HARRIS

Constellation™

Systems Application Information

Point-to-Point

Digital Radio

next level solutions

Constellation™
Microwave Radio

SYSTEMS APPLICATION INFORMATION

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CHAPTER

1

GENERAL INFORMATION

Introduction

The Systems Application Information (SAI) provides technical information required for determining communication system design, site layout, and interface equipment compatibility. This information will assist in the configuration of Constellation digital microwave radio equipment.

The Constellation Radio

Constellation radios make up one of Harris' families of high-quality transmission equipment. The radios feature multiple capacities and frequency bands, upgrade capability, high commonality of spares, and are compatible with existing systems and equipment.

Constellation radios offer advanced technology and efficient engineering that allow network operators to focus on serving customers, expanding their network, and increasing revenue and profitability.

Constellation radios offer high levels of reliability that are required in rugged or congested environments. The radios make use of the following:

- Fully digital adaptive time domain equalizer (ATDE)
- Forward error correction (FEC)
- Anticipatory errorless receiver switching
- Automatic transmitter power control (ATPC) can be provisioned to be enabled, disabled with transmitter set to high power, or disabled with transmitter set to low power.

The Constellation radio's self-aligning operation eliminates the need for most of the test equipment required by older-generation, low-, medium-, to high-capacity microwave radios. The operation includes the following:

- Remote inventory management capability
- SCAN (system control and alarm network) communication bus for remote diagnostics
- SNMP (Simple Network Management Protocol) and FarScan network management interfaces
- Self-healing architecture
- Self-adaptive circuitry
- Automatic calibration of replacement circuit packs (excludes the Transmitter and Receiver)
- Remote software download

Harris' Proven Ability

Harris has a reputation as a worldwide supplier of cost-effective communication solutions for small and large networks. Many types of businesses, including telephone companies, government agencies, educational institutions, broadcast stations, pipelines, railroads, transportation agencies, gas and electric utilities, public safety agencies, wireless telephone providers, hospitals, and other organizations with communication networks in the United States, Canada, and over 100 other countries are satisfied Harris customers.

Statement of Accuracy and Liability

Harris reserves the right to make changes in circuit design, specifications, services, and other information at any time without prior notice. Harris does not assume responsibility or liability arising out of the application or use of any product or service described herein, except as expressly agreed to in writing by Harris Corporation.

CHAPTER

2

FREQUENCY PLANNING

Frequency Bands

Constellation radios are available in 6, 7, 8, 10, and 11 GHz frequency bands. The following tables show the frequency bands for the various countries.

Table 2-1: Frequency band, Canada

Frequency Band (MHz)	Channel Bandwidth (MHz)	In Compliance with Industry Canada
5850 to 5915	3.5 5.25 10	GL-34[a]
5915 to 6425	29.65	SRSP-305.9
6425 to 6930	10 30	SRSP-306.4
7125 to 7725	3.75 5 10 30	RSP-307.1
7725 to 8275	10 30	SRSP-307.7
10550 to 10680	3.75 5	SRSP-310.5
10700 to 11700[b]	40	SRSP-310.7

a. These systems are not included in SP 305.8. Refer to GL-34 for details.

b. 11,650 to 11,700 MHz is on reserve in Canada.

Table 2-2: Frequency band, International

Frequency Band (MHz)	Channel Bandwidth (MHz)	In compliance with ITU-R
7425 to 7900	14	Rec. 385-6 A4
8275 to 8500	14	Rec. 386-5 A3

Table 2-3: Frequency band, U.S.A.

Frequency Band (MHz)	Channel Bandwidth (MHz)	In Compliance With
5925 to 6425	3.75 5 10 30	FCC Part 101
6525 to 6875	3.75 5 10	FCC Part 101
7125 to 8500	3.75 5 10	NTIA (US Government)
10550 to 10680	3.75 5	FCC Part 101
10700 to 11700	3.75 5 10 30	FCC Part 101

Channel Assignments

Canada

Industry Canada, GL-34[1]

Table 2-4: 5850 MHz to 5915 MHz (Industry Canada, GL-34)

3.5 MHz Bandwidth		5 MHz Bandwidth		10 MHz Bandwidth	
Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
5851.75	5885.25	5852.825	5886.125	5855	5900
5855.25	5888.75	5857.875	5891.375	5865	5910
5858.75	5892.25	5863.125	5896.625		
5862.25	5895.75	5868.375	5901.875		
5865.25	5899.25	5873.625	5907.125		
5869.25	5902.75	5878.875	5912.375		
5872.75	5906.25				
5876.25	5909.75				
5879.75	5913.25				

Industry Canada, SRSP-305.9

Table 2-5: 5915 MHz to 6425 MHz (Industry Canada SRSP-305.9)

29.65 MHz Bandwidth			
Group A (main/preferred)		Group B[a] (interleaved)	
Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
5945.20	6197.24	5930.37	6182.41
5974.85	6226.89	5960.02	6212.06
6004.50	6256.54	5989.67	6241.71
6034.15	6286.19	6019.32	6271.36
6063.80	6315.84	6048.97	6301.01

1. *These systems are not included in SP 305.8. Please refer to GL-34 for details.*

Table 2-5: 5915 MHz to 6425 MHz (Industry Canada SRSP-305.9)

29.65 MHz Bandwidth

Group A (main/preferred)		Group B[a] (interleaved)	
Transmit (Receive) (MHz)	**Receive (Transmit) (MHz)**	**Transmit (Receive) (MHz)**	**Receive (Transmit) (MHz)**
6093.45	6345.49	6078.62	6330.66
6123.10	6375.14	6108.27	6360.31
6152.75	6404.79	6137.92	6389.96

a. Same as FCC Part 21/101 and ITU-R Rec. 383-5 alt. International Channels.

Industry Canada, SRSP-306.4

Table 2-6: 6425 MHz to 6930 MHz (Industry Canada, SRSP-306.4)

10 MHz Bandwidth

Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
340 MHz Tx-Rx Spacing	
6435	6775
6445	6785
6455	6795
6465	6805
6475	6815
6485	6825
6495	6835
6505	6845
6515	6855
6525	6865
6535	6875
6545	6885
6555	6895
6565	6905
6575	6915
6585	6925

30 MHz Bandwidth

Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
340 MHz Tx-Rx Spacing	
6445	6785
6475	6815
6505	6845
6535	6875
6565	6905
100 MHz Tx-Rx Spacing	
6595	6695
6625	6725
6655	6755

Table 2-6: 6425 MHz to 6930 MHz (Industry Canada, SRSP-306.4) (Continued)

10 MHz Bandwidth		30 MHz Bandwidth	
Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
90 MHz Tx-Rx Spacing			
6595	6685		
6605	6695		
6615	6705		
6625	6715		
6635	6725		
6645	6735		
6655	6745		
6665	6755		
6675	6765		

Industry Canada, SRSP-307.1

Table 2-7: 7125 MHz to 7725 MHz (Industry Canada, SRSP-307.1)

5 MHz Bandwidth		5 MHz Bandwidth		10 MHz Bandwidth		30 MHz Bandwidth	
Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
175 MHz Tx-Rx Spacing		*150 MHz Tx-Rx Spacing*		*175 MHz Tx-Rx Spacing*			
7127.5	7302.5	7427.5	7577.5	7130	7305	7140	7315
7132.5	7307.5	7432.5	7582.5	7140	7315	7440	7590
7137.5	7312.5	7437.5	7587.5	7150	7325		
7142.5	7317.5	7442.5	7592.5	7160	7335		
7147.5	7322.5	7447.5	7597.5	7170	7345		
7152.5	7327.5	7452.5	7602.5	7180	7355		
7157.5	7332.5	7457.5	7607.5	7190	7365		
7162.5	7337.5	7462.5	7612.5	7200	7375		
7167.5	7342.5	7467.5	7617.5	7210	7385		
7172.5	7347.5	7472.5	7622.5	7220	7395		
7177.5	7352.5	7477.5	7627.5	7230	7405		
7182.5	7357.5	7482.5	7632.5	7240	7415		
7187.5	7362.5	7487.5	7637.5	*150 MHz Tx-Rx Spacing*			
7192.5	7367.5	7492.5	7642.5	7430	7580		
7197.5	7372.5	7497.5	7647.5	7440	7590		

Table 2-7: 7125 MHz to 7725 MHz (Industry Canada, SRSP-307.1)

5 MHz Bandwidth		5 MHz Bandwidth		10 MHz Bandwidth		30 MHz Bandwidth	
Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
7202.5	7377.5	7502.5	7652.5	7450	7600		
7207.5	7382.5	7507.5	7657.5	7460	7610		
7212.5	7387.5	7512.5	7662.5	7470	7620		
7217.5	7392.5	7517.5	7667.5	7480	7630		
7222.5	7397.5	7522.5	7672.5	7490	7640		
7227.5	7402.5	7527.5	7677.5	7500	7650		
7232.5	7407.5	7532.5	7682.5	7510	7660		
7237.5	7412.5	7537.5	7687.5	7520	7670		
7242.5	7417.5	7542.5	7692.5	7530	7680		
7247.5	7422.5	7547.5	7697.5	7540	7690		
		7552.5	7702.5	7550	7700		
		7557.5	7707.5	7560	7710		
		7562.5	7712.5	7570	7720		
		7567.5	7717.5				
		7572.5	7722.5				

Industry Canada, SRSP-307.7

Table 2-8: 7725 MHz to 8275 MHz (Industry Canada, SRSP-307.7)

10 MHz Bandwidth		30 MHz Bandwidth	
Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
7730	8030	7740	8040
7740	8040	7770	8070
7750	8050	7800	8100
7760	8060	7830	8130
7770	8070	7860	8160
7780	8080	7890	8190
7790	8090	7920	8220
7800	8100	7950	8250
7810	8110		
7820	8120		
7830	8130		

Table 2-8: 7725 MHz to 8275 MHz (Industry Canada, SRSP-307.7) (Continued)

10 MHz Bandwidth

Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
7840	8140
7850	8150
7860	8160
7870	8170
7880	8180
7890	8190
7900	8200
7910	8210
7920	8220
7930	8230
7940	8240
7950	8250
7960	8260
7970	8270

30 MHz Bandwidth

Transmit (Receive) (MHz)	Receive (Transmit) (MHz)

Industry Canada, SRSP-310.5

Table 2-9: 10550 MHz to 10595 MHz and 10615 MHz to 10660 MHz (Industry Canada, SRSP-310.5)

5 MHz Bandwidth

Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
10552.5	10617.5
10557.5	10622.5
10562.5	10627.5
10567.5	10632.5
10572.5	10637.5
10577.5	10642.5
10582.5	10647.5
10587.5	10652.5
10592.5	10657.5

Industry Canada, SRSP-310.7

Table 2-10: 10700 MHz to 11700 MHz (Industry Canada, SRSP-310.7)

40 MHz Bandwidth

Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
10735	11225
10775	11265
10815	11305
10855	11345
10895	11385
10935	11425
10975	11465
11015	11505
11055	11545
11095	11585
11135	11625

International

ITU-R 385-6 A4

Table 2-11: 7425 MHz to 7900 MHz (ITU-R 385-6 A4)

14 MHz Bandwidth

Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
7435	7680
7449	7694
7463	7708
7477	7722
7491	7736
7505	7750
7519	7764
7533	7778
7547	7792
7561	7806

Table 2-11: 7425 MHz to 7900 MHz (ITU-R 385-6 A4)

14 MHz Bandwidth

Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
7575	7820
7589	7834
7603	7848
7617	7862
7631	7876
7645	7890

ITU-R 386-5 A3

Table 2-12: 8275 MHz to 8500 MHz (ITU-R 386-5 A3)

14 MHz Bandwidth

Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
8293	8412
8307	8426
8321	8440
8335	8454
8349	8468
8363	8482

U.S.A.

FCC Part 101

Table 2-13: 5925 MHz to 6425 MHz (FCC Part 101)

3.75 MHz Bandwidth		5 MHz Bandwidth		10 MHz Bandwidth		30 MHz Bandwidth	
Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
6111.364	6363.404	6110.75	6362.79	5935.32	6187.36	5945.20	6197.24
6116.305	6368.345	6115.69	6367.73	5945.20	6197.24	5974.85	6226.89
6121.247	6373.287	6120.63	6372.67	5955.08	6207.12	6004.50	6256.54
6126.189	6378.229	6125.57	6377.61	5964.97	6217.01	6034.15	6286.19

Table 2-13: 5925 MHz to 6425 MHz (FCC Part 101) (Continued)

3.75 MHz Bandwidth		5 MHz Bandwidth		10 MHz Bandwidth		30 MHz Bandwidth	
Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
6131.130	6383.170	6130.51	6382.55	5974.85	6226.89	6063.80	6315.84
6136.072	6388.112	6135.45	6387.49	5984.73	6236.77	6093.45	6345.49
6141.014	6393.054	6140.40	6392.44	5994.62	6246.66	6123.10[b]	6375.14[b]
6145.955	6397.995	6145.34	6397.38	6004.50	6256.54	6152.75[b]	6404.79[b]
6150.897	6402.937	6150.28	6402.32	6014.38	6266.42		
6155.839	6407.879	6155.22	6407.26	6024.27	6276.31		
6160.780	6412.820	6160.16	6412.20	6034.15	6286.19		
6165.722	6417.762	6165.10	6417.14	6044.03	6296.07		
6175.000[a]	n/a			6053.92	6305.96		
				6063.80	6315.84		
				6073.68	6325.72		
				6083.57	6335.61		
				6093.45	6345.49		
				6103.33	6355.37		
				6113.22[b]	6365.26[b]		
				6123.10[b]	6375.14[b]		
				6132.98[b]	6385.02[b]		
				6142.87[b]	6394.91[b]		
				6152.75[b]	6404.79[b]		
				6162.63[b]	6414.67[b]		

a. This frequency may be assigned for unpaired use.

b. Alternate channels. These channels are set aside for narrow bandwidth systems and should be used only if all other channels are blocked.

Table 2-14: 6525 MHz to 6875 MHz (FCC Part 101)

3.75 MHz Bandwidth		5 MHz Bandwidth		10 MHz Bandwidth	
Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
6545.625[a]	6715.625[a]	6545[a]	6715[a]	6545	6715
6550.625	6730.625	6550	6730	6555	6725
6555.625[a]	6725.625[a]	6555[a]	6725[a]	6565	6735
6560.625	6740.625	6560	6740	6585	6745
6565.625	6735.625	6565	6735	6595	6755
6585.625	6745.625	6585	6745	6605	6765
6590.625	6750.625	6590	6750	6615	6775
6595.625	6755.625	6595	6755	6625	6785
6600.625	6760.625	6600	6760	6635	6795
6605.625	6765.625	6605	6765	6645	6805
6610.625	6770.625	6610	6770	6655	6815
6615.625	6775.625	6615	6775	6665	6825
6620.625	6780.625	6620	6780	6675	6835
6625.625	6785.625	6625	6785	6685	6845
6630.625	6790.625	6630	6790	6695	6855
6635.625	6795.625	6635	6795	6705	6865
6640.625	6800.625	6640	6800	6535[b]	6575[b]
6645.625	6805.625	6645	6805		
6650.625	6810.625	6650	6810		
6655.625	6815.625	6655	6815		
6660.625	6820.625	6660	6820		
6665.625	6825.625	6665	6825		
6670.625	6830.625	6670	6830		
6675.625	6835.625	6675	6835		
6680.625	6840.625	6680	6840		
6685.625	6845.625	6685	6845		
6690.625	6850.625	6690	6850		
6695.625	6855.625	6695	6855		
6700.625	6860.625	6700	6860		
6705.625	6865.625	6705	6865		
6710.625[a]	6720.625[a]	6710[a]	6720[a]		

a. These frequencies may be assigned for unpaired use.

b. Available only for emergency restoration, maintenance bypass, or other temporary fixed purposes. Such uses are authorized on a noninterference basis to other freqencies in this band. Interference analysis required by § 101.105 does not apply to this frequency pair.

Table 2-15: 10550 MHz to 10680 MHz (FCC Part 101)

3.75 MHz Bandwidth		5 MHz Bandwidth	
Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
10553.125	10618.125	10552.5	10617.5
10558.125	10623.125	10557.5	10622.5
10563.125	10628.125	10562.5	10627.5
10568.125	10633.125	10567.5[a]	10632.5[a]
10573.125	10638.125	10572.5[a]	10637.5[a]
10578.125	10643.125	10577.5[a]	10642.5[a]
10583.125	10648.125	10582.5[a]	10647.5[a]
10588.125	10653.125	10587.5	10652.5
10593.125	10658.125	10592.5	10657.5
10598.125	10663.125	10597.5	10662.5
10603.125	10668.125	10602.5	10667.5

a. These frequencies are also available for DEMS stations licensed, in operation, or applied for prior to July 15, 1993.

Table 2-16: 10700 MHz to 11700 MHz (FCC Part 101)

3.75 MHz Bandwidth		5 MHz Bandwidth	
Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
11133.125	11623.125	11132.5	11622.5
11138.125	11628.125	11137.5	11627.5
11143.125	11633.125	11142.5	11632.5
11148.125	11638.125	11147.5	11637.5
11153.125	11643.125	11152.5	11642.5
11158.125	11648.125	11157.5	11647.5
11163.125	11653.125	11162.5	11652.5
11168.125	11658.125	11167.5	11657.5
11173.125	11663.125	11172.5	11662.5
11178.125	11668.125	11177.5	11667.5
11183.125	11683.125	11182.5	11682.5
11188.125	11688.125	11187.5	11687.5
11193.125	11693.125	11192.5	11692.5
11198.125	11698.125	11197.5	11697.5

Table 2-17: 10700 MHz to 11700 MHz (FCC Part 101)

10 MHz Bandwidth

Transmit (Receive) (MHz)	Receive (Transmit) (MHz)	Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
10705	11205	10965	11455
10715	11215	10975	11465
10725[a]	11675[b]	10985	11475
10735	11225	10995	11485
10745	11235	11005	11495
10755	11245	11015	11505
10765	11255	11025	11515
10775	11265	11035	11525
10785	11275	11045	11535
10795	11285	11055	11545
10805	11295	11065	11555
10815	11305	11075	11565
10825	11315	11085	11575
10835	11325	11095	11585
10845	11335	11105	11595
10855	11345	11115	11605
10865	11355	11125	11615
10875	11365	11135[b]	11625[a]
10885	11375	11145[b]	11635[b]
10895	11385	11155[b]	11645[b]
10905	11395	11165[b]	11655[b]
10915	11405	11175	11665[b]
10925	11415	11185	11685[b]
10935	11425	11195	11695[b]
10945	11435		
10955	11445		

a. These frequencies may be assigned for unpaired use.

b. Alternate channels. These channels are set aside for narrow bandwidth systems and should be used only if all other channels are blocked.

