3.4 Software Interface

3.4.1 Scope

3.4.1.1 Identification

This document defines the interface between the Operations Monitor and Control System and the TDRS User RF Test Set (TURFTS).

3.4.1.2 Interface Overview

The interface between the OMCS and the TURFTS consists of two information flows. The basic structure and mode of operation is identical for each flow. These flows are:

a. Control
b. Status

3.4.1.2.1 Control

Control data flows from the OMCS to the TURFTS as a directive/response sequence. The directive will be sent by the OMCS at the direction of the operator or by program control. When the directive is received, the TURFTS will interpret the directive and generate the appropriate response.

All control sequences sent to the TURFTS will be in the form of an ASCII character string. Responses from the TURFTS shall be formatted as described in Appendix I.

3.4.1.2.2 Status

The status data flow is a sub-set of the control data flow. The OMCS will pool the TURFTS for a status block (directive). The TURFTS will reply with the desired status block (response).

3.4.2 Interface Specifications

3.4.2.1 Interfaces

There are two data exchanges between the OMCS and the TURFTS:

a. Control
b. Status

3.4.2.2 Control

The control portion of the interface is implemented as a set of directive/response messages.

3.4.2.3 Message Descriptions

The description for the control directive message is shown in Table IV.

Table IV. Directive Message Description

Field	Length	Explanation/<Value>
Start of Message	1 byte	<1>
Sub Unit Address	1 byte	<0>
Length	2 bytes	block length
Sequence Code	1 byte	<0>..<255>
Message ID	1 byte	<0x12>
Directive String	<80 bytes	Command data (up to 80 bytes)
CRC	2 bytes	CRC-16

Sequence Code: A unique number from 0 to 255 that identifies a specific directive. The number recycles to 0 after it reaches 255.

Message ID: Unique identifier for each message. The ID for a directive message is 12 (Hex Value)

Directive String: Free form variable length ASCII string with a maximum length of 80 bytes.

The control response is illustrated in Table V.

Table V. Response Message Description

Field	Length	Explanation/<Value>
Start of Message	1 byte	<1>
Sub Unit Address	1 byte	<0>
Length	2 bytes	block length
Sequence Code	1 byte	Matches directive block
Message ID	1 byte	<0x13>
Response Category	2 bytes	Type of response. See Table VI
Directive String	<=80 bytes	Response message (up to 80 bytes)
CRC	2 bytes	CRC-16

Sequence Code: A unique number from 0 to 255 that identifies a specific directive. The response message sequence code must match the code contained in the directive message.

Message ID: Unique identifier for each message. The ID for a directive message is 13 (Hex Value)

Directive String: Value from TURFTS that indicates its response to the directive. The values are defined in Table VI.

Table VI. Response Categories

Code	Response
0	Accepted
1..3,5	Unused
4	Rejected

The TURFTS should place the proper code in the field reflecting its response to the directive. The TURFTS will only accept the directive or reject the directive. When the directive is rejected the TURFTS can place a message explaining why the directive was rejected in the directive string field.

3.4.2.4 Data Elements

Data elements for control data can be broken down into two different classes; batch file commands and individual commands.

3.4.2.4. 2 Commands

This directive allows the operator to configure one item on the TURFTS. The syntax is

CNF <parm=value>

parm - the mnemonic that identifies the specific parameter to be altered.

Value - the new value for the specific parameter.

For example: CNF RXCF=2287.5

This command causes TURFTS to set the receiver to a center frequency of 2287.5 Mhz.

Valid TURFTS commands are presented in Section 3.4.4.

3.4.3 Status

The status interface consists of a message flowing from the OMCS to the TURFTS asking for a specific status message. The TURFTS will respond by sending the desired status data to the OMCS.

3.4.3.1 Message Descriptions

Table VII provides the structure for the status block request.

Table VII. Status Request Message

Field	Length	Explanation/<Value>
Start of Message	1 byte	<1>
Sub Unit Address	1 byte	<0>
Length	2 bytes	block length
Reserved	1 byte	<0>
Message ID	1 byte	<0x18>
Reserved	1 byte	<0>
Segment Number	1 byte	Segment Required <01>
CRC	2 bytes	CRC-16

Message ID: Unique identifier for each message. The ID for a directive message is 18 (Hex Value)

Segment Number: A unique identification number for the status segment. Valid values are 0 to 127.

