



LBI-38983

Mobile Communications

ANTENNA SYSTEMS



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Assembly Manual

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DESCRIPTION

Antenna systems are generally installed by crews with specialized equipment and skills for installing antennas and working on antenna towers. This manual includes assembly drawings that provide information to assemble complete antenna systems (with vendor options) for radio station equipment operating in the VHF, UHF, 800 MHz, and 900 MHz frequency bands. System configurations addressed include both conventional and trunked radio systems as well as auxiliary receivers. Upon completing the installation, a physical inspection of the antenna system should be made to verify that all connections are made and secure.

INSTALLATION

Coaxial cable and connectors are supplied separately in bulk and must be cut to length and terminated in the field. Select the appropriate antenna system configuration from the drawings included in this manual. Begin at the point where the antenna cable enters the equipment room and assemble the necessary cables from the entry point to the individual TX and Rx. first measure to determine the correct length when the cable is routed from the repeater to the RF equipment via the cabinet top ducts then terminate with the proper connectors as shown on the antenna system assembly diagram. refer also to the station transmitter manual for general information pertaining to the trunked repeater.

In order to cut the coaxial cable properly for easy connector attachment it is recommended that an Andrew "EASIAX" cutting tool be used when terminating the coaxial cable.

ANTENNA SYSTEM INSPECTION

Each transmitter and receiver antenna system must be inspected per the following procedure.

This inspection is to verify proper installation of the antenna system components and may be accomplished using field glasses from various positions on the ground to view the antenna system. Complete one data sheet for each antenna at the site. A typical data sheet is shown in Figure 1.

- Record the make of antenna.
- Record the type of antenna: omni or directional.
- Record the design gain of the antenna.
- If the antenna is directional, record the bearing of the main lobe. If it is omni, write "Omni" in the data entry line.
- Record the height of the antenna above ground.
- Confirm that cable hoisting grips were installed as required to prevent damage to the coaxial cable. Hoisting grips should be installed at the antenna end of the cable plus one for each 200 ft of cable length.
- Confirm the cable is secured to the tower at intervals which do not exceed 3 feet.
- Confirm the cable is grounded at the top of the tower.
- Confirm the cable is grounded at the point where it leaves the tower.
- Confirm the cable is grounded at the point where it enters the building.

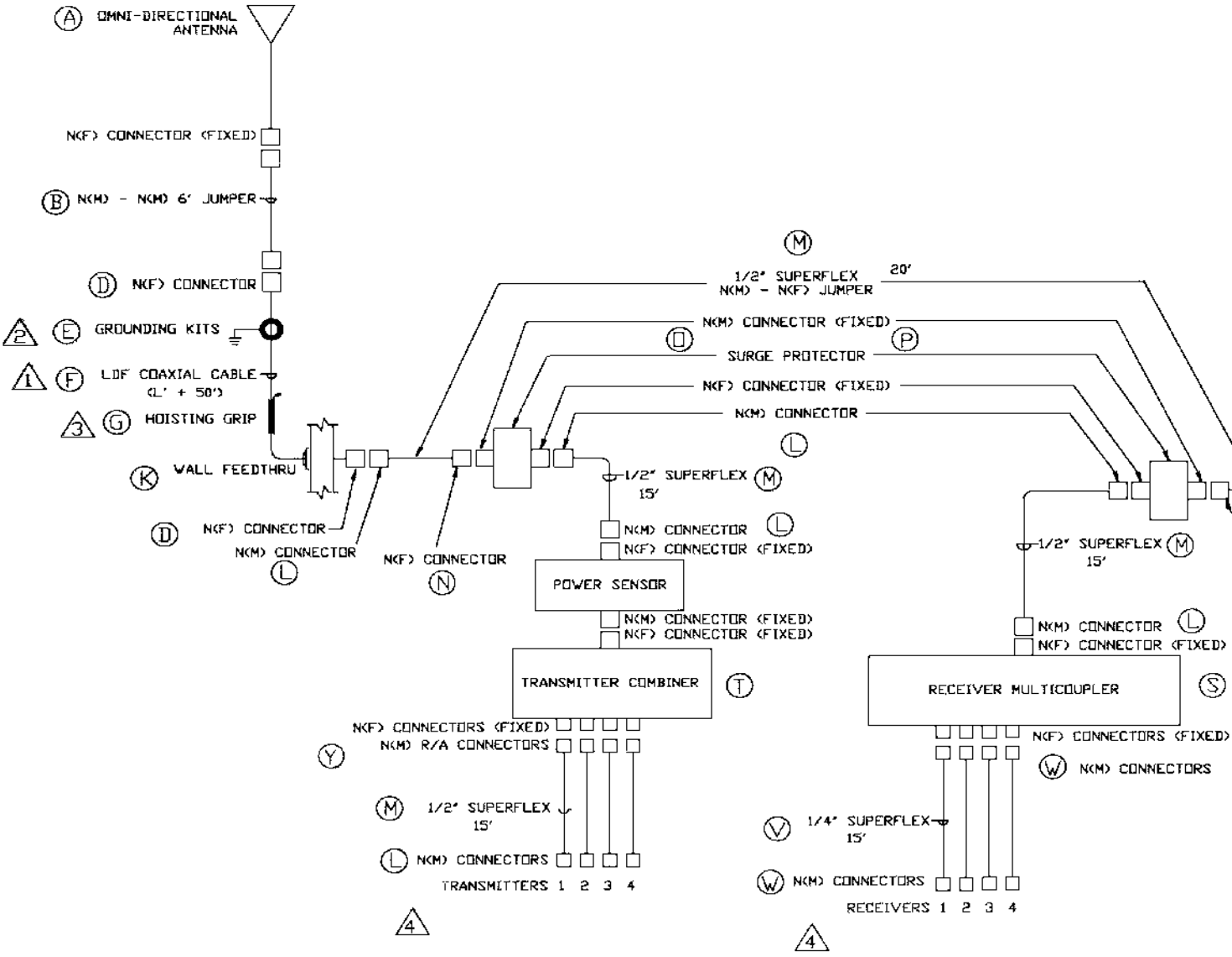
ANTENNA TESTS

1. Make of antenna
2. Type of antenna
3. Design gain of antenna
4. Bearing of antenna
5. Height of antenna above ground
6. Are hoisting grips installed as specified?
7. Is cable secured to tower at specified intervals?
8. Is cable grounded at top of tower?
9. Is cable grounded at bottom of tower?
10. Is the cable grounded at the point where the cable enters the building?
11. Transmission paths OK?
12. Is cable feed through properly installed?
13. Are coaxial connectors weather sealed?
14. Cable entrance weather sealed?

