fhg:factory-settings:pd:pdh-dc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the FHG cavity-rejection photo diode.

For usage see **laser1:nlo:shg:factory-settings:pd:int:** on page 212.

laser1:nlo:fhg:factory-settings:pd:pdh-rf:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the FHG PDH photo diode.

For usage see **laser1:nlo:shg:factory-settings:pd:pdh-rf:** on page 212.

laser1:nlo:fhg:factory-settings:lock:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the lock engine.

For usage see **laser1:nlo:shg:factory-settings:lock:** on page 213.

laser1:nlo:fhg:factory-settings:apply

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

This command applies all factory settings for the FHG cavity.

laser1:nlo:fhg:factory-settings:retrieve-now

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

This command sets the factory settings according to the currently active parameter values.

laser1:nlo:fhg:store

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Stores current laser head parameters related to the FHG cavity, power optimization, and power stabilization in the laser head's flash memory.

laser1:nlo:fhg:restore

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Restores laser head parameters related to the FHG cavity, power optimization, and power stabilization from the laser head's flash memory.

laser1:nlo:opo:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the control of the OPO cavity.

laser1:nlo:opo:crystal:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the OPO crystal in frequency-converted diode laser systems.

laser1:nlo:opo:crystal:tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the temperature controller (TC) board for the OPO crystal in frequency-converted diode laser systems.

For usage see **laser1:dl:tc:** on page 68.

laser1:nlo:opo:cavity:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the OPO cavity in frequency-converted diode laser systems.

laser1:nlo:opo:cavity:tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the temperature controller (TC) board for the OPO cavity in frequency-converted diode laser systems.

For usage see **laser1:dl:tc:** on page 68.

laser1:nlo:opo:cavity:pc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the Piezo Control (PC) board for the OPO cavity in frequency-converted diode laser systems.

For usage see **laser1:dl:pc:** on page 76.

laser1:nlo:opo:cavity:pc-fast:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the fast piezo of the OPO cavity in frequency-converted diode laser systems.

laser1:nlo:opo:cavity:pc-fast:voltage-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to set the desired piezo voltage in V.

laser1:nlo:opo:cavity:pc-fast:voltage-min

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the minimum piezo voltage in V.

laser1:nlo:opo:cavity:pc-fast:voltage-max

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the maximum piezo voltage in V.

laser1:nlo:opo:cavity:pc-fast:external-input:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to configure the piezo voltage control by an external, analog voltage input.

For usage see **laser1:dl:cc:external-input:** on page 63.

laser1:nlo:opo:cavity:pc-fast:voltage-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the calculated voltage in V, including contributions of external input, feedforward etc.

laser1:nlo:opo:cavity:pc-fast:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating channel status information. Each bit of the integer value provides specific channel status information.

bit 7 - voltage at lower limit

bit 8 - voltage at upper limit

bit 9 - voltage slew-rate limited

laser1:nlo:opo:cavity:pc-fast:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating a brief text version of the **:status** parameter.

laser1:nlo:opo:cavity:fast-pzt-voltage-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the voltage of the fast OPO cavity piezo (in V).

laser1:nlo:opo:cavity:slow-pzt-voltage-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the voltage of the slow OPO cavity piezo (in V).

laser1:nlo:opo:cavity:motor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for controlling the OPO intra-cavity motor.

laser1:nlo:opo:cavity:motor:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the motor driver.

laser1:nlo:opo:cavity:motor:position-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to set the motor position in millimeters.

laser1:nlo:opo:cavity:motor:position-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual motor position in millimeters.

laser1:nlo:opo:cavity:motor:position-min

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to set the minimum motor position in millimeters.

laser1:nlo:opo:cavity:motor:position-max

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to set the minimum motor position in millimeters.

laser1:nlo:opo:cavity:motor:recalibrate

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to re-calibrate the absolute position of the motor. The motor will move in negative direction to the mechanical limit of its travel range and then set its zero position a certain distance away from this limit. At the end it will move back to its previous position.

laser1:nlo:opo:factory-settings:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the most important parameters related to OPO systems.

laser1:nlo:opo:factory-settings:modified

(BOOLEAN parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating if the user has modified the factory settings.

laser1:nlo:opo:factory-settings:crystal-tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the temperature controller (TC) of the OPO nonlinear crystal.

For usage see **laser1:nlo:shg:factory-settings:tc:** on page 208.

laser1:nlo:opo:factory-settings:cavity-tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the temperature controller (TC) of the OPO nonlinear crystal.

For usage see **laser1:nlo:shg:factory-settings:tc:** on page 208.

laser1:nlo:opo:factory-settings:cavity-pc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the piezo controller (PC) of the slow OPO cavity piezo element.

For usage see **laser1:nlo:shg:factory-settings:pc:** on page 210.

laser1:nlo:opo:factory-settings:pd:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the OPO photodiodes.

laser1:nlo:opo:factory-settings:pd:pump:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the pump output power photo diode in an OPO system.

For usage see **laser1:nlo:shg:factory-settings:pd:shg:** on page 211.

laser1:nlo:opo:factory-settings:pd:pump-dep:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the pump depleted output power photo diode in an OPO system.

For usage see **laser1:nlo:shg:factory-settings:pd:shg:** on page 211.

laser1:nlo:opo:factory-settings:pd:sig:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the *signal* output power photo diode in an OPO system.

For usage see **laser1:nlo:shg:factory-settings:pd:shg:** on page 211.

laser1:nlo:opo:factory-settings:pd:fiber:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the fiber monitor photo diode in an OPO system.

For usage see **laser1:nlo:shg:factory-settings:pd:shg:** on page 211.

laser1:nlo:opo:factory-settings:apply

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

This command applies all factory settings for the OPO cavity.

laser1:nlo:opo:factory-settings:retrieve-now

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

This command sets the factory settings according to the currently active parameter values.

laser1:nlo:opo:store

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Stores current parameter values in the laser head's flash memory.

laser1:nlo:opo:restore

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Restores saved parameters from the laser head's flash memory.

laser1:nlo:ssw-ver

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the version of the currently installed SHG system software.

laser1:uv:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters relevant for the operation of UV frequency-converted diode laser systems.

laser1:uv:pump:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters for the diode-pumped solid state (DPSS) laser.

For usage see **laser1:dpss:** on page 152.

laser1:uv:eom:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters concerning the electro-optic modulator in UV-SHG systems.

laser1:uv:eom:tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

The **laser1:uv:eom:tc** section provides parameters related to the temperature controller for the EOM in frequency-converted diode laser systems.

For usage see **laser1:dl:tc:** on page 68.

laser1:uv:cavity:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters describing the doubling cavity in UV-SHG systems.

laser1:uv:cavity:tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

The **laser1:uv:cavity:tc** section provides parameters related to the temperature controller for the doubling cavity in frequency-converted diode laser systems.

For usage see **laser1:dl:tc:** on page 68.

laser1:uv:cavity:pc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters for the Piezo Control (PC) board in the doubling cavity in frequency-converted diode laser systems.

For usage see **laser1:dl:pc:** on page 76.

laser1:uv:crystal:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters describing the NLO-crystal in UV-SHG systems.

laser1:uv:crystal:tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

The **laser1:uv:cavity:tc** section provides parameters related to the temperature controller for the doubling cavity in frequency-converted diode laser systems.

For usage see **laser1:dl:tc:** on page 68.

laser1:uv:crystal:optics-shifters:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter describing for the crystal spots an UV-SHG system.

laser1:uv:crystal:optics-shifters:current-spot

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the current spot position, beginning at 1.

laser1:uv:crystal:optics-shifters:remaining-spots

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the number of remaining spot positions.

laser1:uv:servo:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

This section provides access to the servo motors in UV-SHG systems.

laser1:uv:servo:shg1-hor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters of the first mirror/horizontal axis servo of the SHG stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:uv:servo:shg1-vert:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters of the first mirror/vertical axis servo of the SHG stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:uv:servo:shg2-hor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters of the second mirror/horizontal axis servo of the SHG stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:uv:servo:shg2-vert:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters of the second mirror/vertical axis servo of the SHG stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:uv:servo:hwp:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters of the servo of the half-wave plate.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:uv:servo:lens:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters of the servo of the beamforming lens.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:uv:servo:outcpl:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters of the servo of the out-coupler in the UV cavity.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:uv:servo:cryst:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters of the servo of the crystal in the UV cavity.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:uv:servo:comp-hor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters of the horizontal compensation servo of the SHG stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:uv:servo:comp-vert:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters of the vertical compensation servo of the SHG stage.

For usage see **laser1:nlo:servo:ta1-hor:** on page 174.

laser1:uv:pd:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

This section provides access to the photodiodes in UV-SHG systems.

laser1:uv:pd:shg:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters for value and calibration of the SHG photo diode in an UV-SHG system.

For usage see **laser1:nlo:pd:fiber:** on page 179.

laser1:uv:pd:pdh-rf:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters for value and gain of the SHG PDH photo diode in an UV-SHG system.

For usage see **laser1:nlo:pd:shg-pdh-rf:** on page 181.

laser1:uv:pd:pdh-dc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters for value and calibration of the SHG cavity-rejection photo diode in an UV-SHG system.

For usage see **laser1:nlo:pd:shg-int:** on page 180.

laser1:uv:power-optimization:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

This section provides access to the power optimization routine in UV-SHG systems.

laser1:uv:power-optimization:ongoing

(BOOLEAN parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the status of the power optimization routine:
#t: An optimization routine is in progress.
#f: No optimization routine is in progress.

laser1:uv:power-optimization:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the optimization for internal purposes.

laser1:uv:power-optimization:status-string

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the status of the power optimization routine in textual form.

laser1:uv:power-optimization:cavity:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Parameters for the SHG power optimization routine of frequency-converted diode laser systems.

For usage see **laser1:nlo:power-optimization:stage1:** on page 184.

laser1:uv:power-optimization:progress-data

(BINARY parameter, read-only)
(reading requires userlevel 4)

Parameter array indicating the SHG power after the various iteration steps of the SHG power optimization routine. The values are represented as a BASE64-encoded sequence of 4-byte long floating point numbers in *little endian* byte order.

laser1:uv:power-optimization:abort

(BOOLEAN parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter specifying whether to abort the power optimization routine.

laser1:uv:power-stabilization:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

This section provides access to the power stabilization routine in UV-SHG systems.

laser1:uv:power-stabilization:enabled

(BOOLEAN parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to enable/disable the power stabilization.

laser1:uv:power-stabilization:gain:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

Gain parameters for the power stabilization.

laser1:uv:power-stabilization:gain:all

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to control the overall gain. This parameter has no physical unit.

laser1:uv:power-stabilization:gain:p

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to control the proportional gain.
The unit of **:gain:p** is mA/mW.

laser1:uv:power-stabilization:gain:i

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to control the integral gain.
The unit of **:gain:i** is $\frac{mA}{mW \cdot ms}$.

laser1:uv:power-stabilization:gain:d

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to control the differential gain.
The unit of **:gain:d** is $\frac{mA \cdot \mu s}{mW}$.

laser1:uv:power-stabilization:power-set

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the target power in mW.

laser1:uv:power-stabilization:power-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current power level (in mW).

laser1:uv:power-stabilization:power-min

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the minimal target power in mW.

laser1:uv:power-stabilization:power-max

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the maximum target power in mW.

laser1:uv:power-stabilization:state

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the state of the power stabilization PID controller.

0: off

1: in lock

2: on hold

3: suspended

laser1:uv:power-stabilization:update-strategy

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the strategy used for updating the output power during power-stabilization:

0 - change the pump laser power output only.

1 - change the position of the half-wave plate only.

2 - change both the pump laser power output and the position of the half-wave plate as necessary.

laser1:uv:optimization-settings:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

This section provides access to the power optimization settings in UV-SHG systems.

laser1:uv:optimization-settings:single-mode-optimization

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter specifying whether a single-mode-optimization is done before the power-optimization.

laser1:uv:optimization-settings:automatic-optics-shift

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter specifying whether a cavity optics shift is done if necessary.

laser1:uv:scan:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

This section provides access to the UV-SHG cavity scan signal generator.

For usage see **laser1:nlo:shg:scan:** on page 193.

laser1:uv:scope:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

This section provides access to the data traces for the UV-SHG signal display.

For usage see **laser1:nlo:shg:scope:** on page 194.

laser1:uv:lock:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 0)

This section provides access to the UV-SHG cavity's lock engine. It has two PID regulators for controlling two independed output channels. Furthermore it provides modules for lock-in detection, automatic relock or reset, as well as for easy to use click-and-lock functionality.

For usage see **laser1:nlo:shg:lock:** on page 197.

laser1:uv:factory-settings:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for UV-SHG systems.

laser1:uv:factory-settings:eom-tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the EOM temperature controller (TC).

For usage see **laser1:nlo:shg:factory-settings:tc:** on page 208.

laser1:uv:factory-settings:crystal-tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the crystal temperature controller (TC).

For usage see **laser1:nlo:shg:factory-settings:tc:** on page 208.

laser1:uv:factory-settings:cavity-tc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the cavity temperature controller (TC).

For usage see **laser1:nlo:shg:factory-settings:tc:** on page 208.

laser1:uv:factory-settings:pc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the piezo controller (PC) of the slow SHG cavity piezo element.

For usage see **laser1:nlo:shg:factory-settings:pc:** on page 210.

laser1:uv:factory-settings:pd:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the SHG photodiodes.

laser1:uv:factory-settings:pd:shg:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the SHG photo diode.

For usage see **laser1:nlo:shg:factory-settings:pd:shg:** on page 211.

laser1:uv:factory-settings:pd:pdh-rf:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the SHG PDH photo diode.

For usage see **laser1:nlo:shg:factory-settings:pd:pdh-rf:** on page 212.

laser1:uv:factory-settings:pd:pdh-dc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the SHG cavity-rejection photo diode.

For usage see **laser1:nlo:shg:factory-settings:pd:int:** on page 212.

laser1:uv:factory-settings:lock:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Factory settings for the lock engine.

For usage see **laser1:nlo:shg:factory-settings:lock:** on page 213.

laser1:uv:factory-settings:modified

(BOOLEAN parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating if the user has modified any factory settings.
#t - at least one of the factory settings parameters has been modified
#f - factory settings have not been modified after read-out

laser1:uv:factory-settings:apply

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to apply all factory settings.

laser1:uv:factory-settings:retrieve-now

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to set all the factory settings according to the currently active parameter values.

laser1:uv:status-parameters:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for configuring the UV-SHG state machine.

laser1:uv:status-parameters:baseplate-temperature-limit

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the limit for temperature of the baseplate (in °C) on an UV-SHG system before reporting an error.

laser1:uv:status-parameters:temperature-settle-time

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the time limit (in seconds) for which the temperature loop is allowed to be out of lock.

laser1:uv:status-parameters:pump-lock-settle-time

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the time limit (in seconds) for which the pump laser is allowed to be out of lock.

laser1:uv:status-parameters:settle-down-delay

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify a delay (in seconds) to allow the system to settle down after an optimization.

laser1:uv:status-parameters:power-margin-tolerance-time

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the time limit (in seconds) for which the power margin is allowed to be under the threshold.

laser1:uv:status-parameters:power-margin-threshold

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the minimum recommended value of the power-margin for the pump laser.

laser1:uv:status-parameters:cavity-lock-settle-time

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the time limit (in seconds) for the cavity lock-in mechanism to get into a locked state.

laser1:uv:status-parameters:cavity-lock-tolerance-factor

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the time limit for which the cavity is allowed to be out of lock, as multiple of **lock:relock:delay**.

laser1:uv:status-parameters:power-lock-settle-time

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the time limit (in seconds) for which the power-stabilization is allowed to be out of lock.

laser1:uv:status-parameters:cavity-scan-duration

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the duration of the cavity scan (in seconds) before attempting a lock in case of power-warning.

laser1:uv:status-parameters:power-stabilization-strategy

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the strategy used for updating the output power during power-stabilization:

0 - change the pump laser power output only.

1 - change the position of the half-wave plate only.

2 - change both the pump laser power output and the position of the half-wave plate as necessary.

laser1:uv:status-parameters:power-stabilization-level-low-factor

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the power-stabilization level threshold, as a multiple of **laser1:uv:power-stabilization:power-min**.

laser1:uv:status-parameters:power-output-relative-error-max

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the maximum tolerated error for the power output relative to its set value.

laser1:uv:status-parameters:power-output-relative-deviation-max

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the maximum tolerated value for the standard deviation of the power output relative to its set value.

laser1:uv:status-parameters:operational-pump-power

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the value for pump power used for the power-stabilization.

laser1:uv:status-parameters:degradation-detection-slope-threshold

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the limit for a variation in pump power indicating optics degradation (in mW/h).

laser1:uv:status-parameters:degradation-detection-measurement-interval

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the delay between measurements of the pump power to detect optics degradation (in seconds).

laser1:uv:status-parameters:degradation-detection-number-of-measurements

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the number of measurements of the pump power to detect optics degradation.

laser1:uv:status-parameters:idle-alignment-option

(BOOLEAN parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify whether the HWP should be set to minimum transmission during idle state. Set to #t if the HWP should *NOT* be set to minimum transmission.

laser1:uv:power-margin

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the overall fractional power-margin for the pump laser/HWP system.

laser1:uv:hwp-transmittance

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the transmittance of the half-wave plate.

laser1:uv:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the UV-SHG system corresponding to the following states:

0 - *power off*

10 - *preparing*

20 - *standby*

30 - *pre-emission*

35 - *idle*

40 - *ready*

50 - *power warning*

60 - *optimizing*

-1 - *error*

99 - *service mode*

laser1:uv:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the UV-SHG system in textual form.

laser1:uv:specs-fulfilled

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether the laser specifications are currently met.

laser1:uv:error

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the error status of the UV-SHG system.

laser1:uv:error-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the error status of the UV-SHG system.

laser1:uv:operation-time

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the operation time of the UV-SHG system in hours.

laser1:uv:remaining-optics-spots

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the number of remaining optics spot positions.

laser1:uv:baseplate-temperature

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current temperature of the baseplate on an UV-SHG system.

laser1:uv:ssw-ver

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the version of the currently installed SHG system software.

laser1:uv:store

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Stores current UV-SHG parameters in the laser head's flash memory.

laser1:uv:restore

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Restores UV-SHG parameters from the laser head's flash memory.

laser1:uv:perform-optimization

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to optimize the power level of the UV-SHG system.

laser1:uv:perform-optics-shift

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to shift the optics of the UV-SHG system to the next spot position.

laser1:uv:clear-errors

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to reset all error flags.

laser1:pd-ext:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for using an external photodiode at one of the BNC inputs as user-calibrated power meter.

laser1:pd-ext:input-channel

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the input channel, the photodiode is connected to. Allowed values are 0, 1, 2, 4.

laser1:pd-ext:photodiode

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter showing the voltage measured at the input specified by **:input-channel**.

laser1:pd-ext:power

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter for reading the laser power. The signal measured at the input specified by **:input-channel** in Volts is converted into power by use of the calibration parameters **:cal-offset** and **:cal-factor**.

laser1:pd-ext:cal-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the calibration offset for the photodiode in V.

laser1:pd-ext:cal-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the calibration factor for the photodiode in mW/V.

laser1:power-stabilization:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Power Stabilization

laser1:power-stabilization:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the power stabilization.

laser1:power-stabilization:gain:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Gain parameters for the power stabilization.

For usage see **laser1:uv:power-stabilization:gain:** on page 236.

laser1:power-stabilization:sign

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Sign of the power stabilization action. Typically this parameter should be #f.
#f - to increase the power level the output current needs to be increased
#t - to increase the power level the output current needs to be decreased.

laser1:power-stabilization:input-channel

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to select the signal channel to be stabilized.
Depending on the laser head connected, different choices are possible here. The possible values are a subset of the signals listed in the "Signal Channel IDs" section in appendix 4.1 on page 374.

laser1:power-stabilization:setpoint

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the target power in mW.

laser1:power-stabilization:window:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for power supervision.

laser1:power-stabilization:window:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Set this parameter to #t to enable the power supervision engine.

laser1:power-stabilization:window:level-low

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify a lower limit (in mW) for power stabilization.
If the power level drops below this limit, the power stabilization loop with be set to hold state, waiting for the power level to return to higher levels.

laser1:power-stabilization:window:level-hysteresis

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the hysteresis (in mW) for the supervision engine.
If the power stabilization was set to hold state because the power level dropped below **:level-low**, the requirement for the stabilization loop to continue is that the power level returns to values higher than **:level-low + :level-hysteresis**.

laser1:power-stabilization:hold-output-on-unlock

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to determine the behaviour when power stabilization is disabled.
#t - upon disabling the power stabilization the, the PID output is transferred to the current set-value, keeping the current power level.
#f - upon disabling the power stabilization the, the PID output is reset to zero. The current will return to the value it had before enabling power stabilization.

laser1:power-stabilization:output-channel

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the PID output channel for the power-stabilization. For amplified laser heads (TA pro and alike) this will be the amplifier current (63). For all other lasers it will be the laser diode current (51). (See the "Signal Channel IDs" section in appendix 4.1 on page 374.)

laser1:power-stabilization:input-channel-value-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current power level (in mW) as measured by the input specified with **:input-channel**.

laser1:power-stabilization:state

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the state of the power stabilization PID controller.

