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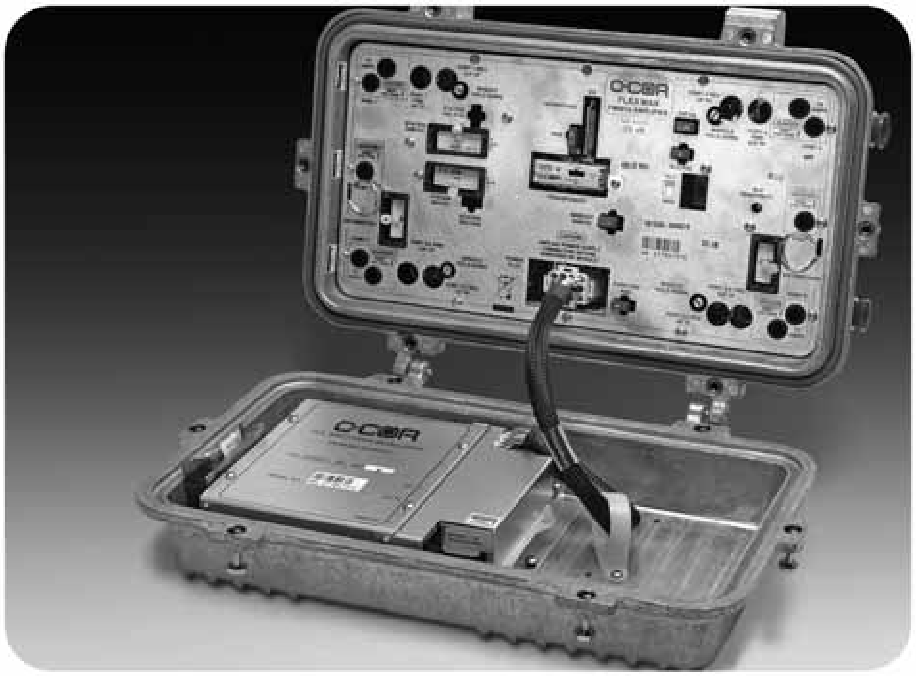

Flex Max901e
1 GHz Amplifiers

Equipment Manual

1502154 Revision D

Flex Max901e 1 GHz Amplifiers

Trunks (FMTE) and Bridgers (FMBE)

1502154 Revision D

Flex Max901e 1 GHz Trunk and Bridger Amplifiers Equipment Manual

C-COR Document Number: 1502154 Revision D

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Revision History

Revision	Date	Reason for Change
A	5/23/06	Initial release.
B	6/12/06	Revised specification tables, remove 870 MHz bridger specification table, revise Upgraded Solutions table in Appendix A.
C	6/21/06	Revised specification tables 1502211 and 1502213 to Rev C.
D	12/18/06	Revised ordering matrix. Revised power supply upgrade table and graphics. Added new 1 GHz configuration diagrams and procedures. Added 55/70 and 65/85 specification tables. Revised graphics and photos. Revised ALC setup section of Configuration chapter. Revised FBDs. Added new ALC pilots.

Contacting C-COR

You may contact the following departments via the C-COR website (http://www.c-cor.com) or as indicated below.

Customer Service

Contact Customer Service if your product has been damaged during shipping.

United States

Phone: 800-233-2267

EuroPacific

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Fax: +31 36 546 1155

Technical Support

Contact Technical Support when you need assistance with installed products.

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E-Mail: techpubs@c-cor.com

Table of Contents

Introduction

This chapter includes an overview of Flex Max901e 1 GHz Trunk and Bridger Amplifiers, document conventions, compliance statements, and suggested tools and materials required when working with these amplifiers.

How This Manual is Organized

This equipment manual is organized according to function in the following order:

Chapter 2, *Physical Identification*

Chapter 3, *Upgrading Legacy FlexNet Amplifiers*

Chapter 4, *Housing Instructions*

Chapter 5, *Configuration*

Chapter 6, *Troubleshooting*

Chapter 7, *Maintenance*

This manual also includes several appendixes that provide important reference information:

Appendix A, *Comparison—Flex Max901e and 700/800/900/901 Series*

Appendix B, *Specifications*

Appendix C, *Functional Block Diagrams*

Appendix D, *Reference Tables*

Appendix E, *Warranty*

Appendix F, *Flex Max901e 1 GHz Trunk and Bridger Amplifiers Data Sheet*

Overview

Flex Max901e 1 GHz Trunk and Bridger Amplifiers are the new industry standard for RF distribution products. The FM901e continues to offer the same excellent features, reliability, and performance customers have come to rely on with C-COR's legacy 700/800/900/901 series amplifiers. In addition, operational bandwidth is extended to 1 GHz, plug-in diplex filters provide the capability for higher return bandwidth options [Next Generation Network Architecture[1] (NGNA) compatible] as well as international applications, and, an option for element management monitoring is offered.

The Flex Max901e offers 1 GHz technology that lets broadband service providers increase forward capacity for HDTV, HSD, and VOD—allowing over 60 additional HDTV channels in a lineup. Operating specifications, such as gain and tilt, are maintained at 550 MHz, 750 MHz, and 870 MHz with extended gain and tilt out to 1 GHz. These design considerations enable reuse of legacy amplifier housings and existing spacing—eliminating the cost of resplicing.

Flex Max901e amplifiers feature automatic level control pilot frequencies common to legacy FlexNet amplifiers. The **ALC PAD** location reduces the ALC pilot frequency operating level range by 6 dB for a QAM signal in case digital channels will be loaded in the bandwidth, below 550 MHz, that is traditionally reserved for analog channels. Flex Max901e trunk amplifiers (FMTEs) provide a single, trunk level output and up to four bridger outputs, depending on the specific amplifier model. Flex Max901e bridger amplifiers (FMBEs) provide only bridger outputs.

Additional features of the Flex Max901e series are:

- While all trunk amplifiers are factory aligned for 1 GHz operation, they can be ordered preconfigured for 750/870 MHz operation as spares or extensions
- Ability to:
  - drop trunk modules into existing 700/800/900 series locations as a spare without the need to rebalance amplifiers downstream
  - accept all legacy 750 and 870 MHz forward EQ plug-in accessories—new plug-in guides ease installation
- –20 or –25 dB internal and external testpoints match existing system design
- Expanded ALC pilot selection to match existing system builds

Note *While the Flex Max901e trunk amplifiers are designed and factory aligned for 1 GHz operation, they can also be configured for use as spares in existing 750 or 870 MHz systems. Refer to Factory-Shipped Configurations for Flex Max901e Trunk and Bridger Amplifiers beginning on page 5-9 for the plug-in accessories and their locations for 1 GHz or 750/870 operation.*

Note *Flex Max901e trunk amplifiers (1 GHz operation) can be configured with equal or unequal tilt on the trunk and bridger ports. Flex Max901e amplifiers configured for 750/870 MHz operation offer trunk and bridger ports with equal tilt. Refer to Factory-Shipped Configurations for Flex Max901e Trunk and Bridger Amplifiers on page 5-9 for more information.*

For specific amplifier characteristics, refer to the C-COR customer specification sheet for the particular amplifier in question. Flex Max901e model options are detailed in *Part Numbers (Model Options)* on page 1-4. Depending on the configuration, some options may not be available.

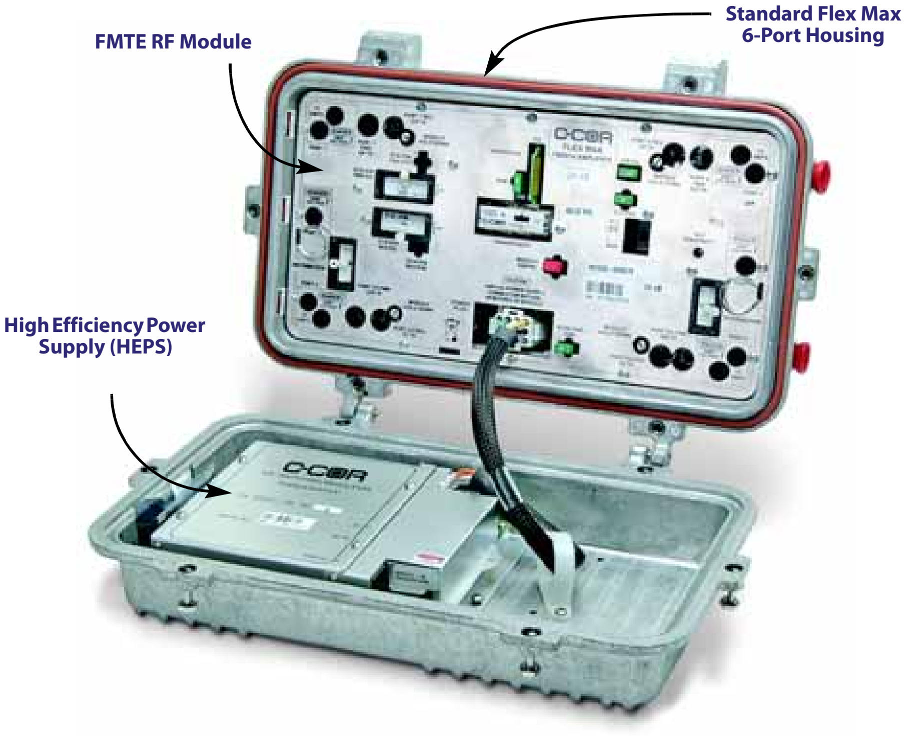
A comprehensive overview and various comparisons (features, specifications, etc.) can be found in Appendix A.

Please consult your C-COR Customer Service Representative for further information.

1. Next Generation Network Architecture (NGNA) is a set of specifications developed by a cable industry think tank to guide the development and deployment of future products, services, and applications. The basic premise is to route IP and MPEG traffic over a single Gigabit Ethernet backbone to the cable network edge.

Figure 1.1

Flex Max901e



Part Numbers (Model Options)

Flex Max901e Trunk Amplifiers

			1	2	3	4		5	6	7	8	9	10	11	12
F	M	T	E	x	x	x	–	x	x	x	x	x	x	x	N

1	Series	
E	Flex Max901e series	a
	a) 15 A current passing capability.	

2	Tilt Configuration	
D	Equal trunk and bridger tilt	a
G	Optimized tilt for 1 GHz operation	b
	*a) Must choose "**5**" in #3 block, **Spacing**. Suitable for replacement of FNT7, FNT8, and FNT9 series amplifiers*	
	*b) Must choose "**8**" in #3 block, **Spacing**.*	

3	Spacing	
5	32 dB	a
8	33 dB	b
	*a) 18 dB factory equalization. Must choose "**D**" in #2 block, **Bandwidth**.*	
	*b) 13 dB factory equalization. Must choose "**G**" in #2 block, **Bandwidth**.*	

4	Frequency Split
J	42/54 MHz
N	65/85 MHz
Q	55/70 MHz

5–6	Level Control
K0	427.25 MHz NTSC TV
KB	439.25 MHz NTSC TV
KC	451.25 MHz NTSC TV
KL	423.25 MHz NTSC TV
KN	471.25 MHz NTSC TV
L0	499.25 MHz NTSC TV
L4	495.25 MHz NTSC TV
MB	645.00 MHz QAM
RM	711.00 MHz QAM
SD	609.00 MHz QAM

7	Return	
3	14.5 dB active gain	a
6	18 dB active gain	b
7	18 dB active gain with return switches	c
	*a) Select "**D**" in #2 block, **Bandwidth**.*	
	*b) Select "**7**" if future element management transponder is planned.*	
	c) Operation of return switches requires a transponder.	

8	Output Configuration	
F	Trunk with two bridger outputs—user-configurable to 4 outputs with **–25 dB External** testpoints	a, e
H	Trunk with two bridger outputs—user-configurable to 4 outputs with **–20 dB Internal** testpoints	b, e
P	Trunk with two bridger outputs—user-configurable to 4 outputs with **–20 dB External** testpoints	c, e
S	Trunk with two bridger outputs—user-configurable to 4 outputs with **–25 dB Internal** testpoints	d, e
	*a) Select "**A**", "**F**", or "**L**", in #10 block, **Housing**.*	
	*b) Select "**A**", "**C**", or "**K**" in #10 block, **Housing**.*	
	*c) Select "**A**", "**F**", or "**L**" in #10 block, **Housing**.*	
	*d) Select "**A**", "**C**", or "**K**" in #10 block, **Housing**.*	
	e) Plug-in splitters and directional couplers must be ordered separately.	

9	Powering	
1	None	a
6	2.3 A, 90 V, 50/60 Hz, H.E. transformerless	b
	*a) Select "**A**" in #10 block, **Housing**. Required when ordering RF module only.*	
	b) 40–90 V operating range; includes detachable cable.	

10	Housing	
A	None	a
C	6-port Flex Max, 1 GHz, **Internal** testpoints	b
F	6-port Flex Max, 1 GHz, **External** testpoints	c
K	6-port Flex Max, 1 GHz, four 90° access ports, **Internal** testpoints	b
L	6-port Flex Max, 1 GHz, four 90° access ports, **External** testpoints	c
	*a) Select "**1**" in #11 block, **Housing Finish**. Required when ordering RF module only.*	
	*b) Select "**H**" or "**S**" in #8 block, **Output Configuration**.*	
	*c) Select "**F**" or "**P**" in #8 block, **Output Configuration**. Forward external testpoints only.*	

11	Housing Finish	
1	Standard (or N/A)	a
4	Corrosion protected	
	a) Required when ordering RF module only.	

12	Element Management	
N	EMS capable	a, b
	a) Transponder sold separately: *AM protocol (P/N 810-0354-01A)* *HMS protocol (P/N 810-0354-01H)*	
	b) Must order mounting bracket kit (P/N 1501024)	

Flex Max901e Bridger Amplifiers

			1	2	3	4		5	6	7	8	9	10	11	12
F	M	B	E	G	P	x	–	x	x	x	x	x	x	x	N

1	Series	
E	Flex Max901e series	a
	a) 15A current passing capability.	

2	Bandwidth
G	1002 MHz

3	Spacing	
P	43 dB	a
	a) 23 dB factory equalization.	

4	Frequency Split
J	42/54 MHz
N	65/85 MHz
Q	55/70 MHz

5–6	Level Control
K0	427.25 MHz NTSC TV
KB	439.25 MHz NTSC TV
KC	451.25 MHz NTSC TV
KL	423.25 MHz NTSC TV
KN	471.25 MHz NTSC TV
L0	499.25 MHz NTSC TV
L4	495.25 MHz NTSC TV
MB	645.00 MHz QAM
RM	711.00 MHz QAM
SD	609.00 MHz QAM

7	Return	
6	18 dB active gain	a
7	18 dB active gain with return switches	b
	*a) Select "**7**" if future element management transponder is planned.*	
	b) Operation of return switches requires a transponder.	

8	Output Configuration	
E	Two bridger outputs—user-configurable to 4 outputs with **–25 dB External** testpoints	a, e
G	Two bridger outputs—user-configurable to 4 outputs with **–20 dB Internal** testpoints	b, e
N	Two bridger outputs—user-configurable to 4 outputs with **–20 dB External** testpoints	c, e
R	Two bridger outputs—user-configurable to 4 outputs with **–25 dB Internal** testpoints	d, e
	*a) Select "**A**", "**F**", or "**L**" in #10 block,* **Housing**.	
	*b) Select "**A**", "**C**", or "**K**" in #10 block,* **Housing**.	
	*c) Select "**A**", "**F**", or "**L**" in #10 block,* **Housing**.	
	*d) Select "**A**", "**C**", or "**K**" in #10 block,* **Housing**.	
	e) Plug-in splitters and directional couplers must be ordered separately.	

9	Powering	
1	None	a
6	2.3 A, 90V, 50/60 Hz, H.E. transformerless	b
	*a) Select "**A**" in #10 block,* **Housing**. *Required when ordering RF module only.*	
	b) 40–90 V operating range; includes detachable power cable.	

10	Housing	
A	None	a
C	6-Port Flex Max, 1 GHz, w/ **Internal** testpoints	b
F	6-Port Flex Max, 1 GHz, w/ **External** testpoints	c
K	6-Port Flex Max, 1 GHz, four 90° access ports, w/ **Internal** testpoints	b
L	6-Port Flex Max, 1 GHz, four 90° access ports, w/ **External** testpoints	c
	*a) Select "**1**" in #11 block,* **Housing Finish**. *Required when ordering RF module only.*	
	*b) Select "**G**" or "**R**" in #8 block,* **Output Configuration**.	
	*c) Select "**E**" or "**N**" in #8 block,* **Output Configuration**. *Forward testpoints only.*	

11	Housing Finish	
1	Standard (or N/A)	a
4	Corrosion protected	
	a) Required when ordering RF module only.	

12	Element Management	
N	EMS capable	a, b
	a) Transponder sold separately: *AM protocol (P/N 810-0354-01A)* *HMS protocol (P/N 810-0354-01H)*	
	b) Must order mounting bracket kit (P/N 1501024)	

Part Number Example

Based on the Flex Max901e bridger amplifier model options, a Flex Max901e with the part number, **FMBEGPJ-KB7P6F4N**, has the following options:

- Flex Max901e series bridger amplifier—**FMBE**
- 1002 MHz—**G**
- 43 dB spacing—**P**
- 42/54 MHz split—**J**
- 439.25 MHz TV ALC pilot frequency—**KB**
- 18 dB active gain with return switches—**7**
- Two bridger outputs, user-configurable to four outputs with –20 dB external forward testpoints and internal return testpoints—**N**
- 2.3 A, 90 V, 50/60 Hz H.E. transformerless power supply—**6**
- 6-port, Flex Max 1002 MHz housing with external testpoints—**F**
- Corrosion protected housing finish—**4**
- EMS capable—**N**

Contact your C-COR sales professional for further information regarding the Flex Max901e and Value Max transponders.

Document Conventions

This manual uses a different typeface to show text that is printed or silkscreened on Flex Max901e modules. For example, **ALC** is silkscreened on the RF module faceplate to indicate the Automatic Level Control switch setting.

This manual uses the following notes, cautions, and warnings:

WARNING *Personal injury could result if instructions are not followed.*

CAUTION *Equipment damage may result if instructions are not followed.*

Note *Read for added information and reminders. A note can tell you when a service interruption could occur.*

Tip *Read for helpful hints.*

Statements of Compliance

FCC Compliance:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this device not expressly approved by C-COR Corp. may cause the operation of this device to be in violation of Part 76 of the FCC Rules, voiding the user's authority to operate the equipment.

CE Compliance:

This device conforms to the protection requirements of Council directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility.

Related Publications

Document Number	Title
1502211	Flex Max901e Trunk Amplifier Specifications, 1002 MHz, 42/54 Split, 32 dB Spaced, Same Tilt on Trunk and Bridger
1502212	Flex Max901e Trunk Amplifier Specifications, 1002 MHz, 42/54 Split, 33 dB Spaced, Different Tilt on Trunk and Bridger
1502213	Flex Max901e Bridger Amplifier Specifications, 1002 MHz, 42/54 Split
1502465	Flex Max901e Trunk Amplifier, 1002 MHz, 55/70 Split, 32 dB Spaced, Same Tilt on Trunk and Bridger
1502466	Flex Max901e Trunk Amplifier Specifications, 1002 MHz, 55/70 Split, 33 dB Spaced, Different Tilt on Trunk and Bridger
1502467	Flex Max901e Bridger Amplifier, 1002 MHz, 55/70 Split
1502528	Flex Max901e Trunk Amplifier, 1002 MHz, 65/85 Split, 33 dB Spaced, Different Tilt on Trunk and Bridger
1502529	Flex Max901e Trunk Amplifier, 1002 MHz, 65/85 Split, 32 dB Spaced, Same Tilt on Trunk and Bridger
1502530	Flex Max901e Bridger Amplifier, 1002 MHz, 65/85 Split
1502155	Flex Max901e 1 GHz Amplifiers Upgrade Instructions
1502156	Flex Max901e Trunks and Bridgers Enhanced Features Application Note
MX0510	6-Port Housing Installation Instructions
1500848	Value Max Transponder Installation Manual
MX0830	Bypass Housing Installation Instructions
TD0079	Single Person Reverse Balancing Technical Note

Tools and Materials

Table 1.1 describes the tools, equipment, and materials that may be required to operate, maintain, and test the Flex Max901e. Anyone performing the procedures in this manual is expected to be familiar with the appropriate and safe use of these tools. Tools or equipment with equivalent or superior specifications may be substituted for those listed.

Table 1.1 Tools and Materials

Tools/Equipment	Required Characteristics	Uses
Tools		
Signal level meter	5 MHz to 1002 MHz, –35 to 60 dBmV (25 to 120 dBμV)	Input and output signal testing during forward and return balancing
Signal generator	5 to 65 MHz, 35 to 45 dBmV (70 to 120 dBμV)	Signal input during return balancing
Multimeter	True RMS, AC-coupled; ranges including: 0 to 50 VDC, 0 to 100 VAC, and 0 to 200 mVAC	Power supply testing
Torque wrench/driver	Up to 66 in-lbs (7.5 N·m), with interchangeable 7/16-inch or 11 mm hex socket, Phillips, flat-blade, and Torx<superscript>® or Torx PLUS<superscript>® bits	Strand mounting, housing opening and closing, tightening various fasteners; C-COR recommends torquing all bolts and screws to the appropriate values whenever specified
Nutdriver[1]	7/16-inch (11 mm)	Housing opening and closing
Phillips screwdriver	#1	Attaching grounding bracket to transponder
Phillips screwdriver[2]	#2	Centerseizure screws or other small fasteners
Torx or Torx PLUS driver[2]	T15 (Torx) or 15 I.P. (Torx PLUS)	May be required for small fasteners
Flat-blade screwdrivers	1/4-inch, 5/16-inch	May be required for small fasteners
Wire cutters	—	Coaxial cable center conductor length adjustment; jumper cutting; disconnecting FlexNet 700 series line extender external testpoints during upgrades
Needlenose pliers	—	Jumper removal; disconnecting FlexNet 700 series line extender external testpoints during upgrades
Drill and drill bits	9/32-inch (7 mm)	Wall mounting
Alignment tool	Non-conductive, 1/8-inch wide screwdriver tip	ALC sensitivity adjustment
Fuse puller	Cartridge-type, nonconductive	Fuse removal and installation

Table 1.1 Tools and Materials (cont'd)

Tools/Equipment	Required Characteristics	Uses
Materials		
1/4-20 UNC bolts and flat washers	—	Wall mounting
Heat gun or approved torch and heatshrink tubing, or weathersealing tape or compound	—	Weatherproofing RF cable and fiber optic stub cable connectors
Anti-seize compound	—	RF cable attachment
Value Max Transponder Mounting Kit (P/N 1501024)	Transponder grounding bracket (P/N 1500614), two bracket screws (P/N 30039-0102), module cover screw (P/N HS0160)	Secure Value Max transponder

1. An 11 mm nutdriver or wrench can normally be used in place of a 7/16-inch tool if the bolt and nutdriver are manufactured to nominal "across the flat" tolerances. A non-fit will occur if the nutdriver is manufactured to minimum and the bolt head to maximum dimensions.
2. Small hold-down screws may be Phillips head screws or Torx PLUS head screws. Use the appropriate driver.

1

Physical Identification

This chapter identifies and describes user-accessible testpoints, controls, plug-in locations, connections, modules, and components for the Flex Max901e amplifiers. For specific testpoints, controls, and connections for the power supply and AC distribution board, refer to *Power Supply Configuration* on page 5-3. For information on the element management transponder, refer to *Housing Replacement* on page 7-13.

Figure 2.1

Flex Max901e Trunk and Bridger Amplifier

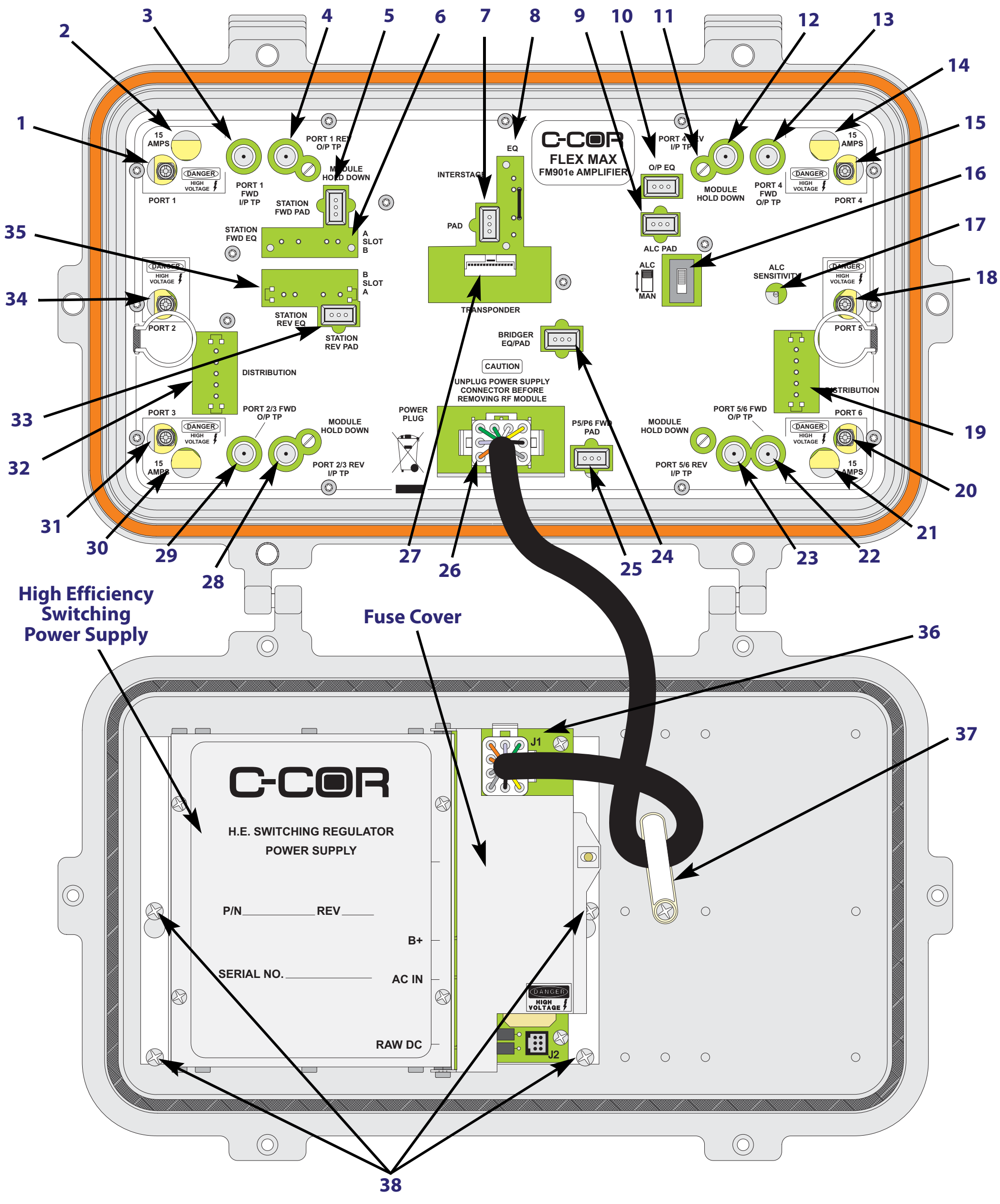


Table 2.1 Testpoints, Plug-in Locations, Controls, and Connections

Item	Label	Function
1	**PORT 1**	Provides access to the Port 1 centerseizure screw.
2	**PORT 1**	Provides access to the Port 1 centerseizure screw (90° rotation).
3	**PORT 1 FWD I/P TP**	Directional testpoint for measuring incoming forward RF signals.
4	**PORT 1 REV O/P TP**	Directional testpoint for measuring outbound return RF signals.
5	**STATION FWD PAD**	Location for installing an NPB series PAD[1].
6	**STATION FWD EQ**	Location for installing an SEQ series equalizer[1].
7	**PAD**	Location for installing an NPB series PAD[1].
8	**EQ**	Location for installing SEQ series equalizer[1].
9	**ALC PAD**	Location for installing an NPB series PAD[1] to adjust RF level to the ALC pilot. Changing the value of the **ALC PAD** lets the ALC deliver an NTSC channel or a QAM signal that operates at a level lower than the NTSC channels. (For example: If the QAM channels are set at –6 dB from the NTSC channels, lower the **ALC PAD** by 6 dB).
10[2]	**O/P EQ** *(Trunk amplifiers only. On bridger amplifiers this location is present on the module cover, but there is no plug-in location on the PCB.)*	Location on trunk amplifiers for installing: ▪ an NPB-000 PAD to optimize standard 1 GHz operation with different tilts on the trunk and bridger ports (T:10 dB, B:18 dB) ▪ a GEQC-1 GHz-050, GEQC-1 GHz-070, or GEQC-1 GHz-090 equalizer to optimize 1 GHz operation with equal tilt on the trunk and bridger ports (14 dB, 15.5 dB, and 17 dB respectively) ▪ a GEQC-870-080 equalizer to optimize 750/870 MHz operation with equal tilt on the trunk and bridger ports (14.5 dB)
11	**MODULE HOLD DOWN**	One of four screws that secure the RF module in the housing.
12	**PORT 4 REV I/P TP**	Directional testpoint for measuring inbound return RF signals.
13	**PORT 4 FWD O/P TP**	Directional testpoint for measuring outbound forward RF signals.
14	**PORT 4**	Provides access to the Port 4 centerseizure screw (90° rotation).
15	**PORT 4**	Provides access to the Port 4 centerseizure screw.
16	**ALC/MAN**	Selects either automatic level control or fixed gain control.
17	**ALC SENSITIVITY**	Adjusts amplifier output when operating in ALC mode.
18	**PORT 5**	Provides access to the Port 5 centerseizure screw.
19	**DISTRIBUTION**	Location for installing a distribution plug-in accessory for Port 5/6[1].
20	**PORT 6**	Provides access to the Port 6 centerseizure screw.
21	**PORT 6**	Provides access to the Port 6 centerseizure screw (90° rotation).
22	**PORT 5/6 FWD O/P TP**	Directional testpoint for measuring outbound forward RF signals.
23	**PORT 5/6 REV I/P TP**	Directional testpoint for measuring inbound return RF signals.

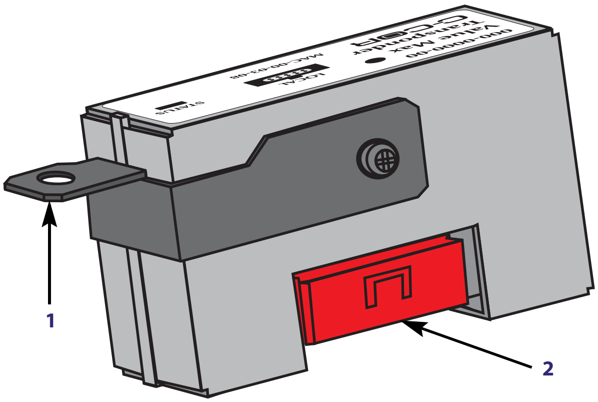
Table 2.1 Testpoints, Plug-in Locations, Controls, and Connections (cont'd)

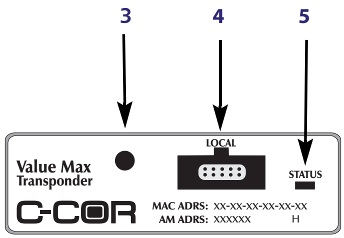
Item	Label	Function
24	**BRIDGER EQ/PAD** *(Trunk and bridger amplifiers)*	**Location on trunk amplifiers for installing:** ▪ a GEQL-1GHz-090 equalizer to optimize standard 1GHz operation with different tilts on the trunk and bridger ports (T:10dB, B:18dB). **Location on bridger amplifiers for installing:** ▪ an NPB-000 PAD to optimize 1GHz operation, or ▪ an NPB-020 PAD to optimize 750/870MHz operation.
25	**P5/P6 FWD PAD**	Location for installing an NPB series PAD[1].
26	**POWER PLUG**	Provides AC power to the HEPS and returns DC power to the RF module.
27	**TRANSPONDER**	Location to install transponder.
28	**PORT 2/3 REV I/P TP**	Directional testpoint for measuring inbound return RF signals.
29	**PORT 2/3 FWD O/P TP**	Directional testpoint for measuring outbound forward RF signals.
30	**PORT 3**	Provides access to the Port 3 centerseizure screw (90° rotation).
31	**PORT 3**	Provides access to the Port 3 centerseizure screw.
32	**DISTRIBUTION**	Location for installing a distribution plug-in accessory for Port 2/3[1].
33	**STATION REV PAD**	Location for installing an NPB series PAD[1].
34	**PORT 2**	Provides access to the Port 2 centerseizure screw.
35	**STATION REV EQ**	Location for installing an equalizer footprint plug-in accessory[1].
36	Power Plug	Provides AC power to the HEPS and returns DC power to the RF module.
37	Power Supply Management Strap	Required for securing the power plug cord in a non-rotated configuration.
38	Power Supply Mounting Screws	8-32x5/16 pan head screws (4) for mounting a power supply.

1. Refer to functional block diagrams (Appendix C) and reference tables (Appendix D) for more information.
2. Refer to *Factory-Shipped Configurations for Flex Max901e Trunk and Bridger Amplifiers* on page 5-9 for more information.

Figure 2.2

Transponder Identification





Actual size

Table 2.2 Transponder Identification

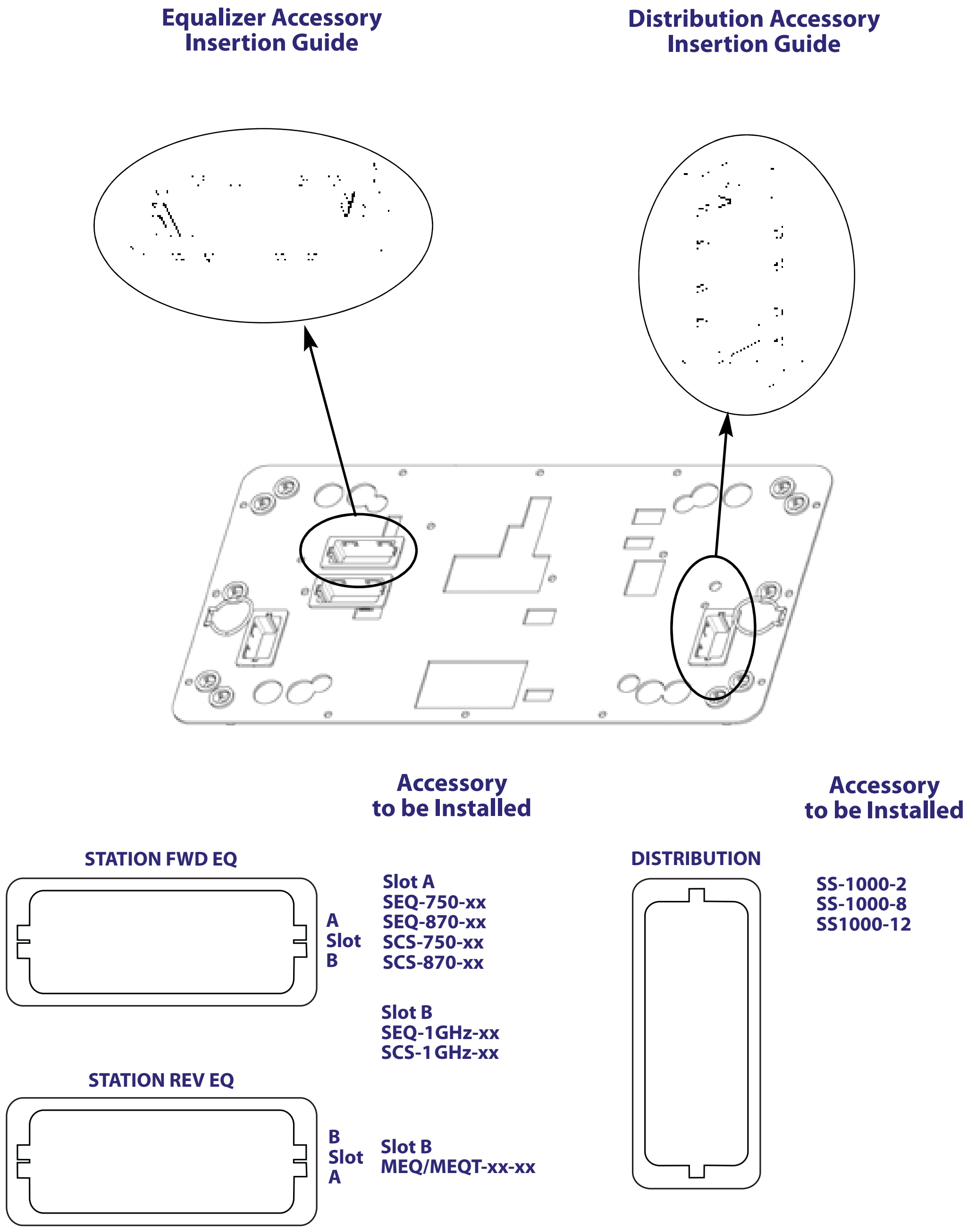
Item	Label	Function
1	Grounding Bracket	Connects transponder to ground
2	Interface Connector	Provides connection to RF board and element management system
3	Tamper Switch	Detects open lid
4	**LOCAL**	Provides local port for bench interface procedures
5	**STATUS**	LED indicates transponder status

Table 2.3 Value Max Transponder LED Status

LED Sequence	Indication
Steady on for 3 to 10 seconds	During boot-up immediately following installation.
Single blink every 5 seconds	On, but in search mode (RF input is low or receiver is not tuned to forward data carrier).
Double blink every 5 seconds	Registration to forward data carrier frequency may be about to occur or may be in process.
Burst blink of transmitted data	Transponder is sending data to the headend controller. Blinks every second or so; often in multiple transponder systems.
Blinks on 0.5 second then off 0.5 second	Transmitter constantly on.
Off, stays off	Fault/failure

Figure 2.3

Plug-in Accessory Insertion Guides



CHAPTER 3

Upgrading Legacy FlexNet Amplifiers

Note *C-COR 700, 800, and 900 series amplifiers can be upgraded to the Flex Max901e. The Flex Max901e module can be placed in existing 700, 800, and 900 series locations without the need for respacing.*

This chapter describes how to upgrade existing 750 MHz and 870 MHz FlexNet® trunks and bridgers to 1002 MHz Flex Max901e amplifiers. Refer to *Return Switch Installation* on page 7-4, for instructions on installing return switches in an amplifier that was purchased without return switches.

Upgrade Considerations

WARNING *Hazardous voltages are present. Use approved safety equipment and procedures.*

CAUTION *Amplifier electronic components can be damaged by the environment. Close the housing whenever it is left unattended to keep moisture out of the station and to protect the network from RF interference.*

CAUTION *When opening a housing, a vacuum may exist. If it is necessary to pry open the lid, do so at the lid bolt bosses which offer additional structural support. Prying the lid at another location may damage the housing.*

Although upgrading an existing 700/800/900 series FlexNet trunk or bridger amplifier to a Flex Max901e enables reuse of the housing and maintenance of amplifier spacing, there are five major issues to consider:

1. Hazardous voltages are present. Use approved safety equipment and procedures.
2. This upgrade will disrupt service to downstream subscribers and to upstream subscribers if AC power is back-fed through the existing line extender to power upstream amplifiers.
3. While SEQ-1G and SCS-1G plug-in accessories will address all bandwidths up to 1 GHz, you may wish to reuse your current equalizers and cable simulators until you expand your system to 1 GHz. The following plug-in accessory information applies to all FlexNet 700, 800, and 900 series upgrades. Please note:
    - SPB series PADs **cannot** be used. NPB series PADS are required.
    - MEQ and MEQT series return equalizers **can** be used.
    - All SEQ-750 and SEQ-862 series equalizers (with and without covers) **can** be used.
    - While the Flex Max901e trunk amplifiers are designed for 1 GHz operation, they can also be configured for use as spares in existing 750 or 870 MHz systems. Refer to *Factory-Shipped Configurations for Flex Max901e Trunk and Bridger Amplifiers* beginning on page 5-9 for the appropriate plug-in accessories and locations.
4. Power supplies may need a cable adapter or the power supply may need to be replaced. Refer to Table 3.2 on page 3-6 and *Cable Adapter (9-pin to 12-pin) Installation* on page 3-9 for important power supply information.
5. Review *Tools Required* on page 3-3 to ensure that you are prepared to perform the upgrade in the field.

Tools Required

Table 3.1 describes the tools that may be required to upgrade an existing FlexNet trunk and bridger amplifier to a Flex Max901e. Anyone performing the procedures in this chapter is expected to be familiar with the appropriate and safe use of these tools. Tools or equipment with equivalent or superior specifications may be substituted for those listed.

Table 3.1 Tools Required

Tools/Equipment	Required Characteristics	Uses
Torque wrench/driver	Up to 66 in-lbs (7.5 N·m), with interchangeable 7/16-inch or 11 mm hex socket, Phillips, flat-blade, and Torx/Torx PLUS bits	Strand mounting, housing opening and closing, tightening various fasteners; C-COR recommends torquing all bolts and screws to the appropriate values whenever specified
Nutdriver[1]	7/16-inch (11 mm)	Housing opening and closing
Phillips screwdriver[2]	#2	Required for small fasteners
Torx/Torx PLUS driver[2]	T15 (Torx) or 15 I.P. (Torx PLUS)	May be required for small fasteners
Flat-blade screwdrivers	1/4-inch, 5/16-inch	May be required for small fasteners

1. An 11 mm nutdriver or wrench can normally be used in place of a 7/16-inch tool if the bolt and nutdriver are manufactured to nominal “across the flat” tolerances. A non-fit will occur if the nutdriver is manufactured to minimum and the bolt head to maximum dimensions.
2. Small hold-down screws may be Phillips head screws or Torx PLUS head screws. Use the appropriate driver.

3

Housing Opening

The existing FlexNet amplifier has a specialized, diecast aluminum housing. Proper installation and other housing related procedures are important to ensure the integrity of the electronics in the housing.

WARNING *Hazardous voltages are present. Use approved safety equipment and procedures.*

CAUTION *Amplifier electronic components can be damaged by the environment. Close the housing whenever it is left unattended to keep moisture out of the station and to protect the network from RF interference.*

CAUTION *When opening a housing, a vacuum may exist. If it is necessary to pry open the lid, do so at the lid bolt bosses which offer additional structural support. Prying the lid at another location may damage the housing.*

➤ ***To open the housing***

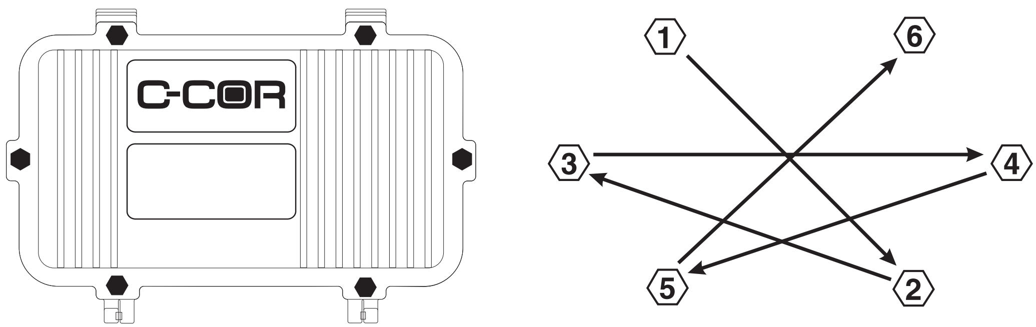
1. Loosen the six captive lid bolts with a 7/16-inch (11 mm) nutdriver using the sequence shown in Figure 3.1.

2. Hand loosen and release the two captive cover bolts next to the cover hinges. Hand loosen and release the captive cover bolts at the ends of the unit.

