TECHNICAL MANUAL
888-2761-001

Main/Alt FlexStar™ Controller
981-0193-001

Main/Alt FlexStar™ Controller

T.M. No. 888-2761-001

October 22, 2013
RevF

Manual Revision History

Main/Alt FlexStar™ Controller

REV.	DATE	ECN	Pages Affected
A	16 APR 2008	P38719	Preliminary
B	25 SEP 2008	P40932	Released
C	19 Nov 2008	P41750	Misc. spelling corrections on various pages
D	04 Dec 2009	P45690	Reformatted entire manual
E	14 Aug 2013	P55472	Complete manual updates
F	22-Oct-2013	P55801	Fixed Dipswitch settings for S2 (On-Off were reversed)

WARNING: Disconnect primary power prior to servicing.

Technical Assistance

Technical and troubleshooting assistance for Harris Broadcast products is available from the field service department during normal business hours 8:00AM to 5:00PM CST.

Emergency service is available 24 hours a day, seven days a week, *by telephone only*.

Telephone ***+1-217-222-8200***, FAX ***+1-217-221-7086***, email ***tsupport@harrisbroadcast.com.***

Online assistance, including technical manuals, software downloads, and service bulletins, is available at ***http://www.harrisbroadcast.com/servicesandsupport/default.asp.***

Address written correspondence to Field Service Dept.
Harris Broadcast
P.O. Box 4290
Quincy, IL 62305-4290, USA.

For global service contact information, visit: ***http://www.harrisbroadcast.com/contactus***.

NOTE: For all service and parts correspondence, please provide the sales order number, as well as the serial number for the transmitter or part in question. Record those numbers here:

_____/_____

Provide these numbers for any written request, or have these numbers ready in the event you choose to call regarding any service or parts requests. For warranty claims it will be required. For out of warranty products, this will help us to best identify what hardware was shipped.

Replaceable Parts Service

Replacement parts are available from Harris Broadcast service parts department from 7:00AM to 11:00 PM CST Monday through Friday, and 8:00AM to 1:00PM CST on Saturday.

Emergency parts are available 24 hours a day, seven days a week, *by telephone only*.

Telephone ***+1-217-221-7500*** or email ***servicepartsreq@harrisbroadcast.com*** to contact the service parts department.

Unpacking

Carefully unpack the equipment and perform a visual inspection to determine if any damage was incurred during shipment. Retain the shipping materials until it has been verified that all equipment has been received undamaged. Locate and retain all packing check lists. Use the packing check list to help locate and identify any components or assemblies which are removed for shipping and must be reinstalled. Also remove any shipping supports, straps, and packing materials prior to initial turn on.

Returns And Exchanges

No equipment can be returned unless written approval and a return authorization is received from Harris Broadcast. Special shipping instructions and coding will be provided to assure proper handling. Complete details regarding circumstances and reasons for return are to be included in the request for return. Custom equipment or special order equipment is not returnable. In those instances where return or exchange of equipment is at the request of the customer, or convenience of the customer, a restocking fee will be charged. All returns will be sent freight prepaid and properly insured by the customer. When communicating with Harris Broadcast, specify the Harris Broadcast order number or invoice number.

Harris Broadcast
PO Box 4290
3200 Wismann Lane 62305

PARTS ORDER FORM

Phone: 217-221-7500
FAX: 217-221-7084

Billing Information

Customer Name: _____

Address: _____

_____

_____

_____

Telephone: _____

FAX: _____

Preferred

Payment Method : _____

Frequency & Channel: _____

Equipment Part Number:_____

Equipment Serial Number:_____

Shipping Information

Ship To (If different from billing information):

_____

Address: _____

_____

_____

_____

Telephone: _____

FAX: _____

Preferred

Shipping Method : _____

Guide for Ordering Parts: Please provide as much information as possible to facilitate part substitution as required. Equipment name, part number and serial number is found on a metal ID plate on the rear of the unit. Describe the unit using the parts list if possible. Include schematic information, schematic number, or number of next higher assembly. The next higher assembly usually has a part number that begins with a 9xx-xxxx-xxx.

Item	Quantity	Part Number	Description of Part - Part's Name, Description, and Specification from Parts List	Ref Des e.g. C21, R100, etc.	Item Used On - Assembly if Known e.g. C21 used on 992-8025-001 & Schematic 839-8038-991	Comments

WARNING:
THE CURRENTS AND VOLTAGES IN THIS EQUIPMENT ARE DANGEROUS. PERSONNEL MUST AT ALL TIMES OBSERVE SAFETY WARNINGS, INSTRUCTIONS AND REGULATIONS.

This manual is intended as a general guide for trained and qualified personnel who are aware of the dangers inherent in handling potentially hazardous electrical/electronic circuits. It is not intended to contain a complete statement of all safety precautions which should be observed by personnel in using this or other electronic equipment.

The installation, operation, maintenance and service of this equipment involves risks both to personnel and equipment, and must be performed only by qualified personnel exercising due care. Harris Broadcast shall not be responsible for injury or damage resulting from improper procedures or from the use of improperly trained or inexperienced personnel performing such tasks. During installation and operation of this equipment, local building codes and fire protection standards must be observed.