Table 2-18: 10700 MHz to 11700 MHz (FCC Part 101)

40 MHz Bandwidth

Transmit (Receive) (MHz)	Receive (Transmit) (MHz)
10735	11225
10775	11265
10815	11305
10855	11345
10895	11385
10935	11425
10975	11465
11015	11505
11055	11545
11095	11585
11135[a]	11625
11175	11665

a. Alternate channels. These channels are set aside for narrow bandwidth systems and should be used only if all other channels are blocked.

b. In congested areas where 40 MHz channels block most 30 MHz channels, radios authorized for 30 MHz bandwidths may use the 40 MHz channels. In uncongested areas, 30 MHz channels should be used.

1+1 Frequency Selection

1+1 Frequency Spacing for Hot-standby (HS) and Nonprotected (NP) Radios

Recommended paired frequencies are shown beginning on page 2-3. However, any of the listed transmit frequencies may be used with any of the listed receive frequencies, provided the minimum T-to-R separation is maintained. It is recommended that any unlisted frequency be verified by Harris MCD.

Table 2-19: Frequency spacing

Frequency (GHz)	Minimum Spacing[a]			
	T-to-R		T-to-T (for like signal)	
	8T-28T/ DS3 (MHz)	155 Mbit/ 3DS3 (MHz)	8T-28T/ DS3 (MHz)	155 Mbit/ 3DS3 (MHz)
6	50[b]	100	40	56
7/8	50	100	40	56
10	65	100	45	56
11	76	100	47	56

b. Narrowband transmit filter is available for 33.5 MHz T/R spacing of LL6 GHz band specified in Industry Canada GL-34.

1+1 Intermodulation Products for Multiple HS or NP Radios with Common Antenna Feedline

For single antenna configurations, to avoid creation of intermodulation conversion products in the ferrite devices which can cause threshold degradation in a local receiver, the following rule must be observed.

The intermodulation frequency products that result from combining two or more transmitter frequencies on a common antenna feeder must be 48 MHz or more above or below each of the receiver frequencies on that antenna feeder. Note that all possible combinations must be taken into account (for example, 2A-B, 2B-D, A+B-C, C+D-B, and so forth).

Regulatory Information Licensed Part 101 Service

Table 2-20: Regulatory information licensed Part 101 service

Emission Designator	Equipment ID	Stability (%)	Max. Pwr. (watts)	Type of Service	Capacity T1/VC	Modulation Rate (Mbit/s)	Modulation Type m	ATPC
B4	B6	B7	B8*	B9	B10	B11	B12	B14
Constellation (6 GHz, 8DS1)								
3M75D7W	HRS-CX-06G08D1	0.003	2.00	DIG	8 T1	13.8	32 QAM	Y
Constellation (6 GHz, 16DS1)								
5M0D7W	HRS-CX-06G16D1	0.003	1.75	DIG	16 T1	27.1	128 QAM	Y
Constellation (6 GHz, 28DS1)								
10M0D7W	HRS-CX-06G28D1	0.003	1.75	DIG	28 T1	47.0	64 QAM	Y
Constellation (6 GHz, OC3/3DS3)								
30M0D7W	HRS-CX-06155M	0.003	1.75	DIG	OC3/3DS3	169.66	128 TCM	Y
Constellation (7/8 GHz, 8DS1)								
3M75D7W	HRS-CX-07G08D1	0.003	1.42	DIG	8 T1	13.8	32 QAM	Y
Constellation (7/8 GHz, 16DS1)								
5M0D7W	HRS-CX-07G16D1	0.003	1.24	DIG	16 T1	27.1	128 QAM	Y
Constellation (7/8 GHz, 28DS1)								
10M0D7W	HRS-CX-07G28D1	0.003	1.24	DIG	28 T1	47.0	64 QAM	Y
Constellation (7/8 GHz, OC3/3DS3)								
30M0D7W	HRS-CX-07G155M	0.003	1.24	DIG	OC3/3DS3	169.66	128 TCM	Y
Constellation (10 GHz, 8DS1)								
3M75D7W	HRS-CX-10G08D1	0.003	0.71	DIG	8 T1	13.8	32 QAM	Y
Constellation (10 GHz, 16DS1)								
5M0D7W	HRS-CX-10G16D1	0.003	0.62	DIG	16 T1	27.1	128 QAM	Y
Constellation (11 GHz, 8DS1)								
3M75D7W	HRS-CX-11G08D1	0.003	0.71	DIG	8 T1	13.8	32 QAM	Y
Constellation (11 GHz, 16DS1)								
5M0D7W	HRS-CX11G16D1	0.003	0.62	DIG	16 T1	27.1	128 QAM	Y
Constellation (11 GHz, 28DS1)								
10M0D7W	HRS-CX-11G28D1	0.003	0.70	DIG	28 T1	47.0	64 QAM	Y
Constellation (11 GHz, OC3/3DS3)								
30M0D7W	HRS-CX-11G155M	0.003	0.70	DIG	OC3/3DS3	169.66	128 TCM	Y

* *Maximum output power on FCC grant is listed here. Form 415 Item B8 should be the value from coordination and/or path data sheet.*

CHAPTER

3

CONSTELLATION RADIO CONFIGURATIONS

The Constellation Radio

The Constellation Radio is a scalable narrow, medium, and high capacity digital radio. The radios are available in 6, 7, 8, 10, and 11 GHz frequency bands.

The Constellation platform includes both terminal and repeater configurations. Repeater configuration radio supports an add/drop of up to 16 DS1 signals from each direction. The DS1 signals must be dropped in groups of four.

The high-capacity Constellation radio is not available in a repeater configuration, only in a back-to-back configuration.

Narrow/Medium Capacity Radio

- 4, 8, 16, 28* DS1 (terminal and repeater)
- 1 DS3 (available in back-to-back, but not in repeater configuration)

** Supports a maximum of 16 DS1 add/drop signals from each direction. If more than 16 DS1 signals are to be dropped, then a back-to-back configuration is required.*

High Capacity Radio

- 3 DS3 with 1 DS1 wayside
- 3 DS3 with add-drop capabilities
- 2 DS3 + 28 DS1 with 1 DS1 wayside
- OC-3 with 1 DS1 wayside
- STM-1/STS-3 with 1 DS1 wayside

Upgradability

Requirements for upgrading from a medium to a high capacity radio are listed below. The current radios with -001, -002, or -003 Tx/Rx, which will be upgraded to OC-3 or 3xDS3.

- Swap the Modem and High Level Mux cards (and install splitter-combiner for 3xDS3 or cable interconnection bracket for STM1/STS3)
- Swap the transmit and receive waveguide filters (10 to 30 MHz bandwidth)
- Return/trade in Model 2 or existing Model 3 Transmitter and Receiver Assemblies to factory for upgrades
- Download new radio operating software
- Cabling

3xDS3 and 155 Configurations

- The 3xDS3 unit is compatible with the HLM-155 unit. However, the 3xDS3 unit is not compatible with OEM SONET-DS3 multiplexers.
- The HLM-3xDS3 unit and the HLM-155 operate only in a terminal radio.
- At back-to-back terminals, when the receive DS3 signals are passed directly from radio to radio without passing through external terminating equipment, the maximum number of hops is limited to 15 because of the accumulation of jitter. After 15 hops, the DS3 must be terminated.
- When the 3x3DS3 system is configured in an add-drop mode, T1 signals may pass through no more that 5 consecutive add-drop sites before being terminated.

Network Management and Control

Network Management Interfaces

The Constellation Radio offers versatile open network management with an embedded SNMP agent and compatibility with Harris' NetBoss, StarView, or FarScan network management platforms.

Craft Interface Tool

The Constellation also supports a Keypad interface. The Keypad can be used for local (per hop) and remote monitoring of alarms and statuses for any radio in a contiguous network, and for provisioning the network elements. The Keypad allows the customer to quickly configure a system or diagnose a trouble on a hop.

In place of a Keypad, the customer can connect a terminal (VT100-compatible) or a laptop with terminal emulator software to communicate with the Constellation radio.

External Alarm/Control

Eight alarm dry-contact relay outputs (Keypad programmable) and eight opto-isolated alarm inputs are provided for customer-configured alarms.

Antenna Coupling Unit (ACU)

The ACU options offer a wide variety of optimal RF transmission architectures as well as expansion ports that accommodate additional radios on existing antenna feed systems. Refer to Chapter 6 for more information.

Multiplexer Configurations

Figure 3-1: Multiplexer configuration for a radio terminal

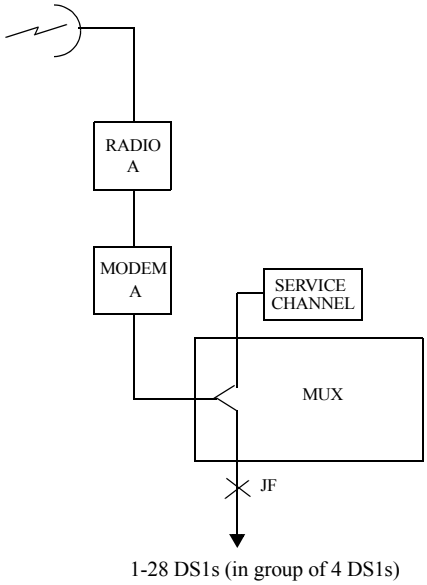


Figure 3-2: Multiplexer configuration for a radio-to-radio repeater

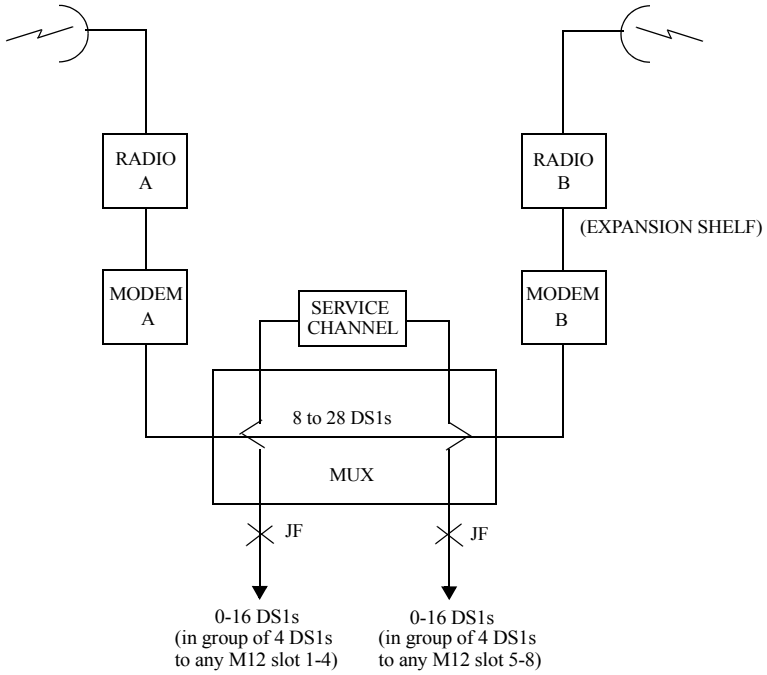
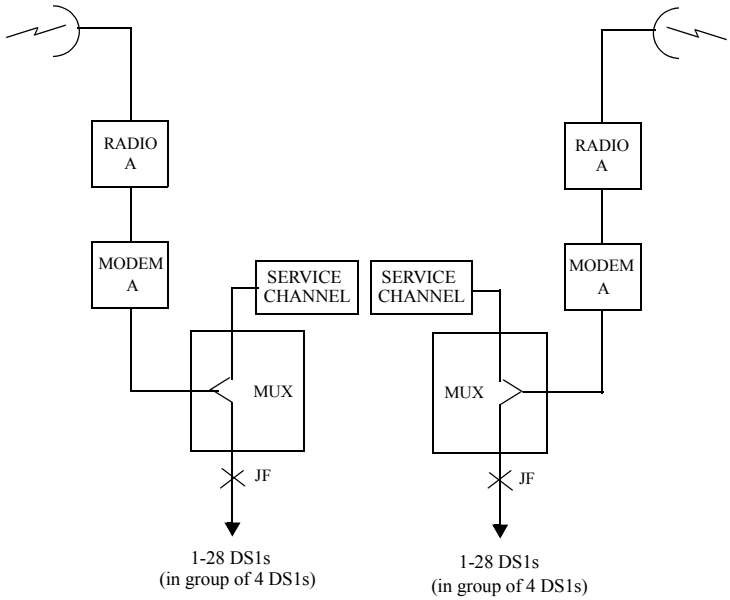
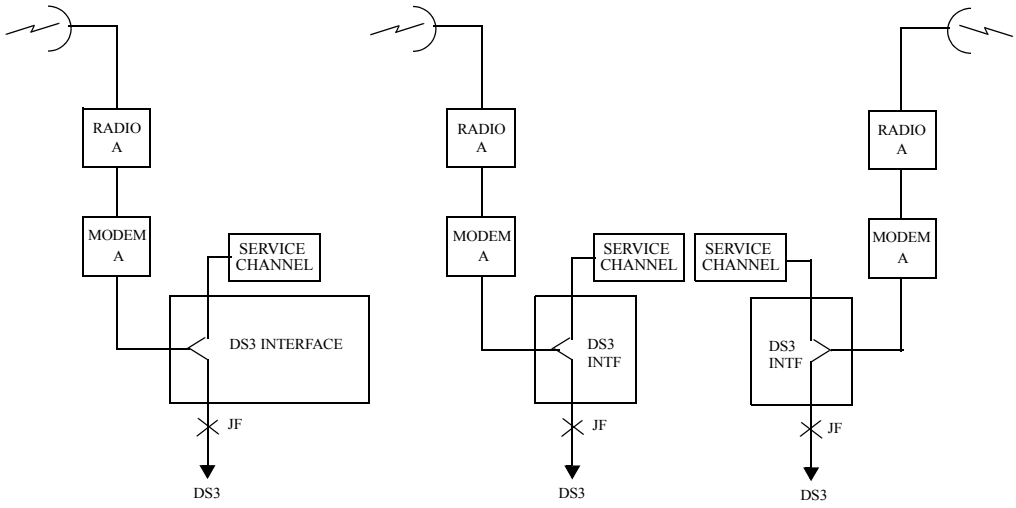


Figure 3-3: Multiplexer configuration for a dual radio terminal



Constellation DS3 Interface Configurations

Figure 3-4: Constellation radio terminal, DS3 interface



(a) Radio Terminal **(b) Dual Radio Terminal**

Figure 3-5: 28 DS1 to DS3 application

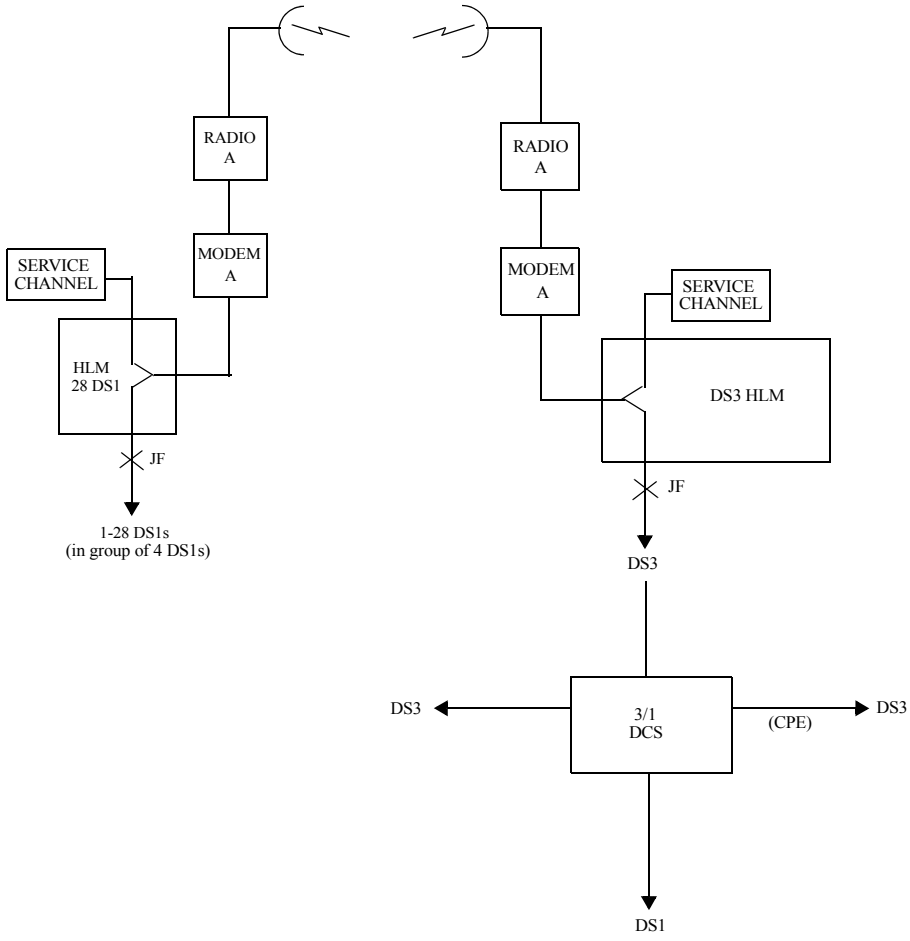
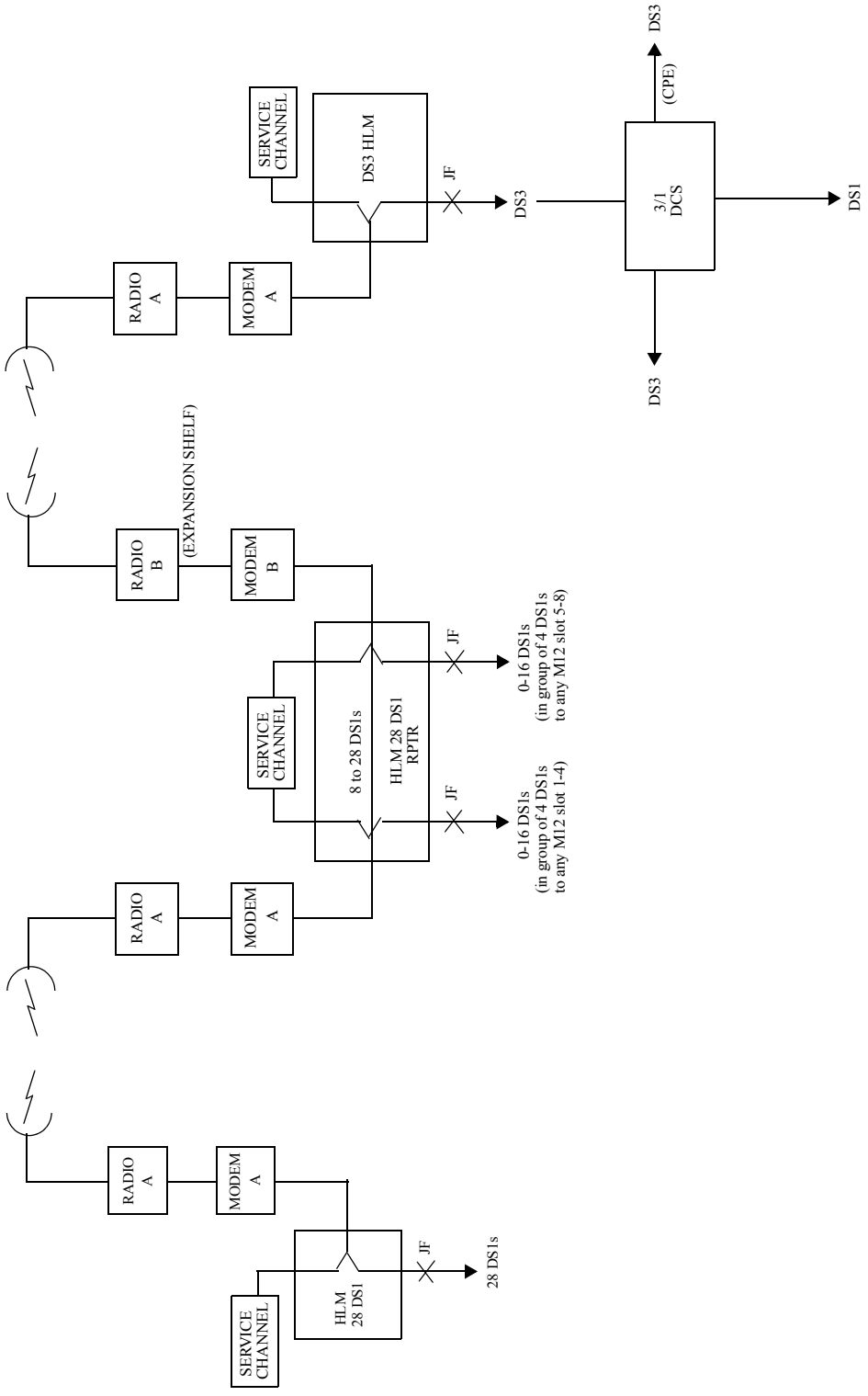