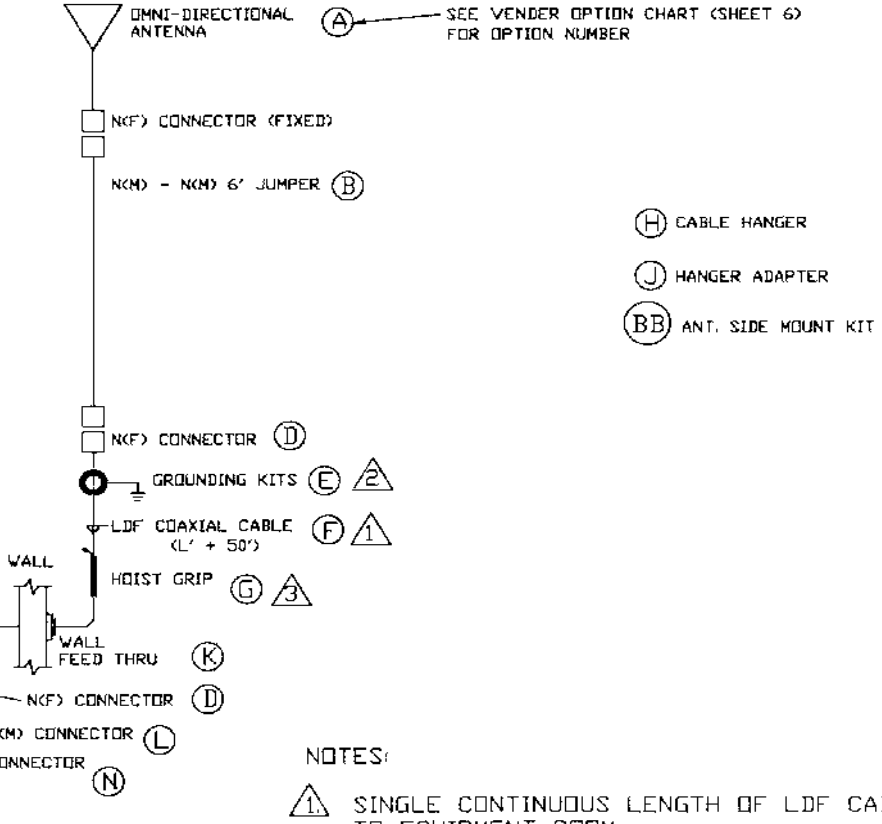
DATE _____
TECHNICIAN _____
SITE _____
ANTENNA NO _____

DATA SHEET 1
SHEET 1 OF 1

TRANSMIT ANTENNA HARDWARE



RECEIVE ANTENNA HARDWARE



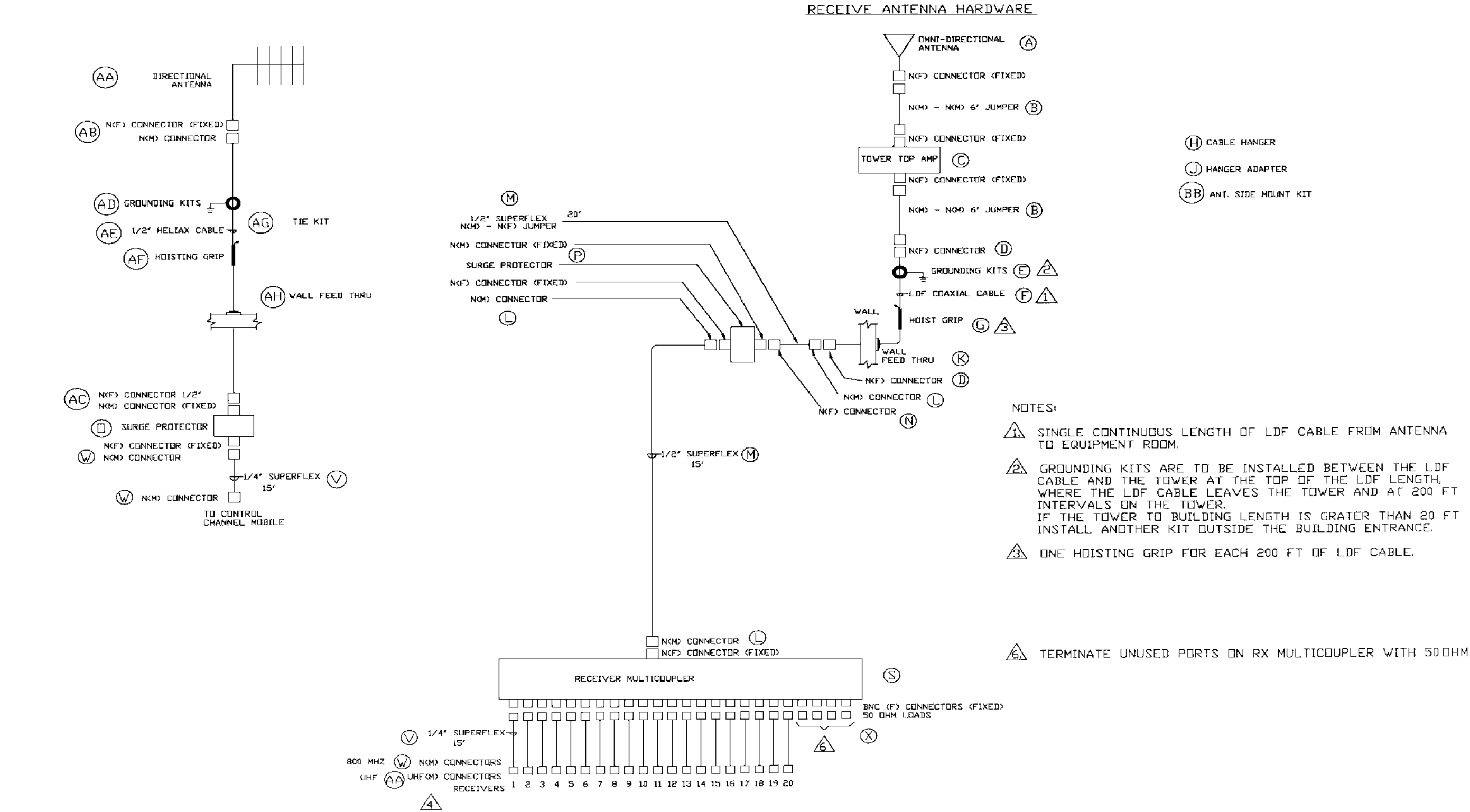
- (H) CABLE HANGER
- (J) HANGER ADAPTER
- (BB) ANT. SIDE MOUNT KIT

- NOTES:
- 1 SINGLE CONTINUOUS LENGTH OF LDF CABLE FROM ANTENNA TO EQUIPMENT ROOM.
 - 2 GROUNDING KITS ARE TO BE INSTALLED BETWEEN THE LDF CABLE AND THE TOWER AT THE TOP OF THE LDF LENGTH, WHERE THE LDF CABLE LEAVES THE TOWER AND AT 200 FT INTERVALS ON THE TOWER. IF THE TOWER TO BUILDING LENGTH IS GRATER THAN 20 FT INSTALL ANOTHER KIT OUTSIDE THE BUILDING ENTRANCE.
 - 3 ONE HOISTING GRIP FOR EACH 200 FT OF LDF CABLE.
 - 4 DIAGRAM SHOWM FOR UP TO 4 CHANNELS. HARDWARE FOR SYSTEM EXPANSION IN CHART.