3. While holding the cover closed with one hand, release the last two captive cover bolts, and open (lower) the cover.

Figure 3.1

Housing Lid Bolt Loosening Sequence



RF Module Upgrade

WARNING *Hazardous voltages are present. Use approved safety equipment and procedures.*

CAUTION *Arcing between the RF module and centerseizure assemblies will damage the unit.*

Upgrading an existing 700/800/900 series FlexNet trunk or bridger amplifier to a Flex Max901e involves the following steps:

- preparing the power supply
- removing the existing RF module
- installing the Flex Max901e RF module

➤ ***To prepare the power supply for the Flex Max901e RF module upgrade***

1. Refer to Table 3.2 on page 3-6 to determine if you can operate a new RF module with an existing FlexNet power supply.
2. Ensure that you have completed the necessary power supply upgrade requirements before proceeding.

Note *The Flex Max901e RF module requires a minimum 2.3A power supply and uses a 12-pin connector. FlexNet 700 series amplifiers used 9-pin connectors. To prepare for the Flex Max901e RF module upgrade, it may be necessary to use a cable adapter (9-pin to 12-pin) or upgrade to a new power supply (P/N 122027-05). If a cable adapter is needed, refer to Cable Adapter (9-pin to 12-pin) Installation on page 3-9.*

3

Table 3.2 Flex Max901e Upgrade Considerations

IF you have this power supply...	THEN you need...
700 Series Amplifiers	
122019-10 (1.8A)	New power supply (P/N 122027-05) and a detachable 14-inch cable (P/N 174355-02)
122019-11 (1.8A)	New power supply (P/N 122027-05) and a detachable 14-inch cable (P/N 174355-02)
122021-01 (2.2A)	New power supply (P/N 122027-05) and a detachable 14-inch cable (P/N 174355-02)
122027-01 (2.3A)	9-pin to 12-pin cable adapter (P/N 173720-02) **OR** new power supply (P/N 122027-05) and a detachable cable [P/N 174355-02 (14")]
122027-03 (2.3A)	9-pin to 12-pin cable adapter (P/N 173720-02) **OR** new power supply (P/N 122027-05) and a detachable cable [P/N 174355-02 (14")]
122027-05 (2.3A)	Detachable cable [P/N 174355-02 (14")]
800 Series Amplifiers	
122027-02 (2.3A)[1]	No power supply or cable changes necessary
122027-04 (2.3A)[1]	No power supply or cable changes necessary
122027-05 (2.3A)	No power supply or cable changes necessary
900/901 Series Amplifiers	
122028-01 (1.0A)	New power supply (P/N 122027-05) and a detachable cable [P/N 174355-02 (14")]
122028-02 (1.0A)	New power supply (P/N 122027-05) and a detachable cable [P/N 174355-02 (14")]
122027-02 (2.3A)[1]	No power supply or cable changes necessary
122027-04 (2.3A)[1]	No power supply or cable changes necessary
122027-05 (2.3A)	No power supply or cable changes necessary

1. If necessary, replace with 122027-05 power supply and 174355-02 (14") cable.

Figure 3.2

Power Supply Cables

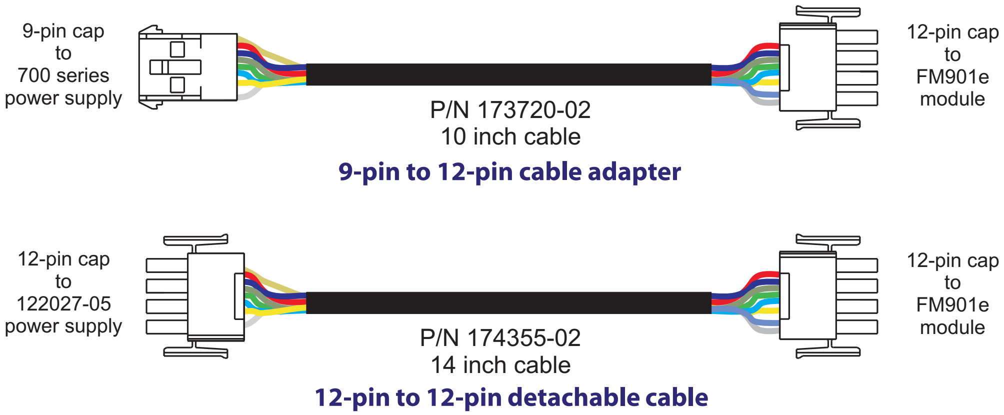


Figure 3.3

Power Supply Upgrade Requirements

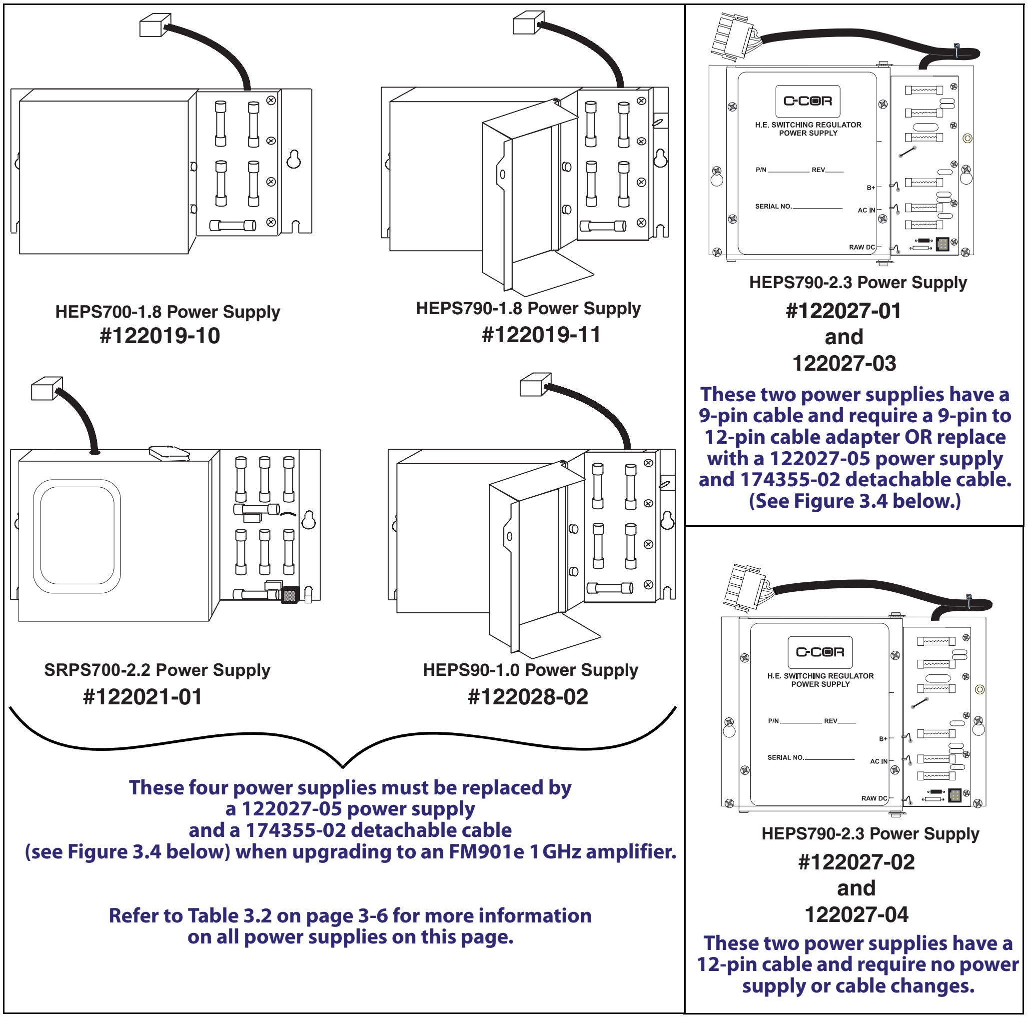
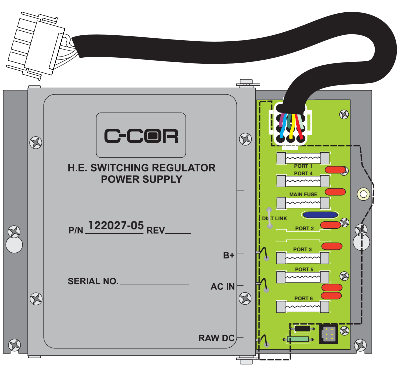


Figure 3.4

Replacement Power Supply HEPS790-2.3A 122027-05 with Detachable Cable 174355-02



➤ *To remove the existing RF module*

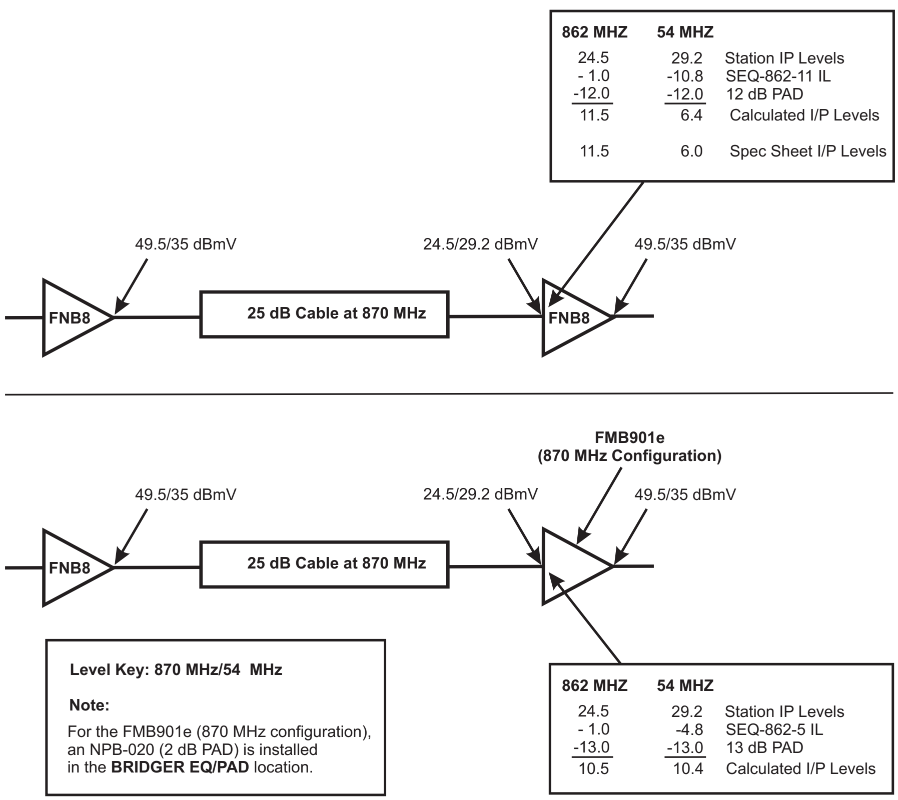
1. Open the housing according to instructions in *Housing Opening* on page 3-4.
2. If a high-efficiency power supply is mounted in the lid, disconnect the power plug from the RF module **POWER PLUG** connector. Release the plug by squeezing the tabs on the sides.
3. Use a flat-blade screwdriver to loosen and release the captive module hold-down screws.
4. Grasp the RF module handles and pull the RF module straight out of the housing.

➤ *To install the Flex Max901e RF module*

1. Orient the Flex Max901e RF module appropriately. Align the RF module back pins with the receptacles located on the centerseizure assemblies.
2. Firmly press the RF module into the housing until the back of the RF module contacts the inside of the housing.
3. Using a flat-blade screwdriver, start the captive module hold-down screws into the housing. Tighten the screws alternately to prevent stressing the module or housing. Torque to between 25 and 27 in-lbs (2.8 and 3.1 N·m).
4. Connect the power plug to the RF module **POWER PLUG** connector.
5. Refer to Chapter 5, Configuration, for setup and balancing information.

Figure 3.5

870 MHz Drop-in Example



Cable Adapter (9-pin to 12-pin) Installation

C-COR FlexNet 700 Series trunk and bridger amplifiers use 9-pin cables to connect the power supply to the RF module; however, the Flex Max901e module requires a 12-pin connector. To upgrade to the Flex Max901e RF module, a cable adapter is required.

WARNING *Hazardous voltages are present. Use approved safety equipment and procedures.*

CAUTION *Use of a power supply adapter limits the amplifier's current passing to 13 amps, regardless of the power supply or RF module current passing capability.*

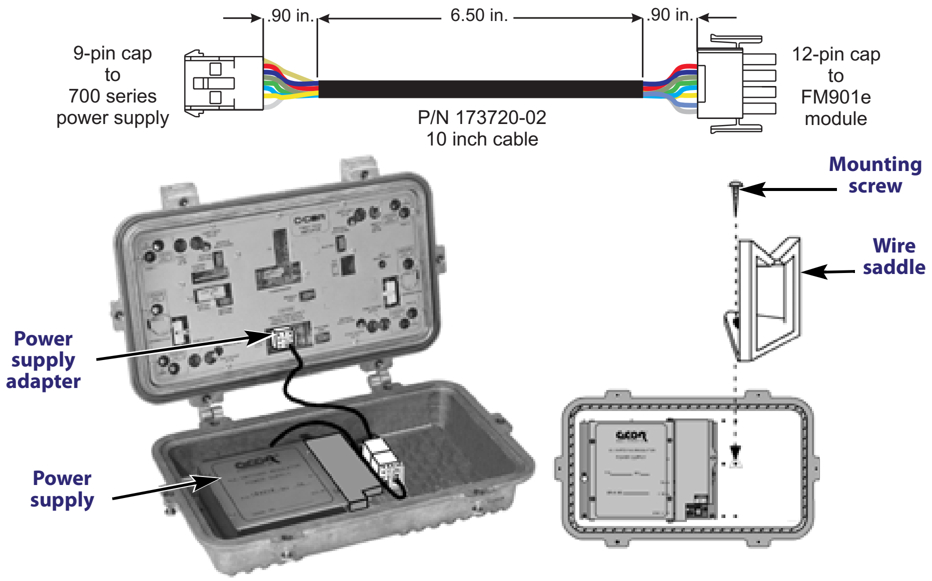
3

To install the 9-pin to 12-pin cable adapter (P/N 173720-02)

1. Open the amplifier housing. (See *Housing Opening* on page 3-4.)
2. Remove all fuses/buss bars from the AC distribution board.
3. Connect the cable adapter's 9-pin plug to the power supply plug.
4. Connect the cable adapter's 12-pin plug to the Flex Max901e RF module **POWER PLUG** connector.
5. Using a Phillips screwdriver, install the wire saddle as shown in Figure 3.6. A mounting hole is located in the center of the housing lid between the power supply and transponder mounting location.
6. Route the cable as shown in Figure 3.6.
7. Set up and energize the power supply, refer to *Power Supply Configuration* on page 5-3 of the Configuration chapter as necessary.
8. Close the housing. (See *Housing Closing and Tightening* on page 3-10.)

Figure 3.6

Cable Adapter Installation



Housing Closing and Tightening

CAUTION *Ensure that no wire scraps or foreign materials remain within the housing.*

Note *Close the housing whenever it is left unattended to keep moisture out of the unit and protect the network from RF interference.*

3

To close the housing

1. Examine the rubber gasket and mesh seal. Remove all foreign materials that could interfere with proper sealing. Dry any moist areas.

2. Close the lid until it is flush with the rubber gasket. Thread all six bolts finger tight to hold the lid in place. Ensure that the lid seats evenly on the rubber gasket.

3. Tighten the lid bolts with a 7/16 inch (11 mm) nutdriver, following the pattern shown in Figure 3.7. Observe that the lid seats on the rubber gasket.

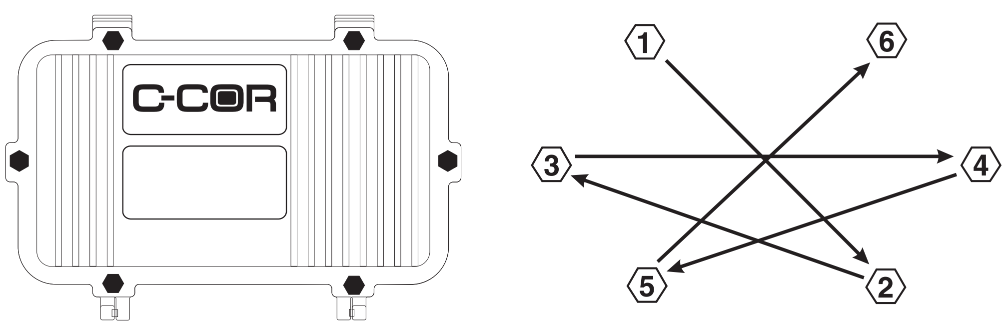
CAUTION *Do not torque the lid bolts more than 40 in-lbs (4.5 N·m). Overtightening may warp the housing—allowing moisture to enter and damage the components—or cause the threaded inserts to spin.*

4. Continue the tightening sequence, torquing to between 35 and 40 in-lbs (4.0 and 4.5 N·m) with a torque wrench. The lid should now seat evenly and compress the rubber gasket to create a weatherproof seal.

5. If the housing is equipped with external testpoints, install testpoint caps on all testpoints and finger tighten. Use a wrench to tighten the caps an additional one quarter to one half turn.

Figure 3.7

Housing Closing and Tightening Sequence



Housing Instructions

This chapter describes recommended cable attachment procedures and proper opening and closing procedures to be used when accessing the internal components.

Tools and Materials

The following tools and materials may be used to complete the procedures in this chapter. Persons performing the procedures in this chapter are expected to be familiar with the proper and safe use of these tools. Tools or equipment with equivalent or superior specifications may be substituted for those listed.

Table 4.1 Tools and Materials

Tools/Equipment	Required Specifications	Uses
Tools		
Flat blade screwdrivers	1/4 inch, 5/16 inch	May be required for small fasteners
Wire cutters	—	Trim coaxial cable center conductor
Nutdriver or wrench[1]	7/16 inch (11 mm)	Housing opening and closing
Phillips screwdriver[2]	#2	Centerseizure screws
Torque wrench/driver	Up to 66 in-lbs (7.5 N·m), with interchangeable 7/16 inch or 11 mm hex socket, Phillips, flat blade, and Torx® or Torx PLUS® bits	Strand mounting, housing closing, tightening various fasteners[3]
Torx® or Torx PLUS® driver[2]	T15 (Torx®) or 15 I.P. (Torx PLUS®)	May be required for small fasteners
Drill and drill bits	9/32 inch (7 mm)	Wall or pedestal mounting

Table 4.1 Tools and Materials (cont'd)

Tools/Equipment	Required Specifications	Uses
Materials		
Heat gun or approved torch and heatshrink tubing, or weathersealing tape or compound	—	Weatherproofing RF cable connectors
1/4-20 UNC bolts and shims	—	Wall mounting
Metal port inserts	C-COR P/N MX0008	Cover unused ports
Anti-seize compound	—	RF cable attachment

1. An 11 mm tool can normally be used for a 7/16-inch bolt unless the tool is manufactured to minimum, and the bolt head to maximum, "across the flat" dimensions.
2. Small, hold-down screws may be Phillips head screws or Torx PLUS® head screws. Use the appropriate driver.
3. C-COR recommends torquing all bolts and screws to the specified values.

Preparing for Installation

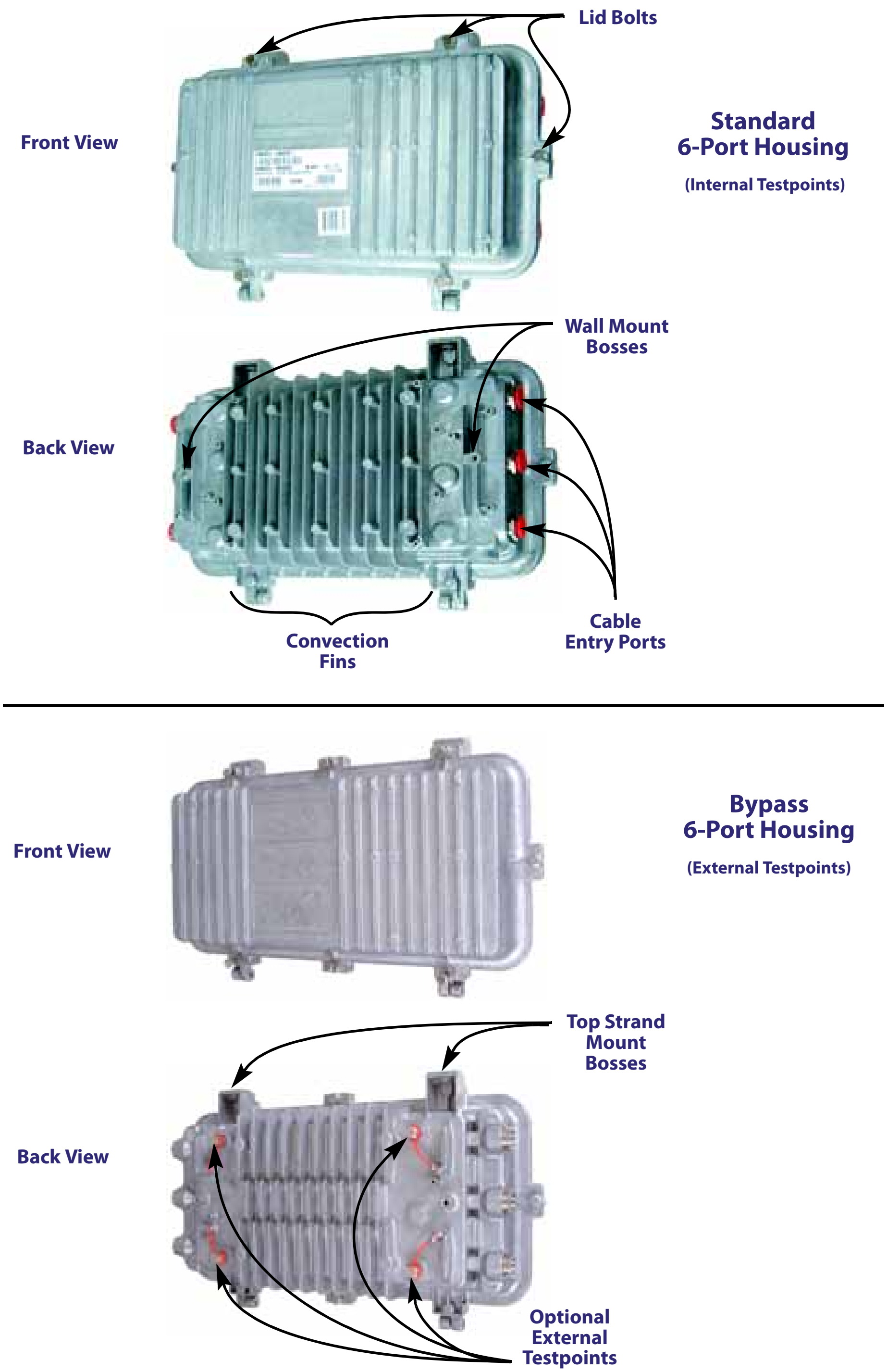
CAUTION *Check the unit for damage. If there is shipping damage, contact the shipping company and the C-COR Customer Service Department.*

➤ ***To prepare for installation***

1. Ensure that the following are included with each housing:
   - two (2) strand clamp assemblies (P/N HB0214), each consisting of:
     - one strand clamp
     - one 1/4-20 UNC x 1-inch bolt
     - one lock washer
     - one rubber O-ring (retaining)
   - metal port inserts (P/N MX0008) for each unused port
2. Inspect the outside of the housing (refer to Figure 4.1):
   a. Check the convection fins, cable entry ports, lid bolts, and all testpoint connectors for damage.
   b. Ensure that each port is plugged with either a metal port insert or a plastic dust cap.

Figure 4.1

Housing Inspection (Outside)



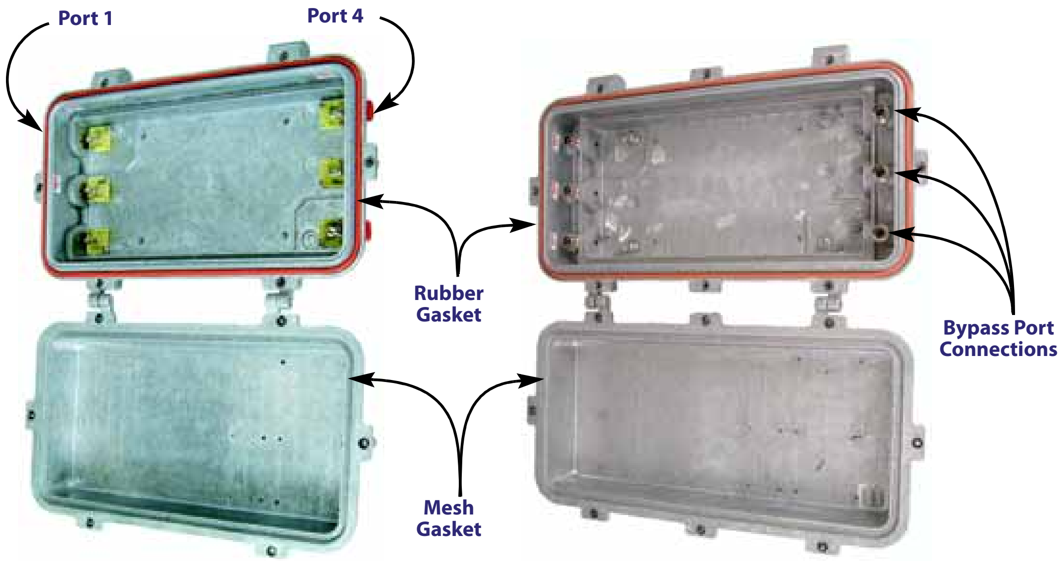
3. Open the housing. Refer to *Housing Opening* on page 4-5 as needed.
4. Inspect the inside of the housing:
    a. Inspect the rubber gasket on the housing base.
    b. Inspect the metal mesh gasket on the housing lid.
    c. Be certain they are well seated and unbroken.

Note *The rubber gasket can be replaced. If the metal mesh is damaged, the housing must be replaced.*

4

Figure 4.2

Housing Inspection (Inside)



5. Before closing the housing:
    a. Determine the orientation of the module in the housing for your application. See Figure 7.3 on page 7-8 for the orientation options and *RF Module Replacement* on page 7-7 for instructions on installing an RF module. Install the module now or after the housing is mounted. Cable attachment may be easier without a module installed. Refer to *RF Module Replacement* on page 7-7 for instructions on installing an RF module.
    b. If desired, install plug-in accessories. Installing accessories at this point is often more convenient than after the housing is mounted. Always install the accessories before the unit is powered on in order to prevent damage to the hybrid. Accessory values can be found on system maps.
6. Close the housing. Refer to *Housing Closing and Tightening* on page 4-19, as needed.
7. If additional space is needed between the unit and the strand or structure, ensure that you have the appropriate extension mounting bracket (EMB) kit. Refer to *Strand/Pedestal Mounting With Extension Mounting Brackets (EMBs)* on page 4-8 or *Wall Mounting With Extension Mounting Brackets (EMBs)* on page 4-12. EMBs are not included with the unit but may be purchased separately. Contact your C-COR sales professional for ordering information.

Housing Opening

The electronic components of the Flex Max901e are enclosed in a specialized, diecast aluminum housing. Proper installation and other housing-related operations are important to ensure the integrity of the electronics within.

WARNING *Hazardous voltages are present. Use approved safety equipment and procedures.*

CAUTION *Amplifier electronic components can be damaged by the environment. Close the housing whenever it is left unattended to keep moisture out of the station and to protect the network from RF interference.*

CAUTION *When opening a housing, a vacuum may exist. If it is necessary to pry open the lid, do so at the lid bolt bosses which offer additional structural support. Prying the lid at another location may damage the housing.*

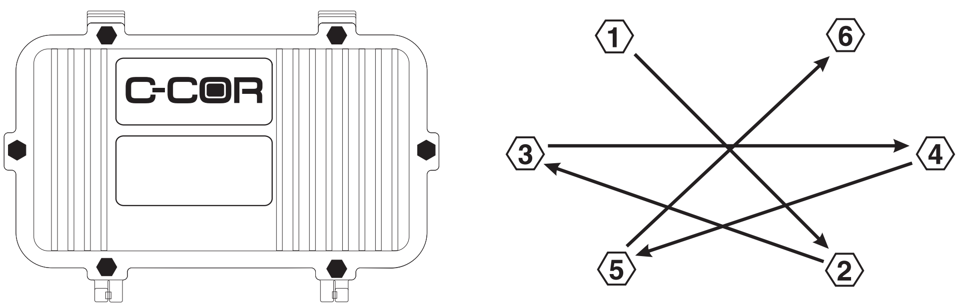
Note *In 1998, the bypass housing—an expanded version of our standard 6-port housing— was introduced. A bypass housing provides additional internal port connections that route your RF signal around (bypass) the RF module which lets you remove the module for maintenance or replacement without service interruption.*

➤ ***To open the housing***

1. Loosen, but do not remove, the six captive lid bolts with a 7/16 inch (11 mm) nutdriver using the sequence shown in Figure 4.3.
2. Hand loosen and release the two bolts next to the lid hinge and then the two bolts at the ends of the unit.
3. While holding the lid closed with one hand, release the last two bolts, and open (lower) the lid.

Figure 4.3

Housing Lid Bolt Loosening Sequence



Housing Mounting

Depending on the requirements of the system, Flex Max901es can be mounted in any one of the following ways:

- strand/pedestal mount
- strand/pedestal mount with extension mounting brackets
- wall mount
- wall mount with EMBs

4

Strand/Pedestal Mounting

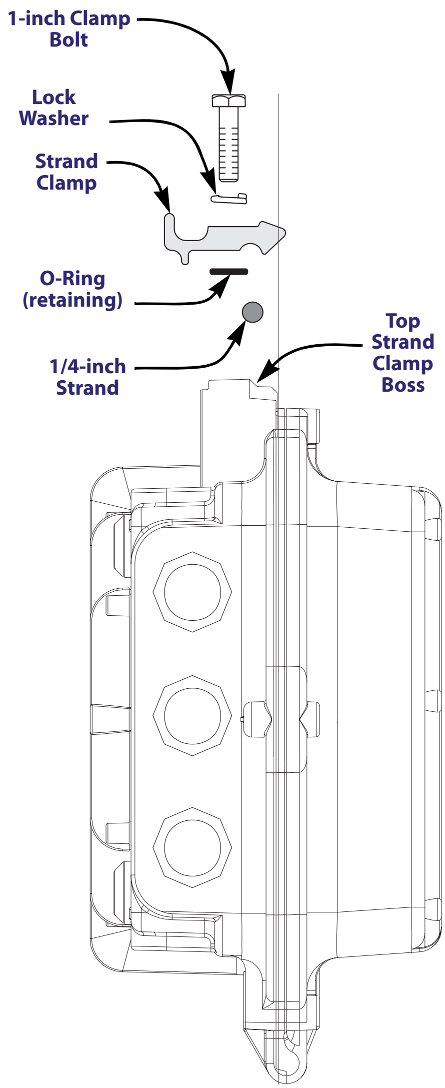
Both strand and pedestal mounting involve the use of a strand for mounting. In either case, strand diameter determines the orientation of the strand clamp. Refer to Figure 4.4.

➤ ***To strand/pedestal mount***

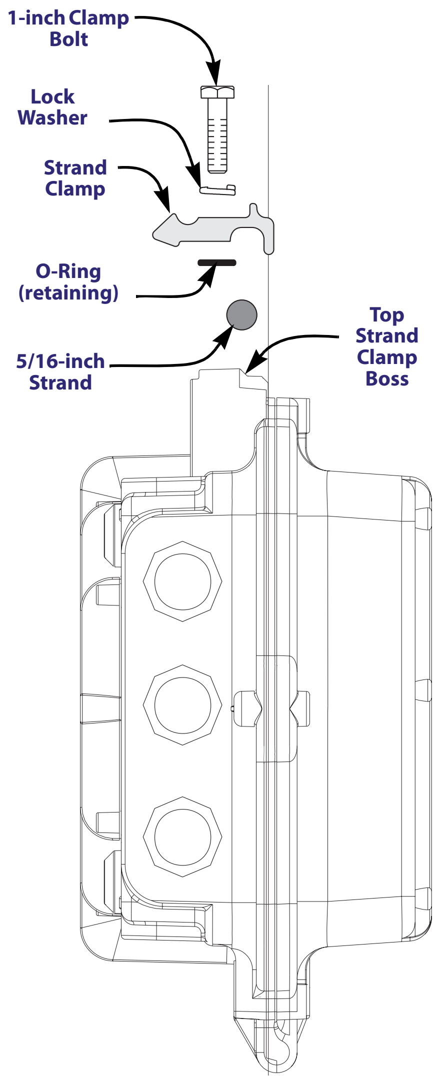
1. Attach the strand clamp assemblies to the top strand clamp bosses (mounting surfaces) with the 1-inch (2.54 cm) long clamp bolts and lock washers, threading the bolts 4 or 5 turns.
2. Hoist the housing to the strand and hang it in position.
3. Tighten the clamp bolts so that the housing cannot come off the strand, but can still be adjusted.
4. Position the housing at a location on the strand that is accessible for attaching cables and performing maintenance and balancing, and that complies with the requirements of the system.
5. Torque the clamp bolts to between 40 and 66 in-lbs (4.5 and 7.5 N·m).

Figure 4.4

Strand/Pedestal Mounting



Strand Clamp Orientation for 1/4-inch Strand or Smaller



Strand Clamp Orientation for 5/16-inch Strand or Larger

Strand/Pedestal Mounting With Extension Mounting Brackets (EMBs)

Use EMBs to mount a Flex Max901e if additional space is required between the unit and the strand. The following kits are available:

- 3.2-inch (8 cm) EMB (P/N 172187-01)
- 6-inch (15 cm) EMB (P/N 172187-03)

Note *EMBs are not included with the unit but may be purchased separately. Contact C-COR for ordering information. Each EMB kit includes the following additional mounting hardware:*

- *1/4-20 UNC x 1/2-inch bolt*
- *1/4-inch lock washer*
- *1/4-20 UNC nut*

4

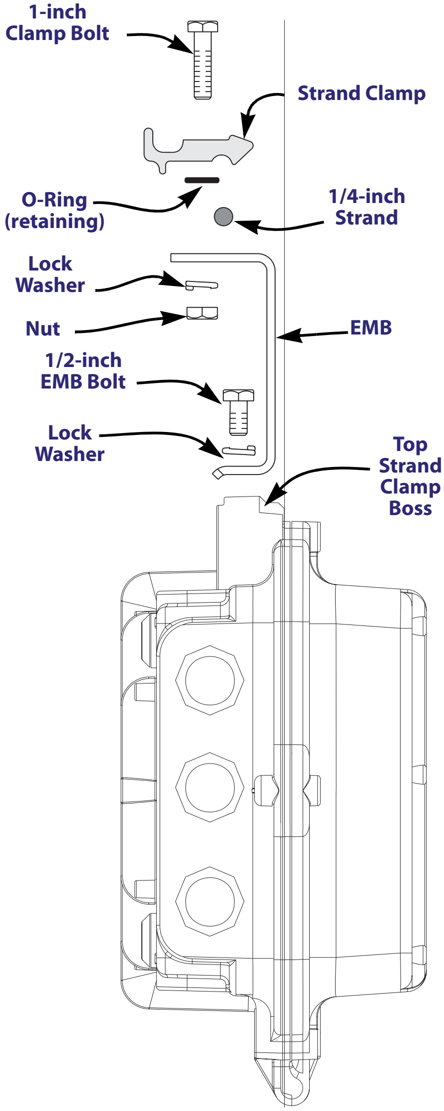
Strand diameter determines the orientation of the strand clamp. Refer to Figure 4.5.

➤ ***To strand/pedestal mount with EMBs***

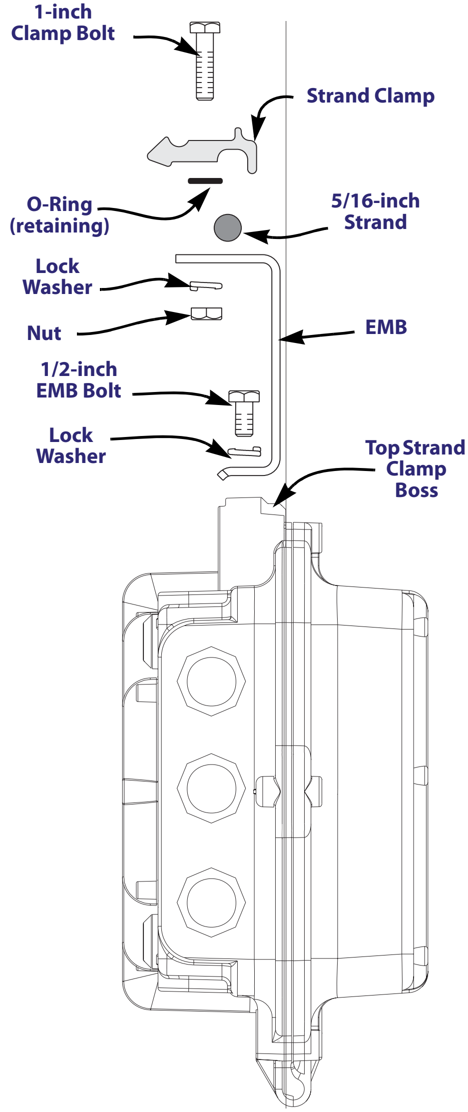
1. Attach the EMBs to the top strand clamp bosses (mounting surfaces) with the 1/2-inch (1.27 cm) long EMB bolts and lock washers (see Figure 4.5). The flat face of the EMB mates with the top strand clamp boss. Tighten the bolts until the EMBs are snug but can still be adjusted.
2. Attach the strand clamp assemblies to the EMBs with the 1-inch (2.54 cm) long clamp bolts, o-rings, lock washers, and nuts. See Figure 4.5.
3. Hoist the housing to the strand and hang it in position.
4. Tighten the clamp bolts so that the housing cannot come off of the strand, but is still free to be adjusted.
5. Position the housing at a location on the strand that is accessible for attaching cables and performing maintenance and balancing, and that complies with the requirements of the system.
6. Torque both the clamp and EMB bolts to between 40 and 66 in-lbs (4.5 and 7.5 N·m).

Figure 4.5

Strand/Pedestal Mounting with EMBs



Strand Clamp Orientation for 1/4-inch Strand or Smaller



Strand Clamp Orientation for 5/16-inch Strand or Larger

Wall Mounting Using Wall Mounting Bosses

Use the wall mounting bosses (mounting surfaces) when mounting a Flex Max901e to a wall. Refer to Figure 4.6

➤ ***To wall mount with wall mount bosses***

1. Measure the thickness of the surface where the housing will be located.

2. Plan the installation with enough clearance around the housing to install the cable and cable connectors and to ensure access to all housing testpoints and internal electronic components. You may need to shim, drill access holes, or provide cutouts.

3. Drill mounting holes 11.8 inches (30.0 cm) apart in the mounting surface if required. Use a 9/32 inch (7 mm) diameter drill for 1/4 inch diameter bolts. See Figure 4.6 for the location of the wall mount bosses.

4

Tip *Use flat washers with a large outside diameter (not supplied) on any walls that are made of compressible material.*

4. Select appropriate length 1/4-20 UNC mounting bolts and nuts, washers (not supplied), and lock washers to allow a threaded bolt length of 1/4 to 3/8 inch (6 to 10 mm) to extend into the housing. Table 4.2, *Mounting Bolt Selection*, lists three examples.

Table 4.2 Mounting Bolt Selection

Minimum Wall Thickness	Bolt Length
1/16 inch (1.6 mm)	3/8 inch (10 mm)
1/4 inch (6 mm)	5/8 inch (16 mm)
1/2 inch (13 mm)	7/8 inch (22 mm)

CAUTION *Do not torque mounting bolts more than 66 in-lbs (7.5 N·m), or more than three to four turns, to avoid penetrating the housing and damaging the electronics.*

Tip *The external testpoints for this housing are on the same surface as the wall mount bosses. If wall mounting will restrict access to the testpoints, use an alternate mounting design such as shimming, drilling the wall for access, providing a cutout, or using extension mounting brackets (see Wall Mounting With Extension Mounting Brackets (EMBs) on page 4-12). Shim only enough to gain access to the testpoints. Testpoints can also be extended using 90° F-connector elbows with terminators.*

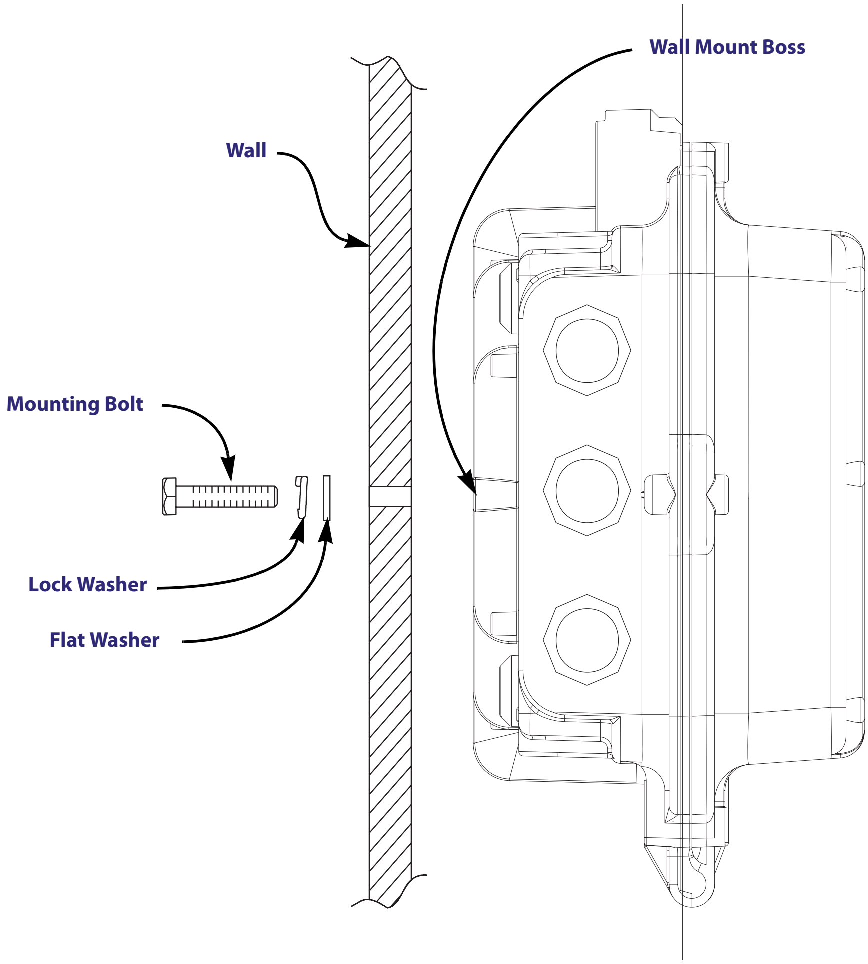
5. Install as shown in Figure 4.6.