Figure 3-6: 28 DS1 to repeater to DS3 application



Constellation 3xDS3 Interface Configurations

Figure 3-7: 3xDS3 to 3xDS3 configuration

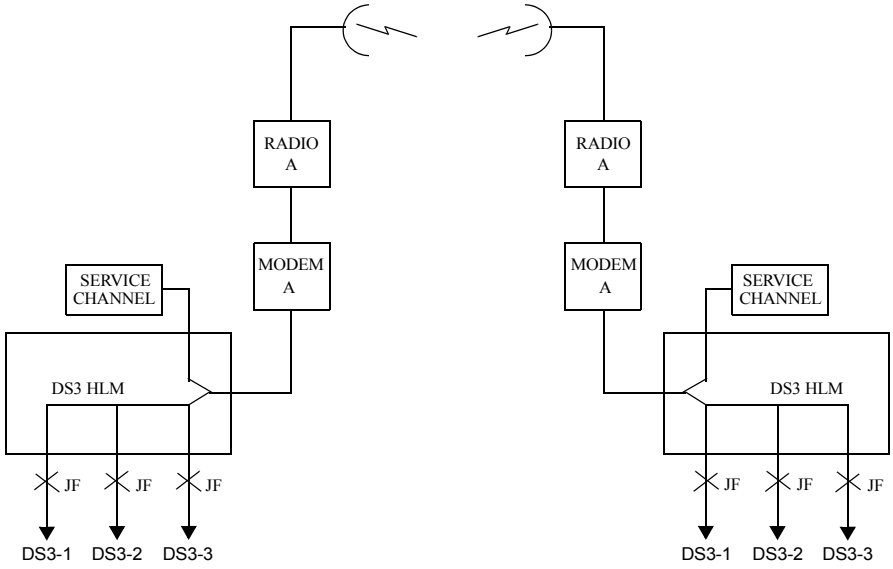


Figure 3-8: 3xDS3 to 3xDS3 back-to-back terminals (repeater)

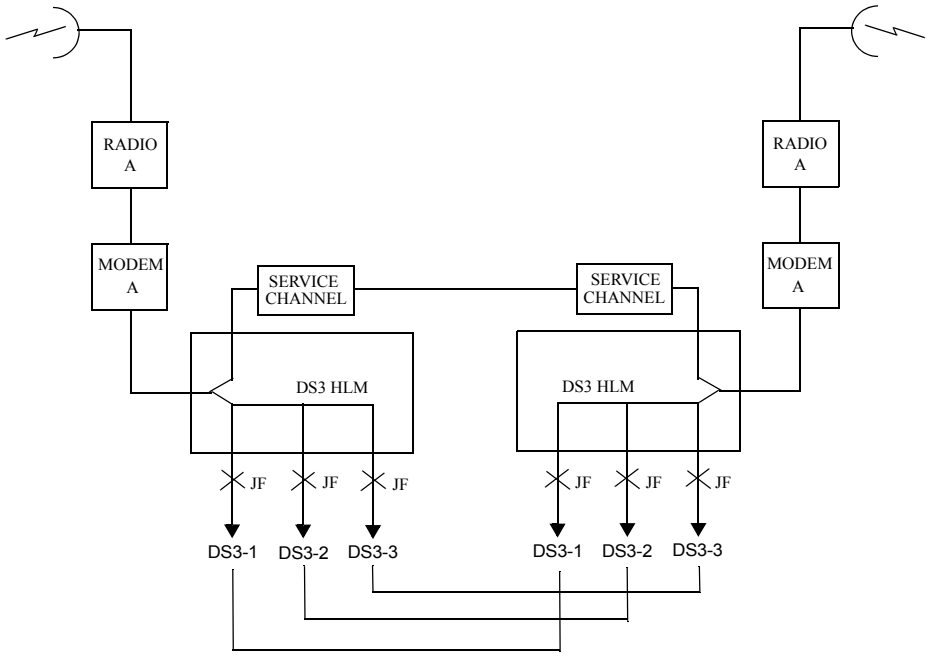


Figure 3-9: 2xDS3 + 28DS1 configuration

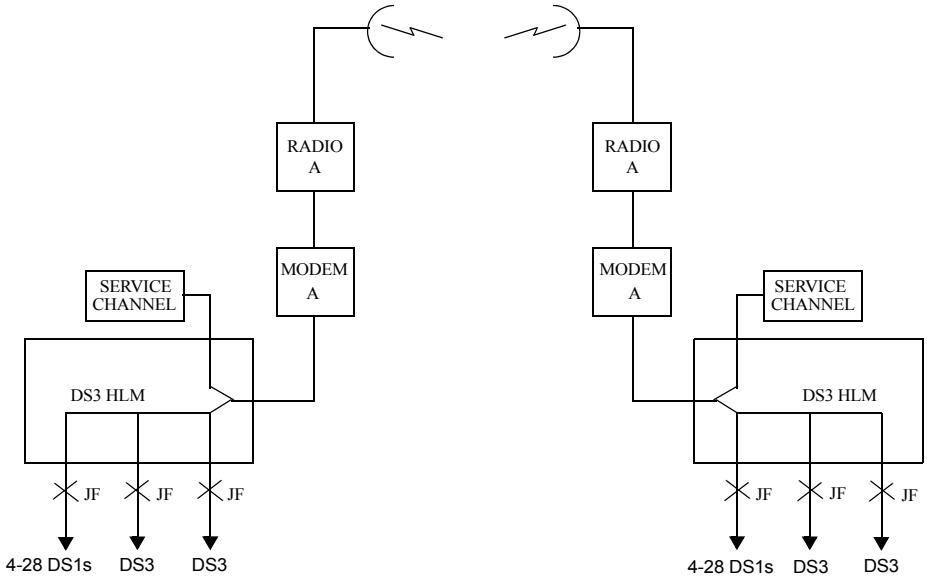
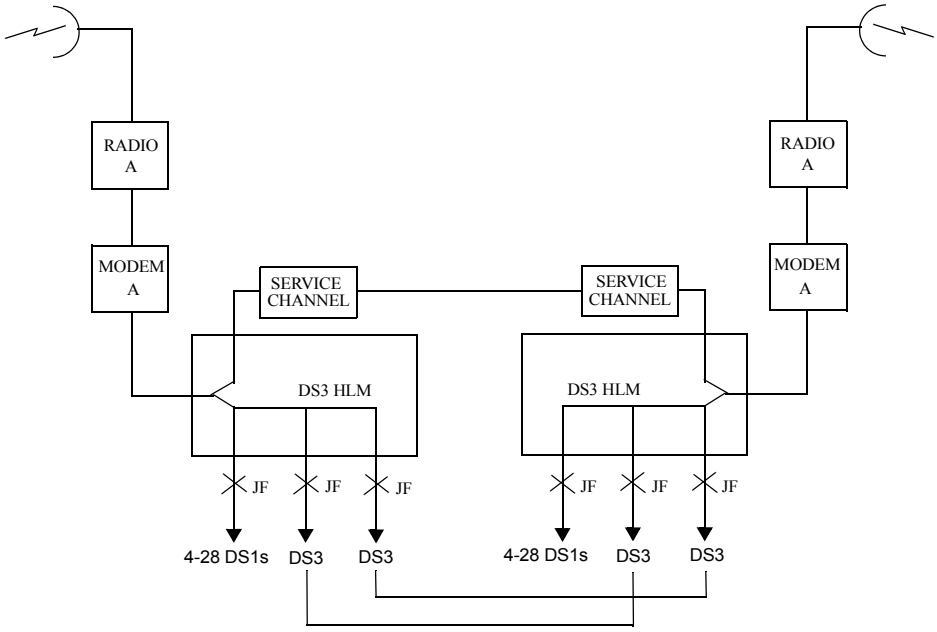


Figure 3-10: 2xDS3 + 28DS1 back-to-back terminals (repeater)



Radio Synchronization Configuration

The High Level Mux (HLM) cards in a repeater configuration can be set for either Through timing or Source timing.

Through timing mode minimizes the jitter accumulation on DS1s directly passing through multiple repeaters.

In a loop system with all repeaters, at least one repeater needs to be set for Source timing. In large systems, the HLM cards in repeater configurations need to be set for Source timing after 15 consecutive repeaters to clear the accumulated jitter.

The HLM cards in a terminal configuration are always set for Source timing.

If Source timing is selected, the Service Channel must be configured with Local Off Hook enabled.

CHAPTER

4

TECHNICAL SPECIFICATIONS

Power Requirements (Top of Rack)

Power Consumption

	Power Consumption* (watts)			
	6, 7/8 GHz		10/11 GHz	
Configuration, Terminal	24 V	48 V	24 V	48 V
Nonprotected	205	180	225	215
Nonprotected/space diversity Rx	315	270	360	335
Fully protected	405	360	450	425

**Notes*

1. Measured values.

2. 8/16/28 DS1 repeater power consumption = 2 x terminal consumption, less 5%.

3. Add 3.5 W for each M12 Unit.

4. DS3 and 155 use back-to-back terminals.

Power Source

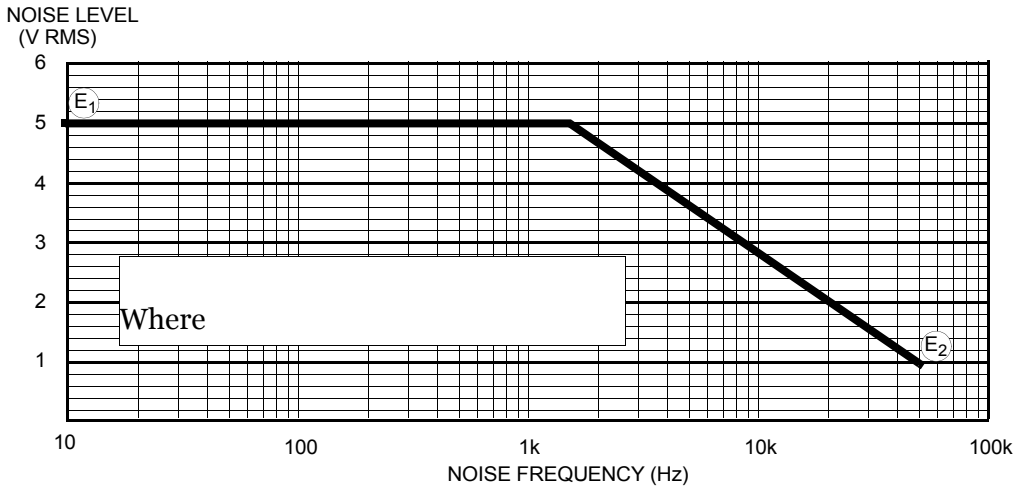
Power Source Voltage

System DC power input	Wide mouth auto polarity directing 22 Vdc to 60 Vdc at top of rack (TOR)
Input noise level and ripple tolerated	100 mV RMS in a 3-kHz bandwidth, 100 kHz to 20 MHz
Protection	Fused

Power Source Noise

The battery noise level must comply with Figure 4-1.

Figure 4-1: Battery voltage noise limit



Built-in Radio Fuse Panel

Constellation radio has a built-in radio fuse panel whose power rating is designed to provide individual fused power only to the various assemblies in the radio equipment shelf. Harris recommends that external fuse panel be used to provide fused power to all other equipment on the same radio rack.

Circuit Breakers

The values in Table 4-1 are for the Constellation radio only.

Table 4-1: Recommended circuit breaker sizes

	6, 7/8 GHz		10/11 GHz	
Configuration	**24 V**	**48 V**	**24 V**	**48 V**
Fully protected	25 A	15 A	30 A	15 A

RF Performance Specifications

Table 4-2 shows values measured at the Top of Rack Antenna Port, guaranteed at 25°C for nonprotected systems.

See the table below for additional ACU (Antenna Coupling Unit) loss:

Table 4-2: Additional ACU loss

Band (GHz)	Configuration	Additional ACU Loss (dB)
6, 7/8, and 11	Protected transmit pair	0.4
6 and 11	Protected receive pair	1.0
7/8	8/16/28 DS1	0.9
7/8	155 Mbit/s	0.8

Table 4-3: RF performance specifications

				Receive Threshold		System Gain[a]	
Band (GHz)	Capacity	Config-uration[b]	Tx Pwr Output (dBm)	10^{-3} BER (dBm)	10^{-6} BER (dBm)	10^{-3} BER (dB)	10^{-6} BER (dB)
5.9 to 6.9 [c]	8 DS1	NP	29.5	-82.5	-81.0	112.0	110.5
		NP/SD	29.5	-82.5	-81.0	112.0	110.5
		HS[d]	29.1	-81.3	-79.8	110.4	108.9
		HS/SD	29.1	-82.5	-81.0	111.6	110.1
		ST/SD	29.1	-82.5	-81.0	111.6	110.1
		FD	29.5	-82.5	-81.0	112.0	110.5
		FD/SD	29.5	-82.5	-81.0	112.0	110.5
	16 DS1	NP	28.5	-76.0	-74.5	104.5	103.0
		NP/SD	28.5	-76.0	-74.5	104.5	103.0
		HS[d]	28.1	-75.0	-73.5	103.1	101.6
		HS/SD	28.1	-76.0	-74.5	104.1	102.6
		ST/SD	28.1	-76.0	-74.5	104.1	102.6
		FD	28.5	-76.0	-74.5	104.5	103.0
		FD/SD	28.5	-76.0	-74.5	104.5	103.0
	28 DS1/DS3	NP	29.0	-76.0	-74.5	105.0	103.5
		NP/SD	29.0	-76.0	-74.5	105.0	103.5
		HS[d]	28.6	-74.8	-73.3	103.4	101.9
		HS/SD	28.6	-76.0	-74.5	104.6	103.1
		ST/SD	28.6	-76.0	-74.5	104.6	103.1
		FD	29.0	-76.0	-74.5	105.0	103.5
		FD/SD	29.0	-76.0	-74.5	105.0	103.5
	155 Mbit/s	NP	29.0	-72.5	-71.0	101.5	100.0
		NP/SD	29.0	-72.5	-71.0	101.5	100.0
		HS[d]	28.6	-71.5	-70.0	100.1	98.6
		HS/SD	28.6	-72.5	-71.0	101.1	99.6
		ST/SD	28.6	-72.5	-71.0	101.1	99.6
		FD	29.0	-72.5	-71.0	101.5	100.0
		FD/SD	29.0	-72.5	-71.0	101.5	100.0

Table 4-3: RF performance specifications (Continued)

				Receive Threshold		System Gain[a]	
Band (GHz)	Capacity	Config-uration[b]	Tx Pwr Output (dBm)	10^{-3} BER (dBm)	10^{-6} BER (dBm)	10^{-3} BER (dB)	10^{-6} BER (dB)
7 to 8	8 DS1	NP	27.5	-81.5	-80.0	109.0	107.5
		NP/SD	27.5	-81.5	-80.0	109.0	107.5
		HS[d]	27.1	-80.6	-79.1	107.7	106.2
		HS/SD	27.1	-81.5	-80.0	108.6	107.1
		ST/SD	27.1	-81.5	-80.0	108.6	107.1
		FD	27.5	-81.5	-80.0	109.0	107.5
		FD/SD	27.5	-81.5	-80.0	109.0	107.5
	16 DS1	NP	26.5	-75.0	-73.5	101.5	100.0
		NP/SD	26.5	-75.0	-73.5	101.5	100.0
		HS[d]	26.1	-74.1	-72.6	100.2	98.7
		HS/SD	26.1	-75.0	-73.5	101.1	99.6
		ST/SD	26.1	-75.0	-73.5	101.1	99.6
		FD	26.5	-75.0	-73.5	101.5	100.0
		FD/SD	26.5	-75.0	-73.5	101.5	100.0
	28 DS1/DS3	NP	27.0	-75.0	-73.5	102.0	100.5
		NP/SD	27.0	-75.0	-73.5	102.0	100.5
		HS[d]	26.6	-74.1	-72.6	100.7	99.2
		HS/SD	26.6	-75.0	-73.5	101.6	100.1
		ST/SD	26.6	-75.0	-73.5	101.6	100.1
		FD	27.0	-75.0	-73.5	102.0	100.5
		FD/SD	27.0	-75.0	-73.5	102.0	100.5
	155 Mbit/s	NP	27.5	-72.0	-70.5	99.5	98.0
		NP/SD	27.5	-72.0	-70.5	99.5	98.0
		HS[d]	27.1	-71.2	-69.7	98.3	96.8
		HS/SD	27.1	-72.0	-70.5	99.1	97.6
		ST/SD	27.1	-72.0	-70.5	99.1	97.6
		FD	27.5	-72.0	-70.5	99.5	98.0
		FD/SD	27.5	-72.0	-70.5	99.5	98.0

Table 4-3: RF performance specifications (Continued)

				Receive Threshold		System Gain[a]	
Band (GHz)	Capacity	Config-uration[b]	Tx Pwr Output (dBm)	10^{-3} BER (dBm)	10^{-6} BER (dBm)	10^{-3} BER (dB)	10^{-6} BER (dB)
10.5 to 10.6; 11.1 to 11.6	8 DS1	NP	26.0	-81.5	-80.0	107.5	106.0
		NP/SD	26.0	-81.5	-80.0	107.5	106.0
		HS[d]	25.6	-80.6	-79.1	106.2	104.7
		HS/SD	25.6	-81.5	-80.0	107.1	105.6
		ST/SD	25.6	-81.5	-80.0	107.1	105.6
		FD	26.0	-81.5	-80.0	107.5	106.0
		FD/SD	26.0	-81.5	-80.0	107.5	106.0
	16 DS1	NP	24.5	-75.0	-73.5	99.5	98.0
		NP/SD	24.5	-75.0	-73.5	99.5	98.0
		HS[d]	24.1	-74.0	-72.5	98.1	96.6
		HS/SD	24.1	-75.0	-73.5	99.1	97.6
		ST/SD	24.1	-75.0	-73.5	99.1	97.6
		FD	24.5	-75.0	-73.5	99.5	98.0
		FD/SD	24.5	-75.0	-73.5	99.5	98.0
	28 DS1/DS3	NP	25.0	-75.0	-73.5	100.0	98.5
		NP/SD	25.0	-75.0	-73.5	100.0	98.5
		HS[d]	24.6	-74.1	-72.6	98.7	97.2
		HS/SD	24.6	-75.0	-73.5	99.6	98.1
		ST/SD	24.6	-75.0	-73.5	99.6	98.1
		FD	25.0	-75.0	-73.5	100.0	98.5
		FD/SD	25.0	-75.0	-73.5	100.0	98.5
	155 Mbit/s	NP	25.0	-71.5	-70.0	96.5	95.0
		NP/SD	25.0	-71.5	-70.0	96.5	95.0
		HS[d]	24.6	-70.5	-69.0	96.1	93.6
		HS/SD	24.6	-71.5	-70.0	96.1	94.6
		ST/SD	24.6	-71.5	-70.0	96.1	94.6
		FD	25.0	-71.5	-70.0	96.5	95.0
		FD/SD	25.0	-71.5	-70.0	96.5	95.0

a. System gain = Tx power output - receive threshold.

b. Configurations:

NP = nonprotected transmitter and receiver

NP/SD = nonprotected transmitter, space diversity receivers

HS = hot standby transmitters, protected receivers

HS/SD = hot standby transmitters, space diversity receivers

ST/SD = split transmitters/space diversity receivers; separate main (transmit and receive) and space diversity (transmit and receive) antennas.