4 SYSTEM EXPANSION CHART

NO. CHAN	TRANSMIT			RECEIVE		
	ANT QTY	QTY COMB		ANT QTY	RX MULTICOUPLER	
		4 CHAN	8 CHAN		4 CHAN	8 CHAN
4	1	1		1	1	
8	1		1	1		1
12	2	1	1	2	1	1
16	2		2	2		2
20	3	1	2	3	1	2

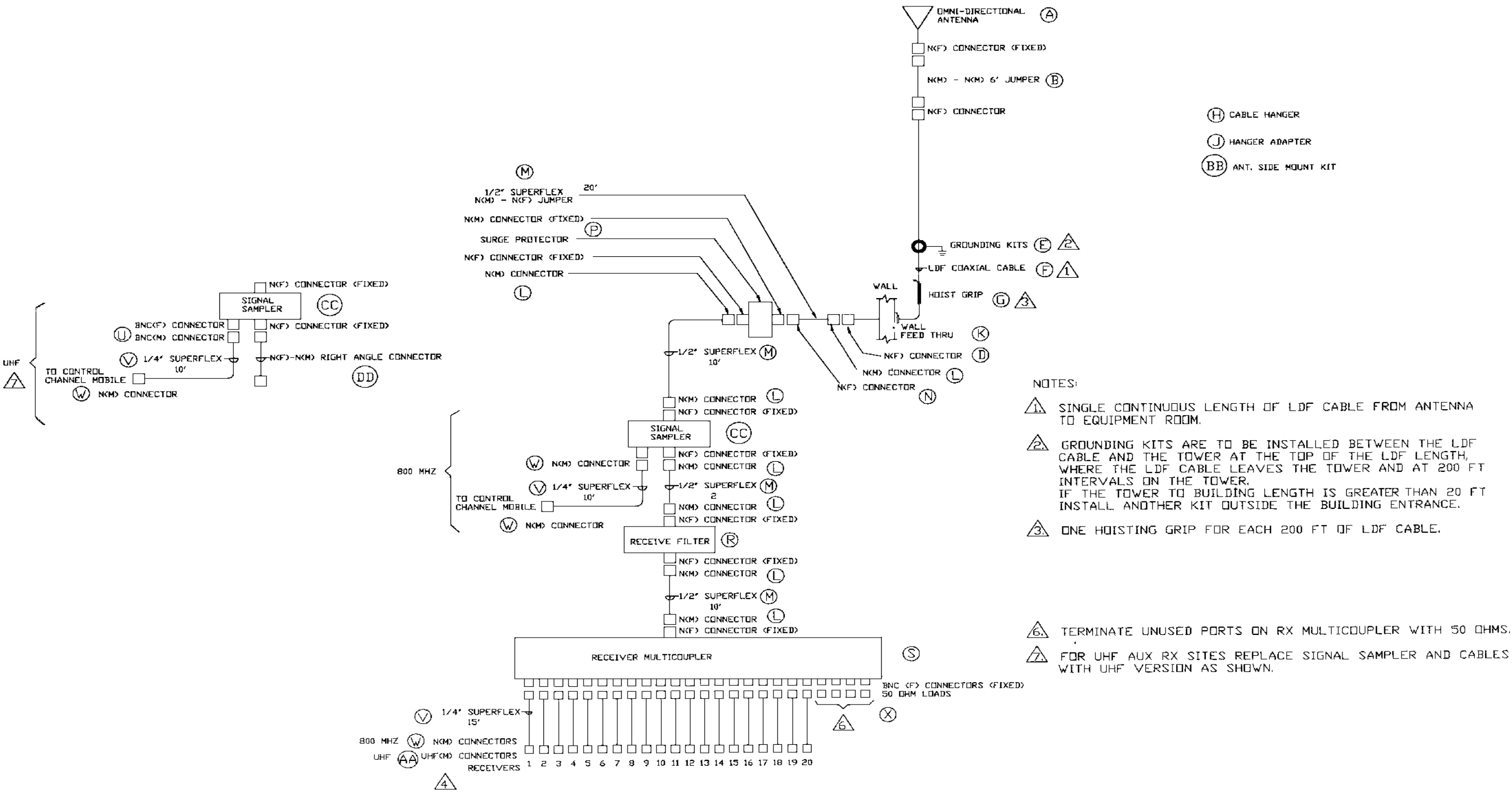
VHF ANTENNA SYSTEM (136-174 MHz)
(With Vendor Options)
(19D904223 Sh. 2 Rev. 0)



**800 MHz AUXILIARY RECEIVER SITE
(With Vendor Options and
Tower Top Amplifier)**

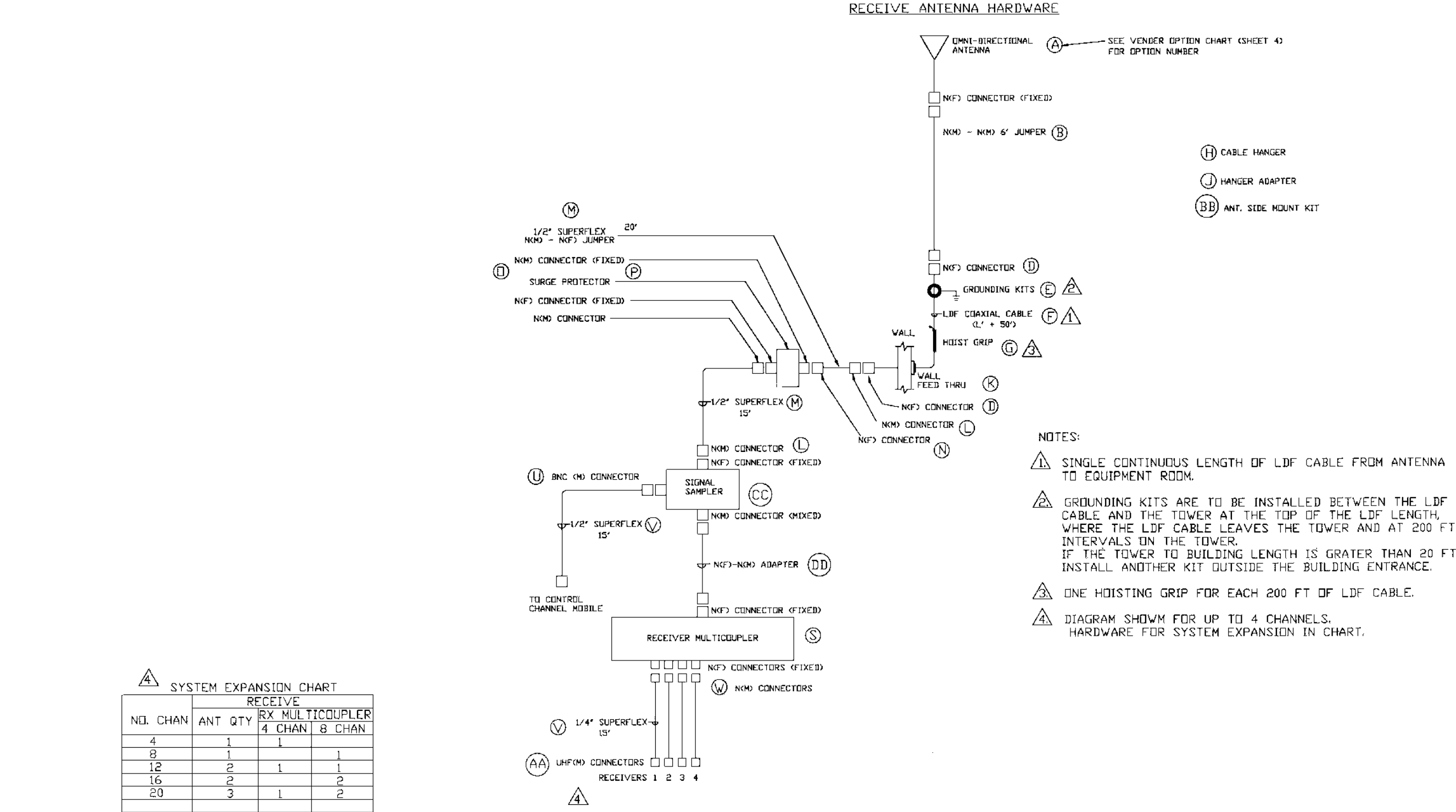
(19D904223 Sh. 3 Rev. 1)

