Debug Modes

CLI INFORMATION COMMANDS

- "VERSION" - Shows the current firmware loaded and the last github code commit [ie: "(9f67a584b)"] for the specific build of the firmware.
- "STATUS" - Shows various information about the quad setup such as ROM space available for firmware, gyro type, detected voltage, etc...
- "TASKS" - Shows the active tasks running and their CPU utilization. Make sure the "gyro/PID tasks rate/hz is running at the specified rate.
- "DSHOT_TELEMETRY_INFO" - Shows the DShot RPM bi-directional telemetry packet success for each ESC. (4.1+)
- "RC_SMOOTHING_INFO" - Shows the detected RX frame rate. This only works if the "Filter" RC signal smoothing type is selected in the Receiver tab, and both "Input Cutoff Type" and "Derivative Cutoff Type" are set to "auto". The radio and RX need to be connected and powered up for the detected frame rate data to be valid.
- "get DEBUG_MODE" - Shows the current debug mode and all available debug modes.

DEBUG MODES

GYRO SIGNAL (https://youtu.be/A09sprstYql)

GYRO_RAW: (Raw gyro data without scaling or filtering) For use in seeing the unscaled gyro signal into the firmware for use in stack overflow detection (ICM gyros).

- [0] = roll: gyro signal input to firmware **UN**scaled
- [1] = pitch: gyro signal input to firmware **UN**scaled
- [2] = yaw: gyro signal input to firmware **UN**scaled

- [3] = [empty]

GYRO_SCALED: (Gyro data converted to deg/s, before any flight controller filtering)

- [0] = roll: gyro signal input to firmware **scaled** into deg/sec
- [1] = pitch: gyro signal input to firmware **scaled** into deg/sec
- [2] = yaw: gyro signal input to firmware **scaled** into deg/sec
- [3] = [empty]

GYRO_FILTERED: (SAME AS GYRO TRACES RECORDED BY DEFAULT)

- [0] = roll: filtered gyro trace
- [1] = pitch: filtered gyro trace
- [2] = yaw: filtered gyro trace
- [3] = [empty]

GYRO_SAMPLE: (

- [0] = Gyro data before down-sampling to PID loop rate
- [1] = Gyro data at PID loop rate
- [2] = Gyro data at PID loop rate after RPM filtering
- [3] = Gyro data at PID loop rate, after RPM and all static filters, but before Dynamic Notch filters

FILTERS (https://youtu.be/__vyp60cU_8)

D_LPF:

- [0] = roll: unfiltered D
- [1] = pitch: unfiltered D
- [2] = roll: filtered, after DMin/Dmax modification, pre application of TPA
- [3] = pitch: filtered, after DMin/Dmax modification, pre application of TPA

DYN_LPF:

- [0] = roll: raw gyro data (scaled)
- [1] = roll: notch center frequency
- [2] = roll: lowpass filter cutoff frequency
- [3] = roll: pre-dyn notch (post lowpass filters)gyro data

FFT_FREQ:

- [0] = gyroDebugAxis: notch 1 center frequency

- [1] = gyroDebugAxis: notch 2 center frequency
- [2] = gyroDebugAxis: notch 3 center frequency
- [3] = gyroDebugAxis: pre-dyn notch gyro data (post lowpass and RPM filter)

FFT:

- [0] = gyroDebugAxis: pre-dyn notch gyro data (post lowpass and RPM filter)
- [1] = gyroDebugAxis: post-dyn notch gyro data
- [2] = gyroDebugAxis: downsampled data used for FFT
- [3] = [empty]

FFT_TIME:

- [0] = currently active calculation step
- [1] = duration of this step
- [2] = [empty]
- [3] = [empty]

RPM_FILTER:

- [0] = motor #1 RPM Notch center frequency (where peak motor noise is anticipated)
- [1] = motor #2 RPM Notch center frequency
- [2] = motor #3 RPM Notch center frequency
- [3] = motor #4 RPM Notch center frequency

PIDs

D_MIN:

- [0] = gyro factor (percent, scaled by `d_min_gain`)
- [1] = setpoint factor (percent, scaled by `d_min_advance`). The larger of *gyro* and *setpoint* factors takes effect.
- [2] = roll: active D-term gain
- [3] = pitch: active D-term gain