Table VIII provides the structure for the data portions of the status block.

Table VIII. Status Block

Field	Length	Explanation/<Value>
Start of Message	1 byte	<1>
Sub Unit Address	1 byte	<0>
Length	2 bytes	block length
Reserved	1 byte	<0>
Message ID	1 byte	<0x19>
Segment Number	1 byte	Low order bit is high order bit of segment length
Segment Length	1 byte	Low order 8 bits of segment length in bytes
Segment Data	N bytes	Data structure
CRC	2 bytes	CRC-16

Message ID: Unique identifier for each message. The ID for a directive message is 19 (Hex Value)

Segment Number: A unique identification number for the status segment. Valid values are 0 to 127. The segment number is bits 1 through 7 of the segment number field and is unique for each status segment. The segment number identifies that segment to the OMCS driver for parsing and conversion before the data is placed in the OMCS database.

Segment Length: The number of bytes contained in the segment data field. It consists of the low order bit of the segment number field and the eight bits of the segment length, allowing for a maximum length of 512 bytes.

3.4.3.2 Data Elements

The data elements that make up each type of status block are described below.

3.4.3.2.1 TURFTS Status Message

This message provides all status from TURFTS in one block. Its identification parameters are:

Segment ID = 01

Segment Name = TURFTS Status

Segment Length = <133> Bytes

The data element structure are shown in Table IX

Table IX. TURFTS Status

#	Data Type	Length	Description	Value	Block Index
1	BI	1 byte	TURFTS Control	0=Remote / 1=Local	0
2	MBBI	2 bytes	TURFTS Status Word		1..2
			Bit Function		
			15 PN Loop Lock	0=Unlocked/1=Locked	
			14 Carrier Loop Lock	0=Unlocked/1=Locked	
			13 Subcarrier Lock	0=Unlocked/1=Locked	
			12 I-Ch Bit-Sync Lock	0=Unlocked/1=Locked	
			11 Q-Ch Bit-Sync Lock	0=Unlocked/1=Locked	
			10 I-Ch Decoder Lock	0=Unlocked/1=Locked	
			9 Q-Ch Decoder Lock	0=Unlocked/1=Locked	
			8 Receiver Fault	0=Fault/1=No Fault	
			7 Transmitter Fault	0=Fault/1=No Fault	
			6 TURFTS Fault	0=Fault/1=No Fault	
			5 Transmitter ON/OFF	0=Off/1=On	
			3..4 Service Configuration	0=Self Test	
				1=Diplexed	
				1=No Diplexed	
			0..2 Receiver State	0=Initialization	
				1=AGC	
				2=PN Code Acq	
				3=Long PN Code Acq	
				4=Carrier Estimation	
				5=Carrier Acquisition	
				6=Tracking	
				7= SubCarrier Acquisition	
3	Integer	1 byte	Spec Analyzer Test Pt		3
			0=Forward Link		
			1=Return Link		
			2=RX RFDIS 370 MHz IF		
			3=RX 370 MHz IF		
			4=RX 70 MHz Carrier Loop IF		
			5=RX 70 MHz PN Loop IF		
			6=RX 70 MHz I Ch Demod IF		
			7=RX 70 MHz Q Ch Demod IF		
4	ASCII	11 bytes	RX Center Freq (Mhz)		4..14
5	Float	4 bytes	RX Offset Freq (Hz)		15..18
6	Float	4 bytes	Rx Signal Level (dBm)		19..22
7	Float	4 bytes	Reserved		23..26
8	Float	4 bytes	I-Channel Eb/No		27..30
9	Float	4 bytes	Q-Channel Eb/No		31..34
10	Float	4 bytes	Car Phase Error (Deg)		35..38
11	Integer	1 byte	Carrier Loop Track BW		39
			0=30 Hz		
			1=70 Hz		
			2=500 Hz		
			3=1000 Hz		