RECEIVE ANTENNA HARDWARE



800 MHz AUXILIARY RECEIVER SITE
(With Vendor Options and
No Tower Top Amplifier)

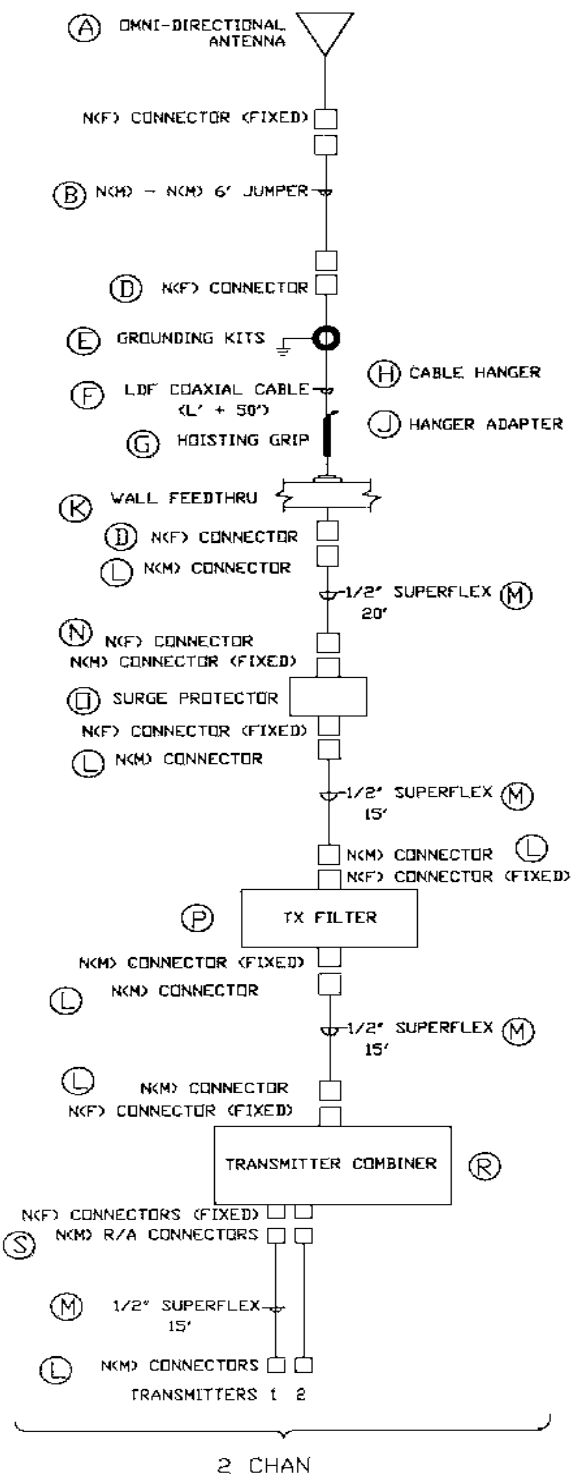
(19D904223 Sh. 3A Rev. 0)



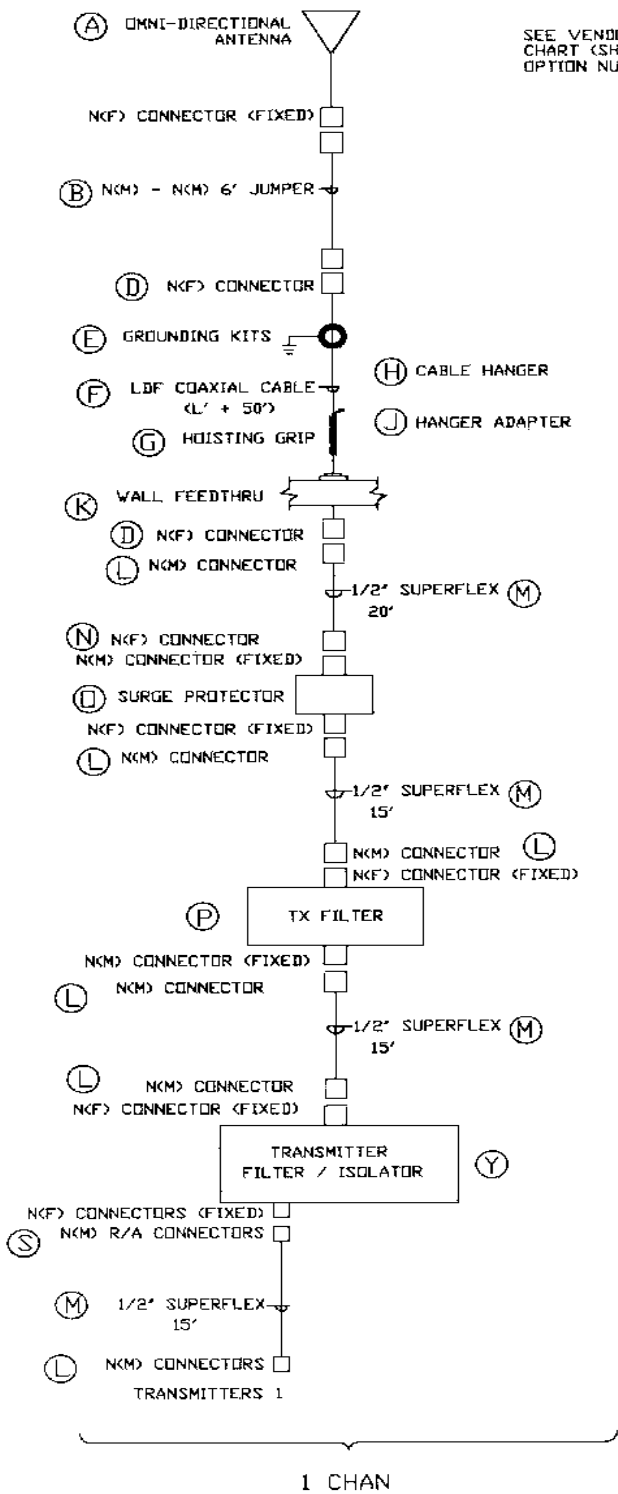
VHF AUXILIARY RECEIVER SITE
(136-174 MHz)
(With Vendor Options)

(19D904223 Sh. 4 Rev. 0)

