

Figure 1. MDR Format (192 Bit Frame) (Sheet 1 of 2)

1	TIME TAG			
2	SC/ID	TIME COR FLAG	DAY OF YEAR	
3	UDT	DDT	SYNC COND CODE	DQI
4	# BIT ERRORS PN	YEAR DIGIT	SNR	
5	DSS	LOCK STATUS BITS	CONFIGURATION INDICATORS	
6	SPCL DATA TYPE	GDD	# OF DATA BITS IN RECORD	
7	#AGC SAMP AVER	HSD ERR CON BITS	RATE OF DATA TRANSMISSION	
8	AVERAGE AGC OVER DATA IN RECORD			
9	FORMAT	SPARE	NUMBER OF FRAMES	
10	ZEROS			
11	192 BIT FRAME ONE			
:				
:				
:				
:				
16	192 BIT FRAME TWO			
17				
:				
:				
:				
22	192 BIT FRAME THREE			
23				
:				
:				
:				
28	192 BIT FRAME FOUR			
29				
:				
:				
:				
34	MS CLOCK LSB'S (FRAME 2 OF 4)		MS CLOCK LSB'S (FRAME 3 OF 4)	
35	MS CLOCK LSB'S (FRAME 4 OF 4)		DDA I/P ERRORS (1)	DDA
36	COMPUTATIONS (1)	DDA STATUS (1)	SPARE	GROUND RECEIVER AGC
37	DDA I/P ERRORS (2)	DDA COMPUTATIONS (2)		DDA STATUS (2)
38	SPARE		DDA I/P ERRORS (3)	DDA
39	COMPUTATIONS (3)	DDA STATUS (3)	SPARE	
40	DDA I/P ERRORS (4)	DDA COMPUTATIONS (4)		DDA STATUS (4)
41	SCF 1	SCF 2	SCF 3	SCF 4
42				

Figure 1. MDR Format (384 Bit Frame) (Sheet 2 of 2)

1	TIME TAG							
2	SC/ID	TIME COR FLAG	DAY OF YEAR					
3	UDT	DDT	SYNC COND CODE	DQI				
4	# BIT ERRORS PN	YEAR DIGIT	SNR					
5	DSS	LOCK STATUS BITS	CONFIGURATION INDICATORS					
6	SPCL DATA TYPE	GDD	# OF DATA BITS IN RECORD					
7	#AGC SAMP AVER	HSD ERR CON BITS	RATE OF DATA TRANSMISSION					
8	AVERAGE AGC OVER DATA IN RECORD							
9	FORMAT	SPARE	NUMBER OF FRAMES					
10	ZEROS							
11	384 BIT FRAME ONE							
:								
:								
:								
:								
:								
:								
:								
:								
:								
:								
22	384 BIT FRAME TWO							
23								
:								
:								
:								
:								
:								
:								
:								
:								
:								
34	384 BIT FRAME TWO							
35					MS CLOCK LSB'S (FRAME 2 OF 2)		SPARE	
36					SPARE		DDA I/P ERRORS (1)	DDA
37					COMPUTATIONS (1)	DDA STATUS	SPARE	GROUND RECEIVER AGC
38					DDA I/P ERRORS (2)	DDA COMPUTATIONS (2)		DDA STATUS (2)
39					SPARE		FILLER	
40					FILLER			
41					FILLER			
42					SCF 1	SCF 2		

Table 1. MDR Format Description (Sheet 1 of 5)