0: off

1: in lock

2: on hold

3: suspended

4: limited

5: unstable

laser1:power-stabilization:feedforward-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Only for CTL laser heads: Parameter for enabling/disabling the feedforward for the cavity piezo. The feedforward is used to compensating current change induced wavelength changes by adapting the cavity.

laser1:power-stabilization:feedforward-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Only for CTL laser heads: Parameter to specify the feedforward factor between piezo voltage and laser current (in V/mA).

laser1:hf-cavity:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter relevant for using the external high-finess-cavity.

laser1:hf-cavity:tc1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

The **laser1:hf-cavity:tc1** section provides parameters related to the first temperature controller for laser first external high-finess-cavity.

For usage see **laser1:dl:tc:** on page 68.

laser1:hf-cavity:tc2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

The **laser1:hf-cavity:tc2** section provides parameters related to the second temperature controller for laser second external high-finess-cavity.

For usage see **laser1:dl:tc:** on page 68.

laser1:hf-cavity:factory-settings:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the most important high-finess-cavity parameters.
These settings are only available for non-legacy heads with an EEPROM.

laser1:hf-cavity:factory-settings:tc1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the first temperature controller (TC).

For usage see **laser1:dl:factory-settings:tc:** on page 116.

laser1:hf-cavity:factory-settings:tc2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

Factory settings for the second temperature controller (TC).

For usage see **laser1:dl:factory-settings:tc:** on page 116.

laser1:hf-cavity:factory-settings:last-modified

(STRING parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating when the latest change of the factory settings took place.

laser1:hf-cavity:factory-settings:modified

(BOOLEAN parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating if the user has modified any factory settings.
#t - at least one of the factory settings parameters was modified
#f - factory settings have not been modified after read-out from EEPROM

laser1:hf-cavity:factory-settings:apply

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to apply all factory settings for the respective TC channel.

laser1:hf-cavity:factory-settings:retrieve-now

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to set all the factory settings according to the currently active parameter values.

laser1:hf-cavity:store

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to store data for the external high-finess-cavity to the board's EEPROM.

laser1:hf-cavity:restore

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to restore data for the external high-finess-cavity from the board's EEPROM.

laser1:config:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters and commands to load, save, modify and inspect a configurations file.

Up to four configurations can be stored on the controller, addressed by the labels "dlc:config1" through "dlc:config4". More configurations can be stored on an attached USB stick. They are stored in a folder named "toptica", get the file extensions ".laserconf" and are addressed by the labels "usb:*filename*". Furthermore, configurations can be imported from and exported to a remote PC via command line.

Working with a configuration always consists of two steps: First, the content of the configuration must be set with one of the commands **:retrieve**, **:load** or **:import**. Then, second, the content can be either applied to the laser parameters or stored into a file or transferred to a remote PC with the commands **:apply**, **:save** or **:export**, respectively.

Examples:

Activate configuration #4, stored on the device
First execute `(exec 'laser1:config:load "dlc:config4")` to load the content of the configuration file into memory. Then execute `(exec 'laser1:config:apply)` to set all laser parameters according to the configuration values.

Copy configuration #1 from the device to a file on a remote PC
First execute `(exec 'laser1:config:load "dlc:config1")` to load the content of the configuration file into memory. Then execute `(exec 'laser1:config:export)` to read out the configuration content in BASE64 format. Decode the data and store the result in a file on the PC.

Save current parameter values to configuration file "laser-settings.laserconf" on the USB stick
First execute `(exec 'laser1:config:retrieve)` to get a snapshot of the current parameter values. If desired use `(param-set! 'laser1:config:caption "...")` to add a descriptive text to the configuration. Then execute `(exec 'laser1:config:save "usb:laser-settings.laserconf")` to store the values onto the USB stick.

Replace configuration #3 on the device by a file from a remote PC
First encode your file content to BASE64 format. Then start the command `(exec 'laser1:config:import)`. When prompted for data transfer, send the BASE64 data, followed by a '#' character. Now the file content is in memory. Execute `(exec 'laser1:config:save "dlc:config3")` to write the content into configuration #3.

laser1:config:source

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the source of the configuration.
The label has the form "dlc:configX" for configurations stored on the controller, "usb:filename" for configurations stored on an USB-stick, "imported" for contents imported from remote or "retrieved" for values retrieved from the current parameters.

laser1:config:product-name

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating type and serial number of the laser head, the configuration was generated for.
This value is automatically set when the **:retrieve** command is used.
Note: The configuration can only be applied to a laser head with the exactly same product name.

laser1:config:date

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating date and time when the configuration was generated.
This value is automatically set when the **:retrieve** command is used.

laser1:config:caption

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify a short description of the purpose of the configuration.

laser1:config:pristine

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether the configuration is in an 'original' state, i.e. whether it was not manually modified outside the device.

laser1:config:load

(command, 1 argument, returns empty tuple)
(execution requires userlevel 3)

Arguments:
1. *source* of type STRING

Command to load the content of the configuration file specified by the *source* argument. The *source* argument accepts values "dlc:config1" to "dlc:config4" for configurations stored inside the controller or "usb:filename" for a configuration stored on a USB-Stick.

laser1:config:save

(command, 1 argument, returns empty tuple)
(execution requires userlevel 3)

Arguments:

1. *destination* of type STRING

Command to save the configuration content to a configuration file specified by the *destination* argument.
The *destination* argument accepts the same values as the *source* argument of the **:load** command. If the USB stick is used as destination, the file will be stored in a folder named "toptica". If the folder does not exist it will be created.

laser1:config:import

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to import a configuration content via command line.
Start the command with `(exec 'laser1:config:import)`.
The device then prompts for the content file:
`waiting for input (send # for end-of-file) ...`
Send the entire configuration content BASE64 encoded. The end-of-file signal (# character) tells the firmware to process the data which then gets acknowledge by `transfer complete.`.

laser1:config:export

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to export the content of the configuration via command line.
The content gets printed to the command line in BASE64 format.

laser1:config:retrieve

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to retrieve the configuration content from the current parameter values.
The parameter **:date** will automatically be set to the current system-time and the parameter **:product-name** will be set to the product name of the laser head. The parameter **:caption** will be set to an empty string.

laser1:config:apply

(command, no arguments, returns BOOLEAN)
(execution requires userlevel 3)

Command to apply the content of the configuration to the parameters. Note: Only parameters accessible in the current userlevel will be applied. If all parameters from the configuration are used, the command returns #t. If, due to userlevel restrictions, parameter values need to be omitted, the return value is #f. If the product name of the laser head **laser1:product-name** differs from that in the **laser1:config:product-name** parameter, the command refuses to apply the parameters and exits with an error message.

laser1:config:show

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to print the content of the configuration to the console.

laser1:config:list

(command, no arguments, returns STRING)
(execution requires userlevel 3)

Command to list the configuration files available on the device and the attached USB stick.
The return value consists of a multi-line string, listing informations for one file per line. Each line contains the configuration name in the format needed for the **:load** and **:save** commands, the product-name, the date when the configuration was saved and the optional caption, separated by semicolons. Files on the USB stick are listed if their file extension is ".laserconf" and if they reside in a folder named "toptica".

laser1:diagnosis:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Parameters and commands to run a laser diagnosis.

laser1:diagnosis:ready

(BOOLEAN parameter, read-only)
(reading requires userlevel 1)

Parameter indicating that the requested diagnosis run has finished.

laser1:diagnosis:options:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Parameters to configure certain diagnosis steps.

laser1:diagnosis:options:servo-test

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify whether alignment servos should be tested by moving them an checking their influence on laser power.

laser1:diagnosis:options:servo-stepsize

(INTEGER parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify the step size to be used when moving the NLO alignment servos.

laser1:diagnosis:options:motor-test

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify whether active tests of motor should be performed.

laser1:diagnosis:options:piezo-test

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify whether active tests of piezo should be performed.

laser1:diagnosis:start

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to initiate a diagnosis run. The command will fail if the emission button is not enabled. During the diagnosis run emission will be switched on and off. After executing this command, wait for the **:ready** parameter to become #t and the use the **:print-result** command to get the results.

laser1:diagnosis:print-result

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to print the result of the diagnosis to the console. The result is a BASE64 coded ZIP file containing several data files.

laser1:diagnosis:execute

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to run the diagnosis, wait for it to finish and then print the result to the console.

laser1:diagnosis:generate-to-usb

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to start the diagnosis, wait for it to finish and then store diagnostic report on the USB drive. Note: USB drive has to be inserted into USB port.

laser1:components:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Optional hardware components which can not be detected automatically.

laser1:save

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to save laser parameters to the DLC pro flash memory.
This includes all relevant parameters related of **:dl:cc**, **:dl:pc**, **:dl:tc**, **:dl:scan**, **:scope**, **:dl:lock**, **:amp:cc**, and **:amp:tc**.

laser1:load

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to load laser parameters from the DLC pro flash memory.

laser1:load-head

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to load laser head parameters from the DLC pro flash memory.

laser2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the second laser head attached to the DLC pro controller.

For usage see **laser1:** on page 56.

laser3:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the third laser head attached to the DLC pro controller.

For usage see **laser1:** on page 56.

laser4:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the fourth laser head attached to the DLC pro controller.

For usage see **laser1:** on page 56.

laser-common:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parmeters and commands related to more than one laser.

laser-common:scan:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters and command to synchronize the scan generators of multiple lasers.

laser-common:scan:sync-laser1

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify if the **laser1:scan** should be considered when the command **:sync** is executed.

laser-common:scan:sync-laser2

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify if **laser2:scan** should be considered when the command **:sync** is executed.

laser-common:scan:sync-laser3

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify if **laser3:scan** should be considered when the command **:sync** is executed.

laser-common:scan:sync-laser4

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify if **laser4:scan** should be considered when the command **:sync** is executed.

laser-common:scan:frequency

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the common frequency the scan generators should use when they get synchronized with the **:sync** command.

laser-common:scan:sync

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to synchronize the scan generators of all connected lasers.
When the command is executed, the scan generators of all configured lasers get set to the same frequency **:frequency**. They then get restarted simultaneously and will continue to oscillate synchronously with zero relative phase-shift.
Note: During the process of synchronization the digital output 3 will be toggled.

laser-common:scan:save

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to save scan-synchronization settings.

laser-common:scan:load

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to load scan-synchronization settings.

laser-common:ampcc-load:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters indicating information about electrical power consumption of amplifier current channels.
In systems with several amplifier current channels, the total electrical load of all channels must not exceed a limit of 40W. Therefore each amplifier current channel can only be enabled, if its contribution to the total load will not make the total load exceed this limit. The potential load contribution of a single channel is calculated by **:voltage-clip** * **:current-clip**.

laser-common:ampcc-load:potential-load-total

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the maximum total electrical load (in W) of all amplifier current channels, if they would all be enabled with their maximum currents.

laser-common:ampcc-load:potential-load-enabled

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the total potential electrical load (in W) of all amplifier current channels, currently being enabled, if they would be operated with their maximum current.

laser-common:ampcc-load:load-max

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the maximum allowed total electrical load (in W) of all amplifier current channels.

laser-common:ampcc-load:load-ok

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether all amplifier current channels can be enabled at the same time, without exceeding the limit for maximum electrical load.

laser-common:save-all

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to save all user-settings, including global settings and settings of all connected lasers.

laser-common:load-all

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to load all user-settings, including global settings and settings of all connected lasers.

laser-common:store-all

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to store all laser-settings, including global settings and settings of all connected lasers.

laser-common:restore-all

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to restore all laser-settings, including global settings and settings of all connected lasers.

laser-common:apply-all

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to apply all factory-settings, including global settings and settings of all connected lasers.

laser-common:retrieve-all

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to retrieve all factory-settings, including global settings and settings of all connected lasers.

uv:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for a UV-SHG laser head attached to the DLC pro controller.

uv:laser-on

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable the UV-SHG laser head.

uv:emission

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the emission status for the UV-SHG laser head.
#t - laser emits light
#f - laser emission is switched off

uv:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the UV-SHG system corresponding to the following states:

0 - *power off*
10 - *preparing*
20 - *standby*
30 - *pre-emission*
35 - *idle*
40 - *ready*
50 - *power warning*
60 - *optimizing*
-1 - *error*
99 - *service mode*

uv:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the UV-SHG system in textual form.

uv:specs-fulfilled

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether the laser specifications are currently met.

uv:error

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the error status of the UV-SHG system.

uv:error-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the error status of the UV-SHG system in textual form.

uv:operation-time-pump

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the operation time of the pump laser in hours.

uv:operation-time-uv

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the operation time of the UV-SHG system in hours.

uv:pump-power-margin

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the fractional power-margin for the pump laser.

uv:remaining-optics-spots

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the number of remaining optics spot positions.

uv:power-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the target power in mW.

uv:power-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current power level (in mW).

uv:baseplate-temperature

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current temperature of the baseplate on an UV-SHG system.

uv:idle-mode

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable the idle mode in the UV-SHG system.

uv:idle-alignment-option

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify whether laser power should be minimized in idle-mode (#f) or should should keep a certain level to allow for optical alignment procedures (#t).

uv:optimization-settings:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

This section provides access to the power optimization settings in UV-SHG systems.

For usage see **laser1:uv:optimization-settings:** on page 238.

uv:perform-optimization

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to optimize the power level of the UV-SHG system.

uv:perform-optics-shift

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to shift the optics of the UV-SHG system to the next spot position.

uv:clear-errors

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to optimize the power level of the UV-SHG system.

auto-nlo:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for controlling the AutoNLO feature of frequency-converted diode laser systems.

auto-nlo:automatic-mode

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter to enable the Auto-Pilot feature.

auto-nlo:serial-number

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the serial-number of the laser head.

auto-nlo:fw-ver

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the firmware version of the laser head.

auto-nlo:fw-ver-valid

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the validity of the firmware version of the laser head.

auto-nlo:customer

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the customer of the laser head.

auto-nlo:laser-on

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable the NLO laser head.

auto-nlo:emission

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the emission status for the NLO laser head.
#t - laser emits light
#f - laser emission is switched off

auto-nlo:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the NLO system corresponding to the following states:

0 - *power off*
10 - *preparing*
20 - *standby*
30 - *pre-emission*
35 - *idle*
40 - *ready*
50 - *power warning*

60 - *optimizing*
-1 - *error*
99 - *service mode*
999 - *disabled*

auto-nlo:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the status of the NLO system in textual form.

auto-nlo:error

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the error status of the NLO system.

auto-nlo:error-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the error status of the NLO system in textual form.

auto-nlo:locked-cavity

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the SHG cavity status.
#t - cavity locked
#f - cavity unlocked

auto-nlo:locked-cavity-fhg

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the FHG cavity status.
#t - cavity locked
#f - cavity unlocked

auto-nlo:operation-time-master

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the operation time of the master laser in hours.

auto-nlo:operation-time-amplifier

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the operation time of the amplifier in hours.

auto-nlo:operation-time-cavity

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the operation time of the SHG resonator in hours.

auto-nlo:operation-time-cavity-fhg

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the operation time of the FHG resonator in hours.

auto-nlo:current-set-master

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the setpoint value for the master laser diode current in mA.

auto-nlo:current-act-master

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual master laser diode current in mA.

auto-nlo:current-set-amplifier

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the setpoint value for the amplifier diode current in mA.

auto-nlo:current-act-amplifier

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual amplifier diode current in mA.

auto-nlo:power-act-master

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the master laser output power in mW.

auto-nlo:power-act-amplifier

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual amplifier output power in mW.

auto-nlo:power-act-shg

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current power level (in mW) of SHG cavity.

auto-nlo:power-act-fhg

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current power level (in mW) of FHG cavity.

auto-nlo:temp-set-master

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the setpoint value for the master laser diode temperature in °C.

auto-nlo:temp-act-master

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual master laser diode temperature in °C.

auto-nlo:temp-set-amplifier

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the setpoint value for the amplifier diode temperature in °C.

auto-nlo:temp-act-amplifier

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual amplifier diode temperature in °C.

auto-nlo:temp-set-crystal

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the setpoint value for the SHG crystal temperature in °C.

auto-nlo:temp-act-crystal

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual SHG crystal temperature in °C.

auto-nlo:temp-set-cavity

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the setpoint value for the SHG cavity temperature in °C.

auto-nlo:temp-act-cavity

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual SHG cavity temperature in °C.

auto-nlo:temp-set-crystal-fhg

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 1)

Parameter indicating the setpoint value for the FHG crystal temperature in °C.

auto-nlo:temp-act-crystal-fhg

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual FHG crystal temperature in °C.

auto-nlo:temp-set-cavity-fhg

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the setpoint value for the FHG cavity temperature in °C.

auto-nlo:temp-act-cavity-fhg

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual FHG cavity temperature in °C.

auto-nlo:temp-act-baseplate

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual baseplate temperature in °C. (Available on TopWave 405 laser-heads only).

auto-nlo:voltage-set-master

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the setpoint value for the master cavity piezo voltage in V.

auto-nlo:voltage-act-master

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual master cavity piezo voltage in V.

auto-nlo:voltage-act-shg

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the actual SHG cavity piezo voltage in V.

auto-nlo:air-pressure

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the air pressure measured inside the DLC pro in hPa.

auto-nlo:amplifier-current-margin

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the fractional current-margin for the amplifier.

auto-nlo:amplifier-current-margin-alo

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the fractional current-margin after last optimize for the amplifier.

auto-nlo:conversion-efficiency

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the conversion efficiency of the SHG resonator.

auto-nlo:conversion-efficiency-fhg

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the conversion efficiency of the FHG resonator.

auto-nlo:master-noise

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the relative RMS-noise in the master power output.

auto-nlo:power-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the target power in mW.

auto-nlo:power-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current power level (in mW).

auto-nlo:wavelength-set

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter indicating the target wavelength for the single-mode optimization (in nm).

auto-nlo:wavelength-set-min

(REAL parameter, read-only)
(reading requires userlevel 1, writing requires userlevel 0)

Parameter indicating the minimum target wavelength for the single-mode optimization (in nm).

auto-nlo:wavelength-set-max

(REAL parameter, read-only)
(reading requires userlevel 1, writing requires userlevel 0)

Parameter indicating the maximum target wavelength for the single-mode optimization (in nm).

auto-nlo:wavelength

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the wavelength (in vacuum) in nanometer.

auto-nlo:idle-mode

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable the idle mode in the NLO system.

auto-nlo:wavemeter:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Parameters concerning the wavelength meter.

For usage see **laser1:nlo:auto-nlo:wavemeter:** on page 190.

auto-nlo:power-stabilization-settings:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Parameters for configuring the power stabilization of the NLO system.

auto-nlo:power-stabilization-settings:power-min

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify the minimal target power in mW.

auto-nlo:power-stabilization-settings:power-max

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify the maximum target power in mW.

auto-nlo:power-stabilization-settings:amplifier-initial-current

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify the initial value for the amplifier current in mA.

auto-nlo:power-stabilization-settings:gain:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Gain parameters for the power stabilization.

For usage see **laser1:uv:power-stabilization:gain:** on page 236.

auto-nlo:optimization-settings:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Parameters for configuring the AutoNLO optimization in frequency-converted diode laser systems.

auto-nlo:optimization-settings:pressure-compensation

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to enabled/disable automatic pressure compensation.

auto-nlo:optimization-settings:auto-align-amplifier

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to enable/disable the AutoAlign optimization of the amplifier.

auto-nlo:optimization-settings:auto-align-cavity

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to enable/disable the AutoAlign optimization of the SHG cavity.

auto-nlo:optimization-settings:auto-align-include-advanced

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to enable/disable the advanced AutoAlign optimization of amplifier and cavity.

auto-nlo:optimization-settings:single-mode-optimization

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to enable/disable the Single-Mode optimization.

auto-nlo:optimization-settings:optimize-after-standby

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to enable/disable performing optimization before emission happens.

auto-nlo:optimization-settings:power-balance-optimization

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to enable/disable performing power balance optimization on systems supporting CBC.

auto-nlo:optimization-settings:cbc-lockpoint-optimization

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to enable/disable performing lockpoint optimization on systems supporting CBC.

auto-nlo:optimization-progress

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the progress of the power optimization routine as a percentage:

0 : Optimization routine is starting.

100 : Optimization routine has finished.

auto-nlo:last-time-auto-align

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating when the latest power optimization took place.

auto-nlo:last-time-single-mode-optimization

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating when the latest single mode optimization took place.

auto-nlo:single-mode-optimization-valid

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether the last single-mode optimization is still valid.