Table IX. TURFTS Status

#	Data Type	Length	Description	Value	Block Index
12	Integer	1 byte	Receiver Mode 0=F/L 1=Mode 1 2=Mode 2 3=Mode 3 4=GN		40
13	Integer	1 byte	Track Channel 0=I-Channel 1=Q-Channel		41
14	ASCII	11 bytes	TX Center Freq (Mhz)		42..52
15	Float	4 bytes	TX Offset Freq (Hz)		53..56
16	Integer	1 byte	TX Sweep Status	0=Off 1=Linear Continuous 2=Linear One-Way 3=Table Sweep/Sync 4=Table Sweep/No Sync	57
17	Integer	1 byte	Sweep State	0=Running 1=Holding 2=Slewing to Zero	58
18	MBBI	2 bytes	TX Fault Status Word (0=Fault for all bits) Bit Use 15-9 Not Used 8 Power Supplies 7 Transfer Switches 6 Attenuators 5 QPSK Modulator 4 x14 Multiplier 3 x3 Multiplier 2 DSP Ready 1 Reference Frequency Sources 0 Modules Present		59..60
19	MBBI	1 byte	RX Fault Status Word (0=Fault for all bits) Bit Use 7 Not Used 6 Power Supplies 5 Transfer Switches 4 Attenuators 3 x16 Multiplier 2 DSP Ready 1 Reference Frequency Sources 0 Modules Present		61

Table IX. TURFTS Status

#	Data Type	Length	Description	Value	Block Index
20	MBBI	2 byte	Module Presence Word (0=Fault for all bits)		62..63
			Bit Use		
			15..12	Not Used	
			11	RFD - RF Distribution	
			10	A12 - Subcarrier RCVR	
			9	A11 - Not Used	
			8	A10 - Data Simulator	
			7	A9 - Not Used	
			6	A8 - Bit-Sync & Decoder	
			5	A7 - DSP	
			4	A6 - Data Demodulator	
			3	A5 - Tracking IF	
			2	A4 - RX PNG & Synthesizer	
			1	A3 - TX Frequency Source	
			0	A2 - Reference Frequency Source	
21	MBBI	3 bytes	Ref. Freq Status Word (0=Fault for all bits)		64..66
			Bit Use		
			23	n/c	
			22	n/c	
			21	A6 Q Demod LO	
			20	A6 I Demod LO	
			19	A6 Q-PN LO	
			18	A6 I-PN LO	
			17	A5 LO Fault	
			16	A5 Carrier Loop LO	
			15	A5 PN Loop LO	
			14	A5 TKPN LO	
			13	A5 SPN LO	
			12	A4 Carrier Loop LO	
			11	A3 PN Clock PLL	
			10	A3 Translator LO Signal Present	
			9	A3 Translator LO PLL	
			8	A3 Transmitter LO Signal Present	
			7	A3 Transmitter Synth PLL	
			6	A4 Receiver LO Signal Present	
			5	A4 Receiver Synth PLL	
			4	A2 10 MHz	
			3	A2 50 MHz	
			2	A2 70 MHz	
			1	A2 110 MHz	
			0	A2 280 MHz	
22	Integer	1 byte	File Number		67