ITEM	LENGTH & ORIENTATION	DESCRIPTION
TIME TAG	1 fullword (32 bits)	Binary time in elapsed milliseconds from start of day (GMT) of ground receipt at specified Deep Space Station (DSS) of first bit of data in record.
SPC	1 byte	Spacecraft number assigned spacecraft number in binary. OCTAL 23 Pioneer 10 24 Pioneer Saturn 33 Pioneer 10 Simulation 34 Pioneer Saturn Simulation
TCF	1 byte	Time correction flag (0 = no correction; FF ₁₆ = suspect or corrected).
DOY	1 halfword	Day of year associated with item 1 in 4-bit packed BCD.
UDT	1 byte	User data type code (see Module OPS-6-2 in 320-13)
DDT	1 byte	Data dependent type code (see Module OPS-6-2 in 320-13).
SCC	1 byte	Sync condition code VALUE (BINARY) MEANING 11 Full sync, leading and trailing PN code found 111 Full sync, leading PN only was requested and found 10 Leading PN code only 1 Trailing PN code only 0 No sync - no PN codes found

Table 1. MDR Format Description (Sheet 2 of 5)

ITEM	LENGTH & ORIENTATION	DESCRIPTION										
DQI	1 byte	Data Quality Indicator <table><thead><tr><th>VALUE (BINARY)</th><th>MEANING</th></tr></thead><tbody><tr><td>11</td><td>All indicators are good, data is good</td></tr><tr><td>10</td><td>At least one indicator is bad, data is suspect</td></tr><tr><td>01</td><td>At least two indicators are bad, data is suspect</td></tr><tr><td>0</td><td>Data is bad - no sync</td></tr></tbody></table> This value is computed by the following logic: $DQI = FS (1-S+H)$ where: FS = 1 if data stream is in sync 0 if data stream is not in sync S = 1 if average SNR over frame is $\geq$ a specified minimum 0 if average SNR over frame is $<$ a specified minimum H = 1 if HSD block was received with no error indicators 0 if any bit errors were detected in HSD block	VALUE (BINARY)	MEANING	11	All indicators are good, data is good	10	At least one indicator is bad, data is suspect	01	At least two indicators are bad, data is suspect	0	Data is bad - no sync
VALUE (BINARY)	MEANING											
11	All indicators are good, data is good											
10	At least one indicator is bad, data is suspect											
01	At least two indicators are bad, data is suspect											
0	Data is bad - no sync											
PN ERRORS	1 byte	Number of bit errors detected in leading PN in binary.										
YR DIGIT	1 byte	Last 2 digits of year in 4-bit packed BCD if available; otherwise 0.										
SNR	1 halfword	SNR (signal-to-noise ratio extracted from HSD (block). This is a 12-bit fixed binary quantity with the binary point just to the right of the 2^5 bit (xxxxxxx.xxxxxx as binary positions).										
DSS	1 byte	DSS of data receipt (Station No. in binary.) (See Module OPS-6-2 in 320-13.)										

Table 1. MDR Format Description (Sheet 3 of 5)

ITEM	LENGTH & ORIENTATION	DESCRIPTION
LOCK STATUS	1 byte	Lock status bits extracted from HSD block (byte configuration) for Pioneer 10/Saturn: 0 1 2 3 4 5 6 7 0 0 XXXXXX Bits 0-1 = 0 Bit 2 = 0, Receiver in Lock ✓ 1, Out of Lock Bit 3 = 0, Demodulator in Lock (M) 1, Out of Lock Bit 4 = 0, Bit Sync in Lock, or not in use T 1, Out of Lock Bit 5 = 0, Symbol Sync in Lock, or not in use S 1, Out of Lock Bit 6 = 0, Data Decoder Assembly in Lock, D or not in use 1, Out of Lock Bit 7 = 0, Block Decoder in Lock 1, Out of Lock
CONFIG INDICATOR	1 halfword	DSS configuration bits extracted from HSD blocks (see Table TLM-3-2-3). DSS Configuration: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 0 0 0 0 0 RCVR DEMOD TCP BLC SSC BDC CDC Bits 5-6 = Receiver (RCVR): 01 = 1; 10 = 2; 11 = 3; 00 = 4 Bits 7-9 = Demodulator (DEMOD): 001 = 1; 010 = 2; 011 = 3; 100 = 4; 101 = 5; 110 = 6 Bits 10-11 = Computer (TCP): 00 = Alpha; 01 = Data; 10 = Gamma Bit 12 = Internal Bit Loop Configuration (BLC): 0 = ON; 1 = OFF