The following National Fire Protection Association (NFPA) standards are recommended as reference:

- Automatic Fire Detectors, No. 72E
- Installation, Maintenance, and Use of Portable Fire Extinguishers, No. 10
- Halogenated Fire Extinguishing Agent Systems, No. 12A

WARNING:
ALWAYS DISCONNECT POWER BEFORE OPENING COVERS, DOORS, ENCLOSURES, GATES, PANELS OR SHIELDS. ALWAYS USE GROUNDING STICKS AND SHORT OUT HIGH VOLTAGE POINTS BEFORE SERVICING. NEVER MAKE INTERNAL ADJUSTMENTS, PERFORM MAINTENANCE OR SERVICE WHEN ALONE OR WHEN FATIGUED.

Do not remove, short-circuit or tamper with interlock switches on access covers, doors, enclosures, gates, panels or shields. Keep away from live circuits, know your equipment and don’t take chances.

WARNING:
IN CASE OF EMERGENCY ENSURE THAT POWER HAS BEEN DISCONNECTED.

IF OIL FILLED OR ELECTROLYTIC CAPACITORS ARE UTILIZED IN YOUR EQUIPMENT, AND IF A LEAK OR BULGE IS APPARENT ON THE CAPACITOR CASE WHEN THE UNIT IS OPENED FOR SERVICE OR MAINTENANCE, ALLOW THE UNIT TO COOL DOWN BEFORE ATTEMPTING TO REMOVE THE DEFECTIVE CAPACITOR. DO NOT ATTEMPT TO SERVICE A DEFECTIVE CAPACITOR WHILE IT IS HOT DUE TO THE POSSIBILITY OF A CASE RUPTURE AND SUBSEQUENT INJURY.

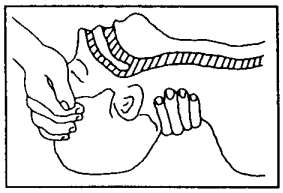
TREATMENT OF ELECTRICAL SHOCK

1. IF VICTIM IS NOT RESPONSIVE FOLLOW THE A-B-CS OF BASIC LIFE SUPPORT.

PLACE VICTIM FLAT ON HIS BACK ON A HARD SURFACE

(A) AIRWAY

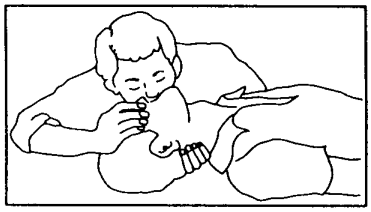
IF UNCONSCIOUS,
OPEN AIRWAY



LIFT UP NECK
PUSH FOREHEAD BACK
CLEAR OUT MOUTH IF NECESSARY
OBSERVE FOR BREATHING

(B) BREATHING

IF NOT BREATHING,
BEGIN ARTIFICIAL BREATHING

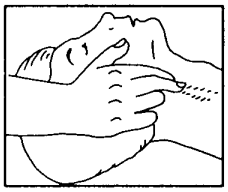


TILT HEAD
PINCH NOSTRILS
MAKE AIRTIGHT SEAL

4 QUICK FULL BREATHS

REMEMBER MOUTH TO MOUTH RESUSCITATION MUST BE COMMENCED AS SOON AS POSSIBLE

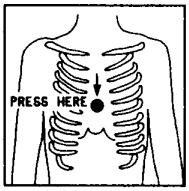
CHECK
CAROTID PULSE



IF PULSE ABSENT,
BEGIN ARTIFICIAL
CIRCULATION

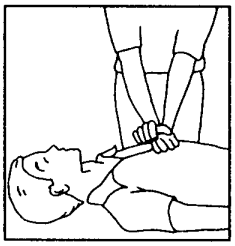
(C) CIRCULATION

DEPRESS STERNUM 1 1/2 TO 2 INCHES



APPROX. RATE OF COMPRESSIONS --80 PER MINUTE
- ONE RESCUER
- 15 COMPRESSIONS
- 2 QUICK BREATHS

APPROX. RATE OF COMPRESSIONS --60 PER MINUTE
- TWO RESCUERS
- 5 COMPRESSIONS
- 1 BREATH



NOTE: DO NOT INTERRUPT RHYTHM OF COMPRESSIONS WHEN SECOND PERSON IS GIVING BREATH

CALL FOR MEDICAL ASSISTANCE AS SOON AS POSSIBLE.

2. IF VICTIM IS RESPONSIVE.

A. KEEP THEM WARM
B. KEEP THEM AS QUIET AS POSSIBLE
C. LOOSEN THEIR CLOTHING
D. A RECLINING POSITION IS RECOMMENDED

WARNING: Disconnect primary power prior to servicing.

FIRST-AID

Personnel engaged in the installation, operation, maintenance or servicing of this equipment are urged to become familiar with first-aid theory and practices. The following information is not intended to be complete first-aid procedures, it is a brief and is only to be used as a reference. It is the duty of all personnel using the equipment to be prepared to give adequate Emergency First Aid and there by prevent avoidable loss of life.

Treatment of Electrical Burns

1. Extensive burned and broken skin
    a. Cover area with clean sheet or cloth. (Cleanest available cloth article.)
    b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply any salve or ointment.
    c. Treat victim for shock as required.
    d. Arrange transportation to a hospital as quickly as possible.
    e. If arms or legs are affected keep them elevated.

NOTE:
If medical help will not be available within an hour and the victim is conscious and not vomiting, give him a weak solution of salt and soda: 1 level teaspoonful of salt and 1/2 level teaspoonful of baking soda to each quart of water (neither hot or cold). Allow victim to sip slowly about 4 ounces (a half of glass) over a period of 15 minutes. Discontinue fluid if vomiting occurs. (Do not give alcohol.)

