SECTION X TRANSCEIVER/RECEIVER MAINTENANCE INTERFACE DIAGRAMS

Section 3.4 describes the various FDL-978-XVR/RX configuration and setup options via the Maintenance Port Interface (MPI). The diagrams below provide a pictorial representation of these available options for accessing the maintenance port of the FDL-978-XVR/RX.

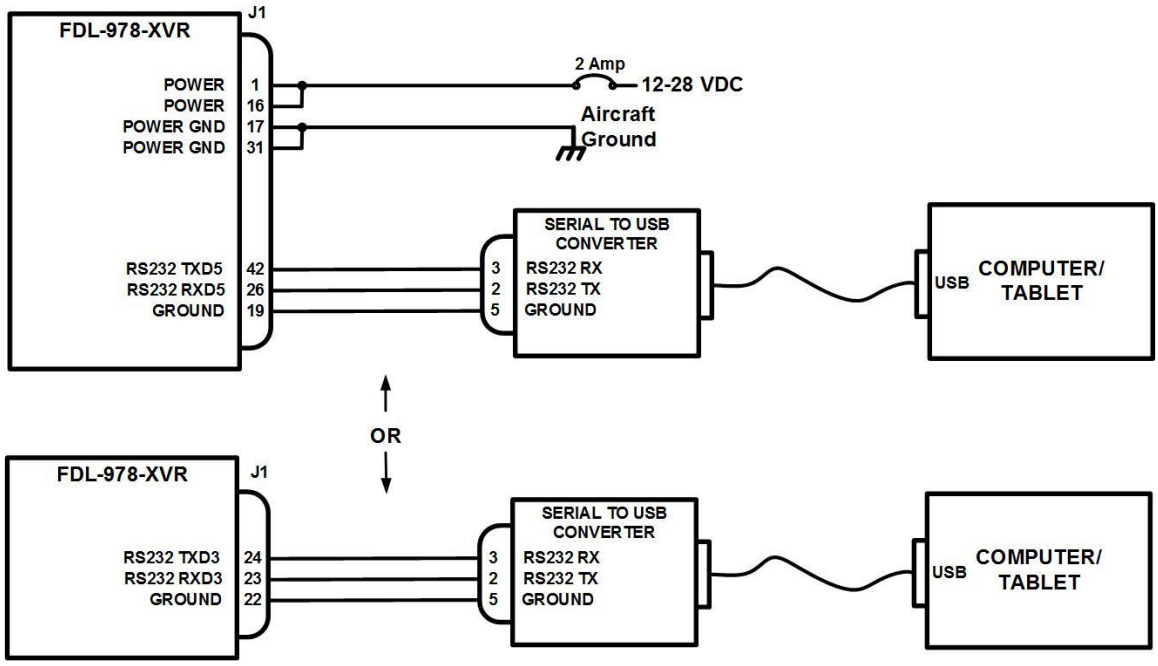


Figure 19. Off-the-shelf RS-232 to USB Converter

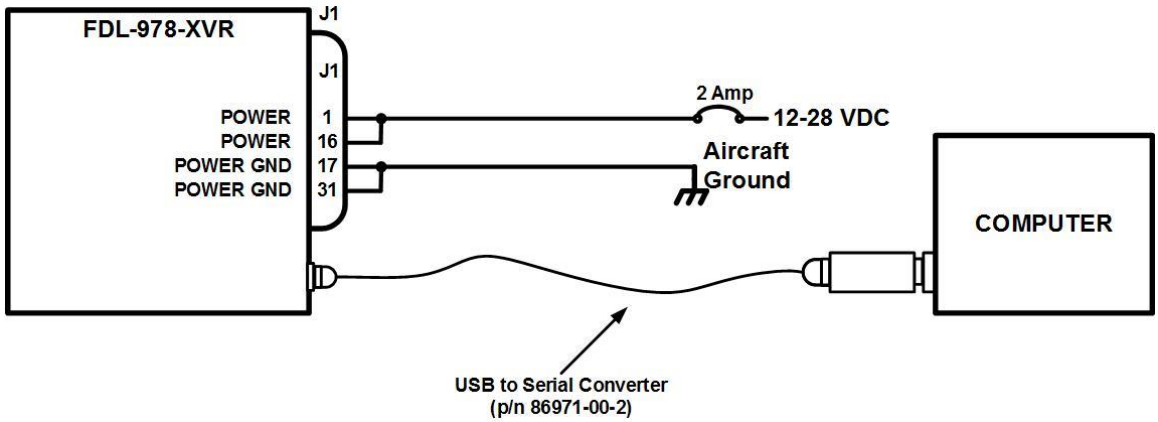


Figure 20. Serial-to-USB MPI Cable and USB-MPI

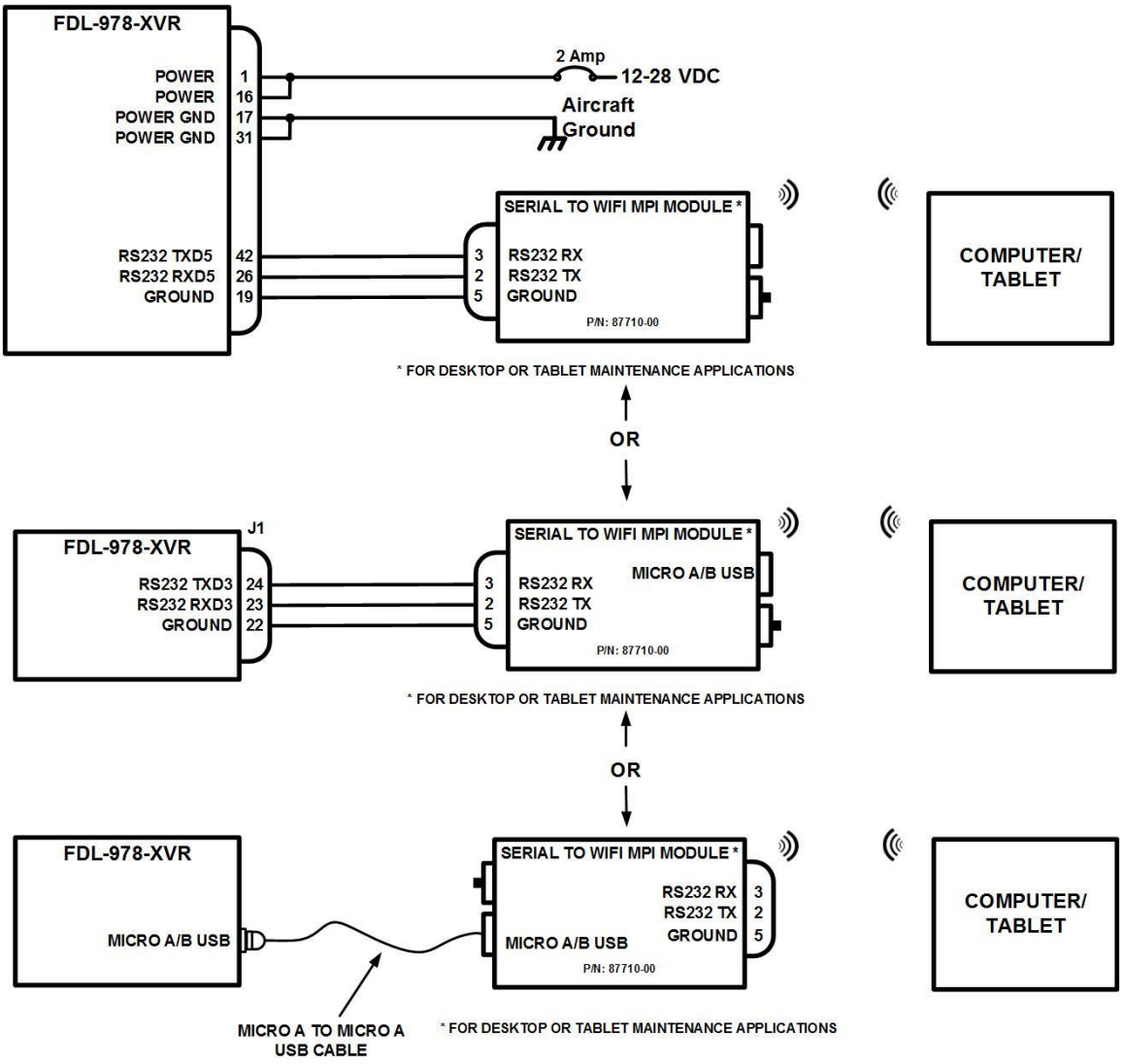


Figure 21. Serial-to-WiFi MPI

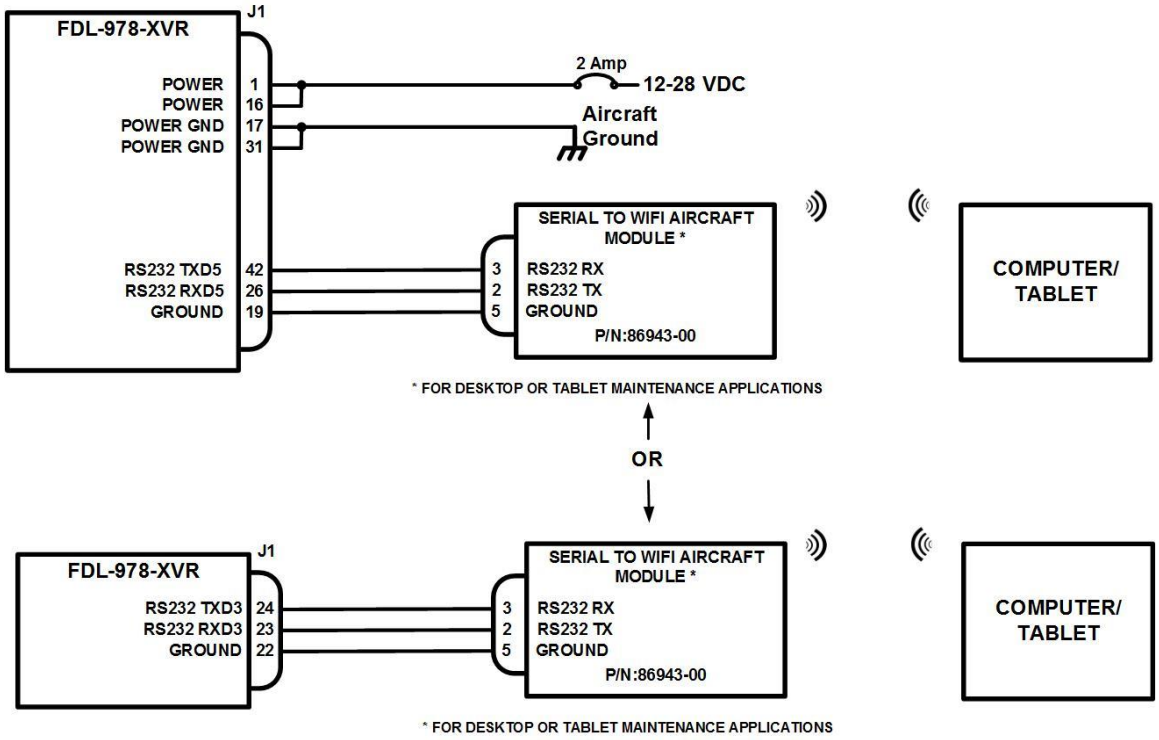


Figure 22. Serial-to-WiFi Aircraft Module

3.2 PRELIMINARY CHECKOUT

Before the unit is installed and tested, verify that all cables are properly secured. With the FDL-978-XVR/RX and TC978 removed, turn on aircraft power and verify the following:

1. Verify that Aircraft DC bus voltage is present on pins 1 and 16 of P1.
2. Verify that ground is present on pins 17 and 31 of P1.
3. Verify that the two UAT antenna coax center conductors are not shorted to its shield or aircraft ground.

When the above conditions are verified, turn off the master power. Properly attach the external connectors to the FDL-978-XVR/RX and TC978. Mount the FDL-978-XVR/RX and TC978 in their respective mounting locations. Turn on master power and then turn on the TC978, if installed. During initialization the FDL-978-XVR/RX unit performs a comprehensive diagnostics test.

A system component failure will be annunciated by a "Warning Indication" on the TC978, if installed, or the display. Warnings concerning the GPS status may not be displayed until 2.5 minutes after power on in order to give the GPS time to acquire satellites. Consult the Pilot Guide / User Manual for more information concerning WARNING messages. Detailed system status can be observed using the Maintenance Port Interface as described in Section 3.4.

The FDL-978-XVR/RX aircraft installation must be verified to ensure compliant operation and configuration. The FFS FT-9000 Ramp Tester can be used for this purpose (see Section 1.5.2 for more information) and use of the FFS STC data requires the use of the FT-9000 for installation verification.

3.3 INSTALLATION SETUP AND CONFIGURATION

System installation is configured using either:

- The MPI on serial port 3 or port 5 or,
- The TC978 Controller, if installed, in a special configuration mode.