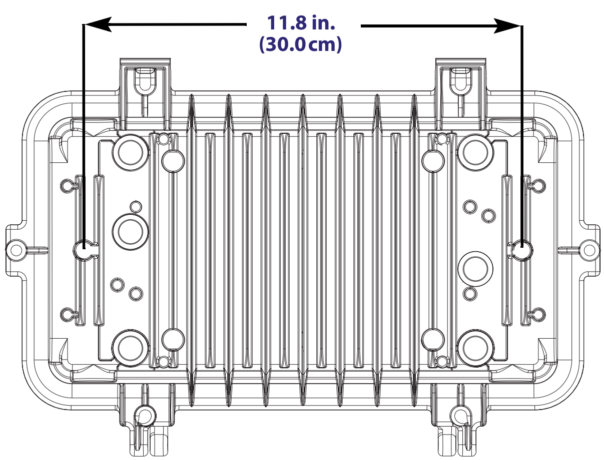
Note *The amount of torque required will depend on the mounting surface used.*

6. Tighten the mounting bolts. Use 40 to 66 in-lbs (4.5 to 7.5 N·m) of torque.

Figure 4.6

Wall Mounting with Wall Mount Bosses





4

Wall Mounting With Extension Mounting Brackets (EMBs)

Use EMBs to mount a Flex Max901e if additional space is required between the unit and the mounting surface. The following kits are available:

- 3.2-inch (8 cm) EMB (P/N 172187-01)
- 6-inch (15 cm) EMB (P/N 172187-03)

Note *EMBs are not included with the unit but may be purchased separately. Contact C-COR for ordering information. Each EMB kit includes the following additional mounting hardware:*

- *1/4-20 UNC x 1/2-inch bolt*
- *1/4-inch lock washer*
- *1/4-20 UNC nut*

4

➤ *To wall mount with EMBs*

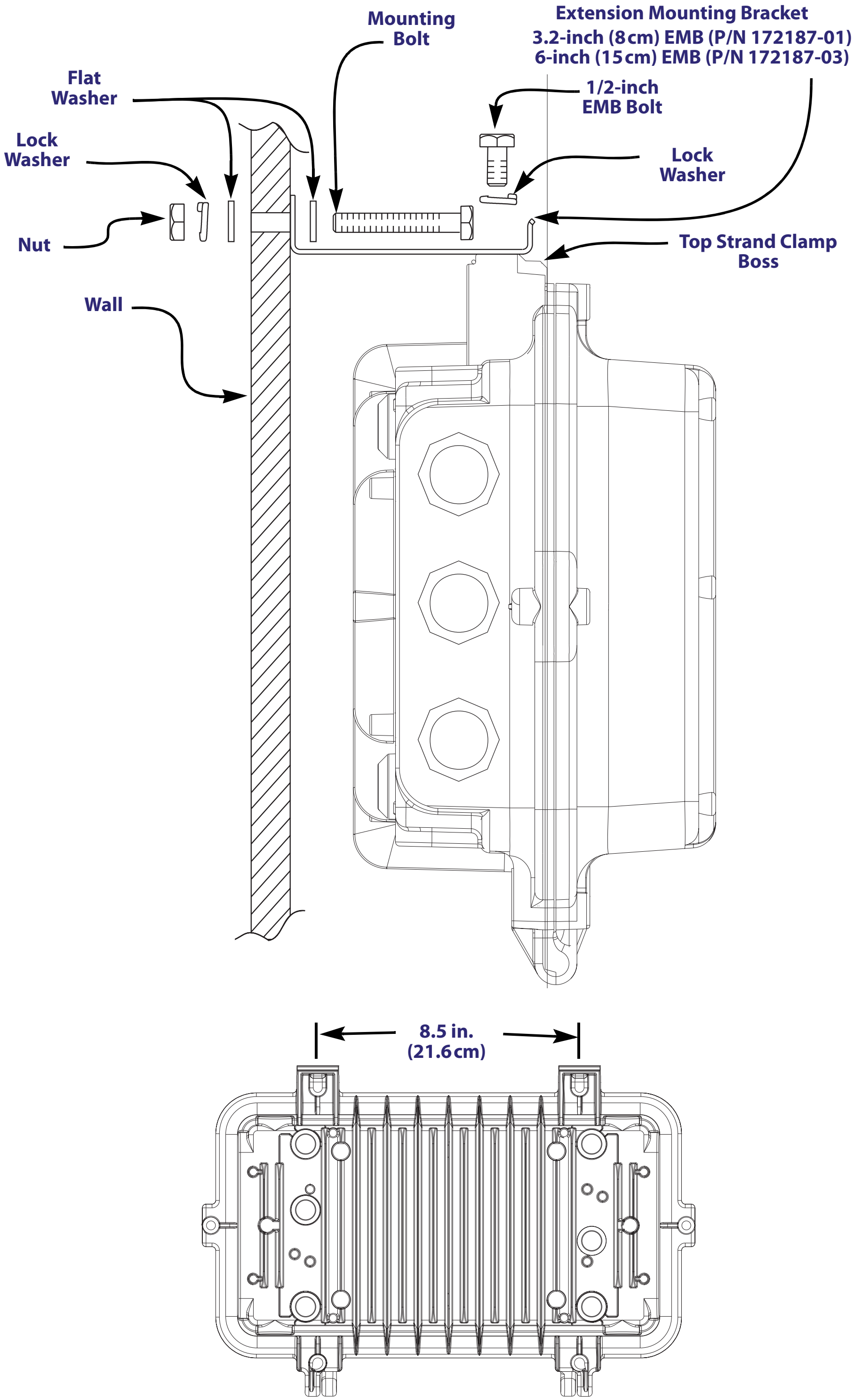
1. Place the lock washers on the bolts supplied with the EMBs and bolt the EMBs to the top strand clamp bosses (mounting surfaces) as shown in Figure 4.7. Tighten the bolts until the EMBs are snug but not fully tightened.
2. Measure the thickness of the surface where the housing will be located.
3. Plan the installation to provide enough clearance around the housing to install the cable and cable connectors and to ensure access to all housing testpoints and internal electronic components.
4. Drill mounting holes 8.5 inches (21.6 cm) apart in the mounting surface as required. Use a 9/32 inch (7 mm) diameter drill for 1/4-inch diameter bolts. See Figure 4.7 for the location of the wall mount bosses.

Tip *Use flat washers with a large outside diameter (not supplied) on any walls that are made of compressible material.*

5. Select appropriate length 1/4-20 UNC mounting bolts and nuts, flat washers (not supplied), and lock washers to allow a threaded bolt length of 1/4 to 3/8 inch (6 to 10 mm) to extend into the housing. Table 4.2 on page 4-10 lists three examples. Use flat washers on the back side of any mounting surface made of compressible material.
6. Align the EMB flange holes with the wall mounting holes. Insert the bolts with flat washers through the aligned holes, slip a lock washer over the end of each bolt, and thread and finger tighten the nuts onto the bolts.
7. Tighten the mounting bolts using no more than 66 in-lbs (7.5 N·m) of torque, but the amount of torque will depend on the mounting surface used.

Figure 4.7

Wall Mounting with EMBs



4

Cable Attachment

WARNING *Hazardous voltages are present. Use approved safety procedures. Turn off all power sources feeding into the unit before installing the cable and connectors.*

CAUTION *Centerseizure screws may not be captive. Modules manufactured after June 1999 have either captive boots over these screws or captive screws that cannot be backed out completely. Do not back non-captive screws out more than two full turns since they can fall out into the housing and under the RF module, possibly causing short circuits and definitely requiring removal of the RF module and service interruption.*

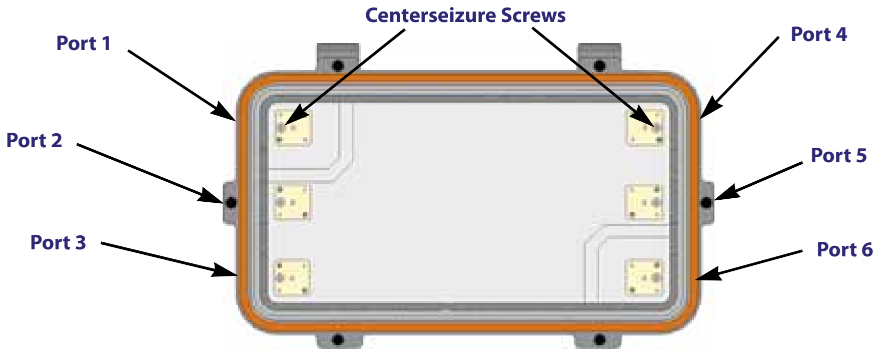
4

➤ *To attach cable*

1. For each port, use a #2 Phillips screwdriver to turn the centerseizure screw clockwise until it seats, loosen the centerseizure screw two full turns (no more), and remove the cap or threaded plug from the cable entry port. Refer to Figure 4.8 as necessary.

Figure 4.8

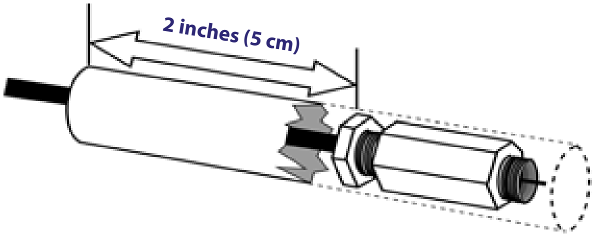
Centerseizure Assemblies (with RF module removed)



2. If using heatshrink tubing, prepare a heatshrink boot according to specifications supplied by the manufacturer. Be sure that the boot is long enough to cover the cable entry port insert and the entire connector. The boot must also extend at least 2 inches (5.08 cm) beyond the back nut. Slide the boot further onto the cable to allow access to the end of the cable. Refer to Figure 4.9.

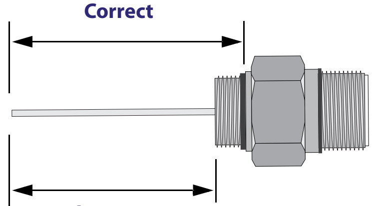
Figure 4.9

Heatshrink Boot



CAUTION *Do not use feed-thru type connectors. Use pin-type connectors only. Using connectors with center conductors exceeding 0.080 inches (2.03 mm) in diameter will damage the centerseizure mechanism.*

Note *Because Flex Max901e 6-port housings have extended port inserts to better accommodate heatshrink boots, stinger lengths should be measured from the mating surface of the O-ring on the cable connector to the tip of the center conductor.*



Note *Close the housing whenever it is left unattended to keep moisture out of the unit and protect the network from RF interference.*

3. Prepare the coaxial cable for attachment:

    a. Prepare the cable end as recommended by the connector manufacturer.

    b. Measure the conductor length as shown in the above note.

    c. Use Tables 4.3 and 4.4 to determine the correct center conductor length. Trim the center conductor with wire cutters to the appropriate length. Figure 4.10 shows a typical cable connector and common variations.

Table 4.3 STANDARD Flex Max901e Housing Center Conductor Lengths (images not to scale)

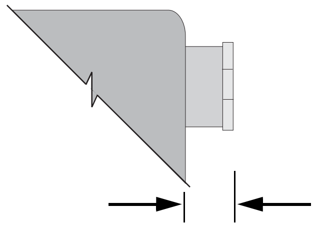
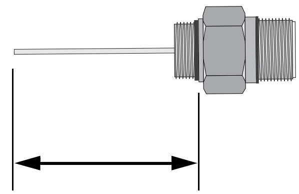
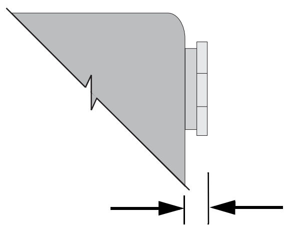
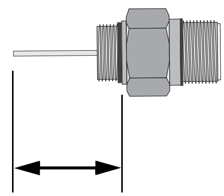
IF you have a housing in which the port insert extends...	THEN cut the center conductor to...
 9/16 in (1.43 cm)	 1 1/2 in (3.81 cm)
 3/16 in (0.48 cm)	 1 1/8 in (2.86 cm)

Table 4.4 BYPASS Housing Center Conductor Lengths (images not to scale)

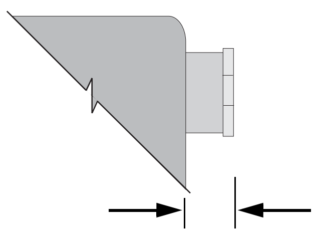
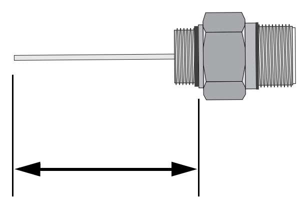
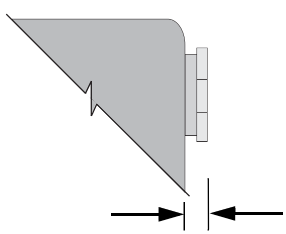
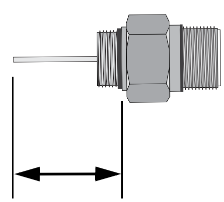
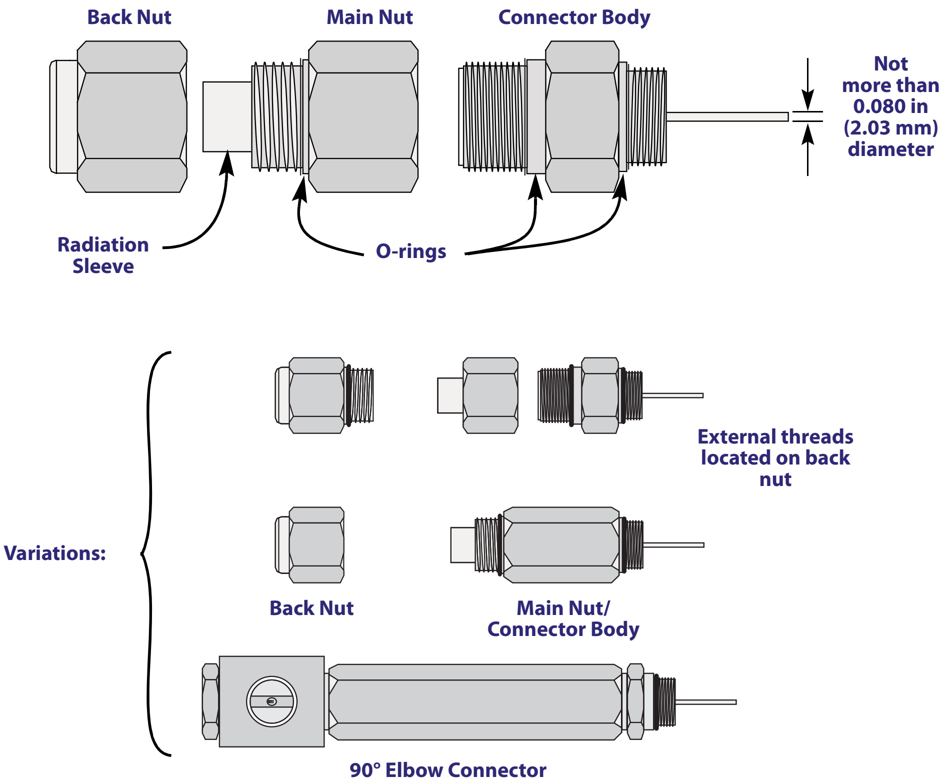
IF you have a housing where the port insert extends...	THEN cut the center conductor to...
 5/16 in (0.79 cm)	 2 5/16 in (5.87 cm)
 1/4 in (0.64 cm)	 2 1/4 in (5.72 cm)

Figure 4.10

Cable Connector Assembly



4. Apply anti-seize compound to threads and O-ring. Do *not* use spray lubricant.

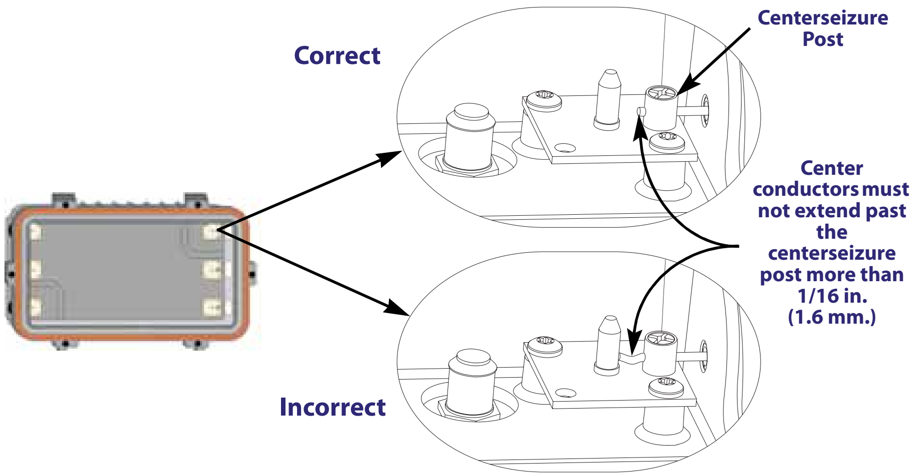
CAUTION *Do not let the center conductor contact the RF module chassis. Ensure that the center conductor extends through the centerseizure post but extends no more than 1/16 in (1.6 mm) beyond it so that it does not touch the RF module chassis or housing. See Figure 4.11. Ensure that no cable scraps or foreign materials remain within the housing.*

5. Attach the coaxial cable to the housing:

   a. Thread the connector body into the cable entry port. Ensure that the pin extends through the centerseizure block but does not touch anything inside the housing.

Figure 4.11

Exploded View of a Centerseizure Assembly



b. Slide the back nut onto the cable away from the end. Make sure the threaded end of the locking nut faces the cable entry port.

c. Slide the cable into the main nut with the outer conductor (shield) outside the radiation shield. Make sure the end of the cable shield bottoms against the main nut.

CAUTION *Avoid possible damage to the housing. Use two wrenches when tightening the connector body, one on the port insert and one on the connector. Always tighten the connector before tightening the centerseizure screw.*

d. Thread, tighten, and torque the cable connector assembly according to specifications supplied by the manufacturer. Hold the cable firmly in position while tightening the connector hardware.

CAUTION *Avoid damage to the seizure block or connector pin. Torque the centerseizure screw to no more than 8 in-lbs (0.9 N·m).*

Tip *Tighten the centerseizure screw with only two fingers on the screwdriver.*

e. Tighten the centerseizure screw down to the pin. Torque to between 6 and 8 in-lbs (0.7 and 0.9 N·m). The centerseizure screw must be tight enough to ensure good electrical contact, but should not bend or cut the center conductor.

6. Connect cable to the remaining cable entry ports by repeating Steps 1 through 5.

CAUTION *The Teflon straps securing the testpoint caps to the housing will melt if exposed to an open flame. Shield the straps from the flame when heating the heatshrink boot.*

7. Apply weathersealing tape or compound to each connector and cable entry port, or, if using heatshrink tubing, slide each heatshrink boot over the entire connector and cable entry port. Heat the boot to shrink it securely around the insert, connector, and cable as specified by the shrink tubing manufacturer.

Housing Closing and Tightening

CAUTION *Ensure that no wire scraps or foreign materials remain within the housing.*

CAUTION *Close the housing whenever it is left unattended to keep moisture out of the unit and protect the network from RF interference.*

➤ *To close the housing*

1. Examine the rubber gasket and mesh seal. Remove all foreign materials that could interfere with proper sealing. Dry any moist areas.
2. Close the lid until it is flush with the rubber gasket. Thread all six bolts finger tight to hold the lid in place. Ensure that the lid seats evenly on the rubber gasket.
3. Tighten the lid bolts with a 7/16 inch (11 mm) nutdriver, following the pattern shown in Figure 4.12. Observe that the lid seats on the rubber gasket.

CAUTION *Do not torque the lid bolts more than 40 in-lbs (4.5 N·m). Overtightening may warp the housing—allowing moisture to enter and damage the components—or cause the threaded inserts to spin.*

4. Continue the tightening sequence, torquing to between 35 and 40 in-lbs (4.0 and 4.5 N·m) with a torque wrench. The lid should now seat evenly and compress the rubber gasket to create a weatherproof seal.
5. If the housing is equipped with external testpoints, install testpoint caps on all testpoints and finger tighten. Use a wrench to tighten the caps an additional one quarter to one half turn.

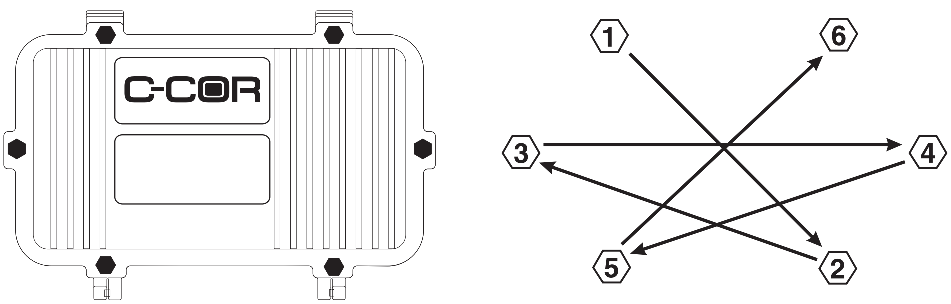


Figure 4.12

Housing Closing and Tightening Sequence

Configuration

This chapter provides instructions for the initial setup of Flex Max901e 1 GHz Trunk and Bridger Amplifiers.

The following tools and materials may be used to complete the procedures in this chapter.

Table 5.1 Tools and Materials

Tools/Equipment	Required Specifications	Uses
Signal level meter (SLM)	5 MHz to 1002 MHz, –35 to +60 dBmV (25 to 120 dBμV)	Input and output signal testing during forward and return balancing
Signal generator	5 to 100 MHz, 10 to 60 dBmV (70 to 120 dBμV)	Signal input during return balancing
Multimeter	True RMS, AC-coupled; ranges: 0 to 200 VDC, 0 to 200 VAC, and 0 to 200 mVAC	Power supply testing
Flat blade screwdrivers	1/4 inch, 5/16 inch	May be required for small fasteners
Wire cutters	—	Jumper cutting
Nutdriver or wrench[1]	7/16 inch (11 mm)	Housing opening and closing
Phillips screwdriver[2]	#2	Centerseizure screws; power supply and transponder hold-down screws
Torque wrench/driver	Up to 66 in-lbs (7.5 N·m), with interchangeable 7/16 inch or 11 mm hex socket, Phillips, flat blade, and Torx® or Torx PLUS® bits	Strand mounting, housing closing, tightening various fasteners[3]
Torx® or Torx PLUS® driver[2]	T15 (Torx®) or 15 I.P. (Torx PLUS®)	May be required for small fasteners
Tuning wand	Non-conductive	Adjust ALC sensitivity and modulation depth
Fuse puller	Non-conductive (C-COR P/N FP-1)	Fuse removal and installation

1. An 11 mm tool can normally be used for a 7/16-inch bolt unless the tool is manufactured to minimum, and the bolt head to maximum, “across the flat” dimensions.
2. Small, hold-down screws may be Phillips head screws or Torx PLUS® head screws. Use the appropriate driver.
3. C-COR recommends torquing all bolts and screws to the specified values.

Power Supply Configuration

WARNING *Hazardous voltages are present. Use approved safety equipment and procedures.*

CAUTION *To prevent hybrid damage, C-COR recommends that all amplifiers in a power supply group have PADs and Equalizers installed in the forward RF path before energizing. The initial recommended accessory values are shown on the system map.*

Refer to *Fuse Shorting Bar (Slug) Replacement* on page 7-3 for all fuse removal and installation procedures.

➤ ***To configure the power supply***

1. Open the amplifier housing. (Refer to *Preparing for Installation* on page 4-2 if necessary.)
2. Verify that an appropriate **MAIN FUSE** is installed. Table 5.2 lists the appropriate fuse values for Flex Max901es. Inspect the fuse for obvious defects.
3. Check the system map to determine which ports receive or pass AC power. Verify that the required fuses, brass shorting bars (slugs), or surge terminators are installed in the appropriate port locations. Table 5.2 lists the maximum AC power passing approved for these amplifiers.

Table 5.2 Fusing/Power Passing Considerations

Power Supply	Part Number	Recommended MAIN FUSE	Maximum Continuous Current Passing[1]	Figure Reference
90VAC, HEPS790 (2.3A)	122027-05	6.25A, slo-blo	Ports 1, 3, 4, and 6: 15A Ports 2 and 5: 13A	Figure 5.1

1. Refer to the system map for actual port fuse values.

4. If AC power is to be routed through two separate circuits—one for trunks and one for bridger outputs—cut the AC distribution link (jumper wire). See Figure 5.1.

Figure 5.1

HEPS790-2.3A (122027-05)

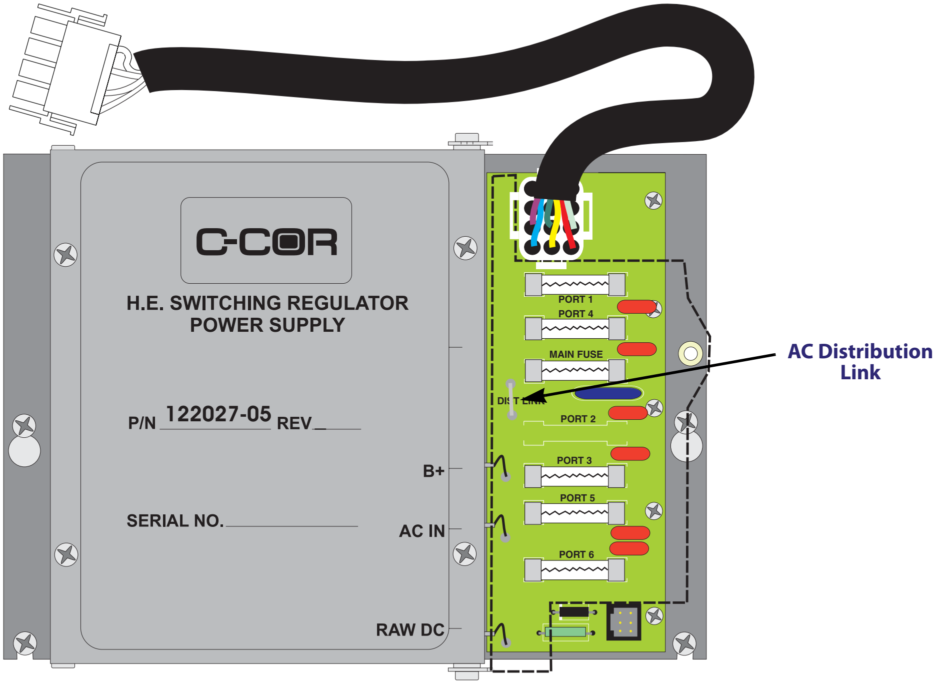
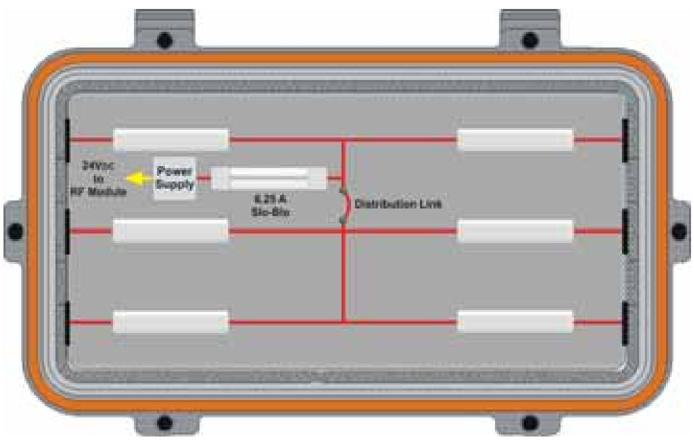


Figure 5.2

Power Routing Diagram



Voltage Testing

CAUTION *Testing voltage at any centerseizure screw in an operating system may interfere with, or cause the loss of, signal to the subscriber.*

Note *AC measurements may read up to 10% error if a true RMS meter is not used. AC ripple measurements cannot be made without an AC-coupled meter.*

Check the power distribution system according to Table 5.3. Record all voltages on the Amplifier Data Sheet (Appendix F).

Table 5.3 Testpoints and Test Values

Testpoint[1]	Acceptable Range	Troubleshooting when Unacceptable
AC insertion port centerseizure screw	42–95VAC	Verify that neither the center conductor pin nor the power cable are shorted to ground. Check the tightness of the centerseizure screw. Check cable plant powering.
AC insertion port fuse input	42–95VAC	If power is acceptable at the centerseizure screw, but not at the fuse input, check the cabling, plugs, and jacks between the power supply and RF module. Check for a short circuit or broken current path.
All fuse inputs and outputs	42–95VAC	If power is present at a fuse input, but not at a fuse output, check for a blown or misaligned fuse. Replace or reinsert the fuse. If the fuse blows when reinserted, check the distribution system for short circuits.
AC IN testpoint	42–95VAC	Check the **MAIN FUSE**.
All power passing port centerseizure screws	42–95VAC	If power is acceptable at the power passing fuse output, but not at the associated centerseizure screw, check the cabling, plugs and jacks between the power supply and the RF module.
RAW DC testpoint	37–100VDC	Replace the power supply.
B+ testpoint [+24 VDC test]	23.5–24.5VDC	Replace the power supply.
[AC ripple test]	< 15mVAC	Replace the power supply.

1. Attach the ground lead to the amplifier housing.

Calculating Balancing Carrier Levels

Typically, only the Forward High Balancing Carrier level will need to be calculated (if it is not provided by the system manager). All other balancing carrier levels are near enough to the signal levels of the bandedge carriers that bandedge levels may be used for balancing.

Perform this calculation only when the Forward High Balancing Carrier is not at the high bandedge frequency. This calculation method can speed up the process of balancing and needs to be done only once for all similar amplifiers within a cascade.

1. Obtain a copy of the Amplifier Data Sheet from the system manager or make a copy from the sample at the end of this manual.
2. Calculate the Forward High Balancing Carrier level using the following equation.

$$L_C = \left[\frac{L_H - L_L}{F_H - F_L}\right] \times (F_C - F_L) + L_L$$

L_C = Forward High Balancing Carrier level (dBmV)

L_H = system output level at the high bandedge frequency (dBmV)

L_L = system output level at the low bandedge frequency (dBmV)

F_H = system high bandedge frequency (MHz)

F_L = system low bandedge frequency (MHz)

F_C = Forward High Balancing Carrier frequency (MHz)

3. Copy the Forward High Balancing Carrier level to the appropriate box in the Map Signal Information section of the Amplifier Data Sheet.

Temperature Compensation

Note *Temperature correction only applies to aerial cable. Use a 0 dB Temperature Correction Value for all underground cable.*

Tip *To compensate for cable loss due to temperature change, you can remember that the percentage of change of cable loss is measured 1% for every 10°F (5.5°C) of temperature change, or you can complete the procedure that follows.*

Typically, only the forward balancing carriers require temperature compensation. The effect of temperature on the cable attenuation associated with the low frequency return balancing carriers is minimal except in extreme conditions.

When the temperature surrounding an amplifier is between 50 and 90• F (10 and 32• C), balancing carrier levels do not require temperature compensation.

If the temperature is less than 50• F (10• C) or greater than 90• F (32• C), perform temperature compensation as follows:

➤ *To perform temperature compensation*

1. For both forward balancing carriers, note the loss (in dB at the carrier frequency) due to the cable preceding the unit under test. Note the temperature of the air surrounding the preceding cable.

2. Using Figure 5.3 on page 5-8, obtain a Temperature Compensation Value (TCV) for that section of cable for each carrier.

   a. Find the intersecting point on the chart corresponding to your cable loss and temperature values.

   b. Find the TCV line nearest this point. The dB value label on that line is your TCV.

   c. Record both TCVs in the calculation box below and on the Flex Max901e Data Sheet.

   Example: Your cable loss is 23 dB. The air temperature is 25° F (–5° C). The point on the graph corresponding to these two values is between the 0.75 and 1.0 dB lines, but closer to the 1.0 dB line. (The dotted lines mark the halfway-between-lines points on the graph.) The TCV is then 1.0 dB.

3. Record the System Forward High and Low Balancing Carrier levels from the Flex Max901e Data Sheet into the following calculation box. Perform the calculation to get the adjusted output levels.

______________	+	______________	=	______________
System Forward High Balancing Carrier Level		TCV For High Carrier (from Figure 5.3)		Adjusted Forward High Balancing Carrier Level
______________	+	______________	=	______________
System Forward Low Balancing Carrier Level		TCV For Low Carrier (from Figure 5.3)		Adjusted Forward Low Balancing Carrier Level

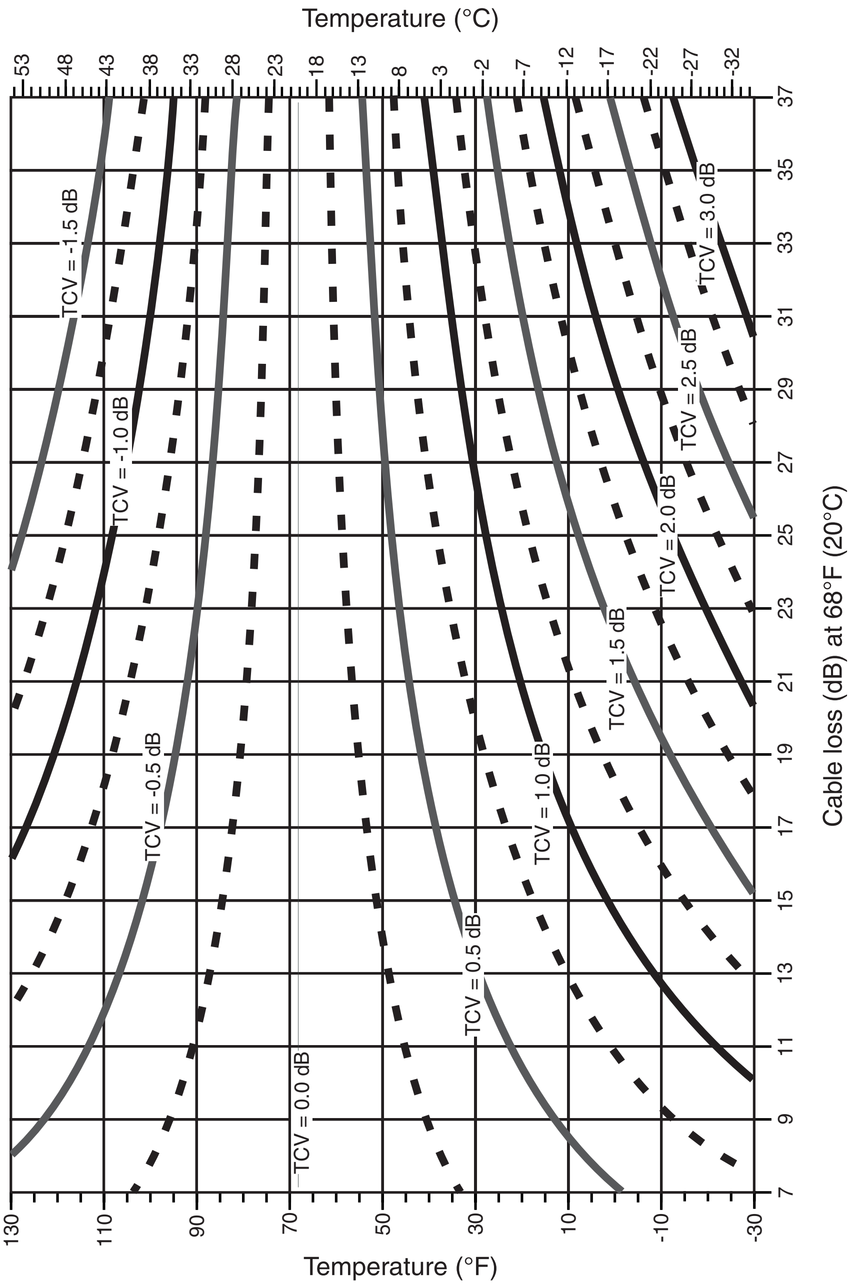
4. Use the temperature compensated forward balancing carrier levels in *Factory-Shipped Configurations for Flex Max901e Trunk and Bridger Amplifiers* on page 5-9 and *Forward Field Testing* on page 6-4.

5. If necessary, repeat Steps 1 and 2 for the return balancing carriers. Use these temperature compensated levels in *Return Balancing* on page 5-20 and *Return Field Testing* on page 6-5.

5

Figure 5.3

Temperature Compensation Value Chart



5

Factory-Shipped Configurations for Flex Max901e Trunk and Bridger Amplifiers

The information in this section details the factory-shipped configurations for 1 GHz and 870 MHz operation for Flex Max901e trunks and bridgers when upgrading from FlexNet 900 amplifiers. To display or discuss every possible upgrade scenario is beyond the scope of this publication. If you are upgrading from the 700, 800, or 900 series amplifiers, contact your C-COR sales professional to ensure you are configuring your Flex Max901e amplifiers correctly.

Flex Max901e Trunk Amplifier with Optimized Tilt for 1 GHz Operation with Trunk and Bridger Legs at Different Output Tilts—page 5-10

Flex Max901e Trunk Amplifier Configured for 1 GHz Operation with Equal Output Tilt on the Trunk and Bridger Legs—page 5-11

Flex Max901e Trunk Amplifier Configured for 870 MHz operation with 14.5 dB Output Tilt—page 5-12

Flex Max901e Bridger Amplifier Configured for 1 GHz Operation—page 5-13

Flex Max901e Bridger Amplifier Configured for 870 MHz Operation—page 5-14

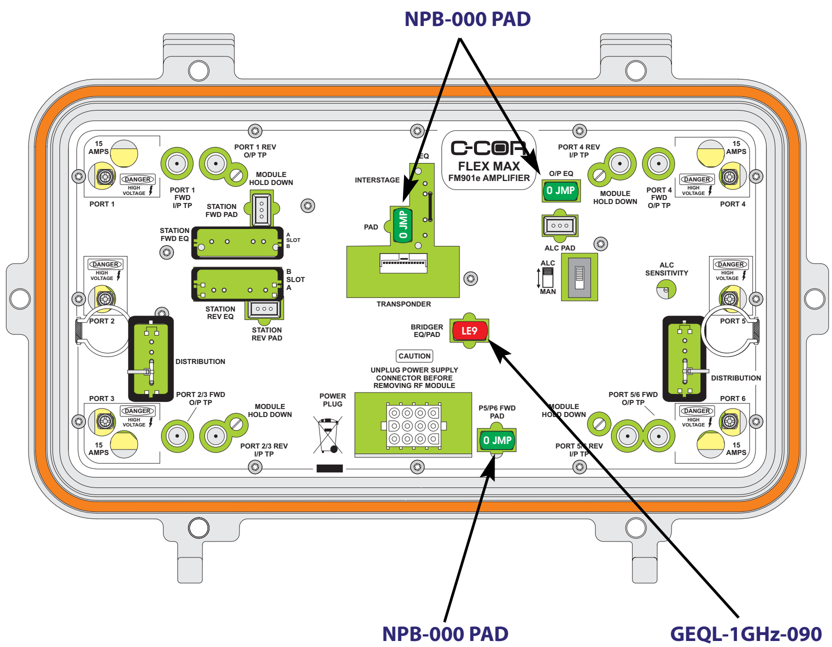
Flex Max901e Trunk Amplifier with Optimized Tilt for 1 GHz Operation with Trunk and Bridger Legs at Different Output Tilts

> ***Note*** *The following example is how this Flex Max901e is shipped from the factory.*

1. Ensure that a GEQL-1GHZ-090 (9 dB) is installed in the **BRIDGER EQ/PAD** location.
2. Ensure that NPB-000 (0 dB) PADs are installed in the following locations:
   - **INTERSTAGE PAD**
   - **O/P EQ**
   - **P5/P6 FWD PAD**
3. ***Do not*** remove the jumper installed in the **INTERSTAGE EQ** location.

Figure 5.4

Flex Max901e trunk amplifier configured for 1 GHz operation with trunk and bridger at different tilts



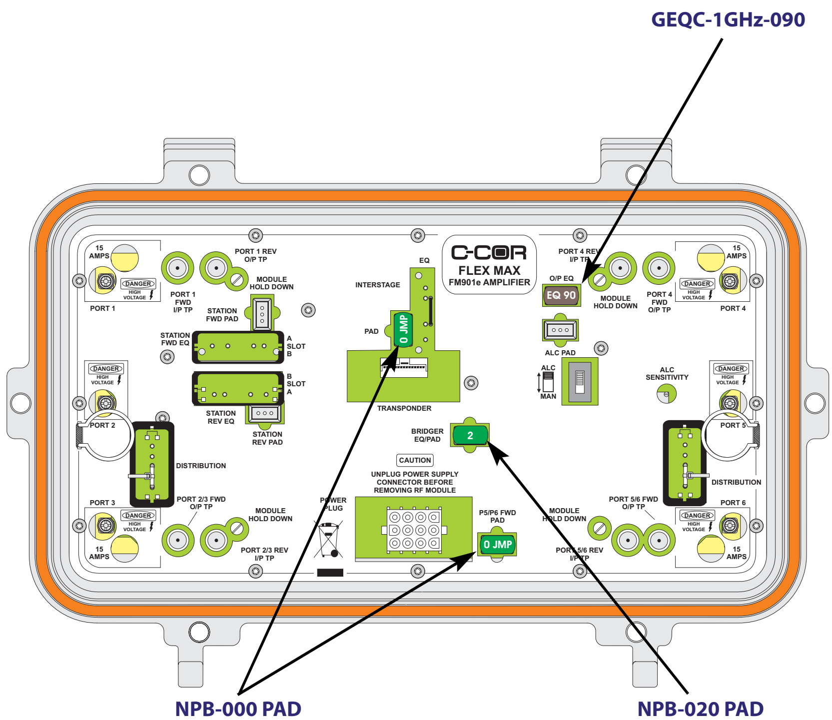
Flex Max901e Trunk Amplifier Configured for 1 GHz Operation with Equal Output Tilt on the Trunk and Bridger Legs

> ***Note*** *The following example is how this Flex Max901e is shipped from the factory.*
>
> ***Note*** *This FM901e configuration is suitable for replacement of FNT7, FNT8, FNT9 amplifiers.*

1. Ensure that a GEQC-1GHZ-090 (9 dB) is installed in the **O/P EQ** location. (17 dB output tilt. See note below for optional tilts.)
2. Ensure that an NPB-020 (2 dB) PAD is installed in the **BRIDGER EQ/PAD** location.
3. Ensure that an NPB-000 (0 dB) PAD is installed in the **INTERSTAGE PAD** and **P5/P6 FWD PAD** locations.
4. ***Do not*** remove the jumper installed in the **INTERSTAGE EQ** location.

Figure 5.5

Flex Max901e trunk amplifier configured for 1 GHz operation with equal output tilt on the trunk and bridger



> ***Note*** *A GEQC-1GHZ-050 plug-in (14 dB output tilt) and a GEQC-1 GHZ-070 plug-in (15.5 dB output tilt) are optional and must be ordered separately. Please contact your C-COR sales professional.*

Flex Max901e Trunk Amplifier Configured for 870 MHz operation with 14.5 dB Output Tilt

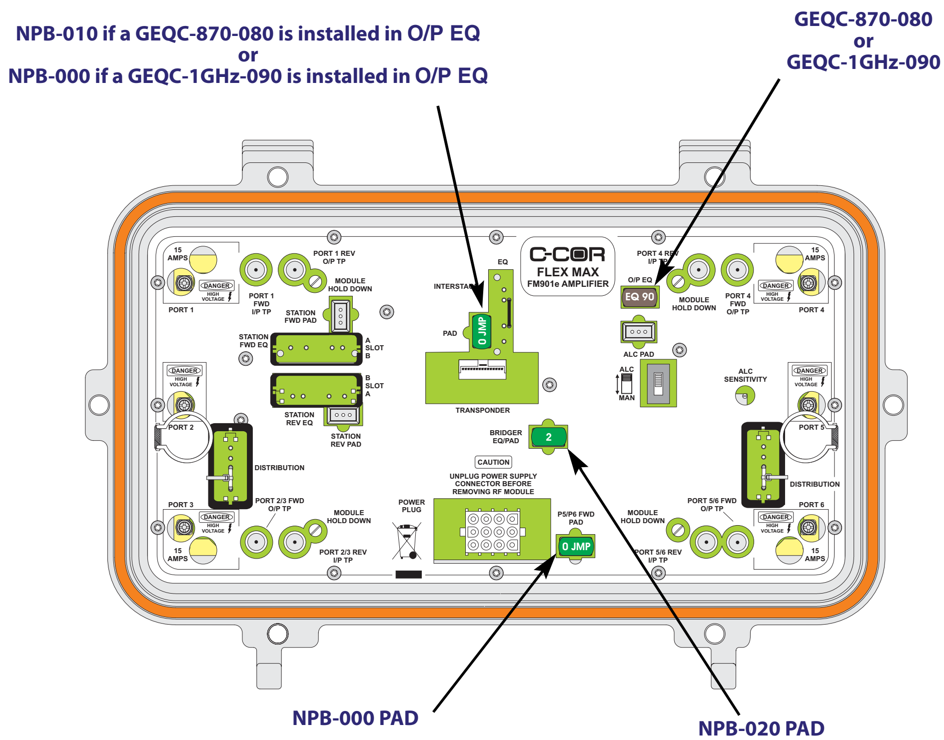
> **Note** *The following example is how this Flex Max901e is shipped from the factory.*
>
> **Note** *After initial setup, 870 MHz equalizers and cable simulators may be used.*

1. Ensure that a GEQC-870-080 (8 dB) or a GEQC-1 GHz-090 (9 dB) is installed in the **O/P EQ** location.
2. In the **INTERSTAGE PAD** location, ensure that:
   - an NPB-010 (1 dB PAD) is installed if using GEQC-870-080 in Step 1
   - an NPB-000 (0 dB PAD) is installed if using GEQC-1 GHz-090 in Step 1.
3. Ensure that an NPB-020 (2 dB) PAD is installed in the **BRIDGER EQ/PAD** location.
4. Ensure that an NPB-000 (0 dB) PAD is installed in the **P5/P6 FWD PAD** locations.
5. ***Do not*** remove the jumper installed in the **INTERSTAGE EQ** location.