2. Less severe burns - (1st & 2nd degree)
    a. Apply cool (not ice cold) compresses using the cleanest available cloth article.
    b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply salve or ointment.
    c. Apply clean dry dressing if necessary.
    d. Treat victim for shock as required.
    e. Arrange transportation to a hospital as quickly as possible.
    f. If arms or legs are affected keep them elevated.

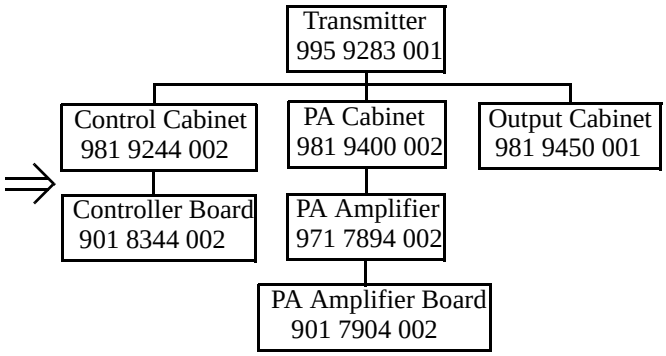
REFERENCE:
ILLINOIS HEART ASSOCIATION
AMERICAN RED CROSS STANDARD FIRST AID AND PERSONAL SAFETY MANUAL (SECOND EDITION)

Guide to Using Parts List Information

The Replaceable Parts List Index portrays a tree structure with the major items being left most in the index. The example below shows the Transmitter as the highest item in the tree structure. If you were to look at the bill of materials table for the Transmitter you would find the Control Cabinet, the PA Cabinet, and the Output Cabinet. In the Replaceable Parts List Index the Control Cabinet, PA Cabinet, and Output Cabinet show up one indentation level below the Transmitter and implies that they are used in the Transmitter. The Controller Board is indented one level below the Control Cabinet so it will show up in the bill of material for the Control Cabinet. The tree structure of this same index is shown to the right of the table and shows indentation level versus tree structure level.

Example of Replaceable Parts List Index and equivalent tree structure:

Replaceable Parts List Index	Part Number	Page
Table 7-1. Transmitter	995 9283 001	7-2
Table 7-2. Control Cabinet	981 9244 002	7-3
Table 7-3. Controller Board	901 8344 002	7-6
Table 7-4. PA Cabinet	981 9400 002	7-7
Table 7-5. PA Amplifier	971 7894 002	7-9
Table 7-6. PA Amplifier Board	901 7904 002	7-10
Table 7-7. Output Cabinet	981 9450 001	7-12



The part number of the item is shown to the right of the description as is the page in the manual where the bill for that part number starts. Inside the actual tables, four main headings are used:

- Table #-#. ITEM NAME - PART NUMBER - this line gives the information that corresponds to the Replaceable Parts List Index entry;
- PART NUMBER column gives the ten digit Harris Broadcast part number (usually in ascending order);
- DESCRIPTION column gives a 25 character or less description of the part number;
- REF. SYMBOLS/EXPLANATIONS column 1) gives the reference designators for the item (i.e., C001, R102, etc.) that corresponds to the number found in the schematics (C001 in a bill of material is equivalent to C1 on the schematic) or 2) gives added information or further explanation (i.e., “Used for 208V operation only,” or “Used for HT 10LS only,” etc.).

NOTE: Inside the individual tables some standard conventions are used:

- A # symbol in front of a component such as #C001 under the REF. SYMBOLS/EXPLANATIONS column means that this item is used on or with C001 and is not the actual part number for C001.
- In the ten digit part numbers, if the last three numbers are 000, the item is a part that has been purchased and has not manufactured or modified. If the last three numbers are other than 000, the item is either manufactured or is purchased from a vendor and modified for use in the Harris Broadcast product.
- The first three digits of the ten digit part number tell which family the part number belongs to - for example, all electrolytic (can) capacitors will be in the same family (524 xxxx 000). If an electrolytic (can) capacitor is found to have a 9xx xxxx xxx part number (a number outside of the normal family of numbers), it has probably been modified in some manner at the factory and will therefore show up farther down into the individual parts list (because each table is normally sorted in ascending order). Most Harris Broadcast made or modified assemblies will have 9xx xxxx xxx numbers associated with them.

The term “SEE HIGHER LEVEL BILL” in the description column implies that the reference designated part number will show up in a bill that is higher in the tree structure. This is often the case for components that may be frequency determinant or voltage determinant and are called out in a higher level bill structure that is more customer dependent than the bill at a lower level.

Table of Contents

Section 1
Introduction/Specifications

Section 2
Installation and Operation

Section 3
Replaceable Parts List

Table of Contents (Continued)

Section 1 Introduction/ Specifications

1

1.1 Scope and Purpose

This technical manual contains the information necessary to install and maintain the MAIN/ALT FlexStar™ Controller (981-0193-001).

The manual is conveniently divided into the following sections:

- **SECTION I, INTRODUCTION/SPECIFICATIONS.** Provides general manual lay out, equipment purpose, system block diagrams, and specifications.
- **SECTION II, INSTALLATION/INITIAL TURN-ON.** Provides detailed installation procedures and initial turn on instructions.
- **SECTION III, PARTS LIST.** Provides a parts list for the entire assembly.