0: Last optimization is invalid.

1: Last optimization is valid.

The optimization becomes valid after a successful optimization run and invalid, whenever the master laser emission gets switched off or the master laser temperature gets unstable.

auto-nlo:single-mode-algorithm

(INTEGER parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to select th single-mode optimization algorithm to use:

1 : Algorithm 1, finding the largest single-mode plateau by varying the laser current only.

2 : Algorithm 2, finding the a single-mode plateau while keeping the wavelength constant. (Requires a wavelength meter to be connected.)

auto-nlo:perform-optimization

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to optimize the power level of the NLO system.

auto-nlo:perform-warm-up

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to perform warm-up routine of the NLO system.

auto-nlo:abort-warm-up

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to abort ongoing warm-up routine of the NLO system.

auto-nlo:reset-operation-time-cavity

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to reset the **:operation-time-cavity** parameter to zero in case of a cavity replacement.

auto-nlo:reset-operation-time-cavity-fhg

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to reset the **:operation-time-cavity-fhg** parameter to zero in case of a cavity replacement.

auto-nlo:clear-errors

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to reset all the AutoNLO related error flags.

cc1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the first Current Controller (CC) board. CC controls the laser current and provides checks for the laser system's health.

cc1:slot

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the slot, the CC-board is mounted in.

cc1:serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the CC-board's serial number.

cc1:revision

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the CC-board's hardware revision number.

cc1:fpga-fw-ver

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the firmware version of the FPGA.

cc1:board-temp

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the CC-board temperature (in °C).

cc1:variant

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter describing the hardware configuration of the CC-channel. For example, "2x 250 mA" or "1x 500 mA"

cc1:parallel-mode

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether both CC channels are combined into a single high-power channel.
#t - both 250mA CC channels are combined into a single 500mA channel.
#f - the two 250mA CC channels are not combined and can be used separately.

cc1:smc-support

(BOOLEAN parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating whether the hardware for single mode control is available.

cc1:status

(INTEGER parameter, read-only)
(reading requires userlevel 2)

Parameter indicating CC-board status information. Each bit provides specific information.

bit 0 - board is missing / not answering

bit 1 - mainboard over-temperature

bit 2 - alu-board over-temperature

bit 3 - power-supply-board over-temperature

bit 4 - head-supply undervoltage

bit 5 - analog-supply undervoltage

bit 6 - logics-supply undervoltage

bit 7 - PLL not locked

bit 8 - power-supply error

bit 9 - p15V power-supply error

bit 10 - n15V power-supply error

bit 11 - fpga power-supply error

bit 12 - fpga PLL error

cc1:status-txt

(STRING parameter, read-only)
(reading requires userlevel 2)

Parameter indicating a brief text version of the **:status** parameter.

cc1:channel1:

(parameter section)
(reading requires userlevel 2, writing requires userlevel 2)

This section provides controls for the first channel of the current controller (CC) board. The controls include setting the laser current, configuring the clips of the laser protection circuitry, reading status information, etc.

For usage see **laser1:dl:cc:** on page 62.

cc1:channel2:

(parameter section)
(reading requires userlevel 2, writing requires userlevel 2)

This section provides controls for the second channel of the current controller (CC) board.

For usage see **laser1:dl:cc:** on page 62.

cc2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the optional 2nd Current Controller (CC) board.

For usage see **cc1:** on page 275.

cc3:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the optional 3rd Current Controller (CC) board.

For usage see **cc1:** on page 275.

cc4:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the optional 4th Current Controller (CC) board.

For usage see **cc1:** on page 275.

ampcc1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the Amplifier Current Controller (CC) board. CC controls the amplifier current and provides checks for the laser system's health.

ampcc1:slot

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the slot, the CC-5000 board is mounted in.

ampcc1:serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the CC-5000 board's serial number.

ampcc1:revision

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the CC-5000 board's hardware revision number.

ampcc1:fpga-fw-ver

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the firmware version of the FPGA.

ampcc1:board-temp

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the CC-board temperature (in °C).

ampcc1:variant

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter describing the hardware configuration of the CC-5000 channel. For example, "1x 5000mA"

ampcc1:parallel-mode

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter describing the hardware configuration of the CC-5000 channel.
#t - this board's channel is combined with a second CC-5000 board's channels into a single 10000mA channel.
#f - this board is provigin a single 5000mA channel

ampcc1:inverter-temp

(REAL parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the temperature at the inverter in °C.

ampcc1:inverter-temp-fuse

(REAL parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter to specifiy the maximum allowed temperature for the inverter circuit in °C. If **:inverter-temp** increases above this limit, the current will be switched off.

ampcc1:regulator-temp

(REAL parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the temperature at the linear regulator in °C.

ampcc1:regulator-temp-fuse

(REAL parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter to specifiy the maximum allowed temperature for the linear regulator in °C.
If **:regulator-temp** increases above this limit, the current will be switched off.

ampcc1:power-15v

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify power supply to use for the CC5000 board.
#t - use 15V line
#f - use 5V line.

ampcc1:status

(INTEGER parameter, read-only)
(reading requires userlevel 2)

Parameter indicating CC-board status information. Each bit provides specific information.

bit 0 - board is missing / not answering

bit 1 - mainboard over-temperature

bit 4 - +5V power supply problem

bit 5 - +15V supply problem

bit 6 - -15V supply problem

bit 7 - PLL not locked

bit 8 - overtemperature of linear regulator

bit 9 - overtemperature of inverter

ampcc1:status-txt

(STRING parameter, read-only)
(reading requires userlevel 2)

Parameter indicating a brief text version of the **:status** parameter.

ampcc1:channel1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the current channel of the current controller (CC-5000) board. The controls include setting the amplifier chip current, configuring the clips of the chip protection circuitry, reading status information, etc.

ampcc1:channel1:path

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter describing the hardware location of the current control channel.
Example: "ampcc1:channel1" indicates the current channel of the first CC-5000 current controller.

ampcc1:channel1:variant

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter describing the hardware variant of the current control channel channel. For example, it returns "5000 mA" or "10000 mA" for CC5000 or CC10000 channel, respectively.

ampcc1:channel1:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to switch the amplifier current on/off:
#t - laser emission on
#f - laser emission off

ampcc1:channel1:emission

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the amplifier emission status.
#t - all criteria for laser emission are fulfilled. Laser radiation should be emitted from this channel's amplifier.
#f - if laser emission is not possible for one of the following reasons:
- interlock circuit is open.
- the front panel key swicth is "off".
- the laser emission push button on the frontpanel is not pressed.
- laser emission is disabled by the software.

ampcc1:channel1:current-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to set the desired amplifier current in mA.
If **laser1:amp:cc:feedforward-enabled** is #t, **laser1:amp:cc:current-set** is determined as follows:

laser1:amp:cc:current-set = **laser1:amp:cc:current-offset** + **laser1:amp:cc:feedforward-factor** * (**laser1:dl:pc:voltage-set** - *voltage-pivot*) where *voltage-pivot* is the value of **laser1:dl:pc:voltage-set** at the time the feedforward gets enabled.
The **laser1:amp:cc:current-set** parameter setting affects the **laser1:amp:cc:current-offset** value.

ampcc1:channel1:current-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the amplifier current without Feed Forward contribution (in mA). This parameter setting affects the **laser1:amp:cc:current-set** value.

ampcc1:channel1:external-input:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to configure the current control by an external, analog voltage input.

For usage see **laser1:dl:cc:external-input:** on page 63.

ampcc1:channel1:output-filter:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to configure output filters such as slew rate.

For usage see **laser1:dl:cc:output-filter:** on page 64.

ampcc1:channel1:current-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the measured value of the amplifier chip current in mA. Usually, this is the current flowing through the amplifier chip. However, if the safety circuitry shorts the current output, this is not true.

ampcc1:channel1:current-out

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current value in mA, as applied to the digital-to-analog converter. The value should be close to the **current-act** value, but with higher resolution and without measurement noise.

ampcc1:channel1:current-clip

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the maximum allowed current (in mA) for this channel's amplifier chip.

ampcc1:channel1:current-clip-tuning

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the maximum allowed tuning current (in mA) for this channel's amplifier chip.

ampcc1:channel1:use-current-clip-tuning

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify if the maximum tuning current **:current-clip-tuning** should be taken into account for limiting the amplifier current. If set to #t the current gets limited to the maximum tuning current **:current-clip-tuning** or the maximum current **:current-clip**, depending on which one is smaller.

ampcc1:channel1:current-clip-free-run

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the maximum value for the **:current-clip** parameter (in mA) in case of seedless operation.
The maximum parameter value is limited with **:current-clip**.

ampcc1:channel1:using-current-clip-free-run

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating if current of amplifier was changed due to amplifier's seedless operation.

ampcc1:channel1:current-clip-limit

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the maximum value for the **:current-clip** parameter (in mA). IMPORTANT: To be specified only for legacy laser heads (without factory settings stored in EEPROM; **:legacy** = #t).
.

ampcc1:channel1:voltage-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the measured value of the voltage applied to the amplifier chip (in V).

ampcc1:channel1:voltage-out

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the measured value of the voltage at the voltage fuse (in V).

ampcc1:channel1:voltage-clip

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the maximum allowed voltage (in V) for this channel's amplifier chip.
Can be changed only for legacy laser heads (without factory settings stored in EEPROM).

ampcc1:channel1:potential-load

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the approximate electrical load in W, this current channel can potentially exert on the power supply if the maximum diode current is used. The sum of all amplifier channel loads must not exceed 40W.

ampcc1:channel1:feedforward-master

(INTEGER parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to specify the master channel for the feed forward.

ampcc1:channel1:feedforward-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable Feed Forward for this current control channel.
#t - Feed Forward enabled
#f - Feed Forward disabled
If enabled, a current proportional to another channel's output is added to this channel. The other channel is defined by the **laser1:feedforward-master** parameter.

ampcc1:channel1:feedforward-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control how much of the piezo channel's output is to be added to the current channel (in mA/V).

ampcc1:channel1:aux

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the measured voltage in V at the AUX input.

ampcc1:channel1:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter providing channel status information. Each bit of the integer value provides specific channel status information. For CC-5000 type channels, the bits provide the following information:

bit 0 - emission
bit 1 - enabled
bit 2 - inverter in constant-current mode
bit 3 - inverter dummyload enabled
bit 4 - crowbar enabled (protective short circuit)
bit 5 - DAC enabled
bit 6 - current clip
bit 7 - voltage clip
bit 12 - DAC not initialized
bit 11 - shortcircuit detected
bit 12 - channel forced to be off bei health monitoring
bit 14 - laser diode current at lower limit
bit 15 - laser diode current at upper limit

bit 16 - laser diode current limited by slew rate

ampcc1:channel1:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter providing a brief text version of the **:status** parameter.

ampcc1:channel1:forced-off

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

For internal use. Parameter indicating if the channel is forced off by health monitoring.
#t - channel is forced to be off
#f - channel can be switched on
IMPORTANT: Set **:forced-off** to *#f* only if you accept the risk of operating the amplifier in undefined health.

ampcc2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for an optional 2nd Amplifier Current Controller (CC) board.

For usage see **ampcc1:** on page 278.

hcc1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the High Current Controller (HCC) board. HCC controls the amplifier current and provides checks for the laser system's health.

hcc1:slot

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the slot, the HCC board is mounted in.

hcc1:serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the HCC board's serial number.

hcc1:revision

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the HCC board's hardware revision number.

hcc1:fpga-fw-ver

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the firmware version of the FPGA.

hcc1:board-temp

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the HCC-board temperature (in °C).

hcc1:variant

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter describing the hardware configuration of the HCC channel. Returns "HCC".

hcc1:inverter-temp

(REAL parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the temperature of the converter circuit on the HCC board (in °C).

hcc1:regulator-temp

(REAL parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the temperature of the linear regulator circuit on the HCC board (in °C).

hcc1:status

(INTEGER parameter, read-only)
(reading requires userlevel 2)

Parameter indicating HCC-board status information. Each bit provides specific information.

bit 0 - board is missing / not answering

bit 1 - mainboard over-temperature

bit 4 - 15V supply voltage low

bit 7 - PLL not locked

bit 8 - overtemperature of linear regulator

bit 9 - overtemperature of inverter

hcc1:status-txt

(STRING parameter, read-only)
(reading requires userlevel 2)

Parameter indicating a brief text version of the **:status** parameter.

hcc1:channel1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the current channel of the high current controller (HCC) board. The controls include setting the amplifier chip current, configuring the clips of the chip protection circuitry, reading status information, etc.

hcc1:channel1:path

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter describing the hardware location of the current control channel.
Example: "hcc1:channel1" indicates the current channel of the first HCC current controller.

hcc1:channel1:variant

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter describing the hardware variant of the current control channel channel. Returns "HCC" for all HCC channels.

hcc1:channel1:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to switch the amplifier current on/off:
#t - laser emission on
#f - laser emission off

hcc1:channel1:emission

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the amplifier emission status.
#t - all criteria for laser emission are fulfilled. Laser radiation should be emitted from this channel's amplifier.
#f - if laser emission is not possible for one of the following reasons:
- interlock circuit is open.
- the front panel key swicth is "off".
- the laser emission push button on the frontpanel is not pressed.
- laser emission is disabled by the software.

hcc1:channel1:current-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to set the desired amplifier current in mA.
If **laser1:amp:cc:feedforward-enabled** is #t, **laser1:amp:cc:current-set** is determined as follows:

laser1:amp:cc:current-set = **laser1:amp:cc:current-offset** + **laser1:amp:cc:feedforward-factor** * (**laser1:dl:pc:voltage-set** - *voltage-pivot*) where *voltage-pivot* is the value of **laser1:dl:pc:voltage-set** at the time the feedforward gets enabled.
The **laser1:amp:cc:current-set** parameter setting affects the **laser1:amp:cc:current-offset** value.

hcc1:channel1:current-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the amplifier current without Feed Forward contribution (in mA). This parameter setting affects the **laser1:amp:cc:current-set** value.

hcc1:channel1:external-input:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to configure the current control by an external, analog voltage input.

For usage see **laser1:dl:cc:external-input:** on page 63.

hcc1:channel1:output-filter:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to configure output filters such as slew rate.

For usage see **laser1:dl:cc:output-filter:** on page 64.

hcc1:channel1:polarity-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the polarity of the current driver. Possible values are "anode-grounded", "cathode-grounded" and "floating".

hcc1:channel1:current-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the measured value of the amplifier chip current in mA. Usually, this is the current flowing through the amplifier chip. However, if the safety circuitry shorts the current output, this is not true.

hcc1:channel1:current-out

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current value in mA, as applied to the digital-to-analog converter. The value should be close to the **current-act** value, but with higher resolution and without measurement noise.

hcc1:channel1:current-clip

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the maximum allowed current (in mA) for this channel's amplifier chip.

hcc1:channel1:current-clip-tuning

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the maximum allowed tuning current (in mA) for this channel's amplifier chip.

hcc1:channel1:use-current-clip-tuning

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify if the maximum tuning current **:current-clip-tuning** should be taken into account for limiting the amplifier current. If set to #t the current gets limited to the maximum tuning current **:current-clip-tuning** or the maximum current **:current-clip**, depending on which one is smaller.

hcc1:channel1:current-clip-free-run

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the maximum value for the **:current-clip** parameter (in mA) in case of seedless operation.
The maximum parameter value is limited with **:current-clip**.

hcc1:channel1:using-current-clip-free-run

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating if current of amplifier was changed due to amplifier's seedless operation.

hcc1:channel1:current-clip-limit

(REAL parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter to specify the maximum value for the **:current-clip** parameter (in mA).
IMPORTANT: To be specified only for legacy laser heads (without factory settings stored in EEPROM; **:legacy** = #t).
.

hcc1:channel1:voltage-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the measured value of the voltage applied to the amplifier chip (in V).

hcc1:channel1:voltage-out

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the measured value on the board, used for detection voltage-clip (V).

hcc1:channel1:voltage-clip

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter to specify the maximum allowed voltage (in V) for this channel's amplifier chip.
Can be changed only for legacy laser heads (without factory settings stored in EEPROM).

hcc1:channel1:potential-load

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the approximate electrical load in W this current channel can potentially exert on the power supply if the maximum diode current is used. The sum of all amplifier channel loads must not exceed 40W.

hcc1:channel1:feedforward-master

(INTEGER parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to specify the master channel for the feed forward.

hcc1:channel1:feedforward-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable Feed Forward for this current control channel.
#t - Feed Forward enabled
#f - Feed Forward disabled
If enabled, a current proportional to another channel's output is added to this channel. The other channel is defined by the **laser1:feedforward-master** parameter.

hcc1:channel1:feedforward-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control how much of the piezo channel's output is to be added to the current channel (in mA/V).

hcc1:channel1:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter providing channel status information. Each bit of the integer value provides specific channel status information. For HCC type channels, the bits provide the following information:

bit 0 - emission
bit 1 - enabled
bit 6 - current-clip
bit 7 - voltage clip
bit 11 - short circuit detected
bit 12 - channel forced to be off by health monitoring
bit 13 - driver fault

bit 14 - laser diode current at lower limit

bit 15 - laser diode current at upper limit

bit 16 - laser diode current limited by slew rate

bit 18 - ground offset voltage exceeds limit

hcc1:channel1:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter providing a brief text version of the **:status** parameter.

hcc1:channel1:forced-off

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

For internal use. Parameter indicating if the channel is forced off by health monitoring.
#t - channel is forced to be off
#f - channel can be switched on
IMPORTANT: Set **:forced-off** to *#f* only if you accept the risk of operating the amplifier in undefined health.

hcc2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for an optional 2nd High Current Controller (HCC) board.

For usage see **hcc1:** on page 286.

cbc:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

This section provides controls for the CBC amplifier.

cbc:node-id

(INTEGER parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the CANopen node ID of the CBC amplifier.

cbc:serial-number

(STRING parameter, read-only)
(reading requires userlevel 1, writing requires userlevel 0)

Parameter indicating the CBC amplifier's serial number.

cbc:revision

(STRING parameter, read-only)
(reading requires userlevel 1, writing requires userlevel 0)

Parameter indicating the CBC hardware revision number.

cbc:fw-ver

(STRING parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the version of firmware on the CBC amplifier

cbc:cbc-scheme

(STRING parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the beam combining scheme of the CBC amplifier (modulation or polarization).

cbc:status

(INTEGER parameter, read-only)
(reading requires userlevel 1)

Parameter indicating device's status. Each bit provides specific information:

bit 0 - Over-temperature of the CBC amplifier board.

bit 15 - Device is missing or not answering.

cbc:status-txt

(STRING parameter, read-only)
(reading requires userlevel 1)

Parameter indicating a brief text version of the **:status** parameter.

cbc:board:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Parameters of the CBC controller board.

cbc:board:pid:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Parameters to configure the PID controller, stabilizing the coherent beam combination.

cbc:board:pid:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to enable/disable DAC the PID controller.

cbc:board:pid:relock-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to enable/disable relock of CBC regulator.

cbc:board:pid:setpoint

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify the setpoint for the PID in arbitrary units.

cbc:board:pid:output-value

(REAL parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the PID output in arbitrary units.

cbc:board:pwm-tim1:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Parameters to configure the phase control PWM output.

cbc:board:pwm-tim1:phase1

(INTEGER parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to control phase 1 in units of TIM1 output compare value.

cbc:board:pwm-tim1:neg-polarity1

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to control the polarity of output channel 1 of TIM1. #f = high, #t = low.

cbc:board:polarization:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Polarization.

cbc:board:polarization:pd-inputs:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Parameters to configure photodiode inputs.

cbc:board:polarization:pd-inputs:offset-pd1

(INTEGER parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Sets the offset of PD1 input. 0 to 65535.

cbc:board:polarization:pd-inputs:offset-pd2

(INTEGER parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Sets the offset of PD2 input. 0 to 65535.

cbc:board:polarization:value-pd1

(REAL parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the averaged signal of photodiode PD1 in Volts.

cbc:board:polarization:value-pd2

(REAL parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the averaged signal of photodiode PD2 in Volts.

cbc:board:scope:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Simple oscilloscope.

cbc:board:scope:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Start/stop sampling of data.

cbc:board:scope:channel1:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Settings for channel of the scope engine.

cbc:board:scope:channel1:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to enable/disable data acquisition for the scope channel.
#t - data acquisition enabled
#f - data acquisition disabled

cbc:board:scope:channel1:input

(INTEGER parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Input selection for channel 0. 0 - PID Input (= Error signal) 1 - Mod-PD AC 2 - Pol-PD1 3 - Pol-PD2 4 - Mod-PD DC

cbc:board:scope:channel2:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Settings for channel of the scope engine.

For usage see **cbc:board:scope:channel1:** on page 296.

cbc:board:scope:channel3:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Settings for channel of the scope engine.