Sections 3.3 through 3.5 describe the system installation configuration details necessary for configuring the FDL-978-XVR/RX installation. Installers should review the information in these sections to ensure proper system configuration. It is important to carefully review Section 3.3.2 to ensure proper system configuration of the serial and ARINC ports, regardless of using the MPI or TC978 for configuration.

For reference, the configuration sections are organized as follows:

- 3.3 Installation Setup and Configuration – General Configuration Details
  - 3.3.1 Configuration Item Summary – List of all Configuration Items
  - 3.3.2 Serial and ARINC Port Configuration Details – General Port Details
- 3.4 Configuration and Setup Using MPI
- 3.5 Configuration and Setup Using TC978

3.3.1 Configuration Item Summary

Use the configuration setting lists below to document the system installation.

SERIAL & ARINC PORT CONFIGURATION SETTINGS

CONFIGURATION ITEM		DEFAULT	SETTING
Serial Port 1 Configuration:	**IN Function**	GPS-Internal	
	Baud	19200	
Serial Port 2 Configuration:	**IN FUNCTION**	UNUSED	
	OUT Function	UNUSED	
	Baud	9600	
Serial Port 3 Configuration [(1)]:	**IN Function**	TMAP	
	OUT Function	TMAP	
	Baud	38400	
Serial Port 4 Configuration:	**IN Function**	UNUSED	
	Baud	9600	
Serial Port 5 Configuration [(2)]:	**IN Function**	MAINT	
	OUT Function	MAINT	
	Baud	115200	
Serial Port 6 Configuration:	**IN Function**	MAINT	
	OUT Function	MAINT	
	Baud	115200	
ARINC IN 1 Configuration:	**Function**	UNUSED	
	Speed	Low	
ARINC IN 2 Configuration:	**Function**	UNUSED	
	Speed	Low	
ARINC OUT 1 Configuration:	**Function**	UNUSED	
	Speed	Low	

[(1)] Serial Port 3 is not configurable on the TC978.

[(2)] Serial Port 5 is not available on the 87098-00 and 87098-10 Transceivers.

ADS-B TRANSMIT CONFIGURATION SETTINGS

CONFIGURATION ITEM		DEFAULT	SETTING
ICAO Address (Mode S)		0	
VFR Call Sign (Flight ID)			
GPS SDA Level		UNKNOWN	
GPS NACv Mode		UNKNOWN	
Receiver Configuration:	**UAT Receiver Installed**	no978	
	ES1090 Receiver Installed	no1090	
Emitter (Aircraft) Category		UNKNOWN	
Squat Mode		none	
Groundspeed Threshold		0 knots	
Vehicle Size:	**Length**	0	
	Width	0	
UAT Antenna:	**Diversity**	Top Only	
	DC Ground Check	No DC Gnd Chk	
GPS Antenna Offset:	**Longitudinal**	No Data	
	Lateral	No Data	
Mode A Receive		disable	
Disable Squawk Transmit (3)		off	
VFR Squawk Code (4)		1200	

(3) Disable Squawk Transmit is not configurable on the TC978.

(4) VFR Squawk Code is only set on the TC978.