1.2 Equipment Purpose

The Main/Alternate Controller may be used in many different applications with many different Harris and non-Harris products. This technical manual is primarily concerned with the unit operating in one of the following configurations:

1.2.1 Main/Alt Exciter/Transmitter Controller Using Internal Relay

The Main/Alternate exciter or low power transmitter control utilizes it own internal relay switch circuitry for power levels up to 100 W. See See Figure 1-1 for system configuration. The internal relay does not provide for a test load to be connected to the unit not on the air. If high isolation between the exciters/transmitters is required the external switch option should be used. Should only be used when isolation is not required.

1.2.2 Main/Alt Exciter/Transmitter Controller Using External Switch

The Main/Alternate exciter/transmitter can control an external coaxial transfer switch. See Figure 1-2 for system configuration. If the switch is a 4-port switch a test load can be used. This also allows high isolation.

WARNING: Disconnect primary power prior to servicing.

1.3 Operating Modes

In any of the above applications, the Main/Alternate Controller may be operated in the AUTOMATIC or MANUAL mode. Front panel selector switches are used to select between the two modes of operation.

1.3.1 Manual Mode

In the manual mode of operation, the controller allows the user to control the selected device (exciter or transmitter) to be "ON AIR". For instance, if exciter/transmitter A is on air and the front panel POSITION switch is pushed toward the B ON AIR indicator - the controller will actuate the RF switch (internal or external) to connect the exciter/transmitter B to the antenna port.

1.3.2 Automatic Mode

In the automatic mode of operation, if the power output of the selected exciter/transmitter is reduced to below a user-set RF power out threshold, the controller will automatically switch to the off-air unit and place it on the antenna port. After the switch has taken place, the controller will switch itself to the manual mode of operation. This will prevent the controller from attempting to switch back to the faulty unit.

1.4 System Block Diagrams

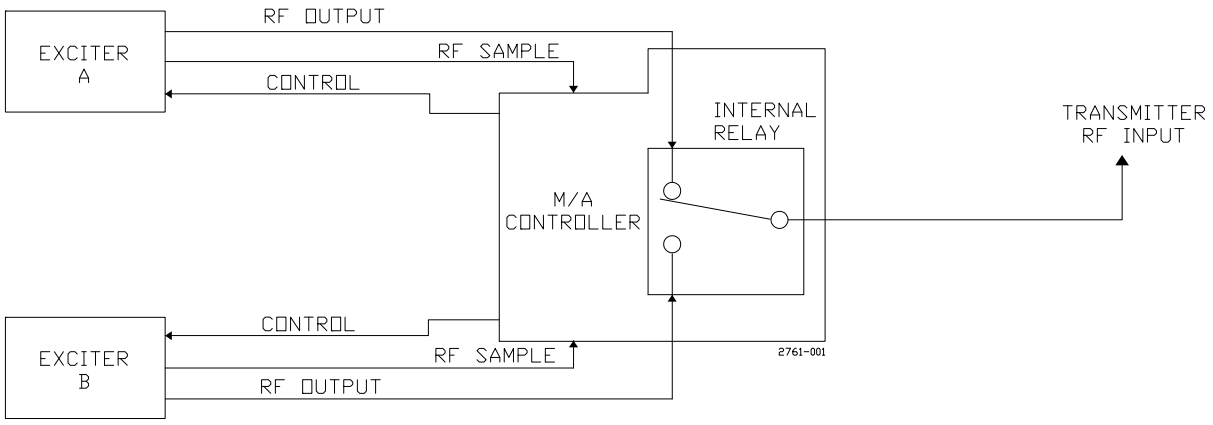


Figure 1-1 Main/Alt Controller using the Internal RF Relays

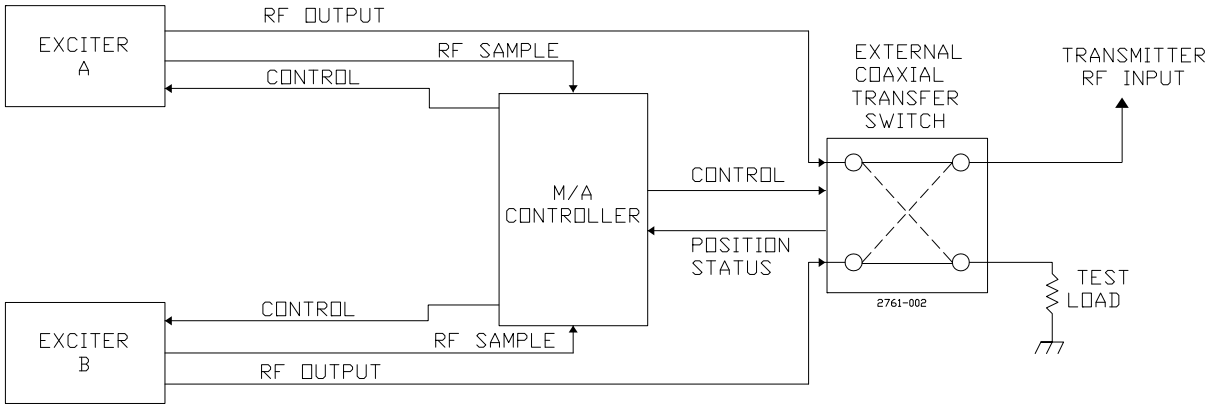


Figure 1-2 Main/Alt Controller with an External Switch

1.5 Physical Description

The Main/Alternate Controller consists of a single-circuit board assembly mounted in a 44mm (1-3/4") standard EIA (1RU) rack panel enclosure. Switch and status indicators are provided on the front panel. Connectors are provided on the rear panel for system interconnection as well as ancillary system connections and remote control.