For usage see **cbc:board:scope:channel1:** on page 296.

cbc:board:scope:timescale

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to define the timescale (in ms).

cbc:board:scope:data

(BINARY parameter, read-only)
(reading requires userlevel 1)

Scope data as binary.

cbc:board:temp-act-baseplate

(REAL parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the base-plate temperature of the CBC board.

cbc:power-balance:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Parameters for balancing the power of the beams to combine.

cbc:power-balance:current-factor-taper1

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify the factor between virtual CBC current and current of taper 1

cbc:power-balance:current-factor-taper2

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify the factor between virtual CBC current and current of taper 2

cbc:power-balance:ongoing

(BOOLEAN parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the status of the power balance optimization routine:
#t: An optimization routine is in progress.
#f: No optimization routine is in progress.

cbc:power-balance:optimize

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to perform power balancing optimization.

cbc:lock-track:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Parameters for supporting the CBC phase lock.

cbc:lock-track:tracking-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to enable/disable coarse tracking of the beam 1 phase.

cbc:lock-track:disable-current-jump

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to enable/disable current jumps on tracking.

cbc:lock-search:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Parameters for supporting the CBC lockpoint search.

cbc:lock-search:settings:

(parameter section)
(reading requires userlevel 1, writing requires userlevel 1)

Settings of lockpoint search routine.

cbc:lock-search:settings:inverted-phase

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify behavior of CBC controller in locked state.
#t - CBC controller increases when external ridge current increases #f - CBC controller decreases when external ridge current decreases

cbc:lock-search:settings:target-channel

(INTEGER parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify which power should be optimized

1 - amplifier power

2 - SHG power

5 - fiber power

cbc:lock-search:settings:cbc-time

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify wait time for CBC stabilization.
Time unit are seconds.

cbc:lock-search:settings:power-time

(REAL parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify wait time before power readout.
Time unit are seconds.

cbc:lock-search:settings:increase-current

(INTEGER parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Parameter to specify how the current should be increased after lock

-3 - increase until CBC reaches out-max, ignore power drop
-2 - increase until CBC reaches out-min, ignore power drop
-1 - increase to the current bounds, ignore power drop
0 - OFF, no current should not be increased after lock
1 - increase to the current bounds, stop on power drop
2 - increase until CBC reaches out-min, stop on power drop
3 - increase until CBC reaches out-max, stop on power drop

cbc:lock-search:searching

(BOOLEAN parameter, read-only)
(reading requires userlevel 1)

Parameter to identify, if lock-search routing is running.

cbc:lock-search:execute

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to perform lock-search routine.

cbc:lock-search:abort

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Command to perform lock-search routine.

pc1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the Piezo Controller (PC) board. The PC controls the piezo voltage applied to the laser head.

pc1:slot

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the slot, the PC-board is mounted in.

pc1:serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the PC-board's serial number.

pc1:revision

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the PC-board's hardware revision number.

pc1:variant

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the board variant of the PC module.

pc1:channel-count

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the number of available voltage channels.

pc1:fpga-fw-ver

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the firmware version of the FPGA.

pc1:status

(INTEGER parameter, read-only)
(reading requires userlevel 2)

Parameter indicating PC-board status information. Each bit provides specific information.

bit 7 - PLL not locked

pc1:status-txt

(STRING parameter, read-only)
(reading requires userlevel 2)

Parameter indicating a brief text version of the **:status** parameter.

pc1:channel1:

(parameter section)
(reading requires userlevel 2, writing requires userlevel 2)

This section provides controls for the first channel of the piezo controller (PC) board.
.

For usage see **laser1:dl:pc:** on page 76.

pc1:channel2:

(parameter section)
(reading requires userlevel 2, writing requires userlevel 2)

This section provides controls for the second channel of the piezo controller (PC) board.
.

For usage see **laser1:dl:pc:** on page 76.

pc2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section gives access to the piezo control board. It provide means for controlling the piezo voltage.

For usage see **pc1:** on page 300.

pc3:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section gives access to the piezo control board. It provide means for controlling the piezo voltage.

For usage see **pc1:** on page 300.

tc1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the Temperature Control (TC) board.

tc1:slot

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the slot, the TC-board is mounted in.

tc1:serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the TC-board's serial number.

tc1:revision

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the TC-board's hardware revision number.

tc1:fpga-fw-ver

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the firmware version of the FPGA.

tc1:channel-count

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the number of available channels.
The standard version of TC board features 2 channels. For certain laser heads 4-channel versions are available. Only 4-channel boards support **channel1b** and **channel2b**. The additional channels share the electrical connectors with **channel1** and **channel2**, respectively.

tc1:board-temp

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the TC-board temperature in °C.

tc1:channel1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for controlling channel1 of the TC board.

For usage see **laser1:dl:tc:** on page 68.

tc1:channel1b:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for controlling channel1b of the TC board.
Channel1b is only available on 4-channel versions of the TC board (see parameter **:channel-count**). It shares the electrical connector with channel1. Please note that the maximum available current is only 50% of that of channel1.

For usage see **laser1:dl:tc:** on page 68.

tc1:channel2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for controlling channel2 of the TC board.

For usage see **laser1:dl:tc:** on page 68.

tc1:channel2b:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for controlling channel2b of the TC board.
Channel1b is only available on 4-channel versions of the TC board (see parameter **:channel-count**). It shares the electrical connector with channel2. Please note that the maximum available current is only 50% of that of channel2.

For usage see **laser1:dl:tc:** on page 68.

tc2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the Temperature Control (TC) board.

For usage see **tc1:** on page 302.

mc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the Main Controller (MC) board.

mc:serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the serial number of the MC-board.

mc:revision

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the MC-board's hardware revision number.

mc:fpga-type

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the type of FPGA hardware.
1 = generation 1 hardware, 2 = generation 2 hardware.

mc:fpga-fw-ver

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the firmware version of the FPGA.

mc:board-temp

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the temperature measured on the MC-board (in °C).

mc:relative-humidity

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the relative humidity measured by the humidity sensor (in %).

mc:air-pressure

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the air pressure measured by the pressure sensor (in hPa).

io:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the Input/Output (I/O) board.

io:serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the serial number of the I/O-board.

io:revision

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the I/O-board's hardware revision number.

io:fpga-fw-ver

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the firmware version of the FPGA.

io:fine-1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the Fine 1 analog frontpanel input.

io:fine-1:value-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the voltage in V, measured at the analog input connector.

io:fine-2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the Fine 2 analog frontpanel input.

For usage see **io:fine-1:** on page 306.

io:fast-3:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the Fast 3 analog frontpanel input.

For usage see **io:fine-1:** on page 306.

io:fast-4:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the Fast 4 analog frontpanel input.

For usage see **io:fine-1:** on page 306.

io:out-a:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for the Out A analog frontpanel output.

io:out-a:voltage-set

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the static output voltage in V.
In contrast to the **:voltage-offset** parameter, this value includes the static contribution of the feedforward (See **laser1:dl:cc:current-set**). With feedforward disabled **:voltage-offset** and **:voltage-set** are identical.

io:out-a:voltage-act

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the output voltage (in V) including all contributions like static offset, feed forward, analog remote control, PIDs and signal generators.
Please note that this is not a measured value and that the actual voltage can differ due to component tolerances.

io:out-a:voltage-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the static output voltage offset in V.

io:out-a:voltage-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the static output voltage offset.

io:out-a:voltage-min

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the minimum output voltage in V.

io:out-a:voltage-max

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the maximum output voltage in V.

io:out-a:signal-monitor:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to configure analog signal monitoring.

io:out-a:signal-monitor:signal

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

ID for the input signal to be routed to this laser channel.
For possible values, refer to the "Signal Channel IDs" section in appendix 4.1 on page 374.

io:out-a:signal-monitor:operating-point

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the operating point within the input signal, that is to be mapped to 0V at the monitor output.

io:out-a:signal-monitor:factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Factor to be applied to the input signal.

io:out-a:signal-monitor:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable the monitoring signal on the analog output channel.
#t - the monitoring signal is added to the output channel
#f - monitoring is disabled

io:out-a:output-filter:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to configure output filters such as slew rate.

For usage see **laser1:dl:cc:output-filter:** on page 64.

io:out-a:linked-laser

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify which laser's channels are to be used if, eg, the **:feedforward-master** is specified. Use 1 for **laser1** and 2 for **laser2**.

io:out-a:feedforward-master

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the master channel for the Feed Forward.

io:out-a:feedforward-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable Feed Forward for this voltage output channel.
#t - Feed Forward enabled
#f - Feed Forward disabled
If enabled, a voltage proportional to another channel's output is added to this channel. The other channel is defined by the **:feedforward-master** parameter.

io:out-a:feedforward-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control how much of the master channel's output is to be added to this voltage channel.

io:out-a:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter providing channel status information. Each bit of the integer value provides specific channel status information.

bit 0 - voltage output enabled

bit 1 - voltage at lower limit

bit 2 - voltage at upper limit

bit 3 - voltage limited by slew rate

io:out-a:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter providing a brief text version of the **:status** parameter.

io:out-b:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for the Out B analog frontpanel output.

For usage see **io:out-a:** on page 306.

io:digital-in0:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital input 0.

io:digital-in0:value-act

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the electrical state of the digital input pin.
#t - high signal (5V)
#f - low signal (0V)

io:digital-in1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital input 1.

For usage see **io:digital-in0:** on page 310.

io:digital-in2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital input 2.

For usage see **io:digital-in0:** on page 310.

io:digital-in3:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital input 3.

For usage see **io:digital-in0:** on page 310.

io:digital-out0:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital output 0.

io:digital-out0:value-act

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the electrical state of the digital output pin.
#t - high signal (5V)
#f - low signal (0V)

io:digital-out0:value-set

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter specifying the electrical state of the digital output pin in case of software control.
#t - high signal (5V)
#f - low signal (0V)
If the **:invert** parameter is #t, the signal will be inverted. To use software control set the **:mode** parameter to 3.

io:digital-out0:mode

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the signal source for digital output.

0 - trigger output of signal generator **laserX:scan** of the linked laser

1 - *out-of-lock* signal of lock engine **laserX:dl:lock** of the linked laser

2 - trigger output of the wide-scan **laserX:wide-scan** of the linked laser

3 - software control via parameter **:value-set**

io:digital-out0:linked-laser

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify which laser's trigger signals are to be used on this digital output channel. Use 1 for **laser1** and 2 for **laser2** etc.

io:digital-out0:invert

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify if the digital output logic should be inverted.

io:digital-out1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital output 1.

For usage see **io:digital-out0:** on page 310.

io:digital-out2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital output 2.

For usage see **io:digital-out0:** on page 310.

io:digital-out3:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital output 3.

For usage see **io:digital-out0:** on page 310.

io:save

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to save user settings for the analog output channels.

io:load

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to load user settings for the analog output channels.

si:

(parameter section)
(reading requires userlevel 2, writing requires userlevel 2)

This section provides information about System Integration board.

si:serial-number

(STRING parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating the serial number of the SI board.

si:revision

(STRING parameter, read-only)
(reading requires userlevel 2, writing requires userlevel 0)

Parameter indicating the SI board's hardware revision number.

si:si1-input-signal

(BOOLEAN parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the signal on the Laser Class 4 emission control line.

si:si2-enabled

(BOOLEAN parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the state of the Laser Class 3B emission control enabling switch.

power-supply:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 2)

This section provides information about power supply lines.

power-supply:type

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the type of power supply installed.

power-supply:serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the serial number of the power supply.

power-supply:revision

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the power supply's hardware revision number.

power-supply:board-temp

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the temperature of the power filter PCB (in °C).

power-supply:heatsink-temp

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the temperature of the power supply heatsink (in °C).
This parameter is only available if the power supply hardware supports it.

power-supply:current-5V

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current on the +5V line (in A).

power-supply:current-15V

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current on the +15V line (in A).

power-supply:current-15Vn

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current on the -15V line (in A).

power-supply:voltage-5V

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the voltage of the +5V line (in V).

power-supply:voltage-15V

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the voltage of the +15V line (in V).

power-supply:voltage-15Vn

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the voltage of the -15V line (in V).

power-supply:voltage-3V3

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the voltage of the +3.3V line (in V).

power-supply:load

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating total power consumption of 5V, +15V and -15V line in W.

power-supply:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter providing status information about the power-supply health. Each bit of the integer value provides specific channel status information.

bit 0 - high temperature (temperature above limit T_1)

bit 1 - critical temperature (temperature above limit T_2)

bit 2 - legacy powersupply without temperature sensor

bit 3 - problem with reading one of the sensors

bit 4 - very high current at DC/DC converter

The temperature limits T_1 and T_2 depend on type and revision of the power-supply installed. At temperatures above T_2 all modules with be switched off.

power-supply:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter providing a brief text version of the **:status** parameter.

buzzer:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to access the buzzer.

buzzer:welcome

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to determine the welcome melody that is played by the buzzer at boot time when the firmware is started.
Set an empty string if no melody is to be played.

buzzer:sounds:

(parameter section)
(reading requires userlevel 2, writing requires userlevel 2)

Parameters to control sounds played by DLCpro

buzzer:sounds:on-connection

(BOOLEAN parameter, read-write)
(reading requires userlevel 2, writing requires userlevel 2)

Parameter to determine if welcome melody is to be played on network connection

buzzer:play-welcome

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to play the **:welcome** melody.

buzzer:play

(command, 1 argument, returns empty tuple)
(execution requires userlevel 3)

Arguments:
1. *melody* of type STRING

Command to play the melody specified in the command argument.

buzzer:save

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to save current buzzer configuration.

buzzer:load

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to load buzzer configuration.

display:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to specify the behaviour of the DLCpro touch screen illumination.

display:brightness

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the brightness of the touch screen illumination. The minimum value for darkest illumination is 0.5. The maximum value of 100 means maximum brightness. The scale is not linear.

display:auto-dark

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable *screen save* mode.
#t - If the touchscreen on DLC pro frontpanel is not used for a time specified by the **:idle-timeout**, the display illumination is automatically switched off. It is automatically switched on again as soon as the screen is touched again.
#f - The display stays illuminated.

display:idle-timeout

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter specifying the time in seconds after which the display illumination is switched off, if the touchscreen on the frontpanel has not been used.

display:state

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the display state.

0 - display is off

1 - display is about to be turned off (semi dark)

2 - display is on, **:auto-dark** is enabled

3 - display is on, **:auto-dark** just got enabled,

4 - display is on, **:auto-dark** is disabled

display:save

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to save display user-settings.

display:load

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to load display user-settings.

display:update-state

(command, 1 argument, returns empty tuple)
(execution requires userlevel 3)

Arguments:
1. *active* of type BOOLEAN

Command for the touch UI to report frontpanel activity to the device control.

standby:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to modify the settings of the standby mode. The standby mode is toggled with the power/standby button on the DLCpro frontpanel.

standby:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating wheteher the system is in standby mode.
#t - system in standby mode
#f - system not in standby mode

standby:state

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating standby state of the system.

0 - standby disabled, system is in *power mode*

1 - standby enabled, system is in *standby mode*

2 - transition from *standby mode* to *power mode*, system is waiting for confirmation

standby:laser1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for the standby mode of laser1.

standby:laser1:dl:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for the standby mode of the laser-head's diode laser.

standby:laser1:dl:disable-pc

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to disable the piezo voltage in laser standby mode.
#t - piezo voltage disabled in laser standby mode

standby:laser1:dl:disable-cc

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to disable the diode current in laser standby mode.
#t - diode current disabled in laser standby mode

standby:laser1:dl:disable-tc

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to disable the temperature control in laser standby mode.
#t - temperature control disabled in laser standby mode

standby:laser1:dl:disable-eom

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to disable the intra-cavity EOM voltage in laser standby mode.
#t - intra-cavity EOM voltage disabled in laser standby mode

standby:laser1:amp:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for the standby mode of the laser-head's amplifier.

standby:laser1:amp:disable-cc

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to disable the amplifier current in laser standby mode.
#t - amplifier current disabled in laser standby mode

standby:laser1:amp:disable-tc

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to disable the amplifier temperature control in laser standby mode.
#t - amplififer temperature control disabled in laser standby mode

standby:laser1:ctl:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for the standby mode of laser-head's CTL.

standby:laser1:ctl:disable

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Disable the CTL laser-head in standby mode.

standby:laser1:nlo:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for the SHG (and FHG) standby mode.

standby:laser1:nlo:disable-pc

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Disable the SHG (and FHG) piezo control in standby mode.

standby:laser1:nlo:disable-tc

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Disable the temperature control of the SHG-cavity (and of the FHG-cavity) in standby mode.

standby:laser1:nlo:disable-servo-subsystem

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Disable the servo subsystem of the SHG (and FHG) in standby mode.

standby:laser1:nlo:disable-power-stabilization

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Disable the TA power stabilization in standby mode.

standby:laser1:nlo:disable-cavity-lock

(BOOLEAN parameter, read-write)
(reading requires userlevel 1, writing requires userlevel 1)

Disable the lock of the SHG-cavity (and of the FHG-cavity) in standby mode.

standby:laser2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for the standby mode of laser2.

standby:laser2:dl:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for the standby mode of the laser-head's diode laser.

For usage see **standby:laser1:dl:** on page 318.

standby:laser2:amp:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for the standby mode of the laser-head's amplifier.

For usage see **standby:laser1:amp:** on page 319.

standby:laser3:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for the standby mode of laser3.

standby:laser3:dl:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for the standby mode of the laser-head's diode laser.

For usage see **standby:laser1:dl:** on page 318.

standby:laser4:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Settings for the standby mode of laser4.

For usage see **standby:laser3:** on page 321.

pdh1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the first Pound-Drever-Hall (PDH) board.

pdh1:slot

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the slot, the PDH board is mounted in.

pdh1:serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the PDH board's serial number.

pdh1:revision

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the PDH board's hardware revision number.

pdh1:fpga-fw-ver

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the firmware version of the FPGA.

pdh1:board-temp

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the PDH board temperature (in °C).

pdh1:status

(INTEGER parameter, read-only)
(reading requires userlevel 2)

Parameter indicating PDH board status information. Each bit provides specific information.

pdh1:status-txt

(STRING parameter, read-only)
(reading requires userlevel 2)

Parameter indicating a brief text version of the **:status** parameter.

pdh1:channel1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Channel1 of PDH board.

pdh1:channel1:label

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the PDH channel's label.

pdh1:channel1:modulation-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable/disable modulation of the output channel signal (**:output-channel**).
#t - apply modulation to the channel selected by **:output-channel**.
#f - no modulation of the output channel signal.

pdh1:channel1:use-fast-oscillator

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the modulation/demodulation frequency.
#t - select 25MHz.
#f - select 5MHz.

pdh1:channel1:modulation-amplitude-dbm

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the modulation amplitude in dBm.

pdh1:channel1:modulation-amplitude-vpp

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter to view the modulation amplitude (in V peak to peak).

pdh1:channel1:lo-output-amplitude-dbm

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the lo output amplitude in dBm.

pdh1:channel1:lo-output-amplitude-vpp

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter to view the lo output amplitude in volts.

pdh1:channel1:lo-output-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for enabling the output of the pdh lo signal.

pdh1:channel1:phase-shift

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the phase difference between modulation and demodulation (in °). Used to optimize the demodulated Lock-In signal.

pdh1:channel1:input-level-max

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the maximal input level for the signal.
Possible values:

0: -10dBm

1: 0dBm

2: +10dBm

pdh1:channel1:lock-level

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the setpoint level for top-of-fringe locks to compensate for an eventual DC offset in lock-in output signal.

pdh1:channel1:auto-pdh:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the automatic adjustment of the PDH phase-shift.
This feature is only available if a valid lock license is installed.

For usage see **laser1:dl:lock:lockin:auto-lir:** on page 90.

pdh1:channel2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Channel2 of PDH board.

For usage see **pdh1:channel1:** on page 322.

pdh1:save

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to save PDH parameters to the DLC pro flash memory.

pdh1:load

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to load PDH parameters from the DLC pro flash memory.

pdh2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the second Pound-Drever-Hall (PDH) board.

For usage see **pdh1:** on page 321.

falc1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the first FALC pro device with CANopen node-id 91.

falc1:node-id

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the CANopen node ID of the FALC device.

falc1:serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the FALC device's serial number.

falc1:label

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the FALC device's label.

falc1:model

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the hardware model of the FALC device.

0 - FALC

1 - mFALC

falc1:revision

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the FALC device's hardware revision number.

falc1:boot-ver

(INTEGER parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the version of bootloader on the FALC device.

falc1:fw-ver

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the version of firmware on the FALC device.

falc1:mcu-temp

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the FALC MCU temperature (in °C).

falc1:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter to specify FALC device status information. Each bit provides specific information.

bit 0 - mainboard over-temperature

bit 1 - main output at lower internal limit

bit 2 - main output at upper internal limit

bit 3 - unlim output at lower limit

bit 4 - unlim output at upper limit

bit 5 - main locked

bit 6 - unlim locked

bit 7 - unlim on hold

bit 31 - device is missing / not answering

falc1:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter to specify a brief text version of the **:status** parameter.

falc1:input:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

FALC input parameters.

falc1:input:gain

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the gain of FALC's input.