DISPLAY OUTPUT CONFIGURATION SETTINGS

CONFIGURATION ITEM	DEFAULT	SETTING
Max Targets Output	max	
Chelton CSA Enable *(4)*	disable	
Traffic Velocity Validation *(5)*	enable	

(4) Chelton CSA Enable is not configurable on the TC978.

(5) Traffic Velocity Validation is not configurable on the TC978.

Refer to Section 3.4.2.13.3 for detailed information on determining the proper display output settings in this table.

3.3.2 Serial and ARINC Port Configuration Details

The FDL-978-XVR Transceiver and FDL-978-RX Receiver installations require data interfaces to other equipment for complete aircraft installation. The necessary data interfaces are Control Input (Transceiver Only), GPS Input, Altitude Input, TCAS Input, and Display Output. The FDL-978-XVR/RX Serial and ARINC ports must be configured to enable these data interfaces and are described in the table below:

Data Interfaces for FDL-978-XVR/RX Installation

INTERFACE	DESCRIPTION
Control Input	Control inputs such as Flight Plan ID (Squawk Code), call sign, and mode control (IDENT, Altitude Inhibit, transmit Standby) are needed by the FDL-978-XVR. The TC978 provides control or the FDL-978-XVR can be configured for other control formats. If a control format is configured and functional with the TC978 installed, the TC978 displays control status but will not accept control inputs. Serial port 2 is typically used for control input. *Control Input is NOT required for receive only systems.*
GPS Input	The FDL-978-XVR/RX requires position, velocity, time, and integrity data from a GPS sensor. The internal GPS or an external GPS must be configured to provide this data. Serial port 1 is typically used for GPS Input.
Altitude Input	The FDL-978-XVR/RX requires external pressure altitude data input from an altitude/air data sensor (ADS). Altitude rate and airspeed will be used if available in the configured protocol. Pressure altitude data output can also be configured to share with a transponder. Serial port 4 is typically used for Altitude Input.
Heading Input	The FDL-978-XVR/RX can optionally receive aircraft true heading data. True heading is sent in UAT transmit messages on the ground and is also used to more accurately correlate TCAS and ADS-B Traffic. Heading input is not required but desirable with TCAS installations.
TCAS Input	TCAS traffic MUST be input to the FDL-978-XVR/RX if the aircraft is TCAS equipped then so the TCAS traffic can be integrated with ADS-B traffic and one traffic picture can be presented to the Display output. The FDL-978-XVR accepts TCAS traffic input via ARINC input per the ARINC 735A/B Intruder Labels.
Display Output	ADS-B traffic and FIS-B data output can be sent to one or more displays simultaneously. A display control can also be configured to provide the *Control Input*. Three different Serial Ports can be configured to simultaneously provide display output: • Display on Serial Port 3 • Display on Serial Port 5 • Display on either Port 2 or 6 ARINC OUT1 can also be configured to output ARINC 735 Intruder Traffic.

The installer should configure Serial and ARINC ports to specific data functions which provide the necessary data interfaces. All data interface types (except Display Output) from the table above can be configured to *one and only one* Serial or ARINC port.

If multiple Serial/ARINC ports are set to the same data interface type then ***only one*** port is actually configured and other settings of the same data interface type are ignored. The data interface order of precedence is as follows:

1. ARINC 429 ports take precedence over UART Serial ports
2. Lowest port channel number takes precedence over higher channel number

For example, if the FDL-978-XVR/RX has an internal GPS and serial in 1 is set to '*GPS-Internal*' and ARINC in 1 is set to '*GPS-743*' then the FDL-978-XVR/RX *will not* receive GPS data from the internal GPS.

Set *only one* Control Input, *only one* Altitude Input, and *only one* GPS Input. Inadvertently setting more than one of the same input type may result in the correct input data not being received.

Only ONE function can typically be set to *either* the input or output of each bi-directional Serial Port (2, 3, 5, or 6). If the serial port input is set to a function then the output should be set to 'UNUSED' and vice versa. If a Serial port's input and output are *both* set *only one* setting is configured and unexpected operation can occur. The exception is if a display output is set on a port output then the port input can be set to display control otherwise the input should be set to 'UNUSED'. (See paragraph 3.3.2.1 and 3.3.2.2 for details).

Control Input is not required for receive only systems.

3.3.2.1 Serial Port Input Configuration

The following tables define the serial port input data formats and baud rate settings:

Serial Port Input Configuration Settings

Setting (1)	Interface	Description
UNUSED (Not Used)	-	No connection to serial port
ADS (Air Data Sensor)	Altitude Input	Altitude, Airspeed, and Vertical Rate data input. Format for air data sensors using the protocol in Section 6.2.
Alt-Encoder (Altitude Encoder)	Altitude Input	Altitude data. Format for air data sensors using the protocol in Section 6.1.
Internal-GPS (Internal GPS)	GPS Input	GPS position, velocity, time, and integrity data input and output. Selects use of the internal GPS (models with GPS only). Baud rate must be set to 19200. Internal GPS is only valid for serial port 1. ***The internal GPS data is used by the XVR/RX and GPS data is automatically output at 19200 baud on serial output port 1 using the FFS/Chelton Protocol. The output is TSO-C145c Class Beta 1 certified and can be used as an ADS-B position source or navigation source.***
GPS-FFS (GPS-FreeFlight)	GPS Input	GPS position, velocity, time, and integrity data input. Format for the FFS 1201 or other sensors that support the FFS/Chelton Protocol. Typically configured on port 1.
GPS-ADSBPlus (GPS-GNS ADS-B)	GPS Input	GPS position, velocity, time, and integrity data input. Format for the Garmin Series 400/500 ADSBPlus GPS Protocol. Typically configured on port 1.
GSL-71 (Control Panel)	Control Input (3)	Squawk code, IDENT, call sign, mode (standby/alt inhibit), and altitude data input. Format for the GSL-71 controller or SL 70 transponder. (2)
GTX-Remote (GTX Remote)	Control Input (3)	Squawk code, IDENT, call sign, and mode (standby/alt inhibit) input. Format for GTX 330/33/327/32 transponders.
Disp-Cntrl (TIS/FIS)	Control Input (3)	Squawk code, IDENT, call sign, and mode (standby/alt inhibit). Enables display control from an MX-20, GMX-200, or other displays using the GDL/FDL protocol. The corresponding serial output port must be configured to TIS-FIS or MX-20 at the same baud rate to enable display control input. (3)

(1) MPI setting names are listed first with TC978 configuration menu names in parenthesis ().

(2) Altitude input configuration of the GSL-71 / SL 70 can affect the control output baud rate. Refer to respective installation manuals for these units.

(3) Control Input is not required for receive only systems.

(3) Setting an input port to Disp-Cntrl (TIS/FIS) must correspond to setting the same output port to a display output. I.E., if serial port 6 output is set to Traffic-Alert (TIS/FIS) then serial port 6 input can be set to either a) Disp-Cntrl (TIS/FIS) to enable display control or b) UNUSED (Not Used) to disable display control. ONLY one display port should be set to Disp-Ctrl.

Serial Port Input Baud Rate Settings

Setting	Description
4800, 9600, 19200, 38400, 57600, 115200	These baud rates are typical for RS-232 or RS-422 equipment but the correct rate must be selected to match the interfacing equipment's configured or default baud rate.
230400, 460800	These high baud rates are not normally recommended for RS-232 serial ports.

3.3.2.2 Serial Port Output Configuration

The following tables define the serial port output data formats and baud rate:

Serial Port Output Configuration Settings

Setting (1)	Interface	Description
UNUSED (Not Used)	-	No connection to serial port
Alt-Encoder (Encoded Altitude)	Altitude Output	Altitude data. Format for sending altitude to a transponder or display using the protocol in Section 6.1.
Xpndr-Monitor (XPDR Monitor)	Control Input	Sends requests for squawk code and IDENT input data. (Xpndr-Monitor Protocol) This selection requires both serial input and output connections. (2)
Traffic-Alert (TIS/FIS)	Display Output	Ownship data, traffic reports, and FIS-B data. Format for the Aspen, GMX-200, Chelton displays, or other displays using the GDL/FDL protocol. The corresponding serial port input can be configured to Disp-Cntrl to enable display control input. (3)
Pass-Thru (ADS-B Pass Thru)	Display Output	Ownship data, ADS-B traffic data, and FIS-B data. Format for sending unprocessed, uncorrelated, and un-prioritized raw ADS-B messages. Traffic must be processed in another device to meet TSO-C195a ASSAP installation requirements. (3)
MX-20 (MX-20)	Display Output	Ownship data, traffic reports, and FIS-B data. Format for the MX-20. The corresponding serial input port can be configured to Disp Cntrl at the same baud rate to enable display control input. (3) (4)

(1) Maintenance port setting names listed first with TC978 configuration menu setting names in parenthesis ().