5

Figure 5.6

Flex Max901e trunk amplifier configured for 870 MHz operation



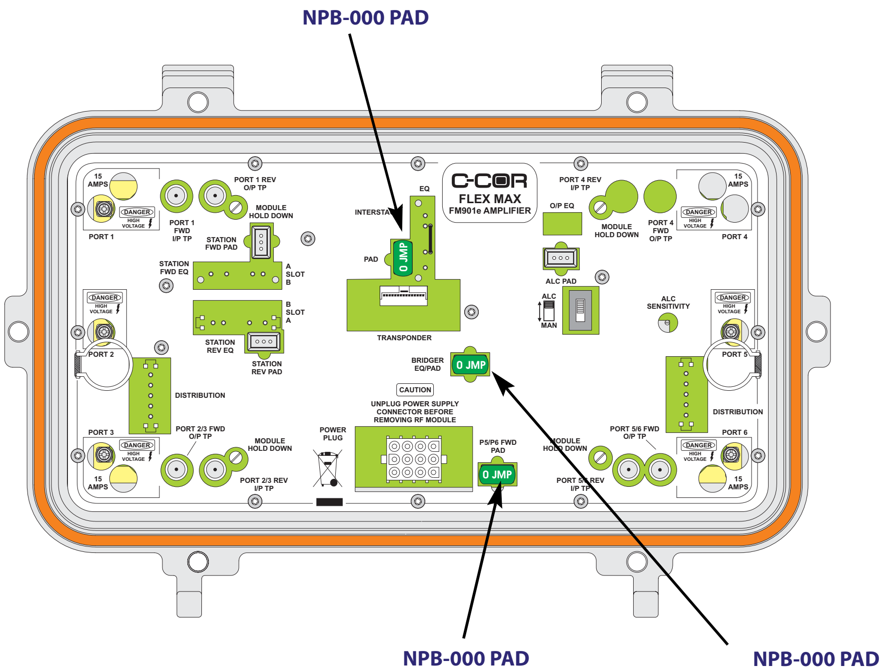
Flex Max901e Bridger Amplifier Configured for 1 GHz Operation

Note *The following example is how this Flex Max901e is shipped from the factory.*

1. Install NPB-000 PADs in the following locations:
   - **INTERSTAGE PAD**
   - **BRIDGER EQ/PAD**
   - **P5/P6 FWD PAD**
2. ***Do not*** remove the jumper installed in the **INTERSTAGE EQ** location.

Figure 5.7

Flex Max901e bridger amplifier configured for 1 GHz operation



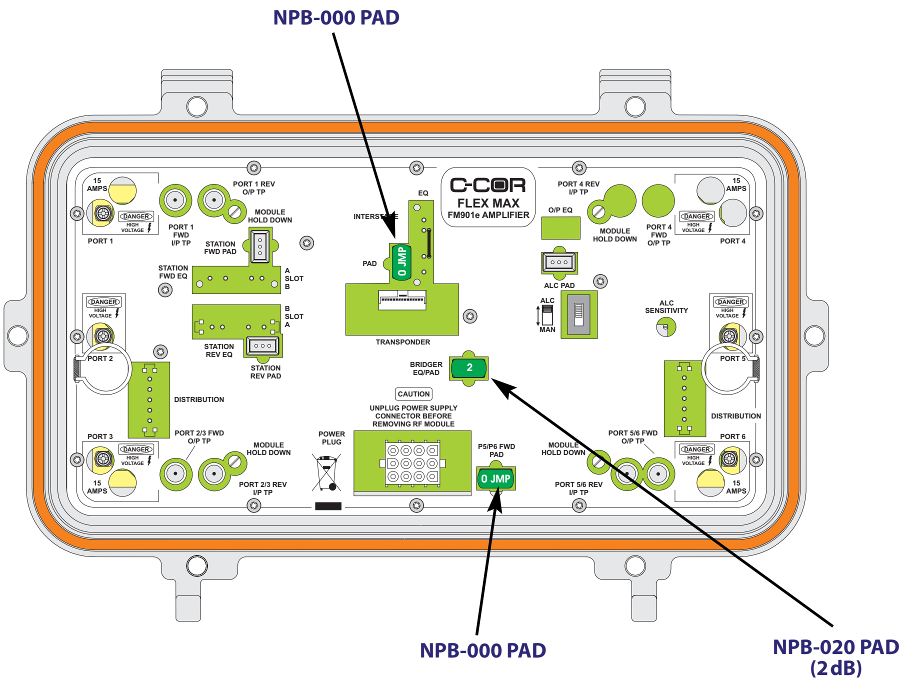
Flex Max901e Bridger Amplifier Configured for 870 MHz Operation

Note *The following example is how this Flex Max901e is shipped from the factory.*

1. Install NPB-000 PADs in the following locations:
   - **INTERSTAGE PAD**
   - **P5/P6 FWD PAD**
2. Install an NPB-020 PAD in the following location:
   - **BRIDGER EQ/PAD**
3. ***Do not*** remove the jumper installed in the Interstage **EQ** location.

Figure 5.8

Flex Max901e bridger amplifier configured for 870 MHz operation



Forward Balancing

ALC operating range for NTSC or QAM channel pilot operation prior to performing the forward balancing procedure

The ALC setup range in Flex Max901e amplifiers originally featured a pilot frequency setup range of **+2/-6 dB** at standard output levels. To achieve this range, amplifiers shipped with a factory-installed **ALC PAD** (see table below). **Effective September 22, 2006**, C-COR changed the factory-set ALC setup range for these products to feature an improved range of **+5/-3 dB** at standard output levels. As of that date, Flex Max901e amplifiers began shipping with a new factory-installed **ALC PAD** (see table below).

Model	ALC PAD Value Before 9/22/2006		ALC PAD Value After 9/22/2006	
	NTSC Pilot Factory-Installed PAD	QAM Pilot[1] Technician-Installed PAD	NTSC Pilot Factory-Installed PAD	QAM Pilot[1] Technician-Installed PAD
Flex Max901e Trunk—1 GHz T&B same tilt	8 dB	2 dB	6 dB	0 dB
Flex Max901e Trunk—1 GHz T&B different tilt	8 dB	2 dB	9 dB	3 dB
Flex Max901e Bridger—1 GHz	8 dB	2 dB	13 dB	7 dB

1. QAM pilots operate 6 dB down from the NTSC pilots.

C-COR currently offers three QAM pilot frequencies above 499.00 MHz: 609.00 MHz, 645.00 MHz, and 711.00 MHz. QAM pilot frequencies are centered on standard NTSC channel frequencies.

Model	ALC PAD Values for QAM Pilots Above 499.00 MHz	
	QAM Reference Pilot Level	ALC PAD Value Factory-Installed
Flex Max901e Trunk—1 GHz FMTEG8x—Optimized for 1 GHz Trunk and bridger different tilt	32 dBmV	4 dB
Flex Max901e Trunk—1 GHz FMTED5x—Ideal as drop-in spares Trunk and bridger same tilt	31 dBmV	3 dB
Flex Max901e Bridger—1 GHz	39 dBmV	9 dB

The **ALC PAD** location controls NTSC and QAM channel operating range setup. The Flex Max901e ships with a factory-installed NPB series PAD in this location for standard NTSC operation at C-COR recommended pilot levels. Refer to the tables above for exact NPB PAD values.

- For optimum operation of ALC, the value of the ALC PAD should be changed in direct relationship to recommended C-COR forward output pilot level.
  - ***NTSC example***: if your system design increases the output pilot level of the 1 GHz configuration trunk 3 dB above the nominal output (37 dBm), increase the factory-installed 9 dB ALC PAD by 3 dB, to 12 dB, for an optimum ALC operating range.
- Changing the ALC PAD allows a QAM signal to operate 6 dB lower than the NTSC channels.
  - ***QAM example***: If the QAM channels are set at –6 dB from the NTSC channels, lower the ALC PAD by 6dB.

Changing the value of the ALC PAD readjusts the operating range of the ALC to ensure pilot level control over C-COR's specified temperature range. The same ALC balancing techniques can be used for both analog and digital operation if the QAM channel occupies the same spectrum as the NTSC channel.

5

Forward Balancing Requirements

__CAUTION__ RF input signal levels greater than +45 dBmV @ 1 NTSC channel loading can damage amplifier active components. Derate maximum input level according to actual channel loading (for example, +26 dBmV @ 79 NTSC channel loading) (+26 dBmV = +86 dBµV).

__Note__ "System" values are those recommended values shown on the system map. "Measured" values are the signal levels actually measured at the amplifier.

__Note__ While SEQ-1G and SCS-1G plug-in accessories will address all bandwidths up to 1 GHz, you may wish to reuse your current equalizers and cable simulators until you expand your system to 1 GHz. Refer to the bulleted items in Step 3 under Upgrade Considerations on page 3-2 to determine which plug-ins can be reused.

Make sure that the following requirements are met before you start to balance:

- The system map is marked with amplifier output levels for bandedge frequencies.
- Forward balancing carriers, set at the proper levels, are injected into the cable network from the headend.
- One forward balancing carrier is available at a lower bandedge.
- One forward balancing carrier is available at a higher bandedge.
- RAW DC, B+, and B+ ripple voltages are within acceptable range (refer to *Voltage Testing* on page 5-5 as necessary).
- All tap outlets, ends of feeder cables, and unused active RF ports are terminated with a 75 Ω impedance.
- Unscrambled ALC carriers are injected into the system at the assigned frequency for the amplifier (if ALC is to be used).
- The correct **ALC PAD** value is installed for NTSC or QAM channel ALC operation. The **ALC PAD** ships with factory-installed NPB series PADs for standard NTSC operation. Refer to the tables on page 5-15 for exact NPB PAD values.
- Preceding amplifiers have been properly balanced and provide the desired forward band signals to the amplifier for forward balancing.
- Flex Max901e trunk and bridgers amplifiers can be configured with the appropriate plug-in accessories for 1 GHz operation **or** for use as spares in 750/870 MHz systems. Refer to *Power Supply Configuration* beginning on page 5-3.

Forward Balancing Procedure

Refer to Figure 2.1 and Table 2.1 for control and accessory locations.

➤ *To balance the forward path*

1. Determine the System Forward High and Low Balancing Carrier Levels:
   - If bandedge carriers are used for balancing, copy the amplifier bandedge carrier output levels from the system map to the Map Signal Information table on the Amplifier Data Sheet.
   - If other than the bandedge carriers are used for balancing, calculate the balancing carrier levels (see *Calculating Balancing Carrier Levels* on page 5-6 if not already done). Record these levels in the Map Signal Information table on the Amplifier Data Sheet.
2. Temperature compensate the System Forward High and Low Balancing Carrier Levels:

Temperature	Need Compensation?	Procedure
below 50°F (10°C) or above 90° F (32°C)	Yes	Record the current air temperature on the Amplifier Data Sheet. Perform temperature compensation according to *Temperature Compensation* on page 5-6. Record the compensated values in the System High and Low Balancing Carrier Levels calculation boxes as shown in Steps 4 and 5. If the air temperature changes more than 20• F (11• C) while balancing the amplifier, recalculate the temperature compensation.
between 50 and 90°F (10 and 32°C)	No	Record the current air temperature on the Amplifier Data Sheet. Copy the Forward High/Low Balancing Carrier Levels from the Map Signal Information table on the Amplifier Data Sheet to the calculation boxes in Steps 4 and 5.

Note *Distribution accessories are reversible. The recessed groove on the top of a directional coupler indicates the high-loss leg. Ensure that the accessory is installed with the correct orientation to get the required level at each port.*

3. Set the amplifier to factory-aligned condition as follows:
   a. Set the **ALC/MAN** switch to the **MAN** position.
   b. Ensure that an SEQ-0 or SEQ-1G-00 is installed in the **STATION FWD EQ** location and an NPB-000 is installed in the **STATION FWD PAD** location.
   c. Ensure the **ALC PAD** location contains a factory-installed NPB PAD for an NTSC pilot channel or an NPB PAD determined by the tables on page 5-15 for a QAM pilot channel.
   d. Install the interstage **EQ**, **BRIDGER EQ/PAD**, and **P5/P6 FWD PAD** as specified by the system design specifications (available from the system manager).

e. Install the distribution accessories as specified on the system map. Refer to the distribution accessories table in *Accessory Tables* on page D-6 as needed.

f. If no distribution accessories are to be installed, ensure that factory-installed jumper wires are present. Install jumper wires if absent.

g. Ensure that all unused, active ports are terminated with a 75 Ω impedance.

Note *Testpoints are –20 dB or –25 dB referenced to the associated port input or output level as indicated by the housing label.*

Note *Do not terminate the unused port testpoint as it can affect testpoint accuracy.*

4. Equalize the RF signal:

a. Connect the signal level meter to:

- the internal/external **PORT 4 FWD O/P TP** for FMT1 amplifiers.
- the internal/external **P5/P6 FWD O/P TP** for FMB1 amplifiers.

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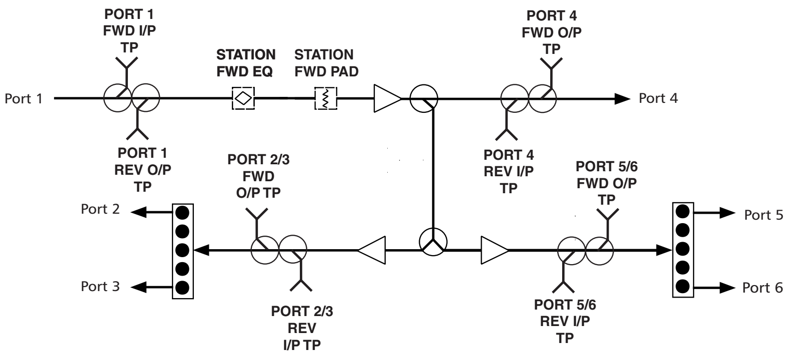
Figure 5.9

Simplified Forward Path Block Diagram



b. Measure the signal levels of both forward balancing carriers. These levels will be referred to as the Measured High and Low Balancing Carrier Levels. Record these levels as shown in the box that follows. Calculate System Tilt, Measured Tilt, and Equalization Value.

____________	–	____________	=	____________
System Forward High Balancing Carrier Level		System Forward Low Balancing Carrier Level		System Tilt
____________	–	____________	=	____________
Measured Forward High Balancing Carrier Level		Measured Forward Low Balancing Carrier Level		Measured Tilt
____________	–	____________	=	____________
System Tilt		Measured Tilt		Equalization Value

c. If the Equalization Value is positive, an SEQ is needed. If the value is negative, an SCS is needed. Using the appropriate tables in *Accessory Tables* on page D-6, select an accessory with a tilt as close to the Equalization Value as possible. For a full explanation of the selection process and accessories, see *Use Of Accessory Tables* on page D-1.

d. If necessary, remove the accessory from the **STATION FWD EQ** location and install the selected cable equalizer or cable simulator.

5. Attenuate the RF input:

a. Measure the new Forward High Balancing Carrier Level and record the adjusted value as shown in the box that follows. Calculate the PAD Value.

____________	–	____________	=	____________
Measured Forward High Balancing Carrier Level		System Forward High Balancing Carrier Level		PAD Value

b. Select an NPB PAD that has a flat loss within ± 0.5 dB of the PAD Value.

c. If necessary, remove the accessory from the **STATION FWD PAD** and install the selected attenuator (PAD).

6. Measure and record balancing levels and RF output for future reference:

a. Measure both forward balancing carrier levels and verify that the signal level of the Forward High Balancing Carrier is within acceptable tolerance (typically ± 0.5 dB) of the specified system level. If the signal level is not within tolerance, rebalance or troubleshoot the amplifier.

b. Record both forward balancing carrier levels in the Balancing TP (MAN) box of the Forward Signal Levels table on the Amplifier Data Sheet. Record the **STATION FWD EQ** and **STATION FWD PAD** values on the Amplifier Data Sheet.

Note *Because the* **ALC SENSITIVITY** *control has a limit of about 20 turns, the change in output level may not be proportional to the size of adjustment using the control. Several complete rotations of the control may be required to observe a change in the output level. When the control is near the operating range, small adjustments will produce large changes in the output level. The control will click when you reach the limit in each direction.*

7. Adjust the ALC:

   a. Set the **ALC/MAN** switch to the **ALC** position. Wait 30 seconds.

   b. Adjust the **ALC SENSITIVITY** control while observing the system high carrier on the SLM. Clockwise decreases, counterclockwise increases the signal level. Stop adjusting when the output at the high carrier reaches the Forward High Balancing Carrier Level. If Temperature Compensation was used, balance in ALC mode for the levels calculated before Temperature Correction Values were determined.

   c. Record both forward balancing carrier levels in the Balancing TP (ALC) box of the Forward Signal Levels table on the Amplifier Data Sheet.

8. Measure the signal levels of both forward balancing carriers at all internal/external testpoints and record these levels in the Forward Signal Levels table on the Amplifier Data Sheet.

9. Close the housing and replace the caps on all external testpoints. (Refer to *Housing Closing and Tightening* on page 4-19, if necessary.)

Return Balancing

For signals on the return path to arrive at the headend at the correct level and with as little distortion as possible, the return path must be properly balanced. Properly balanced means that the return signals on each leg arrive at each succeeding amplifier at the same level and tilt; this is called unity gain. Balancing with unity gain ensures that all return signals, regardless of point of origination, arrive at the headend at the same signal level. This keeps signal distortion at the lowest possible level. In most systems, the return band will have a tilt of 0 dB between the low and high return bandedges. The following sections cover the single person and the two person return balancing procedures.

These procedures assume the requirements listed in *Forward Balancing Requirements* on page 5-16 are met. When balancing the return path keep in mind the following:

- The forward path must be balanced first and be trouble free.
- The network must be free of ingress.
- You are trying to achieve constant inputs at the *return input port* of each amplifier. To do this you must adjust signal level and tilt in the return path through the use of return port PADs, equalizers, and distribution accessories.
- When using the single-person method, turn off the ALC, if present, in the return rack mount receiver at the headend.

The following sections cover the single and two person balancing procedures.

Single Person Return Balancing Procedure

Single person return balancing requires the use of more sophisticated equipment than does two person return balancing. Figure 5.10 shows the typical single person configuration of the test equipment used in the single person return balancing procedure.

For single person return balancing, proper balancing of each unit depends on all preceding units being properly balanced. It is particularly critical that the first amplifier or node be balanced correctly since, if balanced incorrectly, all succeeding units will also be affected. For this reason, when initially balancing, start at the unit closest to the headend and work outward.

Because these are sweep systems, ingress may effect the outcome. Terminating return ports or keeping all amplifiers terminated until activation will limit ingress. Standard sweep equipment also has a "noise/ingress" feature that can be used for troubleshooting. This displays the noise seen in the headend.

Tech Note TD0079 provides the generalized procedure using Wavetek Stealth® equipment (3ST/3HRV and 3SRV), Hewlett-Packard CaLan equipment (3010H and 3010R), and the method using relatively inexpensive video equipment (spectrum analyzer, signal generator, video camera, video signal modulator, and TV monitor). For specific instructions on operation of this equipment, refer to the manufacturer's user manual.

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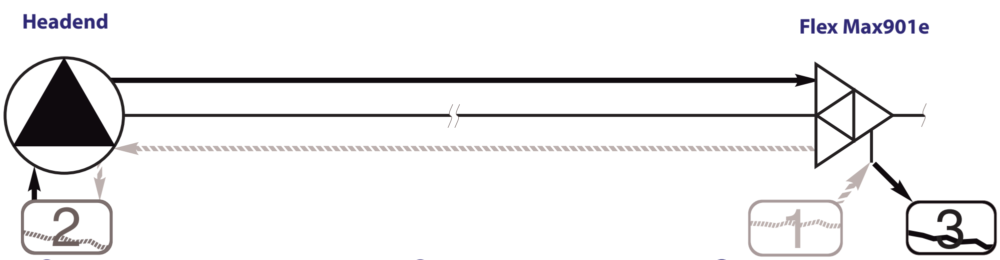
Note *If a unit closer to the headend is balanced incorrectly, all succeeding amplifiers will not be balanced correctly using the single person method.*

Figure 5.10

Typical Configuration of Single Person Return Balancing Equipment



❷ A device (usually rack mounted) at the headend analyzes the incoming signal and transmits the results back to the handheld unit.

❶ A handheld sweep device transmits a signal to the headend through the return path of the amplifier being balanced.

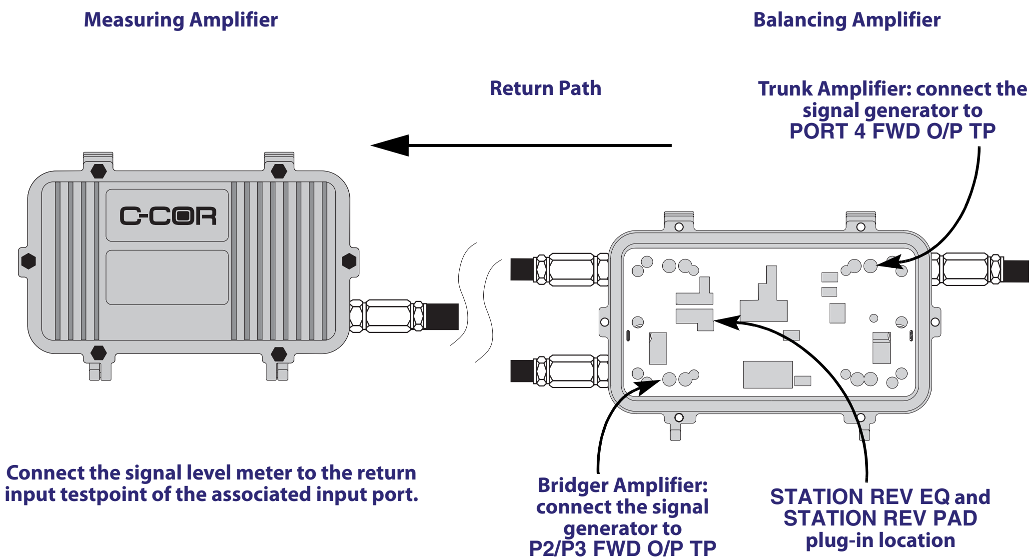
❸ The handheld unit receives the data from the headend unit and displays an image of the signal as it would appear at the headend.

Two Person Return Balancing

Note *This method of return balancing requires two technicians communicating between two successive amplifier locations. Balancing signals are injected into a forward path output testpoint of the Balancing Amplifier and measured at the return input testpoint of the Measuring Amplifier.*

Figure 5.11

Return Balancing Cascade



CAUTION *RF signal levels greater than +45 dBmV @ 1 NTSC channel loading at the hybrid can damage amplifier active components. Derate maximum input level according to actual channel loading (for example, +26 dBmV @ 79 NTSC channel loading) (+26 dBmV = +86 dBμV).*

Note *The return path is not active until the PADs and return EQ accessories are installed.*

Note *Testpoints are –20 dB referenced to the associated port input or output level. Refer to the housing label for testpoint loss.*

➤ *To balance the return path*

1. Obtain the Return High and Low Balancing Carrier Levels from the System Map for both amplifiers. Record these levels in the corresponding boxes on the Amplifier Data Sheet and as shown in the following boxes in Steps 3c and 4a. (Return input levels may vary depending upon the input port.)

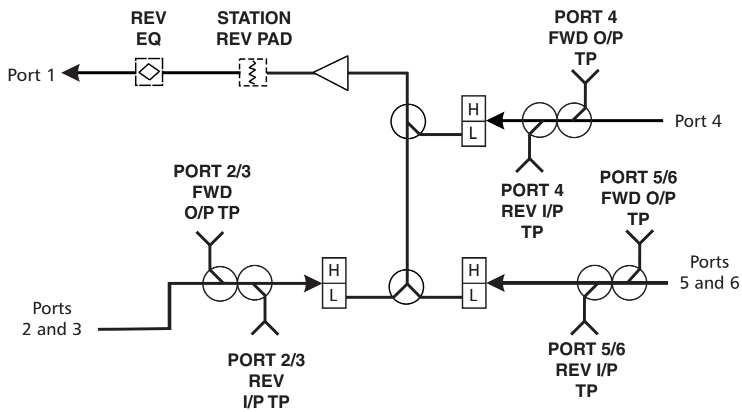
2. Set the Flex Max901e as follows:

   a. At the Balancing Amplifier, ensure that NPB-000/SEQ-0 accessories are installed in the **STATION REV PAD** and **STATION REV EQ** locations.

   b. If the system calls for one, install an NPB series PAD in the **STATION REV PAD** location in the Balancing Amplifier.

Figure 5.12

Simplified Return Path Block Diagram



Note *Do not terminate the unused port testpoint as it can affect testpoint accuracy.*

3. Equalize the RF signal:

   a. At the Balancing Amplifier:

      - For Trunk amplifiers, connect a signal generator to the **PORT 4 OUTPUT TP**.
      - For Bridgers amplifiers, a signal generator to the **P2/P3 OUTPUT TP**.

   b. Set the Signal Generator to output the system Return High and Low Balancing carriers (plus 20 or 25 dB to compensate for the RF module testpoint loss; see the module label for testpoint loss).

   c. At the Measuring Amplifier, connect a signal level meter to the return input testpoint of the associated port. Measure the Return High and Low Balancing Carrier Levels and record them as shown in the following calculation box.

____________	–	____________	=	____________
System Return High Balancing Carrier Level (Measuring Amp)		System Return Low Balancing Carrier Level (Measuring Amp)		System Tilt of Measuring Amp
____________	–	____________	=	____________
Measured Return High Balancing Carrier Level (Measuring Amplifier)		Measured Return Low Balancing Carrier Level (Measuring Amplifier)		Measured Tilt
____________	–	____________	=	____________
System Tilt		Measured Tilt		Equalization Value

d. Calculate the Equalization Value. Using the appropriate table in Appendix D, select an MEQ plug-in accessory that has a tilt as close to the Equalization Value as possible. For a full explanation of the selection process and accessories, see *Use Of Accessory Tables* on page D-1.

e. If necessary, at the Balancing Amplifier, remove the SEQ-0 from the **STATION REV EQ** plug-in location and install the selected MEQ.

4. Attenuate the RF outputs:

   a. At the Measuring Amplifier, measure the adjusted Return High Balancing Carrier Level and record it as shown in the box below. Calculate the PAD Value.

____________	–	____________	=	____________
Measured Return High Balancing Carrier Level		System Return High Balancing Carrier Level		PAD Value

   b. Select an NPB PAD that has a flat loss within ± 0.5 dB of the PAD Value.

   c. If necessary, at the Balancing Amplifier, remove the NPB-000 PAD or factory installed jumper from the **STATION REV PAD** plug-in location and install the selected PAD.

   d. At the Measuring Amplifier, measure both return balancing carrier levels and verify that they are within acceptable tolerance (typically ± 1.0 dB) of the specified system levels. If not, rebalance or troubleshoot the amplifier.

5. At the Balancing Amplifier, connect a signal level meter to the **PORT 1 REV O/P TP** and measure the signal levels of both return balancing carriers. Record these levels on the Amplifier Data Sheet.

6. Close the housing and replace the caps on all external testpoints. (Refer to *Housing Closing and Tightening* on page 4-19, if necessary.)

Troubleshooting

This chapter provides procedures that check all operational characteristics of a Flex Max901e that is suspected of being faulty.

Overview

These procedures check all operational characteristics of a Flex Max901e that is suspected of being faulty. Troubleshooting flow diagrams are provided beginning on page 6-7.

The following information is required for Forward and Return Field Testing:

- The operational gain of the amplifier (see C-COR Amplifier Specification Sheets)
- System Forward and Return High and Low Balancing Carrier levels for the amplifier being tested (see the System Map or Amplifier Data Sheet

Note *Most System Maps list the input and output signal levels at bandedge frequencies established for 68° F (20° C). If necessary, refer to Calculating Balancing Carrier Levels on page 5-6 and Temperature Compensation on page 5-6.*

If available, historical Amplifier Data Sheets will aid in troubleshooting a faulty amplifier.

Verify the following prior to beginning any test procedure:

- The amplifier is grounded.
- All tap outlets, active unused ports, ends of cables, and branch points are terminated with a 75 Ω impedance.
- A true RMS, AC-coupled voltmeter is available for AC voltage measurements. Non-true RMS AC voltmeters will give up to a 10% higher reading than actual. DC voltage measurements will not be affected.

Tools and Materials

The following tools may be used to complete the procedures in this chapter.

Table 6.1 Tools Required

Tools/Equipment	Required Specifications	Uses
Signal level meter (SLM)	5 MHz to 1002 MHz, –35 to 60 dBmV (25 to 120 dBμV)	Input and output signal testing during forward and return balancing
Signal generator	5 to 100 MHz, 10 to 60 dBmV (70 to 120 dBμV)	Signal input during return balancing
Multimeter	True RMS, AC-coupled; ranges: 0 to 200 VDC, 0 to 200 VAC, and 0 to 200 mVAC	Power supply testing
Flat blade screwdrivers	1/4 inch, 5/16 inch	May be required for small fasteners
Wire cutters	—	Trim coaxial cable center conductor
Nutdriver or wrench[1]	7/16 inch (11 mm)	Housing opening and closing
Phillips screwdriver[2]	#2	Centerseizure and module faceplate screws; power supply and transponder hold-down screws
Torque wrench/driver	Up to 66 in-lbs (7.5 N·m), with interchangeable 7/16 inch or 11 mm hex socket, Phillips, flat blade, and Torx® or Torx PLUS® bits	Strand mounting, housing closing, tightening various fasteners[3]
Torx® or Torx PLUS® driver[2]	T15 (Torx®) or 15 I.P. (Torx PLUS®)	May be required for small fasteners
Tuning wand	Non-conductive	Adjust ALC sensitivity and modulation depth

1. An 11 mm tool can normally be used for a 7/16-inch bolt unless the tool is manufactured to minimum, and the bolt head to maximum, “across the flat” dimensions.
2. Small, hold-down screws may be Phillips head screws or Torx PLUS® head screws. Use the appropriate driver.
3. C-COR recommends torquing all bolts and screws to the specified values.

Quick Forward Outage Check

This check is not a comprehensive check of all amplifier functions. The steps listed here can help you quickly determine whether or not an amplifier is causing a signal outage to subscribers downstream in the forward path, especially when no automated status monitoring is used.

➤ ***To perform a quick forward outage check***

1. Use a signal level meter to measure an active frequency/channel at the testpoint of an active forward output port (Port 3 or 4 recommended). Choose a frequency/channel that has historical (or designed) values to compare against.
2. If the output signal is at a reasonable level, check devices further down the signal path; if not, check the input signal level at the **PORT 1 FWD I/P TP**.
3. If the input signal is at a reasonable level, but the output signal is not, use the troubleshooting sections in this book to see if this amplifier is the source of the outage. If the input signal is not at a reasonable level, check amplifiers closer to the signal source or headend.

Reasonable levels are determined by the system design. Your system map and Amplifier Data Sheets can give you the designed and historical levels. When trying to fix an outage quickly, you may accept a much wider range of values than when balancing or sweeping a system. You can usually fix smaller problems after service is restored.

When you have many amplifiers to check, a good general method for finding the source of an outage is the 50/50 method. The 50/50 method consists of testing for RF signals and power problems at a device halfway through the cascade (or problem leg). Keep dividing the problem section in half until you isolate the malfunction. You can combine this method with other methods.

An Flex Max901e that outputs reasonable RF signal levels may not pass power to the next device (likely due to a blown fuse). The lack of power passing is then caught when the next active device in the signal path is checked, which leads you back to the problem amplifier.

Power Supply Troubleshooting

Refer to *Voltage Testing* on page 5-5 to troubleshoot the power supply.

Forward Field Testing

This procedure verifies that the amplifier:

- is balanced to the correct forward signal levels
- delivers the specified gain to forward RF signals

These procedures require the use of a signal level meter (SLM). A more comprehensive test involves sweeping the entire bandwidth with an appropriate sweep generator/receiver—especially when response problems are suspected.

➤ ***To field test the forward path***

1. Set the **ALC/MAN** switch to the **MAN** position.

__Note__ All measured signal levels must be temperature compensated to a common temperature before they can be accurately compared. Refer to Temperature Compensation on page 5-6 for information.

__Note__ Do not terminate the unused port testpoint as it can affect testpoint accuracy.

2. Connect an SLM to **PORT 1 FWD I/P TP** and measure the input signal levels of both forward balancing carriers. Verify that the input signal levels are within reasonable tolerance of the measurements made during the initial balancing procedure. If not, find the cause of the variation external to the amplifier. Correct if necessary, then rebalance the amplifier.

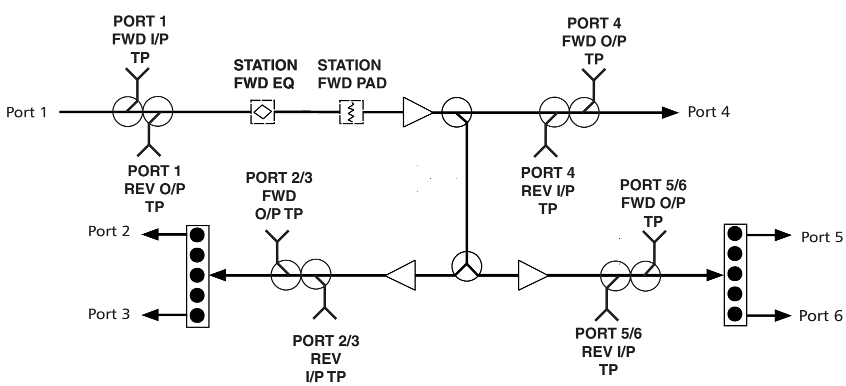


Figure 6.1

Simplified Forward Path Block Diagram

3. Measure the output signal levels of both forward balancing carriers at the output testpoints of all active ports. Compare these current levels to the measurements made when the amplifier was previously balanced. If these measurements are unacceptable, verify that the proper accessories are still installed in all forward plug-in locations and replace any accessories not in compliance with the Amplifier Data Sheet. If necessary, rebalance the amplifier.

__Note__ The Operational Gain listed on a C-COR Amplifier Specification Sheet is the gain at the high bandedge frequency and includes loss equal to the forward equalizer plug-in value.

4. Calculate the true amplifier gain by subtracting the input high balancing carrier signal level measured at Port 1 from the output signal levels measured in Step 3. The difference should equal the operational gain of the amplifier (at the balancing carrier) minus insertion losses from accessories installed in the forward path. Refer to *Use Of Accessory Tables* on page D-1 to determine insertion losses at the high carrier frequency. Replace the RF module if the amplifier gain measured at any port is outside of acceptable tolerance.

5. Reset the **ALC/MAN** switch to **ALC**.

6. Adjust the **ALC SENSITIVITY** control as described in *Factory-Shipped Configurations for Flex Max901e Trunk and Bridger Amplifiers* on page 5-9.

Return Field Testing

CAUTION *RF signal levels greater than +90 dBmV (1 return NTSC channel) injected into a forward output testpoint can damage amplifier active components. Derate maximum input level according to actual channel loading (for example, +82 dBmV @ 6 NTSC channel loading) (+82 dBmV = +142 dBµV).*

This procedure verifies that the amplifier:

- is balanced to the correct return signal levels
- delivers the specified gain to return RF signals

The following procedure requires the use of a signal generator and a signal level meter (SLM). A more comprehensive test that sweeps the entire bandwidth with an appropriate sweep generator/receiver may be required, especially if response problems at specific frequencies are suspected.

Note *All measured signal levels must be temperature compensated to a common temperature before they can be accurately compared. Refer to Temperature Compensation on page 5-6 for information.*

Note *Do not terminate the unused port testpoint as it can affect testpoint accuracy.*

➤ *To field test the return path*

1. Connect the signal generator to:
   - the internal/external **PORT 4 FWD O/P TP** for Trunk amplifiers
   - the internal/external **P2/P3 FWD O/P TP** for Bridger amplifiers

2. Set the signal generator to output the correct Return High Balancing Carrier level (plus 20dB to compensate for testpoint loss) at the proper frequency.

3. Connect an SLM to the **PORT 1 REV O/P TP** and measure the output signal level of the Return High Balancing Carrier. Compare the current level to the measurements made when the amplifier was previously balanced. If the current measurement is unacceptable, verify that the proper accessories are still installed in all return plug-in locations and replace any accessories not in compliance with the Amplifier Data Sheet. If necessary, rebalance the amplifier.

> ***Note*** *The Operational Gain listed on a C-COR Amplifier Specification Sheet is the gain at the high bandedge frequency and includes 1.0 dB of loss for the return equalizer.*

4. Calculate the true return amplifier gain by subtracting the input signal level (set in Step 2) from the output level measured at the **PORT 1 REV O/P TP**. The difference should equal the operational gain of the amplifier (at the balancing carrier) minus insertion losses from accessories installed in the return path. Refer to *When the Equalization Value is Known* on page D-1 to determine insertion losses at the high carrier frequency. Replace the RF module if the amplifier gain measured at any port is out of tolerance.

5. Repeat this procedure for all active return ports.

Figure 6.2

Simplified Return Path Block Diagram

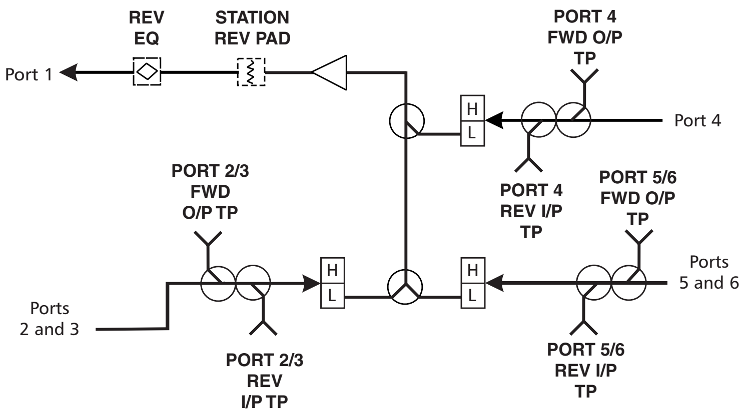


Figure 6.3

Troubleshooting Flow Diagram (1 of 2)

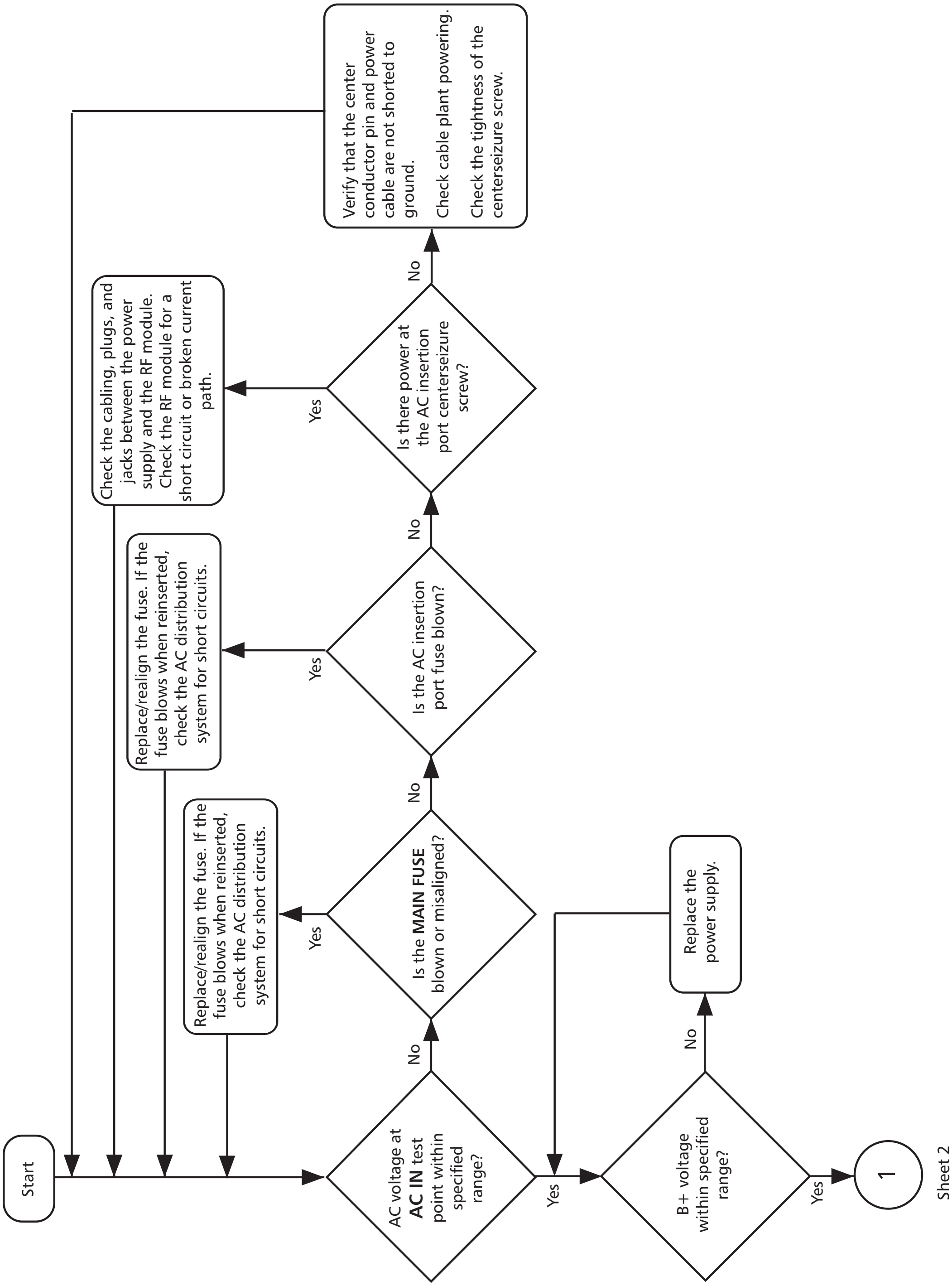
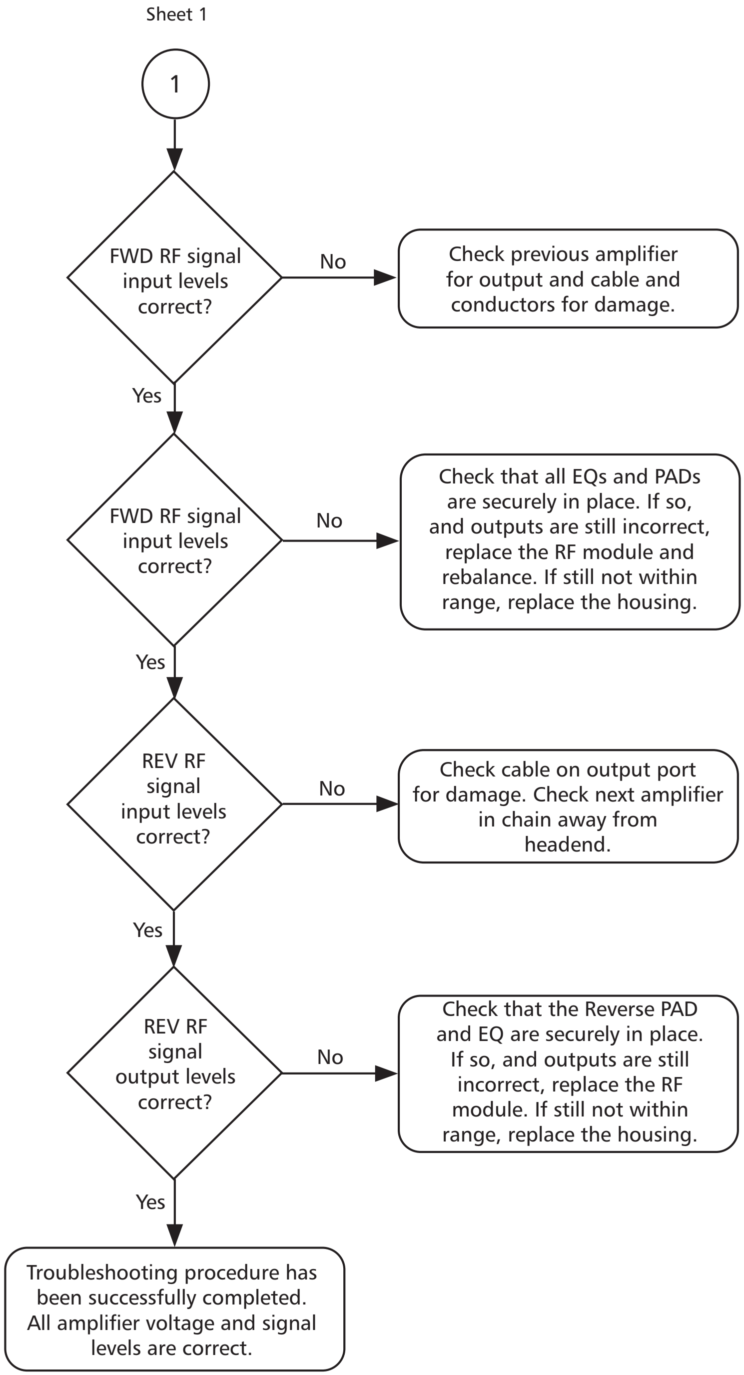


Figure 6.4

Troubleshooting Flow Diagram (2 of 2)



Maintenance

This chapter provides instructions on installing and/or replacing fuses, the RF module, transponder, and the housing. Refer to Chapter 3, *Upgrading Legacy FlexNet Amplifiers*, for information on upgrading an existing 750 MHz and 870 MHz FlexNet® trunk and bridger amplifiers to the Flex Max901e 1002 MHz amplifiers.