FD = Frequency diversity transmitters and receivers.

FD/SD = Frequency diversity transmitters, space diversity receivers or hybrid diversity receivers.

c. System gain is 1 dB lower for LL6 GHz band (5850-5915 MHz).

d. For HS, thresholds are for RCVR 1 (main); thresholds for RCVR 2 (standby) are approximately 6 dB higher.

Transmitter

Frequency Stability

+/-0.0003% = +/-3 ppm

Unwanted (Out-of-Band and Spurious) Emissions

The Constellation radio meets the following specifications:

- FCC Part 101 Section 101.111, Emission Limitations.
- FCC Part 15, Subpart B, Class A

Receiver

General Specifications

Frequency stability	±0.0003% = ±3 ppm
Residual BER (typical at room temperature)	< 10^{-12} per hop or link
Receiver image rejection	> 90 dB

Refer to Chapter 11 for performance curves.

Receiver Overload*

Band (GHz)	10^{-6} BER (dBm)	10^{-3} BER (dBm)
6	-17.0	-16.0
7/8	-17.5	-16.5
10/11	-18.5	-17.5

** Typical values for nonprotected systems measured at the antenna port of the Antenna Coupling Unit (ACU).*

Dispersive Fade Margin (DFM)

Table 4-4: DFM* with delay of 6.3 ns

	BER 10^{-3} (dB)
8 DS1	71.5
16 DS1	68.5
28 DS1 / DS3	66.5
OC-3 / 3xDS3	50.0

**Typical values for nonprotected systems measured at the antenna port of the ACU.*

Signal Acquisition Time

The system must re-establish customer traffic within 60 ms of a hardware failure.

For RF signal failures lasting greater than 1 minute, the system must re-establish customer traffic within 250 ms of restoration of the RF signal.

Table 4-5: Re-acquisition budget for hardware failures

Subsystem/Module	Time (ms)
Software	10
RF Switch	5
HLM	8
Modem	35
M12	2

Auto-DADE

The main and space-diversity receiver signal delays are automatically equalized up to a diversity antenna spacing of 150 feet.

Tributary Interface

Tributary Signal Characteristics

Tributary	Bit Rate (Mbit/s)	Impedance/ Connector	Line Code	Length
DS1	1.544	100 ohms/50-pin	AMI/B8ZS	655 feet to DSX-1
E1	2.048	120 ohms/50-pin	HDB3	6 dB at 1.024 MHz
DS3	44.736	75 ohms/BNC female	B3ZS	450 feet to DSX-3
E1 (wayside)	2.048	75 ohms/BNC female or 120 ohms/RJ-45	HDB3	6 dB at 1.024 MHz
DS1 (wayside)	1.544	100 ohms/RJ-45	AMI/B8ZS	655 feet to DSX-1

Tributary Jitter

- Jitter transfer conforms to AT&T Standard TR-62411.
- Jitter tolerance conforms to Bellcore Standard GR-499, Section 7.3.2.
- Jitter generation conforms to Bellcore Standard GR-499, Section 7.3.3.
- The DS1 interface meets the jitter transfer and jitter acceptance requirements of ITU-T G.958 and Bellcore GR-253.
- Jitter curves are given in Chapter 11, “Performance Curves”.

Tributary Specification Compliance

Tributary	Bit Rate (Mbit/s)	Bellcore	ANSI	ITU-T
DS1	1.544	GR-499-CORE, Section 9.3	T1.102-1993	G.703
DS3	44.736	GR-499-CORE	T1.102-1993	G.703
E1	2.048			G.703

Signal Processing

Equipment Transmission Delay Time

One-way transmission delay per hop is measured through back-to-back radio subsystems.

Capacity	DS1 to DS1 (μs)	DS3 to DS3 (μs)
8 DS1	302	
16 DS1	177	
28 DS1	155	
DS3		85

High capacity 155 Mbit/s with DDM-2000 Multiplexer: 312 μs.
No filters.
DDM-2000 Multiplexer contribution: 74 μs.

Capacity	DS1 to DS1 (μs)	DS3 to DS3 (μs)
8 DS1	302	
16 DS1	177	
28 DS1	155	
DS3		85

Modulation

Capacity	Modulation Format	Occupied Bandwidth (MHz)	Symbol Rate (MHz)	Agg. Bit Rate (Mbit/s)
8 DS1	32 QAM	3.43	2.74	13.70
16 DS1	128 QAM	4.80	3.84	26.85
28 DS1/DS3	64 QAM	9.71	7.76	46.58
3 DS3	128 TCM	29.58	24.65	172.56
OC-3	128 TCM	29.58	24.65	172.56

Forward Error Correction (FEC)

Reed-Solomon 8-byte error correcting code is implemented in the Constellation Modem. The overall FEC code rate is 204/188.

For the High Capacity 155 Modem, the modulation format is 128 TCM with an FEC code rate of 238/232.

Modulation Format	C/N with FEC BER 10^{-6} (dB)
32 QAM	22
64 QAM	25
128 QAM	28
128 TCM	24

Intermediate Frequency Signal

Transmit and receive 140 MHz IF frequency signals are maintained at a level of -8 dBm. The impedance is 50 ohms and the return loss is 15 dB at the IF interfaces.

Protection Switching

1+1 Transmitter and Receiver Switching

Hot-Standby Transmitter Switching

Hot-standby (HS) Transmitter protection switching is automatically caused by a Transmitter fault or by reverse path protection and is nonrevertive.

Reverse Path Protection

Reverse path protection software enables a HS radio to automatically switch from the on-line Transmitter to the standby Transmitter when the Receiver has a sync loss alarm. Reverse path protection is accomplished in less than 60 milliseconds.

HS Receiver Switching

Hot-standby Receiver protection switching is automatically caused by a Receiver fault and does not revert to the main Receiver after the fault clears. Path and maintenance switching do not introduce errors. Switching caused by a fault introduces errors.

Space Diversity Receiver Switching

Space diversity protected Receiver switching is automatic and nonrevertive. Space diversity receive switching is errorless and employs an anticipatory function which uses performance degradation as an indicator.

Receiver Switching Criteria

Receiver switching is based on receive uncorrected BER (UBER) alarm and received signal level (RSL) alarm.

Uncorrected BER (UBER) Alarm

This received signal degradation indication is based on an error syndrome count. When the Receiver under stress begins to make errors which are corrected by the FEC decoder, error syndromes are generated.

Received Signal Level (RSL) Alarm

The RSL alarm is based on a predetermined RSL threshold level.

Maintenance

Protected Transmitters and Receivers are arranged to allow repair of a single Transmitter or a Receiver without removing the traffic.

Manual Switch-over

A control capability is provided to switch the main and standby Transmitters or Receivers to lock-on main or lock-on standby. Manual locking of a protected Transmitter or Receiver is reported as a minor alarm. Manual Receiver switching has no effect on traffic.

1+1 Switching Times

The average recovery time for switching caused by hardware failures in a protected system is 60 ms or less.

For temporary signal interruptions of 1 to 2 seconds duration, no more than 5% of recovery times will exceed 0.5 second.

Supervisory Interfaces

Network Management Interface

Table 4-6: Network management interface

Port	Signal	Application
FSCAN	RS-232 async	FarScan computer connection
Monitor	RS-232 async	SCAN interconnection
VersaT1lity	RS-232 async or RS-423* async	SCAN interconnection
Keypad	RS232 async	Hand-held Keypad connection
Aux	RS-422 sync	Constellation Radio interconnection
Spur	RS-422 sync	Constellation Radio interconnection
Ethernet	10Base-T	SNMP

** Inverted mark/space polarity.*

Note: Refer to the **Constellation Installation and Maintenance manual** for pinout information and data rates.

Alarms

Alarm Indication Signal (AIS)

The AIS signal is transmitted under the following conditions on a line input by line input basis:

- When an AIS signal is received at the line input.
- When equipment failure causes a loss of signal to the multiplexer.

The AIS signal is removed once line data has been restored to the M12 Unit.

Radio Alarm LED Indicators

Radio alarm LED indicators are:

- MAJOR (red)
- MINOR (red)
- STATUS (yellow)

Site Status Inputs and Control Outputs

Eight relay outputs and eight opto-isolated alarm inputs are provided on External Alarm/Control connector. Input level of alarm input shall be open or ground.

The first two relay outputs are pre-defined to LOCAL MAJOR and LOCAL MINOR alarms in the factory. The other six relay outputs can be used for customer site command outputs or radio alarm outputs.

Alarm List for Relay Output

The following radio alarms can be configured through the Keypad.

- Major Alarm
- Minor Alarm
- Input LOS
- Sync Loss A
- Sync Loss B
- Errored Seconds A
- Errored Seconds B
- Signal Degradation A1
- Signal Degradation A2
- Signal Degradation B1
- Signal Degradation B2
- On Line Mod/Tx A
- On Line Mod/Tx B
- On Line Rx A
- On Line Rx B
- On Line HLM
- Manual Control (external site control)

Relay Specifications

Radio alarm relays are provided as dry relay contacts to customer equipment from the External Alarm/Control connector.

Table 4-7: Relay specifications

Characteristic	Value
Nominal switching capacity (resistive)	2 A, 60 VDC
Maximum switching power (resistive)	60 W
Maximum switching voltage	220 VDC
Maximum switching current	2 A
Minimum switching capability	10 μA, 10 mV DC

Environmental Specifications

Electromagnetic Emissions

Constellation radios are shielded for electromagnetic interference and meet the following electromagnetic compatibility standards:

- FCC Part 15, Subpart B for Class A devices.

Conducted Emissions

- ETS 300 826
- Bellcore TR-TSY-000752, 14.5.2

Ambient Temperature, Humidity, and Altitude

Characteristic	Value
Temperature range:	
Operating	0°C to 50°C
Storage and transportation	-40°C to +65°C
Humidity	to 95%, noncondensing
Altitude	0 to 5000 meters, AMSL

Earthquake, Shock, and Vibration

Test specification

IEC 721-3-1

Rack Specifications

Standard EIA aluminum rack meets zone 2 earthquake standards. Optional zone 4 rack and bracing kit are available.

Mechanical Dimensions

EIA Rack

Refer to Appendix A for information on a Harris standard rack.

Constellation Radio

Configuration*	Unit	Height	Depth	Width
Terminal	Millimeters	622	300	445
	Inches	24.5	11.8	17.5
8/16/28xDS1 Repeater**	Millimeters	1200	300	445
	Inches	47.25	11.8	17.5

* *Radio mounts in a standard 19-inch wide rack. Dimensions include branching circulators, fully configured ACU and doors. Cannot be flush-mounted.*

** *With ADM. 1-3xDS3 and OC3 use back-to-back terminals.*

Weights (Typical)

Configuration	pound	kg
Constellation terminal (fully equipped) (MHSB, 28 x DS1 terminal)	74	33.6
Constellation repeater (fully equipped)	127	57.6
7-foot x 19-inch rack	35	15.9

CHAPTER

5

SYSTEM INTERCONNECT AND CONFIGURATION

System Interconnection

Orderwire Interconnection

Table 5-1 describes the interconnection between the Harris MCD Service Channel equipment and the Constellation radio.

Table 5-1: Orderwire interconnection

Constellation Port	Connector Type	Radio Equipment	Port	Connector Type	Signal
VF PORT 1	RJ45	DVS II	VF1	50-pin female	4W VF (600 Ω)
			VF2	50-pin female	
		MegaStar	VF1B	DB-25 female	
			VF2A	DB-25 female	
			VF2B		
		MicroStar L	4W VF	RJ-45	
		MicroStar L (16 E1)		DE-9 female	
		MicroStar M (1 rms IDU)		DC-37 female	
		MicroStar M/H (3 rms IDU)		DE-9 female	
VF PORT 2	RJ45	DVSII	VF1	50-pin female	4W VF (600 Ω)
			VF1 AUX		
			VF2	50-pin female	
			VF2 AUX		
		MegaStar	VF1A	DB-25 female	
			VF1B		
			VF2A	DB-25 female	
		MicroStar L	4W VF	RJ-45	
		MicroStar L (16 E1)		DE-9 female	
		MicroStar M (1 rms IDU)		DC-37 female	
		MicroStar M/H (3 rms IDU)		DE-9 female	

Table 5-1: Orderwire interconnection (Continued)

Constellation Port	Connector Type	Radio Equipment	Port	Connector Type	Signal
DATA PORT	RJ45	DVSII	DATA1	50-pin female	RS-232
1 & 2			DATA2		
			DATA3		
			DATA4		
		MegaStar	DATA1	DA-15 female	
			DATA2		
		MicroStar L/M/H	DATA	DE-9 female	

Refer to the *Constellation Installation and Maintenance manual* for detailed pinout information.

Four-Wire VF Orderwire Interface

Connector: RJ45

One VF orderwire channel provides two 4-wire VF ports.

Table 5-2: Four-wire VF Orderwire input specifications

VF Port	Input Levels[a]	Output Levels[a]
VF1	0 dBm (default) -16 dBm	0 dBm (default) +7 dBm
VF2	0 dBm (default) +7 dBm	0 dBm (default) -16 dBm

a. Selectable through the Keypad.

Table 5-3: Four-wire VF ports performance specifications[a]

Frequency response	300-3400 Hz, ±1.5 dB
Idle noise C-message	≤ 30 dBrnc0
Quantizing noise	≤ 56 dBrnc0 at 1004 Hz
Return loss	≥ 40 dB (telephone set on-hook) ≥ 15 dB (telephone set off-hook when only one telephone is connected to 2-wire port)
Impedance	600 ohms, balanced
Output level accuracy	±1.0 dB

a. Specifications are for one drop/insert.

Table 5-4: Ringing generator specifications

Load	2 REN
Voltage (rated load)	60 Vrms
Ringing cadence ON	2.3 sec
Ringing cadence OFF	4.7 sec

Two-Wire VF Orderwire Interface

Standard 2-wire telephone jack (RJ11).

Address

The DTMF receiver decoder can be set (using the Keypad) to any address between 000 and 999. This feature is compatible with DVS II orderwire and Megastar orderwire. The * key causes all stations to be called. The # key is not used by the Constellation VF Orderwire but is used by the DVS II orderwire to cancel the “all call” at the DVS II sites.

Data Orderwire Interface

Connector: RJ45

Maximum Distance: 50 feet (worst case)

One data channel provides two RS-232 ports.

Two RS-232 data ports can be selected to be bridged together providing half-duplex communications or selected to be isolated providing full duplex in a port-to-port application. Data can be set for sampling or asynchronous start-stop data signals. When data is set for sampling, data rates up to 4800 bit/s can be used with no restriction on the size of the data byte. When asynchronous start-stop is selected, bit rates 9600 bit/s or 19.2 kbit/s are available with the data byte set to 8 bits. A parity option can be enabled to send the parity bit through the system. The system does not monitor the parity bit.

Table 5-5: Output voltage range (with 7k ohm load)

	Minimum (V)	Maximum (V)
Low	– 5	–11
High	+ 5	+11

Table 5-6: Input voltage range

	Minimum (V)	Maximum (V)
Low	0	+ 0.8
High	+ 3.6	+5.0

SCAN Equipment Interconnection

Table 5-7 describes the interconnection between Harris MCD SCAN (system control and alarm network) equipment and the Constellation radio.

Table 5-7: SCAN equipment interconnection

Constellation Port	Connector Type	Radio Equipment	Port	Connector Type	Signal
AUX	RJ45	Constellation	AUX	RJ45	RS-422
SPUR			SPUR		
VERSAT1LITY	RJ45	CAU	COMM 1	DE-9 female	RS-232 or RS-423*
			COMM 2		
			COMM 3		
			RTU		
		DVA	COMM 1	DE-9 female	RS-232 or RS-423*
			COMM 2		RS-232 or RS-423*
			COMM 3		RS-423*
			COMM 4		RS-423*
			COMM 5		RS-423*
		DVM/DVL/	INT CTL	DB-25 female	RS-423*
		DVT	EXT B		
		GlobeStar	RTU	DE-9 female	RS-232 or RS-423*
		MegaStar	AUX	DE-9 female	RS-232 or RS-423*
			SPUR		
		MicroStar L/M/H	RTU	DE-9 female	RS-232 or RS-423*

Table 5-7: SCAN equipment interconnection (Continued)

Constellation Port	Connector Type	Radio Equipment	Port	Connector Type	Signal
Monitor	RJ45	CAU	COMM 1	DE-9 female	RS-232
			COMM 2		
			COMM 3		
			RTU		
		DVA	COMM 1	DE-9 female	RS-232
			COMM 2		
		GlobeStar	RTU	DE-9 female	RS-232
		MegaStar	AUX	DE-9 female	RS-232
			SPUR		
		MicroStar L/M/H	RTU	DE-9 female	RS-232
FSCAN	RJ45	FarScan PC	COMM	DE-9 male	RS-232
		HNM UNIX Station	COMM	DB-25 female	RS-232
ETHERNET	RJ45	StarView PC	LAN	RJ45	10Base-T

* *RS-423 is with inverted Mark/Space polarity.*

Refer to the *Constellation Installation and Maintenance Manual* for detailed pinout information.