(2) Xpndr-Monitor selection requires a serial input and output port for operation. If, I.E., port 2 output is set to Xpndr-Monitor then serial port 2 input is automatically used for Xpndr-Monitor input and serial port 2 input should be set to 'UNUSED'.

(3) Setting Disp-Cntrl for an input port must correspond to setting a display output on the same output port. I.E., if serial port 6 output is set to MX-20 or Traffic-Alert then serial port 6 input can be set to Disp-Cntrl to enable control.

(4) For proper traffic and status presentation on legacy displays, review display settings in paragraphs 3.4.2.13.3.2 and 3.4.2.13.3.3 and set accordingly.

Serial Port Output Baud Rate Settings

Setting	Description
4800, 9600, 19200, 38400, 57600, 115200	These baud rates are typical for RS-232 or RS-422 equipment but the correct rate must be selected to match the interfacing equipment's configured or default baud rate.
230400, 460800	These high baud rates are not normally recommended for RS-232 serial ports.

3.3.2.3 ARINC 429 Port Input Configuration

The ARINC 429 input data formats and speed configuration settings are described in the following tables:

ARINC 429 Port Input Configuration Settings

Setting (1)	Interface	Description
UNUSED (Not Used)	-	No connection to ARINC 429 input port
ADC (Air Data Computer)	Altitude Input	Altitude, Airspeed, Vertical Rate data input. Format for air data sensors and computers that output the Air Data Computer Labels listed in the table below.
ADC&AHRS (ADC+AHRS)	Altitude & Heading Input	Altitude, Airspeed, Vertical Rate, & True Heading data input. Format for devices that output the Labels listed in the ADC&AHRS table below.
AHRS (AHRS)	Heading Input	True Heading data input. Format for devices that output the True Heading Label 314
Transpndr-Cntrl (Txpdr Control)	Heading Input	Squawk code, IDENT, and call sign. Format for transponders or controllers that output the ARINC Transponder Control Data Labels listed in the table below.
GPS-743 (GPS)	GPS Input	GPS position, velocity, time, and integrity data input. Format for the FFS 1203 and 1203C or other sensors that output the ARINC 743A labels (listed in GPS-743 Labels Table below) and ALSO outputs a Time Mark that is UTC second synchronized.

Setting (1)	Interface	Description
Traffic (Traffic)	TCAS Input	TCAS Intruder Traffic data input. Format for TCAS that output the Labels listed in the Traffic Input table below.

(1) Maintenance port setting names listed first with TC978 configuration menu setting names in parenthesis ().

ARINC Port Input Speed Configuration Settings

Setting	Description
low	Low speed ARINC 429 – 12.5 kBaud
high	High speed ARINC 429 – 100 kBaud

The ARINC 429 Input channels can be configured as the following:

GPS-743 Input ARINC Labels

LABEL	DESCRIPTION
110	Latitude Coarse
120	Latitude Fine
111	Longitude Coarse
121	Longitude Fine
370	Altitude (HAE)
166	North/South Velocity
174	East/West Velocity
112	Groundspeed
103	True Track Angle
165	Vertical Speed
260	Date
150	UTC
130	Horizontal Integrity Limit (HIL)
133	Vertical integrity Limit (VIL)
247	Horizontal Figure of Merit (HFOM)
136	Vertical Figure of Merit (VFOM)
273	Sensor Status

Transpnder-Cntrl Input ARINC Labels

LABEL	DESCRIPTION
016	TCAS/ATC Control (squawk code and IDENT only)
031	ATCRBS Control (squawk code and IDENT only)
233	Flight ID Characters 1&2
234	Flight ID Characters 3&4
235	Flight ID Characters 5&6
236	Flight ID Characters 7&8

Label 016 or 031 must be present as a minimum

Labels 016 or 031 control only Squawk Code and IDENT

Labels 233 – 236, if present, control Call Sign

ADC Format Input ARINC Labels

LABEL	DESCRIPTION
203	Pressure Altitude
210	Airspeed
212	Altitude Rate

AHRS Format Input ARINC Labels

LABEL	DESCRIPTION
314	True Heading

ADC & AHRS Format Input ARINC Labels

LABEL	DESCRIPTION
203	Pressure Altitude
210	Airspeed
212	Altitude Rate
314	True Heading

Traffic Format Input ARINC Labels

LABEL	DESCRIPTION
274	TCAS Output – Receiver health in System Status
350	Fault Summary – TA only mode set in RI field
314	True Heading
357	RTS and ETX words for Intruder File
130	Intruder Range
131	Intruder Altitude
132	Intruder Bearing

3.3.2.4 ARINC 429 Port Output Configuration

The ARINC 429 output data formats and speed configuration settings are described in the following tables:

ARINC 429 Port Output Configuration Settings

Setting [(1)]	Interface	Description
UNUSED (Not Used)	-	No connection to ARINC 429 output port
Traffic (Traffic)	Display Output	Ownship data and traffic intruder data format for displays that receive the ARINC 735 Traffic Labels listed in the table below

[(1)] Maintenance port setting names listed first with TC978 configuration menu setting names in parenthesis ().

ARINC 429 Port Output Speed Configuration Settings

Setting	Description
low	Low speed ARINC 429 – 12.5 kBaud
high	High speed ARINC 429 – 100 kBaud

The ARINC 429 Output channel can be configured as the following:

Traffic Format Output ARINC Labels

LABEL	DESCRIPTION
274	TCAS Output – Receiver health in System Status
350	Fault Summary – TA only mode set in RI field
357	RTS and ETX words for Intruder File
130	Intruder Range
131	Intruder Altitude
132	Intruder Bearing

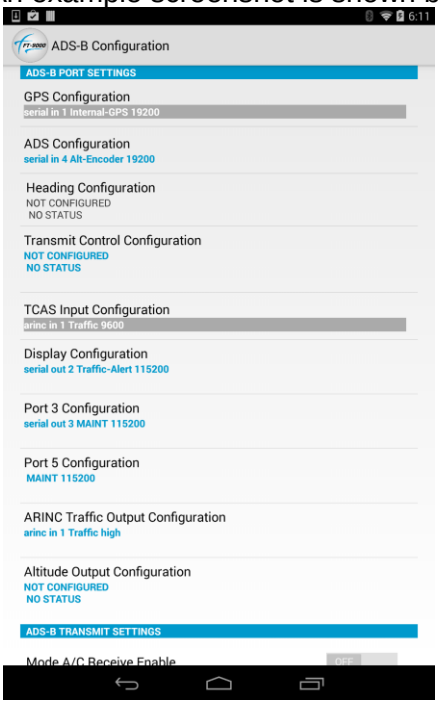
3.4 CONFIGURATION AND SETUP USING MPI

This section describes FDL-978-XVR/RX configuration and setup via the MPI on Serial Port 3 or 5. The MPI connections detailed in paragraph 2.6.11 can be connected to a PC or Tablet via one of following four devices:

- Off-the-shelf RS-232 to USB converter
- Serial-to-WiFi MPI Module, WiFi-MPI (P/N 87710-00) from FFS
- Serial-to-WiFi Aircraft Module (P/N 86943-00) from FFS
- Serial-to-USB MPI Cable, USB-MPI (P/N 86971-00-2) from FFS

Please refer to Section X for descriptions on connecting the above devices from the FDL-978-XVR/RX to a PC or Tablet.