ITERM_RELAX: (https://youtu.be/QfiGTG5LfCk)

- [0] = highpass filter to detect large setpoint changes
- [1] = relax factor (percent, only used in `SETPOINT` mode)
- [2] = relaxed I-term Error
- [3] = absolute control axis error [roll]

ANTI_GRAVITY: I and P boost during rapid throttle changes

- [0] = simple I gain factor from high-pass throttle (* 1000)
- [1] = final I gain factor (includes a delayed smoothed lowpass element (* 1000)
- [2] = P gain factor (* 1000) [roll]
- [3] = P gain factor (* 1000) [pitch]

FEEDFORWARD_LIMIT (FF_LIMIT): Cuts back on Feedforward when sticks rapidly approach max rate

- [0] = Limit factor [roll]
- [1] = Limit factor [pitch]
- [2] = Limited feedforward [roll]
- [3] = Not used

FEEDFORWARD (4.3):

- [0] = Interpolated Setpoint [roll]
- [1] = Setpoint delta, smoothed [roll]
- [2] = Boost factor, smoothed [roll]
- [3] = RC Command delta [roll] (us)

FF_INTERPOLATED (4.2):

- [0] = Setpoint Delta [roll]
- [1] = Setpoint Acceleration [roll]
- [2] = Setpoint Acceleration, clipped [roll]
- [3] = Duplicate Counter

FF_INTERPOLATED (4.0):

- [0] = Setpoint Delta Impl[roll]
- [1] = Boost Amount [roll]
- [2] = Boost Amount, clipped [roll]
- [3] = Clip Amount

ESC and MOTORS

DSHOT_RPM_TELEMETRY: RPM in Configurator 10.8, eRPM for <10.8 (where RPM = eRPM * motor_magnet_count)

- [0] = motor #1 RPM

- [1] = motor #2 RPM
- [2] = motor #3 RPM
- [3] = motor #4 RPM

DSHOT_RPM_ERRORS:

- [0] = Motor #1: the per-motor invalid packet percentages in hundredths of a percent (so 123 is 1.23%)
- [1] = Motor #2: "
- [2] = Motor #3: "
- [3] = Motor #4: "

DYN_IDLE (4.3):

- [0] = Dyn Idle P [roll]
- [1] = Dyn Idle I [roll]
- [2] = Dyn Idle D [roll]
- [3] = min RPM (lowest current motor rpm)

DYN_IDLE (<4.3):

- [0] = motorRangeMinIncrease * 1000
- [1] = targetRpsChangeRate (simple RPM error * idle_adjustment_speed)
- [2] = error (amount of error to fix)
- [3] = minRps (lowest current motor rpm, in revolutions per second _ 10) So, for example, a minRps value of 500 corresponds to 50.0 _ 60 = 3000rpm

LOOPTIME STABILITY

CYCLETIME:

- [0] = The time in microseconds since the PID task last ran
- [1] = The current CPU load in percent
- [2] = The time since the previous motor update (uS)
- [3] = The variance in the motor update interval vs. the target PID loop time (uS) note: with 4.2.x restructuring of the gyro/PID loops [2] & [3] are pointless since the motor updates are part of the PID task now.

PIDLOOP:

- [0] The time the Gyro Task ran (Useless post BF 4.2.x)
- [1] Time microseconds the PID calculations

- [2] Time in microseconds for mixer, servos, motor update, dshot telemetry stats
- [3] Time in microseconds the mag hold and blackbox processing logic

SCHEDULER_DETERMINISM:

- [0] - Gyro task start cycle time in 10th of a us
- [1] - ID of late task
- [2] - Amount task is late in 10th of a us
- [3] - Gyro lock skew in clock cycles

TIMING_ACCURACY:

- [0] - % CPU busy
- [1] - Tasks late in last second
- [2] - Total lateness in last second in 10ths us
- [3] - Total tasks run in last second

RC SMOOTHING (https://youtu.be/M50fKpvFjT8)

RC_INTERPOLATION:

- [0] = raw un-smoothed rc channel data [roll]
- [1] = current RX frame rate
- [2] = interpolation step count
- [3] = rc setpoint [roll]

RC_SMOOTHING:

- [0] = raw un-smoothed rc channel data
- [1] = raw un-smoothed setpoint derivative
- [2] = filtered setpoint derivative before applied to setpoint weight
- [3] = the current calculated average (shows the current "locked" rate used to set the filters)

RC_SMOOTHING_RATE:

- [0] = log each RX frame interval (shows the delay from the previous frame in microsecond)
- [1] = log the training step count
- [2] = the current calculated average (shows the current "locked" rate used to set the filters)

- [3] = indicates whether guard time is active

FLIGHT DYNAMICS

AC_ERROR (Absolute Control Error):

- [0] = roll: axis error * 10
- [1] = pitch: axis error * 10
- [2] = yaw: axis error * 10
- [3] = [none]

AC_CORRECTION (AC = Absolute Control):

- [0] = roll: axis AC correction * 10
- [1] = pitch: axis AC correction * 10
- [2] = yaw: axis AC correction * 10
- [3] = [none]

FF_THUMB (Absolute Control Correction):

- [0] = roll normal FF
- [1] = roll FF after stick limit
- [2] = FF after max deflection
- [3] = projected max rate due to stick extrapolation

SENSOR FUSION GYRO BOARDS:

DUAL_GYRO_RAW:

- [0] = roll: RAW gyro #1 data (NOT scaled to Deg/sec)
- [1] = pitch: RAW gyro #1 data (NOT scaled to Deg/sec)
- [2] = roll: RAW gyro #2 data (NOT scaled to Deg/sec)
- [3] = pitch: RAW gyro #2 data (NOT scaled to Deg/sec)

DUAL_GYRO_SCALED:

- [0] = roll: RAW SCALED gyro #1 data (scaled to Deg/sec)
- [1] = pitch: RAW SCALED gyro #1 data (scaled to Deg/sec)
- [2] = roll: RAW SCALED gyro #2 data (scaled to Deg/sec)
- [3] = pitch: RAW SCALED gyro #2 data (scaled to Deg/sec)

DUAL_GYRO_DIFF:

- [0] = roll: gyro #1 filter – gyro #2 filtered
- [1] = pitch: gyro #1 filter – gyro #2 filtered
- [2] = yaw: gyro #1 filter – gyro #2 filtered
- [3] = [empty]

DUAL_GYRO_COMBINED: (programmer useful only)

- [0] = [empty]
- [1] = roll: filtered gyro (same as “gyro” trace)
- [2] = pitch: filtered gyro (same as “gyro” trace)
- [3] = [empty]

DUAL_GYRO_COMBINED: (programmer useful only)

- [0] = [empty]
- [1] = roll: filtered gyro (same as “gyro” trace)
- [2] = pitch: filtered gyro (same as “gyro” trace)
- [3] = [empty]

VTX

SMARTAUDIO:

- [0] = SmartAudio Version * 100 + Device Mode
- [1] = Device Channel
- [2] = Device Frequency
- [3] = Device Power

TRAMP

- [0] = Status
- [1] = Reply Code
- [2] = Pit Mode
- [3] = Retry Count

RX

SBUS (FrSky SBUS)

- [0] = Frame flags
- [1] = State Flags

- [2] = Frame Time
- [3] = not used

FPORT (FrSky FPORT)

- [0] = Frame Interval
- [1] = Frame Errors
- [2] = Last Error
- [3] = Telemetry Interval

GHST (Ghost)

- [0] = CRC Error Count
- [1] = RSSI
- [2] = Link Quality
- [3] = Unknown Frame count

CRSF_LINK_STATISTICS_UPLINK

- [0] = Uplink RSSI 1
- [1] = Uplink RSSI 2
- [2] = Uplink Link Quality
- [3] = RF Mode

CRSF_LINK_STATISTICS_UPLINK

- [0] = Uplink RSSI 1
- [1] = Uplink RSSI 2
- [2] = Uplink Link Quality
- [3] = RF Mode

CRSF_LINK_STATISTICS_PWR

- [0] = Antenna
- [1] = SNR
- [2] = Tx Power
- [3] = not used

CRSF_LINK_STATISTICS_DOWN

- [0] = Downlink RSSI
- [1] = Downlink LQ

- [2] = Downlink SNR
- [3] = not used

RX_SFHSS_SPI (FrSky SPI software based Rx)