CHAPTER

6

ANTENNA COUPLING UNIT (ACU)

ACU Waveguide Flanges

Table 6-1: Standard flange specifications

Band (GHz)	Flange Type	Tapped
5.9 to 7.125	CMR-137	#6-32
7.1 to 8.5	CMR-112	#6-32
10.5 to 11.7	UG-39	#8-32

Table 6-2: Spacer adapter height, standard (other interfaces available)

Band (GHz)	Flange Type	Main Spacer Height	Space Diversity Spacer Height	Tapped
5.9 to 7.125	CPR-137G	1.75 in. (44.45 mm)	4.0 in. (101.6 mm)	#10-32
7.1 to 8.5	CPR-112G	1.75 in. (44.45 mm)	3.5 in. (88.9 mm)	#8-32
10.5 to 11.7	CPR-90F	1.75 in. (44.45 mm)	1.75 in. (44.45 mm)	#8-32

ACU Configuration and Mechanical Drawings

Available Configurations

Table 6-3: Available ACU configurations*

ACU Configuration
NP (Tx/Rx)
NP SD (Tx/Rx, Rx)
HS (Tx/Rx)
HS SD (Tx/Rx, Rx)
HS prot. split Tx/SD Rx (Tx/Rx, Tx/Rx)
HS, 2 antennas (Tx/Tx, Rx/Rx)
FD, 1 antenna (Tx/Tx/Rx/Rx)
FD, 2 antennas (Tx/Tx, Rx/Rx)
NP, 2 antennas (Tx, Rx)
FD, 2 antennas (Tx/Rx, Tx/Rx)
HS, 2 antennas (Tx/Rx, Tx/Rx)
HS SD, 3 antennas (Tx, Rx, Rx)
NP SD, 3 antennas (Tx, Rx, Rx)

**Consult your sales representative for availability.*

List of ACU Mechanical Drawings

- ACU, nonprotected (top view) 6-3
- ACU, nonprotected (front view) 6-4
- ACU, hot standby (top view) 6-4
- ACU, hot standby (front view) 6-5
- ACU, hot standby Transmitters, space diversity Receivers (top view) 6-5
- ACU, hot standby Transmitters, space diversity Receivers (front view) 6-6
- ACU, hot standby/frequency diversity 2 antennas (T/R, T/R) (top view) 6-6
- ACU, hot standby/frequency diversity 2 antennas (T/R, T/R) (front view) 6-7
- ACU, repeater/dual terminal 6-8

ACU Mechanical Drawings

Figure 6-1: ACU, nonprotected (top view), mechanical drawing

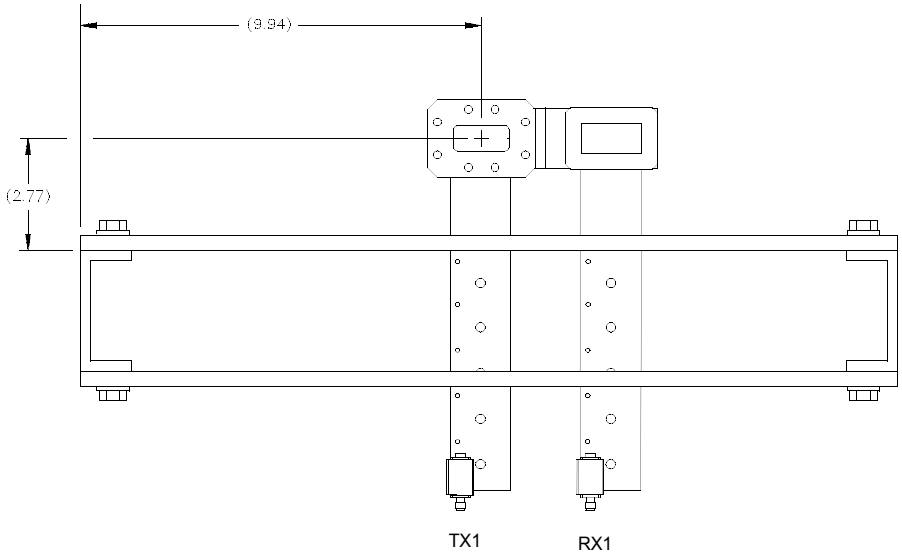
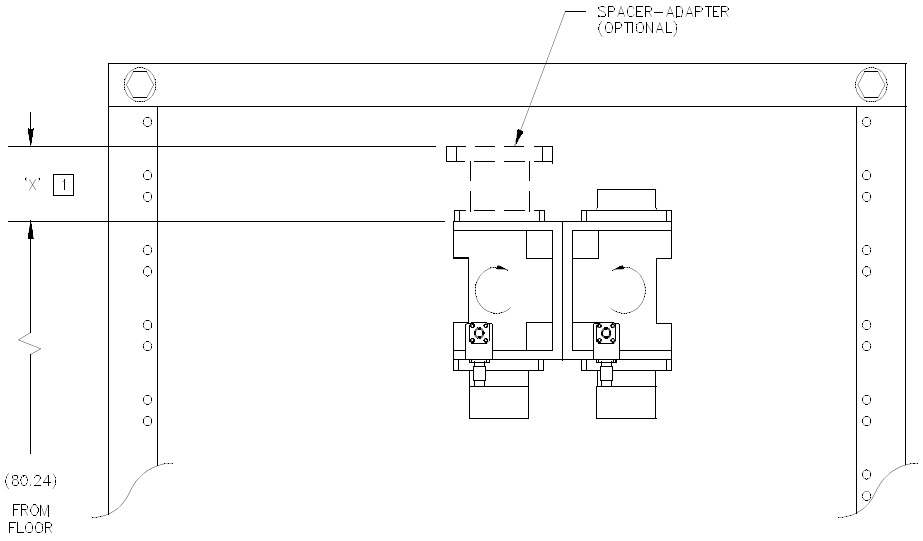


Figure 6-2: ACU, nonprotected (front view), mechanical drawing



1 Refer to Table 6-2 on page 1.

Figure 6-3: ACU, hot-standby (top view), mechanical drawing

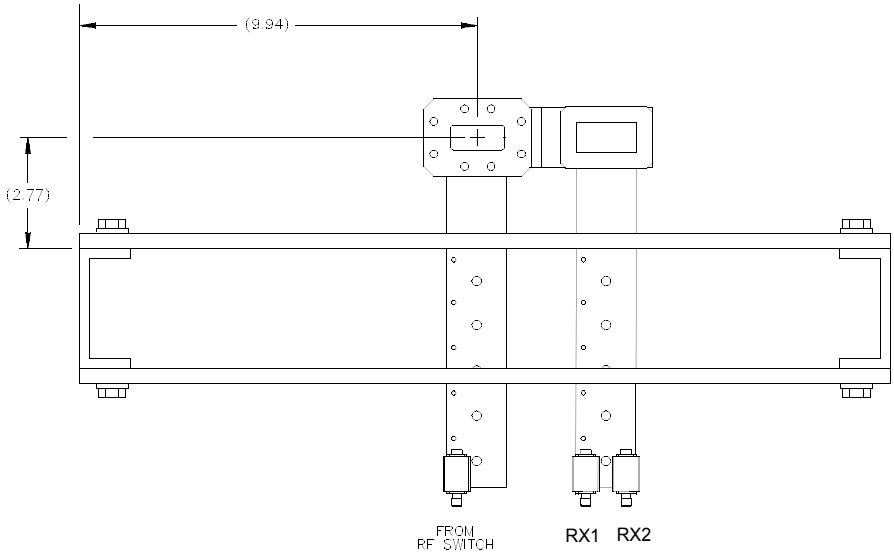
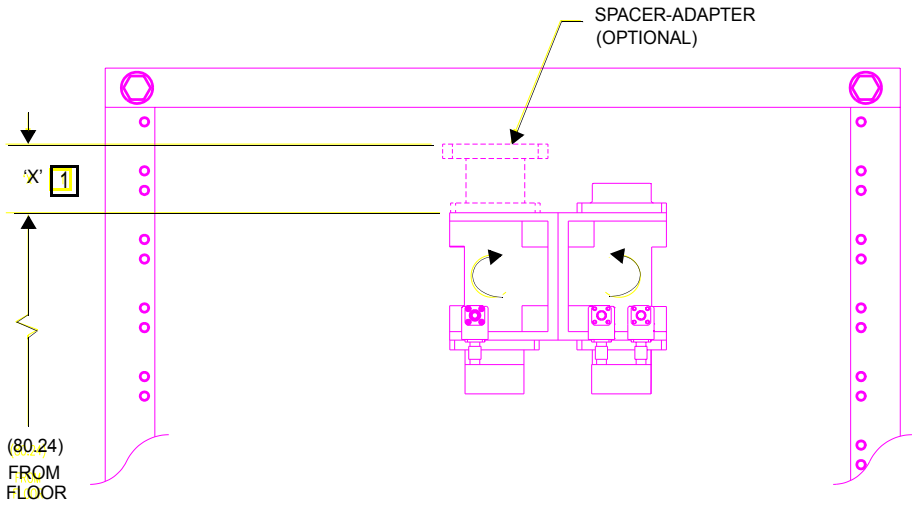


Figure 6-4: ACU, hot-standby (front view), mechanical drawing



1 Refer to Table 6-2 on page 1.

Figure 6-5: ACU, hot-standby Transmitters, space-diversity Receivers (top view), mechanical drawing

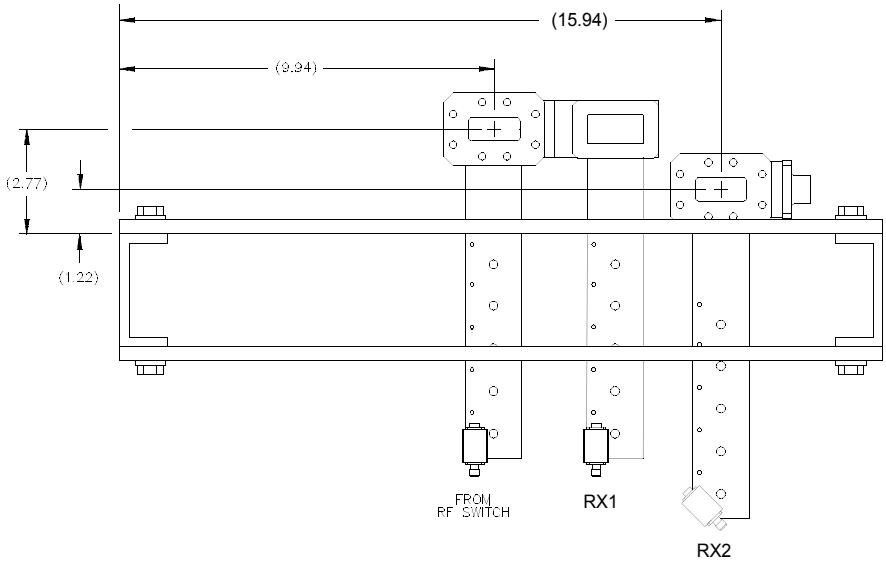
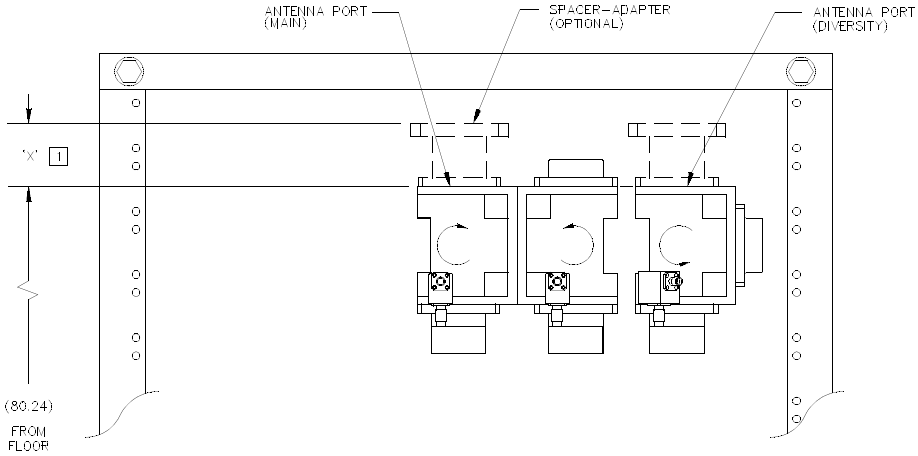


Figure 6-6: ACU, hot-standby Transmitters, space-diversity Receivers (front view), mechanical drawing



1 Refer to Table 6-2 on page 1.

Figure 6-7: ACU, hot-standby/frequency-diversity, 2-antenna (T/R, T/R) (top view), mechanical drawing

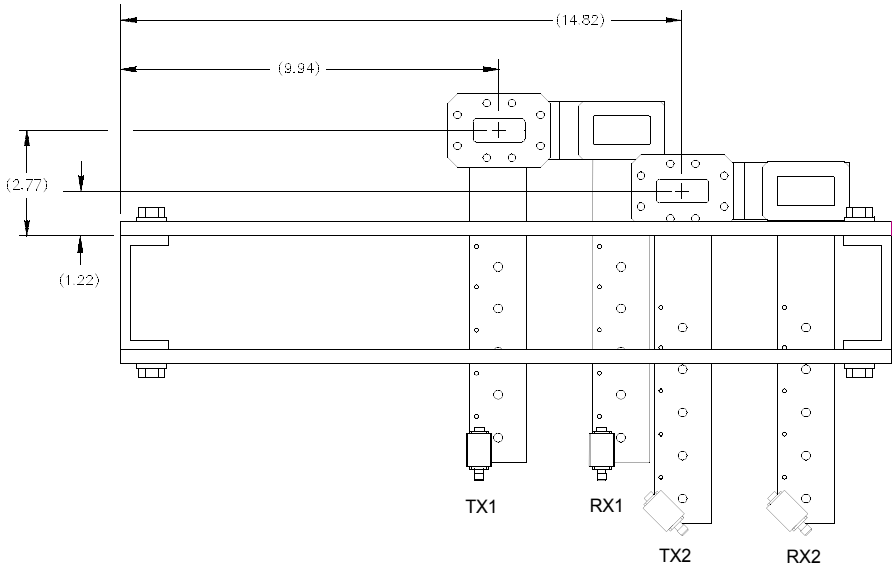
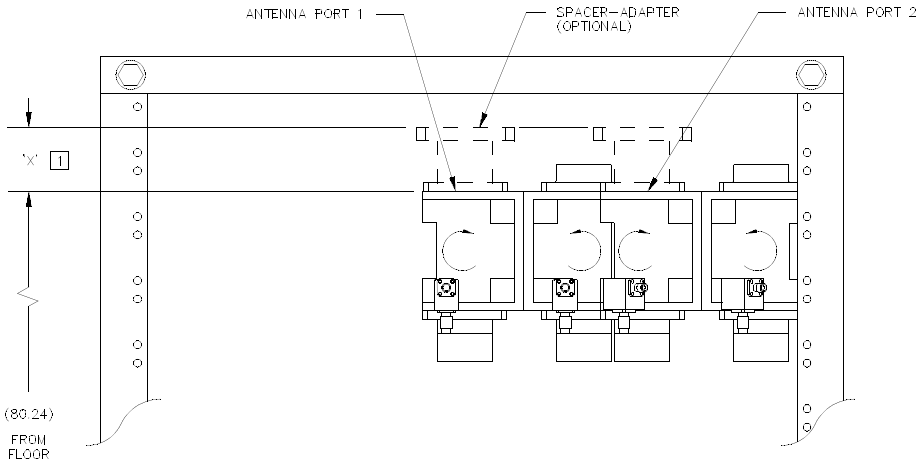


Figure 6-8: ACU, hot-standby/frequency-diversity 2-antenna (T/R, T/R) (front view), mechanical drawing



1 Refer to Table 6-2 on page 1.

Figure 6-9: ACU, repeater/dual terminal, mechanical drawing

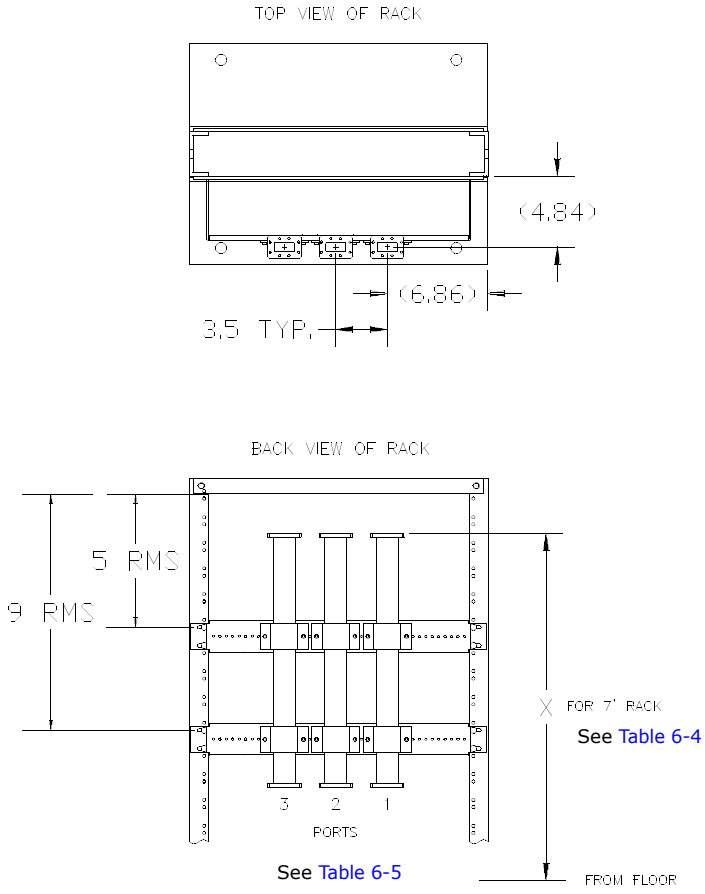


Table 6-4: X dimension from floor, ACU, repeater/dual terminal

ACU frequency (GHz)	X dimension (inches)
6	80.24
7/8	79.61
11	79.25

ACU Port Configurations

Table 6-5: ACU port configurations

Available ACU Configuration	Port 1	Port 2	Port 3
NP (Tx/Rx)	TX/RX		
NP SD (Tx/Rx, Rx)	TX/RX	RX	
HS (Tx/Rx)	TX/RX		
HS SD (Tx/Rx, Rx)	TX/RX	RX	
HS, 2 antennas (Tx/Tx, Rx/Rx)	TX/TX	RX/RX	
HS/FD, 2 antennas (Tx/Rx, Tx/Rx)	TX/RX	TX/RX	
FD, 1 antenna (Tx/Tx/Rx/Rx)	TX/TX/RX/RX		
FD, 2 antennas (Tx/Tx, Rx/Rx)	TX/TX	RX/RX	
NP, 2 antennas (Tx, Rx)	TX	RX	
HS SD, 3 antennas (Tx, Rx, Rx)	TX	RX	RX
NP SD, 3 antennas (Tx, Rx, Rx)	TX	RX	RX

CHAPTER

7

PERFORMANCE CURVES

Performance Curves

Performance curves provide important parameters (hop distance, channel spacing, and so forth) required for designing a communications system. The curves in this chapter include the following:

1. Typical threshold-to-interference (T/I) curve (6 GHz and 7/8 GHz, 8 DS1)
2. Typical threshold-to-interference (T/I) curve (10/11 GHz, 8 DS1)
3. Typical threshold-to-interference (T/I) curve (6 GHz and 7/8 GHz, 16 DS1)
4. Typical threshold-to-interference (T/I) curve (10/11 GHz, 16 DS1)
5. Typical threshold-to-interference (T/I) curve (6 GHz and 7/8 GHz, 28 DS1/DS3)
6. Typical threshold-to-interference (T/I) curve (10/11 GHz, 28 DS1/DS3)
7. Typical threshold-to-interference (T/I) curve (6, 7/8, 10/11 GHz, 155 Mbit/s, 128 TCM)
8. Typical BER versus C/N curve (8 DS1)
9. Typical BER versus C/N curve (16 DS1)
10. Typical BER versus C/N curve (28 DS1/DS3)
11. Typical BER versus C/N curve (Constellation 155)
12. Typical BER versus RSL curve
13. Typical DS1 jitter transfer curve
14. Typical DS1 input jitter tolerance curve
15. Typical DS3 jitter transfer curve
16. Typical DS3 input jitter tolerance curve

Threshold-to-Interference (T/I) Ratios

Overview

The T/I curve shows the strength of interference and the frequency away from the carrier required to degrade the 10^{-6} BER (bit error ratio) state threshold and the 10^{-3} BER dynamic/outage thresholds by 1 dB. Measurements were made by fading the wanted received signal level (RSL) until the 10^{-6} BER point is found (T). A modulated interfering signal is then added until the 10^{-6} BER point is degraded by 1 dB (I). The measurement is also made with a CW interfering signal which emulates an analog radio FM emission. The ratio is the T/I. The T/I curve is used for choosing radio frequency assignments and to find the fade margin in congested areas. T/I curves plotting allowable T/I versus frequency offset of the interfering signal must be on file with the frequency search companies and are therefore available for all Harris digital microwave radios.