Tools and Materials

The following tools and materials may be used to complete the procedures in this chapter.

Table 7.1 Tools and Materials

Tools/Equipment	Required Specifications	Uses
Tools		
Signal level meter (SLM)	5 MHz to 1002 MHz, –35 to 60 dBmV (25 to 120 dBμV)	Input and output signal testing during forward and return balancing
Signal generator	5 to 100 MHz, 10 to 60 dBmV (70 to 120 dBμV)	Signal input during return balancing
Multimeter	True RMS, AC-coupled; ranges: 0 to 200 VDC, 0 to 200 VAC, and 0 to 200 mVAC	Power supply testing
Flat blade screwdrivers	1/4 inch, 5/16 inch	May be required for small fasteners
Needlenose pliers	—	Jumper removal
Wire cutters	—	Trim coaxial cable center conductor; jumper cutting
Nutdriver or wrench[1]	7/16 inch (11 mm)	Housing opening and closing
Phillips screwdriver	#1	Attaching grounding bracket to transponder
Phillips screwdriver[2]	#2	Centerseizure and module faceplate screws; power supply screws, and transponder grounding screw
Torque wrench/driver	Up to 66 in-lbs (7.5 N·m), with interchangeable 7/16 inch or 11 mm hex socket, Phillips, flat blade, and Torx® or Torx PLUS® bits	Strand mounting, housing closing, tightening various fasteners[3]
Torx® or Torx PLUS® driver[2]	T15 (Torx®) or 15 I.P. (Torx PLUS®)	May be required for small fasteners
Drill and drill bits	9/32 inch (7 mm)	Wall or pedestal mounting
Tuning wand	Non-conductive	Adjust ALC sensitivity/modulation depth
Fuse puller	Non-conductive (C-COR P/N FP-1)	Fuse removal and installation
Materials		
Heat gun or approved torch and heatshrink tubing, or weathersealing tape or compound	—	Weatherproofing RF cable connectors
1/4-20 UNC bolts and shims	—	Wall mounting
Dust caps	C-COR P/N MX0008	Cover unused ports
Anti-seize compound	—	RF cable attachment

1. An 11 mm tool can normally be used for a 7/16-inch bolt unless the tool is manufactured to minimum, and the bolt head to maximum, “across the flat” dimensions.
2. Small, hold-down screws may be Phillips head screws or Torx PLUS® head screws. Use the appropriate driver.
3. C-COR recommends torquing all bolts and screws to the specified values.

7

General Inspection

Inspect the entire unit for the following each time maintenance and adjustments are done:

- damaged or missing gaskets (rubber in the base and metal mesh in the lid)
- loose modules or assemblies
- missing, open (blown), loose, or misaligned fuses
- heat damage (burn marks, charred components)
- water damage

Fuse Shorting Bar (Slug) Replacement

WARNING *Hazardous voltages are present. Use approved safety equipment and procedures. Do not energize any station until all other stations in the power supply group have been installed.*

CAUTION *Improper fuse installation can:*

- *damage the amplifier*
- *fail to power the amplifier*
- *fail to distribute through power.*

CAUTION *Damaged fuse clips or misaligned fuses can cause heat damage. Do not force or misalign the fuse when installing.*

CAUTION *Ensure that your shorting bar is plated with the same material as the fuse clips. Differing materials may cause corrosion which may damage the fuse clips. C-COR slugs are plated with the same material as the fuse clips.*

➤ ***To remove the fuse***

1. Remove the fuse/slug using a fuse puller.
2. Inspect for the following:
   - fatigue cracks in both leaves of the fuse clips
   - broken connections between the fuse clips and the circuit board
   - heat damage on the circuit board or fuse clips
3. If damage is evident, replace the damaged power supply. (See *Power Supply Replacement* on page 7-9.)

➤ ***To install the fuse***

1. Use a fuse puller to center the fuse or slug across the fuse clip. Be sure that the metal tips of the fuse/slug do not extend beyond the fuse guides of the holder on either side.
2. Apply even, steady pressure to the fuse or slug until both ends snap into the holder simultaneously.

Return Switch Installation

> ***Note*** *A Value Max Transponder needs to be installed in a Flex Max901e to operate the return switches. The procedure to install a Value Max Transponder is provided in Element Management Transponder Installation/Replacement on page 7-10.*

This section provides the bench procedure to install return switches in a Flex Max901e trunk amplifier (P/N FMTExxx-xxxxxxxN) or a Flex Max901e bridger amplifier (P/N FMBExxx-xxxxxxxN) that was purchased without return switches. To minimize service interruption, C-COR recommends installing the return switch in a spare RF module and then replacing the RF module with the spare RF module that has the return switch installed.

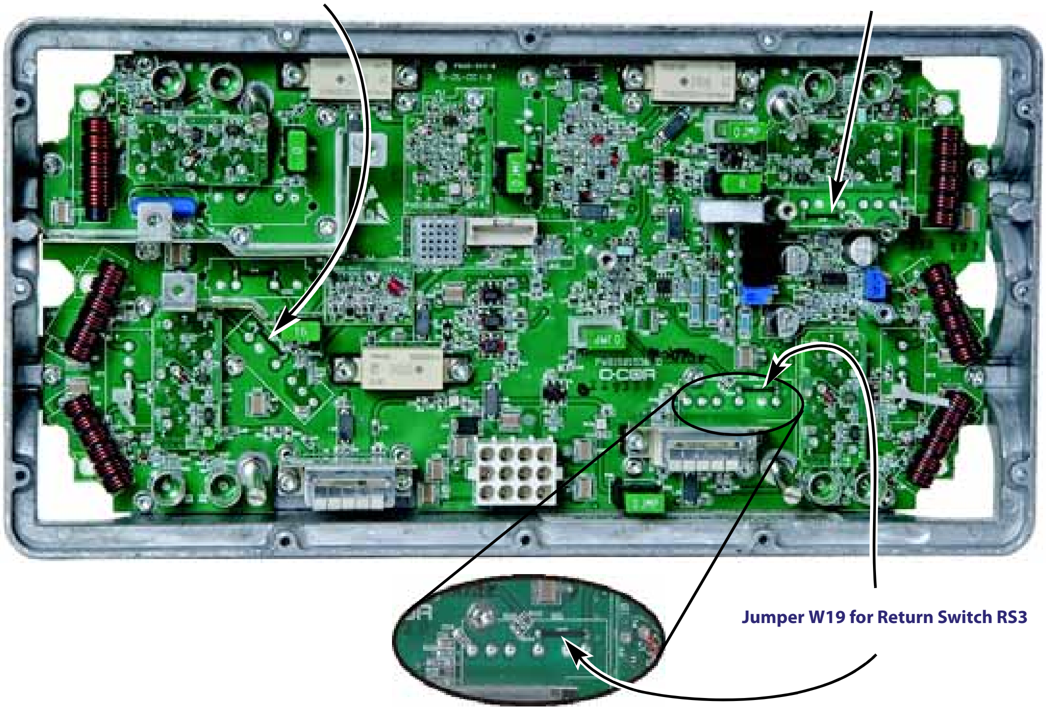
➤ ***To install return switches in a spare RF module at the bench***

1. Using a Torx T15 driver, remove the 17 Torx screws securing the RF module cover to the RF module.
2. Remove all plug-in accessories.
3. For the trunk amplifier, locate and remove jumpers **W17**, **W18**, and **W19**. For the bridger amplifier, locate and remove jumpers **W18** and **W19**. See Figure 7.1 for the location of these jumpers. Remove each jumper by performing the following substeps.
    a. Use wire cutters to cut one end of the jumper.
    b. Use needlenose pliers to grasp the jumper at the cut end.
    c. While firmly grasping the jumper, use wire cutters to cut the other soldered end of the jumper.
    d. Remove the jumper with the needlenose pliers.
4. For the trunk amplifier, locate where the return switches **RS1**, **RS2**, and **RS3** will be installed. For the bridger amplifier, locate where the return switches **RS2** and **RS3** will be installed. See Figure 7.1 for the location of the return switches.
5. Install each return switch by aligning the six pins of the return switch (P/N BOM1500141-001) with the six socket holes in the RF module and firmly pushing the return switch into the socket. The installed return switches for a bridger amplifier are shown in Figure 7.2 on page 7-5.
6. Lower the RF module cover over the RF module and align the holes in the cover with the mounting holes in the RF module.
7. Partially install the 17 Torx screws. Tighten these screws, finally torquing the Torx screws to between 10 and 12 in-lbs (1.1 and 1.4 N·m).

7

Figure 7.1

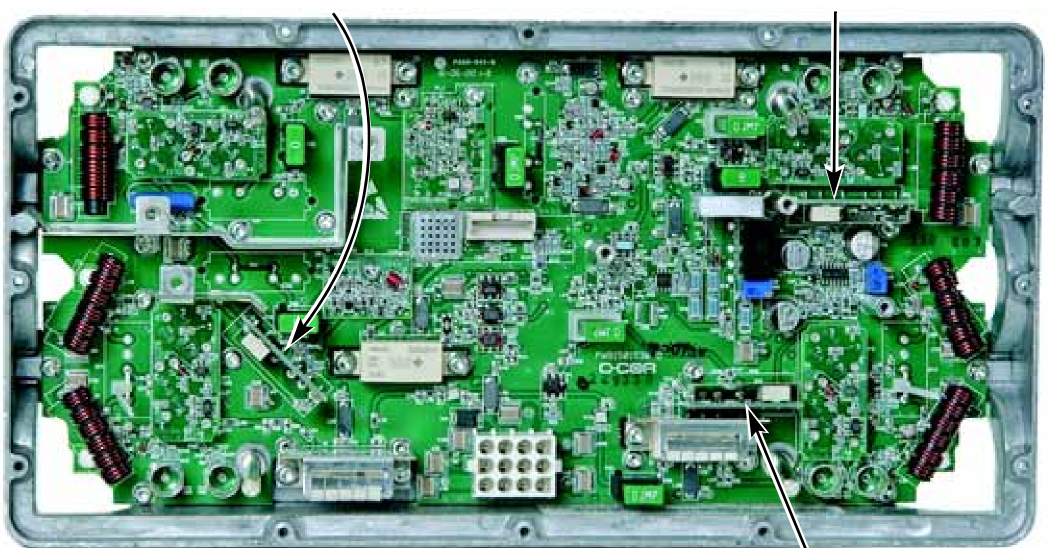
Location of the Jumper and Return Switch in the Flex Max901e Trunk and Bridger Amplifiers



7

Figure 7.2

Return Switches Installed in the Flex Max901e Trunk and Bridger (shown) Amplifier



➤ ***To replace the RF module with the spare RF module with return switches installed***

WARNING *Hazardous voltages are present. Use approved safety equipment and procedures.*

CAUTION *Arcing between the RF module and centerseizure assemblies will damage the unit. Disconnect power supply plug before removing the RF module from the housing.*

Note *If replacing an RF module with one having a different testpoint loss, modify the testpoint loss labeling on the housing accordingly. If the testpoint loss is labeled on the replacement module faceplate, modify or remove the housing label.*

Tip *If aluminum oxide (white powder) is present on the centerseizure assemblies, remove it before proceeding.*

1. Open the Flex Max901e housing. Refer to *Housing Opening* on page 4-5 if necessary.
2. Disconnect the power supply plug from the RF module **POWER PLUG** connector.
3. Use a flat-blade screwdriver to loosen and release the four captive **MODULE HOLD DOWN** screws.

Note *Observe the orientation of the RF module before removing it.*

4. Firmly grasp the RF module handles and pull the RF module straight out of the housing.
5. Remove the plug-in accessories from the removed module and install them into the replacement RF module.
6. Orient the replacement RF module with the return switches into the housing as observed in Step 4. Align the RF module back pins with the receptacles located on the centerseizure assemblies. If using
7. Firmly press the replacement RF module into the housing until the back of the RF module contacts the inside of the housing.
8. Using a flat-blade screwdriver, start threading the captive **MODULE HOLD DOWN** screws into the housing. Tighten the screws alternately to prevent stressing the module or housing. Torque to between 25 and 27 in-lbs (2.8 and 3.1 N·m).
9. Connect the power supply plug to the RF module **POWER PLUG** connector.
10. Perform the Forward and Return Field Test described in the Flex Max901e 1 GHz Amplifiers Equipment Manual, 1500335.
11. Close the Flex Max901e housing. Refer to *Housing Closing and Tightening* on page 4-19 if necessary.

RF Module Replacement

The RF module can be installed in the housing in one of two orientations (refer to Figure 7.3). When installing fuses, surge terminators, or brass shorting bars to route AC power, note that the power supply fuses are associated with the RF module ports and not the housing ports.

WARNING *Hazardous voltages are present. Use approved safety equipment and procedures.*

CAUTION *Arcing between the RF module and centerseizure assemblies will damage the unit. Disconnect power supply plug before removing the RF module from the housing.*

Note *If replacing an RF module with one having a different testpoint loss, modify the testpoint loss labeling on the housing accordingly. If the testpoint loss is labeled on the replacement module faceplate, modify or remove the housing label.*

Tip *If aluminum oxide (white powder) is present on the centerseizure assemblies, remove it before proceeding.*

➤ ***To remove the RF module***

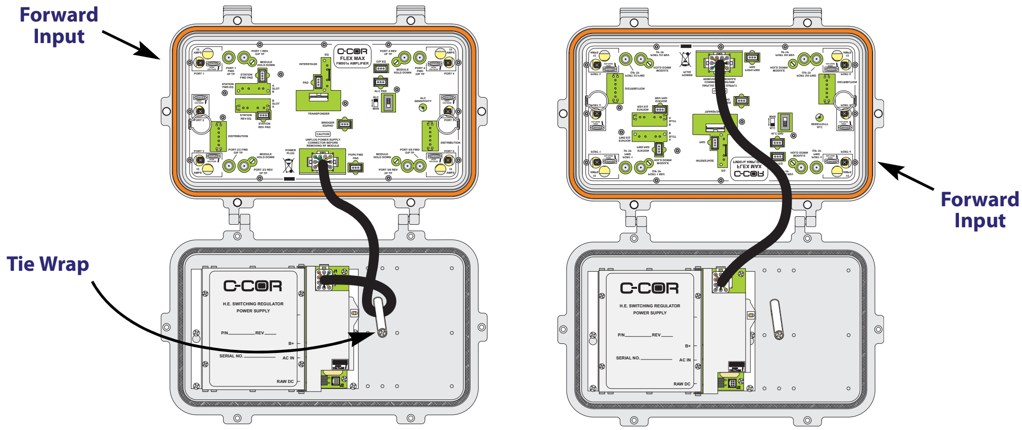
1. Disconnect the power supply plug from the RF module **POWER PLUG** connector (See Figure 2.1 on page 2-2).
2. Use a flat blade screwdriver to loosen and release the four captive module hold-down screws (See Figure 2.1 on page 2-2).
3. Firmly grasp the RF module handles and pull the RF module straight out of the housing.

➤ ***To install the RF module***

1. Verify that the back of the module is clean and dry.
2. Orient the replacement RF module in the housing as required (see Figure 7.3 on page 7-8). Align the RF module back pins with the receptacles located on the centerseizure assemblies. If using the Rotated Configuration, cut and remove the tie wrap around the power supply connector lead so the plug on the connector lead will reach the module socket.

Figure 7.3

RF Module Orientation Options



Standard Configuration

Rotated Configuration (rotate RF module 180° if street side access is required)

Note: The standard and rotated configurations use a 14” cable (P/N 174355-02)

3. Firmly press the replacement RF module into the housing until the back of the RF module bottoms against the inside of the housing.

4. Use a flat blade screwdriver to start the captive module hold-down screws into the threaded receptacles in the housing. Tighten the screws alternately to prevent stressing the module or housing. Torque to between 25 and 27 in-lbs (2.8 and 3.1 N·m).

5. Remove the plug-in accessories from the original module and install them into the replacement RF module.

6. Connect the power supply plug to the RF module **POWER PLUG** connector.

7. Perform the Forward and Return Field Tests. Refer to *Forward Field Testing* on page 6-4 and *Return Field Testing* on page 6-5.

Power Supply Replacement

WARNING *Hazardous voltages are present. Use approved safety equipment and procedures.*

➤ ***To remove the power supply***

1. Disconnect the power supply plug from the RF module **POWER PLUG** connector.
2. Use a #2 Phillips screwdriver to loosen, but not remove, the four power supply hold-down screws.
3. Slide the power supply toward the RF module. Then lift it straight out of the housing.

➤ ***To install the power supply***

1. Orient the replacement power supply with the four screw holes aligned over the corresponding hold-down screws in the housing lid. Refer to Figure 2.1 on page 2-2. Lower it onto the screws and slide it away from the RF module.
2. Use a #2 Phillips screwdriver to tighten the power supply hold-down screws. Torque to between 17 and 20 in-lbs (2.0 and 2.3 N·m).
3. Configure the power supply according to *Power Supply Configuration* on page 5-3.
4. Connect the power supply plug to the RF module **POWER PLUG** connector.

Element Management Transponder Installation/Replacement

__Note__ Using element management software, the transponder monitors and controls Flex Max901e functions. The element management software will automatically recognize the transponder. Requires Windows 2000 or higher.

The Flex Max901e can be monitored and controlled through the Value Max transponder. The transponder collects all Management Information Base (MIB) and electronic Module Architecture Profile (eMAP) data and transmits it to the headend. A laptop can be connected to a transponder on an individual module in order to monitor and control the module's parameters.

Figure 7.4

Transponder Identification

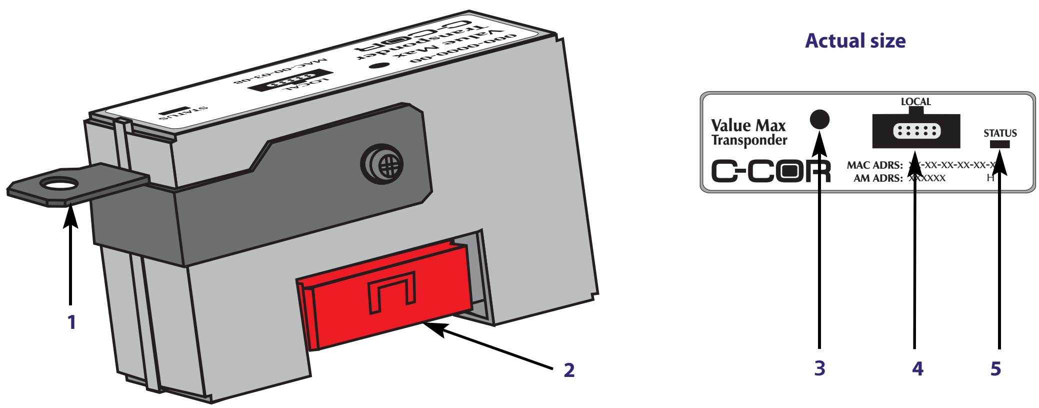


Table 7.2 Transponder Identification

Item	Label	Function
1	Grounding Bracket	Connects transponder to ground
2	Interface Connector	Provides connection to RF board and element management system
3	Tamper Photo Detector	Detects open lid
4	**LOCAL**	Provides local port for bench interface procedures
5	**STATUS**	LED indicates transponder status

Installing the Transponder

Note Using element management software, the transponder monitors and controls Flex Max901e functions. The element management software will automatically recognize the transponder. Requires Windows 2000 or higher.

Note Ensure that the Flex Max901e is balanced according to system design before installing the transponder.

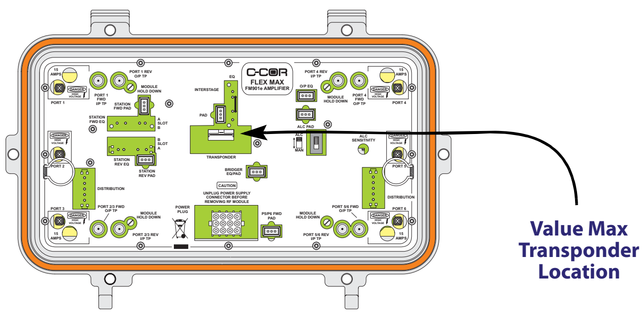
Note A Value Max transponder Mounting Kit (P/N 1501024) is available that contains the transponder grounding bracket (P/N 150061-4), two bracket screws (P/N 30039-0102), and the module cover screw (P/N HS0160).

➤ *To install the Value Max transponder*

1. Use a #1 Phillips screwdriver to secure the grounding bracket to the transponder with two screws (P/N 30039-0102).
2. Use a Torx 15 driver to remove the module cover screw to the right of the transponder opening in the module cover.
3. Insert the transponder into the transponder socket. Refer to Fig. 7.5 for the location of the transponder.

Figure 7.5

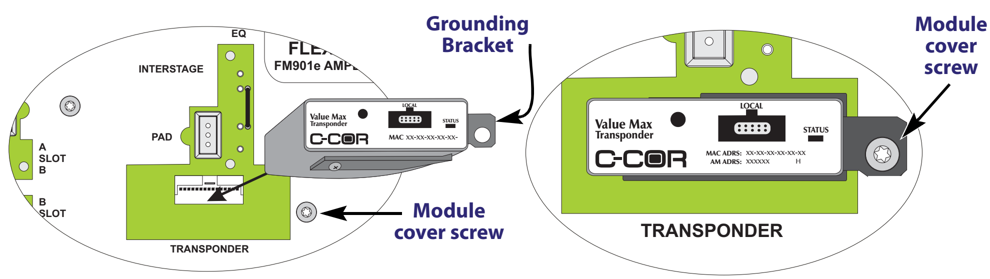
Value Max Transponder



4. Secure the grounding bracket to the module cover with the module cover screw. Torque to between 15 and 18 in-lbs (1.7 and 2.0 N·m). Refer to Fig. 7.6.

Figure 7.6

Value Max Transponder Installation



Insert transponder with grounding bracket into transponder socket

Secure grounding bracket with module cover screw

5. The element management software will automatically recognize the transponder. Refer to Table 7.3 on page 7-12 for a description of operating state of the transponder based on the **STATUS** LED.

Table 7.3 Value Max Transponder LED Status

LED Sequence	Indication
Steady on for 3 to 10 seconds	During boot-up immediately following installation.
Single blink every 5 seconds	On, but in search mode (RF input is low or receiver is not tuned to forward data carrier).
Double blink every 5 seconds	Registration to forward data carrier frequency may be about to occur or may be in process.
Burst blink of transmitted data	Transponder is sending data to the headend controller. Blinks every second or so; often in multiple transponder systems.
Blinks on 0.5 second then off 0.5 second	Transmitter constantly on.
Off, stays off	Fault/failure

Setting Transponder Levels

The Flex Max901e does not have transponder input and output PADs similar to the OM4100. The Value Max transponder input range is –20 to 20 dBmV, with a nominal input of 0 dBmV. The factory-shipped maximum output level is 40 dBmV. An AM protocol transponder output level can be set to 40, 34, 28, 22 dBmV, or auto from the headend using Omni2000. The auto setting adjusts the return transmitter level automatically to be close to 0 dBmV at the MCU/modem card input. An HMS protocol transponder output level can be adjusted from 40 to 10 dBmV in 0.1 dBmV steps from the headend using HMS-based software. If the Flex Max901e forward path has been balanced correctly, and if the transponder's forward data carrier level has been set 10 dB below the analog level, then the input into the transponder should be correct. If the Flex Max901e return path has been balanced correctly, the factory-shipped transponder output level of 40 dBmV should be sufficient to achieve a level of –10 to 10 dBmV at the headend. Therefore, if the node is balanced properly, the Value Max transponder is truly Plug & Play. You should not ever need to adjust the output level of the transponder.

When setting up a Value Max transponder for the first time, measure the signal level received from the transponder at the RF modem location with a signal level meter. If the received signal is not within the appropriate range for your RF modem receiver, monitor the unit through your element management system and adjust the signal level from the headend to achieve correct levels.

Table 7.4 Value Max Transponder Monitored Parameters

Parameters	Activity	Operational Range
Temperature	Monitor	–40 to 85° C, case
Received Forward Data Carrier Power	Monitor	+20 dBmV; 0 dBmV; –20 dBmV
+24 VDC	Monitor	+23.5 VDC to +24.5 VDC
Three Return Switches (T); Two Return Switches (B)	Monitor/Control	Low atten. (0 dB); 6 dB; High atten. (30 dB)

Removing the Transponder

The Value Max transponder is secured by a bracket to the module cover.

➤ ***To remove the transponder***

1. Use a Torx 15 driver to remove the module cover screw securing the bracket of the transponder from the right of the transponder opening in the module cover. Refer to Figure 7.5 on page 7-11 for the location of the transponder.
2. Pull the transponder out of the base.

Housing Replacement

WARNING *Hazardous voltages are present. Use approved safety equipment and procedures. Sheath currents may flow through the amplifier housing. Establish a second current path around the housing before disconnecting any cables. Automotive jumper cables are recommended.*

CAUTION *Amplifier electronic components can be damaged by the environment. Close the housing whenever it is left unattended to keep moisture out of the amplifier and to protect the network from RF interference.*

➤ ***To replace the housing***

1. Disconnect all power to the unit, then remove the RF module and power supply as described in *RF Module Replacement* on page 7-7, *Power Supply Replacement* on page 7-9, and *Housing Replacement* on page 7-13.

CAUTION *Centerseizure screws may not be captive. Modules manufactured after June 1999 have either captive boots over these screws or captive screws that cannot be backed out completely. Do not back out non-captive screws more than two full turns, because they can fall out into the housing and under the RF module where they can cause short circuits requiring removal of the RF module and service interruption.*

2. Beginning at Port 1, use a #2 Phillips screwdriver to loosen the centerseizure screw no more than two full turns.
3. Loosen the connector back nut and main nut on the external cable connector.
4. Pull the cable with connector main nut straight out of the connector body.
5. Loosen and remove the connector body from the housing cable entry port.
6. Disconnect the remaining ports by repeating Steps 2 through 5.
7. When all cabling is disconnected, close the housing and finger tighten the bolts.
8. Loosen the bolts that secure the housing to the strand, or remove bolts for housings mounted to EMBs, a pedestal, or a wall.
9. Install the replacement housing in accordance with installation procedures given in *Housing Replacement* on page 7-13.
10. Install the RF module and power supply as described in *RF Module Replacement* on page 7-7, *Power Supply Replacement* on page 7-9, and *Housing Replacement* on page 7-13.

7

Comparison—Flex Max901e and 700/800/900/901 Series

C-COR Flex Max901e trunk and bridger amplifiers are the new industry standard for RF distribution products. The FM901e continues to offer the same excellent feature sets, reliability, and performance that customers have come to rely on with C-COR's legacy 700/800/900/901 series trunk and bridger amplifiers.

The objective of the enhancements to the current FM901 series was to assist and promote the migration of current customers—those still buying the legacy FlexNet700/800/900 amplifiers—to the new FM901e 1 GHz series amplifiers. The FM901e can be deployed at either 870 MHz or 1 GHz. To that extent, C-COR now provides several design enhancements to the original FM901 series amplifier.

This enhanced product family will deliver these features:

- Bandwidth extended to 1 GHz.
- Factory aligned to 1 GHz specifications, but can be deployed into 750/870 MHz applications with field accessible plug-ins.
- Trunk amplifiers can be ordered preconfigured for 870 MHz operation for spares or extensions.
- Ability to:
  - drop trunk modules into existing 700/800/900 series locations as a spare without the need to rebalance amplifiers downstream.
  - accept all legacy 750 and 870 MHz forward EQ plug-in accessories—new plug-in guides ease installation.
- Choice of –20 or –25 dB internal and external testpoints.
- Expanded ALC pilot selection to match existing system designs.
- Plug-in diplex filters that provide for higher future return bandwidth requirements and international applications.
- Element management monitoring capability.

A

Table A.1 General Features Comparison

Feature	700/800/900 Series Amplifiers	FM901 Amplifiers	FM901e Enhanced Amplifiers
1 GHz bandwidth	—	✔	✔
750/870 MHz bandwidth	✔	✔[1]	✔[1]
Traditional architectures	✔	✔	✔
Traditional OR Fiber Deep Architectures	—	✔	✔
Competitive market pricing	✔	✔[2]	✔[2]
Trunk and bridger modules available	✔	✔	✔
–20 dB Testpoints	✔	✔	✔
–25 dB Testpoints	✔	—	✔
External Return Testpoints	✔	—	—
Internal Return Testpoints only	—	✔	✔
Large installed base	✔	—[3]	—[3]
International band splits	✔	—	✔
Fixed band splits	✔	—	—
Upgradable diplexors enable future bandwidth harvesting	—	✔	✔
Third party EMS capabilities	✔[4]	✔	✔
C-COR's Value Max Transponder with return port switching	—	✔	✔
1 GHz Trunk amplifier preconfigured for 862 MHz tilt	—	—	✔
750/862 MHz equalizers and cable simulators	✔	—[5]	✔[6]
1 GHz equalizers and cable simulators	—	✔	✔
ALC/Pilot Frequency	—[7]	✔[8]	✔[8]
SPB PADs	✔	—	—
NPB PADs	—	✔	✔

1. Factory aligned to 1 GHz, but can be deployed into 750/870 applications with field accessible plug-ins.
2. Consistent with 700/800/900 trunk and bridger pricing.
3. Can drop into or replace current installed base.
4. No return port switching.
5. Will accept 750/870 MHz equalizers and cable simulators without covers.
6. Equalizer and cable simulator guides ease installation.
7. NTSC channel only.
8. NTSC or QAM channel.

Table A.2 FlexNet 900/Flex Max901/Flex Max901e Trunk Comparison Specifications Summary

Specification	FlexNet 900 FNT94CL-xx6x1A1	FlexNet 900 FNT95DJ-xx6x1A1	Flex Max901 FMT1G8J-xx6x1A1	Flex Max901e FMTEG8J-xx6x1A1
Bandwidth	FWD: 54–750 MHz REV: 5–40 MHz	FWD: 54–870 MHz REV: 5–42 MHz	FWD: 54–1002 MHz REV: 5–42 MHz	FWD: 54–1002 MHz REV: 5–42 MHz
Operational Gain (dB)	FWD: 28 (T) & 37 (B) REV: 18	FWD: 30 (T) & 39 (B) REV: 18	FWD: 33 (T) & 43 (B) REV: 18	FWD: 33 (T) & 43 (B) REV: 18
Operational O/P Levels (dBmV)	FWD: 38.5/26 (T) & 47.5/35 (B) REV: 35/35	FWD: 40.5/26 (T) & 49.5/35 (B) REV: 35/35	FWD: 43/33 (T) & 53/35(B) REV: 35/35	FWD: 42/32 (T) & 52/35(B) REV: 35/35
Factory Cable, dB	17 (T) & 17 (B) @ 750 MHz	18 (T) & 18 (B) @ 870 MHz	13 (T) & 23 (B) @ 1002 MHz	13 @ 1002 MHz
CTB,–dBc (79 CH w/ SDL)	82 (T) & 70 (B)	81 (T) & 69 (B)	82 (T) & 75 (B)	84(T) & 75 (B)
CSO,–dBc (79 CH w/ SDL)	73 (T) & 66 (B)	79 (T) & 73 (B)	76 (T) & 73 (B)	79 (T) & 73 (B)
XMD, –dB (79 CH w/ SDL)	79 (T) & 67 (B)	76 (T) & 66 (B)	73 (T) & 67 (B)	76 (T) & 67 (B)
CIN, –dBc (79 CH w/ SDL)	85 (T) & 68 (B)	82 (T) & 65 (B)	80 (T) & 65 (B)	1002 MHz: 80 (T) & 66 (B) 870 MHz: 86 (T) & 72 (B)
CNR, 4 MHz, dB	60.5/60 (T) & 60.5/60 (B)	60/59 (T) & 60/59 (B)	60/58 (T) & 60/58 (B)	59/57.2 (T) & 59/57.2 (B)
Flatness @ GS, dB	1.0 P–V (T) & 1.5 P–V (B)	±0.5 (T) & ±0.75 (B)	± 0.75 (T) & ± 1.0 (B)	± 0.75 (T) & ± 1.0 (B)
FWD Testpoints, dB	I/P: –20 ± 0.75 O/P: –20 ± 0.5	I/P: –20 ± 0.75 O/P: –20 ± 0.5	I/P: –20 ± 1.0 O/P:–20 ± 0.5 (54-550) & –20 ± 1.0 (551-1002)	I/P: –20 or –25 ± 1.0 O/P:–20 or –25 ± 0.5 (54-550) & –20 or –25 ± 1.0 (551-1002)
REV Testpoints, dB	I/P & O/P: –20 ± 0.5	I/P & O/P: –20 ± 0.5	I/P & O/P: –20 ± 0.5	I/P & O/P: –20 & –25 ± 0.5
AC Power, W (Max)	54 @ 90V	53.5 @ 90V	53.5 @ 90V	53.5 @ 90V

Table A.3 FlexNet 900/Flex Max901/Flex Max901e Bridger Comparison Specifications Summary

Specification	FlexNet 900 FNB96CL-xx6x1A1	FlexNet 900 FNB9ADJ-xx6x1A1	Flex Max901 FMB1GPJ-xx6x1A1	Flex Max901e FMBEGPJ-xx6x1A1
Bandwidth	FWD: 54–75 MHz REV: 5–40 MHz	FWD: 54–870 MHz REV: 5–42 MHz	FWD: 54–1002 MHz REV: 5–42 MHz	FWD: 54–1002 MHz REV: 5–42 MHz
Operational Gain (dB)	FWD: 37 REV: 18	FWD: 40 REV: 18	FWD: 43 REV: 18	FWD: 43 REV: 18
Operational O/P Levels (dBmV)	FWD: 47.5/35 REV: 35/35	FWD: 49.5/35 REV: 35/35	FWD: 53/35 REV: 35/35	FWD: 52/35 REV: 35/35
Factory Cable, dB	17 @ 750 MHz	18 @ 870 MHz	23 @ 1002 MHz	23 @ 1002 MHz
CTB,–dBc (79 CH w/ SDL)	70	70	75	75
CSO, –dBc (79 CH w/ SDL)	66	70	73	73
XMD, –dB (79 CH w/ SDL)	67	69	67	67
CIN, –dBc (79 CH w/ SDL)	68	65	72	1002 MHz: 73 870 MHz: 79
CNR, 4 MHz, dB	60/58	58.5/58	58/57	59/59.1
Flatness @ Gain Slope, dB	1.5 P–V	±0.75	± 1.0	± 1.0
FWD Testpoints, dB	I/P: –20 ± 0.75 O/P: –20 ± 0.5	I/P: –20 ± 0.75 O/P: –20 ± 0.5	I/P: –20±1.0 O/P: –20 ± 0.5 (54–550) & –20 ± 1.0 (551–1002)	I/P: –20 or –25 ± 1.0 O/P:–20 or –25 ± 0.5 (54-550) & –20 or –25 ± 1.0 (551-1002)
REV Testpoints, dB	I/P & O/P: –20 ± 0.5	I/P & O/P: –20 ± 0.5	I/P & O/P: –20 ± 0.5	I/P & O/P: –20 & –25 ± 0.5
AC Power, W (Max)	48.5 @ 90V	48.0 @ 90V	45.5 @ 90V	45.5 @ 90V

Table A.4 FlexNet/Flex Max Trunk Model Options Comparison

Options	700 Series	800 Series	900 Series	FM901 Series	FM901e Enhanced
Spacing (dB)	Trunk: 28 (750 MHz) Trunk: 29.5 (750 MHz) Trunk: 31 (550 MHz) Bridger: 37 (750 MHz) Bridger: 37 (550 MHz)	Trunk: 28 (750 MHz) Trunk: 30 (862 MHz) Bridger: 37 (750 MHz) Bridger: 38 (862 MHz)	Trunk: 28 (750 MHz) Trunk: 30 (862 MHz) Trunk: 31 (750 MHz) Bridger: 37 (750 MHz) Bridger: 39 (862 MHz)	Trunk: 33 (1002 MHz) Bridger: 43 (1002 MHz)	Trunk: 33 (1002 MHz) Trunk: 30 (862 MHz) Bridger: 43 (1002 MHz) Bridger: 40 (862 MHz)
Bandwidth (MHz)	750 550	750 862	750 862	1002	1002[1]
Factory Equalization (dB @ HF)	11 (750 MHz) 11 (550 MHz)	11 (750 MHz) 12 (862 MHz)	11 (750 MHz) 17 (750 MHz) 18 (862 MHz)	Trunk: 13 (1002 MHz) Bridger: 23 (1002 MHz)	13 (1002 MHz)
Frequency Split (MHz)	42/54 40/54 55/70	42/54 40/54	42/54 65/85 55/70	42/54[2]	42/54[2] 65/85[2] 55/70[2]
Transfer Linearization	No	No	Yes	No[3]	No[3]
ALC Operation (NTSC/QAM)	NTSC only[4]	NTSC only[4]	NTSC only[4]	NTSC & QAM[5]	NTSC & QAM[5]
Frequency Control (MHz)	Manual 439.25 499.25 451.25	Manual 439.25 499.25	423.25 471.25 427.25 495.25 439.25 499.25 451.25	439.25 499.25	423.25 471.25 427.25 495.25 439.25 499.25 451.25 609.00 711.00
Return (dB)	Passive 14.5 (T) & 11 (B) 18.5	Passive 18	18	18	14.5 (T) & 11 (B) 18
Output Configuration	2 O/P (Fixed) 4 O/P (User Config)	4 O/P (User Config)	2 O/P (Fixed) 4 O/P (User Config)	4 O/P (User Config)	4 O/P (User Config)
Powering	None[6] 90V HE P/S (1.8 A) 90V HE P/S (2.3 A)	None 90 Volt HE P/S	None 90 Volt HE P/S	None 90 Volt HE P/S	None 90 Volt HE P/S
Power Passing	13 A (all Ports)	15 A (P1, P3, P4 & P6) 13 A (P2 & P5)	15 A (P1, P3, P4 & P6) 13 A (P2 & P5)	15 A (P1, P3, P4 & P6) 13 A (P2 & P5)	15 A (P1, P3, P4 & P6) 13 A (P2 & P5)
Housing	None 6-Port (STD) 6-PT 90º Access	None 6-Port (STD) 6-PT 90º Access	None 4-Port (ITP) 4-Port (ETP) 6-Port (ITP) 6-Port (ETP) 4-Port 90º (ITP) 4-Port 90º (ETP)	None 6-Port (ITP) 6-Port (ETP) 6-Port 90º (ITP) 6-Port 90º (ETP) 6-Port Bypass (ETP)	None 6-Port (ITP) 6-Port (ETP) 6-Port 90º (ITP) 6-Port 90º (ETP) 6-Port BP (ETP)
Housing Finish	Standard Corrosion Protection	Standard Corrosion Protection	Standard Corrosion Protection	Standard Corrosion Protection	Standard Corrosion Protection
Testpoint Access	External Only[7]	External Only[7]	Internal[8] External[8]	Internal[8] External[8]	Internal[8] External[8]
Testpoint Value (dB)	−25	−20 −25	−20 −25	−20	−20 −25
Number of Forward Testpoints	6 (Ports)[9] 1 (Balance)[9]	6 (Ports)[9] 1 (Balance)[9]	3 (P1, P2/P3, P5/P6)[10]	3 (P1, P2/P3, P5/P6)[11]	3 (P1, P2/P3, P5/P6)[11]
Number of Return Testpoints	6 (Ports)	6 (Ports) 1 (Balance)	3 (P1, P2/P3, P5/P6)	3 (P1, P2/P3, P5/P6)	3 (P1, P2/P3, P5/P6)

1. For 862 MHz operation, a cable EQ is required after the Port 4 output hybrid to provide the proper output tilt.
2. The frequency dependent assemblies are bench replaceable to upgrade frequency split of amplifier at a later date if required.
3. GaAs hybrids provide TL performance at TL operating levels.
4. ALC may operate on a QAM channel. This depends on the level of the QAM signals. *Not recommended.*
5. The ALC PAD can be adjusted to compensate for the lower QAM signal.
6. The 700 series used a 9-pin power supply cable, but a conversion kit is available to convert to the 12-pin FM901e module.
7. The balance testpoint is internal only.
8. Only Forward testpoints can be either internal or external. Return testpoints are always internal.
9. Bi-directional port testpoints. Balance testpoint is directional coupler type.
10. Separate Forward and Return directional coupler testpoints.
11. Combined directional coupler Forward and Return testpoints.

