

Interface Control Document

F Series Products FSK Data

Transceivers, Transmitters, and Receivers

FMX1 Transceiver



FSX1 Transceiver



FMT1 Transmitter



FSR1 Receiver



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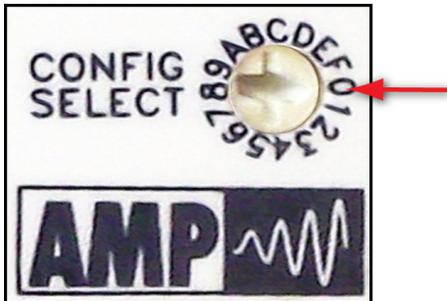
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AMP F-Series Interface Control Document

This document guides you through the steps and commands to program your F-series transceiver, transmitter, or receiver using a standard serial communications port interface. All information contained herein is applicable to the programming of the units at any of the available signalling levels, which may be RS232 (default), 5V TTL, 3.3V TTL, or RS422 as specified at time of purchase.

Step 1

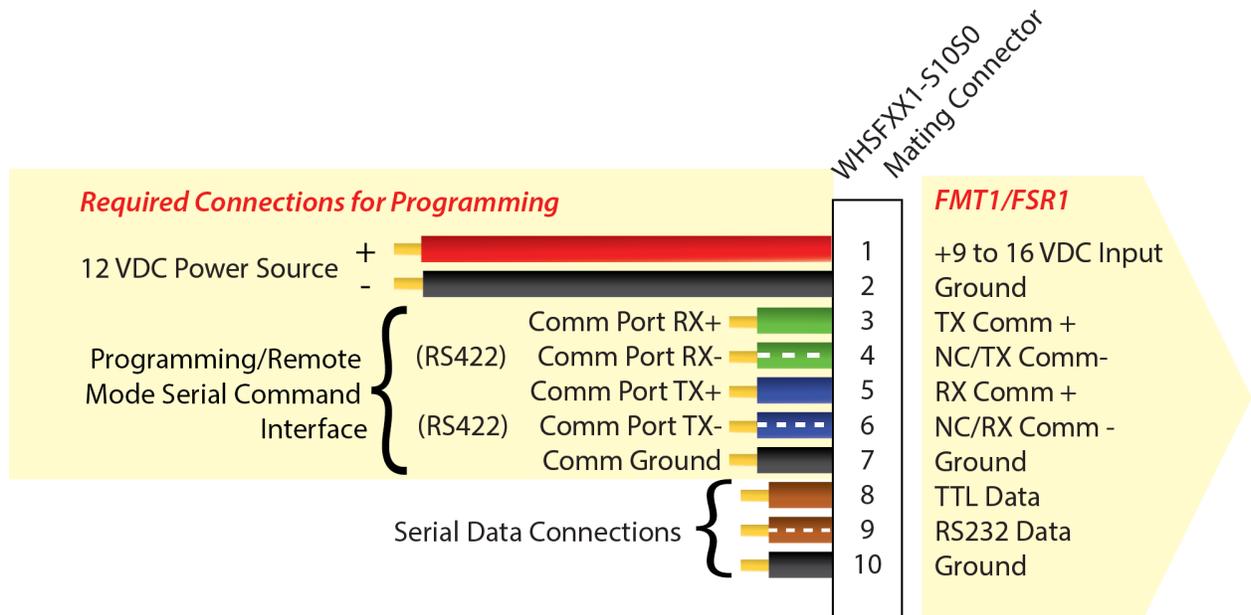
Set the rotary switch on the unit lid to the "0" position as shown below to set the unit to Remote Mode. The unit must be in Remote Mode to accept commands, answer queries, and program the Preset configurations. To access Preset Mode, position the switch to the desired Preset number (1-F).