Example: if 10^{-6} BER threshold is -80 dBm and T/I is 30 dB, then the allowable interference level at threshold is -80 dBm minus 30 dB = -110 dBm.

Like Signal T/I Ratio

Table 7-1: Like signal T/I for 6 and 7/8 GHz

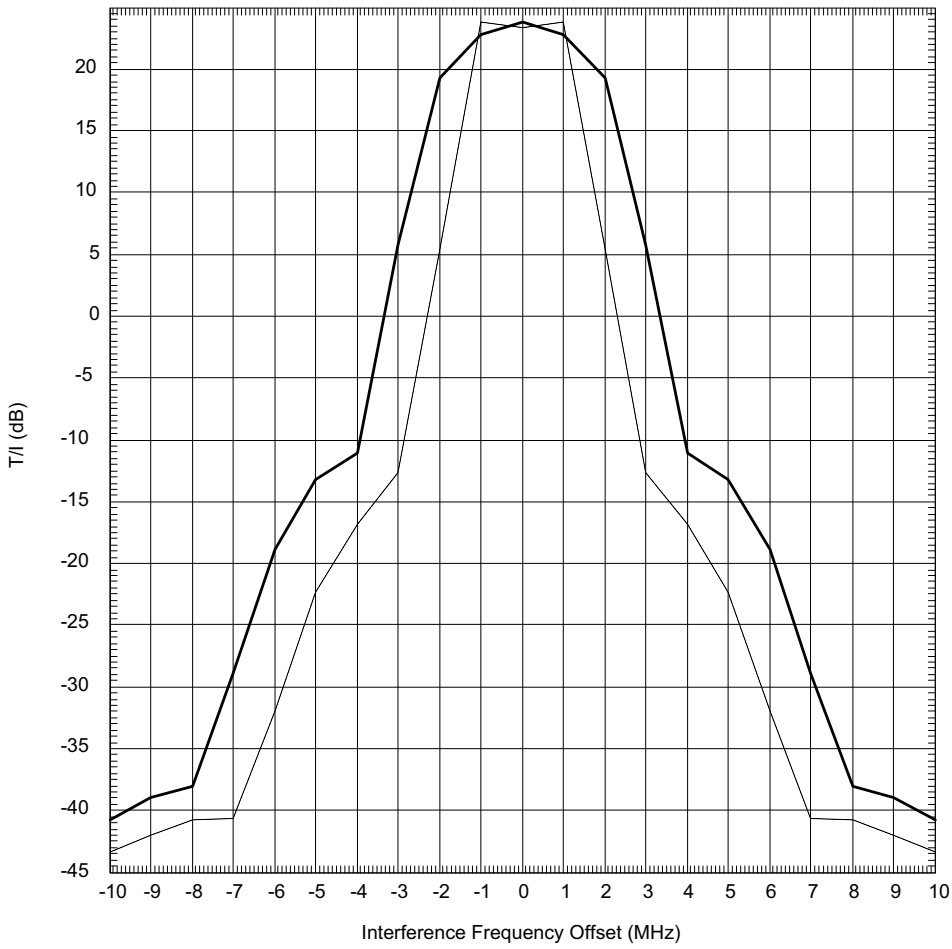
Capacity	Co-channel T/I (dB)	Adjacent Channel T/I (dB)	Two Times Adjacent Channel T/I (dB)
8 DS1	25	-12	-40
16 DS1	33	-4	-32
28 DS1/DS3	29	-5	-38
OC-3 3 x DS3	33	-4	-32

Table 7-2: Like signal T/I for 10/11 GHz

Capacity	Co-channel T/I (dB)	Adjacent Channel T/I (dB)	Two Times Adjacent Channel T/I (dB)
8 DS1	25	-12	-37
16 DS1	33	-4	-32
28 DS1/DS3	29	-5	-28
OC-3 3 x DS3	33	-4	-32

T/I Curves

Figure 7-1: Typical threshold-to-interference (T/I) curve (6 GHz and 7/8 GHz, 8 DS1)



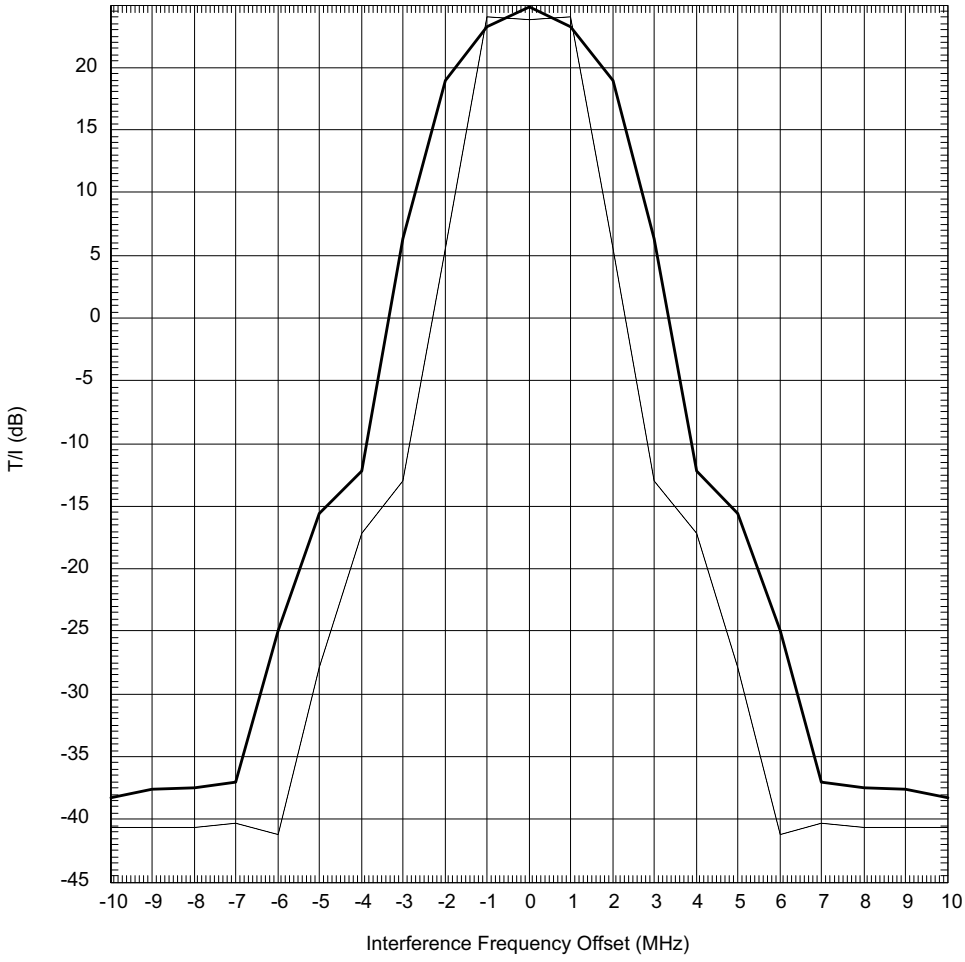
KEY:

Like Interferer

Analog (CW) Interferer

Radio:	**Constellation**
Capacity:	8 DS1
Frequency Band:	5850 - 8500 MHz
Date:	8/7/2000

Figure 7-2: Typical threshold-to-interference (T/I) curve (10/11 GHz, 8 DS1)



KEY:

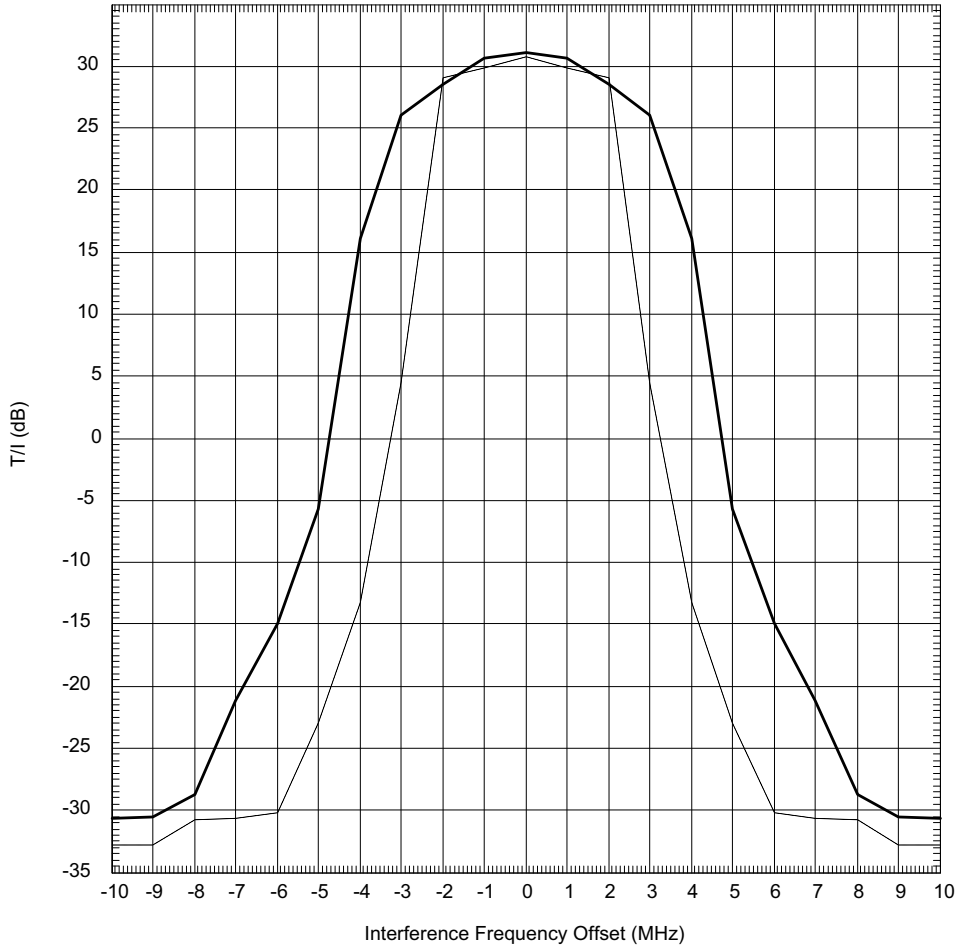
Like Interferer

Analog (CW) Interferer

Radio:	**Constellation**
Capacity:	8 DS1
Frequency Band:	10550 - 11700 MHz
Date:	8/7/2000

PERFORMANCE CURVES

Figure 7-3: Typical threshold-to-interference (T/I) curve (6 GHz and 7/8 GHz, 16 DS1)



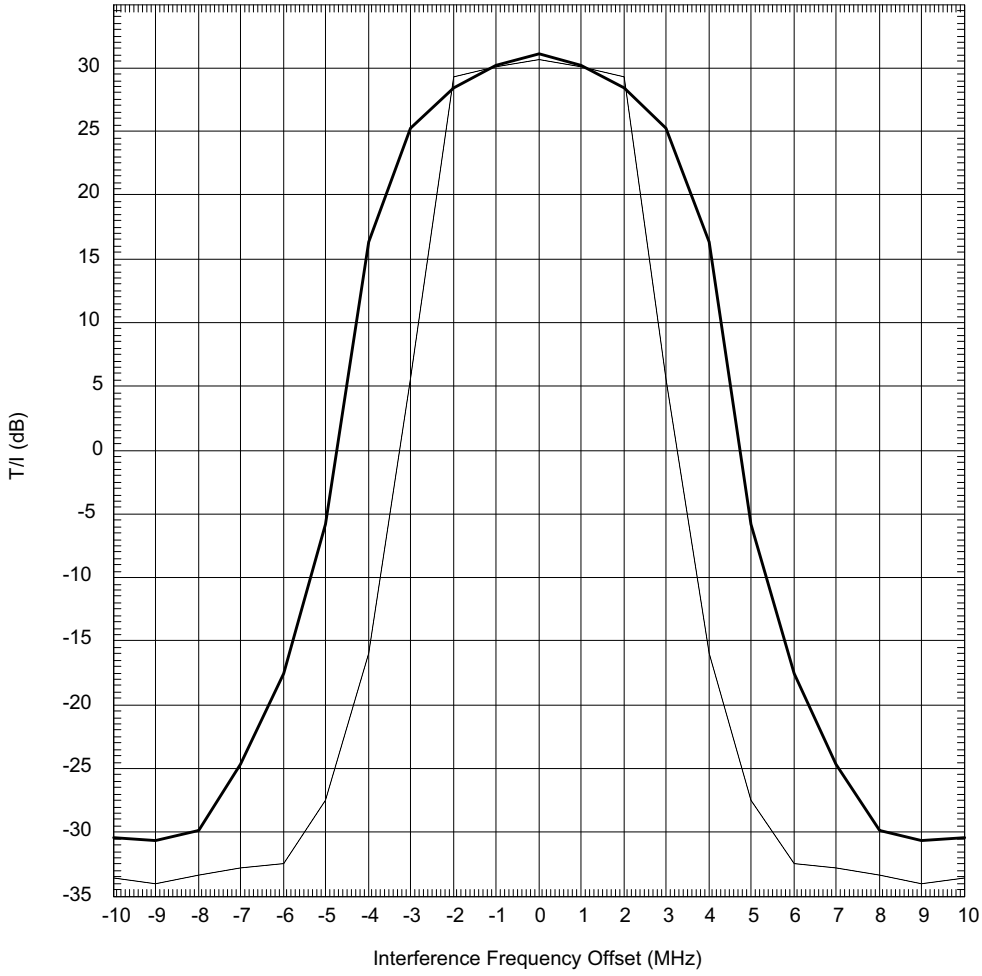
KEY:

Like Interferer

Analog (CW) Interferer

Radio:	**Constellation**
Capacity:	16 DS1
Frequency Band:	5850 - 8500 MHz
Date:	8/7/2000

Figure 7-4: Typical threshold-to-interference (T/I) curve (10/11 GHz, 16 DS1)



KEY:

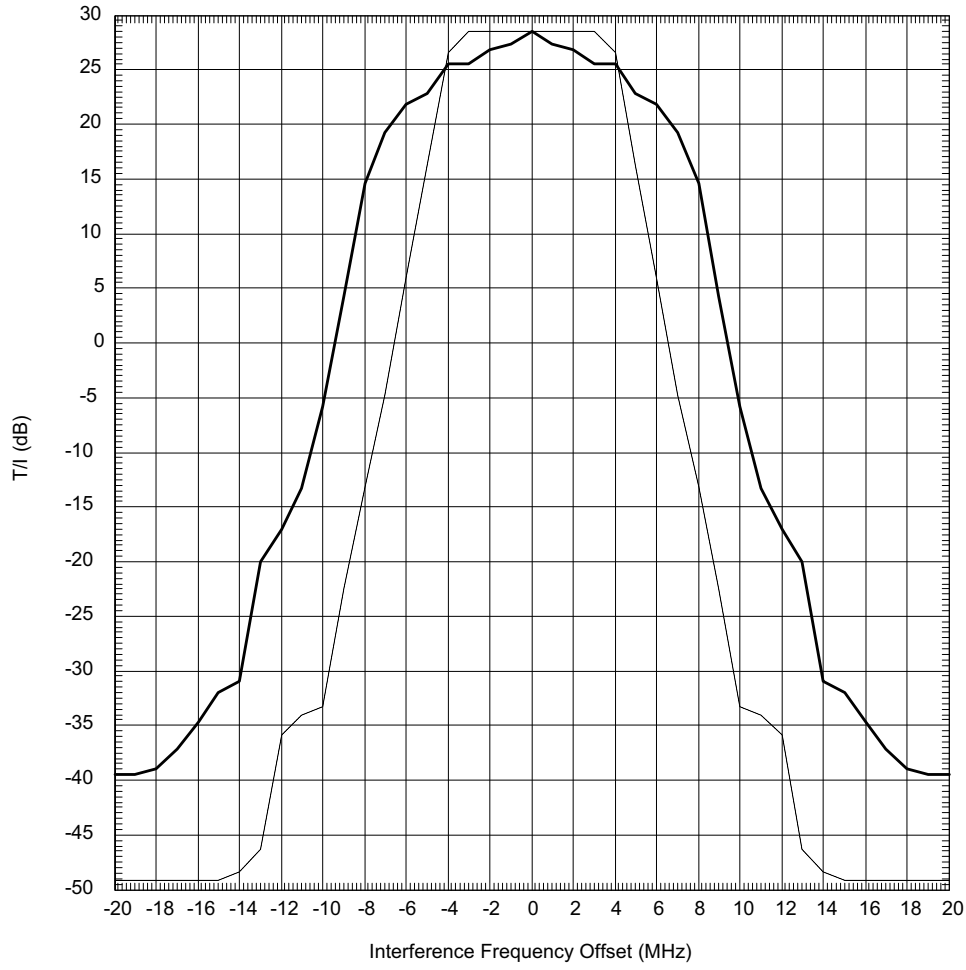
——— Like Interferer

——— Analog (CW) Interferer

Radio:	**Constellation**
Capacity:	16 DS1
Frequency Band:	10550 - 11700 MHz
Date:	8/7/2000