The battery powered Serial-to-Wifi MPI Module, WiFi-MPI (P/N 87710-00) or the Serial-to-WiFi Aircraft Module (P/N 86943-00) can use the available MPI Tablet Application. The MPI Tablet Application provides a complete Graphical User Interface (GUI) for configuring, troubleshooting, and updating the system. The MPI Tablet Application, called “ADS-B MPI”, includes user documentation and can be obtain from the Google Playstore or through FFS. An example screenshot is shown below:



The following 3.4 sub-sections describe interfacing directly to the MPI using a terminal interface program on a PC, like “Tera Term”, to enter MPI commands. Any of the four interface devices mentioned above can be used to interface to the PC.

3.4.1 Terminal Program Interface

“Tera Term” should be installed on the PC and a MPI connection made via serial port or WiFi depending on the interface device used. The following two sub-paragraphs detail the serial port settings and WiFi settings.

3.4.1.1 MPI Serial Connection Settings

The typical “Tera Term” serial port settings for a serial connection are:

- BAUD Rate 115200
- Parity – None
- Data bits - 8
- Stop - 1
- Flow Control – None

The default Port 3 settings are be Baud Rate: 38400, Parity: odd, Data bits: 8, Stop: 1, & Flow Control: none.

The terminal setup should be set to:

- Local Echo – checked

3.4.1.2 MPI WiFi Connection Settings

A WiFi connection to the WiFi Module SSID must first be made on the PC. The typical “Tera Term” TCP settings for the WiFi connection are:

- Host: 192.168.10.1
- TCP Port#: 44000
- Service: Other - 8
- Protocol: UNSPEC

The terminal setup should be set to:

- Local Echo – checked

3.4.1.3 Initial MPI Connection

Once connected to the MPI with a serial or WiFi connection, type the <Enter> key three times to remove the maintenance lockout. The following prompt should be displayed:

`RANGR-XVR>` (Transceiver) or
`RANGR-RX>` (Receiver)

3.4.2 Maintenance Commands

The available commands are summarized in the table below:

Command	Description
ads	Display data from the altitude/air data input
bit	Display built-in test status
comm	Display communication ports' status - continuous
control	Display control squawk and mode status
cnfg	Display configuration data
gps	Display data from the GPS input
help or ?	Display command help
info	Display info – S/N, operation hours, versions, etc.
Reset	Reset and restart the unit
rx status	Display receiver status info – continuous
set <item> <value>	Set a configuration item's value
stop	Stop continuous data outputs
cnfg defaults	Reset configuration to defaults
cnfgstatus	Display configuration status

3.4.2.1 "help or ?" Command

This command displays a list of available commands as shown below:

```
help

 AVAILABLE COMMANDS.....
  ads                    Display air data
  bit                    Display POST and PBIT status
  comm                   Display communication ports' status
  control                Display control squawk and mode status
  cnfg                   Display all configuration data
  gps                    Display GPS data
  help or ?              This help
  info                   Display SN, operation hours, versions, etc.
  Reset                  Reset the UAT
  rx status              Display receiver status info
  set <item> <opt>       Set configuration <item> to <opt>
      <item> ---------- ?, addr, emit cat, squat, threshold, nacv, gps,
                        acsize, rx, call sign, gpsant, uatant, max trgs,
                        serial in, serial out, arinc in, arinc out, modeArx
      <opt> ----------- <item> options, enter '?' for usage
  cnfg defaults          Reset configuration to defaults
  cnfgstatus             Display configuration status

RANGR-XVR>
```

3.4.2.2 "ads" Command

This command displays the data from the Altitude/Air Data input interface.

```
ADS Data from NONE
 Heading Data from NONE
  Altitude:   --- feet, Vert Rate:   --- ft/min, Airspeed: --- knots
  Heading: ---.-ø   Altitude above Ground: --- ft
```

3.4.2.3 "bit" Command

This command displays built-in-test information about the FDL-978-XVR\RX health. Example output is displayed below:

```
RANGR-XVR> bit
 BIT
 Temperature= 36.00 øC
 External Power= 12.48 V
 Internal Power= 4.95 V
 IC Power= 3.30 V
 RF Tx Pwr= 28.13 V

 POST ==> PASS
  RAM Verify..... P   SDRAM Verify..... P   Temp Sensor ..... P
  UART1 Loopback... P   UART2 Loopback... P   UART3 Loopback... P
  UART4 Loopback... P   UART5 Loopback... P   UART6 Loopback... P
  ARINC1 Loopback.. P   ARINC2 Loopback.. P
  PM/Checksum.... F/F   Cnfg/Checksum.. P/P   Calibration..... F
  Tx Pwr Control... P   Tx Synthesizer... P   Tx Modulator..... P
  FPGA Enabled..... P   FPGA Data Bus.... P   Rx Synthesizer... P

 PBIT ==> FAIL
  Valid Address.... P   Temperature..... P   Input DC Power... P
  GPS Data Good.... F   GPS PPS Good..... F   GPS Comm Good.... F
  ADS Data Good.... F   ADS Comm Good.... F
  Tx Msg Good..... P   Tx PLL Lock..... P   TX PS Good..... P
  UAT Tx Power..... P   BroadcastMonitor. P   Nominal Msg Rate. P
  Rx Own Msg..... P   Rx PLL Lock..... P
  Top Antenna..... P   Bottom Antenna... P

RANGR-XVR>
```

3.4.2.4 "comm" Command

This command continually displays serial port communication status information: enabled/disabled status and receive and transmit byte count and errors. The data is updated once per second. Example output is displayed below:

```
Serial Comm:
Port   Status     Baud(Set/Act) P  Rx Count   Tx Count   RxErr   TxErr
-------------------------------------------------------------------
 1     ENABLED     19200/ 19345 N     69070          2       0      00
 2     DISABLED   115200/116071 N         2          2       0       0
 3     ENABLED     38400/ 38385 O         2          2       0       0
 4     DISABLED   115200/115205 N         2          2       0       0
 5     ENABLED    115200/115205 N        17       7096       0       0
 6     DISABLED   115200/115205 N         2          2       0       0

ARINC Comm:
Port   Status     Speed   Rx Count   Tx Count
-----------------------------------------
IN1    DISABLED   high             1          0
IN2    DISABLED   high             1          0
OUT1   DISABLED   high             0          1
```

Type the "stop" command to stop updating and return to the prompt.

3.4.2.5 "control" Command

This command displays the control, squawk and mode status including the squawk code, IDENT status, altitude control status, call sign, transmit control status and vertical status.

```
RANGR-XVR> control

 Squawk: 1200, IDENT OFF, ALT Transmit, Tx ON, AIRBORNE,
 CallSign: , Emergency: 0- None
```

3.4.2.6 "gps" Command

This command displays data which is being received from the GPS input.

```
GPS Info

Configuration: Internal GPS - gamma1, 19200
Source: Internal - FFS
SWVer: 1.10

Date:  9/16/2014  UTC Time: 19:36:03 (70563)

 Mode    Latitude   Longitude   Alt NSVel EWVel GSpd  Track   VertV
 SBAS  32.91718øN  96.98651øW   450     0     0    0 192.7øtt     0

   HIL (NIC)    HFOM(NACp)    VFOM(GVA)   VHFOM(NACv)   VVFOM        VIL
0.0132nm(10)  0.0111nm( 9)   53.13ft(2)    0.13m/s(4)    0.20m/s  141.75ft

Message Counts:
 Msgs: 33796  Nav:  8449  Status:  8449  Aux:  8449  Other:  8449

Status
 Comm:1  Valid:1  Lat:1  Lon:1  FDE:0  SBAS:1  SATu: 0
 Fail:0  NoWAAS:0  neWASS:0  neSAT:0  Ex:0  Ao:0  As:0  SR:0  Osc:0  PL:0
 RTC:0  sbasH:0  ALM:0  RF:0  EEPROM:0  SDRAM:0  Step:0
```