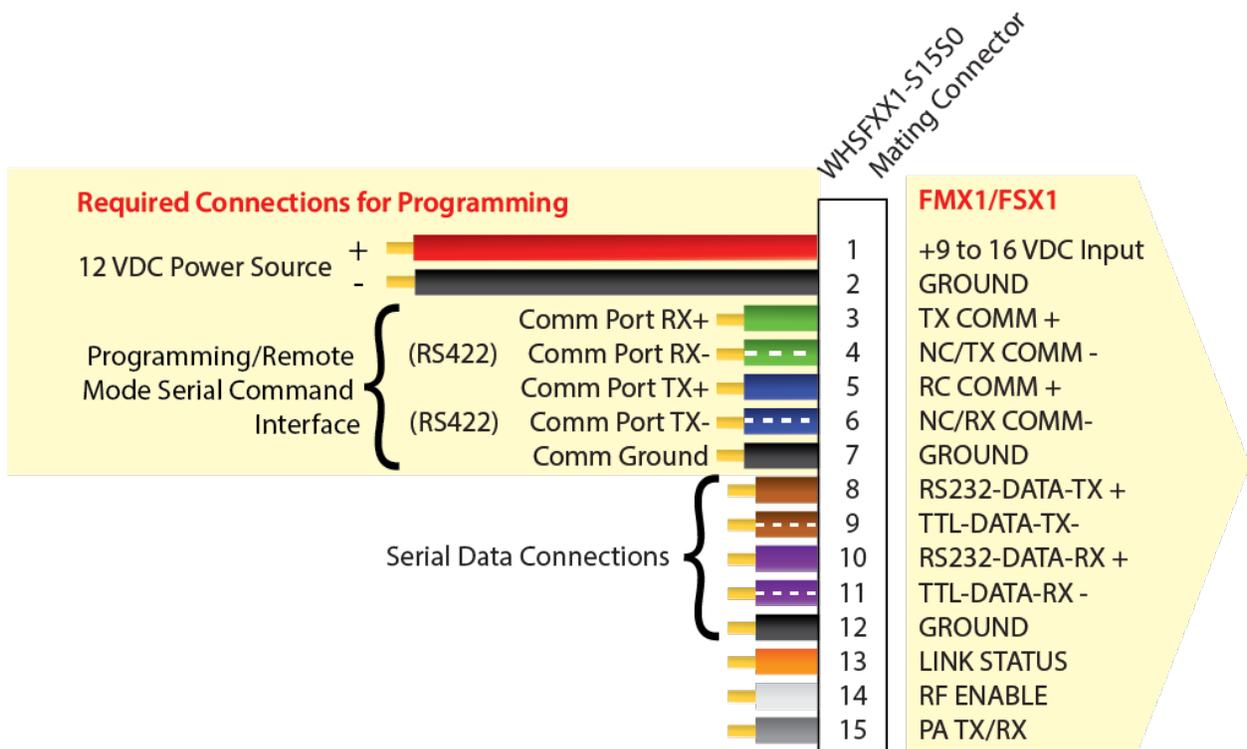
Step 2

Wire the power and comm (TX and RX) to the included mating connector using the wiring guide below.

FMT1/FSR1 Wiring



FMX1/FSX1 Wiring



Step 3

Set up your terminal.