Table IX. TURFTS Status

#	Data Type	Length	Description	Value	Block Index
23	MBBI	1 byte	RX Config Word		68
			Bit Use	Description	
			7 Not Used		
			6 Track Loop BW Control	0=Auto/1=Manual	
			5 Acq Loop BW Control	0=Auto/1=Manual	
			4..3 Expected C/No		0=Low
				1=Med	
				2=High	
			2 Q Ch PN Code	0=Off/1=On	
			1 I Ch PN Code	0=Off/1=On	
			0 Track Channel	0=I/1=Q	
24	Float	11 asc	RX Center Freq (Mhz) (Cmd)		69..79
25	Float	4 bytes	RX Offset Freq (Cmd)		80..83
26	Integer	1 byte	RX User Code		84
27	MBBI	1 byte	RX Config Word #2		85
			Bit Use	Description	
			7		
			6..5 Agency User Code	0=NASA	
				1=NASDA	
				2=ESA	
			3..4 I:Q Power Ratio	0=10:1	
				1=1:1	
				2=1:2	
				3=1:4	
			0-2 TDRSS Mode	0=F/L	
				1=R/L Mode 1	
				2=R/L Mode 2	
				3=R/L Mode 3	
				4=GN	
28	Float	4 bytes	I-Ch Data Rate (Kbps)		86..89
29	Float	4 bytes	Q-Ch Data Rate (Kbps)		90..93
30	MBBI	1 byte	Bit-Sync Word		94
			Bit Use	Description	
			7-6 Not Used		
			3-5 Q Ch Bit-Sync BW	0=12.5%	
				1= 5.0%	
				2= 2.0%	
				3= 0.1%	
				4= 0.5%	
				5= 0.25%	
				6= 0.125%	
			0-2 I Ch Bit-Sync BW	0=12.5%	
				1= 5.0%	
				2= 2.0%	
				3= 0.1%	
				4= 0.5%	
				5= 0.25%	
				6= 0.125%	

Table IX. TURFTS Status

#	Data Type	Length	Description	Value	Block Index
31	MBBI	1 byte	Carrier Loop Word		95
			Bit Use	Description	
			7-4 Not Used		
			2-3 Track Loop BW	0= 30 Hz	
				1= 70 Hz	
				2= 500 Hz	
				3=1000 Hz	
			0-1 Acquisition Loop BW	0= 30 Hz	
				1= 70 Hz	
				2= 500 Hz	
				3=1000 Hz	
32	MBBI	1 byte	Bit Sync I-Ch Data Encode/Format		96
			Bit Use	Description	
			7-4 Data Format	0=NRZ-L	
				1=NRZ-M	
				2=NRZ-S	
				3=Bi∅-L	
				4=Bi∅-M	
				5=Bi∅-S	
			3-0 Encoding	0=None	
				1=Rate 1/2, G2 Norm	
				2=Rate 1/2, G2 Inv	
33	MBBI	1 byte	Bit Sync Q-Ch Data Encode/Format		97
			Bit Use	Description	
			7-4 Data Format	0=NRZ-L	
				1=NRZ-M	
				2=NRZ-S	
				3=Bi∅-L	
				4=Bi∅-M	
				5=Bi∅-S	
				6=NRZ-L Interleaved	
				7=NRZ-M Interleaved	
				8=NRZ-S Interleaved	
			3-0 Encoding	0=None	
				1=Rate 1/2, G2 Norm	
				2=Rate 1/2, G2 Inv	
				3=Rate 1/3	

Table IX. TURFTS Status

#	Data Type	Length	Description	Value	Block Index
34	MBBI	1 byte	TX Config Word		98
			Bit Use	Description	
			7-5 Sweep Mode	0=Off	
				1=Linear Continuous	
				2=Linear One-Way	
				3=Table Sweep/Sync	
				4=Table Sweep/No Sync	
			4-3 Agency User Code	0=NASA	
				1=NASDA	
				2=ESA	
			2 Q-PN Code	0=Off/1=On	
			1 I-PN Code	0=Off/1=On	
			0 Transmitter Output	0=Off/1=On	
35	ASCII	11 bytes	TX Center Freq (Mhz) (Cmd)		99..109
36	Float	4 bytes	TX Offset Freq (Hz) (Cmd)		110..113
37	Float	4 bytes	Power Output (dBm)		114..117
38	Integer	1 byte	TX User Code		118
39	MBBI	1 byte	TX Config Word #2		119
			Bit Use	Description	
			7 Not Used		
			6-5 I-Ch Data Simulator Output	0=Off	
				1=External, User Input	
				2=Data Simulator	
			4-3 I:Q Power Ratio	0=10:1	
				1=1:1	
				2=1:2	
				3=1:4	
			2-0 TDRSS Mode	0=F/L	
				1=R/L Mode 1	
				2=R/L Mode 2	
				3=R/L Mode 3	
40	MBBI	1 byte	PRN Length Word		120
			Bit Use	Description	
			7-6 Q-Ch Data Simulator Output	0=Off	
				1=I-Channel	
				2=Q-Ch Data Simulator	
			3-5 I-Ch PRN Reg Length	0=3	
				1=7	
				2=11	
				3=15	
				4=20	
				5=23	
			0-2 Q-Ch PRN Reg Length	0=3	
				1=7	
				2=11	
				3=15	
				4=20	
				5=23	