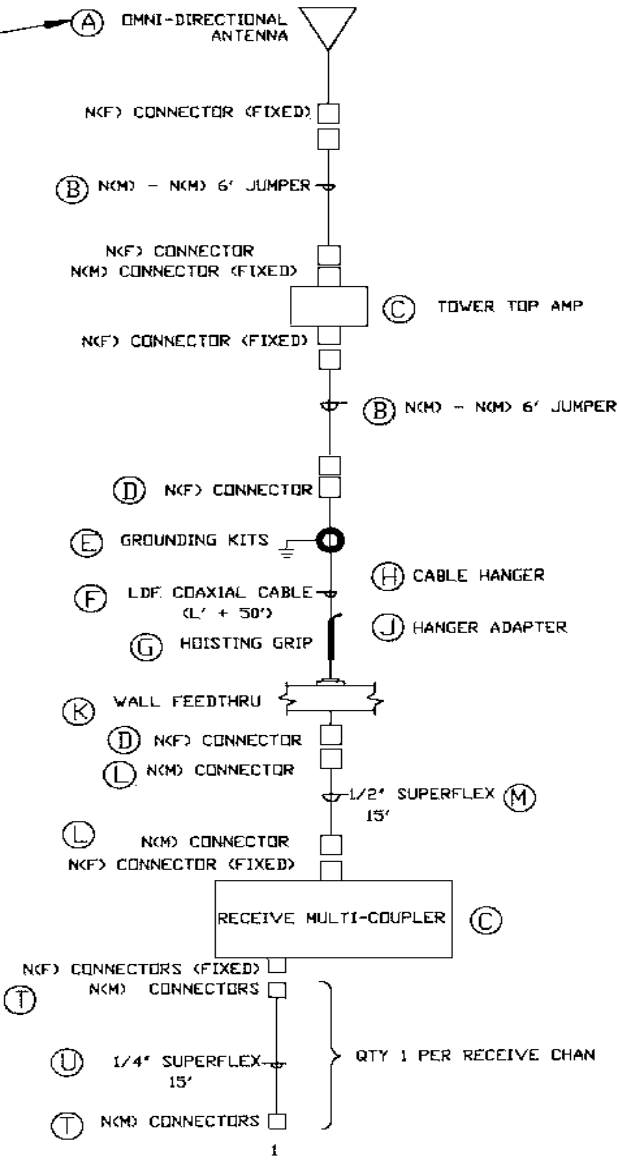
TRANSMIT ANTENNA HARDWARE



TRANSMIT ANTENNA HARDWARE



RECEIVE ANTENNA HARDWARE



BB ANT. SIDE MOUNT KIT

C TOWER TOP AMPLIFIER AND RECEIVE MULTICOUPLER COMBINED, INCLUDES SURGE PROTECTOR

SYSTEM EXPANSION
1. SEE CHART BELOW FOR EXPANSION OF THE TRANSMIT PORTION OF THE ANTENNA SYSTEM.
2. A SINGLE RECEIVE ANTENNA AND SINGLE RX MULTICOUPLER IS REQUIRED FOR UP TO 20 CHANNELS.

NO. CHAN	TRANSMIT		
	NO. ANT.	NO. 2 CHAN SYSTEMS	NO. 1 CHAN SYSTEMS
2	1	1	
3	2	1	1
4	2	2	
5	3	2	1
6	3	3	
7	4	3	1
8	4	4	
9	5	4	1
10	5	5	
11	6	5	1
12	6	6	
13	7	6	1
14	7	7	
15	8	7	1
16	8	8	
17	9	8	1
18	9	9	
19	10	9	1
20	10	10	

900 MHz AUXILIARY RECEIVER SITE
(With Vendor Options)

(19D904223 Sh. 5 Rev. 0)

VENDOR OPTION LISTING FOR TRUNKED REPEATER AND AUX RECEIVER SITES

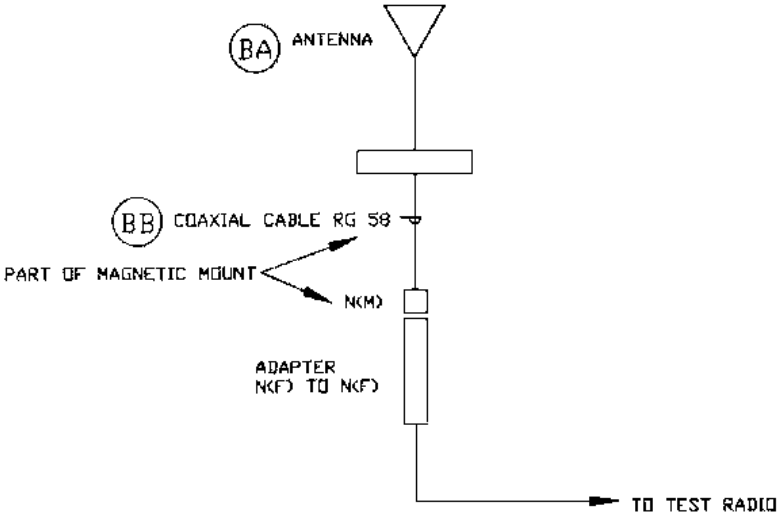
KEY	DESCRIPTIONS	7/8" COAXIAL CABLE						1 5/8" COAXIAL CABLE					KEY
		140 MHZ	160 MHZ	400 MHZ	450 MHZ	800 MHZ		140 MHZ	160 MHZ	400 MHZ	450 MHZ	800 MHZ W/O/TTA	
						W/TTA	W/O/TTA						
A	TX AND RX ANTENNA	7912	7912	7286	7284	7412	7412	7912	7912	7286	7284	7412	A
B	COAXIAL CABLE JUMPER N(M)–N(M)	PART OF ANT.	PART OF ANT.	7736	7736	7736	7736	PART OF ANT.	PART OF ANT.	7736	7736	7736	B
C	TOWER TOP AMP	NONE	NONE	NONE	NONE	7272 +	NONE	NONE	NONE	NONE	NONE	NONE	C
D	CONN N(F) LDF CABLE	7776	7776	7776	7776	7776	7776	7781	7781	7781	7781	7781	D
E	COAX GROUNDING KIT	7741	7741	7741	7741	7741	7741	7742	7742	7742	7742	7742	E
F	LDF COAXIAL CABLE	7775	7775	7775	7775	7775	7775	7780	7780	7780	7780	7780	F
G	HOISTING GRIP	7744	7744	7744	7744	7744	7744	7745	7745	7745	7745	7745	G
H	COAXIAL CABLE HANGER												H
	–SNAP IN	7904	7904	7904	7904	7904	7904	7905	7905	7905	7905	7905	
	–SCREW ON	7748	7748	7748	7748	7748	7748	7749	7749	7749	7749	7749	
J	HANGER ADAPTER												J
	–SCREW ON FOR ANGLE MEMBER	7750	7750	7750	7750	7750	7750	7750	7750	7750	7750	7750	
	–SCREW ON FOR ROUND MEMBER	7906 FOR 2" DIA., 7907 FOR 3" DIA., OR 7908 FOR 4" DIA. – APPLIES TO EITHER 7/8" OR 1 5/8" CABLE											
	–3/8" HARDWARE KIT FOR FLAT SURFACE	7911	7911	7911	7911	7911	7911	7911	7911	7911	7911	7911	
K	WALL/ROOF FEED THRU												K
	–SINGLE BOOT AND PLATE	7795	7795	7795	7795	7795	7795	7796	7796	7796	7796	7796	
	–4" BOOT FOR MULTIPLE PLATE	7900	7900	7900	7900	7900	7900	7901	7901	7901	7901	7901	
	–5" BOOT FOR MULTIPLE PLATE	7902	7902	7902	7902	7902	7902	7903	7903	7903	7903	7903	
L	CONN N(M) FOR 1/2" SF CABLE	7723	7723	7723	7723	7723	7723	7723	7723	7723	7723	7723	L
M	1/2" SUPER FLEX COAXIAL CABLE	7722	7722	7722	7722	7722	7722	7722	7722	7722	7722	7722	M
N	CONN N(F) FOR 1/2" SF CABLE	7724	7724	7724	7724	7724	7724	7724	7724	7724	7724	7724	N
O	TX SURGE PROTECTOR												O
	–FLANGE MOUNT (STANDARD)	7242	7242	7242	7242	7240	7240	7242	7242	7242	7242	7240	
	–BULKHEAD MOUNT (OPTIONAL)	NA	NA	NA	NA	7909	7909	NA	NA	NA	NA	7909	
P	RX SURGE PROTECTOR	7242	7242	7242	7242	7241	7240	7242	7242	7242	7242	7240	P
R	RX FILTER	NA	NA	7262	7291/92	NA	7248	NA	NA	7262	7291/92	7248	R
S	RX MULTI COUPLER												S
	–4 CHANNEL	7915	7915	NA	NA	NA	NA	7915	7915	NA	NA	NA	
	–8 CHANNEL	7916	7916	7263 +	7263 +	7246 +	7246 +	7916	7916	7263 +	7263 +	7246 +	
	–12 CHANNEL	NA	NA	7264 +	7264 +	7247 +	7247 +	NA	NA	7264 +	7264 +	7247 +	
	–16 CHANNEL	NA	NA	7264 +	7264 +	7275 +	7275 +	NA	NA	7264 +	7264 +	7275 +	
	–20 CHANNEL	NA	NA	7281 +	7281 +	7276 +	7276 +	NA	NA	7281 +	7281 +	7276 +	
T	TX COMBINER												T
	–4 CHANNEL	7913	7913	NA	NA	NA	NA	7913	7913	NA	NA	NA	
	–5 CHANNEL	NA	NA	7278	7278	7224	7224	NA	NA	7278	7278	7224	
	–8 CHANNEL	7914	7914	NA	NA	NA	NA	7914	7914	NA	NA	NA	
	–10 CHANNEL	NA	NA	7279	7279	7225	7225	NA	NA	7279	7279	7225	
U	CONN BNC (M)	NA	NA	7797	7797	7797	7797	7797	7797	7797	7797	7797	U
V	1/4" SF COAXIAL CABLE	7719	7719	7719	7719	7719	7719	7719	7719	7719	7719	7719	V
W	CONN N(M) FOR 1/4" SF CABLE	7720	7720	7720	7720	7720	7720	7720	7720	7720	7720	7720	W
X	RX MULTICOUPLER LOAD RESISTOR	NA	NA	7228	7228	7228	7228	NA	NA	7228	7228	7228	X
Y	CONN RA N (M) FOR 1/2" SF CABLE	7726	7726	7726	7726	7726	7726	7726	7726	7726	7726	7726	Y
AA	CONN UHF (M) FOR 1/4" SF CABLE	7721	7721	7721	7721	NA	NA	7721	7721	7721	7721	NA	AA
BB	ANTENNA SIDE MOUNT KIT												BB
	–FOR ROUND TOWER MEMBER	7699	7699	7699	7699	7699	7699	7699	7699	7699	7699	7699	
	–FOR ANGLE TOWER MEMBER	7469	7469	7469	7469	7469	7469	7469	7469	7469	7469	7469	
CC	SAMPLER	ARC3K	ARC3K	ARC3K	ARC3K	ARC3L	ARC3L	ARC3K	ARC3K	ARC3K	ARC3K	ARC3L	CC
DD	N(M)–N(F) RIGHT ANGLE ADAPTER					NA	NA					NA	DD
		+ TO CONVERT ANTENNA SYSTEM FROM 120VAC TO 230 VAC OPERATION											
		CHANGE FROM 120VAC MODEL		CHANGE TO 230VAC MODEL									
		7246		7244									
		7247		7245									
		7263		7266									
		7264		7259									
		7272		7274									
		7275		7267									
		7276		7268									
		7281		7280									