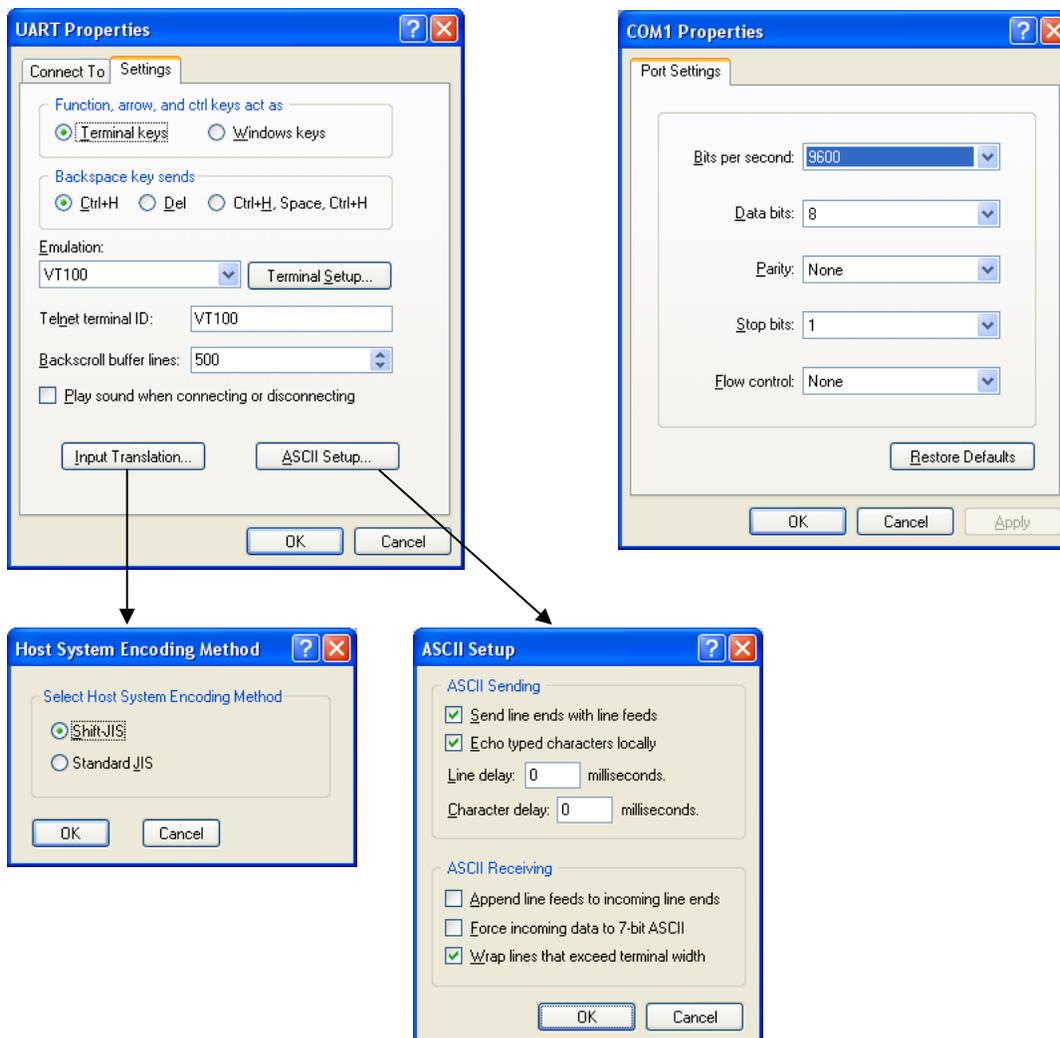
Hardware Parameters

UART/RS-232

Baud Rate	9600
Data Bits	8
Stop Bits	1
Parity	None
Handshake	None

Terminal Setup

When using a terminal program such as HyperTerminal or equivalent to interface with the F series, the following settings are recommended.



Step 4

Establish communication and send commands to your unit. Some commands may not be applicable depending on your product configuration.

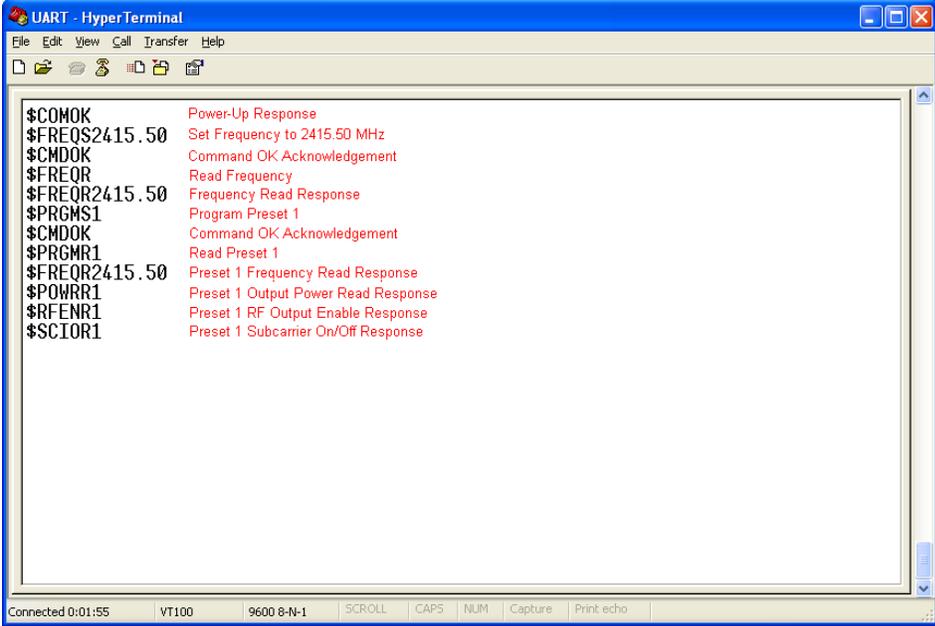
Power Up/Reset

All configurable parameters are stored in non-volatile flash memory internal to unit. After a power reset or fluctuation, the unit runs an initialization routine and restores itself to its last commanded state within 1 second. Once the unit is initialized and ready to receive commands, it will transmit the Communications OK string, \$COMOK[CR][LF].