Table IX. TURFTS Status

#	Data Type	Length	Description	Value	Block Index
41	Float	4 bytes	Data Source: I-Ch Data Rate (kbps)		121..124
42	Float	4 bytes	Data Source: Q-Ch Data Rate (kbps)		125..128
43	Float	4 bytes	Sweep Rate (Hz/Sec)		129..132
44	Float	4 bytes	Sweep Range (Hz)		133..136
45	Float	4 bytes	TX SubCarr Center Freq (Khz)		137..140
46	Float	4 bytes	Subcarrier Receiver Mod. Index		141..144
47	MBBI	1 byte	TX PM Source Config Word		145
			Bit Use	Description	
			4-7 Not Used		
			3 Ch-4, Aux Input	0=OFF, 1=ON	
			2 Ch-3, GN User Cmd	0=OFF, 1=ON	
			1 Ch-2, Carrier Data	0=OFF, 1=ON	
			0 Ch-1, SubCarrier	0=OFF, 1=ON	
48	Float	4 bytes	TX PM Mod Index,Ch1,SubCarr		146..149
49	Float	4 bytes	TX PM Mod Index,Ch2,Carrier Data		150..153
50	Float	1 byte	TX PM Mod Index Type, User Cmd		154
			0 Baseband		
			1 Subcarrier		
51	Float	1 byte	TX PM Mod Index Type, Aux Input		155
			0 Baseband		
			1 Subcarrier		
52	Integer	6 bytes	Reserved		156..161
53	Float	4 bytes	RX SubCarr Center Freq (Khz) (Received)		162..165
54	Float	4 bytes	RX SubCarr Offset Freq (Hz) (Received)		166..169
55	Integer	1 byte	Reserved		170
56	Float	4 bytes	RX SubCarr Phase Error (Deg)		171..174
57	Float	4 bytes	RX SubCarr Center Freq (Khz) (Cmd)		175..178
58	Float	4 bytes	RX Sweep Range		179..182
59-78	Integer	1 Byte	Reserved Bytes		183..202

3.4.4 TURFTS Commands

	CMD	DESCRIPTION	VALID VALUES (Prec)
0	RXCF	Receiver Center Frequency	2200-2300 MHz (6)
1	RXOF	Receiver Offset Frequencies	-999999 - 999999 Hz
3	RXCN	Receiver Expected C/No Range	0 - 2
		0 Low	
		1 Medium	
		2 High	
4	TSRV	TURFTS Service	0 - 2
		0 Self Test	
		1 Diplexed	
		2 Non Diplexed	
5	RXTC	Receiver Track Channel	0=I-Ch/1=Q-Ch
6	RXIR	Receiver I-Channel Data Rate	0 - 3000 kbps
7	RXQR	Receiver Q-Channel Data Rate	0 - 3000 kbps
8	RXIE	Receiver I-Channel Encoding	0 - 2
		0 None	
		1 Rate 1/2, G2 Non Inverted	
		2 Rate 1/2, G2 Inverted	
9	RXQE	Receiver Q-Channel Encoding	0 - 3
		0 None	
		1 Rate 1/2, G2 Non Inverted	
		2 Rate 1/2, G2 Inverted	
		3 Rate 1/3	
10	RXAB	Receiver Acquisition Loop BW	0 - 3
		0 30 Hz	
		1 70 Hz	
		2 500 Hz	
		3 1000 Hz	
11	RXTB	Receiver Tracking Loop BW	0 - 3
		0 30 Hz	
		1 70 Hz	
		2 500 Hz	
		3 1000 Hz	
12	RXAM	Receiver Acq. Loop Mode	0=AUTO/1=MANUAL
13	RXTM	Receiver Tracking Loop Mode	0=AUTO/1=MANUAL
14	RXIB	Receiver I-Ch Bit-Sync BL	0 - 6
		0 12.5%	
		1 5%	
		2 2%	
		3 1%	
		4 0.5%	
		5 0.25%	
		6 0.125%	
15	RXQB	Receiver Q-Ch Bit-Sync BL	0 - 6
		0 12.5%	
		1 5%	
		2 2%	
		3 1%	
		4 0.5%	
		5 0.25%	
		6 0.125%	