PERFORMANCE CURVES

Figure 7-5: Typical threshold-to-interference (T/I) curve (6 GHz and 7/8 GHz, 28 DS1/DS3)



KEY:

——— Like Interferer

——— Analog (CW) Interferer

Radio:	**Constellation**
Capacity:	28 DS1
Frequency Band:	5850 - 8500 MHz
Date:	8/7/2000

Figure 7-6: Typical threshold-to-interference (T/I) curve (10/11 GHz, 28 DS1/DS3)

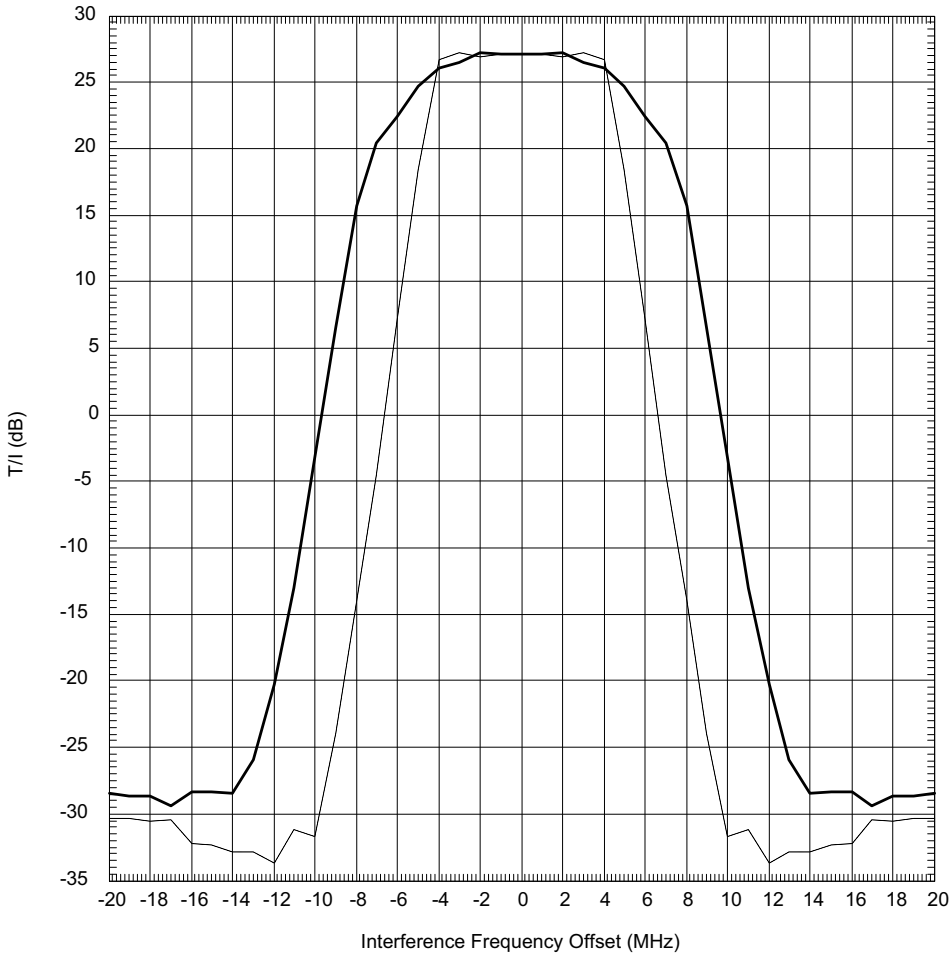
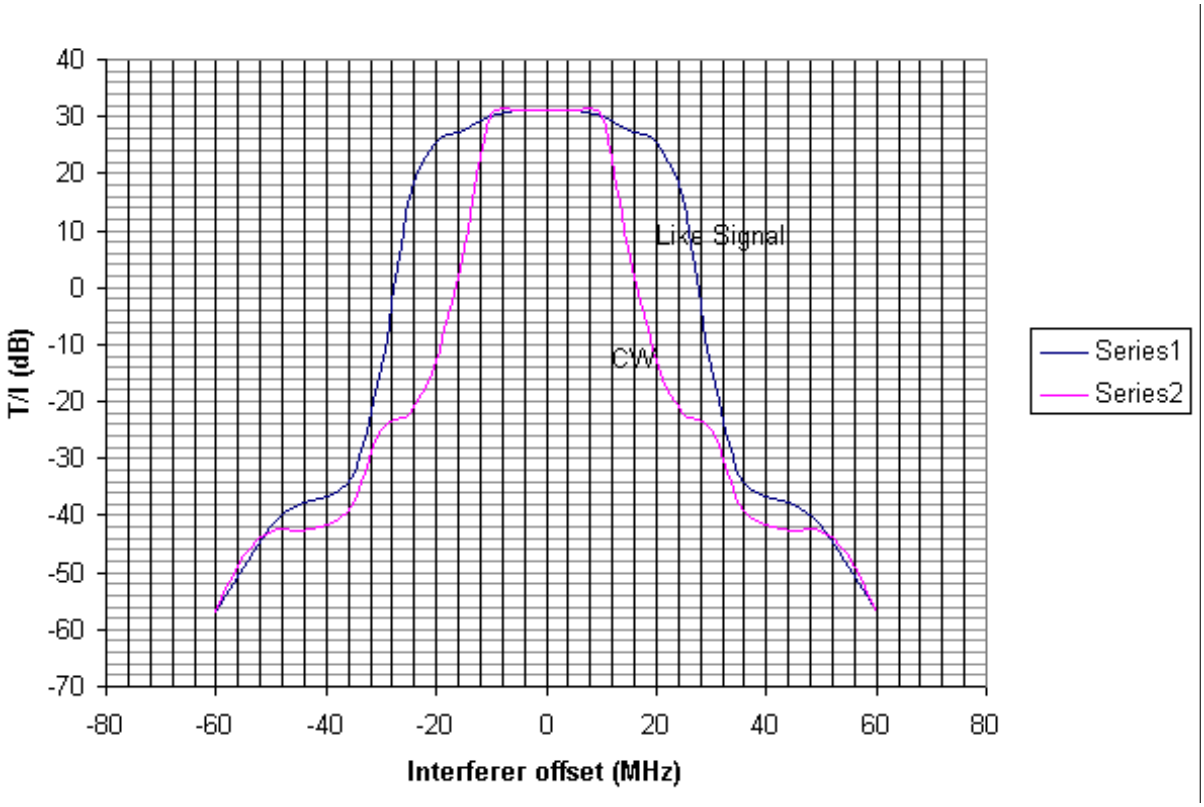


Figure 7-7: Typical threshold-to-interference (T/I) curve (6, 7/8, 10/11 GHz, 155 Mbit/s, 128 TCM)

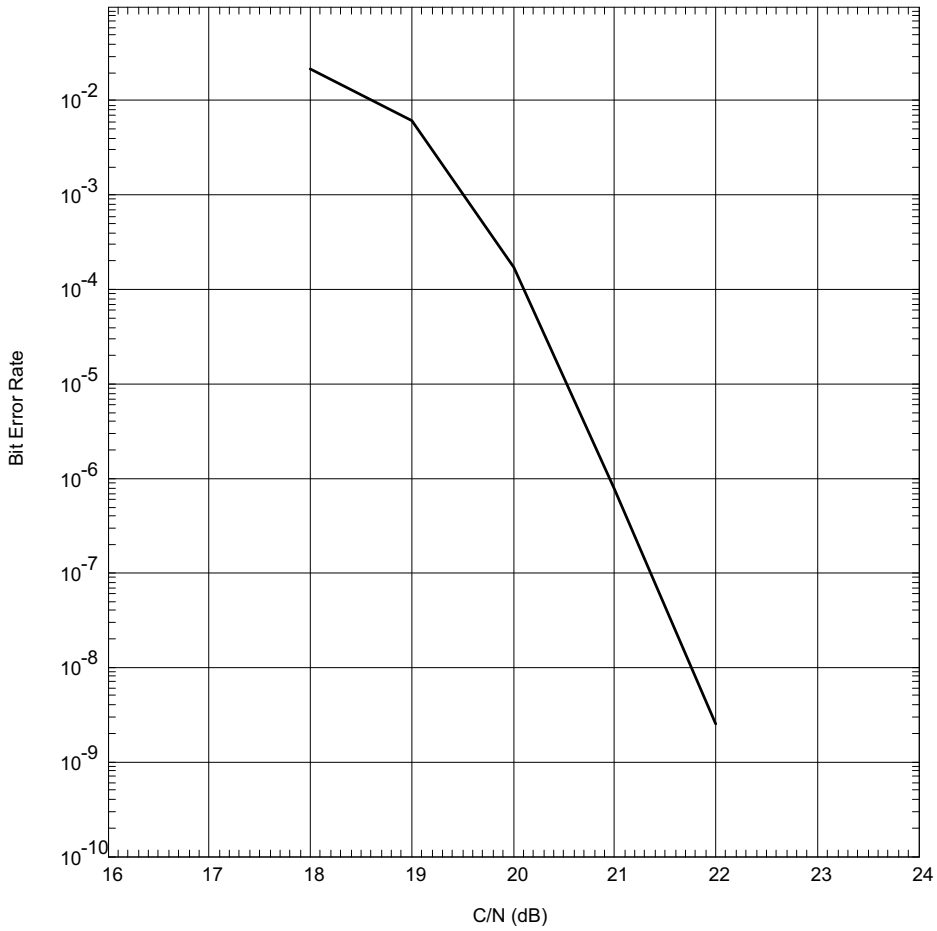


Receiver Signal-to-Noise Characteristics

BER versus C/N Curve

The Receiver C/N curve indicates how signal to noise affects the BER.

Figure 7-8: Typical BER versus C/N curve (8 DS1)



KEY:

BER vs. C/N

Radio:	**Constellation**
Capacity:	8 DS1
Frequency Band:	5850 - 11700 MHz
Date:	10/6/99

Figure 7-9: Typical BER versus C/N curve (16 DS1)

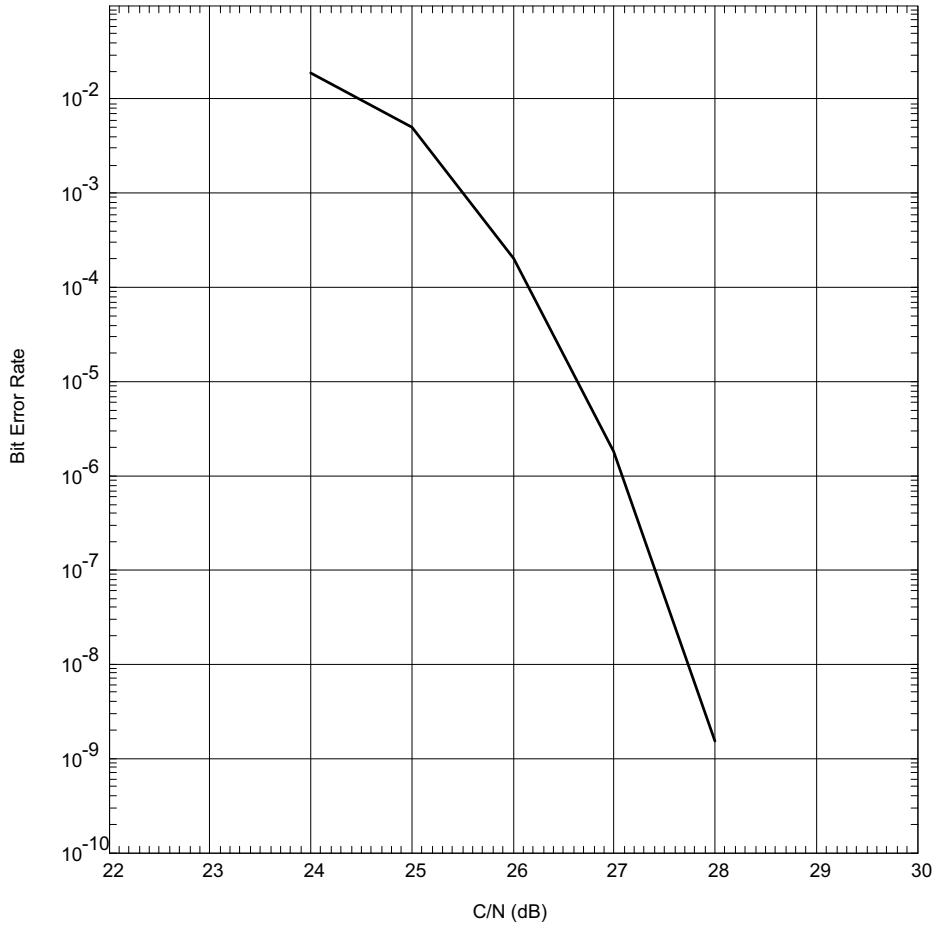
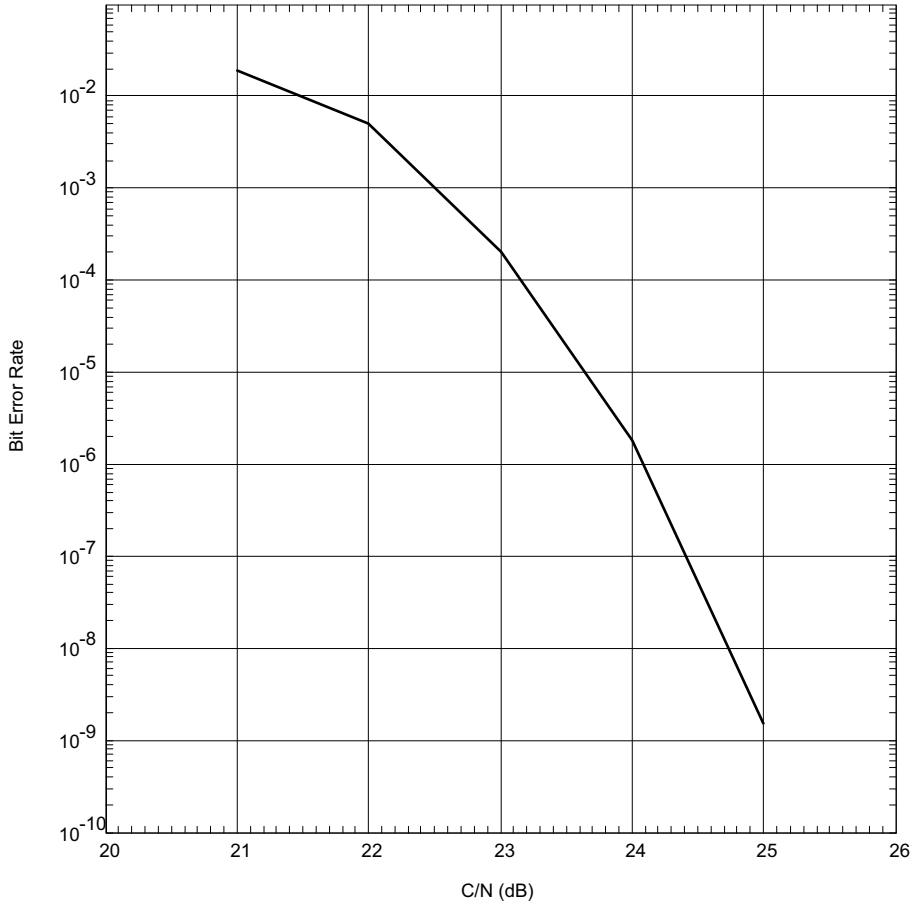


Figure 7-10: Typical BER versus C/N curve (28 DS1/DS3)

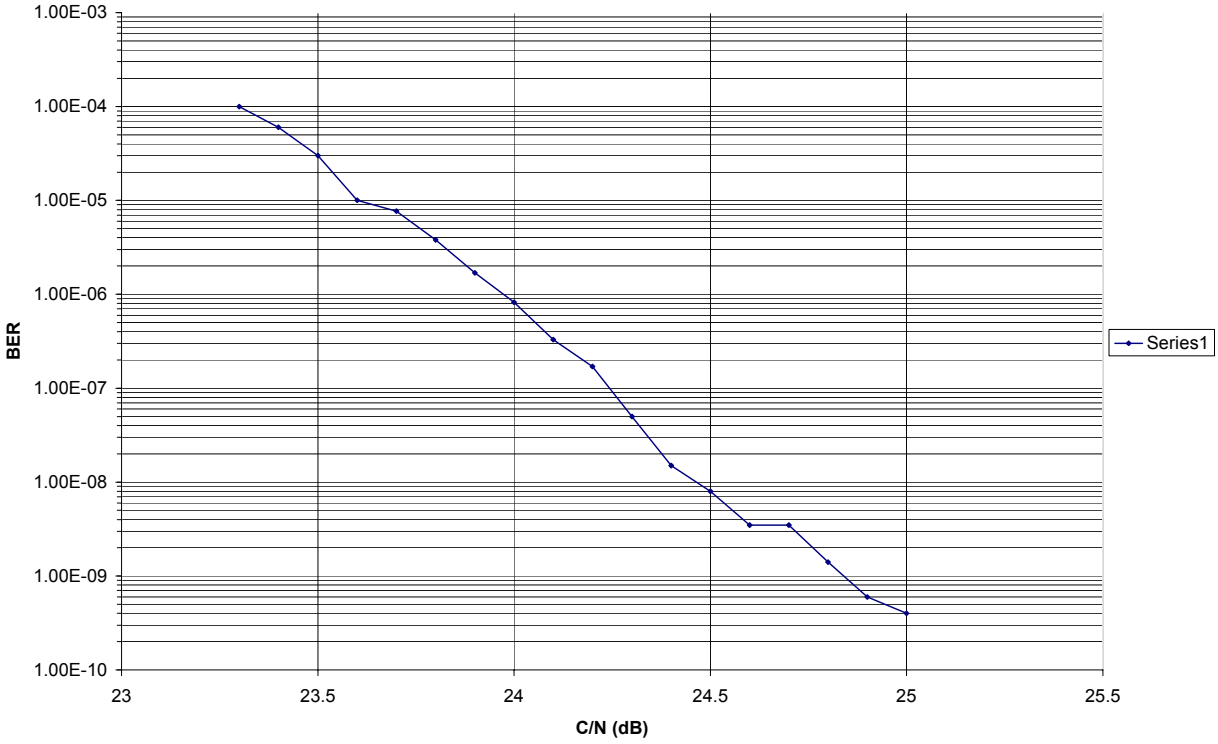


KEY:

BER vs. C/N

Radio:	**Constellation**
Capacity:	28 DS1/DS3
Frequency Band:	5850 - 11700 MHz
Date:	10/6/99

Figure 7-11: Typical BER versus C/N curve (Constellation 155)

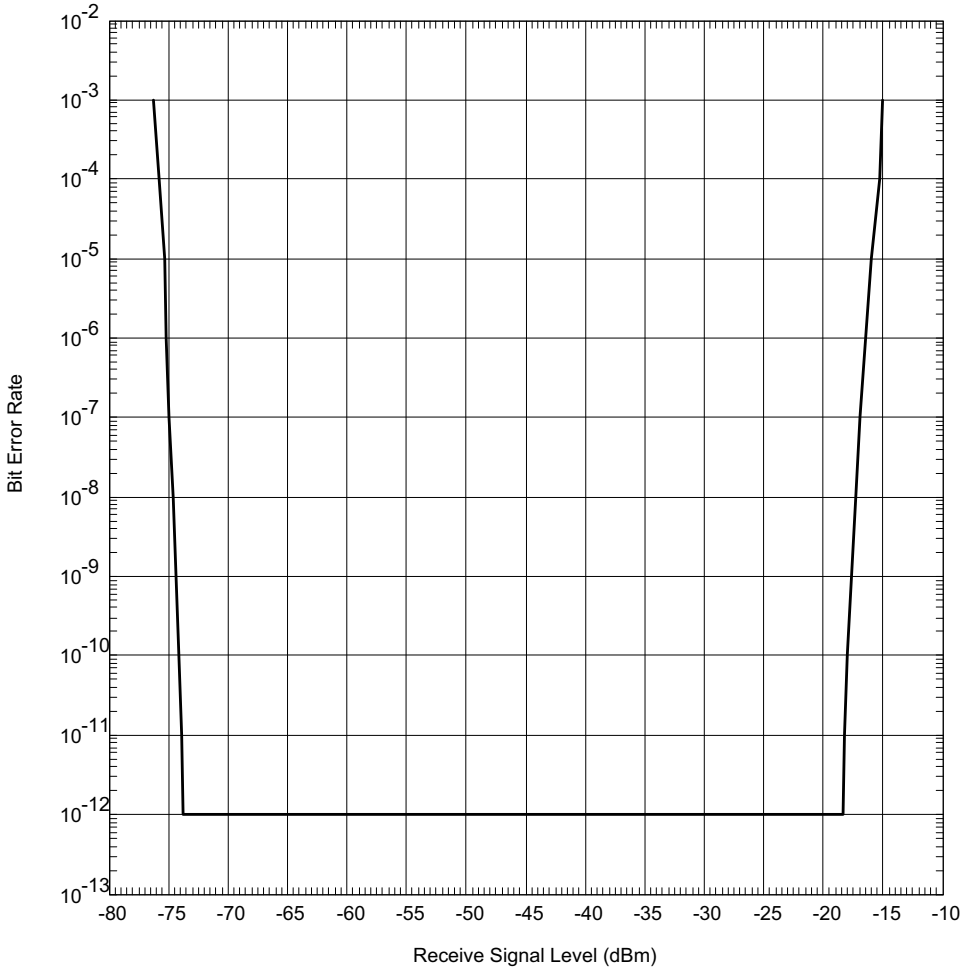


BER versus RSL Dynamic Range

The increase of BER as the result of a faded RSL indicates the sensitivity of the Receiver. The curve includes the received signal overload characteristics.

The dynamic range of the Receiver is the range from the low RSL to the high RSL at 10^{-6} BER or other BER (10^{-3} outage, 10^{-13} error-free, and so forth).

Figure 7-12: Typical BER versus RSL curve



KEY:

BER vs. RSL

Radio:	**Constellation**
Capacity:	16 DS1
Frequency Band:	5850 - 6875 MHz
Date:	12/7/99

Jitter Characteristics

This set of curves contains two types of jitter curves: a curve of the jitter transfer function and a curve of the jitter tolerance. The curve of the jitter transfer function shows how jitter at different frequencies is attenuated in the radio and is shown with ITU-T G.958 mask. The jitter tolerance curve shows how much jitter at various frequencies the radio will tolerate at its inputs before errors occur as specified in ITU-T G.958.

Figure 7-13: Typical DS1 jitter transfer curve

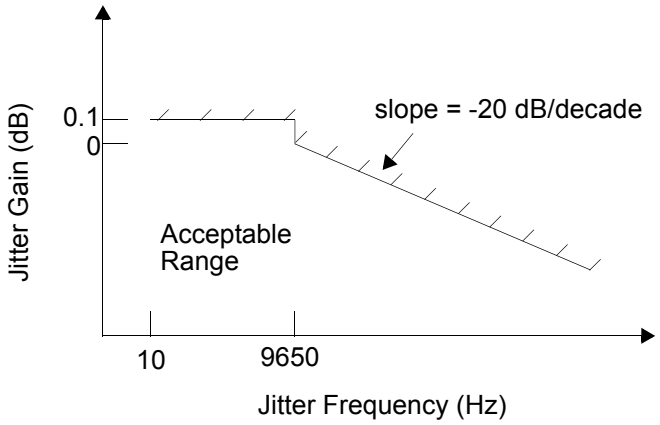


Figure 7-14: Typical DS1 input jitter tolerance curve

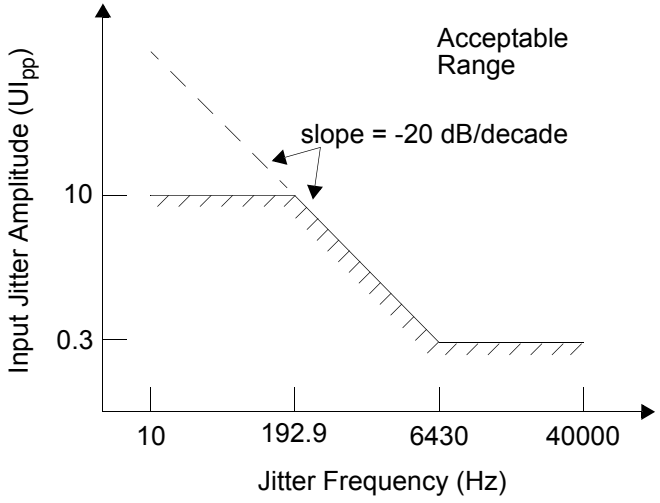


Figure 7-15: Typical DS3 jitter transfer curve

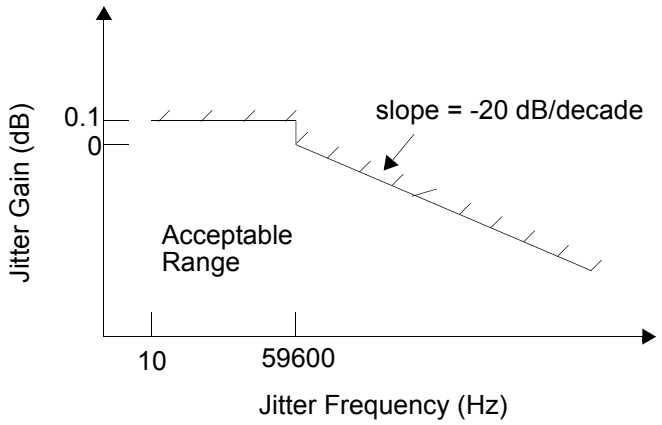
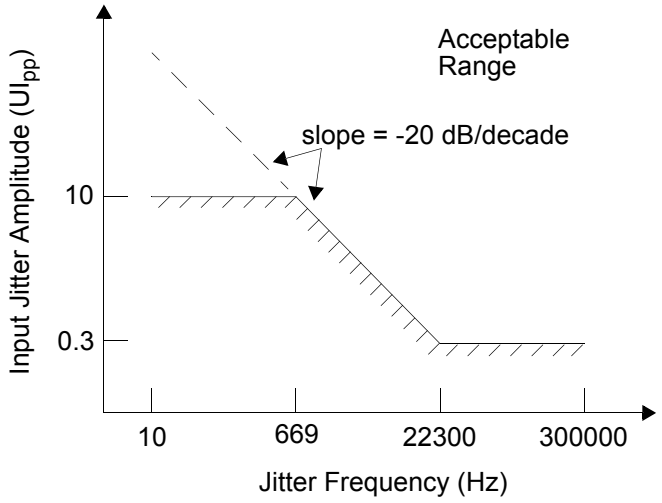


Figure 7-16: Typical DS3 input jitter tolerance curve



APPENDIX

A

RACK PROFILES

19-inch Rack Frame

Figure A-1 and Figure A-2 show the Harris standard rack dimensions.

Figure A-1: EIA 19-inch rack frame and pedestal detail (top view)

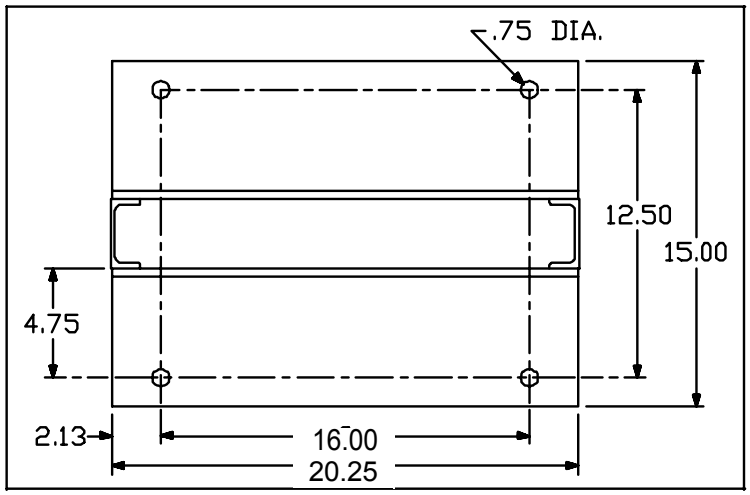
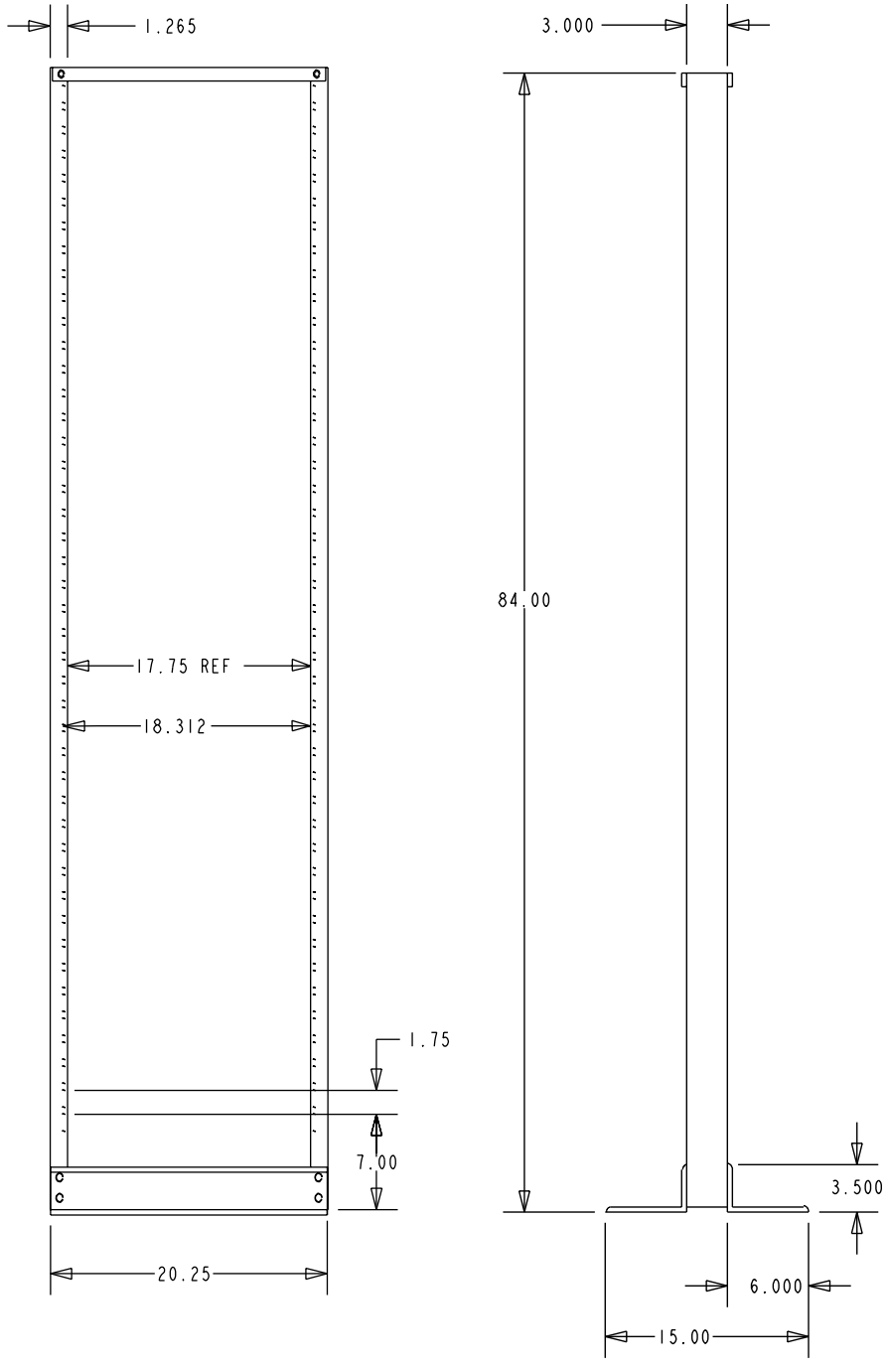


Figure A-2: EIA 19-inch rack frame and pedestal detail



APPENDIX

B

GLOSSARY

A

ACU. Antenna Coupling Unit.

AGC. Automatic Gain Control; automatic gain adjustment of a varying input signal level to produce a constant output signal level.

AIS. Alarm Indication Signal.

AMI. Alternate Mark Inversion.

AMSL. Above Mean Sea Level.

ANSI. American National Standards Institute.

ATDE. Adaptive Time Domain Equalizer.

ATPC. Automatic Transmitter Power Control.

AUX. Auxiliary port.

B

B8ZS. Bipolar with Eight Zero Substitution.

baseband. A frequency band occupied by a modulating information signal.

Bellcore. Bell Communications Research, Inc. (source of telephony standards in the U.S.A.).

BER. Bit Error Ratio.

BERT. Bit Error Ratio Tester.

C

CAN. Controller Area Network. An interface standard (ISO 11898) for interconnecting microcontrollers.

CFM. Composite Fade Margin.

CGA. Carrier Group Alarm.

CPE. Customer Premises Equipment.

CW. Continuous Wave.

D

DACS. Digital Access and Cross-connect System.

DADE. Differential Absolute Delay Equalization. A method for aligning, in time, two identical data streams that are traveling through channels of differing length (time).

DFM. Dispersive Fade Margin.

D connectors, subminiature. The size of the subminiature D connector is specified by the standard shell size and the number of connectors. For example, a 15-pin connector is referred to as a DA-15. See the following table.

Standard Shell Size	No. of Connectors
E	9
A	15
B	25
C	37
D	50

DCS. Digital Cross-connect System.

DTMF. Dual-Tone MultiFrequency.

E

EFS. Error-Free Seconds.

EIA. Electronic Industries Association.

EMI. Electro-Magnetic Interference.

ERP. Effective Radiated Power.

ES. Errored Seconds.

ETSI. European Telecommunications Standards Institute.

F

FarScan. Harris' network management system software.

FCC. Federal Communications Commission (U.S.).

FD. Frequency Diversity. Diversity transmission and reception in which the same information signal is transmitted and received simultaneously on two or more independently fadings carrier frequencies.

FEC. Forward Error Correction.

FFM. Flat Fade Margin.

FITs. Failures In Time (10^9 hours).

H

HLM. High Level Mux.

hop. The span between a transmitter and a receiver.

HS. Hot Standby.

I

IEC. International Electrotechnical Commission.

IF. Intermediate Frequency; frequency below the radio frequency.

IFM. Interference Fade Margin.

IP. Internet Protocol.

ISO. International Organization for Standardization.

ITU. International Telecommunication Union.

J

JF. JackField.

L

LAN. Local Area Network.

LED. Light-Emitting Diode.

LNA. Low-Noise Amplifier.

LNC. Low-Noise Converter.

Loopback Test. A test of the coupling of a signal from the transmitting path back to the local receiving path.

LOS. Loss Of Signal.

M

M12. A multiplexing method that transforms between 1 DS1 up to 4 DS1 input/outputs and a T2 output/output.

M2X. A multiplexing method that transforms between 1 T2 up to 7 T2 input/outputs and a T3 output/output.

MCD. Microwave Communications Division, formerly Farinon Division.

MHSB. Monitored Hot StandBy.

MIB. Management Information Base.

MTBF. Mean Time Between Failures.

MTBO. Mean Time Between Outages.

MTR. Mean Time to Restore the circuit after failure.

MTTR. Mean Time To Repair.

MUX. MUltipleXer.

N

NMS. Network Management System.

Noise Figure. The ratio of the output noise power to the portion of the output noise power stemming from thermal noise at the input at standard noise temperature.

NP. NonProtected.

NRZ. NonReturn to Zero (coding).

NTIA. National Telecommunications and Information Administration (U.S.A.)

P

PA. Power Amplifier.

PBX. Private Branch Exchange.

PCB. Printed Circuit Board.

PCM. Pulse Code Modulation.

Q

QAM. Quadrature Amplitude Modulation. Quadrature modulation in which two carriers are amplitude-modulated.

R

RF. Radio Frequency.

RFI. Radio Frequency Interference.

RIP. Routing for Internet Protocol.

RMS. Root Mean Square.

RSL. Received Signal Level.

RTU. Remote Terminal Unit.

RX. Receiver.

S

SAI. System Application Information.

SCAN. System Control And Alarm Network. Harris' proprietary standard for sending alarm/status/control messages over a serial port.

SD. Space Diversity. Pertaining to signal transmission and reception in which two or more separate and independent propagation media or paths are used for transmitting the same information.

SES. Severely Errored-Seconds.

SLVA. Successive Log Video Amplifier.

SNMP. Simple Network Management Protocol.

SNR. Signal-to-Noise Ratio.

SPU. Signal Processing Unit.

SPUR. Extended SCAN port. A communications channel branching of from the trunk and generally carrying less traffic than the trunk.

ST. Split Transmitters.

T

TCM. Trellis-Coded Modulation.

TFM. Thermal Fade Margin.

T/I. Threshold-to-Interference ratio.

TIA. Telecommunication Industries Association.

TOR. Top Of Rack.

TSL. Transmitted Signal Level.

TX. Transmitter.

U

UBER. Uncorrected Bit Error Ratio.

V

VF. Voice Frequency.

VSB. Very Severe Burst.

W

WAN. Wide Area Network.

X

XMTR. Transmitter.

APPENDIX

I

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