Table A.5 FlexNet/Flex Max Trunk Plug-in Accessories Comparison

Options	700 Series	800 Series	900 Series	FM901 Series	FM901e Enhanced
Cable Equalizers (FWD/REV)	SEQ-750-XX MEQ-550-XX MEQ-42-XX	SEQ-862-XX SEQ-750-XX MEQ-42-XX	SEQ-862-xx SEQ-750-xx MEQ-33-xx MEQT-33-xx MEQ-42-xx MEQT-42-xx MEQ-55-xx MEQT-55-xx MEQ-65-xx MEQT-65-xx	SEQ-1G-xx SEQ-862-xx (without cover only) SEQ-750-xx (without cover only) MEQ-42-xx MEQT-42-xx	SEG-1G-xx SEQ-862-xx (with & without cover) SEQ-750-xx (with & without cover) MEQ-42-xx MEQT-42-xx MEQ-55-xx MEQT-55-xx MEQ-65-xx MEQT-65-xx
Cable Simulators	SCS-750-xx	SCS-862-xx SCS-750-xx	SCS-862-xx SCS-750-xx	SCS-1G-xx	SCS-1G-xx SCS-862-xx
PADs (At all locations)	SPB-XXX	SPB-XXX	SPB-XXX	NPB-XXX	NPB-XXX
Bridger EQ/PAD	Yes/Yes	Yes/Yes	Yes/Yes	No/Yes	Yes
P5/P6 Bridger PAD	Yes (AUX EQ)	Yes (AUX EQ)	Yes (AUX EQ)[1]	Yes	Yes
REV Port PADs	Yes	Yes	Yes	No	No
Distribution Accessories	SS-1000-2 SDC-1000-8 SDC-1000-12	SS-1000-2 SDC-1000-8 SDC-1000-12	SS-1000-2 SDC-1000-8 SDC-1000-12	SS-1000-2 SDC-1000-8 SDC-1000-12	SS-1000-2 SDC-1000-8 SDC-1000-12

1. TL version: AUX EQ was changed to SPB location.

Table A.6 FlexNet/Flex Max Bridger Model Options Comparison

Option	700 Series	800 Series	900 Series	901 Series	901e Series
Spacing (dB)	38 (550 MHz) 37 (750 MHz)	37 (750 MHz) 38 (862 MHz)	37 (750 MHz) 38 (862 MHz) 40 (862 MHz)	43	43
Bandwidth (MHz)	550 750	750 862	750 862	1002	1002[1]
Factory Equalization (dB @ HF)	11 (750 MHz) 11 (550 MHz)	11 (750 MHz) 12 (862 MHz)	11 (750 MHz) 17 (750 MHz) 18 (862 MHz)	23 (1002 MHz)	23 (1002 MHz)
Frequency Split (MHz)	42/54 40/54 55/70	42/54 40/54	42/54 40/54 55/70 65/80	42/54[2]	42/54[2] 65/80[2] 55/70[2]
Transfer Linearization	No	No	Yes	No[3]	No[3]
ALC Operation (NTSC/QAM)	NTSC Only[4]	NTSC Only[4]	NTSC Only[4]	NTSC & QAM[5]	NTSC & QAM[5]
Frequency Control (MHz)	Manual 439.25 499.25 451.25	Manual 439.25 499.25	439.25 499.25 451.25 495.25	439.25 499.25	423.25 495.25 427.25 499.25 439.25 609.00 451.25 645.00 471.25 711.00
Return (dB)	Passive 14.5 18.5	Passive 18	18	18	18
Output Configuration	2 O/P (Fixed) 4 O/P (User Config)	4 O/P (User Config)	2 O/P (Fixed) 4 O/P (User Config)	4 O/P (User Config)	4 O/P (User Config)
Powering	None 90 Volt HE P/S (1.8 A)[6] 90 Volt HE P/S (2.3 A)[6]	None 90 Volt HE P/S	None 90 Volt HE P/S	None 90 Volt HE P/S	None 90 Volt HE P/S
Power Passing	13 A (all Ports)	15 A (P1, P3 & P6) 13 A (P2 & P5)	15 A (P1, P3 & P6) 13 A (P2 & P5)	15 A (P1, P3 & P6) 13 A (P2 & P5)	15 A (P1, P3, P4 & P6) 13 A (P2 & P5)
Housing	None 6-Port (STD) 6-PT 90° Access	None 6-Port (STD) 6-PT 90° Access	None 4-Port (ITP) 4-Port (ETP) 6-Port (ITP) 6-Port (ETP) 4-Port 90° (ITP) 4-Port 90° (ETP)	None 6-Port (ITP) 6-Port (ETP) 6-Port 90° (ITP) 6-Port 90° (ETP) 6-Port Bypass (ETP)	None 6-Port (ITP) 6-Port (ETP) 6-Port 90° (ITP) 6-Port 90° (ETP) 6-Port Bypass (ETP)
Housing Finish	Standard Corrosion Protection	Standard Corrosion Protection	Standard Corrosion Protection	Standard Corrosion Protection	Standard Corrosion Protection
Testpoint Access	External Only[7]	External Only[7]	Internal[8] External[8]	Internal[8] External[8]	Internal[8] External[8]
Testpoint Value (dB)	-25	-20 -25	-20 -25	-20	-20 -25
Number of Forward Testpoints	5 (Ports)[9] 1 (Balance)	5 (Ports)9 1 (Balance)	3 (P1, P2/P3, P5/P6)[10]	3 (P1, P2/P3, P5/P6)[11]	3 (P1, P2/P3, P5/P6)[11]
Number of Return Testpoints	5 (Ports only)9	5 (Ports)[9] 1 (Balance)[9]	3 (P1, P2/P3, P5/P6)[10]	3 (P1, P2/P3, P5/P6)[11]	3 (P1, P2/P3, P5/P6)[11]

1. For 750 and 862 MHz applications, the standard 1 GHz FMB amplifier can be used with the appropriate SEQ-750 or SEQ-862 plug-ins.
2. The frequency dependent assemblies are bench replaceable to upgrade frequency split of amplifier at a later date if required.
3. GaAs hybrids provide TL performance at TL operating levels.
4. ALC may operate on a QAM channel. This depends on the level of the QAM signals. *Not recommended.*
5. The ALC PAD can be adjusted to compensate for the lower QAM signal.
6. The 700 series used a 9-pin power supply cable, but a conversion kit is available to convert to the 12-pin FM901e module.
7. The balance testpoint is internal only.
8. Only Forward testpoints could be either Internal or External type. Return testpoints are always Internal type.
9. Bi-directional Port testpoints. Balance testpoint is directional coupler type.
10. Separate Forward and Return directional coupler testpoints.
11. Combined directional coupler Forward and Return testpoints.

Table A.7 FlexNet/Flex Max Bridger Plug-in Accessories Comparison

Features	700 Series	800 Series	900 Series	901 Series	Fusion Series
Cable Equalizers (FWD/REV)	SEQ-750-XX MEQ-550-XX MEQ-42-XX	SEQ-862-XX SEQ-750-XX MEQ-42-XX	SEQ-862-xx SEQ-750-xx MEQ-33-xx MEQT-33-xx MEQ-42-xx MEQT-42-xx MEQ-55-xx MEQT-55-xx MEQ-65-xx MEQT-65-xx	SEQ-1G-xx SEQ-862-xx (without cover only) SEQ-750-xx (without cover only) MEQ-42-xx MEQT-42-xx	SEG-1G-xx SEQ-862-xx (with & without cover) SEQ-750-xx (with & without cover) MEQ-42-xx MEQT-42-xx MEQ-55-xx MEQT-55-xx MEQ-65-xx MEQT-65-xx
Cable Simulators	SCS-750-xx	SCS-862-xx SCS-750-xx	SCS-862-xx SCS-750-xx	SCS-1G-xx	SCS-1G-xx SCS-862-xx
PADs (At all locations)	SPB-XXX	SPB-XXX	SPB-XXX	NPB-XXX	NPB-XXX
Bridger EQ/PAD	Yes/Yes	Yes/Yes	Yes/Yes	No/Yes	No/Yes
P5/P6 Bridger PAD	Yes (AUX EQ)	Yes (AUX EQ)	Yes (AUX EQ)[1]	Yes	Yes
REV Port PADs	Yes	Yes	Yes	No	No
Distribution Accessories	SS-1000-2 SDC-1000-8 SDC-1000-12	SS-1000-2 SDC-1000-8 SDC-1000-12	SS-1000-2 SDC-1000-8 SDC-1000-12	SS-1000-2 SDC-1000-8 SDC-1000-12	SS-1000-2 SDC-1000-8 SDC-1000-12

1. In the TL version, AUX EQ was changed to SPB location.

A

Upgrade Solutions

The following table indicates the FM901e amplifier upgrade solution for a sampling of 700, 800, and 900 series amplifiers.

If you have this amplifier:	Your FM901e 1 GHz upgrade amplifier is:	Your FM901e 870 MHz upgrade amplifier is:
700 Series		
FNT72CDJ-KB4F6W1	FMTEG8J-KB6F6F1N	FMTED5J-KB6F6F1N
FNT72CDL-KB4C2W1	FMTEG8J-KB6F6F1N	FMTED5J-KB6F6F1N
FNB75CDJ-KB4E6W1	FMBEGPJ-KB6E6F1N	FMBEGPJ-KB6E6F1N
FNB75CDL-KB4E6W1	FMBEGPJ-KB6E6F1N	FMBEGPJ-KB6E6F1N
800 Series		
FNT82CDJ-KB5F6W1	FMTEG8J-KB6F6F1N	FMTED5J-KB6F6F1N
FNT82CDL-KB5F1A1	FMTEG8J-KB6F1A1N	FMTED5J-KB6F1A1N
FNB85CDJ-KB5E6W1	FMBEGPJ-KB6E6F1N	FMBEGPJ-KB6E6F1N
FNB85CDL-KB5E6W1	FMBEGPJ-KB6E6F1N	FMBEGPJ-KB6E6F1N
900 Series		
FNT94CL-KB6H6C1	FMTEG8J-KB6H6C1N	FMTED5J-KB6H6C1N
FNT95DJTKB6P6F1	FMTEG8J-KB6P6F1N	FMTED5J-KB6P6F1N
FNB9ADJTL06N1A1	FMBEGPJ-L06N1A1N	FMBEGPJ-L06N1A1N
FNB96CL-KB6G6C1	FMBEGPJ-KB6G6C1N	FMBEGPJ-KB6G6C1N

Contact your C-COR sales professional for specific cross-reference part numbers pertaining to your system design.

Specifications

This appendix provides Flex Max901e specifications.

Note *All specifications are subject to change without notice. Contact C-COR Technical Support (800-504-4443, option 3) to ensure that you have the most recent specifications.*

Table B.1 Flex Max901e Trunk Amplifier, 1002 MHz, 42/54 Split, 33 dB Spaced, Different Tilt on Trunk and Bridger

	FORWARD		RETURN
	Trunk	2 O/P Bridger	Trunk & 2 O/P Bridger
General			
Passband, MHz	54–1002		5–42
Housing, MHz	1002		—
AC Current Passing, A			
Ports 1, 3, 4, 6	15		15
Ports 2, 5 (“H” and “P” options)	13		13
Typical Operating Conditions			
Operational Gain, dB[1, 2]	33	43	18
Channels, Number of NTSC[3]	79	79	6
Operating Levels (recommended)			
Frequency, MHz	1002/870/750/550/54		42/5
Input, dBmV, min.[4]	9.0/8.4/8.4/7.6/9.2		17/17
Output, dBmV[5, 6]	42/40.5/39.5/37/32	52/49.5/47.5/44/35	35/35
Performance Specifications @ Recommended Levels			
(Temperature Range: –40 to 60°C)			
Carrier-to-Interference Ratio, dB[7]			
Composite Triple Beat	84	75	80
Second Order Beat (F1 ± F2)	—	—	—
Cross Modulation (per NCTA std.)[8]	76	67	74
Third Order Beat (F1 ± F2 ± F3)	—	—	—
Composite 2IM	79	73	82
Composite Intermodulation Noise CIN[9]	80	66	—
Composite Intermodulation Noise CIN[10]	86	72	—
Noise, 4 MHz, 75 Ohms[2]	59/59.4/59.4/57.6/57.2		62
Noise Figure, dB (without EQ)[11]	8/7/7/8/10		14
Full Gain, dB (without EQ and ALC)	38	48	19
Factory Alignment (with ALC Reserve, without EQ)			
Cable Loss, dB @ 1002 MHz	13	13	—
Linear Equalization[12]	—	8	—
Flat Loss, dB[13]	21	31	19
Gain Slope, dB	–0.5 to 1.0	–1.0 to 1.0	—
Flatness (@ Gain Slope), ±dB[14, 15]	0.75	1.0	0.5
Return Loss, dB min., All Entry Ports	16	16	16
Testpoint Accuracy[16]			
–20 or –25 dB Forward Input TP, dB	±1.0		—
–20 or –25 dB Forward Output TP, dB	±0.5(54 to 550), ±1.0(551 to 1002)		—
–20 or –25 dB Return In and Out TP, dB	—		±0.5

Table B.1 Flex Max901e Trunk Amplifier, 1002 MHz, 42/54 Split, 33 dB Spaced, Different Tilt on Trunk and Bridger (cont'd)

	FORWARD		RETURN	
	Trunk	2 O/P Bridger	Trunk & 2 O/P Bridger	
Powering Requirements, Max./Typ.[17]			**With Active Return**	
AC Voltage, 60 Hz			@ 90 V	@ 60 V
AC Power, Watts			53.5/49	53/48
AC Current, mA			735/700	970/880
DC Current, mA @ 24 V ± 0.5 V			1955/1775	1955/1775
Level Control				
Range, dB @ 1002 MHz	+4/–5 dB		—	
Accuracy (–40 to 60°C)	±0.5 dB		—	
Output Level Range[18] (from nominal)	+5/–3 dB		—	
Pilot Frequency Band[19] (recommended)	499.25 MHz (Single Channel)		—	
Gain Control				
Plug-in PAD	NPB–XXX		NPB–XXX	
Equalization to Compensate for Cable Loss				
Plug-in Equalizers for Additional Equalization	SEQ–1G–XX		MEQ–42–XX	
Chrominance/Luminance Delay, Max.				
Channel 2, ns/3.58 MHz	33		—	
Channel 3, ns/3.58 MHz	14		—	
Channel 4, ns/3.58 MHz	7		—	
Channel 5, ns/3.58 MHz	3.6		—	
Return Group Delay, Max.				
5.5–7 MHz, ns	—		52	
10–11.5 MHz, ns	—		6	
35–36.5 MHz, ns	—		10	
38.5–40 MHz, ns	—		19	
Hum Modulation (Time Domain @ 15 A)				
5–10 MHz, –dBc	—		55	
11–750 MHZ, –dBc	60		60	
751–1002 MHz, –dBc	55		—	

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1. Spacing at highest frequency with SEQ–1G–XX installed. Return spacing includes losses due to housing, diplex filters, and MEQ–42–X.
2. The specifications are based on the amplifier configured (with two SPB–0) as a 2–output bridger with distribution outputs on Ports 3 and 6. When using distribution plug-ins SS–1000–2, SDC–1000–8 or SDC–1000–12, levels should be derated accordingly based on the accessory specifications.
3. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
4. Recommended minimum forward input levels at 1002 MHz including loss due to equalizer.
5. Recommended maximum return output level at 42 MHz including loss due to equalizer.
6. Bridger output: At specified operational tilt the maximum output level for 870 MHz or 1002 GHz loading is 56.5 dBmV @ HF.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1002 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing in the 54 to 550 frequency spectrum.

10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 870 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise in the 54 to 550 MHz frequency spectrum.
11. The Noise Figure and C/N specifications are typical within specified passband.
12. Difference in linear loss between 54 MHz and 1002 MHz.
13. Total flat loss at 1002 MHz which includes insertion loss of linear EQ.
14. The forward bridger port gain and flatness is 11 ±1.0 dB as referenced to the trunk port with an NPB-000 installed in the Bridger EQ/PAD location.
15. The return bridger port gain and flatness is 0 ±0.5 dB as referenced to the trunk port.
16. All testpoints are directional and referenced to their associated RF port. For "H" output option, all forward and return testpoints are internal and only accessible with the housing lid open. For "P" output option, all forward testpoints are external and all return testpoints are internal.
17. Power requirements indicated are with the HEPS790–2.3 power supply 122027–05. See 333995–17 for additional information. For 60VAC Powering: AC Power consumption in Watts divided by a factor of 43 = Amps required. For 90VAC Powering: For ≤ 67VAC, 1.03 x (AC Power consumption in watts divided by voltage) = Amps required. For 67 - 90VAC, AC Power consumption in watts divided by 65 = Amps required.
18. ALC pilot level range is based on a nominal pilot level of 37 dBmV for pilot frequencies ≤ 499.25 MHz or 32 dBmV for pilot frequencies > 499.25 MHz. C-COR recommends that if the pilot level, from a design standpoint, is more than +2/-1 dBmV from nominal, the ALC PAD should be changed to optimize the ALC pilot level range. This should alleviate any possible ALC setup and/or operation issues due to typical system level variations caused by system components flatness characteristics. See the FM901e equipment manual for correct selection of ALC PAD value to insure proper ALC setup and operation.
19. For ALC pilot frequencies of ≤ 499.25 MHz, the ALC pilot filter is a single channel device. This means that the adjacent channels will have no affect on the RF power level that the RF detector is measuring. For ALC pilot frequencies > 499.25 MHz, the ALC pilot filter is not a single channel device. This means that the adjacent QAM channels will have an affect on the RF power level that the RF detector is measuring. C-COR recommends that the adjacent QAM channels be present on the system before the ALC system of the amplifier station is balanced. This will avoid station re-balance in the future when those QAM channels would be added to the system.

Specifications subject to change without notice

Table B.2 Flex Max901e Trunk Amplifier, 1002 MHz, 42/54 Split, 32 dB Spaced, Same Tilt on Trunk and Bridger

	FORWARD		RETURN	
	Trunk	2 O/P Bridger	Trunk & 2 O/P Bridger	
General				
Passband, MHz	54–1002		5–42	
Housing, MHz	1002		—	
AC Current Passing, A				
Ports 1, 3, 4, 6	15		15	
Ports 2, 5 (“H” and “P” options)	13		13	
Typical Operating Conditions				
Operational Gain at 1002/870 MHz, dB[1, 2]	32/30	41/39	18	
Channels, Number of NTSC[3]	79	79	6	
Operating Levels (recommended)				
Frequency, MHz	1002/870/750/550/54		42/5	
Input, dBmV, min.[4]	11/10.5/10.0/9.4/11.4		17/17	
Output, dBmV[5, 6, 7]	43/40.5/38.5/35/26	52/49.5/47.5/44/35	35/35	
Performance Specifications @ Recommended Levels				
(Temperature Range: –40 to 60°C)				
Carrier-to-Interference Ratio, dB[8]				
Composite Triple Beat	84	75	80	
Second Order Beat (F1 ± F2)	—	—	—	
Cross Modulation (per NCTA std.)[9]	76	67	74	
Third Order Beat (F1 ± F2 ± F3)	—	—	—	
Composite 2IM	79	73	82	
Composite Intermodulation Noise CIN[10]	80	66	—	
Composite Intermodulation Noise CIN[11]	86	72	—	
Noise, 4 MHz, 75 Ohms[2]	62/61.5/61/59.4/59.4		62	
Noise Figure, dB (without EQ)[12]	8/7/7/8/10		14	
Full Gain, dB (without EQ and ALC)	37	46	19	
Factory Alignment (with ALC Reserve, without EQ)				
Cable Loss, dB @ 1002 MHz[13]	22	22	—	
Flat Loss, dB	11	20	19	
Gain Slope, dB	–0.5 to 1.0	–1.0 to 1.0	—	
Flatness (@ Gain Slope), ±dB[14 15]	0.75	1.0	0.5	
Return Loss, dB min., All Entry Ports	16	16	16	
Testpoint Accuracy[16]				
–20 or –25 dB Forward Input TP, dB	±1.0		—	
–20 or –25 dB Forward Output TP, dB	±0.5(54 to 550), ±1.0(551 to 1002)		—	
–20 or –25 dB Return In and Out TP, dB	—		±0.5	
Powering Requirements, Max./Typ.[17]			**With Active Return**	
AC Voltage, 60 Hz			@ 90 V	@ 60 V
AC Power, Watts			53.5/49	53/48
AC Current, mA			735/700	970/880
DC Current, mA @ 24 V ± 0.5 V			1955/1775	1955/1775

Table B.2 Flex Max901e Trunk Amplifier, 1002 MHz, 42/54 Split, 32 dB Spaced, Same Tilt on Trunk and Bridger (cont'd)

	FORWARD		RETURN
	Trunk	2 O/P Bridger	Trunk & 2 O/P Bridger
Level Control			
Range, dB @ 1002 MHz	+4/–5 dB		—
Accuracy (–40 to 60°C)	±0.5 dB		—
Output Level Range[18] (from nominal)	+5/–3 dB		—
Pilot Frequency Band[19] (recommended)	499.25 MHz (Single Channel)		—
Gain Control			
Plug-in PAD	NPB–XXX		NPB–XXX
Equalization to Compensate for Cable Loss			
Plug-in Equalizers for Additional Equalization	SEQ-750-XX SEQ–870–XX SEQ-1G-XX		MEQ–42–XX
Chrominance/Luminance Delay, Max.			
Channel 2, ns/3.58 MHz	33		—
Channel 3, ns/3.58 MHz	14		—
Channel 4, ns/3.58 MHz	7		—
Channel 5, ns/3.58 MHz	3.6		—
Return Group Delay, Max.			
5.5–7 MHz, ns	—		52
10–11.5 MHz, ns	—		6
35–36.5 MHz, ns	—		10
38.5–40 MHz, ns	—		19
Hum Modulation (Time Domain @ 15 A)			
5–10 MHz, –dBc	—		55
11–750 MHZ, –dBc	60		60
751–1002 MHz, –dBc	55		—

Specification Document Number 1502211 Rev D

1. Spacing at highest frequency with Forward EQ installed. Return spacing includes losses due to housing, diplex filters, and MEQ–42–X.
2. The specifications are based on the amplifier configured (with two SPB–0) as a 2–output bridger with distribution outputs on Ports 3 and 6. When using distribution plug-ins SS–1000–2, SDC–1000–8 or SDC–1000–12, levels should be derated accordingly based on the accessory specifications.
3. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
4. Recommended minimum forward input levels at 1002 MHz including loss due to equalizer.
5. Recommended maximum return output level at 42 MHz including loss due to equalizer.
6. Forward trunk output levels achieved by installing an NPB-000 into the interstage PAD location and a GEQC-1 GHz-090 in the O/P EQ location. Forward bridger output levels are achieved by installing an NPB-020 in the bridger EQ/PAD location.
7. Bridger output: At specified operational tilt the maximum output level for 870 or 1002 MHz loading is 56.5 dBmV HF.
8. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
9. Cross modulation specification number indicates typical cascade performance.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1002 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing in the 54 to 550 frequency spectrum.

11. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 870 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing in the 54 to 550 frequency spectrum.
12. The Noise Figure and C/N specifications are typical within specified passband.
13. The cable loss includes both the factory alignment cable loss of 13 dB at 1002 MHz and the cable equivalent loss of the GEQC-1 GHz-090 (9 dB) for a total of 22 dB.
14. The forward bridger port gain and flatness is 9 ±1.0 dB as referenced to the trunk port.
15. The return bridger port gain and flatness is 0 ±0.5 dB as referenced to the trunk port.
16. All testpoints are directional and referenced to their associated RF port. For "H" output option, all forward and return testpoints are internal and only accessible with the housing lid open. For "P" output option, all forward testpoints are external and all return testpoints are internal.
17. Power requirements indicated are with the HEPS790–2.3 power supply 122027–05. See 333995–17 for additional information. For 60VAC Powering: AC Power consumption in Watts divided by a factor of 43 = Amps required. For 90VAC Powering: For ≤ 67VAC, 1.03 x (AC Power consumption in watts divided by voltage) = Amps required. For 67 - 90VAC, AC Power consumption in watts divided by 65 = Amps required.
18. ALC pilot level range is based on a nominal pilot level of 34 dBmV for pilot frequencies ≤ 499.25 MHz or 31 dBmV for pilot frequencies > 499.25 MHz. C-COR recommends that if the pilot level, from a design standpoint, is more than +2/-1 dBmV from nominal, the ALC PAD should be changed to optimize the ALC pilot level range. This should alleviate any possible ALC setup and/or operation issues due to typical system level variations caused by system components flatness characteristics. See the FM901e equipment manual for correct selection of ALC PAD value to insure proper ALC setup and operation.
19. For ALC pilot frequencies of ≤ 499.25 MHz, the ALC pilot filter is a single channel device. This means that the adjacent channels will have no affect on the RF power level that the RF detector is measuring. For ALC pilot frequencies > 499.25 MHz, the ALC pilot filter is not a single channel device. This means that the adjacent QAM channels will have an affect on the RF power level that the RF detector is measuring. C-COR recommends that the adjacent QAM channels be present on the system before the ALC system of the amplifier station is balanced. This will avoid station re-balance in the future when those QAM channels would be added to the system.

Specifications subject to change without notice

Table B.3 Flex Max901e Bridger Amplifier, 1002 MHz, 42/54 Split

	FORWARD 2 O/P Bridger	RETURN 2 O/P Bridger
General		
Passband, MHz	54–1002	5–42
Housing, MHz	1002	—
AC Current Passing, A		
Ports 1, 3, 4, 6	15	15
Ports 2, 5 (“H” and “P” options)	13	13
Typical Operating Conditions		
Operational Gain, dB[1, 2]	43	18
Channels, Number of NTSC[3]	79	6
Operating Levels (recommended)		
Frequency, MHz	1002/870/750/550/54	42/5
Input, dBmV, min.[4]	9/8.1/7.8/7.4/10.1	17/17
Output, dBmV[5, 6]	52/49.5/47.5/44/35	35/35
Performance Specifications @ Recommended Levels		
(Temperature Range: –40 to 60° C)		
Carrier-to-Interference Ratio, dB[7]		
Composite Triple Beat	75	80
Second Order Beat (F1 ± F2)	—	—
Cross Modulation (per NCTA std.)[8]	67	74
Third Order Beat (F1 ± F2 ± F3)	—	—
Composite 2IM	73	82
Composite Intermodulation Noise CIN[9]	73	—
Composite Intermodulation Noise CIN[10]	79	—
Noise, 4 MHz, 75 Ohms[2]	59/58.1/57.8/58.4/59.1	64
Noise Figure, dB (without EQ)[11]	8/8/8/7/9	12
Full Gain, dB (without EQ and ALC)	48	19
Factory Alignment (with ALC Reserve, without EQ)		
Cable Loss, dB @ 1002 MHz	23	—
Flat Loss, dB	21	19
Gain Slope, dB	–1.0 to 1.0	—
Flatness (@ Gain Slope), ±dB[12 13]	± 1.0	0.5
Return Loss, dB min., All Entry Ports	16	16
Testpoint[14]		
–20 or –25 dB Forward Input TP, dB	± 1.0	—
–20 or –25 dB Forward Output TP, dB	± 0.5(54 to 550), ± 1.0(551 to 1002)	—
–20 or –25 dB Return In and Out TP, dB	—	± 0.5

Powering Requirements, Max. /Typ.[15]	**With Active Return**	
AC Voltage, 60 Hz	@ 90 V	@ 60 V
AC Power, Watts	45.5/41	45/40
AC Current, mA	670/630	820/740
DC Current, mA @ 24 V ± 0.5 V	1650/1475	1650/1475

Table B.3 Flex Max901e Bridger Amplifier, 1002 MHz, 42/54 Split (cont'd)

	FORWARD 2 O/P Bridger	RETURN 2 O/P Bridger
Level Control		
Range, dB @ 1002 MHz	+4/–5 dB	—
Accuracy (–40 to 60°C)	±0.5 dB	—
Output Level Range[16] (from nominal)	+5/–3 dB	—
Pilot Frequency Band[17] (recommended)	499.25 MHz (Single Channel)	—
Gain Control		
Plug-in PAD	NPB–XXX	NPB–XXX
Equalization to Compensate for Cable Loss		
Plug-in Equalizers for Additional Equalization	SEQ–1G–XX	MEQ–42–XX
Chrominance/Luminance Delay, Max.		
Channel 2, ns/3.58 MHz	33	—
Channel 3, ns/3.58 MHz	14	—
Channel 4, ns/3.58 MHz	7	—
Channel 5, ns/3.58 MHz	3.6	—
Return Group Delay, Max.		
5.5–7 MHz, ns	—	52
10–11.5 MHz, ns	—	6
35–36.5 MHz, ns	—	10
38.5–40 MHz, ns	—	19
Hum Modulation (Time Domain @ 15 A)		
5–10 MHz, –dBc	—	55
11–750 MHZ, –dBc	60	60
751–1002 MHz, –dBc	55	—

Specification Document Number 1502213 Rev D

1. Spacing at highest frequency with SEQ–1G–XX installed. Return spacing includes losses due to housing, diplex filters, and MEQ–42–X.
2. The specifications are based on the amplifier configured (with two SPB–0) as a 2–output bridger with distribution outputs on Ports 2 and 3. When using distribution plug-ins SS–1000–2, SDC–1000–8 or SDC–1000–12, levels should be derated accordingly based on the accessory specifications.
3. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
4. Recommended minimum forward input levels at 1002 MHz including loss due to equalizer.
5. Recommended maximum return output level at 42 MHz including loss due to equalizer.
6. At specified operational tilt maximum output level for 870 MHz or 1 GHz loading is 56.5 dBmV @ HF.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1002 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing in the 54to 550 frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 870 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise in the 54 to 550 MHz frequency spectrum.
11. The Noise Figure and C/N specifications are typical within specified passband.
12. The forward bridger port gain and flatness (ports 2, 3, and 5 only) is 0 ±1.0 dB as referenced to port 6.
13. The return bridger port gain and flatness (ports 2, 3, and 5 only) is 0 ±0.5 dB as referenced to port 6.

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14. All testpoints are directional and referenced to their associated RF port. For "H" output option, all forward and return testpoints are internal and only accessible with the housing lid open. For "P" output option, all forward testpoints are external and all return testpoints are internal.
15. Power requirements indicated are with the HEPS790–2.3 power supply 122027–05. See 333995–17 for additional information. For 60VAC Powering: AC Power consumption in Watts divided by a factor of 43 = Amps required. For 90VAC Powering: For ≤ 67VAC, 1.03 x (AC Power consumption in watts divided by voltage) = Amps required. For 67 - 90VAC, AC Power consumption in watts divided by 65 = Amps required.
16. ALC pilot level range is based on a nominal pilot level of 43 dBmV for pilot frequencies ≤ 499.25 MHz or 31 dBmV for pilot frequencies > 499.25 MHz. C-COR recommends that if the pilot level, from a design standpoint, is more than +2/-1 dBmV from nominal, the ALC PAD should be changed to optimize the ALC pilot level range. This should alleviate any possible ALC setup and/or operation issues due to typical system level variations caused by system components flatness characteristics. See the FM901e equipment manual for correct selection of ALC PAD value to insure proper ALC setup and operation.
17. For ALC pilot frequencies of ≤ 499.25 MHz, the ALC pilot filter is a single channel device. This means that the adjacent channels will have no affect on the RF power level that the RF detector is measuring. For ALC pilot frequencies > 499.25 MHz, the ALC pilot filter is not a single channel device. This means that the adjacent QAM channels will have an affect on the RF power level that the RF detector is measuring. C-COR recommends that the adjacent QAM channels be present on the system before the ALC system of the amplifier station is balanced. This will avoid station re-balance in the future when those QAM channels would be added to the system.

Table B.4 Flex Max901e Trunk Amplifier, 1002 MHz, 55/70 Split, 33 dB Spaced, Different Tilt on Trunk and Bridger

	FORWARD		RETURN
	Trunk	2 O/P Bridger	Trunk & 2 O/P Bridger
General			
Passband, MHz	70–1002		5–55
Housing, MHz	1002		—
AC Current Passing, A			
Ports 1, 3, 4, 6	15		15
Ports 2, 5 ("H" and "P" options)	13		13
Typical Operating Conditions			
Operational Gain, dB[1, 2]	33	43	18
Channels, Number of NTSC[3]	76	76	6
Operating Levels (recommended)			
Frequency, MHz	1002/870/750/550/70		55/5
Input, dBmV, min.[4]	9/8.4/8.4/7.6/9		17/17
Output, dBmV[5, 6]	42/41/39.5/37.5/33	52/49.5/47.5/44/35.5	35/35
Performance Specifications @ Recommended Levels			
(Temperature Range: –40 to 60°C)			
Carrier-to-Interference Ratio, dB[7]			
Composite Triple Beat	84	75	80
Second Order Beat (F1 ± F2)	—	—	—
Cross Modulation (per NCTA std.)[8]	76	67	74
Third Order Beat (F1 ± F2 ± F3)	—	—	—
Composite 2IM	79	73	82
Composite Intermodulation Noise CIN[9]	80	66	—
Composite Intermodulation Noise CIN[10]	86	72	—
Noise, 4 MHz, 75 Ohms[2]	59/59.4/59.4/57.6/57		62
Noise Figure, dB (without EQ)[11]	8/7/7/8/10		14
Full Gain, dB (without EQ and ALC)	38	48	19
Factory Alignment (with ALC Reserve, without EQ)			
Cable Loss, dB @ 1002 MHz	13	13	—
Linear Equalization[12]	—	7.1	—
Flat Loss, dB[13]	21	31	19
Gain Slope, dB	–0.5 to 1.0	–1.0 to 1.0	—
Flatness (@ Gain Slope), ±dB[14, 15]	0.75	1.0	0.5
Return Loss, dB min., All Entry Ports	16	16	16
Testpoint Accuracy[16]			
–20 or –25 dB Forward Input TP, dB	±1.0		—
–20 or –25 dB Forward Output TP, dB	±0.5(70 to 550), ±1.0(551 to 1002)		—
–20 or –25 dB Return In and Out TP, dB	—		±0.5

Table B.4 Flex Max901e Trunk Amplifier, 1002 MHz, 55/70 Split, 33 dB Spaced, Different Tilt on Trunk and Bridger (cont'd)

	FORWARD		RETURN	
	Trunk	2 O/P Bridger	Trunk & 2 O/P Bridger	
Powering Requirements, Max./Typ.[17]			**With Active Return**	
AC Voltage, 60 Hz			@ 90 V	@ 60 V
AC Power, Watts			53.5/49	53/48
AC Current, mA			735/700	970/880
DC Current, mA @ 24 V ± 0.5 V			1955/1775	1955/1775
Level Control				
Range, dB @ 1002 MHz	+4/–5 dB		—	
Accuracy (–40 to 60°C)	±0.5 dB		—	
Output Level Range[18] (from nominal)	+5/–3 dB		—	
Pilot Frequency Band[19] (recommended)	499.25 MHz (Single Channel)		—	
Gain Control				
Plug-in PAD	NPB–XXX		NPB–XXX	
Equalization to Compensate for Cable Loss				
Plug-in Equalizers for Additional Equalization	SEQ–1G–XX		MEQ–55–XX	
Chrominance/Luminance Delay, Max.				
Channel 5, ns/3.58 MHz	14		—	
Channel 6, ns/3.58 MHz	9		—	
Return Group Delay, Max.				
5.5–7 MHz, ns	—		52	
10–11.5 MHz, ns	—		7	
52–53.5 MHz, ns	—		21	
53.5–55 MHz, ns	—		36	
70–71.5 MHz, ns	21		—	
71.5–73 MHz, ns	15		—	
Hum Modulation (Time Domain @ 15 A)				
5–10 MHz, –dBc	—		55	
11–750 MHZ, –dBc	60		60	
751–1002 MHz, –dBc	55		—	

Specification Document Number 1502466 Rev B

1. Spacing at highest frequency with SEQ–1G–XX installed. Return spacing includes losses due to housing, diplex filters, and MEQ–55–X.
2. The specifications are based on the amplifier configured (with two SPB–0) as a 2–output bridger with distribution outputs on Ports 3 and 6. When using distribution plug-ins SS–1000–2, SDC–1000–8 or SDC–1000–12, levels should be derated accordingly based on the accessory specifications.
3. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
4. Recommended minimum forward input levels at 1002 MHz including loss due to equalizer.
5. Recommended maximum return output level at 55 MHz including loss due to equalizer.
6. Bridger output: At specified operational tilt the maximum output level for 870 MHz or 1002 GHz loading is 56.5 dBmV @ HF.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1002 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing in the 70 to 550 frequency spectrum.

10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 870 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise in the 70 to 550 MHz frequency spectrum.
11. The Noise Figure and C/N specifications are typical within specified passband.
12. Difference in linear loss between 54 MHz and 1002 MHz.
13. Total flat loss at 1002 MHz which includes insertion loss of linear EQ.
14. The forward bridger port gain and flatness is 11 ±1.0 dB as referenced to the trunk port with an NPB-000 installed in the Bridger EQ/PAD location.
15. The return bridger port gain and flatness is 0 ±0.5 dB as referenced to the trunk port.
16. All testpoints are directional and referenced to their associated RF port. For "H" output option, all forward and return testpoints are internal and only accessible with the housing lid open. For "P" output option, all forward testpoints are external and all return testpoints are internal.
17. Power requirements indicated are with the HEPS790–2.3 power supply 122027–05. See 333995–17 for additional information. For 60VAC Powering: AC Power consumption in Watts divided by a factor of 43 = Amps required. For 90VAC Powering: For ≤ 67VAC, 1.03 x (AC Power consumption in watts divided by voltage) = Amps required. For 67 - 90VAC, AC Power consumption in watts divided by 65 = Amps required.
18. ALC pilot level range is based on a nominal pilot level of 37 dBmV for pilot frequencies ≤ 499.25 MHz or 32 dBmV for pilot frequencies > 499.25 MHz. C-COR recommends that if the pilot level, from a design standpoint, is more than +2/-1 dBmV from nominal, the ALC PAD should be changed to optimize the ALC pilot level range. This should alleviate any possible ALC setup and/or operation issues due to typical system level variations caused by system components flatness characteristics. See the FM901e equipment manual for correct selection of ALC PAD value to insure proper ALC setup and operation.
19. For ALC pilot frequencies of ≤ 499.25 MHz, the ALC pilot filter is a single channel device. This means that the adjacent channels will have no affect on the RF power level that the RF detector is measuring. For ALC pilot frequencies > 499.25 MHz, the ALC pilot filter is not a single channel device. This means that the adjacent QAM channels will have an affect on the RF power level that the RF detector is measuring. C-COR recommends that the adjacent QAM channels be present on the system before the ALC system of the amplifier station is balanced. This will avoid station re-balance in the future when those QAM channels would be added to the system.

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Table B.5 Flex Max901e Trunk Amplifier, 1002 MHz, 55/70 Split, 32 dB Spaced, Same Tilt on Trunk and Bridger

	FORWARD		RETURN	
	Trunk	2 O/P Bridger	Trunk & 2 O/P Bridger	
General				
Passband, MHz	70–1002		5–55	
Housing, MHz	1002		—	
AC Current Passing, A				
Ports 1, 3, 4, 6	15		15	
Ports 2, 5 (“H” and “P” options)	13		13	
Typical Operating Conditions				
Operational Gain at 1002/870 MHz, dB[1, 2]	32/30	41/39	18	
Channels, Number of NTSC[3]	76	76	6	
Operating Levels (recommended)				
Frequency, MHz	1002/870/750/550/70		55/5	
Input, dBmV, min.[4]	11/10.5/10/9.4/11.5		17/17	
Output, dBmV[5, 6, 7]	43/40.5/38.5/35/26.5	52/49.5/47.5/44/35.5	35/35	
Performance Specifications @ Recommended Levels				
(Temperature Range: –40 to 60°C)				
Carrier-to-Interference Ratio, dB[8]				
Composite Triple Beat	84	75	80	
Second Order Beat (F1 ± F2)	—	—	—	
Cross Modulation (per NCTA std.)[9]	76	67	74	
Third Order Beat (F1 ± F2 ± F3)	—	—	—	
Composite 2IM	79	73	82	
Composite Intermodulation Noise CIN[10]	80	66		
Composite Intermodulation Noise CIN[11]	86	72	—	
Noise, 4 MHz, 75 Ohms[2]	62/61.5/61/59.4/59.5		62	
Noise Figure, dB (without EQ)[12]	8/7/7/8/10		14	
Full Gain, dB (without EQ and ALC)	37	46	19	
Factory Alignment (with ALC Reserve, without EQ)				
Cable Loss, dB @ 1002 MHz[13]	22	22	—	
Flat Loss, dB	11	20	19	
Gain Slope, dB	–0.5 to 1.0	–1.0 to 1.0	—	
Flatness (@ Gain Slope), ±dB[14, 15]	0.75	1.0	0.5	
Return Loss, dB min., All Entry Ports	16	16	16	
Testpoint Accuracy[16]				
–20 or –25 dB Forward Input TP, dB	±1.0		—	
–20 or –25 dB Forward Output TP, dB	±0.5(70 to 550), ±1.0(551 to 1002)		—	
–20 or –25 dB Return In and Out TP, dB	—		±0.5	
Powering Requirements, Max./Typ.[17]			**With Active Return**	
AC Voltage, 60 Hz			@ 90 V	@ 60 V
AC Power, Watts			53.5/49	53/48
AC Current, mA			735/700	970/880
DC Current, mA @ 24 V ± 0.5 V			1955/1775	1955/1775

Table B.5 Flex Max901e Trunk Amplifier, 1002 MHz, 55/70 Split, 32 dB Spaced, Same Tilt on Trunk and Bridger (cont'd)

	FORWARD		RETURN
	Trunk	2 O/P Bridger	Trunk & 2 O/P Bridger
Level Control			
Range, dB @ 1002 MHz	+4/–5 dB		—
Accuracy (–40 to 60°C)	±0.5 dB		—
Output Level Range[18] (from nominal)	+5/–3 dB		—
Pilot Frequency Band[19] (recommended)	499.25 MHz (Single Channel)		—
Gain Control			
Plug-in PAD	NPB–XXX		NPB–XXX
Equalization to Compensate for Cable Loss			
Plug-in Equalizers for Additional Equalization	SEQ-750-XX SEQ–870–XX SEQ-1G-XX		MEQ–55–XX
Chrominance/Luminance Delay, Max.			
Channel 5, ns/3.58 MHz	14		—
Channel 6, ns/3.58 MHz	9		—
Return Group Delay, Max.			
5.5–7 MHz, ns	—		52
10–11.5 MHz, ns	—		7
52–53.5 MHz, ns	—		21
53.5–55 MHz, ns	—		36
70–71.5 MHz, ns	21		—
71.5–73 MHz, ns	15		—
Hum Modulation (Time Domain @ 15 A)			
5–10 MHz, –dBc	—		55
11–750 MHZ, –dBc	60		60
751–1002 MHz, –dBc	55		—

Specification Document Number 1502465 Rev B

1. Spacing at highest frequency with Forward EQ installed. Return spacing includes losses due to housing, diplex filters, and MEQ–55–X.
2. The specifications are based on the amplifier configured (with two SPB–0) as a 2–output bridger with distribution outputs on Ports 3 and 6. When using distribution plug-ins SS–1000–2, SDC–1000–8 or SDC–1000–12, levels should be derated accordingly based on the accessory specifications.
3. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
4. Recommended minimum forward input levels at 870 MHz including loss due to equalizer.
5. Recommended maximum return output level at 55 MHz including loss due to equalizer.
6. Bridger output: At specified operational tilt, the maximum output level for 870 MHz loading is 56.5 dBmV @ HF.
7. Forward trunk output levels achieved by installing an NPB-010 in the interstage PAD location and a GEQC-1 GHz-090 in the O/P EQ location. Forward bridger output levels are achieved by installing an NPB-000 in the Bridger EQ/PAD location.
8. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
9. Cross modulation specification number indicates typical cascade performance.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1002 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing in the 70 to 550 frequency spectrum.