3.4.4 TURFTS Commands (Cont'd)

	CMD	DESCRIPTION	VALID VALUES/RANGES
16	RXUC	Receiver TDRSS User Code	1 - 85
17	RXMD	Receiver TDRSS Mode	0 - 5
		0 F/L	
		1 DG1 Mode 1	
		2 DG1 Mode 2	
		3 DG1 Mode 3	
		4 GN	
		5 Data Direct (Real Time & Diag Mode)	
18	RXIQ	Receiver I:Q Power Ratio	0 - 4
		0 10:1	
		1 1:1	
		2 1:2	
		3 1:4	
19	RXIP	Receiver I PN Code	0=OFF/1=ON
20	RXQP	Receiver Q PN Code	0=OFF/1=ON
21	TXCF	Transmitter Center Frequency	2025 - 2118 MHz (6)
22	TXOF	Transmitter Offset Frequency	-999999 - 999999 Hz
23	TXFR	Transmitter Sweep Rate	0 - 35 KHz/sec
24	TXSR	Transmitter Sweep Range	-999999 - 999999 Hz
25	TXSM	Transmitter Sweep Mode	0 - 2
		0 Off	
		1 Linear Continous	
		2 Linear One-Way	
26	TXSC	Transmitter Sweep Reset	1
27	TXOL	Transmitter Output Level	-163 - 10 dBm
28	TXOC	Transmitter Output Control	0=OFF/1=ON
29	TXIQ	Transmitter I:Q Power Ratio	0 - 3
		0 10:1	
		1 1:1	
		2 1:2	
		3 1:4	
30	TXUC	Transmitter TDRSS User Code	1 - 85
31	TXMD	Transmitter TDRSS Mode	0 - 4
		0 F/L	
		1 DG1 Mode 1	
		2 DG1 Mode 2	
		3 DG1 Mode 3	
		4 GN	
32	TXIP	Transmitter I PN Code	0=OFF/1=ON
33	TXQP	Transmitter Q PN Code	0=OFF/1=ON
34	DSIC	Data Simulator I-Ch Control	0 - 2
		0 Off	
		1 External User Commands	
		2 Data Simulator	
35	DSQC	Data Simulator Q-Ch Control	0 - 2
		0 Off	
		1 I-Channel	
		2 Data Simulator	

3.4.4 TURFTS Commands (Cont'd)

	CMD	DESCRIPTION	VALID VALUES/RANGES
36	DSIR	Data Simulator I-Ch Rate	0 - 10000 Kbps (3)
37	DSQR	Data Simulator Q-Ch Rate	0 - 10000 Kbps (3)
38	DSIL	Data Simulator, I-Ch PRN Length	0 - 5
		0 2^3-1	
		1 2^7-1	
		2 2^{11}-1	
		3 2^{15}-1	
		4 2^{20}-1	
		5 2^{23}-1	
39	DSQL	Data Simulator, Q-Ch PRN Length	0 - 5
		0 2^3-1	
		1 2^7-1	
		2 2^{11}-1	
		3 2^{15}-1	
		4 2^{20}-1	
		5 2^{23}-1	
40	DSIE	Data Simulator I-Ch Diff Enc	0 - 2
		0 None	
		1 Rate 1/2, G2 Norm	
		2 Rate 1/2, G2 Inverted	
41	DSQE	Data Simulator Q-Ch Diff Enc	0 - 3
		0 None	
		1 Rate 1/2, G2 Norm	
		2 Rate 1/2, G2 Inverted	
		3 Rate 1/3	
42	DSIF	Data Simulator I-Ch Data Format	0 - 5
		0 NRZ-L	
		1 NRZ-M	
		2 NRZ-S	
		3 Bi∅-L	
		4 Bi∅-M	
		5 Bi∅-S	
43	DSQF	Data Simulator Q-Ch Data Format	0 - 8
		0 NRZ-L	
		1 NRZ-M	
		2 NRZ-S	
		3 Bi∅-L	
		4 Bi∅-M	
		5 Bi∅-S	
		6 NRZ-L Interleaved	
		7 NRZ-M Interleaved	
		8 NRZ-S Interleaved	
44	DXPA	TX User Agency PN Code	0 - 2
		0 NASA	
		1 NASDA	
		2 ESA	
45	TXEA	TX External Attenuation	>=0