0 - 1x

1 - 5x

falc1:input:offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the offset of FALC's input (in V).

falc1:mon:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Falc monitor parameters.

falc1:mon:config

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the configuration of FALC's monitor output. Possible values include:

0 - Error output

1 - Main output

2 - Main input RMS

falc1:unlim:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Falc unlim parameters.

falc1:unlim:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the lock-ON/OFF state of FALC's unlim path.

falc1:unlim:hold

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the hold state of FALC's unlim path.

falc1:unlim:sign

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the sign of the action of FALC's unlim path.

falc1:unlim:slew-rate

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the slew rate of FALC's unlim path. The discrete slew rate values are represented by integer indices 1 ... 12. The resulting gain of the unlim path is available from the **:unlim:gain** parameter.

falc1:unlim:gain

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the gain of the FALC's unlim path (in $\frac{V}{s \cdot V}$). It depends on parameters **:unlim:slew-rate**, **:unlim:output-range** and **:input:gain**.

falc1:unlim:output-range

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the output range of FALC's unlim path (in Vpp).
NOTE: only certain discrete voltage values in the range 0.018 V ... 4.10V are available. When setting the parameter, the given target value is rounded to the nearest valid value. When reading, the discrete value is returned.

falc1:unlim:input-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the input offset of FALC's unlim path (in mV).

falc1:unlim:lock-state

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the lock state of FALC's unlim path.

falc1:unlim:hold-state

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the hold state of FALC's unlim path.

falc1:unlim:regulating-state

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the regulating state of FALC's unlim path.

falc1:main:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

FALC main parameters.

falc1:main:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify Lock-ON/OFF for FALC's main path.

falc1:main:gain:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

FALC's Main gain parameters.

falc1:main:gain:all

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the gain of FALC's main path.

falc1:main:gain:use-external-input

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify whether the gain of FALC's main path should be set internally or through an external input.

falc1:main:gain:i1-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify whether the main path's I1 is enabled.

falc1:main:gain:i1

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the corner frequency of the main path's I1. The discrete frequency values are represented by integer indices 1 ... 10, with the following meaning:

1 = 1.5 kHz

2 = 3.0 kHz

3 = 7.0 kHz

4 = 15 kHz

5 = 31 kHz

6 = 70 kHz

7 = 130 kHz

8 = 290 kHz

9 = 620 kHz

10 = 7.0 MHz

falc1:main:gain:i2-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify whether the main path's I2 is enabled.

falc1:main:gain:i2

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the corner frequency of the main path's I2. The discrete frequency values are represented by integer indices 1 ... 9, with the following meaning:

1 = 25 Hz

2 = 50 Hz

3 = 100 Hz

4 = 220 Hz

5 = 470 Hz

6 = 1.0 kHz

7 = 2.2 kHz

8 = 5.0 kHz

9 = 10 kHz

falc1:main:gain:i3-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify whether the main path's I3 is enabled.

falc1:main:gain:i3

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the corner frequency of the main path's I3. The discrete frequency values are represented by integer indices 1 ... 7, with the following meaning:

1 = 0.6 Hz

2 = 1.8 Hz

3 = 6.0 Hz

4 = 18 Hz

5 = 60 Hz

6 = 180 Hz

7 = 600 Hz

falc1:main:gain:d1-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify whether the main path's D1 is enabled.

falc1:main:gain:d1

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the corner frequency of the main path's D1. The discrete frequency values are represented by integer indices 1 ... 10, with the following meaning:

1 = 10 kHz

2 = 20 kHz

3 = 40 kHz

4 = 90 kHz

5 = 190 kHz

6 = 400 kHz

7 = 760 kHz

8 = 1.5 MHz

9 = 3.5 MHz

10 = 7.2 MHz

falc1:main:gain:d2-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify whether the main path's D2 is enabled.

falc1:main:gain:d2

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the corner frequency of the main path's D2. The discrete frequency values are represented by integer indices 1 ... 10, with the following meaning:

1 = 10 kHz

2 = 20 kHz

3 = 45 kHz

4 = 100 kHz

5 = 200 kHz

6 = 420 kHz

7 = 700 kHz

8 = 1.2 MHz

9 = 3.5 MHz

10 = 6.0 MHz

falc1:main:gain:ramp-up-rate

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the maximal ramp-up rate for the main gain. The discrete ramp-up rates are represented by integer indices 1 ... 7.

falc1:main:lock-state

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating FALC's lock state.

falc1:path-selection

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the FALC controller paths for "lock-enabled" and "hold" of the DLC pro lock machine. Possible values include:

0 - None of the controller paths selected.

1 - unlim path only selected.

2 - Main path only selected.

3 - Both unlim and main paths selected.

falc1:hold-state

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating FALC's hold state.

falc1:save

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to save FALC parameters to the DLC pro flash memory.

falc1:load

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to load FALC parameters from the DLC pro flash memory.

falc2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the second FALC pro device with CANopen node-id 92.

For usage see **falc1:** on page 325.

falc3:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the third FALC pro device with CANopen node-id 93.

For usage see **falc1:** on page 325.

falc4:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the fourth FALC pro device with CANopen node-id 94.

For usage see **falc1:** on page 325.

servo-control1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the first ServoControl device with CANopen node-id 95.

servo-control1:node-id

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the CANopen node ID of the Servo-Control device.

servo-control1:serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the Servo-Control device's serial number.

servo-control1:revision

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the Servo-Control device's hardware revision number.

servo-control1:fw-ver

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the version of firmware on the Servo-Control device.

servo-control1:mcu-temp

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the Servo-Control MCU temperature (in °C).

servo-control1:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating Servo-Control device status. Each bit provides specific information:

bit 0 - Over-temperature of the Servo-Control board.

bit 1 - Over-current in one of the servo connections.

bit 15 - Device is missing or not answering.

servo-control1:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating a brief text version of the **:status** parameter.

servo-control2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the second ServoControl device with CANopen node-id 96.

For usage see **servo-control1:** on page 334.

servo-control3:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the third ServoControl device with CANopen node-id 97.

For usage see **servo-control1:** on page 334.

servo-control4:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the fourth ServoControl device with CANopen node-id 98.

For usage see **servo-control1:** on page 334.

mot1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the first Motor pro device with CANopen node-id 90.

mot1:node-id

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the CANopen node ID of the Motor pro.

mot1:serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the Motor pro's serial number.

mot1:revision

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the Motor pro's hardware revision number.

mot1:fw-ver

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the version of firmware on the Motor pro.

mot1:board-temp

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the Motor pro board temperature (in °C).

mot1:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating Motor pro device status. Each bit provides specific information:

bit 0 - Over-temperature of the Motor pro board.

bit 1 - Over-current in one of the stepper connections.

bit 15 - Device is missing or not answering.

mot1:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating a brief text version of the **:status** parameter.

mot1:channel1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the first stepper motor.

For usage see **laser1:dl:motor:** on page 107.

mot1:channel2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters of the second stepper motor.

For usage see **laser1:dl:motor:** on page 107.

mot1:io:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the digital IOs of the board.

mot1:io:digital-in0:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital input 0 of the Motor pro board.

mot1:io:digital-in0:value-act

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the electrical state of the digital input pin.
#t - high signal (5V)
#f - low signal (0V)

mot1:io:digital-in1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital input 1 of the Motor pro board.

For usage see **mot1:io:digital-in0:** on page 337.

mot1:io:digital-in2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital input 2 of the Motor pro board.

For usage see **mot1:io:digital-in0:** on page 337.

mot1:io:digital-in3:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital input 3 of the Motor pro board.

For usage see **mot1:io:digital-in0:** on page 337.

mot1:io:digital-out0:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital output 0 of the Motor pro board.

mot1:io:digital-out0:value-act

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the electrical state of the digital output pin.
#t - high signal (5V)
#f - low signal (0V)

mot1:io:digital-out0:value-set

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter specifying the electrical state of the digital output pin in case of software control.
#t - high signal (5V)
#f - low signal (0V)
If the **:invert** parameter is #t, the signal will be inverted. To use software control set the **:mode** parameter to 3.

mot1:io:digital-out0:mode

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the signal source for digital output.
Following modes are supported:

0 - trigger output for threshold of motor 1

1 - trigger output for threshold of motor 2

2 - unused

3 - software control via parameters **:value-set** and **:invert**

mot1:io:digital-out0:invert

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify if the digital output logic should be inverted.

mot1:io:digital-out1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital output 1 of the Motor pro board.

For usage see **mot1:io:digital-out0:** on page 338.

mot1:io:digital-out2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital output 2 of the Motor pro board.

For usage see **mot1:io:digital-out0:** on page 338.

mot1:io:digital-out3:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital output 3 of the Motor pro board.

For usage see **mot1:io:digital-out0:** on page 338.

mot2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the second Motor pro device with CANopen node-id 99.

For usage see **mot1:** on page 335.

pfd1:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the first PFD pro device with CANopen node-id 86.

pfd1:node-id

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the CANopen node ID of the PFD pro.

pfd1:serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the PFD pro's serial number.

pfd1:label

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the PFD pro's device's label.

pfd1:revision

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the PFD pro's hardware revision number.

pfd1:fw-ver

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the version of firmware on the PFD pro.

pfd1:status

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating device's status. Each bit provides specific information:

bit 0 - signal level at "RF LF" input out of range

bit 1 - cycle slip occurred

bit 15 - device is missing or not answering.

pfd1:status-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating a brief text version of the **:status** parameter.

pfd1:external-clock-detected

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter to indicate that the external clock source is detected.

pfd1:external-clock-locked

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter to indicate that the external clock source is locked.

pfd1:rf-path

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the signal path:

0 - LF.

1 - LF with tunable filter.

2 - HF.

pfd1:reference-path

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the signal used for the reference frequency:

0 - Internal reference.

1 - External reference.

pfd1:dds-output-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable or disable the DDS output.

pfd1:phase-out-filter-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify whether the PFD output filter should be enabled.

pfd1:aux-out1-signal

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the signal on the first auxiliary output (Aux Out 1):

0 - Internal signal.

1 - Internal signal.

2 - LF counter monitor.

3 - LF frequency monitor.

4 - Internal signal.

pfd1:aux-out2-signal

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the signal on the second auxiliary output (Aux Out 2):

0 - Reference frequency.

1 - Frequency error.

2 - Feed-forward for frequency switch.

pfd1:frequency-counters:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters controlling the PFD pro's frequency counters.

pfd1:frequency-counters:gating-time

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter specifying the gating time for the frequency counters (in μs).

pfd1:frequency-counters:reference-frequency

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the value of the frequency counter for the reference frequency (in Hz).

pfd1:frequency-counters:lf-frequency

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the value of the frequency counter for the LF frequency (in Hz).

pfd1:frequency-counters:counter-output-frequency

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the value of the frequency counter for the counter output (in Hz).

pfd1:frequency-counters:phase-output-frequency

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the value of the frequency counter for the phase output (in Hz).

pfd1:frequency-plan:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters controlling the reference frequency scan.

pfd1:frequency-plan:mode

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the reference frequency's operation mode:

0 - Single frequency.

1 - Adjustable frequency.

2 - Scan internal.

3 - Scan external.

4 - Hopping external.

pfd1:frequency-plan:center-frequency

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the frequency at the RF HF or RF LF input, respectively (in MHz).

pfd1:frequency-plan:scan:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters controlling the frequency scan.

pfd1:frequency-plan:scan:amplitude

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the amplitude of frequency scan (in MHz).

pfd1:frequency-plan:scan:frequency

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the frequency for *internal* scans (in Hz).

pfd1:frequency-plan:scan:ramp-rate

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the ramp-rate for *external* scans (in MHz/s).

pfd1:frequency-plan:hopping:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters controlling the frequency switch.

pfd1:frequency-plan:hopping:frequency1

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Frequency value 1 for the frequency switch (in MHz).

pfd1:frequency-plan:hopping:frequency2

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Frequency value 2 for the frequency switch (in MHz).

pfd1:frequency-plan:hopping:frequency3

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Frequency value 3 for the frequency switch (in MHz).

pfd1:frequency-plan:hopping:frequency4

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Frequency value 4 for the frequency switch (in MHz).

pfd1:frequency-plan:hopping:feed-forward-offset

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Frequency offset used for the feed-forward analog output signal (in MHz).

pfd1:frequency-plan:hopping:feed-forward-factor

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Feed-forward factor for the analog output signal (in V/MHz).

pfd1:reference-frequency:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters controlling the reference frequency scan.

pfd1:reference-frequency:center-frequency

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the reference frequency in single-tone mode (in MHz).

pfd1:reference-frequency:scan:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters indicating the reference frequency scan.

pfd1:reference-frequency:scan:amplitude

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter to specify the amplitude of frequency scan (in MHz).

pfd1:reference-frequency:scan:ramp-rate

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter to specify the ramp-rate for *external* scans (in MHz/s).

pfd1:reference-frequency:hopping:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters indicating the reference frequency switch.

pfd1:reference-frequency:hopping:frequency1

(REAL parameter, read-only)
(reading requires userlevel 4)

Frequency value 1 for the frequency switch (in MHz).

pfd1:reference-frequency:hopping:frequency2

(REAL parameter, read-only)
(reading requires userlevel 4)

Frequency value 2 for the frequency switch (in MHz).

pfd1:reference-frequency:hopping:frequency3

(REAL parameter, read-only)
(reading requires userlevel 4)

Frequency value 3 for the frequency switch (in MHz).

pfd1:reference-frequency:hopping:frequency4

(REAL parameter, read-only)
(reading requires userlevel 4)

Frequency value 4 for the frequency switch (in MHz).

pfd1:reference-frequency:hopping:feed-forward-offset

(REAL parameter, read-only)
(reading requires userlevel 4)

Frequency offset used for the feed-forward analog output signal (in MHz).

pfd1:reference-frequency:hopping:feed-forward-factor

(REAL parameter, read-only)
(reading requires userlevel 4)

Feed-forward factor for the analog output signal (in V/MHz).

pfd1:cavity-bridge:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters controlling the cavity bridge scan functionality.

pfd1:cavity-bridge:output-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable or disable the output signal.

pfd1:cavity-bridge:external-trigger-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify whether the trigger control using the digital input should be enabled.

pfd1:cavity-bridge:output-frequency

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the current output frequency of the bridge scan (in MHz).

pfd1:cavity-bridge:scan-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable or disable the bridge scan.

pfd1:cavity-bridge:end-frequency

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the final frequency for the bridge scan (in MHz).

pfd1:cavity-bridge:step-size

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the step-size for the bridge scan frequency (in Hz). Only used for scans using the external trigger.

pfd1:cavity-bridge:ramp-rate

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the ramp-rate for the bridge scan frequency (in Hz/s). Only used for scans using the internal timer.

pfd1:lf:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters controlling the low-frequency phase-frequency detector.

pfd1:lf:r-divider

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the value of the divider for the reference counter in the range [1, 1000].

pfd1:lf:n-divider

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the value of the divider for the input counter in the range [1, 1000].

pfd1:lf:input-filter-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify whether the band-pass input filter should be enabled.

pfd1:lf:input-level

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the absolute input signal level (in dBm).

pfd1:lf:input-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the manual gain factor for the LF input signal when automatic gain control is disabled.

pfd1:lf:signal-level

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the PFD signal level (in dBm).

pfd1:lf:current-gain

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the current gain for the charge pump in the range [0, 7].

pfd1:lf:polarity

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the polarity of the phase detector, "true" meaning positive and "false" negative polarity.

pfd1:lf:tunable-filter-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify whether the tunable filter for the PFD LF branch should be enabled.

pfd1:lf:tunable-filter-center-frequency

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the center frequency for the tunable filter, in MHz.

pfd1:lf:agc:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters controlling the automatic gain control for low-frequency inputs.

pfd1:lf:agc:enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable or disable the automatic gain control.

pfd1:lf:agc:set-level

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the set-value for the control loop (in dBm).

pfd1:lf:agc:p-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the proportional gain for the PID controller (in dBm/dB).

pfd1:lf:agc:i-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the integer gain for the PID controller (in dBm/dB/s).

pfd1:lf:agc:d-gain

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the differential gain for the PID controller (in s·dBm/dB).

pfd1:lf:frequency-deviation:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters controlling the frequency deviation analog output.

pfd1:lf:frequency-deviation:value

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the value of the frequency deviation (in Hz).

pfd1:lf:frequency-deviation:analog-output-scaling

(REAL parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the scaling factor for the analog output signal on Aux Out 2 (in V/MHz).

pfd1:hf:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters controlling the high-frequency phase-frequency detector.

pfd1:hf:r-divider

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the value of the divider for the reference counter in the range [1, 1000].

pfd1:hf:n-divider

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the value of the input divider for the N counter. If the value of **:rfdiv2-enabled** is #f, the **:n-divider** must be in the rage [16, 1000]. If the value of **:rfdiv2-enabled** is #t, the **:n-divider** must be in the rage [32, 1000].

pfd1:hf:rfdiv2-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to enable or disable the RF divide-by-2 divider.

pfd1:hf:current-gain

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the current gain for the charge pump in the range [0, 7].

pfd1:hf:polarity

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the polarity of the phase detector, "true" meaning positive and "false" negative polarity.

pfd1:event-detector:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters for the event monitoring.

pfd1:event-detector:phase-error

(REAL parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the magnitude of the phase error.

pfd1:event-detector:counter

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the value of the event counter.

pfd1:event-detector:indicator

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the value of the digital event monitor.

pfd1:event-detector:indicator-auto-reset-enabled

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify whether auto-reset of the digital event monitor is enabled:

#t - Enabled, digital event monitor is in "single-shot" mode (latched).

#f - Auto-reset after **indicator-auto-reset-time** milliseconds.

pfd1:event-detector:indicator-auto-reset-time

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the time before resetting the digital event monitor (in ms). Only considered if **indicator-auto-reset-enabled** is set to *#t*.

pfd1:event-detector:reset-counter

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Reset the event counter.

pfd1:event-detector:reset-indicator

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Reset the event indicator.

pfd1:digital-io:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters related to the digital IOs of the board.

pfd1:digital-io:in0

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the electrical state of the digital input pin 0.
#t - high signal (5V)
#f - low signal (0V)

pfd1:digital-io:in1

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the electrical state of the digital input pin 1.
#t - high signal (5V)
#f - low signal (0V)

pfd1:digital-io:in2

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the electrical state of the digital input pin 2.
#t - high signal (5V)
#f - low signal (0V)

pfd1:digital-io:in3

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the electrical state of the digital input pin 3.
#t - high signal (5V)
#f - low signal (0V)

pfd1:digital-io:out0

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the electrical state of the digital input pin 0.
#t - high signal (5V)
#f - low signal (0V)

pfd1:digital-io:out1

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the electrical state of the digital input pin 1.
#t - high signal (5V)
#f - low signal (0V)

pfd1:digital-io:out2

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the electrical state of the digital input pin 2.
#t - high signal (5V)
#f - low signal (0V)

pfd1:digital-io:out3

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the electrical state of the digital input pin 3.
#t - high signal (5V)
#f - low signal (0V)

pfd1:user-led-mode

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to specify the function of the user LED.
Possible values:

0 - Off (default).

1 - Indicator for the event detector.

2 - Out-of-lock indicator.

3 - RF LF Frequency deviation > 1.0 % indication.

pfd1:save

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to store PFD pro device-specific data to the DLC pro.

pfd1:load

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to restore PFD pro device-specific data from the DLC pro.

pfd2:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the second PFD pro device with CANopen node-id 87.

For usage see **pfd1:** on page 339.

pfd3:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the third PFD pro device with CANopen node-id 88.

For usage see **pfd1:** on page 339.

pfd4:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

This section provides controls for the fourth PFD pro device with CANopen node-id 89.

For usage see **pfd1:** on page 339.