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11. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 870 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing in the 70 to 550 frequency spectrum.
12. The Noise Figure and C/N specifications are typical within specified passband.
13. The cable loss includes both the factory alignment cable loss of 13 dB at 1002 MHz and the cable equivalent loss of the GEQC-1 GHz-090 9 dB) for a total of 22 dB.
14. The forward bridger port gain and flatness is 9 ±1.0 dB as referenced to the trunk port.
15. The return bridger port gain and flatness is 0 ±0.5 dB as referenced to the trunk port.
16. All testpoints are directional and referenced to their associated RF port. For "H" output option, all forward and return testpoints are internal and only accessible with the housing lid open. For "P" output option, all forward testpoints are external and all return testpoints are internal.
17. Power requirements indicated are with the HEPS790–2.3 power supply 122027–05. See 333995–17 for additional information. For 60VAC Powering: AC Power consumption in Watts divided by a factor of 43 = Amps required. For 90VAC Powering: For ≤ 67VAC, 1.03 x (AC Power consumption in watts divided by voltage) = Amps required. For 67 - 90VAC, AC Power consumption in watts divided by 65 = Amps required.
18. ALC pilot level range is based on a nominal pilot level of 34 dBmV for pilot frequencies ≤ 499.25 MHz or 31 dBmV for pilot frequencies > 499.25 MHz. C-COR recommends that if the pilot level, from a design standpoint, is more than +2/-1 dBmV from nominal, the ALC PAD should be changed to optimize the ALC pilot level range. This should alleviate any possible ALC setup and/or operation issues due to typical system level variations caused by system components flatness characteristics. See the FM901e equipment manual for correct selection of ALC PAD value to insure proper ALC setup and operation.
19. For ALC pilot frequencies of ≤ 499.25 MHz, the ALC pilot filter is a single channel device. This means that the adjacent channels will have no affect on the RF power level that the RF detector is measuring. For ALC pilot frequencies > 499.25 MHz, the ALC pilot filter is not a single channel device. This means that the adjacent QAM channels will have an affect on the RF power level that the RF detector is measuring. C-COR recommends that the adjacent QAM channels be present on the system before the ALC system of the amplifier station is balanced. This will avoid station re-balance in the future when those QAM channels would be added to the system.

Table B.6 Flex Max901e Bridger Amplifier, 1002 MHz, 55/70 Split

	FORWARD 2 O/P Bridger	RETURN 2 O/P Bridger	
General			
Passband, MHz	70–1002	5–55	
Housing, MHz	1002	—	
AC Current Passing, A			
Ports 1, 3, 4, 6	15	15	
Ports 2, 5 ("H" and "P" options)	13	13	
Typical Operating Conditions			
Operational Gain, dB[1, 2]	43	18	
Channels, Number of NTSC[3]	76	6	
Operating Levels (recommended)			
Frequency, MHz	1002/870/750/550/70	55/5	
Input, dBmV, min.[4]	9/8.1/7.8/7.4/10.1	17/17	
Output, dBmV[5, 6]	52/49.5/47.5/44/35.5	35/35	
Performance Specifications @ Recommended Levels			
(Temperature Range: –40 to 60°C)			
Carrier-to-Interference Ratio, dB[7]			
Composite Triple Beat	75	80	
Second Order Beat (F1 ± F2)	—	—	
Cross Modulation (per NCTA std.)[8]	67	74	
Third Order Beat (F1 ± F2 ± F3)	—	—	
Composite 2IM	73	82	
Composite Intermodulation Noise CIN[9]	73	—	
Composite Intermodulation Noise CIN[10]	79	—	
Noise, 4 MHz, 75 Ohms[2]	59/58.1/57.8/58.4/59.1	64	
Noise Figure, dB (without EQ)[11]	8/8/8/7/9	12	
Full Gain, dB (without EQ and ALC)	48	19	
Factory Alignment (with ALC Reserve, without EQ)			
Cable Loss, dB @ 1002 MHz	23	—	
Flat Loss, dB	21	19	
Gain Slope, dB	–1.0 to 1.0	—	
Flatness (@ Gain Slope), ±dB[12 13]	±1.0	0.5	
Return Loss, dB min., All Entry Ports	16	16	
Testpoint[14]			
–20 or –25 dB Forward Input TP, dB	±1.0	—	
–20 or –25 dB Forward Output TP, dB	±0.5(54 to 550), ±1.0(551 to 1002)	—	
–20 or –25 dB Return In and Out TP, dB	—	±0.5	
Powering Requirements, Max. /Typ.[15]		**With Active Return**	
AC Voltage, 60 Hz		@ 90 V	@ 60 V
AC Power, Watts		45.5/41	45/40
AC Current, mA		670/630	820/740
DC Current, mA @ 24 V ± 0.5 V		1650/1475	1650/1475

B

Table B.6 Flex Max901e Bridger Amplifier, 1002 MHz, 55/70 Split (cont'd)

	FORWARD 2 O/P Bridger	RETURN 2 O/P Bridger
Level Control		
Range, dB @ 1002 MHz	+4/–5 dB	—
Accuracy (–40 to 60°C)	±0.5 dB	—
Output Level Range[16] (from nominal)	+5/–3 dB	—
Pilot Frequency Band[17] (recommended)	499.25 MHz (Single Channel)	—
Gain Control		
Plug-in PAD	NPB–XXX	NPB–XXX
Equalization to Compensate for Cable Loss		
Plug-in Equalizers for Additional Equalization	SEQ–1G–XX	MEQ–55–XX
Chrominance/Luminance Delay, Max.		
Channel 5, ns/3.58 MHz	14	—
Channel 6, ns/3.58 MHz	9	—
Return Group Delay, Max.		
5.5–7 MHz, ns	—	52
10–11.5 MHz, ns	—	7
52–53.5 MHz, ns	—	21
53.5–55 MHz, ns	—	36
70–71.5 MHz, ns	21	—
71.5–73 MHz, ns	15	—
Hum Modulation (Time Domain @ 15 A)		
5–10 MHz, –dBc	—	55
11–750 MHZ, –dBc	60	60
751–1002 MHz, –dBc	55	—

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1. Spacing at highest frequency with SEQ–1G–XX installed. Return spacing includes losses due to housing, diplex filters, and MEQ–55–XX.
2. The specifications are based on the amplifier configured (with two SPB–0) as a 2–output bridger with distribution outputs on Ports 2 and 3. When using distribution plug-ins SS–1000–2, SDC–1000–8 or SDC–1000–12, levels should be derated accordingly based on the accessory specifications.
3. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
4. Recommended minimum forward input levels at 1002 MHz including loss due to equalizer.
5. Recommended maximum return output level at 55 MHz including loss due to equalizer.
6. At specified operational tilt maximum output level for 870 MHz or 1002 MHz loading is 56.5 dBmV at HF.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1002 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing in the 54 to 550 frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1002 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise in the 70 to 550 MHz frequency spectrum.
11. The Noise Figure and C/N specifications are typical within specified passband.
12. The forward bridger port gain and flatness (ports 2, 3, and 5 only) is 0 ±1.0 dB as referenced to port 6.
13. The return bridger port gain and flatness (ports 2, 3, and 5 only) is 0 ±0.5 dB as referenced to port 6.

14. All testpoints are directional and referenced to their associated RF port. For “H” output option, all forward and return testpoints are internal and only accessible with the housing lid open. For “P” output option, all forward testpoints are external and all return testpoints are internal.
15. Power requirements indicated are with the HEPS790–2.3 power supply 122027–05. See 333995–17 for additional information. For 60VAC Powering: AC Power consumption in Watts divided by a factor of 43 = Amps required. For 90VAC Powering: For ≤ 67VAC, 1.03 x (AC Power consumption in watts divided by voltage) = Amps required. For 67 - 90VAC, AC Power consumption in watts divided by 65 = Amps required.
16. ALC pilot level range is based on a nominal pilot level of 43 dBmV for pilot frequencies ≤ 499.25 MHz or 39 dBmV for pilot frequencies > 499.25 MHz. C-COR recommends that if the pilot level, from a design standpoint, is more than +2/-1 dBmV from nominal, the ALC PAD should be changed to optimize the ALC pilot level range. This should alleviate any possible ALC setup and/or operation issues due to typical system level variations caused by system components flatness characteristics. See the FM901e equipment manual for correct selection of ALC PAD value to insure proper ALC setup and operation.
17. For ALC pilot frequencies of ≤ 499.25 MHz and below, the ALC pilot filter is a single channel device. This means that the adjacent channels will have no affect on the RF power level that the RF detector is measuring. For ALC pilot frequencies > 499.25 MHz, the ALC pilot filter is not a single channel device. This means that the adjacent QAM channels will have an affect on the RF power level that the RF detector is measuring. C-COR recommends that the adjacent QAM channels be present on the system before the ALC system of the amplifier station is balanced. This will avoid station re-balance in the future when those QAM channels would be added to the system.

Table B.7 Flex Max901e Trunk Amplifier, 1002 MHz, 65/85 Split, 33 dB Spaced, Different Tilt on Trunk and Bridger

	FORWARD		RETURN
	Trunk	2 O/P Bridger	Trunk & 2 O/P Bridger
General			
Passband, MHz	85–1002		5–42
Housing, MHz	1002		—
AC Current Passing, A			
Ports 1, 3, 4, 6	15		15
Ports 2, 5 (“H” and “P” options)	13		13
Typical Operating Conditions			
Operational Gain, dB[1, 2]	33	43	18
Channels, Number of NTSC[3]	79	79	6
Operating Levels (recommended)			
Frequency, MHz	1002/870/750/550/85	1002/870/750/550/85	65/5
Input, dBmV, min.[4]	9.0/8.4/8.4/7.6/9.7	9.0/8.4/8.4/7.6/9.2	17/17
Output, dBmV[5, 6]	42/40.5/39.5/37/32.5	52/49.5/47.5/44/35.5	35/35
Performance Specifications @ Recommended Levels			
(Temperature Range: –40 to 60°C)			
Carrier-to-Interference Ratio, dB[7]			
Composite Triple Beat	84	75	80
Second Order Beat (F1 ± F2)	—	—	—
Cross Modulation (per NCTA std.)[8]	76	67	74
Third Order Beat (F1 ± F2 ± F3)	—	—	—
Composite 2IM	79	73	82
Composite Intermodulation Noise CIN[9]	80	66	—
Composite Intermodulation Noise CIN[10]	86	72	—
Noise, 4 MHz, 75 Ohms[2]	59/59.4/59.4/57.6/57.7	59/59.4/59.4/57.6/57.7	62
Cenelec Performance Specification[11, 12]			
Output Level for 60 dBc CTB Performance[13]	55 dBmV(115 dBμV)		
Output Level for 70 dBc CSO Performance[12]	55 dBmV(115 dBμV)		
Noise Figure, dB (without EQ)[14]	8/7/7/8/10	8/7/7/8/10	14
Full Gain, dB (without EQ and ALC)	38	48	19
Factory Alignment (with ALC Reserve, without EQ)			
Cable Loss, dB @ 1002 MHz	13	13	—
Linear Equalization[15]	—	7.5	—
Flat Loss, dB[16]	21	31	19
Gain Slope, dB	–0.5 to 1.0	–1.0 to 1.0	—
Flatness (@ Gain Slope), ±dB[17, 18]	0.75	1.0	0.5
Return Loss, dB min., All Entry Ports	16	16	16
Testpoint Accuracy[19]			
–20 or –25 dB Forward Input TP, dB	±1.0		—
–20 or –25 dB Forward Output TP, dB	±0.5(85 to 550), ±1.0(551 to 1002)		—
–20 or –25 dB Return In and Out TP, dB	—		±0.5

Table B.7 Flex Max901e Trunk Amplifier, 1002 MHz, 65/85 Split, 33 dB Spaced, Different Tilt on Trunk and Bridger (cont'd)

	FORWARD		RETURN	
	Trunk	2 O/P Bridger	Trunk & 2 O/P Bridger	
Powering Requirements, Max./Typ.[20]			**With Active Return**	
AC Voltage, 60 Hz			@ 90 V	@ 60 V
AC Power, Watts			53.5/49	53/48
AC Current, mA			735/700	970/880
DC Current, mA @ 24 V ± 0.5 V			1955/1775	1955/1775
Level Control				
Range, dB @ 1002 MHz	+4/–5 dB		—	
Accuracy (–40 to 60°C)	±0.5 dB		—	
Output Level Range[21] (from nominal)	+5/–3 dB		—	
Pilot Frequency Band[22] (recommended)	499.25 MHz (Single Channel)		—	
Gain Control				
Plug-in PAD	NPB–XXX		NPB–XXX	
Equalization to Compensate for Cable Loss				
Plug-in Equalizers for Additional Equalization	SEQ–1G–XX		MEQ–65–XX	
Chrominance/Luminance Delay, Max.				
Channel S2, (PAL), ns/4.43 MHz	5		—	
Channel S3, (PAL), ns/4.43 MHz	4		—	
Channel 95, (NTSC), ns/3.58 MHz	10		—	
Channel 96, (NTSC), ns/3.58 MHz	7		—	
Return Group Delay, Max.				
5.5–7 MHz, ns	—		52	
10–11.5 MHz, ns	—		8	
62-63.5 MHz, ns	—		21	
63.5-65 MHz, ns	—		34	
85–86.5 MHz, ns	13		—	
86.5–88 MHz, ns	11		—	
Hum Modulation (Time Domain @ 15 A)				
5–10 MHz, –dBc	—		55	
11–750 MHZ, –dBc	60		60	
751–1002 MHz, –dBc	55		—	

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1. Spacing at highest frequency with SEQ–1G–XX installed. Return spacing includes losses due to housing, diplex filters, and MEQ–65–X.
2. The specifications are based on the amplifier configured (with two SPB–0) as a 2–output bridger with distribution outputs on Ports 3 and 6. When using distribution plug-ins SS–1000–2, SDC–1000–8 or SDC–1000–12, levels should be derated accordingly based on the accessory specifications.
3. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
4. Recommended minimum forward input levels at 1002 MHz including loss due to equalizer.
5. Recommended maximum return output level at 85 MHz including loss due to equalizer.
6. Bridger output: At specified operational tilt the maximum output level for 870 MHz or 1002 GHz loading is 56.5 dBmV @ HF.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross modulation specification number indicates typical cascade performance.

9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1002 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing in the 85 to 550 frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 870 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise in the 54 to 550 MHz frequency spectrum.
11. According to EN50083-3, 42 channel Cenelec loading and 8 dB slope.
12. Cenelec testing performed with NPB-020 installed in the bridger EQ/PAD location.
13. With bridger port 3 output levels at 55/47 dBmv, the trunk output (port 4) will be 46/38 dBmV. At the 46/38 dBmV output level, the trunk output performance will be 82 dBc minimum (CTB) and 78 dBc minimum (CSO).
14. The Noise Figure and C/N specifications are typical within specified passband.
15. Difference in linear loss between 85 MHz and 1002 MHz.
16. Total flat loss at 1002 MHz which includes insertion loss of linear EQ.
17. The forward bridger port gain and flatness is 11 ±1.0 dB as referenced to the trunk port with an NPB-000 installed in the bridger EQ/PAD location.
18. The return bridger port gain and flatness is 0 ±0.5 dB as referenced to the trunk port.
19. All testpoints are directional and referenced to their associated RF port. For “H” output option, all forward and return testpoints are internal and only accessible with the housing lid open. For “P” output option, all forward testpoints are external and all return testpoints are internal.
20. Power requirements indicated are with the HEPS790–2.3 power supply 122027–05. See 333995–17 for additional information. For 60VAC Powering: AC Power consumption in Watts divided by a factor of 43 = Amps required. For 90VAC Powering: For ≤ 67VAC, 1.03 x (AC Power consumption in watts divided by voltage) = Amps required. For 67 - 90VAC, AC Power consumption in watts divided by 65 = Amps required.
21. ALC pilot level range is based on a nominal pilot level of 37 dBmV for pilot frequencies ≤ 499.25 MHz or 32 dBmV for pilot frequencies > 499.25 MHz. C-COR recommends that if the pilot level, from a design standpoint, is more than +2/-1 dBmV from nominal, the ALC PAD should be changed to optimize the ALC pilot level range. This should alleviate any possible ALC setup and/or operation issues due to typical system level variations caused by system components flatness characteristics. See the FM901e equipment manual for correct selection of ALC PAD value to insure proper ALC setup and operation.
22. For ALC pilot frequencies of ≤ 499.25 MHz, the ALC pilot filter is a single channel device. This means that the adjacent channels will have no affect on the RF power level that the RF detector is measuring. For ALC pilot frequencies > 499.25 MHz, the ALC pilot filter is not a single channel device. This means that the adjacent QAM channels will have an affect on the RF power level that the RF detector is measuring. C-COR recommends that the adjacent QAM channels be present on the system before the ALC system of the amplifier station is balanced. This will avoid station re-balance in the future when those QAM channels would be added to the system.

Table B.8 Flex Max901e Trunk Amplifier, 1002 MHz, 65/85 Split, 32 dB Spaced, Same Tilt on Trunk and Bridger

	FORWARD		RETURN
	Trunk	2 O/P Bridger	Trunk & 2 O/P Bridger
General			
Passband, MHz	85–1002		5–65
Housing, MHz	1002		—
AC Current Passing, A			
Ports 1, 3, 4, 6	15		15
Ports 2, 5 ("H" and "P" options)	13		13
Typical Operating Conditions			
Operational Gain at 1002/870 MHz, dB[1, 2]	32/30	41/39	18
Channels, Number of NTSC[3]	73	73	6
Operating Levels (recommended)			
Frequency, MHz	1002/870/750/550/85		65/5
Input, dBmV, min.[4]	11/10.5/10/9.4/10.9		17/17
Output, dBmV[5, 6, 7]	43/40.5/38.5/35/26.5	52/49.5/47.5/44/35.5	35/35
Performance Specifications @ Recommended Levels			
(Temperature Range: –40 to 60°C)			
Carrier-to-Interference Ratio, dB[8]			
Composite Triple Beat	84	75	80
Second Order Beat (F1 ± F2)	—	—	—
Cross Modulation (per NCTA std.)[9]	76	67	74
Third Order Beat (F1 ± F2 ± F3)	—	—	—
Composite 2IM	79	73	82
Composite Intermodulation Noise CIN[10]	80	66	—
Composite Intermodulation Noise CIN[11]	86	72	—
Noise, 4 MHz, 75 Ohms[2]	62/61.5/61/59.4/58.9		62
Noise Figure, dB (without EQ)[12]	8/7/7/8/10		14
Full Gain, dB (without EQ and ALC)	37	46	19
Factory Alignment (with ALC Reserve, without EQ)			
Cable Loss, dB @ 1002 MHz[13]	22	22	—
Flat Loss, dB	11	20	19
Gain Slope, dB	–0.5 to 1.0	–1.0 to 1.0	—
Flatness (@ Gain Slope), ±dB[14, 15]	0.75	1.0	0.5
Return Loss, dB min., All Entry Ports	16	16	16
Testpoint Accuracy[16]			
–20 or –25 dB Forward Input TP, dB	±1.0		—
–20 or –25 dB Forward Output TP, dB	±0.5(70 to 550), ±1.0(551 to 1002)		—
–20 or –25 dB Return In and Out TP, dB	—		±0.5

Powering Requirements, Max./Typ.[17]	**With Active Return**	
AC Voltage, 60 Hz	@ 90 V	@ 60 V
AC Power, Watts	53.5/49	53/48
AC Current, mA	735/700	970/880
DC Current, mA @ 24 V ± 0.5 V	1955/1775	1955/1775

B

Table B.8 Flex Max901e Trunk Amplifier, 1002 MHz, 65/85 Split, 32 dB Spaced, Same Tilt on Trunk and Bridger (cont'd)

	FORWARD		RETURN
	Trunk	2 O/P Bridger	Trunk & 2 O/P Bridger
Level Control			
Range, dB @ 1002 MHz	+4/–5 dB		—
Accuracy (–40 to 60°C)	±0.5 dB		—
Output Level Range[18] (from nominal)	+5/–3 dB		—
Pilot Frequency Band (recommended)[19]	499.25 MHz (Single Channel)		—
Gain Control			
Plug-in PAD	NPB–XXX		NPB–XXX
Equalization to Compensate for Cable Loss			
Plug-in Equalizers for Additional Equalization	SEQ-750-XX SEQ–870–XX SEQ-1G-XX		MEQ–65–XX
Chrominance/Luminance Delay, Max.			
Channel S2, (PAL), ns/4.43 MHz	5		—
Channel S3, (PAL), ns/4.43 MHz	4		—
Channel 95, (NTSC), ns/3.58 MHz	10		—
Channel 96, (NTSC), ns/3.58 MHz	7		—
Return Group Delay, Max.			
5.5–7 MHz, ns	—		52
10–11.5 MHz, ns	—		8
62-63.5 MHz, ns	—		21
63.5-65 MHz, ns	—		34
85–86.5 MHz, ns	13		—
86.5–88 MHz, ns	11		—
Hum Modulation (Time Domain @ 15 A)			
5–10 MHz, –dBc	—		55
11–750 MHZ, –dBc	60		60
751–1002 MHz, –dBc	55		—

Specification Document Number 1502529 Rev B

1. Spacing at highest frequency with Forward EQ installed. Return spacing includes losses due to housing, diplex filters, and MEQ–65–X.
2. The specifications are based on the amplifier configured (with two SPB–0) as a 2–output bridger with distribution outputs on ports 3 and 6. When using distribution plug-ins SS–1000–2, SDC–1000–8 or SDC–1000–12, levels should be derated accordingly based on the accessory specifications.
3. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
4. Recommended minimum forward input levels at 870 MHz including loss due to equalizer.
5. Recommended maximum return output level at 85 MHz including loss due to equalizer.
6. Bridger output: At specified operational tilt, the maximum output level for 870 MHz loading is 56.5 dBmV at HF.
7. Forward trunk output levels achieved by installing an NPB-000 in the interstage PAD location and a GEQC-1 GHz-090 in the O/P EQ location. Forward bridger output levels are achieved by installing an NPB-020 in the Bridger EQ/PAD location.
8. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
9. Cross modulation specification number indicates typical cascade performance.

10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1002 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing in the 70 to 550 frequency spectrum.
11. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 870 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing in the 70 to 550 frequency spectrum.
12. The Noise Figure and C/N specifications are typical within specified passband.
13. The cable loss includes both the factory alignment cable loss of 13 dB at 1002 MHz and the cable equivalent loss of the GEQC-1 GHz-090 (9 dB) for a total of 22 dB.
14. The forward bridger port gain and flatness is 9 ±1.0 dB as referenced to the trunk port.
15. The return bridger port gain and flatness is 0 ±0.5 dB as referenced to the trunk port.
16. All testpoints are directional and referenced to their associated RF port. For “H” output option, all forward and return testpoints are internal and only accessible with the housing lid open. For “P” output option, all forward testpoints are external and all return testpoints are internal.
17. Power requirements indicated are with the HEPS790–2.3 power supply 122027–05. See 333995–17 for additional information. For 60VAC Powering: AC Power consumption in Watts divided by a factor of 43 = Amps required. For 90VAC Powering: For ≤ 67VAC, 1.03 x (AC Power consumption in watts divided by voltage) = Amps required. For 67 - 90VAC, AC Power consumption in watts divided by 65 = Amps required.
18. ALC pilot level range is based on a nominal pilot level of 34 dBmV for pilot frequencies ≤ 499.25 MHz or 31 dBmV for pilot frequencies > 499.25 MHz. C-COR recommends that if the pilot level, from a design standpoint, is more than +2/-1 dBmV from nominal, the ALC PAD should be changed to optimize the ALC pilot level range. This should alleviate any possible ALC setup and/or operation issues due to typical system level variations caused by system components flatness characteristics. See the FM901e equipment manual for correct selection of ALC PAD value to insure proper ALC setup and operation.
19. For ALC pilot frequencies of ≤ 499.25 MHz, the ALC pilot filter is a single channel device. This means that the adjacent channels will have no affect on the RF power level that the RF detector is measuring. For ALC pilot frequencies > 499.25 MHz, the ALC pilot filter is not a single channel device. This means that the adjacent QAM channels will have an affect on the RF power level that the RF detector is measuring. C-COR recommends that the adjacent QAM channels be present on the system before the ALC system of the amplifier station is balanced. This will avoid station re-balance in the future when those QAM channels would be added to the system.

Table B.9 Flex Max901e Bridger Amplifier, 1002 MHz, 65/85 Split

	FORWARD 2 O/P Bridger	RETURN 2 O/P Bridger
General		
Passband, MHz	85–1002	5–65
Housing, MHz	1002	—
AC Current Passing, A		
Ports 1, 3, 4, 6	15	15
Ports 2, 5 (“H” and “P” options)	13	13
Typical Operating Conditions		
Operational Gain, dB[1, 2]	43	18
Channels, Number of NTSC[3]	79	6
Operating Levels (recommended)		
Frequency, MHz	1002/870/750/550/85	65/5
Input, dBmV, min.[4]	9/8.1/7.8/7.4/9.5	17/17
Output, dBmV[5, 6]	52/49.5/47.5/44/35.5	35/35
Performance Specifications @ Recommended Levels		
(Temperature Range: –40 to 60°C)		
Carrier-to-Interference Ratio, dB[7]		
Composite Triple Beat	75	80
Second Order Beat (F1 ± F2)	—	—
Cross Modulation (per NCTA std.)[8]	67	74
Third Order Beat (F1 ± F2 ± F3)	—	—
Composite 2IM	73	82
Composite Intermodulation Noise CIN[9]	73	—
Composite Intermodulation Noise CIN[10]	79	—
Noise, 4 MHz, 75 Ohms[2]	59/58.1/57.8/58.4/58.5	64
Cenelec Performance Specification[11]		
Output Level for 60 dBc CTB Performance	55 dBmV(115 dBµV)	
Output Level for 70 dBc CSO Performance	55 dBmV(115 dBµV)	
Noise Figure, dB (without EQ)[12]	8/8/8/7/9	12
Full Gain, dB (without EQ and ALC)	48	19
Factory Alignment (with ALC Reserve, without EQ)		
Cable Loss, dB @ 1002 MHz	23	—
Flat Loss, dB	21	19
Gain Slope, dB	–1.0 to 1.0	—
Flatness (@ Gain Slope), ±dB[13 14]	±1.0	0.5
Return Loss, dB min., All Entry Ports	16	16
Testpoint[15]		
–20 or –25 dB Forward Input TP, dB	±1.0	—
–20 or –25 dB Forward Output TP, dB	±0.5(54 to 550), ±1.0(551 to 1002)	—
–20 or –25 dB Return In and Out TP, dB	—	±0.5

Table B.9 Flex Max901e Bridger Amplifier, 1002 MHz, 65/85 Split (cont'd)

	FORWARD 2 O/P Bridger	RETURN 2 O/P Bridger	
Powering Requirements, Max. /Typ.[16]		**With Active Return**	
AC Voltage, 60 Hz		@ 90 V	@ 60 V
AC Power, Watts		45.5/41	45/40
AC Current, mA		670/630	820/740
DC Current, mA @ 24 V ± 0.5 V		1650/1475	1650/1475
Level Control			
Range, dB @ 1002 MHz	+4/–5 dB	—	
Accuracy (–40 to 60°C)	±0.5 dB	—	
Output Level Range[17] (from nominal)	+5/–3 dB	—	
Pilot Frequency Band[18] (recommended)	499.25 MHz (Single Channel)	—	
Gain Control			
Plug-in PAD	NPB–XXX	NPB–XXX	
Equalization to Compensate for Cable Loss			
Plug-in Equalizers for Additional Equalization	SEQ–1G–XX	MEQ–65–XX	
Chrominance/Luminance Delay, Max.			
Channel S2, (PAL), ns/4.43 MHz	5	—	
Channel S3, (PAL), ns/4.43 MHz	4	—	
Channel 95, (NTSC), ns/3.58 MHz	10	—	
Channel 96, (NTSC), ns/3.58 MHz	7	—	
Return Group Delay, Max.			
5.5–7 MHz, ns	—	52	
10–11.5 MHz, ns	—	8	
62–63.5 MHz, ns	—	21	
63.5–85 MHz, ns	—	34	
85-86.5 MHz, ns	—	13	
86.5-88 MHz, ns	—	11	
Hum Modulation (Time Domain @ 15 A)			
5–10 MHz, –dBc	—	55	
11–750 MHZ, –dBc	60	60	
751–1002 MHz, –dBc	55	—	

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1. Spacing at highest frequency with SEQ–1G–XX installed. Return spacing includes losses due to housing, diplex filters, and MEQ–55–XX.
2. The specifications are based on the amplifier configured (with two SPB–0) as a 2–output bridger with distribution outputs on Ports 2 and 3. When using distribution plug-ins SS–1000–2, SDC–1000–8 or SDC–1000–12, levels should be derated accordingly based on the accessory specifications.
3. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
4. Recommended minimum forward input levels at 1002 MHz including loss due to equalizer.
5. Recommended maximum return output level at 55 MHz including loss due to equalizer.
6. At specified operational tilt maximum output level for 870 MHz or 1 GHz loading is 56.5 dBmV at HF.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross modulation specification number indicates typical cascade performance.

9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1002 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing in the 54 to 550 frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1002 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise in the 70 to 550 MHz frequency spectrum.
11. According to EN50083-3, 42 channel Cenelec loading and 8 dB slope.
12. The Noise Figure and C/N specifications are typical within specified passband.
13. The forward bridger port gain and flatness (ports 2, 3, and 5 only) is 0 ±1.0 dB as referenced to port 6.
14. The return bridger port gain and flatness (ports 2, 3, and 5 only) is 0 ±0.5 dB as referenced to port 6.
15. All testpoints are directional and referenced to their associated RF port. For “H” output option, all forward and return testpoints are internal and only accessible with the housing lid open. For “P” output option, all forward testpoints are external and all return testpoints are internal.
16. Power requirements indicated are with the HEPS790–2.3 power supply 122027–05. See 333995–17 for additional information. For 60VAC Powering: AC Power consumption in Watts divided by a factor of 43 = Amps required. For 90VAC Powering: For ≤ 67VAC, 1.03 x (AC Power consumption in watts divided by voltage) = Amps required. For 67 - 90VAC, AC Power consumption in watts divided by 65 = Amps required.
17. ALC pilot level range is based on a nominal pilot level of 43 dBmV for pilot frequencies ≤ 499.25 MHz or 39 dBmV for pilot frequencies > 499.25 MHz. C-COR recommends that if the pilot level, from a design standpoint, is more than +2/-1 dBmV from nominal, the ALC PAD should be changed to optimize the ALC pilot level range. This should alleviate any possible ALC setup and/or operation issues due to typical system level variations caused by system components flatness characteristics. See the FM901e equipment manual for correct selection of ALC PAD value to insure proper ALC setup and operation.
18. For ALC pilot frequencies of ≤ 499.25 MHz, the ALC pilot filter is a single channel device. This means that the adjacent channels will have no affect on the RF power level that the RF detector is measuring. For ALC pilot frequencies > 499.25 MHz, the ALC pilot filter is not a single channel device. This means that the adjacent QAM channels will have an affect on the RF power level that the RF detector is measuring. C-COR recommends that the adjacent QAM channels be present on the system before the ALC system of the amplifier station is balanced. This will avoid station re-balance in the future when those QAM channels would be added to the system.

Table B.10 Housing Assembly—Physical Specifications

Specification	Measurement
Standard 6-Port Housing	
Width	16.00 inches (40.6 cm)
Height	10.71 inches (27.2 cm)
Depth	5.35 inches (13.6 cm)
Weight	
(uncrated)	10.14 lbs (4.60 kg)
(crated)	13.24 lbs (6.01 kg)
Bypass 6-Port Housing	
Width	18.1 inches (45.97 cm)
Height	10.75 inches (27.34 cm)
Depth	5.5 inches (13.97 cm)
Weight	
(uncrated)	11.26 lbs (5.11 kg)
(crated)	14.36 lbs (6.52 kg)

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Table B.11 Value Max Transponder Specifications

Characteristic	Specification
Receiver Specifications	
Frequency Range	Agile, 48 to 162 MHz
Frequency Resolution	0.1 MHz steps
Modulation Type	FSK
Modulation Tolerance	±2 kHz
Frequency Deviation	±50 kHz or ±67 kHz
Data Rate	38.4 kbps
Data Format	asynchronous, NRZ, burst packet
Input Levels	
Maximum	+20 dBmV
Nominal	0 dBmV
Minimum	–20 dBmV
Input Return Loss (75 Ohms)	14 dB, 50 to 1002 MHz
Interference Rejection	±300 kHz, 0 dB ±600 kHz, 20 dB
Spurious Outputs	–15 dBmV max., 50 to 1002 MHz
Transmitter Specifications	
Frequency Range	Agile, 5 to 21 MHz
Tuning Resolution	0.1 MHz steps
Frequency Tolerance	0.01%, unmodulated mark
Modulation Type	FSK
Modulation Tolerance	±2 kHz
Frequency Deviation	±50 kHz or ±67 kHz
Data Rate	38.4 kb/s
Data Format	asynchronous, NRZ, burst packet
Output Levels	
Maximum	+40 dBmV, ±3 dB (0 dB attenuation)
Minimum	+10 dBmV, ±3 dB (30 dB attenuation)
Output Attenuator	0 to 30 dB in 2 dB steps, ±1 dB
Bandwidth	300 kHz @ –40 dB 500 kHz @ –50 dB
Output Return Loss (75 Ohms)	14 dB, 5 to 42 MHz
Spurious Outputs	–55 dBc max. relative to transponder transmit carrier or –15 dBmV max., 5 to 88 MHz (referred to a 6 MHz measurement bandwidth)
Low Frequency Disturbances (LFD), defined as power supply switching frequency, etc., below band spurious that may have harmonics to high frequencies.	<–65 dBc with transponder installed. Note: This is different from single in-band spurious requirement because these spurs are closely spaced.

Table B.11 Value Max Transponder Specifications (cont'd)

Characteristic	Specification
Power Requirements	
Power Consumption	
Typical	40 mA @ 24 VDC (0.96 Watt)
Maximum	42 mA @ 24 VDC (1 Watt)
Supply Tolerance	±5%
I^2C Requirements	
Specification	Phillips I^2C Spec 2.1 (Not fully I^2C compatible)
Mode	I^2C Master
Voltage	3.3 VDC
Indicator	
Green LED	Polling, status, and power indicator
Environmental Operation	
Temperature	–40 to 85°C, case
Humidity	0 to 90%, noncondensing
Physical	
Size	50 x 35.5 x 15 mm (1.97 x 1.38 x 0.59 in.)
Weight	71 grams (2.5 oz.)
Connectors	
Interface Connector	JST 15R-JET-P
Local Control Port	2 x 5, miniature, keyed
Tamper Photo Detector	
Optical Type	Photo transistor sensor

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Functional Block Diagrams

This appendix provides functional block diagrams to support the identification and balancing of Flex Max901e 1 GHz Trunk and Bridger Amplifierss.

Figure C.1

Flex Max901e Series Trunk Amplifier

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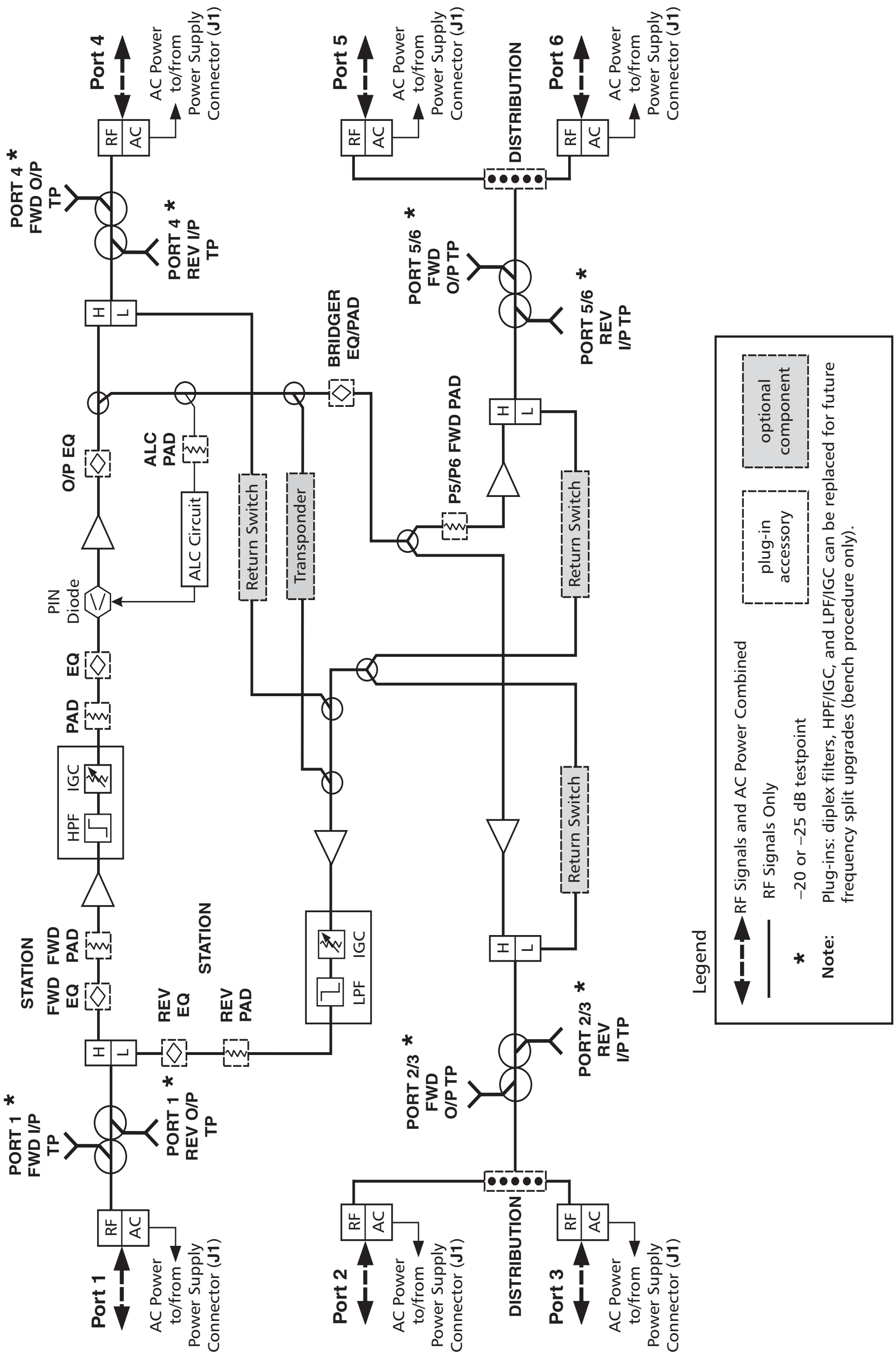
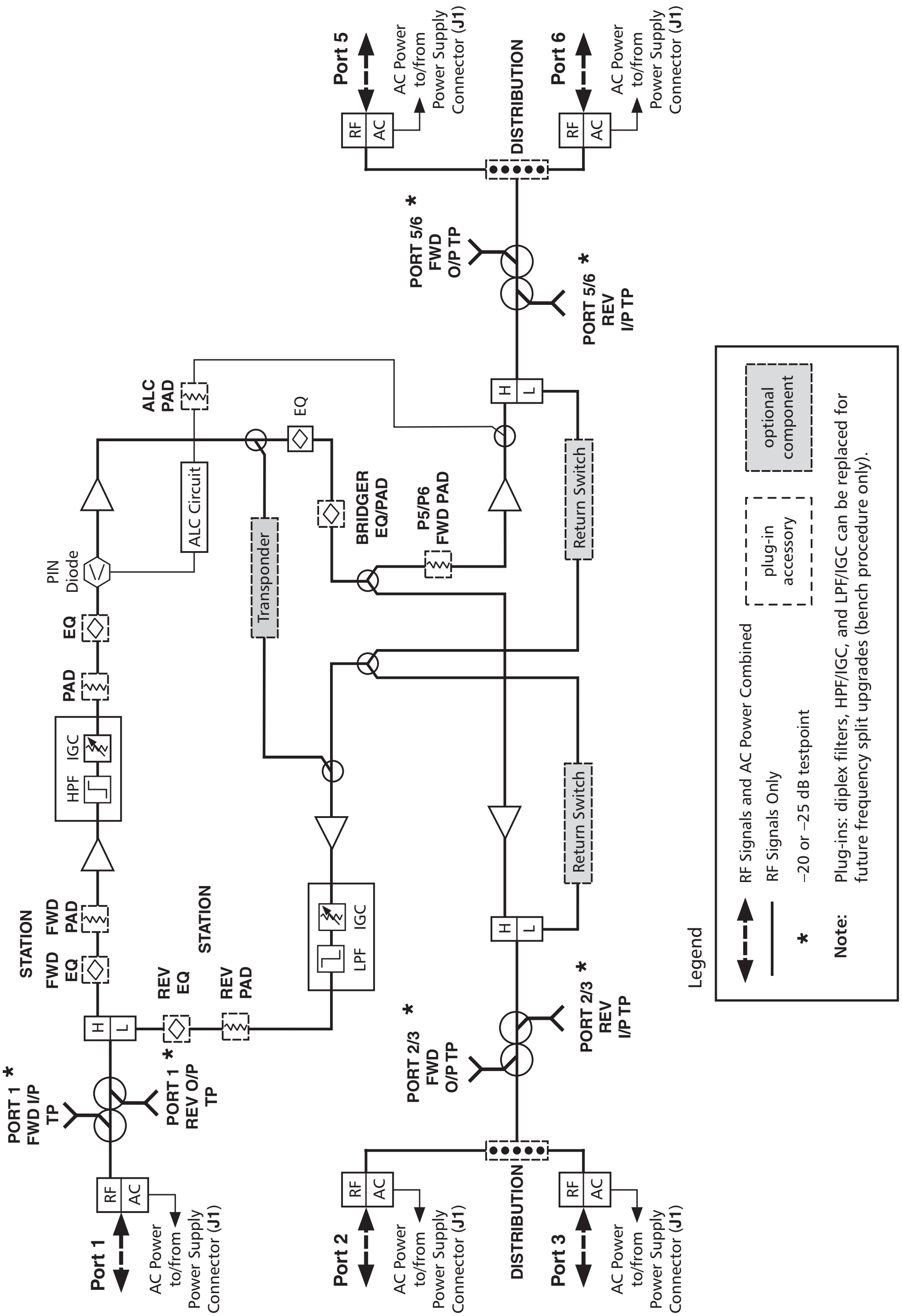


Figure C.2

Flex Max901e Series Bridger Amplifier



C

Reference Tables

This section presents product tables that support the balancing procedures of *Factory-Shipped Configurations for Flex Max901e Trunk and Bridger Amplifiers* on page 5-9 and *Return Balancing* on page 5-20.

Use Of Accessory Tables

There are two methods for using the Accessory Tables to determine the correct accessory needed to balance an Flex Max901e:

- *When the Equalization Value is Known*
- *When Preceding Cable Loss and Internal Equalization are Known*

When the Equalization Value is Known

This procedure assumes prior calculation of the Equalization Value as defined in the Forward Balancing procedure (Refer to *Factory-Shipped Configurations for Flex Max901e Trunk and Bridger Amplifiers* on page 5-9.)

- If the Equalization Value calculated during Forward Balancing is positive, you will need to use an equalizer to balance the Flex Max901e and should refer to *Equalizer Selection (Positive Equalization Value)*.
- If the Equalization Value calculated during Forward Balancing is negative, you will need to use a cable simulator to balance the Flex Max901e and should refer to *Cable Simulator Selection (Negative Equalization Value)* on page D-2.

Equalizer Selection (Positive Equalization Value)

Select an equalizer from the appropriate equalizer table in *Accessory Tables* on page D-6 that has a tilt as close as possible to the desired Equalization Value. If the desired equalizer value is at the midpoint between equalizer values, select the equalizer with the lower value. When selecting an equalizer, be sure to account for the accessory's tilt. The tilt for a particular accessory is calculated as follows:

	Insertion Loss at Low Balancing Carrier
–	**Insertion Loss at High Balancing Carrier**
=	**SEQ/MEQ Tilt**

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For example, if you calculated an Equalization Value of 2 dB, then you need an SEQ-1G-03 equalizer because:

	3.0 (Insertion Loss at 42 MHz)
–	**1.0 (Insertion Loss at 1002 MHz)**
=	**2.0 (Tilt for SEQ-1G-03 Series Cable Equalizers)**

Cable Simulator Selection (Negative Equalization Value)

Select a cable simulator from the appropriate table in *Accessory Tables* on page D-6 that has a tilt as close as possible to the desired Equalization Value. If the desired equalizer value is at the midpoint between equalizer values, select the equalizer with the lower value. When selecting an equalizer, be sure to account for the accessory's tilt. The tilt for a particular accessory is calculated as follows:

	Insertion Loss at Low Balancing Carrier
–	**Insertion Loss at High Balancing Carrier**
=	**SCS Tilt**

For example, if you calculated an Equalization Value of –2dB, then you would need an SCS-1G-03 cable simulator because:

	1.0 (Insertion Loss at 54 MHz)
–	**3.0 (Insertion Loss at 1002 MHz)**
=	**–2.0 (Tilt for SCS-1G-03 Series Cable Simulators)**

When Preceding Cable Loss and Internal Equalization are Known

This procedure accounts for cable losses and the internal equalization of the Flex Max901e. To use the *dB of Cable Equalized at Highest Frequency* (for cable equalizers) and *dB of cable simulated* (for cable simulators) columns of the accessory tables, the amount of factory installed alignment of the Flex Max901e (if any) must be known. This information is found on the Flex Max901e Specification Sheet.