If the switch is set to zero (0), once the unit is initialized and ready to receive commands, it will transmit the Communications OK string, \$COMOK[CR][LF]. If the unit is running and connected to a terminal when the 16 position rotary switch is set to zero (0), the unit will transmit the Communications OK string, \$COMOK[CR][LF], indicating that it is ready to receive commands.

Example Terminal Session

Descriptions are overlaid in red.



```
UART - HyperTerminal
File Edit View Call Transfer Help
$COMOK
$FREQS2415.50
$CMDOK
$FREQR
$FREQR2415.50
$PRGMS1
$CMDOK
$PRGMR1
$FREQR2415.50
$POWRR1
$RFENR1
$SCIOR1
Power-Up Response
Set Frequency to 2415.50 MHz
Command OK/Acknowledgement
Read Frequency
Frequency Read Response
Program Preset 1
Command OK/Acknowledgement
Read Preset 1
Preset 1 Frequency Read Response
Preset 1 Output Power Read Response
Preset 1 RF Output Enable Response
Preset 1 Subcarrier On/Off Response
Connected 0:01:55 VT100 9600 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Custom Serial Interface Considerations

When interfacing to a custom serial interface, the hardware parameters listed earlier in this document must be used. The following information may also be helpful for the interface programmer.

ASCII Character	Description	Hex Value	C Code Mnemonic
[LF]	Line Feed, New Line	A	\n
[CR]	Carriage Return	D	\r

Remote Commands

Command	Description	Applicable To		
		FMT1	FSR1	FMX1/FSX1
\$BAUDR	Baud Rate Read	X	X	X
\$BAUDS	Baud Rate Set	X	X	X
\$CTEST	Communications Test Read	X	X	X
\$DATAR	Data Input Type Read	X		X
\$DATAS	Data Input Type Set	X		X
\$DFLTS	Reset Unit to Factory Defaults	X	X	X
\$FREQR	Frequency Read	X	X	X
\$FREQS	Frequency Set	X	X	X
\$LINKR	Link ID Read			X
\$LINKS	Link ID Set			X
\$MODER	Initiator/Target Read			X
\$MODES	Initiator/Target Set			X
\$PRTYR	Parity Read	X	X	X
\$PRTYS	Parity Set	X	X	X
\$RFENR	RF Output Enable Read	X		X
\$RFENS	RF Output Enable Set	X		X
\$STOPR	Stop Bit Read	X	X	X
\$STOPS	Stop Bit Set	X	X	X
\$TEMPR	Temperature Read	X	X	X

Preset Commands

Command	Description	Applicable To		
		FMT1	FSR1	FMX1/FSX1
\$PREBR	Preset Baud Rate Read	X	X	X
\$PREBS	Preset Baud Rate Set	X	X	X
\$PREDR	Preset Data Input Type Read	X		X
\$PREDS	Preset Data Input Type Set	X		X
\$PREFR	Preset Frequency Read	X	X	X
\$PREFS	Preset Frequency Set	X	X	X
\$PREIR	Preset Parity Read	X	X	X
\$PREIS	Preset Parity Set	X	X	X
\$PRERR	Preset RF Enable Read	X		X
\$PRERS	Preset RF Enable Set	X		X
\$PRETR	Preset Stop Bit Read	X	X	X
\$PRETS	Preset Stop Bit Set	X	X	X

Command Definitions

“Remote” Commands

\$BAUDR[CR][LF]

\$BAUDR[CR][LF] is sent to the unit to query the Baud Rate selection. The unit will respond with \$BAUDR*[CR][LF] where * = 0-6 with the following values: 0=2400 bps, 1=4800 bps, 2=9600 bps, 3=19200 bps, 4=38400 bps, 5=57600 bps, 6=115200 bps. Units are set to 115200 bps by default.

\$BAUDS*[CR][LF]

\$BAUDS*[CR][LF] is sent to the unit to set the Baud Rate. * = 0-6 with the following values: 0=2400 bps, 1=4800 bps, 2=9600 bps, 3=19200 bps, 4=38400 bps, 5=57600 bps, 6=115200 bps. Units are set to 115200 bps by default.

\$CTEST[CR][LF]