1.6 Specifications

NOTE:
Specifications subject to change without notice.

1.6.1 Electrical

AC mains requirement: 90-264 VAC, 48-62 Hz, 1-Phase at 50Watts.

1.6.2 Physical

Size: 19" EIA rack mounted enclosure 44mm (1-3/4") high x 213mm (8-3/8") deep
Weight: 1.9kg (4.2 lbs)

Section 2 Installation and Operation

2

2.1 Introduction

This section provides information and instructions necessary for the configuration, installation and initial turn-on of the Main/Alternate Controller. Please refer to the exciter and transmitter technical manuals as required.

Figure 2-1 shows the location of each control and indicator associated with the Main/Alternate Controller front panel. Table 2-1 lists describes their functions.

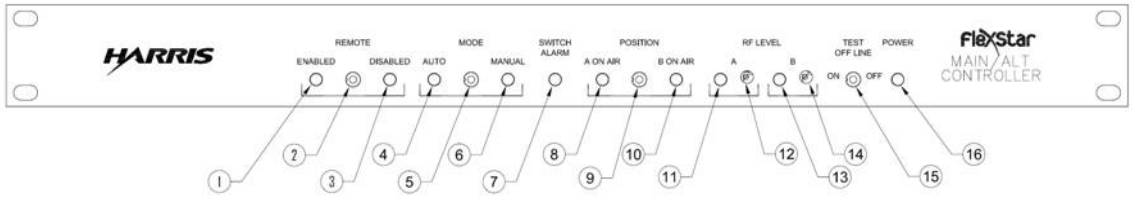


Figure 2-1 Front Panel Controls and Indicators

Table 2-1 Front Panel Description

Ref	Control/Indicator	Function
1	Remote Enabled Indicator	Illuminates green when remote control is enabled.
2	Remote Enable/Disable Switch	Enables or disables the remote control functions.
3	Remote Disabled Indicator	Illuminates red when remote control is disabled.
4	Auto Mode Indicator	Illuminates green when the controller is in Auto Mode.
5	Mode Select Switch	Selects Auto or Manual Mode, also resets Switch Alarm.
6	Manual Mode Indicator	Illuminates orange when the controller is in Manual Mode
7	Switch Alarm Indicator	Illuminates red after a switch has occurred, flashing indicates failure is sensed and the hold off time is expiring.
8	A ON AIR Position Indicator	Illuminates green when the RF switch status indicates position A.

WARNING: Disconnect primary power prior to servicing.

Table 2-1 Front Panel Description

Ref	Control/Indicator	Function
9	Position A/B Select Switch	Selects position A ON AIR or position B ON AIR.
10	B ON AIR Position Indicator	Illuminates green when the RF switch status indicates position B.
11	RF Level A Indicator	Illuminates green when Exciter/Transmitter A's RF level is greater than the adjustable threshold.
12	RF Level A Threshold	RF Level A threshold potentiometer.
13	RF Level B Indicator	Illuminates green when Exciter/Transmitter B's RF level is greater than the adjustable threshold.
14	RF Level B Threshold	RF Level B threshold potentiometer.
15	Off Line Test	Selects test mode (un-mutes off line exciter). Note: Test Mode is functional only in exciter main/alt configurations with an external transfer switch.
16	Power Indicator	Illuminates green when AC power is applied.

2.2 Configuration settings

WARNING:
CHANGING JUMPER POSITIONS REQUIRES GAINING ACCESS TO THE INSIDE OF THE CONTROLLER UNIT. FOLLOW PROPER SAFETY PRECAUTIONS AS AC MAINS VOLTAGES WILL BE PRESENT INSIDE THE UNIT WHEN IT IS PLUGGED INTO THE AC MAINS SUPPLY. UNPLUG THE AC LINE CORD FROM THE POWER MAINS BEFORE ANY SERVICING IS ATTEMPTED.

2.2.1 Configuring JP1 and JP2

JP1, JP2A, and JP2B are used to configure the controller for use with a variety of external coaxial transfer switches. For direction in selecting the proper configuration, please refer to Table 2-2.

Note-1:The maximum current draw from the main/alt controller +12VDC source shall not exceed 150mA.

Note-2:The maximum external voltage connected to J9 pin 8 (+V_EXT) shall not exceed 50VDC.

Note-3:The maximum external supply current draw on J9 pin 1 (POS1_CMD) and J9 pin 2 (POS2_CMD) shall not exceed 1 Amp.