1. Note the amount of cable loss the Flex Max901e is designed to accommodate at the highest system frequency as listed under *Factory Alignment/Cable Loss* on the Flex Max901e Specification sheet.

2. To determine the actual *system cable loss* at the highest frequency, do either of the following:

   - Refer to the System Map and note the cable loss in dB preceding the Flex Max901e being balanced.

   - Calculate the cable loss using cable length and the Manufacturer's Cable Loss Charts.

3. Subtract the Flex Max901e's factory-installed alignment from the system cable loss to determine the dBs of cable equalization/simulation required at the highest frequency.

	System Cable Loss
–	**Factory Alignment/Cable Loss**
=	**X dB**

   - If X dB is positive (+), refer to the SEQ table that lists the accessories being used in the system. Select the SEQ having a value as close to X dB as possible, as listed in the “dB of Cable Equalized at Highest Frequency” column.

   - If X dB is negative (–), refer to the SCS table that lists the accessories being used in the system. Select the SCS with a value as close to X dB as possible, as listed in the “dB of Cable Simulated at Highest Frequency” column.

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Installing Plug-in Accessories

Note *Installing and removing plug-in accessories disrupts customer service.*

Upgrade Information

While SEQ-1G and SCS-1G plug-in accessories will address all bandwidths up to 1 GHz, you may wish to reuse your current equalizers and cable simulators until you expand your system to 1 GHz.The following plug-in accessory information applies to all FlexNet 700, 800, and 900 series upgrades. Please note:

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- SPB series PADs **cannot** be used. NPB series PADS are required.
- MEQ return equalizers **can** be used.
- All SEQ-750 and SEQ-862 series equalizers (with and without covers) **can** be used.
- While the Flex Max901e trunk amplifiers are designed for 1 GHz operation, they can be configured for use as spares in existing 750 or 870 MHz systems. Refer to *Power Supply Configuration* beginning on page 5-3 for the appropriate plug-in accessories and locations for 1 GHz or 750/870 operation.

Equalizers are keyed so they can only be installed one way. The Flex Max901es may have factory installed jumpers that provide a continuous signal path across accessory plug-in areas. The two types of jumpers include:

- soldered-in jumpers
- removable jumper wires

Before installing any accessories, these jumpers/jumper wires *must* be removed. Soldered-in jumpers must be cut from the motherboard (see *Soldered-in Jumper Removal* on page D-5 for instructions), while removable jumper wires can be pulled out. When the jumpers/jumpers wires are removed, use an NPB-000, SEQ-0, or SEQ-1G-00 where appropriate to provide continuity (zero loss) for the signal path.

Soldered-in Jumper Removal

Some plug-in locations have soldered-in jumpers next to a plug-in location. If an accessory will be installed in any plug-in location that has a soldered-in jumper, the soldered-in jumper must first be removed completely before installing the accessory.

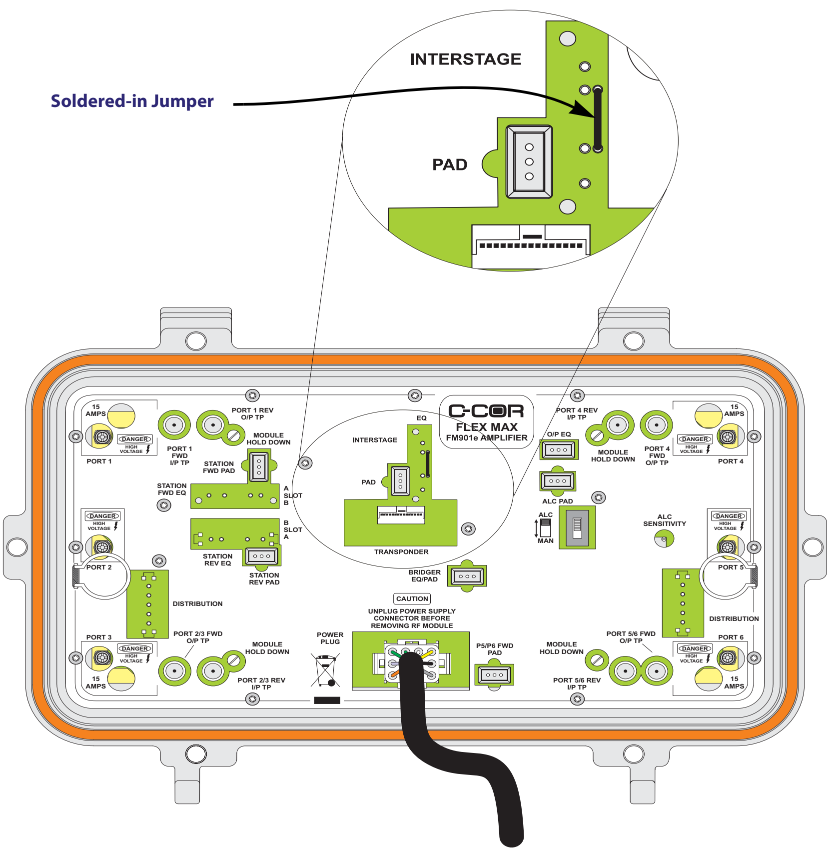
CAUTION *Use caution when removing soldered-in jumpers to ensure that no loose wire scraps remain on the RF module printed circuit board.*

➤ *To remove a soldered-in jumper*

1. Find the jumper wire in a plug-in location (**PAD, EQ**).
2. Use wire cutters to cut one end of the jumper.
3. Use needlenose pliers to grasp the jumper at the cut end.
4. While firmly grasping the jumper, use wire cutters to cut the remaining soldered end of the jumper.
5. Remove the jumper with the needlenose pliers.

Figure D.1

Example of Soldered-in Jumpers



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Accessory Tables

Equalizers provide sloped attenuation of RF signal with the greatest attenuation occurring at the lowest rated frequency. Cable simulators provide sloped attenuation of RF signal with the greatest attenuation occurring at the highest rated frequency. PADs provide flat loss attenuation of RF signal across the entire passband.

- SEQ-1G series cable equalizers and SCS-1G cable simulators are designed for forward balancing 1002 MHz systems.
- SEQ-862 series cable equalizers and SCS-862 cable simulators are designed for 870 MHz systems. SEQ-862 equalizers, however, with and without covers, can still be used with Flex Max901e 1 GHz amplifiers.
- SEQ-750 series cable equalizers and SCS-750 cable simulators are designed for 750 MHz systems. SEQ-750 equalizers, however, with and without covers, can be used with Flex Max901e 1 GHz amplifiers.
- MEQ/MEQT-42, MEQ/MEQT-55, and MEQ/MEQT-65 cable equalizers are designed for return balancing and should be selected according to the return path bandwidth.
- NPB series cable attenuators may be used for both forward and return balancing in any system.

Table D.1 SEQ-1G Series Cable Equalizers

P/N	Insertion Loss in dB at Frequency (MHz)								*
	54	85	105	222	550	750	870	1002	
SEQ-1G-00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SEQ-1G-02	2.0	1.9	1.8	1.5	1.2	0.8	0.7	0.7	1.55
SEQ-1G-03	2.9	2.8	2.6	2.3	1.7	1.1	0.9	0.8	2.8
SEQ-1G-04	4.0	3.8	3.6	3.1	2.1	1.6	1.4	1.0	3.7
SEQ-1G-05	5.0	4.7	4.6	3.8	2.4	1.7	1.4	1.0	5.1
SEQ-1G-06	6.0	5.7	5.5	4.6	2.8	2.0	1.6	1.0	6.35
SEQ-1G-07	7.0	6.6	6.4	5.4	3.1	2.0	1.6	1.0	7.75
SEQ-1G-08	8.0	7.4	7.1	5.8	3.4	2.2	1.6	1.0	8.9
SEQ-1G-09	9.0	8.5	8.2	6.8	3.8	2.5	1.9	1.0	10.2
SEQ-1G-10	10.0	9.3	9.0	7.3	4.0	2.5	1.9	1.0	11.45
SEQ-1G-11	11.0	10.4	10.0	8.1	4.5	2.9	2.1	1.0	12.7
SEQ-1G-12	12.0	11.1	10.8	8.8	4.9	3.0	2.1	1.0	14.0
SEQ-1G-13	13.0	12.2	11.8	9.5	5.1	3.2	2.2	1.0	15.25
SEQ-1G-14	14.0	13.0	12.4	10.2	5.7	3.5	2.3	1.0	16.5
SEQ-1G-15	14.9	13.9	13.3	10.8	5.8	3.5	2.3	1.0	17.8
SEQ-1G-16	16.0	14.9	14.3	11.5	6.3	3.7	2.4	1.0	19.05
SEQ-1G-17	17.0	15.6	15.0	12.2	6.5	3.9	2.4	1.0	20.3
SEQ-1G-18	18.0	16.9	16.2	13.2	7.0	4.0	2.4	0.8	21.8
SEQ-1G-19	19.0	17.7	16.9	13.7	7.3	4.1	2.4	0.8	23.05
SEQ-1G-20	20.0	18.5	17.7	14.2	7.6	4.4	2.6	0.8	24.05

*dB of cable equalized at 1002 MHz

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Return Loss I/O: 18 dB, min. SEQ-1G-02 through 18 16 dB, min. SEQ-1G-19 and 20

Passband Flatness: ±0.3 dB SEQ-1G-02 through 18 ±0.4 dB SEQ-1G-19 and 20

Table D.2 SCS-1G Series Cable Simulators

P/N	Insertion Loss in dB at Frequency (MHz)								dB of cable simulated at							
	50	70	80	550	750	806	862	1002	350	450	550	650	750	806	862	1002
SCS-1G-02	1.0	1.0	1.1	1.6	1.8	1.9	1.9	2.0	0.7	0.8	0.9	1.0	1.1	1.1	1.2	1.3
SCS-1G-03	1.0	1.1	1.1	2.3	2.6	2.7	2.8	3.0	1.4	1.6	1.8	2.0	2.2	2.2	2.3	2.5
SCS-1G-04	1.0	1.1	1.2	2.9	3.4	3.6	3.7	4.0	2.1	2.4	2.7	3.0	3.2	3.3	3.5	3.8
SCS-1G-05	1.0	1.2	1.3	3.6	4.3	4.4	4.6	5.0	2.8	3.2	3.6	3.9	4.3	4.5	4.6	5.0
SCS-1G-06	1.0	1.2	1.3	4.2	5.1	5.3	5.5	6.0	3.5	4.0	4.5	4.9	5.3	5.6	5.8	6.3
SCS-1G-07	1.0	1.3	1.4	4.9	5.9	6.2	6.4	7.0	4.2	4.8	5.4	5.9	6.4	6.7	6.9	7.5
SCS-1G-08	1.0	1.3	1.5	5.5	6.7	7.0	7.3	8.0	4.9	5.6	6.3	6.9	7.5	7.8	8.1	8.8
SCS-1G-09	1.0	1.4	1.5	6.1	7.5	7.9	8.2	9.0	5.6	6.4	7.2	7.9	8.6	8.9	9.2	10.0
SCS-1G-10	1.0	1.4	1.6	6.8	8.3	8.7	9.1	10.0	6.3	7.2	8.1	8.9	9.6	10.0	10.4	11.3
SCS-1G-11	1.0	1.5	1.7	7.4	9.2	9.6	10.0	11.0	7.0	8.0	9.0	9.9	10.7	11.1	11.5	12.5
SCS-1G-12	1.0	1.5	1.7	8.1	10.0	10.5	10.9	12.0	7.7	8.8	9.9	10.8	11.8	12.2	12.7	13.8
SCS-1G-13	1.0	1.6	1.8	8.7	10.8	11.3	11.8	13.0	8.4	9.6	10.8	11.8	12.8	13.4	13.9	15.0
SCS-1G-14	1.0	1.6	1.9	9.4	11.6	12.2	12.7	14.0	9.1	10.4	11.6	12.8	13.9	14.5	15.0	16.3
SCS-1G-15	1.0	1.7	2.0	10.0	12.4	13.0	13.6	15.0	9.8	11.2	12.5	13.8	15.0	15.6	16.2	17.5

Passband Flatness: ±0.4 dB

Specification 1500883 Rev A

Return Loss I/O: 16/16 dB (-02 thru -12)

Return Loss I/O: 15/15 dB (-13 thru -15)

D

Table D.3 GEQL-1 GHz Series Linear Equalizers

Model Number	Insertion Loss in dB at Frequency in MHz												
	45	70	80	90	100	300	400	500	600	700	800	900	1000
GEQL-1GHz-000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GEQL-1GHz-020	2.0	2.0	2.0	2.0	1.9	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0
GEQL-1GHz-030	3.0	2.9	2.9	2.9	2.9	2.5	2.3	2.0	1.8	1.6	1.4	1.2	1.0
GEQL-1GHz-040	4.0	3.9	3.9	3.9	3.8	3.2	2.9	2.6	2.3	2.0	1.6	1.3	1.0
GEQL-1GHz-050	5.0	4.9	4.9	4.8	4.8	3.9	3.5	3.1	2.7	2.3	1.8	1.4	1.0
GEQL-1GHz-060	6.0	5.9	5.8	5.8	5.7	4.7	4.1	3.6	3.1	2.6	2.0	1.5	1.0
GEQL-1GHz-070	7.0	6.8	6.8	6.7	6.7	5.4	4.8	4.1	3.5	2.9	2.3	1.6	1.0
GEQL-1GHz-080	8.0	7.8	7.7	7.7	7.6	6.1	5.4	4.7	3.9	3.2	2.5	1.7	1.0
GEQL-1GHz-090	9.0	8.8	8.7	8.6	8.5	6.9	6.0	5.2	4.4	3.5	2.7	1.8	1.0
GEQL-1GHz-100	10.0	9.8	9.7	9.6	9.5	7.6	6.7	5.7	4.8	3.8	2.9	1.9	1.0
GEQL-1GHz-110	11.0	10.7	10.6	10.5	10.4	8.3	7.3	6.2	5.2	4.1	3.1	2.0	1.0
GEQL-1GHz-120	12.0	11.7	11.6	11.5	11.4	9.1	7.9	6.8	5.6	4.5	3.3	2.2	1.0
GEQL-1GHz-130	13.0	12.8	12.7	12.5	12.4	9.9	8.6	7.3	6.1	4.8	3.5	2.3	1.0

Impedance: 75 ohm Molded red plastic 3-pin plug-in Specification 1500202 Rev C

Return Loss I/O: 18dB min.

Flatness: ±0.3dB; GEQL-1GHz-000: ±0.15dB (Flatness measured with respect to slope)

Insertion loss for other frequencies can be determined on a linear tilt basis

Table D.4 GEQC-1 GHz Cable Equalizer

Model Number	Insertion Loss in dB at Frequency in MHz											
	45	54	70	80	222	400	500	600	700	800	870	1000
GEQC-1 GHz-050	4.7	4.6	4.5	4.4	3.5	2.7	2.3	2.0	1.7	1.4	1.2	0.7
GEQC-1 GHz-070	6.4	6.2	6.0	5.9	4.6	3.5	3.0	2.5	2.0	1.6	1.4	0.7
GEQC-1 GHz-090	7.8	7.6	7.5	7.3	5.7	4.2	3.5	2.8	2.1	1.6	1.3	0.8

dB per 100 feet is 1.87416 Molded brown plastic 3-pin plug-in Specification 1502429 Rev B

Impedance: 75 ohm

Return Loss I/O: 22 dB min.

Flatness: ± 0.3 dB.

Bandwidth: 45-1000MHz

Definition of cable signature: (S-Parameter file cable loss) X (Fiber T-10.625” from equation)

Table D.5 GEQC-870-080 Cable Equalizer

Model Number	Insertion Loss in dB at Frequency in MHz										
	45	54	70	80	222	400	500	600	700	800	870
GEQC-870-080	6.9	6.8	6.6	6.5	4.9	3.5	2.9	2.2	1.5	1.0	0.7

dB per 100 feet is 1.87416 Molded blue plastic 3-pin plug-in Specification 1501842 Rev B

Impedance: 75 ohm

Return Loss I/O: 22 dB min.

Flatness: ± 0.3 dB.

Bandwidth: 45-870MHz

Definition of cable signature: S-Parameter file cable loss “Times Fiber T-10 .625” from equation)

Table D.6 SEQ-862 Series Cable Equalizers[1]

Model	P/N	Insertion Loss in dB at Frequency (MHz)								*
		54	70	80	500	600	700	800	862	
SEQ-0	**162290-00**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SEQ-862-02	**162240-25**	1.9	1.9	1.9	1.4	1.3	1.2	1.1	1.0	1.0
SEQ-862-03	**162240-15**	2.9	2.8	2.8	1.6	1.5	1.4	1.2	1.0	2.0
SEQ-862-04	**162240-08**	4.0	4.0	4.0	1.9	1.6	1.4	1.2	1.0	4.0
SEQ-862-05	**162240-16**	4.8	4.6	4.5	2.1	1.7	1.4	1.2	1.0	5.0
SEQ-862-06	**162240-17**	5.9	5.6	5.6	2.6	2.1	1.6	1.2	1.0	6.5
SEQ-862-07	**162240-18**	6.9	6.6	6.6	3.1	2.5	1.9	1.4	1.0	7.8
SEQ-862-08	**162240-10**	7.8	7.5	7.4	3.4	2.7	2.1	1.4	1.0	8.7
SEQ-862-09	**162240-19**	8.8	8.4	8.3	3.6	2.8	2.0	1.4	1.0	10.5
SEQ-862-10	**162240-20**	9.6	9.1	8.9	3.8	2.9	2.1	1.4	1.0	11.0
SEQ-862-11	**162240-21**	10.8	10.3	10.2	4.4	3.5	2.5	1.6	1.0	13.0
SEQ-862-12	**162240-11**	11.6	11.1	10.8	4.7	3.7	2.7	1.7	1.0	14.5
SEQ-862-13	**162240-22**	12.8	12.4	12.0	5.0	3.9	2.8	1.7	1.0	15.5
SEQ-862-14	**162240-23**	13.6	12.9	12.7	5.2	4.0	2.9	1.8	1.0	16.5
SEQ-862-15	**162240-24**	14.5	13.9	13.5	5.6	4.2	3.0	1.8	1.0	17.5
SEQ-862-16	**162240-12**	15.3	14.7	14.3	6.1	4.7	3.3	2.0	1.0	19.0
SEQ-862-17	**162240-28**	17.5	16.8	16.4	6.5	5.1	3.5	2.0	1.0	21.3
SEQ-862-18	**162240-29**	18.4	17.5	17.2	6.8	5.2	3.6	2.0	1.0	22.4
SEQ-862-19	**162240-30**	19.5	18.6	18.2	7.2	5.7	3.8	2.0	1.0	23.9
SEQ-862-20	**162240-31**	20.3	19.4	19.0	7.6	5.8	3.9	2.0	1.0	24.9

Passband Flatness: ±0.3 dB | *dB of cable equalized at highest frequency

Return Loss I/O: 20/18 dB, min. | Specification 600438 Rev J

1. Only SEQ-862 equalizers **without** covers can be used with Flex Max 901 trunk and bridger amplifiers.

Table D.7 SCS-862 Series Cable Simulators

Model	P/N	Insertion Loss in dB at Frequency (MHz)							dB of cable simulated at				
		54	70	80	550	750	806	862	450	550	750	806	862
SCS-862-02	**162451-02**	1.0	1.0	1.0	1.7	1.9	2.0	2.0	0.8	1.0	1.2	1.2	1.3
SCS-862-03	**162451-03**	1.0	1.0	1.0	2.4	2.8	2.9	3.0	1.7	1.9	2.3	2.5	2.6
SCS-862-04	**162451-04**	1.0	1.1	1.2	3.2	3.8	3.9	4.0	2.6	2.9	3.5	3.8	3.9
SCS-862-05	**162451-05**	1.0	1.0	1.1	3.9	4.7	4.9	5.0	3.4	3.9	4.7	5.0	5.2
SCS-862-06	**162451-06**	1.0	1.0	1.2	4.6	5.5	5.8	6.0	4.2	4.8	5.7	6.2	6.4
SCS-862-07	**162451-07**	1.0	1.2	1.4	5.2	6.3	6.6	7.0	5.4	6.0	7.1	7.4	7.7
SCS-862-08	**162451-08**	1.0	1.3	1.4	6.0	7.3	7.6	8.0	6.2	6.9	8.2	8.6	8.9
SCS-862-09	**162451-09**	1.0	1.3	1.6	6.6	8.1	8.5	9.0	7.1	7.9	9.4	9.8	10.2
SCS-862-10	**162451-10**	1.0	1.4	1.6	7.3	9.0	9.4	10.0	8.0	8.9	10.6	11.1	11.5
SCS-862-11	**162451-11**	1.0	1.5	1.7	8.0	10.0	10.3	11.0	8.9	9.9	11.8	12.3	12.8
SCS-862-12	**162451-12**	1.0	1.5	1.7	8.7	10.9	11.4	12.0	9.8	11.0	13.1	13.6	14.1
SCS-862-13	**162451-13**	1.0	1.5	1.8	9.5	11.9	12.4	13.0	10.7	12.0	14.3	14.8	15.4
SCS-862-14	**162451-14**	1.0	1.6	1.9	10.0	12.9	13.4	14.0	11.5	12.9	15.4	16.0	16.6
SCS-862-15	**162451-15**	1.0	1.7	2.0	10.6	13.7	14.3	15.0	12.4	13.9	16.6	17.3	17.9

Passband Flatness: 0.4 dB P-V (-2 through -13); 0.6 dB P-V (-14 and -15) | Specification: 600662 Revision B

Return Loss I/O: 18/16 dB (-2 through -13); 16/16 dB (-14 and -15)

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Table D.8 SEQ-750 Series Cable Equalizers[1]

Model Number	P/N	Insertion Loss in dB at Frequency (MHz) 54	70	80	222	350	450	550	650	750	dB of cable equalized at highest frequency
SEQ-0	162290-00	00	00	00	00	00	00	00	00	0.0	00
SEQ-750-02	162290-02	2.0	2.0	2.0	1.8	1.4	1.3	1.3	1.2	1.0	1.5
SEQ-750-03	162389-03	3.0	2.8	2.7	2.4	1.9	1.7	1.5	1.3	1.0	2.5
SEQ-750-04	162389-04	3.9	3.9	3.8	3.1	2.4	2.0	1.7	1.4	1.0	4.0
SEQ-750-05	162389-05	4.9	4.6	4.5	3.5	2.9	2.3	1.8	1.4	1.0	5.0
SEQ-750-06	162389-06	5.9	5.7	5.6	4.2	3.3	2.7	2.0	1.5	1.0	6.5
SEQ-750-07	162389-07	7.0	6.8	6.6	5.0	3.6	2.8	2.0	1.6	1.0	8.0
SEQ-750-08	162389-08	8.0	7.9	7.6	5.5	4.2	3.3	2.5	1.8	1.0	9.0
SEQ-750-09	162389-09	9.0	8.8	8.6	6.3	4.8	3.8	2.7	2.0	1.0	10.5
SEQ-750-10	16238910	9.8	9.4	9.2	6.7	5.0	3.8	2.8	2.0	1.0	12.0
SEQ-750-11	162389-11	11.0	10.5	10.2	7.5	5.5	4.2	3.0	2.0	1.0	13.5
SEQ-750-12	162389-12	11.8	11.3	11.0	8.1	6.0	4.6	3.3	2.2	1.0	14.5
SEQ-750-13	162389-13	12.9	12.4	12.2	8.9	6.6	5.1	3.7	2.5	1.0	16.0
SEQ-750-14	162389-14	14.0	13.5	13.2	9.7	6.9	5.3	3.8	2.5	1.0	17.0
SEQ-750-15	162389-15	14.9	14.3	13.9	10.1	7.5	5.8	4.3	2.6	1.0	18.5
SEQ-750-16	162389-16	15.8	14.9	14.5	10.5	8.0	6.1	4.4	2.7	1.0	20.0
SEQ-750-17	162389-17	16.8	16.0	15.6	11.3	8.2	6.2	4.4	2.6	1.0	21.0
SEQ-750-18	162389-18	17.9	17.1	16.6	11.9	8.6	6.6	4.6	2.6	1.0	22.4
SEQ-750-19	162389-19	18.8	17.8	17.4	12.3	9.1	6.9	4.8	2.7	1.0	23.7
SEQ-750-20	162389-20	19.8	19.0	18.5	13.2	9.5	7.2	5.0	2.8	1.0	25.0
SEQ-750-21	162389-21	20.8	19.8	19.3	13.4	10.0	7.5	5.2	2.9	1.0	26.3
SEQ-750-2-2	162433-02	2.8	2.8	2.8	2.5	2.3	2.2	2.1	2.1	2.0	1.1
SEQ-750-4-2	162469-02	4.5	4.4	4.3	3.6	3.1	2.8	2.5	2.2	2.0	3.3
SEQ-750-4-3	162469-03	5.5	5.4	5.3	4.7	4.1	3.8	3.5	3.2	3.0	3.3
SEQ-750-5-5	162469-05	8.9	8.6	8.6	7.6	6.9	6.3	5.8	5.4	5.0	5.0

Passband Flatness: ±0.3 dB — Document number: 600563 Revision J

Return Loss I/O: 18/16 dB

1. Only SEQ-750 equalizers **without** covers can be used with Flex Max 901 trunk and bridger amplifiers.

Table D.9 SCS-750 Series Cable Simulators

Model Number	P/N	Insertion Loss in dB at Frequency (MHz) 54	70	80	222	350	450	550	650	750	dB of cable simulated at 350	450	550	650	750
SCS-750-02	**162391-02**	1.0	1.0	1.0	1.3	1.5	1.6	1.7	1.8	1.8	0.7	0.8	0.9	1.0	1.1
SCS-750-03	**162391-03**	1.0	1.0	1.0	1.6	2.0	2.2	2.4	2.6	2.8	1.5	1.7	1.9	2.1	2.3
SCS-750-04	**162391-04**	1.0	1.0	1.1	1.9	2.4	2.7	3.0	3.3	3.5	2.2	2.5	2.8	3.0	3.3
SCS-750-05	**162391-05**	1.0	1.1	1.2	2.3	3.0	3.4	3.9	4.3	4.6	3.2	3.6	4.0	4.4	4.8
SCS-750-06	**162391-06**	1.0	1.1	1.3	3.1	3.9	4.5	5.1	5.7	6.2	4.6	5.2	5.8	6.4	7.0
SCS-750-07	**162391-07**	1.0	1.1	1.3	3.3	4.2	4.9	5.6	6.2	6.8	5.0	5.7	6.4	7.0	7.6
SCS-750-08	**162391-08**	1.0	1.1	1.5	3.4	4.7	5.6	6.3	7.1	7.8	5.9	6.7	7.5	8.2	9.0
SCS-750-09	**162391-09**	1.0	1.2	1.5	4.0	5.4	6.4	7.3	8.2	9.0	6.9	7.9	8.8	9.7	10.5
SCS-750-10	**162391-10**	1.0	1.2	1.5	4.1	5.7	6.7	7.7	8.7	9.5	7.4	8.4	9.4	10.4	11.2
SCS-750-11	**162391-11**	1.0	1.2	1.5	4.3	6.4	7.6	8.7	9.8	10.7	8.4	9.6	10.7	11.9	12.8
SCS-750-12	**162391-12**	1.1	1.6	2.0	5.1	7.0	8.3	9.5	10.7	11.8	9.4	10.7	11.9	13.2	14.2
SCS-750-13	**162391-13**	1.1	1.6	2.0	5.4	7.5	8.9	10.2	11.6	12.7	10.1	11.6	12.9	14.3	15.4
SCS-750-14	**162391-14**	1.1	1.6	1.7	5.7	8.2	9.8	11.3	12.8	14.1	11.3	12.9	14.4	15.9	17.2
SCS-750-15	**162391-15**	1.1	1.6	1.7	5.8	8.7	10.4	12.0	13.6	15.0	12.1	13.8	15.4	17.0	18.4

Passband Flatness: 0.6 dB, P-V — Document number: 600647 Revision B

Return Loss I/O: 18/16 dB

Table D.10 MEQ-65 and MEQT-65 Series Cable Equalizers

Model Number	P/N	Insertion Loss in dB at Frequency (MHz) 5	65	dB of cable equalized at 65	300	400	450	550	750
MEQ-65-02	**333977-02**	2.0	1.0	1.3	3.0	3.5	3.7	4.2	5.0
MEQ-65-03	**333977-03**	2.9	1.0	2.7	6.0	7.0	7.5	8.3	9.9
MEQ-65-04	**333977-04**	3.9	1.0	4.0	9.0	10.5	11.2	12.5	14.9
MEQ-65-05	**333977-05**	5.2	1.0	5.8	13.0	15.2	16.2	18.1	21.5
MEQ-65-06	**333977-06**	6.2	1.0	7.1	16.0	18.7	19.9	22.2	26.5
MEQ-65-07	**333977-07**	7.1	1.0	8.5	19.0	22.2	23.6	26.4	31.5
MEQT-65-02	**333978-02**	4.4	2.5	2.7	6.0	7.0	7.5	8.3	9.9
MEQT-65-03	**333978-03**	5.4	2.5	4.0	9.0	10.5	11.2	12.5	14.9
MEQT-65-04	**333978-04**	6.7	2.5	5.8	13.0	15.2	16.2	18.1	21.5
MEQT-65-05	**333978-05**	7.7	2.5	7.1	16.0	18.7	19.9	22.2	26.5
MEQT-65-06	**333978-06**	8.6	2.5	8.5	19.0	22.2	23.6	26.4	31.5
MEQT-65-07	**333978-07**	9.6	2.5	9.8	22.0	25.7	27.4	30.6	36.4

Passband Flatness: MEQ-65 (±0.1 dB) — MEQ-65 Document number: 600615 Revision B

MEQT-65 (±0.2 dB) — MEQT-65 Document number: 600616 Revision B

Return Loss I/O: 18/16 dB

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Table D.11 MEQ-55 and MEQT-55 Series Cable Equalizers

Model Number		Insertion Loss in dB at Frequency (MHz)		dB of cable equalized at					
		5	55	55	300	400	450	550	750
MEQ-55-2	**162464-02**	1.9	1.0	1.2	3.0	3.5	3.7	4.2	5.0
MEQ-55-3	**162464-03**	2.7	1.0	2.5	6.0	7.0	7.5	8.3	9.9
MEQ-55-4	**162464-04**	3.6	1.0	3.7	9.0	10.5	11.2	12.5	14.9
MEQ-55-5	**162464-05**	4.5	1.0	4.9	12.0	14.0	14.9	16.7	19.9
MEQ-55-6	**162464-06**	5.6	1.0	6.6	16.0	18.7	19.9	22.2	26.5
MEQ-55-7	**162464-07**	6.8	1.0	8.2	20.0	23.4	24.9	27.8	33.1
MEQT-55-2	**162465-02**	4.2	2.5	2.5	6.0	7.0	7.5	8.3	9.9
MEQT-55-3	**162465-03**	5.1	2.5	3.7	9.0	10.5	11.2	12.5	14.9
MEQT-55-4	**162465-04**	6.0	2.5	4.9	12.0	14.0	14.9	16.7	19.9
MEQT-55-5	**162465-05**	7.1	2.5	6.6	16.0	18.7	19.9	22.2	26.5
MEQT-55-6	**162465-06**	8.3	2.5	8.2	20.0	23.4	24.9	27.8	33.1
MEQT-55-7	**162465-07**	9.5	2.5	9.9	24.0	28.0	29.9	33.3	39.8
Passband Flatness:		0.2 dB, P-V		MEQ-55 Document number: 600695 Revision 50					
Return Loss I/O:		18/16 dB		MEQT-55 Document number: 600696 Revision 50					

Table D.12 MEQ-42 and MEQT-42 Series Cable Equalizers

Model	P/N	Insertion Loss in dB at Frequency (MHz)		dB of cable equalized at					
		5	42	42	300	400	450	550	750
SEQ-0	**162290-00**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MEQ-42-2	**162395-02**	3.0	1.0	3.0	8.0	9.4	10.2	11.3	13.4
MEQ-42-3	**162395-03**	4.0	1.0	4.6	12.6	15.0	15.8	17.7	21.0
MEQ-42-4	**162395-04**	5.0	1.0	6.1	16.7	19.4	20.7	23.0	27.0
MEQ-42-5	**162395-05**	6.0	1.0	7.6	20.4	23.8	25.4	28.3	33.0
MEQ-42-6	**162395-06**	7.0	1.0	9.1	24.6	29.0	30.4	34.0	39.6
MEQ-42-7	**162395-07**	8.0	1.0	10.6	27.0	31.5	33.0	36.4	45.5
MEQT-42-2	**162396-02**	3.6	2.5	3.2	9.0	10.5	11.2	12.5	14.9
MEQT-42-3	**162396-03**	5.6	2.5	4.7	13.0	15.2	16.2	18.1	21.5
MEQT-42-4	**162396-04**	6.8	2.5	6.5	18.0	21.0	22.4	25.0	29.8
MEQT-42-5	**162396-05**	8.4	2.5	9.0	25.0	29.2	31.1	34.7	41.4
MEQT-42-6	**162396-06**	8.7	2.5	9.4	26.0	30.4	32.4	36.1	43.1
MEQT-42-7	**162396-07**	10.1	2.5	11.5	32.0	37.4	39.8	44.5	53.0

Passband Flatness:0.2 dB, P-V (MEQ-42) — MEQ-42 Specification 600540 Rev C

0.3 dB, P-V (MEQT-42) — MEQT-42 Specification 600595 Rev D

Return Loss I/O:18/16 dB

Table D.13 NPB Series Cable Attenuators (PADs)[1]

P/N	5–1002 MHz Flat Loss (dB)	Passband Flatness (dB)	P/N	5–1002 MHz Flat Loss (dB)	Passband Flatness (dB)
NPB-000	0.0	±0.2	**NPB-110**	11.0	±0.3
NPB-010	1.0	±0.3	**NPB-120**	12.0	±0.3
NPB-020	2.0	±0.3	**NPB-130**	13.0	±0.3
NPB-030	3.0	±0.3	**NPB-140**	14.0	±0.3
NPB-040	4.0	±0.3	**NPB-150**	15.0	±0.4
NPB-050	5.0	±0.3	**NPB-160**	16.0	±0.4
NPB-060	6.0	±0.3	**NPB-170**	17.0	±0.4
NPB-070	7.0	±0.3	**NPB-180**	18.0	±0.4
NPB-080	8.0	±0.3	**NPB-190**	19.0	±0.4
NPB-090	9.0	±0.3	**NPB-200**	20.0	±0.4
NPB-100	10.0	±0.3	**NPB-750**	terminator	—

Specification Document Number 601263 Rev B

1. Frequency Range: 5 to 1000 MHz
   Impedance: 75 Ω
   Temperature Range: –40 to 85°C
   Return Loss: 20 dB
   Flatness measured relative to a straight line at the listed dB value.

Table D.14 S-Series Distribution Accessories[1]

Accessory	P/N	Description	Insertion Loss in dB at Frequency (MHz)									
			5	40	54	70	80	222	550	750	862	1000
SS-1000-2	**162399-01**	splitter	3.5	3.3	3.3	3.3	3.3	3.5	3.7	3.8	4.0	4.0
SDC-1000-8	**162400-01**	directional coupler	1.6 8.2	1.4 8.1	1.4 8.1	1.4 8.1	1.5 8.1	1.6 8.2	1.8 8.2	2.0 8.2	2.6 8.5	2.7 8.6
SDC-1000-12	**162400-02**	directional coupler	0.9 12.3	0.7 12.3	0.7 12.3	0.7 12.3	0.7 12.3	0.8 12.3	1.0 12.3	1.3 12.3	1.7 12.4	1.8 12.5
Passband Flatness:			0.5 dB, P-V					Document number 600613 Rev F				

1. The recessed groove indicates the high loss leg. These accessories are reversible.

D

D

Warranty

C-COR Incorporated ("C-COR") warrants from the date of shipment to customer that Product bearing the C-COR name will substantially conform to C-COR specification in effect as of the date of shipment and will be free from substantial defects in material and workmanship under normal use (within published specifications), given proper installation and maintenance, for the specified warranty period for the Product. C-COR further warrants to Customer that all Services performed by C-COR for customer will be provided in a workmanlike manner. **Warranty of C-COR Standard Software is set forth in the software license**.

Customer must promptly notify C-COR of any claimed defect in the Product and/or Services. C-COR or its agent may inspect the Product or workmanship on Customer's premises. Product returned to C-COR under warranty must be shipped prepaid by Customer.

C-COR shall, at its expense, correct any defect in material and workmanship in products manufactured by C-COR which may appear within the Warranty Period. C-COR MAKES NO OTHER REPRESENTATION OR WARRANTY OF ANY OTHER KIND, EXPRESS OR IMPLIED, WITH RESPECT TO THE GOODS, WHETHER AS TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER MATTER.

The C-COR warranty shall not cover components subject to normal wear and tear, such as fuses, batteries, and lamps.

For product shipments after June 2, 2003, the warranty period for C-COR's primary products is as noted in the following table.

C-COR Product Categories	Warranty Period from Shipment Date After June 2, 2003 (Domestic US)	Warranty Period from Shipment Date After June 2, 2003 (Outside the US)
Category A Products PLEXiS Transport and Business Services Products All Access Systems Element Management System (EMS) Hardware Products, including transponders and telemetry devices. (Note EMS software warranty is subject to terms set forth in software license).	Two (2) Years	Two (2) Years
Category B Products All "Max" Series Access Systems active RF distribution equipment (including housings), 1310nm and 1550nm fiber optic products, and nodes. All Access Systems RF and optical accessories including equalizers, attenuators, and DWDM muxes and demuxes.	Five (5) Years	Two (2) Years

For product shipments prior to June 2, 2003, the warranty period for C-COR's primary products is as noted in the following table.

C-COR Product Family	Warranty Period from Shipment Date Prior to June 2, 2003 (Domestic US)	Warranty Period from Shipment Date Prior to June 2, 2003 (Outside the US)
1. lumaCOR™ Headend and Hub Products	Three (3) Years	Three (3) Years
2. Optiworx™ Headend Products	Two (2) Years	Two (2) Years
3. naviCOR™ and I-Flex® Nodes	Three (3) Years	Three (3) Years
4. Optiworx™ Nodes	Two (2) Years	Two (2) Years
5. FlexNet® RF Products	Five (5) Years	Five (5) Years
6. I-Flex® RF Products	Five (5) Years	Five (5) Years
7. Optiworx™ RF Products	Two (2) Years	Two (2) Years
8. Specialty Products manufactured in C-COR's Equipment Service Center: CATV Products DATA Products	 Three (3) Years One (1) Year	 Three (3) Years One (1) Year
9. EMS Hardware Products, including transponders and telemetry devices	Two (2) Years	One (1) Year
10. EMS Software Products	Subject to terms set forth in software license	Subject to terms set forth in software license
11. Diamond Transport Series 1310nm and 1550nm fiber optic platform	Five (5) Years	One (1) Year
12. DXT Digital Transport Series	Five (5) Years	One (1) Year
13. Diamond Link Series 1550nm fiber optic platform	Five (5) Years	One (1) Year
14. Diamond Marquise, Diamond Net, Diamond Point, Diamond Hub Nodes	Five (5) Years	One (1) Year
15. TIARRA series node platform	Five (5) Years	One (1) Year
16. RxHL Series node platform	Five (5) Years	One (1) Year
17. Spectrum 2000 GNA, TNA, and LE series RF amplifiers	Five (5) Years	One (1) Year
18. Diamond Line series RF amplifiers	Five (5) Years	One (1) Year
19. Migra Series RF amplifiers	Five (5) Years	One (1) Year
20. AMP Series RF amplifiers	Five (5) Years	One (1) Year
21. 9000 Series RF taps and line passives	Five (5) Years	One (1) Year
22. OR Series optical passives	One (1) Year	One (1) Year
23. All Other Products	Ninety (90) Days	Ninety (90) Days

PRODUCT AND SERVICES WARRANTY LIMITATIONS

C-COR's entire liability and Customer's exclusive remedy whether in contract, tort or otherwise, for any claim related to or arising out of breach of the warranty covering Product or Services shall be correction of defects by repair, replacement, reperformance of service or credit, at C-COR's discretion. Refurbished Product may be used to repair or replace the Product. Customer shall have no claim to Product which was replaced or the components therein which were replaced. C-COR has no liability with respect to claims relating to or arising from the use of equipment not bearing the C-COR name.

C-COR does not warrant that the operation of the Product will be uninterrupted or error-free. Similarly, C-COR does not warrant that the functions of the Product will meet Customer's requirements or that the Product will operate in combination with other products selected by Customer for its use.

C-COR assumes no liability with respect to (a) defects caused by modification, repair, installation, operation or maintenance except as described in C-COR's documentation; or, (b) negligent or other improper use of the Product.

All equipment and software not bearing the C-COR name, is supplied "AS IS" and Customer will look solely to the warranties and remedies, if any, provided by the equipment manufacturer or vendor thereof. In addition, C-COR assumes no liability for equipment or services furnished by Customer nor does this warranty cover any copy of or update to any user manual for the Product.

No agent, distributor, or representative is authorized to make any warranties on behalf of C-COR or to assume for C-COR any other liability in connection with any Product or Services.

WITH RESPECT TO ALL PURCHASES OF PRODUCT AND/OR SERVICES FROM C-COR BY CUSTOMER, THE ABOVE WARRANTY REPLACES ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND ALL OTHER OBLIGATIONS OF C-COR, INCLUDING ANY WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. ALL OTHER WARRANTIES ARE DISCLAIMED AND EXCLUDED BY C-COR.

E

Flex Max901e 1 GHz Trunk and Bridger Amplifiers Data Sheet

This appendix provides a Data Sheet that can be used for recording specific information for each Flex Max901e. Be sure to have a copy of this Data Sheet for each Flex Max901e in your system. Datasheets are particularly helpful for providing historical information when troubleshooting the Flex Max901e.

System Map Information

Map #		Serial #		Amplifier #	
System		P/S #		Cascade	
Location		Air Temp		Model #	

Map Signal Information

	Forward High/Low Balancing Carriers	TCV	Return High/Low Balancing Carriers (input)
Frequency or Channel	/	N/A	/
Trunk Levels	/		/
Bridger (dist) Levels	/		/

Pre-Selected Accessories

BRIDGER EQ/PAD: ________ **P5/P6 FWD PAD:** ________ **O/P EQ:** ________

Measured Data

Technician-Selected Accessories

STATION FWD EQ		**STATION REV EQ**	
STATION FWD PAD		**STATION REV PAD**	
EQ		**ALC PAD (QAM Pilot)**	
PAD			

Measured Signal Information

Forward Signal Levels

Testpoint	Forward High Carrier	Forward Low Carrier
Port 1 (input)		
P2/P3 (dist output)		
Port 4 (trunk output)		
P5/P6 (dist output)		
Balancing TP (MAN)		
Balancing TP (ALC)		

Return Signal Levels

Testpoint	Return High Carrier	Return Low Carrier
P2/P3 (input)		
Port 4 (input)		
P5/P6 (input)		
Return (output)		

Power Supply Information

F

Power Supply Type

Fuse Values

Port 1 ________ Port 2 ________ Port 3 ________

Port 4 ________ Port 5 ________ Port 6 ________

Main ________

Voltages

AC Volts ________ Raw DC ________

B+ ________ Ripple ________

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