3.4.2.7 "info" Command

This command displays information such as Serial Number, operation time and hardware and software version information about the FDL-978-XVR\RX. Example output is displayed below:

```
Internal GPS Type..... Internal Gamma1
Receiver Output Config.... TIS/FIS, Serial
Mode Rx/Tx..... hw
IO CCA..... 87383
Unit ID..... FX00
Model..... RANGR-XVR

Calibration Data
 Cal Ver...   4  ModGain..  65  PLLOffst.   0[R=  125,N= 3912(B= 244,A= 8)]
 ModOffset.   0  DBias....4000  FBias....4000  CPGain...  67  CPMode.... 1
 Mode A/C:       PwrThrsh.3000  BitThrsh.1600            TxHWLatency.. 320
 RF Power ADC:   Min..... 700  -15dBm... 900  -5dBm....3000


RANGR-XVR> info

RANGR-XVR, Internal Gamma1 GPS

  Serial Number..... 1416X011
  Operation Time..... 30.9 hrs
  HW Version..... 4.11
  Boot Version..... 1.0.1.80
  Boot Checksum..... 0xE18AD740
  Boot Build Time..... 07/20/2014 20:11:20
  SW Version..... 1.9.1.187
  SW Checksum..... 0xC380FD0E
  SW Build Time..... 09/03/2014 18:29:20
  FPGA Version..... 1.2
  FPGA Build ID..... 0xBB0D18DA
  FPGA Build Time..... 11/22/2013 17:40:20
  GPS Version..... 1.10
```

3.4.2.8 “Reset” Command

This command causes the FDL-978-XVR\RX to reboot and restart.

```
RANGR-XVR> Reset
5
```

3.4.2.9 "rx status" Command

This command displays detailed status and other information about the ADS-B data being received by the FDL-978-XVR\RX. Example output is displayed below:

```
UTC Sec:          55056

Msgs Rxd:   Total   LstSec  RSErr:1     2     3     4     5     6    >6   Ovr
UTC Sec:          55060

Msgs Rxd:   Total   LstSec  RSErr:1     2     3     4     5     6    >6   Ovr
-------------------------------------------------------------------------------
 Uplink         0        0        0     0     0     0     0     0     0     0
 Basic        415        0        1     1     1     0     1     1     0     0
 Long         411        2        1     0     1     0     0     1     0     0
 1090ES         0        0        0                                        0

Traffic:   2  Tracks:   2  TCAS:   0  NBAir:  2  Air:  2  Gnd:  0  Other:   0
 #   Addr Typ CallSign   Latitude   Longitude    Alt   Spd G   Msgs  SSI   Range TOs
-------------------------------------------------------------------------------s
OWN      0 ABi XXXXXXXX 32.91716øN  96.98649øW    ---     0 A      0    0     0ft  0s
 1       2 ABi BILL001  32.91716øN  96.98649øW    ---     0 A    409  -89    25ft 24s
 2 ADFBA2 ABi GNDTEST  32.91716øN  96.98651øW    400     0 A    415  -65    49ft 24s
 3
 4
 5
 6
 7
 8
 9
10

Ground Stations:    0  Service Status: 0
 #     Latitude   Longitude Site Slt   Msgs SSI SS   Range TO
-----------------------------------------------------------
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
```

The output displayed contains an initial section with general count information (current UTC second, receiver loop count, and receiver word count). These counts will increment at varying rates when the receiver is operating correctly.
The next rx status output section displays general message count information for ground Uplink, basic, and long message types. The displayed counts include total messages received (Total), messages received in the last second (LstSec) and messages with various counts of corrected Reed-Solomon errors (RSErr:x).

The third rx status section displays detailed traffic information. This information includes total number of traffic targets being tracked and then detailed information about the ownship data being received and the 10 closest traffic targets. The detailed traffic information includes address (Addr), address type (Typ), call sign, Latitude, Longitude, altitude in feet (Alt), speed in knots (Spd), air ground status (AG), message count (msgs), signal strength indication in dbm (SSI), and traffic time out in seconds (TO).

Traffic targets will time out being tracked if no ADS-B message is received from the target for more than twenty five seconds.

The fourth rx status section displays detailed ground station information. This information includes total number of ground stations being received and detailed information about the 10 closest ground stations. The detailed ground station information includes Latitude, Longitude, Site ID, time slot of last transmission, message count (Msgs), signal strength indication in dbm (SSI), and ground station time out in seconds (TO).

Ground stations will time out being tracked if no ADS-B uplink message is received from the ground station for more than forty seconds.

Type the “stop” command to stop updating rx status and return to the prompt.

3.4.2.10 “cnfg” Command

This command displays configurable information such as the serial port settings (protocol and baud rate), the ICAO address, and the VFR Call Sign. Example output is displayed below:

```
ICAO Address.............. 0
VFR Call Sign.............
GPS Config................ UNKNOWN
NACv Mode................. UNKNOWN
Receiver Config........... no1090, no978
Emit Category............. LIGHT AIRCRAFT
Squat Mode................ none
Groundspeed Threshold..... 0 knots
Vehicle Size.............. Length=0 meters, Width=0 meters
UAT Ant................... top, No DC Gnd Chk
GPS Ant Offset............ Long=No Data, Lateral=No Data
Mode A Rx................. disable
Disable Squawk Tx......... off
Max Targets............... max
Chelton CSA Enable........ disable
Traffic Vel Validation.... enable
Serial In  1.............. UNUSED, 9600
Serial Out 1.............. UNUSED, 9600
Serial In  2.............. UNUSED, 9600
Serial Out 2.............. UNUSED, 9600
Serial In  3.............. UNUSED(TMAP), 9600(38400)
Serial Out 3.............. UNUSED(TMAP), 9600(38400)
Serial In  4.............. UNUSED, 9600
Serial In  5.............. MAINT, 115200
Serial Out 5.............. MAINT, 115200
Serial In  6.............. UNUSED, 9600
Serial Out 6.............. UNUSED, 9600
ARINC In 1................ UNUSED, low
ARINC In 2................ UNUSED, low
ARINC Out 1............... UNUSED, low
```

3.4.2.11 “cnfgstatus” Command

This command displays a summary of the serial/ARINC port configuration status for various interfaces (GPS, Altitude, Control, Display, etc.). Details are shown on what port is configured and data reception status for each of the functional interfaces.

```
RANGR-RX> cnfgstatus

 ADS:     Alt-Encoder, Serial In 4 (19200), Rx: NO-RX,
 AHRS:    NONE CONFIGURED
 Alt-Out: NONE CONFIGURED
 GPS:     GPS-FFS, Serial In 1 (19200), Rx: VALID,Internal,Position Acquired
 TCAS:    Traffic, ARINC In 1 (high), Rx: NO-RX,
 TC978:   NONE CONFIGURED
 TCntrl:  NONE CONFIGURED
 ModeARx: NOT CONFIGURED
 Disp1:   Traffic-Alert, Serial Out 2 (115200), Ctrl Disabled, Rx:
 P3Disp:  MAINT, Serial Out 3 (115200)
 P5Disp:  MAINT, Serial Out 5 (115200)
 A-Traf:  Traffic, ARINC Out 1 (high)

RANGR-RX>
```

3.4.2.12 “cnfg defaults” Command

This command resets all configuration values to default factory settings.

```
RANGR-RX> cnfg defaults
Configuration Reset to defaults
RANGR-RX>
```

3.4.2.13 “set” Command

This command is used to modify configuration settings such as ICAO address, call sign, and serial port function. Help on this command is displayed by entering “set ?”. Example “set ?” output is displayed below.

```
USAGE: set <item>

 <item>      Configuration item to set. Item options:
   ?                                 This help
   addr [hex]                        ICAO address (6 hex characters)
   emit cat [num]                    Emitter category number
   squat [opt]                       Squat switch option (none, low, or high)
   threshold <num>                   ON GROUND groundspeed threshold
   nacv <num>                        GPS NACv mode
   acsize <len> <width>              Vehicle length and width
   gps <opt>                         GPS configuration data
   rx <opt>                          Installed receiver(s) capability
   call sign <chars>                 VFR default call sign (8 characters)
   gpsant <lat> <lon>                GPS antenna offset
   uatant <opt> <dcgnd>              UAT antenna mode and DC ground check
   serial in [port] [func] [baud]    Serial in port protocol and baud rate
   serial out <port> <func> <baud>   Serial out port protocol and baud rate
   arinc in <port> <func> <speed>    Arinc in port protocol and speed
   arinc out <port> <func> <speed>   Arinc out port protocol and speed
   max trgs <opt>                    Maximum number of targets received
   modeArx <opt>                     Mode A receive
   disableSquawkTx <opt>             Disable transmit squawk/flight plan id
   cheltonCSA <opt>                  Enable CSA for Chelton
   trafVelVal <opt>                  Disable traffic velocity validation
```

3.4.2.13.1 Serial and ARINC Port Settings

This section describes the configuration settings for serial and ARINC port functionality.