3.2 Maintenance

Commands and parameters for device maintenance

time

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 2)

Parameter indicating the system time of the device.
Format: YYYY-MM-DD hh:mm:ss

time-iso

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the time of the device with millisecond precision in ISO 8601 format.
Format: YYYY-MM-DDThh:mm:ss.uuuZ

tan

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the *transaction number* for specific service tasks.

system-messages:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters providing access to system messages.
The information of system messages is provided in the following component structure:

- timestamp in ISO 8601 format
- status character
- priority indicator
- status/message ID (negative value for *Error* and *Alert*-priority messages)
- message text

The priority of a system message reflects the importance of the event that triggered the message.
Priority indicators of system messages:

0 Information: information only; no action required. Example:

```
laser1: new laser head detected
```

1 Warning: The system is operating within the limits of regular operating conditions. However, check for incorrect parameter settings. Example:

```
laser1: laser diode current at upper limit
```

2 Error: System error; action is required to return the system to regular operating conditions. Example:

```
laser1: diode current safety clip (Imax), current switched off
```

3 Alert: Indication of a system defect. Example:

```
TC board not found
```

Note:
In the PC-GUI, system messages are indicated by a lit-up error indicator in the header of the PC-GUI screen. The system messages and the related code are displayed in the footer of the PC-GUI screen. System messages can also be displayed by clicking the error indicator in the header of the PC-GUI screen.
On the touchscreen, system messages are displayed in the bottom right area. Tapping the bell symbol opens the system messages window where all current system messages are displayed. The system messages window is also accessible from the home screen.

system-messages:count

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the number of system messges.
Number of messages in the *show-all* list

system-messages:count-new

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the number of unread system messages.
Number of messages in the *show-new* list

system-messages:latest-message

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the latest, unread system message.

system-messages:mark-as-read

(command, 1 argument, returns empty tuple)
(execution requires userlevel 3)

Arguments:
1. *ID* of type INTEGER

Command to mark a message, identified by a specific ID, as read and remove it from the *show-new* list of new system messages.
The message ID can be retrieved with the *show-all* command.

system-messages:show-all

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to print the list of system messages to the console. Example:

```
> (exec 'system-messages:show-all)
2014-04-02T10:45:19.915Z * 1 (   1002) emission disabled
()
>
```

Each printed line provides a system message in the structure described in **system-messages:**
The status character displayed after the timestamp indicates the "message read" status:

'*' : message unread

' ' : message read

system-messages:show-new

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to print the list of unread system messages to the console.
Each printed line provides a system message in the structure described in **system-messages:**
The * status character displayed after the timestamp indicates the "message unread" status.

system-messages:show-log

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to print the system message log file to the console. Example:

```
> (exec 'system-messages:show-log)
2014-04-01T16:02:52.818Z + 1 (   1002) emission disabled
2014-04-01T16:02:53.600Z + 1 (   3016) laser1: temperature not settled
2014-04-01T16:04:19.922Z - 1 (   3016)
2014-04-01T16:17:25.954Z - 1 (   1002)
2014-04-02T10:45:19.915Z + 1 (   1002) emission disabled
()
>
```

Each printed line provides a system message in the structure described in **system-messages:**
The status character displayed after the timestamp indicates the chronological sequence of messages in the *show-all* list:

'+' : message is added to the *show-all* list

'-' : message is removed from the *show-all* list

system-messages:show-persistent

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to print the persistent log to the console.
The persistent log collects critical system messages, that is, all messages with *Alert* priority, in the DLCpro's flash memory. Example:

```
> (exec 'system-messages:show-persistent)
2013-11-14T10:08:39.257Z + 3 (  -3003) laser1: no peltier connected
2013-11-14T10:08:39.260Z + 3 (  -3005) laser1: temperature sensor missing
()
>
```

Each printed line provides a system message in the structure described in **system-messages:**
The + status character displayed after the timestamp indicates that the message was added to the *show-all* list.

licenses:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter providing access to the installed license options and license-related commands.

licenses:options:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter providung a list of TOPTICA license options.

licenses:options:lock:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter for the TOPTICA Lock License option.

licenses:options:lock:enabled

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether the license option is enabled.
#t - license option enabled
#f - license option disabled.

licenses:options:lock:valid-until

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the validity of the license option:
- a specific date in ISO8601-format
- 'forever'

licenses:options:dual-laser-operation:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter for the TOPTICA Dual-Laser-Operation License option.

For usage see **licenses:options:lock:** on page 358.

licenses:options:quad-laser-operation:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter for the TOPTICA Quad-Laser-Operation License option.

For usage see **licenses:options:lock:** on page 358.

licenses:options:automatic-nlo-operation:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter for the TOPTICA Automatic-NLO-Operation License option.

For usage see **licenses:options:lock:** on page 358.

licenses:options:pfd1-hf-port:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter for the TOPTICA PFD1 pro HF port License option.

For usage see **licenses:options:lock:** on page 358.

licenses:options:pfd2-hf-port:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter for the TOPTICA PFD2 pro HF port License option.

For usage see **licenses:options:lock:** on page 358.

licenses:options:pfd3-hf-port:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter for the TOPTICA PFD3 pro HF port License option.

For usage see **licenses:options:lock:** on page 358.

licenses:options:pfd4-hf-port:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter for the TOPTICA PFD4 pro HF port License option.

For usage see **licenses:options:lock:** on page 358.

licenses:installed-keys

(INTEGER parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the number of installed license keys.

licenses:get-key

(command, 1 argument, returns STRING)
(execution requires userlevel 2)

Arguments:
1. *key-number* of type INTEGER

Command to retrieve an installed license key.
Key-number range in the command argument: *0 ... (***licenses:installed-keys***-1)*.

licenses:install

(command, 1 argument, returns BOOLEAN)
(execution requires userlevel 3)

Arguments:
1. *licensekey* of type STRING

Command to install a license option with a specific license key.

fw-update:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Commands for applying and diagnosing firmware updates.

fw-update:upload

(command, 1 argument, returns empty tuple)
(execution requires userlevel 3)

Arguments:

1. *filename* of type STRING

Command to upload firmware updates of the DLCpro control firmware. Firmware updates are provided by TOPTICA as single ASCII files, containing BASE64-coded binary data.
Start the command with `(exec 'fw-update:upload "filename")`.
The device prompts for the update file:
`waiting for input (terminate with # ) ...`
Send the entire update file. When the file transfer is complete, a message acknowledges:
`transfer complete.`
The end-of-file signal (# character) tells the firmware to process the data.
Multiple firmware updates can be uploaded consecutively. The updates are installed when the device is booted next time.

fw-update:show-log

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to print the firmware update log to the console.

fw-update:show-history

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to print the firmware update history to the console.

system-service-report:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters to control the service report functionality.

system-service-report:ready

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether a service report request (cf. **:request**) is ready to be printed using **:print**.

system-service-report:service-report

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to print a (base64-encoded) data stream containing detailed information about the system status to the console.
It combines **:request** and **:print** in a single step.

system-service-report:request

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to request the generation of a system summary suitable for the service report.

system-service-report:add-info

(command, 1 argument, returns empty tuple)
(execution requires userlevel 3)

Arguments:
1. *text* of type STRING

Command to add informations to service report.

system-service-report:print

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to print a previously requested (cf. **:request**) service report as a data stream to the console.

system-service-report:save-to-usb

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to save a previously requested (cf. **:request**) service report to a USB storage device. The USB device must be available at the DLC pro front. The file will be saved into a folder "toptica".

system-connections

(command, no arguments, returns INTEGER)
(execution requires userlevel 2)

Command to print a list of open command line connections. The return value provides the number of open connections
There are two permanently open command line connections:
- for the USB port
- for touch-screen user-interface.

debug-log

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to print the firmware debug log file to the console.

error-log

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to print the firmware error log file to the console.

service-log

(command, no arguments, returns empty tuple)
(execution requires userlevel 2)

Command to print the persistent firmware service log file to the console.

service-script

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to execute DeCoF command scripts, provided by TOPTICA service staff.

service-script-from-usb

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to execute DeCoF command scripts, provided by TOPTICA service staff. Note: The scripts must be stored in **toptica** directory and have **.base64** extension. In case when multiple service scripts are provided, they are alphanumeric sorted and the first on the list is executed.

service-report

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Prints a summary of the most important system components to the console.

output-signals-report

(command, no arguments, returns empty tuple)
(execution requires userlevel 1)

Show info for output signals.

3.3 Device Information

Parameters to provide general device information.

uptime

(INTEGER parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the accumulated system uptime in seconds. The uptime counter records whenever the device is switched on.

uptime-txt

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the accumulated system uptime **uptime** as string.
Format: hours:minutes:seconds

fw-ver

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the version of the currently active firmware.
Note: After a firmware update, the system has to be rebooted to activate the new firmware.

ssw-ver

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the version of the currently installed system software.

decof-ver

(STRING parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the version of the TOPTICA firmware framework *DeCoF*[5] implemented in the currently active firmware.
Note: After a firmware update, the system has to be rebooted to activate the new firmware.

boot-ver

(STRING parameter, read-only)
(reading requires userlevel 2)

Parameter indicating the version of the bootloader.

[5] Device Control Framework

echo

(BOOLEAN parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to control the echo behavior of the command console.
#t - each character sent to the device is echoed
#f - no echo
For USB connections the default setting is #t, because this is usually required for use with serial terminal programs (like eg Hyperterminal). For TCP/IP connections the default setting is #f.

serial-number

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the DLCpro's serial number.

revision

(STRING parameter, read-only)
(reading requires userlevel 4, writing requires userlevel 0)

Parameter indicating the DLCpro's hardware revision number.

system-type

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the device type. Currently always returns "DLCpro".

system-model

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the laser hardware composition. The string is built in the following way:
[0:modules]1:laser1[2:laser2[3:laser3 [4:laser4]]]

The module string consists of one or more of the following substrings with an index added, separated by dashes:

- PDH
- FALC
- PFD

The laser1-4 strings consist of one or more of the following substrings, separated by dashes:

- DFB or DFB* (for a DFB laser)
- DL or DL* (for an external cavity laser)
- CBC (for a CBC/XP amplifier)
- CTL (for CTL laser)
- TA or TA* (for a tapered amplifier)
- SHG (for a TOPTICA second harmonic generation)
- FHG (for a TOPTICA fourth harmonic generation)
- servo (for NLO AutoAlign option)
- fiber (for FiberMon option)
- uv (for TOPTICA UV cavity)
- eom (for intra-cavity EOM)
- motor (for motorized diode-lasers)
- opt_probe (for MTA AutoAlign seed probe optimization)
- opt_amp (for MTA AutoAlign amplifier optimization)
- opt_fiber (for MTA AutoAlign fiber coupling optimization)
- shgtc (for temperature stabilized SHG cavity)
- fhgtc (for temperature stabilized FHG cavity)
- hfc (for temperature stabilized high-finesse cavity)

Examples:
"0:PDH1-PDH2-FALC1 1:DL 2:DFB" for a TOPTICA "DL" and a "DFB" laser head with two PDH and one FALC modules.
"1:DL*-TA*-SHG-servo-fiber" for a TOPTICA "TA-SHG pro" laser head with or AutoAlign and FiberMon option.
Asterisks mark modern TOPTICA versions of the respective laser heads, featuring non-volatile memory with factory settings for the most important operation parameters for easy installation.

system-label

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter providing a user-configurable string that can be used to easily identify the device, for example, "pump laser for flux compensator".
On delivery, the **system-label** string is empty.

vcs-id

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter providing an unique identifier for the current firmware in the version control system.

ssw-vcs-id

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter providing an unique identifier for the current system software in the version control system.

build-information:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters providing the build information.

build-information:build-number

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the internal build number.

build-information:build-id

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the date of the build.

build-information:build-tag

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter providing a string description of the build.
Format: jenkins-{JOB_NAME}-{BUILD_NUMBER}

build-information:job-name

(STRING parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the (job name??) URL of the build.

build-information:build-node-name

(STRING parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the name of the build slave.

build-information:build-url

(STRING parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the URL of the build.

build-information:cxx-compiler-version

(STRING parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the C++ compiler version.

build-information:c-compiler-version

(STRING parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the C compiler version.

build-information:cxx-compiler-id

(STRING parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the C++ compiler ID:
- gcc
- msvc

build-information:c-compiler-id

(STRING parameter, read-only)
(reading requires userlevel 1)

Parameter indicating the C compiler ID:
- ???
- ???

system-summary

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to print a summary list of the most important system components to the console.

system-summary-ontimes

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to print a summary of the most importent ontimes of the system.

component-list

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to print a summary list of the most important system components in XML format.

3.4 Network Configuration

Parameters related to the network configuration module
net-conf:

(parameter section)
(reading requires userlevel 4, writing requires userlevel 3)

Parameters providing information about the current network configuration.
Commands for changing the network configuration.
Your device can be controlled via Ethernet. You can either connect it to a local area network (LAN) or directly to your computer. In both cases, the device's TCP/IP network address has to be configured correctly.
In many LANs, the configuration can or must be done automatically by a DHCP server. For a direct PC-to-device connection, the device usually needs a fixed network address assigned.

net-conf:ip-addr

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current IP address of the device[6]. To change the IP address, use the **net-conf:set-dhcp** command for automatic address retrieval in a LAN with a DHCP server, or the **net-conf:set-ip** for manual configuration.

net-conf:net-mask

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current netmask of the device. To change the netmask, use the **net-conf:dhcp** command for automatic address retrieval in a LAN with a DHCP server, or the **net-conf:set-ip** for manual configuration.

net-conf:gateway

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the current gateway of the device. To change the gateway, use the **net-conf:dhcp** command for automatic address retrieval in a LAN with a DHCP server, or the **net-conf:set-ip** for manual configuration.

net-conf:hostname

(STRING parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter to set the hostname of the device.

[6] If you want to access your device via TCP/IP but don't know the current IP address (e.g. in case of DHCP configuration), you can use the "Identification Server" in Appendix 4.4.2 on page 383 to find out.

net-conf:mac-addr

(STRING parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the device's MAC[7] address.

net-conf:dhcp

(BOOLEAN parameter, read-only)
(reading requires userlevel 4)

Parameter indicating whether the device is configured for automatic IP configuration by a DHCP server.
#t - automatic IP configuration by a DHCP server #f - static IP configuration

net-conf:cmd-port

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the TCP/IP port to access the device's command line console.

net-conf:mon-port

(INTEGER parameter, read-only)
(reading requires userlevel 4)

Parameter indicating the TCP/IP port to access the device's monitoring line.
0 - monitoring lines are not supported on this system.

net-conf:set-dhcp

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to change the device's network adapter configuration for automatic setup by a DHCP server.
After executing the command, the **net-conf:dhcp** parameter will return #t. However, IP address, netmask and gateway did not yet change accordingly. The new network adapter configuration will take effect with the next adapter restart.
To use the DHCP mechanism, reboot the system or use the **net-conf:apply** command.

net-conf:set-ip

(command, 2 arguments, returns empty tuple)
(execution requires userlevel 3)

Arguments:

1. *ip-addr* of type STRING

[7] Media Access Control

2. *net-mask* of type STRING

Command to change the device's network adapter configuration to a static IP configuration. The desired IP address and netmask must be provided as IPv4 addresses in the following format:
xxx.xxx.xxx.xxx, for example,
`(exec 'net-conf:set-ip "192.168.1.1" "255.255.255.0")`
After executing the command, the **net-conf:dhcp** parameter will return #f. However, IP address and netmask did not yet change accordingly. The new network adapter configuration will take effect with the next adapter restart.
. To use the new address, reboot the system or use the **net-conf:apply** command.

net-conf:set-ip-gateway

(command, 3 arguments, returns empty tuple)
(execution requires userlevel 3)

Arguments:

1. *ip-addr* of type STRING
2. *net-mask* of type STRING
3. *gateway* of type STRING

Command to change the device's network adapter configuration to a static IP configuration. The desired IP address, netmask and gateway must be provided as IPv4 addresses in the following format:
xxx.xxx.xxx.xxx, for example,
`(exec 'net-conf:set-ip "192.168.1.1" "255.255.255.0" "192.168.50.100")`
The gateway may also be empty.
After executing the command, the **net-conf:dhcp** parameter will return #f. However, IP address, netmask and gateway did not yet change accordingly. The new network adapter configuration will take effect with the next adapter restart.
. To use the new address, reboot the system or use the **net-conf:apply** command.

net-conf:apply

(command, no arguments, returns empty tuple)
(execution requires userlevel 3)

Command to restart the network adapter with the current network configuration. newline Note: Your current TCP/IP connections can get lost if you execute the **net-conf:apply** command. Be careful when executing the **net-conf:apply** command from within a TCP/IP command console.

3.5 Userlevel

Parameters and commands for user level control.

ul

(INTEGER parameter, read-write)
(reading requires userlevel 4, writing requires userlevel 3)

Parameter indicating the currently active user level.

Some parameters and commands are not made available to all users, either because they are not required for regular operation, or because they can adversely affect the system performance. The following user levels are implemented:

4 - read-only level, lowest priority

3 - normal operation

2 - maintenance level

1 - service level

0 - TOPTICA internal

The lower the user level the more parameters and commands are accessible. It is always possible to change the **ul** parameter to a higher value, but setting it to a lower value requires the **change-ul** command.

change-ul

(command, 2 arguments, returns INTEGER)
(execution requires userlevel 3)

Arguments:

1. *ul* of type INTEGER
2. *passwd* of type STRING

Command to change the active user level.

All user levels except for the read-only level (4) are password protected. The password for normal operation (user level 3) can be configured with the **change-password** command. By default, it is an empty string. The higher-priority user-level passwords are predefined.

In order to change the user level, enter the desired level as first argument, and the corresponding password as second argument. Passwords of higher-priority levels are valid for all lower-priority levels as well.

If you provide an empty string instead of the correct password as second argument, the system prints `password:` to prompt you for input. You may then enter the password without any letters being displayed.

The return value is the new user level.

change-password

(command, 1 argument, returns empty tuple)
(execution requires userlevel 3)

Arguments:

1. *password* of type STRING

Command to change the password for the NORMAL user level. If the password is not empty, each subsequent remote connection starts in READONLY mode. The user level has to be explicitly changed to NORMAL.
Please note that there is no way to read out the password. Changing the password to empty, resets to default behavior.

change-password-service

(command, 1 argument, returns empty tuple)
(execution requires userlevel 1)

Arguments:

1. *password* of type STRING

Command to change the password for the SERVICE user level. Changing the password to empty, resets to default behavior.

4 Appendix

4.1 Signal Channel IDs

The following lists provide the numeric ID values to be entered if a specific signal input or output channel is to be configured, for example, the output channel of a PID controller for lock settings.

ID	signal name	type	remark
special			
-3	none		
-2	Time	x-axis	for display only
-1	Frequency	x-axis	for display only
external signals (BNC connector)			
0	Fine In 1	input channel	
1	Fine In 2		
2	Fast In 3		
4	Fast In 4		
20	Output A	output channel	available for Lock-In modulation
21	Output B		
internal signals (FPGA)			
30	Lock-In Out	input channel	
31	PID 1 Out	internal signal	for display only
32	PID 2 Out		
34	Scan Output		
35	Aux Scan Output		
PDH signals (only available with PDH plugin boards)			
40	PDH Error 1	input channel	
41	PDH In 1		
42	PDH Error 2		
43	PDH In 2		
diode laser related signals (only available with ECDL/DFB/DBR lasers)			

50	Piezo Voltage	output channel	not available for DFB/DBR lasers, available for Lock-In modulation
51	CC Current, Laser Current		available for Lock-In modulation
52	CC AIn A	input channel	
53	CC AIn B		
54	Laser PD, Monitor Photo Diode		available for power stabilization
55	PD EXT, user calibrated laser power		available for power stabilization
56	Laser Set Temperature	output channel	available for Lock-In modulation
57	Laser Actual Temperature	input channel	
58	EOM Voltage	output channel	only available for DL pro FL
tapered amplifier related signals (only for TA laser heads)*			
60	AMPCC AIn	input channel	
61	Seed Power	input channel	not available for *SHG/FHG* laser heads (see 85)
62	Amplifier Power		not available for *SHG/FHG* laser heads (see 84), available for power stabilization
63	Amplifier Current	output channel	
CTL related signals (only for CTL laser heads)			
69	CTL Laser Photodiode	input channel	
70	CTL Laser Power		available for power stabilization
78	CTL Set Wavelength	output channel	
79	CTL Actual Wavelength	input channel	
SHG related signals (only for SHG and FHG laser heads)			
80	SHG Cavity Error Signal	input channel	
81	SHG Cavity Rejection Signal		
82	SHG Intra-Cavity Signal		

83	SHG Power		available for power stabilization
84	Amplifier Power		available for power stabilization
85	Seed Power		
86	Fiber Power		with *FiberMon* option only, available for power stabilization
87	SHG Input Power		
90	SHG Cavity Piezo Voltage Slow	output channel	
91	SHG Cavity Piezo Voltage Fast		
	FHG related signals (only for FHG laser heads)		
110	FHG Cavity Error Signal	input channel	
111	FHG Cavity Rejection Signal		
112	FHG Intra-Cavity Signal		
113	FHG Power		available for power stabilization
120	FHG Cavity Piezo Voltage Slow	output channel	
121	FHG Cavity Piezo Voltage Fast		
	OPO related signals (only for TOPO laser heads)		
144	OPO Pump Power	input channel	
145	OPO Pump Depleted Power		
146	OPO Signal Power		
147	OPO Idler Power		
150	OPO Cavity Piezo Voltage Slow	output channel	available for Lock-In modulation
151	OPO Cavity Piezo Voltage Fast		
	aliases		
100	Lock Input	input channel	for display only

101	Scan Output Channel	output channel	
102	PowerLock Input	input channel	
103	Aux Scan Output Channel	output channel	
Laser independent signals			
1000	CC1 AIn 1	input channel	
1001	CC2 AIn 1		
1002	CC3 AIn 1		
1003	CC4 AIn 1		
1004	CC1 AIn 2		
1005	CC2 AIn 2		
1006	CC3 AIn 2		
1007	CC4 AIn 2		
1010	AMPCC1 AIn		
1011	AMPCC2 AIn		
1014	HCC1 AIn 1		
1015	HCC2 AIn 1		
1016	HCC1 AIn 2		
1017	HCC2 AIn 2		

For the so-called 'alias'-settings [100], [101], [102] and [103], the actually used signal channel is determined by the signal channel setting for the following parameters:

100	Spectrum Input Channel: **laser1:dl:lock:spectrum-input-channel**
101	Scan Output Channel: **laser1:scan:output-channel**
102	Laser Output Power: **laser1:power-stabilization:input-channel**
103	Aux Scan Output Channel: **laser1:scan-aux:output-channel**

Example: If [100] is selected for the Input Trace Signal (laser1:scope:channel:signal), the actual channel of the Input Trace Signal is
Fast In 3 if **laser1:dl:lock:spectrum-input-channel** is set to *2*
Fine In 1 if **laser1:dl:lock:spectrum-input-channel** is set to *0*

If not noted otherwise in the above table, the following rules apply for the usage of the signals:

- All signals can be used for display, i.e. for data acquisition by the laser's scope and

recorder features.