When the Communications Test query \$CTEST[CR][LF] is sent the unit performs a self test including verification of on board peripherals and external communications. If the self test is successful, the unit responds with \$COMOK[CR][LF]. If the self test is unsuccessful, the unit will not respond. A successful response will be received within 100ms of the query.

\$DATAR[CR][LF]

\$DATAR[CR][LF] is sent to the unit to query the Data Input Type selection. The unit will respond with \$DATAR*[CR][LF] where * = 0 represents TTL and * = 1 represents RS232. Units are set to RS232 by default.

\$DATAS*[CR][LF]

\$DATAS*[CR][LF] is sent to the unit to set the Data Input Type. * = 0 represents TTL and * = 1 represents RS232. Units are set to RS232 by default.

\$DFLTS[CR][LF]

\$DFLTS[CR][LF] is sent to the unit to Reset Unit to Factory Default settings including preprogrammed frequencies. In order for a link to be operational while using the factory default settings, the \$DFLTS[CR][LF] command must be sent to both the transmitter and receiver. After the \$DFLTS[CR][LF] command has been sent, the unit will respond with \$CMDOK[CR][LF].

\$FREQR[CR][LF]

\$FREQR[CR][LF] is sent to query the unit's current Frequency setting. The unit will respond with \$FREQR****[CR][LF] where **** represents the frequency in MHz. Units are set to the low end of the specified frequency band by default.

\$FREQS** [CR][LF]**

\$FREQS**** [CR][LF] is sent to the unit to set the desired Frequency. **** represents the frequency in MHz. Units are set to the low end of the specified frequency band by default. The following example table illustrates command usage:

Band	Desired Frequency (MHz)	Command
43	433.5	\$FREQS433.5 [CR][LF]
86	868.3	\$FREQS868.3 [CR][LF]
91	922.0	\$FREQS922.0 [CR][LF]
S2	2414	\$FREQS2414 [CR][LF]

Channelization (channel spacing) for all standard units is as follows: 100 kHz for all bands under 1 GHz, 1 MHz for all bands over 1 GHz.

The following table illustrates the default programmed frequencies for units equipped with a 16 position rotary switch:

Frequency Band

	43	86	91	L1	L2	S1	S2	S3
1	433.0 MHz	868.0 MHz	902.0 MHz	1435 MHz	1700 MHz	2200 MHz	2400 MHz	2200 MHz
2	433.1 MHz	868.1 MHz	904.0 MHz	1442 MHz	1711 MHz	2214 MHz	2407 MHz	2221 MHz
3	433.3 MHz	868.3 MHz	906.0 MHz	1449 MHz	1721 MHz	2228 MHz	2414 MHz	2243 MHz
4	433.4 MHz	868.4 MHz	908.0 MHz	1456 MHz	1732 MHz	2243 MHz	2421 MHz	2264 MHz
5	433.5 MHz	868.6 MHz	909.0 MHz	1464 MHz	1743 MHz	2257 MHz	2428 MHz	2285 MHz
6	433.6 MHz	868.7 MHz	911.0 MHz	1471 MHz	1754 MHz	2271 MHz	2435 MHz	2307 MHz
7	433.8 MHz	868.9 MHz	913.0 MHz	1478 MHz	1764 MHz	2285 MHz	2442 MHz	2328 MHz
8	433.9 MHz	869.0 MHz	915.0 MHz	1485 MHz	1775 MHz	2300 MHz	2450 MHz	2350 MHz
9	434.0 MHz	869.1 MHz	917.0 MHz	1492 MHz	1786 MHz	2314 MHz	2457 MHz	2371 MHz
A	434.2 MHz	869.3 MHz	919.0 MHz	1499 MHz	1796 MHz	2328 MHz	2464 MHz	2392 MHz
B	434.3 MHz	869.4 MHz	921.0 MHz	1506 MHz	1807 MHz	2342 MHz	2471 MHz	2414 MHz
C	434.4 MHz	869.6 MHz	922.0 MHz	1514 MHz	1818 MHz	2356 MHz	2478 MHz	2435 MHz
D	434.5 MHz	869.7 MHz	924.0 MHz	1521 MHz	1829 MHz	2371 MHz	2485 MHz	2456 MHz
E	434.7 MHz	869.9 MHz	926.0 MHz	1528 MHz	1839 MHz	2385 MHz	2492 MHz	2478 MHz