Table 2-2 Configuring JP1 and JP2

System Configuration	JP1	JP2A	JP2B
Internal RF switching	NA	NA	NA
External switch with source voltage control (common ground). +12VDC commands (active high) supplied by main/alt controller (No additional power supply required)	Position 2-3	Position 1-2	Position 3-4
External switch with ground control (common source). Common source voltage (+12VDC) supplied by main/alt controller (No additional power supply required) Commands are active low	Position 2-3	Position 1-3	Position 2-4
External switch with source voltage control (common ground). Command voltage other than +12VDC. Note: This requires the use of an external power supply. The power supply will need to be current limited to < 1Amp and properly connected to J9 pin 8 (+V_EXT) and J9 pin 9 (Ground).	Position 1-2	Position 1-2	Position 3-4
External switch with ground control (common source). Common source voltage other than +12VDC. Note: This requires the use of an external power supply. The power supply will need to be current limited to < 1Amp and properly connected to J9 pin 8 (+V_EXT) and J9 pin 9 (Ground).	Position 1-2	Position 1-3	Position 2-4

2.2.2 Configuring JP3 and JP4

Configuring JP3 and JP4 is only required when the controller is configured as an exciter switcher. JP3 and JP4 configure the mute polarity, active hi or active low, to the exciters. If the controller is setup to control transmitters this section can be skipped.

JP3 sets the CPLD inside the controller for use with either an active high mute or active low mute. Set JP3 to connect pins 2-3 for active high mute (+5V = mute). Set JP3 to connect pins 1-2 for active low mute (+0V = mute).

JP4 configures the transmitter mute line J1-9 to be pulled up to +5VDC or pulled down to ground. Set JP4 to connect pins 2-3 to connect a pull up resistor (10k ohm) to the transmitter mute line. Set JP4 to connect pins 1-2 to connect a pull down resistor (10k ohm) to the transmitter mute line.

To aid in the selection of JP3 and JP4, please refer to Table 2-3 for jumper settings for various models of Harris FM radio transmitters:

Table 2-3 JP3 and JP4 Configuration

Model	JP3 (mute polarity)	JP4 (mute line pull up/ down)
FAX	2-3 (active high)	2-3 (pull up)
ZX (All models)	2-3 (active high)	2-3 (pull up)
HT/HD+	1-2 (active low)	1-2 (pull down)
HT-30, 35	1-2 (active low)	1-2 (pull down)
HT-20, 25	2-3 (active high)	2-3 (pull up)
ZCD Dual	2-3 (active high)	2-3 (pull up)

2.2.3 Configuring Dipswitch SW2

Dipswitch SW2 is used to configure the switch hold off time, enable the Test Mode, enable an external switch, or enable the Auto Switch Inhibit function. See the Table 2-4 below for configuring Dipswitch S2.

NOTE:
S2-1 thru S2-6 can all be set to ON for maximum delay of 63 Sec (each section adds to the total delay)

Table 2-4 SW2 Configuration

Switch Section	Name	Description
SW2-1	Time Delay Bit 1	ON -1 Sec delay
SW2-2	Time Delay Bit 2	ON - 2 Sec delay
SW2-3	Time Delay Bit 3	ON - 4 Sec delay
SW2-4	Time Delay Bit 4	ON - 8 Sec delay
SW2-5	Time Delay Bit 5	ON - 16 Sec delay
SW2-6	Time Delay Bit 6	ON - 32 Sec delay
SW2-7	Test Mode Enable	Set to ON only when system contains an external 4 port coax switch with test load. Set to OFF when a test load is not connected.

Table 2-4 SW2 Configuration

Switch Section	Name	Description
SW2-8	External Switch Enabled	Set to ON when using an external coax switch. Set to OFF when using the internal RF relay.
SW2-9	Auto Switch Inhibit Enabled	Set to ON when used as an exciter switcher with a TX or system that provides a mute signal while in the OFF status. Set to OFF when the system does not provide a mute signal or when the mute signal should not inhibit the auto switching.
SW2-10	Spare	

2.2.4 Exciter or Transmitter Interconnections

The following lists the electrical and RFconnections to/from the controller, refer to Drawing 801-0123-841 sheet 1 in the accompanying drawing package for more details. If the internal relay is not being utilized insure the exciters or transmitters are connected properly to the external RF switch.

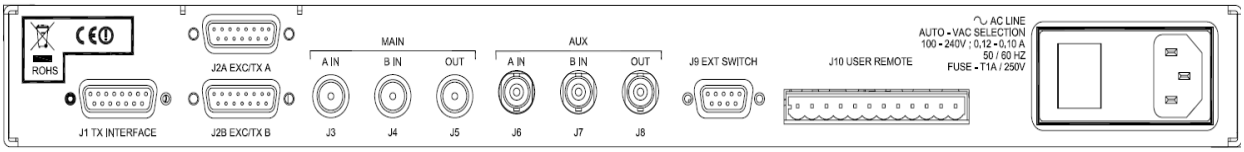


Figure 2-2 Rear Panel Connections

Table 2-5 Rear Panel Connections

Connection	Name	Description
J1	TX INTERFACE	Connection used when the Main/Alt controller is used as a exciter switcher. This connection routes the on-air exciter interface to the transmitter.
J2A	EXCITER A	Exciter A control interface connection.
J2B	EXCITER B	Exciter B control interface connection.
J3	MAIN A IN	RF Connection from Exciter/transmitter A. 100 Watts Maximum.
J4	MAIN B IN	RF Connection from Exciter/transmitter B. 100 Watts Maximum.
J5	MAIN OUT	RF Connection to transmitter or antenna (exciter switcher mode).
J6	AUX A IN	RF Connection from Exciter A auxiliary RF output. 100 Watts Maximum.

WARNING: Disconnect primary power prior to servicing.