VENDOR OPTION TABLE
Repeater & Auxiliary Receivers
VHF/UHF/800 MHz

(19D904223 Sh. 6 Rev. 1)

VENDOR OPTION LISTING FOR TRUNKED REPEATER 900 MHZ SITES

KEY	DESCRIPTIONS	WITH TOWER TOP AMP		W/O TOWER TOP AMP	
		7/8	1 5/8	7/8	1 5/8
A	ANTENNA	7598	7598	7598	7598
B	6' JUMPER N(M) – N(M)	7736	7736	7736	7736
C	TOWER TOP AMP				
	4 CHANNEL	7866	7866	NONE	NONE
	8 CHANNEL	7867	7867	NONE	NONE
	12 CHANNEL	7868	7868	NONE	NONE
	16 CHANNEL	7869	7869	NONE	NONE
	20 CHANNEL	7870	7870	NONE	NONE
D	CONN N(F) LDF CABLE	7776	7781	7776	7781
E	COAX GND KIT	7741	7742	7741	7742
F	LDF COAXIAL CABLE	7775	7780	7775	7780
G	HOISTING GRIP	7744	7745	7744	7745
H	COAXIAL CABLE HANGER				
	–SNAP IN	7904	7905	7904	7905
	–SCREW ON	7748	7749	7748	7749
J	HANGER ADAPTER				
	–SCREW ON FOR ANGLE MEMBER	7750	7750	7750	7750
	–SCREW ON FOR ROUND MEMBER	7906 FOR 2" DIA., 7907 FOR 3" DIA. OR 7908 FOR 4" DIA.			
K	–3/8" HARDWARE KIT FOR FLAT SURFACE	7911	7911	7911	7911
	WALL/ROOF FEED THRU				
	–SINGLE BOOT AND PLATE	7795	7796	7795	7796
	–4" BOOT FOR MULTIPLE PLATE	7900	7901	7900	7901
	–5" BOOT FOR MULTIPLE PLATE	7902	7903	7902	7903
L	CONN N(M) FOR 1/2" SF CABLE	7723	7723	7723	7723
M	1/2" SUPER FLEX COAXIAL CABLE	7722	7722	7722	7722
N	CONN N(F) FOR 1/2" SF CABLE	7724	7724	7724	7724
O	TX SURGE PROTECTOR				
	–FLANGE MOUNT (STANDARD)	7874	7874	7874	7874
	–BULKHEAD MOUNT (OPTIONAL)	7910	7910	7910	7910
P	TX BP FILTER	7863	7863	7863	7863
R	TX COMB 2 CHAN	7855	7855	7855	7855
S	RIGHT ANGLE N(M)	7726	7726	7726	7726
T	CONN N(M) 1/4" SF	7720	7720	7720	7720
U	COAX 1/4" SF	7719	7719	7719	7719
V	RX MC TERM LOAD	NEW	NEW	7728	7728
W	RX SURGE PROTECTOR	NA	NA	7873	7873
X	RX MULTI COUPLER				
	–5 CHANNEL	NA	NA	7859	7859
	–10 CHANNEL	NA	NA	7860	7860
	–15 CHANNEL	NA	NA	7875	7875
	–20 CHANNEL	NA	NA	7876	7876
Y	TX IM SUP PANEL	7919	7919	7919	7919
BB	USE TX IM PANEL TO CONNECT A SINGLE XMTR TO ANT. (IF TWO CHANNEL USE TX COMBINER).				
	ANTENNA SIDE MOUNT KIT				
	–FOR ROUND TOWER MEMBER	7699	7699	7699	7699
	–FOR ANGLE TOWER MEMBER	7469	7469	7469	7469