F	434.8 MHz	870.0 MHz	928.0 MHz	1535 MHz	1850 MHz	2399 MHz	2499 MHz	2499 MHz

“Config Select” Preset

\$LINKR[CR][LF]

\$LINKR[CR][LF] is sent to the unit to query the link ID. The unit will respond with \$LINKR**[CR][LF] where ** represents the link ID in hexadecimal (00-FF). Units are set to Link ID AA by default.

\$LINKS[CR][LF]**

\$LINKS**[CR][LF] is sent to the unit to set the link ID. ** represents the link ID in hexadecimal (00-FF). The link ID must be set to the same value for both FMX1s in order to establish an operational data link. Units are set to Link ID AA by default.

\$MODER[CR][LF]

\$MODER[CR][LF] is sent to the unit to query the Initiator/Target status of the unit. The unit will respond with \$MODER*[CR][LF] where * = 0 represents Initiator and * = 1 represents Target. In order to establish an operational data link one FMX1 must be configured as the Initiator and the other must be configured as the Target. Units are configured as links prior to shipping from the factory and asserting the \$DFLTS[CR][LF] command does not reset the Initiator/Target mode setting.

\$MODES*[CR][LF]

\$MODES*[CR][LF] is sent to the unit to set the Initiator/Target status of the unit. * = 0 represents Initiator and * = 1 represents Target. In order to establish an operational data link one FMX1 must be configured as the Initiator and the other must be configured as the Target. Units are configured as links prior to shipping from the factory and asserting the \$DFLTS[CR][LF] command does not reset the Initiator/Target mode setting.

\$PRTYR[CR][LF]

\$PRTYR[CR][LF] is sent to the unit to query the data Parity selection. The unit will respond with \$PRTYR*[CR][LF] where * = 0 represents no parity, * = 1 represents odd parity, and * = 2 represents even parity. Units are set to no parity by default.

\$PRTYS*[CR][LF]

\$PRTYS*[CR][LF] is sent to the unit to set the data Parity. * = 0 represents no parity, * = 1 represents odd parity, and * = 2 represents even parity. Units are set to no parity by default.

\$RFENR[CR][LF]

\$RFENR[CR][LF] is sent to the unit to query the RF Output Enable status. The unit will respond with \$RFENR*[CR][LF] where * = 0 represents disabled and * = 1 represents enabled. Units are set to enabled by default.

\$RFENS*[CR][LF]

\$RFENS*[CR][LF] is sent to the unit to set the RF Output Enable. * = 0 represents disabled and * = 1 represents enabled. This command allows the transmitter to remain powered on and locked on frequency without broadcasting any data. Units are set to enabled by default.

\$STOPR[CR][LF]

\$STOPR[CR][LF] is sent to the unit to query the data Stop Bit selection. The unit will respond with \$STOPR*[CR][LF] where * = 1 represents 1 Bit and * = 2 represents 2 Bit. Units are set to 1 stop bit by default.

\$STOPS*[CR][LF]

\$STOPS*[CR][LF] is sent to the unit to set the data Stop Bits. * = 1 represents 1 Bit and * = 2 represents 2 Bit. Units are set to 1 stop bit by default.

\$TEMPR[CR][LF]

\$TEMPR[CR][LF] is sent to the unit to query the current Temperature of the unit. The unit will respond with \$TEMPR*##[CR][LF] where * indicates the sign of the temperature and ## represents the temperature in degrees Celsius.