Table 2-5 Rear Panel Connections

Connection	Name	Description
J7	AUX B IN	RF Connection from Exciter B auxiliary RF output. 100 Watts Maximum.
J9	AUX OUT	RF Connection to Aux transmitter.
J9	EXT SWITCH	Interface to external RF switch. Includes control and status lines.
J10	USER REMOTE	Allows for parallel I/O control.
AC	AC MAINS	90-264 VAC 50 or 60 Hz 1-Phase; 50 Watts

2.2.5 Main RF Connections (BNC)

The internal relay switch allows the RF signal from the on air exciter to be routed to the transmitter RF input. Three BNC type input/output connectors are accessible at the rear panel of the controller.

1. Connect the RF output from exciter A to J3 "MAIN A IN".
2. Connect the RF output from exciter B to J4 "MAIN B IN".
3. Connect the transmitter RF input to J5 "MAIN OUT".

2.2.6 AUX RF Connections (BNC)

The internal AUX relay switch allows the AUX OUTPUT RF signal from the on air exciter to be routed to the low level AUX transmitter RF input. Three BNC type input/output connectors are accessible at the rear panel of the controller.

1. Connect the AUX output from exciter A to J6 "AUX A IN".
2. Connect the AUX output from exciter B to J7 "AUX B IN".
3. Connect the AUX transmitter RF input to J8 "AUX OUT".

2.2.7 EXC/TX A J2A and EXC/TXB J2 B

Interfacing to a Harris Flexstar, Digit, SuperCiter, or MicroMax can be accomplished by connecting a simple 15 pin (straight through) cable between the exciter and the Main/Alt Controller.

- Exciter A connects to EXC/TXA J2A
- Exciter B connects to EXC/TXB J2B

Alternately if custom cables are to be manufactured to interface other types of exciters, the following connections are required for auto switching and safe operation:

Exciter A

- J2A pin 1 GND
- J2A pin 2 FWD_PWR_SAMPLE_A

- J2A pin 9 MUTE_A

Exciter B

- J2B pin 1 GND
- J2B pin 2 FWD_PWR_SAMPLE_B
- J2B pin 9 MUTE_B

Note-1:Typically an exciter/transmitter will contain a remote forward power sample output that is a DC voltage proportional to the forward power output. This DC voltage sample is used by the controller to determine when an exciter/transmitter has failed and, when operated in the AUTO mode, to initiate a switch to the alternate unit. If the exciter/transmitter does not have a remote sample output, an RF detector of some fashion will need to be installed to provide a DC sample to the controller.

Note-2:The FWD_PWR_SAMPLE inputs are designed for a range between 0 and 5VDC. Care should be taken to avoid voltages outside of this range.

Note-3:The MUTE_A and MUTE_B outputs are designed to operate with a 0V or 5V logic level. Care should be taken to avoid voltages outside of this range.

2.2.8 TX Interface J1

Interfacing to a Harris transmitter can be accomplished by connecting the exciter cable provided with the transmitter.

Alternately, if custom cables are to be manufactured to interface with other types of transmitters, the following connections are required:

- J1 pin 1 GND
- J1 pin 9 MUTE

2.2.9 Connecting a External Coaxial Switch

When an external switch is required, the interfacing process is simplified when a switch with +12VDC control/command signal is selected, since the controller provides a +12VDC supply for control/command signals. Other control voltages are possible, but will require the connection of a suitable supply to J9 pin 8 (+V_EXT) and the proper selection of JP1, JP2A, and JP2B. Also, verify that the RF power handling capabilities of the switch exceed the maximum expected output power levels of the exciters/transmitters to be used in the system.

When using an external switch it is highly recommended that diodes are placed across the control relays internal to the RF switch. This can be best accomplished be placing them inside the RF switch or if need be inside the cable at the switch end connector. These diodes keep the coil voltage spikes from back feeding into the controller and cause unreliable switching. Some switches have diodes installed by the manufacturer, if this is the case no other diodes are required. A 1N4004 or equivalent diode can be used. Diode orientation will depend on whether the switch uses Ground control or Voltage control. See JP1 and JP2 configuration to determine the control type.

EXT SWITCH Connector J9 on the rear panel of the controller provides the required command and status lines to the external switch. Refer to the user manual of the switch for proper connection to the switch interface.

The external switch interface connections at J9 are as follows:

Table 2-6 External Switch J9 Interface Connections

J9	Name	Description
Pin 1	POS1_CMD	Position 1 command
Pin 2	POS2_CMD	Position 2 command
Pin 3	COMMON	Command common
Pin 4	NC	No connection
Pin 5	NC	No connection
Pin 6	/POS1_STATUS	Position 1 status (active low)
Pin 7	/POS2_STATUS	Position 2 status (active low)
Pin 8	+V_EXT	External command voltage input. For use with switches requiring command voltages other than +12VDC.
Pin 9	GND	Ground

2.3 Initial Turn-On

This procedure will guide the user through setup and testing of the controller.

2.3.1 AC Input

The AC connection is made at the rear of the controller via a standard IEC connector. The AC mains voltage to the controller should be verified to be within the range of 90-264VAC 50 or 60 Hz before the controller is connected to the AC line.

2.3.2 Sensitivity Adjustments

STEP 1 Apply power to the controller by inserting the AC power cord into the socket on the rear panel. Verify that the rear panel AC MAINS switch is ON.

STEP 2 Verify that the MANUAL MODE indicator is illuminated. If not, select MANUAL MODE.

STEP 3 Verify that the POSITION A ON AIR indicator is illuminated. If not, select A ON AIR.

STEP 4 Turn on exciter/transmitter A and set the output power level to the desired switch threshold.