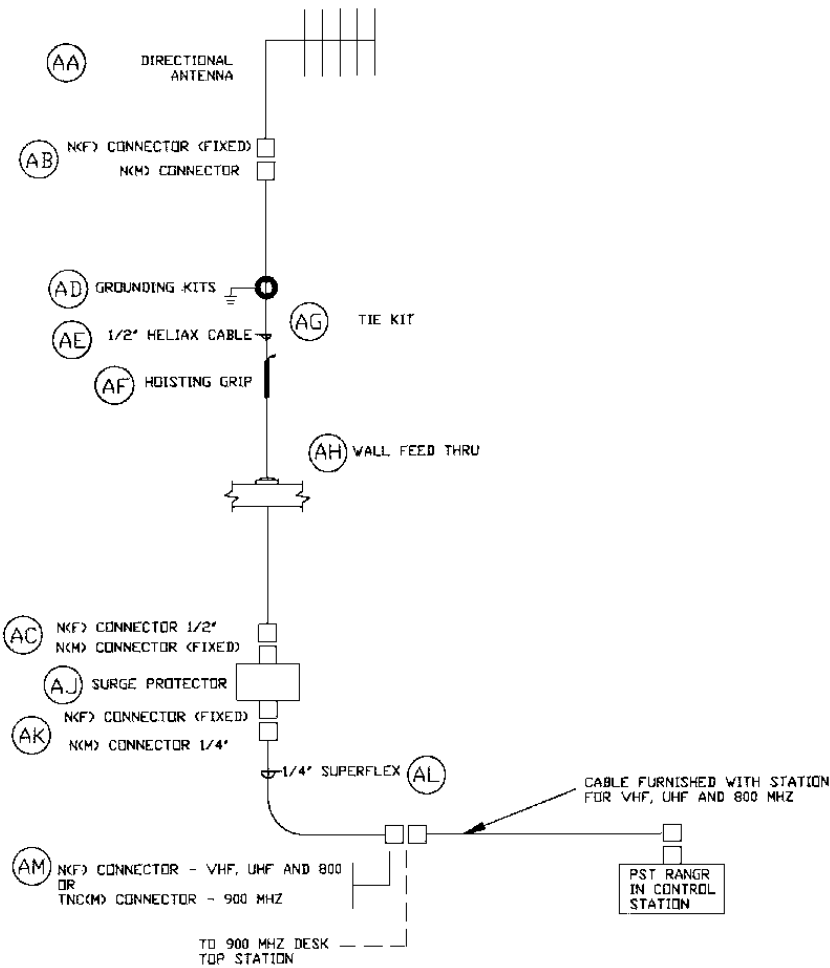


OPTION REFERENCE FOR TEST UNIT ELEMENTS

		136-174 MHZ	400 MHZ	450 MHZ	800 MHZ	900 MHZ
BA	ANTENNA	7140	7209	7209	7103	7143
BB	MAGNETIC MOUNT	7141	7208	7208	7208	7878

VENDOR OPTION TABLE
Trunked Repeaters 900 MHz
(19D904223 Sh. 7, Rev.0)

ANTENNA SYSTEM
(With Vendor Options Test Unit)
(19D904223 Sh. 8, Rev.1)

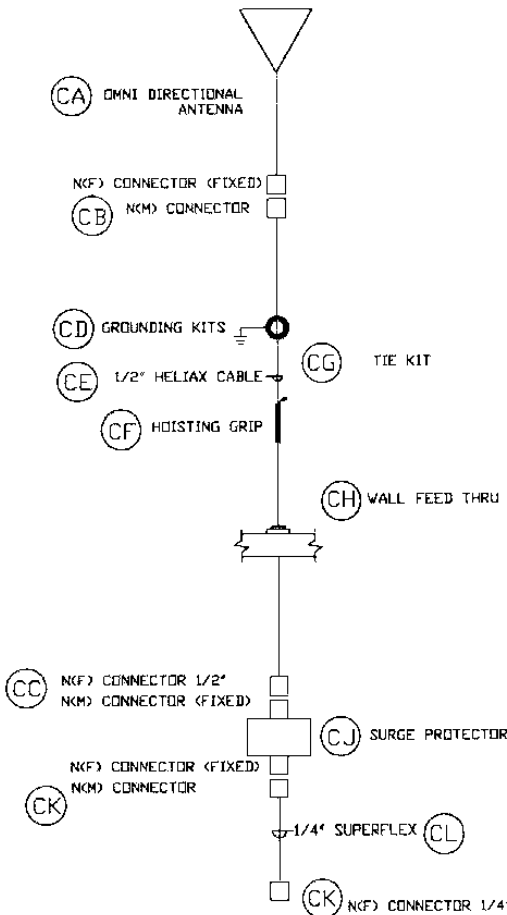


VENDER OPTION LISTING FOR TRUNKED CONTROL STATIONS

	DESCRIPTION	140 MHZ	160 MHZ	400 MHZ	450 MHZ	800 MHZ	900 MHZ
AA	DIRECTIONAL ANTENNA	7576	7576	7880	7287	7269	7269
AB	CONNECTOR NCM) FOR 1/2" HELIAX OR NKF) FOR 1/2" HELIAX	NA	NA	NA	NA	7774	7774
AC	CONNECTOR NKF) FOR 1/2" HELIAX	7771	7771	7771	7771	7771	7771
AD	GROUND KIT 1/2" HELIAX	7506	7506	7506	7506	7506	7506
AE	LDF HELIAX	7770	7770	7770	7770	7770	7770
AF	HQIST GRIP	7743	7743	7743	7743	7743	7743
AG	TIE KIT	7747	7747	7747	7747	7747	7747
AH	WALL FEED THRU	7881	7881	7881	7881	7881	7881
AJ	SURGE PROTECTOR	7242	7242	7242	7242	7240	7874
AK	CONNECTOR NCM) 1/4" SF	7720	7720	7720	7720	7720	7720
AL	COAX 1/4" SF	7719	7719	7719	7719	7719	7719
AM	CONNECTOR NCM) 1/4" SF	7920	7920	7920	7920	7920	NA
	OR CONNECTOR TNC(M) 1/4" SF	NA	NA	NA	NA	NA	7921

ANTENNA SYSTEM
(With Vendor Options Control Station)

(19D904223 Sh. 9, Rev.1)