- [0] = Data State
- [1] = Missing Frame
- [2] = Offset Max
- [3] = Offset Min

RX_EXPRESSLRS_PHASELOCK (ExpressLRS software based PPL)

- [0] = rawOffsetUs: instantaneous phase offset measured by last timer tick
- [1] = offsetUs: filtered offset value used in software PLL
- [2] = frequencyOffsetTicks: frequency offset (in timer ticks) between ELRS transmitter and RX
- [3] = phaseShiftUs: current instantaneous phase shift value that will applied next timer tick

RX_EXPRESSLRS_SPI (ExpressLRS SPI RX)

- [0] = lostConnectionCounter: counts the number of times the connection has been lost since startup
- [1] = rssiFiltered: current low-pass filtered RSSI value reported from sx1280/sx127x
- [2] = snr: current SNR reported by sx1280/sx127s
- [3] = uplinkLQ: uplink link quality percentage

Debug List

Not all debug options are available in some firmware builds.

DEBUG TYPE
DEBUG_CYCLETIME
DEBUG_BATTERY
DEBUG_GYRO
DEBUG_GYRO_FILTERED

DEBUG TYPE
DEBUG_ACCELEROMETER
DEBUG_PIDLOOP
DEBUG_GYRO_SCALED
DEBUG_RC_INTERPOLATION
DEBUG_ANGLERATE
DEBUG_ESC_SENSOR
DEBUG_SCHEDULER
DEBUG_STACK
DEBUG_ESC_SENSOR_RPM
DEBUG_ESC_SENSOR_TMP
DEBUG_ALTITUDE
DEBUG_FFT
DEBUG_FFT_TIME
DEBUG_FFT_FREQ
DEBUG_RX_FRSKY_SPI
DEBUG_RX_SFHSS_SPI
DEBUG_GYRO_RAW
DEBUG_DUAL_GYRO_RAW
DEBUG_DUAL_GYRO_COMBINED
DEBUG_DUAL_GYRO_DIFF

DEBUG TYPE
DEBUG_MAX7456_SIGNAL
DEBUG_MAX7456_SPICLOCK
DEBUG_SBUS
DEBUG_FPORT
DEBUG_RANGEFINDER
DEBUG_RANGEFINDER_QUALITY
DEBUG_LIDAR_TF
DEBUG_ADC_INTERNAL
DEBUG_RUNAWAY_TAKEOFF
DEBUG_SDIO
DEBUG_CURRENT_SENSOR
DEBUG_USB
DEBUG_SMARTAUDIO
DEBUG_RTH
DEBUG_ITERM_RELAX
DEBUG_ACRO_TRAINER
DEBUG_RC_SMOOTHING
DEBUG_RX_SIGNAL_LOSS
DEBUG_RC_SMOOTHING_RATE
DEBUG_ANTI_GRAVITY

DEBUG TYPE
DEBUG_DYN_LPF
DEBUG_RX_SPEKTRUM_SPI
DEBUG_DSHOT_RPM_TELEMETRY
DEBUG_RPM_FILTER
DEBUG_D_MIN
DEBUG_AC_CORRECTION
DEBUG_AC_ERROR
DEBUG_DUAL_GYRO_SCALED
DEBUG_DSHOT_RPM_ERRORS
DEBUG_CRSF_LINK_STATISTICS_UPLINK
DEBUG_CRSF_LINK_STATISTICS_PWR
DEBUG_CRSF_LINK_STATISTICS_DOWN
DEBUG_BARO
DEBUG_GPS_RESCUE_THROTTLE_PID
DEBUG_DYN_IDLE
DEBUG_FF_LIMIT
DEBUG_FF_INTERPOLATED
DEBUG_BLACKBOX_OUTPUT
DEBUG_GYRO_SAMPLE
DEBUG_RX_TIMING

DEBUG TYPE
DEBUG_D_LPF
DEBUG_VTX_TRAMP
DEBUG_GHST
SCHEDULER_DETERMINISM
TIMING_ACCURACY
DEBUG_RX_EXPRESSLRS_SPI
DEBUG_RX_EXPRESSLRS_PHASELOCK

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