“Preset” Commands

\$PREBR*[CR][LF]

\$PREBR*[CR][LF] is sent to the unit to query Baud Rate selection for an individual rotary switch preset. * represents the rotary switch Preset Number (0-F). The unit will respond with \$PREBR*-[#][CR][LF] where * = 0-F and # = 0-6 (0=2400 bps, 1=4800 bps, 2=9600 bps, 3=19200 bps, 4=38400 bps, 5=57600 bps, 6=115200 bps).

\$PREBS*-[#][CR][LF]

\$PREBS*-[#][CR][LF] is sent to the unit to set the Baud Rate. * represents the rotary switch Preset Number (0-F) and # represents the baud rate setting 0-6 (0=2400 bps, 1=4800 bps, 2=9600 bps, 3=19200 bps, 4=38400 bps, 5=57600 bps, 6=115200 bps).

\$PREDR*[CR][LF]

\$PREDR*[CR][LF] is sent to the unit to query Data Input Type selection for an individual rotary switch preset. * represents the rotary switch Preset Number (0-F). The unit will respond with \$PREDR*-[#][CR][LF] where * = 0-F and # = 0 or 1 (0 = TTL or 1 = RS232).

\$PREDS*-[#][CR][LF]

\$PREDS*-[#][CR][LF] is sent to the unit to set the Data Input Type for an individual rotary switch preset. * represents the rotary switch Preset Number (0-F) and # represents the data input type (0 = TTL or 1 = RS232).

\$PREFR*[CR][LF]

\$PREFR*[CR][LF] is sent to the unit to query the center Frequency for an individual rotary switch preset. * represents the rotary switch Preset Number (0-F). The unit will respond with \$PREFR*-[#####] where * = 0-F and ##### = frequency in MHz.

\$PREFS*-[#####][CR][LF]

\$PREFS*-[#####][CR][LF] is sent to the unit to set the center Frequency for an individual rotary switch preset. * represents the rotary switch Preset Number (0-F) and ##### represents the frequency in MHz.

\$PREIR*[CR][LF]

\$PREIR*[CR][LF] is sent to the unit to query the data Parity selection for an individual rotary switch preset. * represents the rotary switch Preset Number (0-F). The unit will respond with \$PREIR*-[#] where * = 0-F and # = 0-2 (0 = No Parity, 1 = Odd, 2 = Even).

\$PREIS*-[#][CR][LF]

\$PREIS*-[#][CR][LF] is sent to the unit to set the data Parity for an individual rotary switch preset. * represents the rotary switch Preset Number (0-F) and # represents the parity setting (0 = No Parity, 1 = Odd, 2 = Even).

\$PRERR*[CR][LF]

\$PRERR*[CR][LF] is sent to the unit to query the RF Output Enable status for an individual rotary switch preset. * represents the rotary switch Preset Number (0-F). The unit will respond with \$PRERR*-[#] where * = 0-F and # = 0 or 1 (0 = Disabled, 1 = Enabled).

\$PRERS*-[CR][LF]

\$PRERS*-[CR][LF] is sent to the unit to set the RF Output Enable for an individual rotary switch preset. * represents the rotary switch Preset Number (0-F) and # represents RF enable setting (0 = Disabled, 1 = Enabled).

\$PRETR*-[CR][LF]

\$PRETR*-[CR][LF] is sent to the unit to query the data Stop Bit selection for an individual rotary switch preset. * represents the rotary switch Preset Number (0-F). The unit will respond with \$PRERR*-[CR][LF] where * = 0-F and # = 1 or 2 (1 = 1 Bit, 2 = 2 Bit).

\$PRETS*-[CR][LF]

\$PRETS*-[CR][LF] is sent to the unit to set the data Stop Bits for an individual rotary switch preset. * represents the rotary switch Preset Number (0-F) and # represents the data stop bits setting (1 = 1 Bit, 2 = 2 Bit).