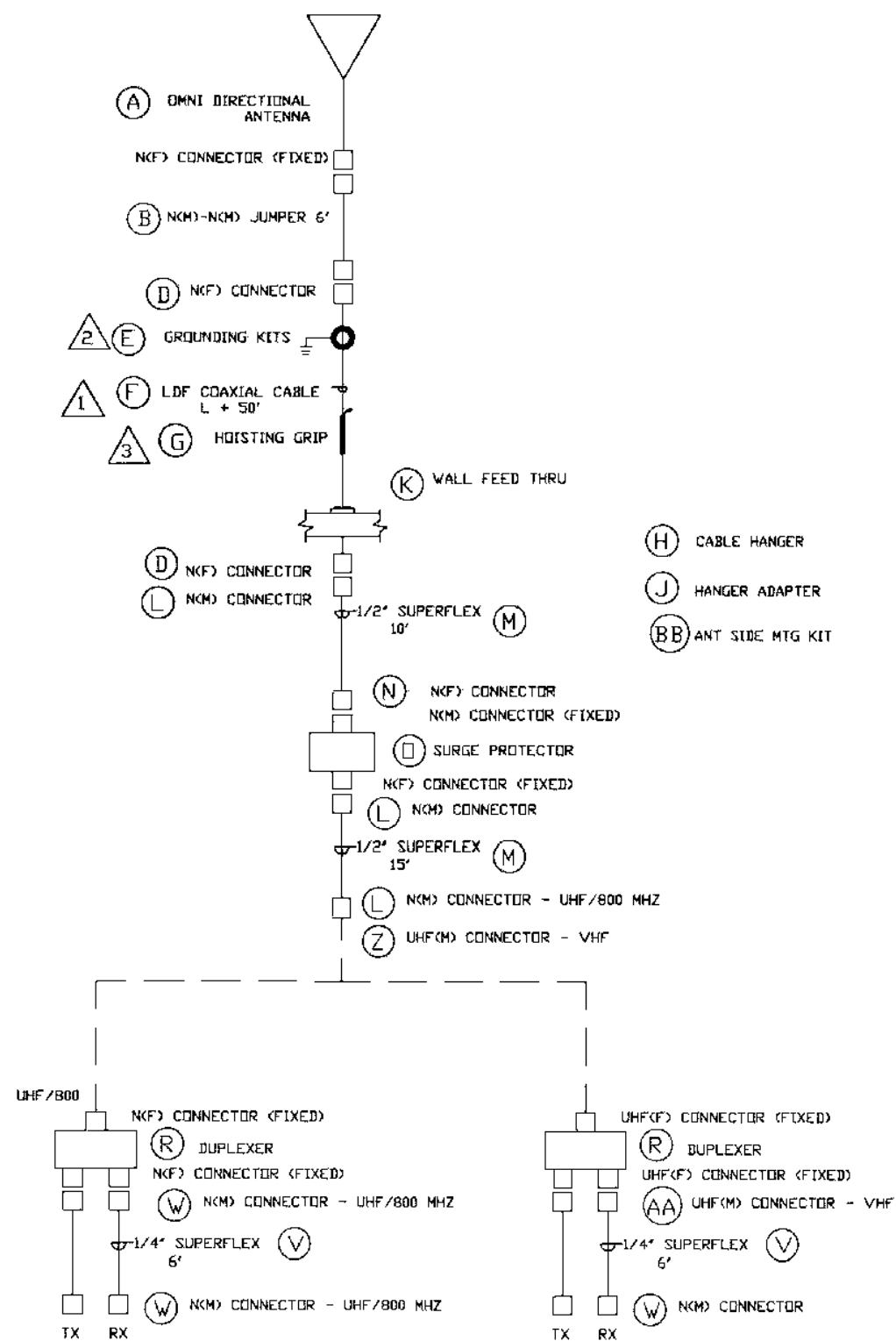


VENDER OPTION LISTING FOR SIMULCAST ALIGNMENT RECEIVER

	DESCRIPTION	140 MHZ	160 MHZ	400 MHZ	450 MHZ	800 MHZ	900 MHZ
CA	OMNI DIRECTIONAL ANTENNA	7912	7912	7286	7284	7412	7598
CB	CONNECTOR NCM) FOR 1/2" HELIAX	NA	NA	NA	NA	7774	7774
CC	CONNECTOR NKF) FOR 1/2" HELIAX	7771	7771	7771	7771	NA	NA
CD	GROUND KIT 1/2" HELIAX	7506	7506	7506	7506	7506	7506
CE	LDF 1/2" HELIAX	7770	7770	7770	7770	7770	7770
CF	HOIST GRIP	7743	7743	7743	7743	7743	7743
CG	TIE KIT	7747	7747	7747	7747	7747	7747
CH	WALL FEED THRU	7881	7881	7881	7881	7881	7881
CJ	SURGE PROTECTOR	7242	7242	7242	7242	7240	7874
CK	CONNECTOR NCM) 1/4" SF	7720	7720	7720	7720	7720	7720
CL	COAX 1/4" SF	7719	7719	7719	7719	7719	7719
CM	SIDE MOUNT KIT						
	-FOR ROUND MEMBER	7699	7699	7699	7699	7699	7699
	-FOR ANGLE MEMBER	7469	7469	7469	7469	7469	7469

ANTENNA SYSTEM
Alignment Receiver With Vendor Options

(19D904223 Sh. 10, Rev.1)



VENDOR OPTION LISTING FOR SCAT REPEATER SITES

KEY	DESCRIPTIONS	7/8" COAXIAL CABLE				
		140 MHZ	160 MHZ	400 MHZ	450 MHZ	800 MHZ
A	TX AND RX ANTENNA	7912	7912	7286	7284	7412
B	COAXIAL CABLE JUMPER NCM-NCM	PART OF ANT.	PART OF ANT.	7736	7736	7736
D	CONN NCF LDF CABLE	7776	7776	7776	7776	7776
E	COAX GROUNDING KIT	7741	7741	7741	7741	7741
F	LDF COAXIAL CABLE	7775	7775	7775	7775	7775
G	HOISTING GRIP	7744	7744	7744	7744	7744
H	COAXIAL CABLE HANGER					
	-SNAP IN	7904	7904	7904	7904	7904
	-SCREW ON	7748	7748	7748	7748	7748
J	HANGER ADAPTER					
	-SCREW ON FOR ANGLE MEMBER	7750	7750	7750	7750	7750
	-SCREW ON FOR ROUND MEMBER	7906 FOR 2" DIA	7907 FOR 3" DIA	7908 FOR 4" DIA		
	-3/8" HARDWARE KIT FOR FLAT SURFACE	7911	7911	7911	7911	7911
K	WALL/ROOF FEED THRU					
	-SINGLE BOOT AND PLATE	7795	7795	7795	7795	7795
L	CONN NCM FOR 1/2" SF CABLE	7723	7723	7723	7723	7723
M	1/2" SUPER FLEX COAXIAL CABLE	7722	7722	7722	7722	7722
N	CONN NCF FOR 1/2" SF CABLE	7724	7724	7724	7724	7724
O	TX SURGE PROTECTOR					
	-FLANGE MOUNT (STANDARD)	7242	7242	7242	7242	7240
	-BULKHEAD MOUNT (OPTIONAL)	NA	NA	NA	NA	7909
R	DUPLEXER	7651	7651	7656	7656	7656
	MINIMUM FREQ. SPACING TX TO RX MHZ	2 MHZ	2 MHZ	3 MHZ	3 MHZ	45 MHZ
V	1/4" SF COAXIAL CABLE	7719	7719	7719	7719	7719
W	CONN NCM FOR 1/4" SF CABLE	7720	7720	7720	7720	7720
Z	CONN UHF (M) FOR 1/2" SF CABLE	7725	7725	NA	NA	NA
AA	CONN UHF (M) FOR 1/4" SF CABLE	7721	7721	NA	NA	NA
BB	ANTENNA SIDE MOUNT KIT					
	-FOR ROUND TOWER MEMBER	7699	7699	7699	7699	7699
	-FOR ANGLE TOWER MEMBER	7469	7469	7469	7469	7469

NOTES:

- 1 SINGLE CONTINUOUS LENGTH OF LDF CABLE FROM ANTENNA TO EQUIPMENT ROOM.
- 2 GROUNDING KITS ARE TO BE INSTALLED BETWEEN THE LDF CABLE AND THE TOWER AT THE TOP OF THE LDF LENGTH, WHERE THE LDF CABLE LEAVES THE TOWER AND AT 200 FT INTERVALS ON THE TOWER. IF THE TOWER TO BUILDING LENGTH IS GREATER THAN 20 FT INSTALL ANOTHER KIT OUTSIDE THE BUILDING ENTRANCE.
- 3 ONE HOISTING GRIP FOR EACH 200 FT OF LDF CABLE.

ANTENNA SYSTEM
SCAT Site With Vendor Options

(19D904223 Sh. 11 Rev. 1)