- All **input channels** can be used as "external inputs" (aka *ARC - Analog Remote Control*) and, if a Lock option is installed, as inputs for PIDs or Lock-In detection. Certain input channels can also be used for power stabilization.
- All **output channels** can be used as "feedforward master" for other output channels, as output for signal generators (e.g. scan or wide-scan) or PIDs (if a Lock option is installed). Certain output channels can also be used for Lock-In modulation.

4.2 Scope, Lock and Recorder Binary Data

Most signal display-relevant data is transferred coded as BASE64 binary blobs[8] in parameters like **laser1:scope:data**, **laser1:dl:lock:candidates**, **laser1:dl:lock:background-trace** and **laser1:recorder:data:zoom-data**. Also the return value of the command **laser1:recorder:data:get-data** is formatted in the same way. These blobs consist of multiple blocks of different type. Each block starts with a header, containing an identifier byte and a blocklength value. The block-length is provided as a null-terminated string in decimal format. After the block-length, the payload data is provided. The format of the payload data depends on the type of data.

4.2.1 Data Blocks

The following table illustrates the layout of a single block:

ID	block-length value	'\0'	payload data
(1 byte)	*(multiple bytes)*	*(1 byte)*	*(many bytes)*

1. Example[9]: a signal trace (array of 1000 single precision floating point values) as in **laser1:scope:data**:

ID	block-length value				'\0'	payload data
(1 byte)	*(4 bytes)*				*(1 byte)*	*(4000 bytes)*
'y'	'4'	'0'	'0'	'0'	'\0'	4000 bytes, containing 1000 floating point values

2. Example: state of the lock module (single byte) as in **laser1:dl:lock:candidates**:

ID	block-length value	'\0'	payload data
(1 byte)	*(1 byte)*	*(1 byte)*	*(1 byte)*
's'	'1'	'\0'	2

[8] blob = binary large object

[9] In the following examples, values of single bytes are either given as decimal numbers or as ASCII characters. For example, ASCII character *'y'* is the same as the decimal value *121*.
In some cases, *backslash escaped* characters are used to stress the difference between character and number. For example, *'\0'* means decimal number *0* and not the ASCII character '0' (or decimal 48).

Usually, mutliple blocks are concatenated inside one blob.

The following types of blocks are used:

ID	description
'x'	x-axis values for signal display or wide-scan array of single precision floating point values (see 4.2.2)
'y'	y-axis values of first trace for signal display array of single precision floating point values (see 4.2.2)
'Y'	y-axis values of second trace for signal display array of single precision floating point values (see 4.2.2)
'l'	selected lockpoint single *candidate type* of data (see 4.2.4)
'c'	list of lockpoint candidates array of *candidate type* of data (see 4.2.4)
's'	ID of the lock module's state single byte
't'	lock tracking position, ie center of mass of the x and y data during lock single *candidate type* of data (see 4.2.4). The *type* reflects the type of the lockpoint at the time the lock got closed. If **lock-without-lockpoint** is set, the type will always be *positive-edge*
'a'	y-axis values with of the lower envelope (minimum values) of the first trace for wide-scan display array of single precision floating point values (see 4.2.2)
'A'	y-axis values with of the upper envelope (maximum values) of the first trace for wide-scan display array of single precision floating point values (see 4.2.2)
'b'	y-axis values with of the lower envelope (minimum values) of the second trace for wide-scan display array of single precision floating point values (see 4.2.2)
'B'	y-axis values with of the upper envelope (maximum values) of the second trace for wide-scan display array of single precision floating point values (see 4.2.2)
'i'	index range of the data returned by **laser1:recorder:data:get-data** two 32 bit integer values (see 4.2.3)

4.2.2 Floating Point Format

Non-integer numerical values are represented as single precision floating point values with 32 bit, according to IEEE 754 standard. The most significat bit 31 contains the sign, bits 23 to 30 contain the exponent, and bits 0 to 22 contain the mantissa.

31	30 23	22 0
+-	8 bit exponent	23 bit mantissa

These 32 bits are transferred in little endian manner, starting with the least significant bytes.

first byte		second byte		third byte		fourth byte	
7	0	15	8	23	9	31	24

This is in accordance with the native way of storing single precision floating point numbers on x86-based computers and, for example, the *float* data type in C on such computers.

For arrays of floating point numbers, the length of array must be calculated from the length of the payload block divided by 4 (size of floating point numbers).

Please note that LabVIEW, in contrast to most other programming languages, uses big endian format, independent of the computer hardware.
To use the "unflatten from string" VI to convert DLCpro floating point data into a LabVIEW SGL value, you first need to reverse the byte order of the 4-byte package.

4.2.3 Integer Format

Integer numerical values are, if not noted differently, given as signed 32 bits values in two's complement representation. Like the floating point values they are transferred in little endian manner, starting with the least significant bytes.

first byte		second byte		third byte		fourth byte	
7	0	15	8	23	9	31	24

Again, for LabVIEW the order of the bytes needs to be reversed before converting them into a LabVIEW I32 value.

4.2.4 Candidate Type

Lockpoint candidates are represented by their x and y position and their type.
The x and y postions are provided as single precision floating point values. The type is given as a single byte.

x value	y value	type
(4 byte, floating point)	*(4 byte, floating point)*	*(1 byte)*

The lockpoint candidate type is coded as follows[10]:

0 - none (not a valid candidate/lockpoint)

1 - top (candidate/lockpoint is a peak)

2 - bottom (candidate/lockpoint is a trough)

3 - positive-edge (candidate/lockpoint is on a rising edge)

4 - negative-edge (candidate/lockpoint is on a falling edge)

4.2.5 BASE64

The DLC pro's remote control protocol is a pure ASCII protocol. Binary data is not transmitted as is, but BASE64-coded. BASE64 data uses only 6 bit per byte. A binary blob of n bytes therefore results in $n * 8/6$ bytes of BASE64 code. The following alphabet is used for BASE64 coding and decoding:

```
"ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789+/"
```

4.2.6 Processing Binary Data

Interpreting these binary parameter values requires the following steps:

1. Decode the BASE64 data into a binary data buffer.
2. Read the first byte of the buffer to get the type of the first block.
3. Interpret the buffer contents as string - from the second byte up to the next zero byte. Parse the number from the string in variable n. This gives the number of bytes to read for the first block's payload.
4. Starting from the first byte behind the zero, read the next n bytes. This is the payload data. Now, interpret the data according to the block type read in step 2.
5. If there is more data available behind this block, repeat steps 2-4 at the buffer position behind the last byte of the previous block.

[10] Compare **laser1:dl:lock:lockpoint:type**.

4.3 USB Connection

When connecting your DLC pro to a USB port of your PC, it will be identified as *"DLCpro"* Device and registered as a *virtual COM port* (Windows) or *ttyACMx* serial interface (Linux). You can use this virtual COM port exactly the same way as a real RS232C interface. The communication is much faster than with normal serial interfaces, though. Settings like baud rate, number of data and stop bits, as well a parity, and handshake settings are ignored.

Please note the following hints:

- Send your commands, terminated by a linefeed character (ASCII code 10 decimal, 0x0A hexadecimal).
- The DLC pro's answer is terminated by the prompt which consists of the two characters "> " (greater-than and space) at the beginning of a new line (i.e. after a linefeed character).
- Any terminal emulator like PuTTY on Windows or Minicom or Kermit on Linux can be used to access the command console.

4.4 Ethernet Connection

The fastest and most flexible way of controlling the DLC pro is via the Ethernet interface. The DLC pro's firmware provides several servers that allow different ways of communicating with it. The device has to be connected to a local area network (LAN) or directly to a PC (e.g. with a cross link cable). Further, the DLC pro and the PC must have IP addresses of the same subnet. Upon delivery, the DLC pro is configured to retrieve its IP address automatically via DHCP. To change these settings, use the **net-conf:** commands on a USB console (for details, see chapter 3.4 above).

4.4.1 Telnet Server: Command Console and Monitoring Line

A Telnet server on standard port 1998 provides access to the Command Console. This connection is intended for automated remote control via Ethernet. The full set of control commands, as discussed in this reference manual, can be used on this console. For manual control, you can use any standard Telnet client. A popular choice on Windows is PuTTY or the "telnet" command at the MS-DOS command console. Alternatively, you can try entering

`telnet://xxx.xxx.xxx.xxx:1998`

in the address bar of your web browser, to let Windows choose its favorite Telnet client. The Telnet command also belongs to every standard Linux distribution. For programmatic control proceed as follows::

1. Open TCP/IP connection to port 1998 at the DLC pro's IP address.

2. Set the socket option TCP_NODELAY[11].
3. Receive the incoming welcome text. The DLC pro then sends a specific welcome text which is terminated by the prompt "> " consisting of the two characters (greater-than and space) at the beginning of a new line (that is, after a linefeed character).
4. Send your commands, terminated by a linefeed character (ASCII code 10 decimal, 0x0A hexadecimal).
5. The DLC pro's answer is again terminated by the prompt.
6. At the end close the TCP/IP connection or send a `(quit)`.

The DLC pro will accept up to eight command line connections at the same time. For example, while the DLC pro is controlled by the software of your automated experiment on one connection, the second connection can be used manually for debugging purposes.

In addition to a Command Console, a second telnet connection may be used to establish a Monitoring Line, which uses port 1999. To establish the connection for the Monitoring Line use telnet as described above for the Command Console but using port 1999. For example:

`telnet://xxx.xxx.xxx.xxx:1999`

Please note that no welcome message will be displayed on the Monitoring Line. Depending on the used telnet program and its settings, the input typed in may be not displayed due to the lack of an echo setting.

Section 2.4 describes how to use the Monitoring Line, e.g. how to subscribe for notifications of changes of selected parameters.

4.4.2 Identification Server

To find the DLC pro's IP address (e.g. in a DHCP-based IP configuration), the firmware provides an UDP-based identification service on port 60010.

For programmatically finding a DLC pro in the LAN proceed as follows:

1. Broadcast a short string like "laserfinder" on port 60010 to the whole LAN (address 255.255.255.255) or to the broadcast address of you network adapter (e.g. 192.168.1.255).
2. On the same port, listen for an answer. The DLC pro will answer the broadcast with an UDP message containing information like its serial number and its firmware version as the payload. The IP address of the DLC pro is contained in the header of the UDP packet.
3. Repeat step 2 until no answer is received within a second. If, within a second, no message is received at all, no device is available.

If more than one DLC pro is connected to the LAN, this procedure should return the list of all devices.

[11] This option is not mandatory. However, it usually helps speeding up communication since typically many very short telegrams are exchanged between PC and DLC pro.

Index

abort, 91, 103, 130, 187, 236, 300
abort-warm-up, 275
activated, 192
add-info, 362
agc, 349
air-pressure, 97, 270, 305
all, 85, 203, 215, 236, 329
amp, 134, 141, 148, 179, 319, 320
ampcc-load, 259
ampcc1, 278
ampcc2, 286
amplifier-current-margin, 190, 270
amplifier-current-margin-alo, 190, 270
amplifier-initial-current, 272
amplitude, 83, 90, 157, 159, 194, 199, 205, 214, 222, 343, 345
analog-dl-gain, 204
analog-output-scaling, 350
analog-p-gain, 216
analog-p-max, 202
analog-p-min, 202
apply, 126, 134, 152, 218, 225, 230, 241, 251, 255, 371
apply-all, 261
attenuation-fhg-raw, 216
attenuation-raw, 206, 222
attenuation-shg-raw, 216
auto-align-advanced-enabled, 218
auto-align-amplifier, 273
auto-align-amplifier-enabled, 217
auto-align-cavity, 273
auto-align-cavity-enabled, 217
auto-align-include-advanced, 273
auto-dark, 316
auto-lir, 90
auto-nlo, 188, 217, 264
auto-pdh, 206, 223, 324
auto-pdh-abort, 206, 223
auto-pdh-state, 206, 222
automatic-mode, 189, 264
automatic-nlo-operation, 359
automatic-optics-shift, 238
autosave-actuator-values, 102, 185
aux, 67, 285
aux-out1-signal, 341
aux-out2-signal, 342

background-trace, 94, 207, 223
backlash, 111, 123
bandwidth-selection, 114
BASE64, 381
baseplate-temperature, 245, 263
baseplate-temperature-limit, 241
binary data, 378
board, 294
board-temp, 276, 279, 287, 303, 305, 313, 322, 336
boot-ver, 325, 364
bottom, 92
brightness, 316
build-id, 367
build-information, 367
build-node-name, 367
build-number, 367
build-tag, 367
build-url, 367
busy, 59
buzzer, 315

c-compiler-id, 368
c-compiler-version, 368
c-gain, 118, 209
c-loop, 71
cal-factor, 98, 99, 122, 180, 212, 247
cal-offset, 98, 99, 122, 180, 181, 211, 212, 247
calibration, 111, 123, 132, 200, 213
candidate type, 381
candidate-filter, 92
candidates, 93, 207, 223
capacitance, 120, 121, 211
caption, 253
cavity, 226, 232, 236
cavity-bridge, 346

cavity-fast-pzt-voltage, 207, 223
cavity-lock-settle-time, 242
cavity-lock-tolerance-factor, 242
cavity-pc, 229
cavity-scan-duration, 242
cavity-slow-pzt-voltage, 207, 223
cavity-tc, 193, 210, 219, 224, 229, 239
cbc, 293
cbc-lockpoint-optimization, 273
cbc-scheme, 294
cbc-time, 299
cc, 62, 115, 136, 146
cc1, 275
cc2, 278
cc3, 278
cc4, 278
center-all-servos, 107, 179
center-fhg-servos, 178
center-fiber-servos, 107, 178
center-frequency, 343, 345
center-probe-servos, 106
center-servo, 105, 175
center-shg-servos, 178
center-ta-servos, 106, 178
change-password, 373
change-password-service, 373
change-ul, 372
channel IDs, 374
channel-count, 301, 303
channel1, 163, 167, 170, 195, 277, 281, 288, 296, 301, 303, 322, 336
channel1b, 303
channel2, 164, 168, 171, 196, 278, 297, 302, 304, 324, 337
channel2b, 304
channel3, 297
channelx, 164, 168, 171, 196
check-peltier, 75
clear-data, 173
clear-errors, 246, 264, 275
close, 95
cmd-port, 370
COM interface, 382
comp-hor, 178, 234
comp-vert, 178, 234
compensation-voltage, 97
component-list, 368
components, 257
config, 252, 327
continue, 111
continuous-calc-pid, 198
continuous-mode, 110, 159
conversion-efficiency, 190, 270
conversion-efficiency-fhg, 190, 270
count, 356
count-new, 356
counter, 351
counter-output-frequency, 342
coupled-modulation, 205, 216, 221
cryst, 234
crystal, 226, 232
crystal-tc, 229, 239
ctl, 127, 319
current-15V, 314
current-15Vn, 314
current-5V, 313
current-act, 65, 73, 138, 154, 282, 290
current-act-amplifier, 267
current-act-master, 267
current-clip, 65, 115, 138, 146, 283, 290
current-clip-free-run, 139, 147, 283, 290
current-clip-free-run-last-modified, 147
current-clip-free-run-modified, 147
current-clip-last-modified, 116, 147
current-clip-limit, 66, 139, 283, 291
current-clip-modified, 116, 146
current-clip-tuning, 65, 116, 138, 146, 283, 290
current-factor-taper1, 298
current-factor-taper2, 298
current-gain, 348, 350
current-max, 114, 117, 154, 208
current-min, 114, 117, 208
current-offset, 63, 137, 282, 289
current-out, 65, 138, 282, 290
current-set, 63, 73, 115, 137, 146, 151, 282, 289
current-set-amplifier, 267

current-set-dithering, 63
current-set-master, 267
current-set-max, 73
current-set-min, 73
current-spot, 233
customer, 265
cut-off-frequency, 168
cxx-compiler-id, 368
cxx-compiler-version, 368
cycle-count, 112

d, 86, 204, 215, 237
d-gain, 71, 118, 209, 349
d1, 331
d1-enabled, 331
d2, 332
d2-enabled, 332
daq-connected, 174
data, 166, 170, 197, 297
date, 253
dds-output-enabled, 341
debug-log, 363
decof-ver, 364
degradation-detection-measurement-interval, 244
degradation-detection-number-of-measurements, 244
degradation-detection-slope-threshold, 243
delay, 83, 199, 214
detect-pd-removal, 143, 149
dhcp, 370
di-hold-enabled, 81
diagnosis, 255
digital-in0, 310, 337
digital-in1, 310, 337
digital-in2, 310, 337
digital-in3, 310, 338
digital-io, 352
digital-out0, 310, 338
digital-out1, 311, 339
digital-out2, 311, 339
digital-out3, 312, 339
disable, 319
disable-all-servos, 107, 179
disable-cavity-lock, 320
disable-cc, 318, 319
disable-current-jump, 298
disable-eom, 319
disable-pc, 318, 319
disable-power-stabilization, 320
disable-servo-subsystem, 320
disable-tc, 318–320
discover, 112
display, 316
display-name, 105, 174
dl, 60, 179, 318, 320, 321
dpss, 152
drv-voltage, 75
dual-laser-operation, 359
duration, 160

echo, 365
edge-level, 92
edge-min-distance, 93
emission, 55, 58, 62, 137, 189, 261, 265, 281, 288
emission-button-enabled, 54
enable-all-servos, 107, 179
enabled, 58, 62, 64, 68, 76, 83–85, 87, 97, 105, 112, 130, 136, 153, 156, 164, 166, 168, 174, 194, 195, 198, 205, 213, 216, 221, 228, 236, 247, 248, 281, 288, 294, 296, 308, 317, 327, 329, 349, 358
enabled-valid, 58
end, 158
end-frequency, 347
eom, 107, 120, 231
eom-tc, 239
error, 245, 262, 266
error-channel, 81
error-channel-inverted, 81
error-code, 153
error-log, 363
error-txt, 153, 245, 262, 266
etalon, 178
event-detector, 351

execute, 256, 300
export, 254
exposure-time, 192
external-clock-detected, 340
external-clock-locked, 340
external-input, 63, 69, 77, 137, 227, 282, 289
external-trigger-enabled, 346

factor, 64, 97, 130, 308
factory-settings, 114, 133, 145, 207, 224, 229, 239, 250
falc-selection, 82
falc1, 325
falc2, 333
falc3, 333
falc4, 333
fast-3, 306
fast-4, 306
fast-pzt-voltage-set, 228
fault, 69
fc-ip, 86
fc-pd, 86
feed-forward-factor, 344, 346
feed-forward-offset, 344, 346
feedforward-enabled, 66, 77, 119, 121, 140, 210, 250, 284, 292, 309
feedforward-factor, 67, 78, 115, 119, 121, 140, 146, 210, 250, 285, 292, 309
feedforward-master, 66, 77, 140, 284, 292, 308
fhg, 181, 218, 224
fhg-int, 182
fhg-pdh-dc, 182
fhg-pdh-rf, 182
fhg1-hor, 176
fhg1-vert, 176
fhg2-hor, 176
fhg2-vert, 176
fiber, 99, 142, 179, 212, 230
fiber-advanced, 100
fiber-pd, 125
fiber1-hor, 106, 125, 177
fiber1-vert, 106, 125, 177
fiber2-hor, 177
fiber2-vert, 177
find-candidates, 94
fine-1, 306
fine-2, 306
fit-a, 111, 123
fit-b, 111, 123
fit-c, 111, 123
floating point, 380
flow, 129
forced-off, 68, 141, 286, 293
fpga-fw-ver, 127, 276, 279, 287, 301, 303, 305, 306, 321
fpga-type, 304
frequency, 83, 90, 157, 194, 199, 214, 259, 343
frequency-counters, 342
frequency-deviation, 349
frequency-plan, 343
frequency1, 344, 345
frequency2, 344, 345
frequency3, 344, 346
frequency4, 344, 346
frontkey-locked, 55
fru-serial-number, 61, 136
fw-update, 360
fw-ver, 264, 294, 326, 334, 336, 340, 364
fw-ver-valid, 265

