

DUSBL-In-Line array

Serial Protocol

Rev G 8/3/2017

Message from Host	Reply from USBL	Description
#U1,S(CR)	!U1,S,nn(CR) where nn = status flag register bit 0 = armed, waiting for sync bit 1 = triggered, waiting for tx lockout bit 2 = gated, waiting for detection bit 3 = rx gate over, no detection bit 4 = detection occurred in current cycle bit 5 = computing result bit 6 = done with cycle, waiting for “P” command. bit 7 =	This is a quick way to poll for usbl status.
#U1,P,nn,ttt,ggg, hh,xx,yy,sss(CR) n = signal number to be received, (00-FF hex). ttt = transmit lockout in 0.001 second increments (000-FFF hex). ggg = receiver gate time in 0.001 second increments (000-FFF hex). hh = detection threshold (00-FF hex) xx = x center degrees (2’s complement hex)	!U1,P(CR) acknowledgement !U1,R,xxx,yyy,tttt,lll,gg1,gg2,ii,oo(CR) xxx = x angle in 0.05 degrees (2’s complement hex) yyy = 0. tttt = travel time in 80 us (unsigned hex) lll = latency in 1ms increments (unsigned hex) gg1 = gain (00-FF unsigned hex) gg2 = gain (00-FF unsigned hex) ii = in-band snr, (unsigned hex)	This command is used to initialize and arm the receiver for a ping cycle. It includes all the setup parameters for the cycle. The next tx-sync or “T” command will start the cycle. The receiver will remain off until the tx lockout time has elapsed. The receiver will be active for the receiver gate time, or until a detection occurs. The beamformer scan will be started at the specified center [or 0,0]. Latency is the amount of time since the detection,

yy = y center is ignored with the in-line array. Set this parameter to 00. sss = local sound speed (m/s) (unsigned hex integer)	oo = out-band snr, (unsigned hex) !U1,N,gg1,gg2,aa,pp(CR) receiver gate is over and no reply occurred. gg1 = gain (00–FF unsigned hex) gg2 = gain (00–FF unsigned hex) aa = average noise (00–FF unsigned hex) pp = peak noise (00–FF unsigned hex)	up to the serial reply. The delay to this reply is tbd, likely less than 0.1 seconds. Travel time is computed from the most recent external sync pulse. Gain is controlled automatically, but is reported for logging. The cycle will terminate with either a result message or a “no reply” message.
#U1,T(CR)	!U1(CR)	This command is the equivalent of a tx-sync. It will restart the travel time counter and tx lockout timer, and will clear the detection flag. Not necessary if external tx-sync is present.
#U1,V(CR)	!U1,V,xxx.xx(CR) xxx.xx is version	Request version
#U1,F,L(CR)	No Reply. Unit will restart with new version in ram. EEprom will not be changed.	Send new firmware file: a) Send file from serial debugger, same as digital transponder board. Command will be embedded in the file header. b) In the event of corrupt or bad program, File transfer may be initiated 6 seconds +/- 2 seconds after a power up, otherwise old version will boot. This will work even if previous

		version of code is bad.
#U1,F,B,Y(CR)	No reply. Unit will copy program from ram to eeprom, then reboot from eeprom.	This will allow user to burn newly bootloaded code into eeprom. This command is sent manually using serial debugger.
	!U1?	Any error in parsing will return this reply

Procedure for Host operation of USBL:

Navigating:

- 1) On power up, usbl will automatically send a version message once.
- 2) To arm a USBL cycle, first send to USBL: #U1,P,n,ttt,ggg,hh,xx,yy,sss(CR), see table above for parameter descriptions.
- 3) The USBL will reply with !U1,P(CR) as an acknowledgement.
- 4) Then send to LBL: #D1,P,w,9,t(CR) where w = waveform # and t = sync timeout. This will send a ping on the next sidescan trigger, and will enable the tx_sync output in order to trigger the usbl.
- 5) LBL will reply with !Pn as an acknowledge.
- 6) If a reply is received by the usbl within the receiver gate, then it will automatically transmit a result message.
- 7) If no reply is received in the gate interval, it will send a “no reply” message indicating that the cycle is over.
- 8) Status may be requested at any time and will indicate what part of the cycle, if any, that the usbl is currently in.

Noise Test:

- 1) Arm a USBL cycle for the noise test just like regular navigation. Send to USBL: #U1,P,n,ttt,ggg,hh,xx,yy,sss(CR), see table above for parameter descriptions. Set the range gate to anything you want, probably a good setting is tx lockout = 100 ms, rx gate = 100 ms.
- 2) Start a fake ping cycle by sending the command #U1,T. This will fool the usbl board into thinking that a tx sync has occurred.

- 3) Wait for the “no reply” message, and read the gain (attenuator actually) setting. If $gg < \text{threshold}$, then display “PASS”.
- 4) Repeat indefinitely.