3.4.2.13.1.1 "set serial in" Command

This command sets the Serial Port Input configuration options. Help on this command is displayed by entering "set serial in ?". Example "set serial in ?" output is displayed below:

```
RANGR-XVR> set serial in ?

 USAGE: set serial in <port> <func> <baud>

  <port>      Serial port number:  1, 2, 3, 4, 5, 6,

  <func>      Interface function/protocol:
              Port 1:
                 UNUSED, GPS-FFS, GPS-ADSBPlus, Internal-GPS,
              Port 2:
                 UNUSED, GPS-FFS, GPS-ADSBPlus, ADS, Alt-Encoder,
                 GSL-71, GTX-Remote, Disp-Ctrl,
              Port 3:
                 MAINT, TC-Control, TC-Monitor, UNUSED, TMAP, Disp-Ctrl,
              Port 4:
                 UNUSED, GPS-FFS, GPS-ADSBPlus, ADS, Alt-Encoder,
                 GSL-71, GTX-Remote,
              Port 5:
                 MAINT, UNUSED, Disp-Ctrl,
              Port 6:
                 UNUSED, GPS-FFS, GPS-ADSBPlus, ADS, Alt-Encoder,
                 GSL-71, Disp-Ctrl,

  <baud>      4800, 9600, 19200, 38400, 57600, 115200, 230400,

RANGR-XVR> set serial in 4 UNUSED 19200
 Serial In  4.............. UNUSED, 19200
```

Refer to Section 3.3.2.1 for information on selecting serial input settings.

87098-00 and 87098-10 Transceivers do not allow Serial Port 5 settings.

3.4.2.13.1.2 "set serial out" Command

This command sets the Serial Port Output configuration options. Help on this command is displayed by entering "set serial out ?". Example "set serial out ?" output is displayed below:

```
RANGR-RX> set serial out ?

 USAGE: set serial out <port> <func> <baud>

  <port>     Serial port number:  1, 2, 3, 5, 6,

  <func>     Interface function/protocol:
             Port 1:
             Port 2:
                UNUSED, Alt-Encoder, Traffic-Alert, Pass-Thru,
                Xpndr-Monitor, MX-20,
             Port 3:
                MAINT, TC-Control, TC-Monitor, UNUSED, TMAP, Traffic-Alert,
                Pass-Thru, MX-20,
             Port 5:
                MAINT, UNUSED, Traffic-Alert, Pass-Thru, MX-20,
             Port 6:
                UNUSED, Alt-Encoder, Traffic-Alert, Pass-Thru,
                Xpndr-Monitor, MX-20,

  <baud>     4800, 9600, 19200, 38400, 57600, 115200, 230400,

RANGR-RX> set serial out 2 Alt-Encoder 4800
 Serial In  2.............. UNUSED, 4800
 Serial Out 2.............. Alt-Encoder, 4800
```

Refer to Section 3.3.2.2 for information on selecting serial output settings.

Serial Port 4 is input ONLY and doesn't accept output settings.

87098-00 and 87098-10 Transceivers do not allow Serial Port 5 settings

3.4.2.13.1.3 "set arinc in" Command

This command sets the ARINC 429 input configuration for ports 1 and 2.

```
set arinc in ?

 USAGE: set arinc in <port> <func> <speed>

  <port>     ARINC port number:  1, 2

  <func>     Interface function/protocol:
             UNUSED, GPS-743, ADC, AHRS, ADC&AHRS, Transpndr-Cntrl, Traffic,

  <speed>    Speed: low, high

RANGR-XVR> set arinc in 1 ADC low
 ARINC In 1................ ADC, low
RANGR-XVR>
```

Refer to Section 3.3.2.3 for information on selecting ARINC input settings.

3.4.2.13.1.4 "set arinc out" Command

This command sets the ARINC 429 output configuration for port 1. Note that there is only one ARINC 429 output port.

```
RANGR-XVR> set arinc out ?

 USAGE: set arinc out <port> <func> <speed>

  <port>      ARINC out port number:  1

  <func>      Interface function/protocol:
              UNUSED, Traffic,

  <speed>     Speed: low, high

RANGR-XVR> set arinc out 1 Traffic high
 ARINC Out 1.............. Traffic, high
```

Refer to Section 3.3.2.4 for information on selecting ARINC output settings.

3.4.2.13.2 ADS-B Transmit Settings

This section describes configuration settings mainly for transmitting ADS-B messages. Some of these settings are relevant for receiver only units as well.

3.4.2.13.2.1 "set addr" Command

This command is used to set the ICAO address of the aircraft. For example, to set the ICAO address to ABCD12, enter "set addr ABCD12". The ICAO address must be entered as a hex value. *The FDL-978-XVR/RX requires the ICAO to be set to the aircraft's registered ICAO address.* This should be set for receivers and transceivers.

```
RANGR-XVR> set addr ?

 USAGE: set addr <chars>

  <hex>       ICAO address - up to 6 hexidecimal characters (0-9 & A-F)

RANGR-XVR> set addr ABCD12
 ICAO Address.............. ABCD12
```

3.4.2.13.2.2 "set call sign" Command

This command sets the default call sign of the aircraft and is typically the aircraft tail number. For example, to set the call sign to ABCD1234, enter "set call sign ABCD1234". The default call sign is transmitted by a Transceiver if a call sign setting is not received from a configured transmit controller (transponder, TC978, etc.). In a receiver the default call sign is for informational purposes only.

```
RANGR-RX> set call sign ?

 USAGE: set call sign <chars>

  <chars>    Default Call Sign - 8 characters (0-9 & A-Z)

RANGR-RX> set call sign 12345678
 VFR Call Sign.............. 12345678
```

3.4.2.13.2.3 "set gps" Command

This command sets the system design assurance level for the GPS input. Internal GPS should be set to Level C. For external GPS units refer to the GPS manufacturer's data

for setting system design assurance level. This should be set for both receivers and transceivers.

```
RANGR-XVR> set gps ?

 USAGE: set gps <opt>

  <opt>       GPS SW design assurance level:
               U, D, C, B,

RANGR-XVR> set gps C
 GPS Config.................. Level C
```

3.4.2.13.2.4 "set nacv" Command

This command sets the Navigation Accuracy Category for velocity (NACv) for the GPS input. Internal GPS should be set to 3 (auto). For external GPS units refer to the GPS manufacturer's data for setting NACv. This should be set for both receivers and transceivers.

```
RANGR-XVR> set nacv ?

 USAGE: set nacv <num>

  <num>       NACv mode number for GPS:
               0 : UNKNOWN
               1 : <10 m/s
               2 : <3 m/s
               3 : Auto (from GPS)

RANGR-XVR> set nacv 2
 NACv Mode................... <3 m/s
RANGR-XVR>
```

3.4.2.13.2.5 "set rx" Command

This command sets the receiver installed options to be transmitted by a Transceiver. Transceivers should be set to 978 and no1090. It is not necessary to set this for a receiver only.

```
RANGR-XVR> set rx ?

 USAGE: set rx <opt>

  <opt>       Installed receiver Capabilities:
               no1090, 1090, no978, 978,

RANGR-XVR> set rx 1090
 Receiver Config........... 1090, no978
```