gain, 85, 181, 203, 213, 236, 247, 272, 327–329
gateway, 369
gating-time, 342
generate-to-usb, 257
get-data, 172
get-key, 360
gradient-max, 151

hcc1, 286
hcc2, 293
head-temperature, 129
health, 58
health-txt, 59
heatsink-temp, 78, 313

hf, 350
hf-cavity, 250
hold, 80, 88, 156, 327
hold-output-on-unlock, 89, 249
hold-state, 88, 329, 333
hopping, 344, 345
hostname, 369
hwp, 234
hwp-transmittance, 244

i, 85, 204, 215, 237
i-cutoff, 86, 204, 215
i-cutoff-enabled, 86, 204, 215
i-gain, 71, 118, 209, 349
i1, 330
i1-enabled, 329
i2, 330
i2-enabled, 330
i3, 331
i3-enabled, 331
identification server, 383
idle-alignment-option, 244, 263
idle-mode, 263, 271
idle-timeout, 316
import, 254
in0, 352
in1, 352
in2, 352
in3, 352
inaccuracy, 123
increase-current, 300
indicator, 351
indicator-auto-reset-enabled, 351
indicator-auto-reset-time, 351
input, 100, 184, 297, 326
input-channel, 84, 87, 89, 98, 151, 162, 199, 214, 247, 248
input-channel-value-act, 249
input-enabled, 161
input-filter-enabled, 347
input-gain, 348
input-level, 348
input-level-max, 323
input-offset, 328
inputs, 167
install, 360
installed-keys, 360
int, 212, 225
integer, 380
interlock-open, 55
interval, 151
invert, 311, 338
inverted-phase, 299
inverter-temp, 279, 287
inverter-temp-fuse, 279
io, 305, 337
ip-addr, 369

job-name, 367

label, 58, 322, 325, 340
laser-common, 258
laser-on, 189, 261, 265
laser1, 56, 318
laser2, 257, 320
laser3, 257, 321
laser4, 258, 321
last-modified, 126, 151, 251
last-recorded-sample, 172
last-time-auto-align, 274
last-time-optimized, 184
last-time-single-mode-optimization, 274
last-valid-sample, 172
latest-message, 356
latest-service, 126, 150
legacy, 60, 134
lens, 234
level-high, 84
level-hysteresis, 84, 199, 214, 249
level-low, 84, 248
lf, 347
lf-frequency, 342
licenses, 358
limits, 72
linked-laser, 308, 311
list, 255
lo-amplitude-max, 203
lo-amplitude-min, 203

lo-output-amplitude-dbm, 323
lo-output-amplitude-vpp, 323
lo-output-enabled, 323
load, 253, 257, 259, 312, 314, 316, 317, 324, 333, 353
load-all, 260
load-head, 257
load-max, 260
load-ok, 260
local-oscillator, 205, 216, 221
lock, 79, 197, 213, 219, 225, 239, 240, 358
lock-enabled, 80, 198, 220
lock-level, 90, 324
lock-search, 299
lock-state, 88, 328, 332
lock-track, 298
lock-tracking, 94
lock-without-lockpoint, 79
locked-cavity, 266
locked-cavity-fhg, 266
lockin, 89
locking-delay, 93
lockpoint, 91
loop-enabled, 130
low-pass-filter, 167
low-power-threshold, 103, 186

mac-addr, 370
main, 329
mark-as-read, 356
master-noise, 271
max, 88
mc, 304
mcu-temp, 326, 334
memory-size, 161, 170, 172
microsteps, 131
mode, 311, 338, 343
mode-control, 130
mode-hop-likely, 113
mode-hop-occurred, 113
model, 61, 127, 135, 325
modified, 126, 151, 207, 224, 229, 241, 251
modulation-amplitude-dbm, 323
modulation-amplitude-vpp, 323
modulation-enabled, 89, 322
modulation-output-channel, 89
mon, 327
mon-port, 370
mot1, 335
mot2, 339
motor, 107, 122, 131, 228
motor-test, 256

n-divider, 347, 350
name, 164, 165, 170, 195, 197
neg-polarity1, 295
negative-edge, 92
net-conf, 369
net-mask, 369
nlo, 174, 319
node-id, 293, 325, 334, 336, 339
ntc-parallel-resistance, 74, 119
ntc-series-resistance, 74, 119, 210
numeric channel values, 374

offset, 97, 157, 159, 194, 327
offset-pd1, 296
offset-pd2, 296
ok-time, 71, 118, 209
ok-tolerance, 71, 118, 209
on, 70, 71
on-connection, 315
ongoing, 99, 183, 235, 298
ontime, 61, 136
ontime-txt, 62, 136
open, 96
operating-point, 308
operation-time, 153, 245
operation-time-amplifier, 189, 266
operation-time-cavity, 189, 267
operation-time-cavity-fhg, 189, 267
operation-time-master, 189, 266
operation-time-pump, 262
operation-time-uv, 262
operational-pump-power, 243
opo, 226
optics-shifters, 232

optimization, 129
optimization-allowed, 184
optimization-in-progress, 101, 185
optimization-progress, 274
optimization-settings, 217, 238, 264, 272
optimize, 298
optimize-after-standby, 273
options, 255, 358
out-a, 306
out-b, 309
out-of-range, 73
out0, 352
out1, 353
out2, 353
out3, 353
outcpl, 234
output-channel, 83, 87, 157, 158, 249
output-enabled, 346
output-filter, 64, 77, 138, 282, 289, 308
output-frequency, 346
output-inverted, 119
output-limits, 144, 149
output-range, 328
output-signals-report, 363
output-threshold, 162
output-value, 295
outputlimit, 87
override-safety-checks, 60

p, 85, 203, 215, 237
p-gain, 71, 118, 204, 209, 349
parallel-mode, 276, 279
path, 62, 68, 76, 136, 281, 288
path-selection, 332
pause, 110
pc, 76, 119, 193, 210, 219, 224, 226, 232, 240
pc-fast, 227
pc-setpoint, 113
pc1, 300
pc2, 302
pc3, 302
pd, 67, 98, 121, 141, 148, 179, 211, 224, 230, 235, 240
pd-ext, 246
pd-inputs, 295
pdh-dc, 212, 225, 235, 240
pdh-rf, 212, 225, 235, 240
pdh-selection, 82
pdh1, 321
pdh2, 324
peak-noise-tolerance, 92
perform-auto-align, 192
perform-optics-shift, 246, 264
perform-optimization, 246, 264, 275
perform-referencing, 112
perform-single-mode-optimization, 192
perform-warm-up, 275
pfd1, 339
pfd1-hf-port, 359
pfd2, 354
pfd2-hf-port, 359
pfd3, 354
pfd3-hf-port, 359
pfd4, 354
pfd4-hf-port, 360
phase-error, 351
phase-out-filter-enabled, 341
phase-output-frequency, 342
phase-shift, 90, 157, 206, 222, 323
phase-shift-fhg, 217
phase-shift-shg, 217
phase1, 295
photodiode, 98, 99, 180, 181, 247
pid, 294
pid-selection, 82, 198, 213, 220
pid1, 84, 203, 221
pid1-all-max, 202
pid1-all-min, 201
pid1-gain, 214
pid1-p-max, 202
pid1-p-min, 202
pid2, 89, 204, 221
pid2-all-max, 201
pid2-all-min, 201
pid2-gain, 215
pid2-p-max, 201
pid2-p-min, 201

piezo-test, 256
play, 316
play-welcome, 315
polarity, 348, 350
polarity-txt, 290
polarization, 295
position, 91
position-accuracy-fullstep, 131
position-accuracy-microstep, 131
position-act, 107, 228
position-hysteresis-fullstep, 131
position-hysteresis-microstep, 131
position-max, 108, 122, 229
position-min, 108, 122, 228
position-set, 107, 228
positive-edge, 92
positive-polarity, 65, 116
potential-load, 139, 284, 291
potential-load-enabled, 260
potential-load-total, 259
power, 98, 99, 115, 133, 142, 146, 180, 247
power-15v, 280
power-act, 133, 154, 237, 263, 271
power-act-amplifier, 267
power-act-fhg, 268
power-act-master, 267
power-act-shg, 268
power-balance, 297
power-balance-optimization, 273
power-hysteresis, 201
power-lock-settle-time, 242
power-margin, 154, 244
power-margin-threshold, 242
power-margin-tolerance-time, 242
power-max, 143, 149, 154, 200, 201, 237, 272
power-max-shutdown-delay, 143, 149
power-max-warning-delay, 143, 149
power-min, 142, 148, 200, 237, 272
power-min-shutdown-delay, 143, 149
power-min-warning-delay, 142, 148
power-optimization, 99, 142, 183, 235
power-output-relative-deviation-max, 243
power-output-relative-error-max, 243
power-save-disabled, 132
power-set, 154, 237, 263, 271
power-source, 75, 118, 209
power-stabilization, 236, 247
power-stabilization-level-low-factor, 243
power-stabilization-settings, 272
power-stabilization-strategy, 243
power-supply, 313
power-time, 299
powerlock-output-channel-override, 126
pressure-compensation, 96, 273
pressure-compensation-enabled, 217
pressure-compensation-factor, 120
print, 362
print-result, 256
pristine, 253
probe-pd, 125
probe1-hor, 105, 124
probe1-vert, 105, 124
product-name, 58, 253
progress, 91, 100, 101, 109, 129, 161, 183, 184
progress-data, 236
progress-data-amp, 103, 186
progress-data-fhg, 187
progress-data-fiber, 103, 187
progress-data-seed-probe, 102
progress-data-shg, 187
pump, 144, 182, 230, 231
pump-dep, 182, 230
pump-lock-settle-time, 241
pump-power-margin, 263
pwm-tim1, 295

quad-laser-operation, 359

r-divider, 347, 350
ramp-rate, 344, 345, 347
ramp-up-rate, 332
ready, 69, 255, 361
recalibrate, 229
recorded-sample-count, 172
recorded-sampling-interval, 171

recorder, 166
recorder-sample-count, 161
recorder-sampling-interval, 161
recorder-sampling-rate, 161
recorder-stepsize, 160
recorder-stepsize-set, 160
recording-mode, 168
recording-time, 169
reference-frequency, 342, 345
reference-path, 341
regress-tolerance, 101, 185
regulating-state, 88, 329
regulator-temp, 280, 287
regulator-temp-fuse, 280
relative-humidity, 305
relock, 83, 198, 213, 220
relock-enabled, 295
remaining-optics-spots, 245, 263
remaining-spots, 233
remaining-time, 109, 161
remote-control, 130
repeats-max, 151
request, 362
rescan, 114
reset, 83
reset-counter, 351
reset-cycles, 112
reset-indicator, 351
reset-mode-hop, 114
reset-operation-time-cavity, 192, 275
reset-operation-time-cavity-fhg, 192, 275
reset-shift, 132
resistance, 74
restore, 127, 152, 218, 226, 231, 246, 252
restore-all, 260
restore-on-abort, 101, 185
restore-on-end, 110, 159
restore-on-regress, 101, 185
retrieve, 254
retrieve-all, 261
retrieve-now, 126, 152, 218, 225, 231, 241, 251
revision, 276, 279, 286, 294, 301, 303–305, 312, 313, 321, 325, 334, 336, 340, 365
rf-path, 341
rfdiv2-enabled, 350
RS232C, 382

sample-count, 169
sample-count-limit, 169
sample-count-set, 169
sampling-interval, 169
sampling-rate, 170
save, 254, 257, 259, 312, 316, 317, 324, 333, 353
save-all, 260
save-to-usb, 362
scan, 109, 156, 193, 219, 239, 258, 343, 345
scan-amplitude, 120, 211
scan-aux, 173
scan-begin, 109, 158
scan-enabled, 347
scan-end, 109, 158
scan-frequency, 211
scan-offset, 120, 121, 211
scope, 163, 194, 219, 239, 296
scope-timescale, 165, 196
searching, 300
seed, 98, 122, 141, 144, 148
seed-limits, 142, 148
seed-probe, 98, 141
seedonly-check, 144, 149
select-lockpoint, 94
serial-number, 61, 135, 191, 264, 276, 278, 286, 293, 301, 302, 304, 305, 312, 313, 321, 325, 334, 336, 340, 365
service-log, 363
service-report, 361, 363
service-script, 363
service-script-from-usb, 363
servo, 104, 142, 174, 233
servo-control, 124, 150
servo-control1, 334
servo-control2, 335
servo-control3, 335
servo-control4, 335

servo-stepsize, 256
servo-test, 256
set, 112
set-dhcp, 370
set-ip, 370
set-ip-gateway, 371
set-level, 349
set-output-to-zoom-offset, 162
set-scan-range-to-zoom-range, 162
set-zoom-range-to-scan-range, 162
setpoint, 82, 87, 198, 213, 220, 248, 295
settings, 299
settle-down-delay, 242
shape, 109, 159
shg, 180, 193, 211, 235, 240
shg-advanced, 184
shg-input, 180, 212
shg-int, 180
shg-pdh-dc, 181
shg-pdh-rf, 181
shg-pdh-rf-gain-max, 202
shg-pdh-rf-gain-min, 202
shg1-hor, 175, 233
shg1-vert, 175, 233
shg2-hor, 176, 233
shg2-vert, 176, 233
shift-wavelength, 132
show, 255
show-all, 356
show-candidates, 94
show-data, 173
show-history, 361
show-log, 357, 361
show-new, 357
show-persistent, 358
shutdown-delay, 145, 150
si, 312
si1-input-signal, 312
si2-enabled, 313
sig, 183, 230
sign, 87, 248, 328
signal, 64, 130, 163, 167, 168, 170, 195, 308
signal channels, 374
signal-level, 348
signal-monitor, 307
signal-type, 156
single-mode-algorithm, 274
single-mode-optimization, 238, 273
single-mode-optimization-valid, 274
slew-rate, 64, 120, 328
slew-rate-enabled, 64, 120
slew-rate-limited, 64
slope, 87
slot, 276, 278, 286, 300, 302, 321
slow-pzt-voltage-set, 228
smc, 112
smc-support, 277
smile, 129
snubber, 67, 116
sounds, 315
source, 253
specs-fulfilled, 245, 262
spectrum-input-channel, 81
spectrum-omit-dc, 165, 196
spectrum-range, 165, 196
speed, 109, 159
speed-max, 109, 160
speed-max-raw, 122
speed-min, 159
ssw-vcs-id, 367
ssw-ver, 231, 246, 364
stage1, 100, 184
stage2, 102, 186
stage3, 102, 186
stage4, 102, 186
stage5, 186
standby, 317
start, 91, 110, 157, 162, 193, 256
start-optimization, 102, 185
start-optimization-all, 104, 187
start-optimization-amp, 104, 188
start-optimization-fhg, 188
start-optimization-fiber, 104, 188
start-optimization-seed-probe, 104
start-optimization-shg, 188
start-warm-up, 104, 188

state, 79, 90, 108, 113, 128, 158, 166, 197, 220, 238, 249, 317, 318
state-txt, 80, 108, 113, 129, 158, 166, 197, 220
status, 67, 69, 78, 100, 133, 140, 143, 145, 153, 183, 191, 227, 235, 244, 261, 265, 277, 280, 285, 287, 292, 294, 301, 309, 314, 322, 326, 334, 336, 340
status-parameters, 241
status-string, 100, 183, 236
status-txt, 68, 70, 78, 133, 140, 144, 145, 153, 191, 228, 245, 262, 266, 277, 280, 286, 288, 293, 294, 301, 309, 315, 322, 326, 335, 336, 340
step-size, 347
stop, 110, 162, 193
stop-warm-up, 104, 188
store, 127, 152, 218, 225, 231, 246, 251
store-all, 260
sync, 259
sync-laser1, 258
sync-laser2, 258
sync-laser3, 258
sync-laser4, 258
system-connections, 362
system-health, 55
system-health-txt, 56
system-label, 366
system-messages, 355
system-model, 365
system-service-report, 361
system-summary, 368
system-summary-ontimes, 368
system-type, 365

t-loop, 70
t1, 154
t2, 155
t3, 155
t4, 156
t5, 156
ta-pd, 125
ta1-hor, 105, 124, 174
ta1-vert, 106, 125, 175
ta2-hor, 106, 125, 175
ta2-vert, 106, 125, 175
tan, 355
target-channel, 299
tc, 68, 116, 141, 147, 193, 208, 219, 224, 226, 231, 232
tc-status, 153
tc-status-txt, 153
tc1, 250, 251, 302
tc2, 250, 251, 304
temp-act, 69, 155
temp-act-amplifier, 268
temp-act-baseplate, 190, 269, 297
temp-act-cavity, 269
temp-act-cavity-fhg, 269
temp-act-crystal, 268
temp-act-crystal-fhg, 269
temp-act-master, 268
temp-max, 72, 117, 208
temp-min, 72, 117, 208
temp-reset, 75
temp-roc-enabled, 75, 117, 208
temp-roc-limit, 75, 117, 155, 208
temp-set, 69, 117, 155, 208
temp-set-amplifier, 268
temp-set-cavity, 269
temp-set-cavity-fhg, 269
temp-set-crystal, 268
temp-set-crystal-fhg, 269
temp-set-master, 268
temp-set-max, 74, 155
temp-set-min, 74, 155
temperature-control, 154
temperature-settle-time, 241
threshold, 110, 199, 214
threshold-current, 115
threshold-max, 200, 203
threshold-min, 200, 203
threshold-trigger, 110
time, 354
time-iso, 354
timed-out, 72
timeout, 72, 118, 209

timescale, 166, 197, 297
top, 92
top-of-fringe-low-pass, 93
tracking-enabled, 298
trigger, 161
trigger-mode, 167
tunable-filter-center-frequency, 348
tunable-filter-enabled, 348
tuning, 114
tuning-current-min, 128, 134
tuning-power-min, 128, 134
type, 56, 60, 79, 91, 135, 313

ul, 372
unit, 157, 164, 165, 170, 195, 197
unlim, 327
update-rate, 163, 195
update-service-date, 126, 152
update-state, 317
update-strategy, 238
upload, 360
uptime, 364
uptime-txt, 364
USB, 382
use-current-clip-tuning, 66, 138, 283, 290
use-external-input, 329
use-external-oscillator, 205
use-fast-oscillator, 205, 216, 222, 322
user-led-mode, 353
using-current-clip-free-run, 139, 283, 291
uv, 231, 261
uv-cryst, 177
uv-lens, 177
uv-outcpl, 177

valid-until, 359
value, 105, 175, 349
value-act, 160, 306, 310, 337, 338
value-calibrated, 101, 184
value-pd1, 296
value-pd2, 296
value-set, 160, 311, 338
value-unit, 160
variant, 62, 136, 163, 194, 276, 279, 281, 287, 288, 301
vcs-id, 366
version, 61, 135
voltage-15V, 314
voltage-15Vn, 314
voltage-3V3, 314
voltage-5V, 314
voltage-act, 66, 74, 77, 139, 227, 284, 291, 307
voltage-act-master, 270
voltage-act-shg, 270
voltage-clip, 66, 116, 139, 147, 284, 291
voltage-enabled, 307
voltage-max, 76, 119, 121, 210, 227, 307
voltage-min, 76, 119, 121, 210, 227, 307
voltage-offset, 307
voltage-out, 77, 139, 284, 291
voltage-set, 76, 227, 306
voltage-set-dithering, 76
voltage-set-master, 270

warm-up, 151, 192
warm-up-active, 103, 187
warning-delay, 145, 150
wavelength, 115, 145, 190, 271
wavelength-act, 108, 127
wavelength-after-optimization, 191
wavelength-before-optimization, 191
wavelength-max, 111, 123, 128, 134
wavelength-min, 111, 123, 128, 134
wavelength-offset, 132
wavelength-set, 108, 122, 127, 190, 271
wavelength-set-max, 271
wavelength-set-min, 271
wavelength-temp-coeff, 192
wavemeter, 190, 272
welcome, 315
wide-scan, 158
window, 84, 199, 214, 221, 248

xy-signal, 164, 196

zoom-amplitude, 171
zoom-data, 171
zoom-offset, 171
zoom-out, 172