3.4.4 TURFTS Commands (Cont'd)

	CMD	DESCRIPTION	VALID VALUES/RANGES
46	RXIF	RX I-Ch Data Format	0 - 5
		0 NRZ-L	
		1 NRZ-M	
		2 NRZ-S	
		3 BiØ-L	
		4 BiØ-M	
		5 BiØ-S	
47	RXQF	RX Q-Ch Data Format	0 - 8
		0 NRZ-L	
		1 NRZ-M	
		2 NRZ-S	
		3 BiØ-L	
		4 BiØ-M	
		5 BiØ-S	
		6 NRZ-L Interleaved	
		7 NRZ-M Interleaved	
		8 NRZ-S Interleaved	
48	PMI1	Subcarrier Test Src Mod Index, CH-1	0.2 to 1.5 Rad
49	PMI2	Carrier Data Test Src Mod Index, CH-2	0.2 to 1.5 Rad
50	PMTU	GN User Commands MI Type	0 - 1
		0 Baseband	
		1 Subcarrier	
51	PMTA	GN Aux Input MI Type	0 - 1
		0 Baseband	
		1 Subcarrier	
52	TPS1	Subcarrier Test Src, CH-1	0=OFF/1=ON
53	TPS2	Carrier Data Test Src, CH-2	0=OFF/1=ON
54	TPS3	GN User Commands, CH-3	0=OFF/1=ON
55	TPS4	GN Aux Input, CH-4	0=OFF/1=ON
56	TSCF	SubCar Test Src Center Freq	16 to 1024 KHz
57	RSCF	SubCar RX Center Freq	16 to 1024 KHz
58	RXMI	RX Mod. Index	0.2 to 1.5 Radians
59	RSPA	RX User Agency PN Code	0 - 2
		0 NASA	
		1 NASDA	
		2 ESA	
60	RAPN	Reacquisition - PN	
61	RACR	Reacquisition - Carrier	
62	RAIB	Reacquisition - I-Channel Bit-Sync	
63	RAQB	Reacquisition - Q-Channel Bit-Sync	
64	RAID	Reacquisition - I-Channel Decoder	
65	RAQD	Reacquisition - Q-Channel Decoder	
66	FILE	Load Configuration File	0-20

3.4.4 TURFTS Commands (Cont'd)

	CMD	DESCRIPTION	VALID VALUES/RANGES
67	SPEC	Spec Analyzer Test Pt Select 0=TX 2106.40625 MHz 1=RX 2287.5 MHz 2=RX RFDIS 370 MHz IF 3=RX 370 MHz IF 4=RX 70 MHz Carrier Loop IF 5=RX 70 MHz PN Loop IF 6=RX 70 MHz I Ch Demod IF 7=RX 70 MHz Q Ch Demod IF	0-15

3.4.5 TURFTS Error Messages

If TURFTS rejects a command or status request it will respond with the following string:

FAIL - *REASON*

Where *REASON* is one of the following:

BAD CRC
IN LOCAL MODE
BAD COMMAND
VALUE OUT OF RANGE
BAD STATUS REQUEST

3.4.6 Valid Data Types

The valid data types for the TURFTS to OMCS interface are:

BI	a single bit input
MBBI	a multi-bit binary input, up to 16 bits as a single word
Integer	a 8 bit unsigned numeric value
Float	a 32 bit IEEE format floating point number
ASCII	a 8 bit ASCII character