3.4.2.13.2.6 "set emit cat" Command

This command sets the emitter category of the aircraft and must be set to something other than the default of 0 (no aircraft type). This should be set for transceivers and receivers.

```
RANGR-XVR> set emit cat ?

 USAGE: set emit cat <num>

  <num>       Vehicle emitter category number:
               0 :  NO AIRCRAFT TYPE
               1 :  LIGHT AIRCRAFT
               2 :  SMALL AIRCRAFT
               3 :  LARGE AIRCRAFT
               4 :  HIGH VORTEX LARGE
               5 :  HEAVY AIRCRAFT
               6 :  HIGH PERFORM AC
               7 :  ROTORCRAFT
               8 :  GLIDER/SAIL
               9 :  undefined
              10 :  LIGHTER THAN AIR
              11 :  PARACHUTIST
              12 :  ULTRALIGHT/HG
              13 :  undefined
              14 :  UAV
              15 :  SPACE VEHICLE
              16 :  undefined
              17 :  EMERGENCY VEHICLE
              18 :  SURFACE VEHICLE
              19 :  POINT OBSTACLE
              20 :  CLUSTER OBSTACLE
              21 :  LINE OBSTACLE

RANGR-XVR> set emit cat 5
 Emit Category.............. HEAVY AIRCRAFT
RANGR-XVR>
```

3.4.2.13.2.7 “set squat” Command

This command sets the active state (low or high) for the squat switch of the aircraft or to indicate there is no active squat switch. The squat switch (or other air/ground determination discrete) is an automatic means to indicate when the aircraft is on the ground or in the air. This should be set for transceivers and receivers.

```
RANGR-XVR> set squat ?

 USAGE: set squat <opt>

  <opt>       squat switch configuration:
              none    No squat switch input
              low     Low input for ON GROUND
              high    High input for ON GROUND

RANGR-XVR> set squat low
 Squat Mode................. low
```

3.4.2.13.2.8 "set threshold" Command

This command sets the groundspeed threshold which is used to determine when the aircraft is on the ground if an automatic means (squat switch) is not configured for the Small Aircraft (2) Emitter Category only. A groundspeed of less than the threshold indicates the aircraft is on the ground. Setting this parameter is only required for transceivers but not receiver only models.

```
RANGR-XVR> set threshold ?

 USAGE: set threshold <knts>

  <knts>     Groundspeed threshold for Air/Gnd switching:
           0, 30, 40, 50, 60, 70, 80, 90, 100, 120,

  NOTE: Groundspeed threshold for (2)SMALL AIRCRAFT Emit Category only

RANGR-XVR> set threshold 53
 Groundspeed Threshold..... 50 knots
```

3.4.2.13.2.9 "set acsize" Command

This command sets the aircraft size that is used to set the aircraft size code transmitted by the Transceiver. Setting this parameter is only required for transceivers but not receiver only models.

```
RANGR-XVR> set acsize ?

 USAGE: set acsize <len> <width>

  <len>      Aircraft length in meters (0-100)

  <width>    Aircraft width in meters (0-100)

  NOTE: Odd values are rounded down to nearest even meter

RANGR-XVR> set acsize 20 50
 Vehicle Size.............. Length=20 meters, Width=50 meters
```

3.4.2.13.2.10 "set uatant" Command

This command sets the UAT antenna configuration. This should be set for transceivers and receivers.

```
RANGR-XVR> set uatant ?

 USAGE: set uatant <opt> <dcgnd>

  <opt>      Antenna configuration:    dual, top, bottom

  <dcgnd>    Antenna DC ground check:  nochk, check

RANGR-XVR> set uatant dual check
 UAT Ant................... dual, DC Gnd Chk
```

3.4.2.13.2.11 "set gpsant" Command

This command sets the GPS antenna configuration. This should be set for transceivers but is not necessary for receivers.

```
RANGR-XVR> set gpsant ?

 USAGE: set gpsant <lon> <lat>

  <lon>      GPS antenna longitudinal offset:
              0 : No Data
              1 : Offset Applied by Sensor
             2-60 : Distance from AC center in even valued meters

  <lat>      GPS antenna lateral offset:
              0 : No Data
              1 : Left 2 meters
              2 : Left 4 meters
              3 : Left 6+ meters
              4 : Center
              5 : Right 2 meters
              6 : Right 4 meters
              7 : Right 6+ meters

RANGR-XVR> set gpsant 5 4
 GPS Ant Offset..... Long=4 meters, Lateral=Center
RANGR-XVR>
```

3.4.2.13.2.12 "set modeArx" Command

This command enables/disables Mode A code reception from the on-aircraft Mode A/C transponder. When enabled Flight Plan ID (squawk code) and IDENT are received from the on aircraft's Mode A/C transponder via its RF transmissions. The default setting is "disable". This is only used with transceivers and should not be set in receiver only units.

```
RANGR-XVR> set modeArx ?

 USAGE: set modeArx <opt>

  <opt>      enable, disable

RANGR-XVR> set modeArx enable
 Mode A Rx..... enable
```

3.4.2.13.2.13 "set disableSquawkTx" Command

This command disables the squawk code transmissions over the UAT datalink when set to "on". This setting should not be set to "on" and left to the default "off" setting. This is only used with transceivers and should not be set in receiver only units.

```
set disableSquawkTx ?

 USAGE: set disableSquawkTx <opt>

  <opt>      on, off

RANGR-XVR> set disableSquawkTx on
 Disable Squawk Tx..... on
RANGR-XVR>
```

3.4.2.13.3 Display Output Settings

This section describes configuration settings for controlling traffic display output typically for legacy displays.

3.4.2.13.3.1 "set max trgs" Command

This command sets the maximum number of targets to be sent on any configured serial or ARINC 429 port configured for traffic display output. This is typically used to limit the number of traffic targets for displays that can process a large number of traffic targets.

```
RANGR-XVR> set max trgs ?

 USAGE: set max trgs <num>

  <num>       8-30, max

RANGR-XVR> set max trgs 8
 Max Targets.............. 8
RANGR-XVR>
```

3.4.2.13.3.2 "set cheltonCSA" Command

This command enables/disables the (Conflict Situational Awareness) CSA bit in the Heartbeat message of the "Traffic-Alert" protocol. This parameter defaults to "disable" and should *ONLY* be set to "enable" when interfacing to a Chelton FlightLogic Display. The legacy Chelton display is not TSOC-195a compliant and requires this Heartbeat message bit to be set or it will generate an ADS-B failure. The FDL-978-XVR does *not* implement a Conflict Situation Awareness (CSA) algorithm since DO-217A and TSOC-195a do not currently specify any CSA applications. For all other displays leave this parameter at the default setting of "disable".

```
RANGR-XVR> set cheltonCSA ?

 USAGE: set cheltonCSA <opt>

  <opt>       enable, disable

RANGR-XVR> set cheltonCSA enable
 Chelton CSA Enable........ enable
```

3.4.2.13.3.3 "set trafVelVal" Command

This command enables/disables the DO-317A/TSOC-195A Traffic Velocity Validation\Invalidation of legacy ADS-B Transmitters that transmit NACv values of 0. This parameter defaults to "enable" and should *ONLY* be set to "disable" when interfacing to legacy displays that are 1) *not* TSOC-195a compliant and 2) *don't* adequately display non-directional traffic symbols. Several non-TSOC-195a displays adequately display non-directional traffic and do not require velocity validation /invalidation to be disabled.

The legacy MX-20 Display does not support non-directional traffic symbols and instead displays a directional traffic symbol pointing at approximately 120 degrees from North. The FDL-978-XVR/RX attempts to validate NACv=0 velocities per DO-317A/TSOC-195a but some traffic states (low-speed ground) will still cause the NACv=0 track velocities to be invalidated and sent to the display as non-directional traffic. Setting this parameter to "disable" turns off all DO-317A/TSOC-195a velocity validation/invalidation and passes the track's velocity data to the display as directional traffic. This parameter should *only* be set to "disable" for legacy non-TSO-C195a displays without non-directional traffic symbols when occasional display of non-directional traffic is deemed to be unacceptable or misleading. Otherwise leave this parameter at the default setting of "enable".

```
RANGR-XVR> set trafVelVal ?

 USAGE: set velValDisable <opt>

  <opt>      enable, disable

RANGR-XVR> set trafVelVal enable
 Traffic Vel Validation.... enable
```