Table 1. MDR Format Description (Sheet 4 of 5)

ITEM	LENGTH & ORIENTATION	DESCRIPTION
CONFIG INDICATOR (Contd)		Bit 13 = External Symbol Sync Configuration (SSC): 0 = ON; 1 = OFF Bit 14 = Block Decoder Configuration (BDC): 0 = ON; 1 = OFF Bit 15 = Convolutional Decoder Configuration (CDC): 0 = ON; 1 = OFF (not used, set to 1)
SDT	1 byte	Special data type code. The high order bit of this byte (leftmost bit) will be set to 1 for a Pioneer DSU readout. The second, third, and fourth bit of this byte will be set to 1's for Pioneer decoded data and 0's for Pioneer uncoded (non-encoded) data.
GDD	1 byte	Gross data descriptor 0 = Real time transmission all systems 1 = Non-telemetry data replay by DSS 2 = All system data replay by GCF 4 = Telemetry data (digital) replay by DSS 5 = Telemetry data (analog) replay by DSS
NO. OF DATA BITS	1 halfword	Total number of data bits in the record in binary. For Pioneer 10/Saturn, synced data is equal to 192 or 384; and for non-synced data, it is the number of data bits in the last subformat containing data and is always less than or equal to 192.
NO. AGC SAMPLES	1 byte	Number of AGC samples included in average AGC (Item No. 27)
HSD ERR CONDITION	1 byte	Error condition bits from HSD block (bits reflect condition of receipt of block: 0 = bad; 7 = good)

Table 1. MDR Format Description (Sheet 5 of 5)

ITEM	LENGTH & ORIENTATION	DESCRIPTION																				
RATE OF DATA TRANS	1 halfword	Rate of transmission of data from spacecraft (binary): <table><tr><th>Value in Binary (Last Byte of Word 6)</th><th>Pioneer 10/Saturn Rate in Bits per Second</th></tr><tr><td>Bit 1234 5678</td><td></td></tr><tr><td>1000</td><td>16</td></tr><tr><td>1001</td><td>32</td></tr><tr><td>1010</td><td>64</td></tr><tr><td>1011</td><td>128</td></tr><tr><td>1100</td><td>256</td></tr><tr><td>1101</td><td>512</td></tr><tr><td>1110</td><td>1024</td></tr><tr><td>1111</td><td>2048</td></tr></table>	Value in Binary (Last Byte of Word 6)	Pioneer 10/Saturn Rate in Bits per Second	Bit 1234 5678		1000	16	1001	32	1010	64	1011	128	1100	256	1101	512	1110	1024	1111	2048
Value in Binary (Last Byte of Word 6)	Pioneer 10/Saturn Rate in Bits per Second																					
Bit 1234 5678																						
1000	16																					
1001	32																					
1010	64																					
1011	128																					
1100	256																					
1101	512																					
1110	1024																					
1111	2048																					
AVG AGC	1 fullword	Average AGC over the data record. This is a fixed point integer, binary quantity averaged over the entire data in the record. This binary value has a binary point between Bits 28 and 29.																				
NO. OF FRAMES	1 halfword	Number of Pioneer frames: 0 = One 192-bit frame 1 = Two 192-bit frames or one 384-bit frame 3 = Three 192-bit frames C = Four 192-bit frames or two 384-bit frames																				
MIL CLOCK LSB 2, 3, 4	1 halfword	Least significant 16 bits of time for frames 2, 3 and 4																				
DDA INFO	1 word	Bits 1-9 = DDA input errors Bits 10-24 = DDA Computations Bits 25-32 = DDA Status																				
SCF NO. 1	1 byte	SCID correction flag for frames 1, 2, 3, 4 0 = No correction 1 = Corrected																				