Command Quick Reference

Command	Command Description	Data	Response	Response Description
\$BAUDR	Baud Rate Read		\$BAUDR*	* = 1-6 (0=2400, 1=4800, 2=9600, 3=19200, 4=38400, 5=57600, 6=115200)
\$BAUDS*	Baud Rate Set	* = 1-6 (0=2400, 1=4800, 2=9600, 3=19200, 4=38400, 5=57600, 6=115200)	\$CMDOK	Command OK Response
\$CTEST	Communications Test Read		\$COMOK	Unit Communications OK
\$DATAR	Data Input Type Read		\$DATAR*	* = 0 or 1 (0 = TTL, 1 = RS232)
\$DATAS*	Data Input Type Set	* = 0 or 1 (0 = TTL, 1 = RS232)	\$CMDOK	Command OK Response
\$DFLTS	Reset Unit to Factory Defaults		\$CMDOK	Command OK Response
\$FREQR	Frequency Read		\$FREQR****	**** = MHz
\$FREQS*	Frequency Set	**** = Frequency in MHz	\$CMDOK	Command OK Response
\$LINKR	Link ID Read		\$LINKR**	** = Link ID in hexadecimal 00-FF
\$LINKS*	Link ID Set	** = Link ID hexadecimal 00-FF	\$CMDOK	
\$MODER	Initiator/Target Status Read		\$MODER*	* = 0 or 1 (0 = Initiator, 1 = Target)
\$MODES	Initiator/Target Status Set	* = 0 or 1 (0 = Initiator, 1 = Target)	\$CMDOK	
\$PRTYR	Parity Read		\$PRTYR*	* = 0-2 (0=None, 1=Odd, 2=Even)
\$PRTYS*	Parity Set	* = 0-2 (0=None, 1=Odd, 2=Even)	\$CMDOK	Command OK Response
\$RFENR	RF Output Enable Read		\$RFENR*	* = 0 or 1 (0 = Disabled, 1 = Enabled)
\$RFENS*	RF Output Enable Set	* = 0 or 1 (0 = Disable, 1 = Enable)	\$CMDOK	Command OK Response
\$STOPR	Stop Bit Read		\$STOPR*	* = 1 or 2 (1 = 1 Bit, 2 = 2 Bit)
\$STOPS*	Stop Bit Set	* = 1 or 2 (1 = 1 Bit, 2 = 2 Bit)	\$CMDOK	Command OK Response
\$TEMPR	Temperature Read		\$TEMPR###	* = + or - and ### = degrees Celsius
\$PREBR*	Preset Baud Rate Read	* = 0-F (Preset)	\$PREBR*-#	* = 0-F (Preset) and # = 0-6 (0=2400, 1=4800, 2=9600,

				3=19200, 4=38400, 5=57600, 6=115200)
\$PREBS* -#	Preset Baud Rate Set	* = 0-F (Preset) and # = 0-6 (0=2400, 1=4800, 2=9600, 3=19200, 4=38400, 5=57600, 6=115200)	\$CMDOK	Command OK Response
\$PREDR*	Preset Data Input Type Read	* = 0-F (Preset)	\$PREDR* -#	* = 0-F (Preset) and # = 0 or 1 (0=TTL, 1= RS232)
\$PREDS* -#	Preset Data Input Type Set	* = 0-F (Preset) and # = 0 or 1 (0=TTL, 1= RS232)	\$CMDOK	Command OK Response
\$PREFR*	Preset Frequency Read	* = 0-F (Preset)	\$PREFR* -####	* = 0-F (Preset) and #### = Frequency (MHz)
\$PREFS* -#	Preset Frequency Set	* = 0-F (Preset) and #### = Frequency (MHz)	\$CMDOK	Command OK Response
\$PREIR*	Preset Parity Read	* = 0-F (Preset)	\$PREIR* -#	* = 0-F (Preset) and # = 0-2 (0=None, 1=Odd, 2=Even)
\$PREIS* -#	Preset Parity Set	* = 0-F (Preset) and # = 0-2 (0=None, 1=Odd, 2=Even)	\$CMDOK	Command OK Response
\$PRERR*	Preset RF Enable Read	* = 0-F (Preset)	\$PRERR* -#	* = 0-F (Preset) and # = 0 or 1 (0 = Disabled, 1 = Enabled)
\$PRERS* -#	Preset RF Enable Set	* = 0-F (Preset) and # = 0 or 1 (0 = Disable, 1 = Enable)	\$CMDOK	Command OK Response
\$PRETR*	Preset Stop Bit Read	* = 0-F (Preset)	\$PRETR* -#	* = 0-F (Preset) and # = 1 or 2 (1 = 1 Bit, 2 = 2 Bit)
\$PRETS* -#	Preset Stop Bit Set	* = 0-F (Preset) and # = 1 or 2 (1 = 1 Bit, 2 = 2 Bit)	\$CMDOK	Command OK Response

Technical Support Information

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