NOTE:
The desired switch threshold is the point at which the controller will attempt to switch. This threshold is set at the discretion of the operator. A threshold level near 50% of the normal operating level would be typical.

STEP 5 Adjust the RF LEVEL A control on the front panel counter clockwise until the front panel RF LEVEL A indicator illuminates.

STEP 6 Slowly adjust the RF LEVEL A control clockwise to the point where the indicator extinguishes and stop.

STEP 7 Raise and lower the output power level of exciter/transmitter A and verify the indicator reflects the desired threshold level.

STEP 8 Adjust the power level of exciter/transmitter A back to its normal power output level.

STEP 9 Select POSITION B ON AIR on the controller. Verify that the POSITION B ON AIR indicator is illuminated.

STEP 10 Set the exciter/transmitter B output power level to the desired switch threshold.

STEP 11 Adjust the RF LEVEL B control on the front panel counter clockwise until the front panel RF LEVEL B indicator illuminates.

STEP 12 Slowly adjust the RF LEVEL B control clockwise to the point where the indicator extinguishes and stop.

STEP 13 Raise and lower the output power level of exciter/transmitter B and verify the indicator reflects the desired threshold level.

STEP 14 Adjust the power level of exciter/transmitter B back to its normal power output level.

2.3.3 Automatic Switching

STEP 1 Operate exciter/transmitter A at 100% power with the controller in the MANUAL MODE and A ON AIR selected. Verify that the system is operating normally and that the RF LEVEL A indicator is illuminated.

STEP 2 Select AUTO MODE and verify that the AUTO MODE indicator is illuminated.

STEP 3 Lower the power output of exciter/transmitter A below the desired switch threshold. The RF LEVEL A indicator should extinguish and the SWITCH ALARM indicator should begin to flash.

STEP 4 After the switch hold off time has expired, 1 to 32 seconds depending on the configuration setup of SW2, verify that the controller switches itself to the MANUAL mode.

STEP 5 The controller B ON AIR indicator should now be illuminated.

STEP 6 The red SWITCH ALARM indicator should now be illuminated indicating an automatic switch has occurred.

STEP 7 The RF LEVEL B indicator should now be illuminated.

STEP 8 If a test load is connected to the external 4-port switch, set the TEST switch to ON. Verify the off-air exciter/transmitter unmutes into the test load. Set the TEST switch back to OFF.

STEP 9 This completes the automatic switching setup procedures.

NOTE:
This procedure can be repeated while substituting exciter/transmitter B for exciter/transmitter A in an effort to test for automatic switching to the opposite position (from B ON AIR to A ON AIR).

2.4 Remote Control J10 Connections

The operation of the Main/Alternate Controller may also be controlled by a remote control device. The front panel REMOTE switch will need to be set to the ENABLED position prior to remote operation. The remote command and remote status connections are available through connector J10 on the rear panel of the controller. Many of the front panel controls and indicators are available through J10 for connection to remote control equipment.

2.4.1 Control Inputs

All of the following control inputs, except MUTE, are momentary only active low inputs.

Table 2-7 Control Inputs J10

J10	Name	Description
Pin 1	/REM_A_SEL	Position A ON AIR select
Pin 2	/REM_B_SEL	Position B ON AIR select
Pin 3	/REM_AUTO_SEL	Auto Mode select
Pin 4	GND	Ground
Pin 5	/REM_MANUAL_SEL	Manual Mode select
Pin 6	/EXT MUTE	MUTE Command

2.4.2 Status Outputs

All status outputs are open collector active low with 10 ohm series resistors. Each status line can sink up to 100 mA of current in the low (ON) state and withstand up to +30 VDC in the high (OFF) state.

Table 2-8 Control Outputs J10

J10	Name	Description
Pin 7	/REM_A_AIR_STAT_OUT	Position A ON AIR status
Pin 8	/REM_AUTO_STAT_OUT	AUTO Mode status
Pin 9	GND	Ground
Pin 10	/REM_SW_ALARM_STAT_OUT	Switch Alarm status
Pin 11	/REM_TEST_MODE_STAT_OUT	Test Mode status

Section 3 Replaceable Parts List

3

3.1 Replaceable Parts List

Table 3-1 M/A SWITCHER - 981 0193 001 (F)

Harris PN	Description	Qty UM	Reference Designators
2500274001	CORD, AC, 3C, NEMA/IEC PLUGS	1 EA	
3980488000	FUSE, CART 5X20MM 1A SLOW	2 EA	
4840446000	*FILTER, RFI POWER LINE ENTRY	1 EA	
6121453000	PLUG, FEMALE 12C 1ROW STRAIGHT	1 EA	
6461255000	LABEL WARN REMOVE PWR	1 EA	
7360292000	PSU, SWITCHING, TRIPLE OUTPUT	1 EA	
9010123841	PWA, EXCITER M/A SWITCHER	1 EA	
9529238149	CABLES, M/A CONTROLLER	1 EA	
9710003086	KIT, CABLE, EXC SWITCHER, MAIN	0 EA	
9710003087	KIT, CABLE, EXC SWITCHER, HD	0 EA	
9882761001	DOC PKG, M/A CONTROLLER	1 EA	

Table 3-2 PWA, EXCITER M/A SWITCHER - 901 0123 841 (F)

Harris PN	Description	Qty UM	Reference Designators
3820406000	IC, LM340/LM7812C (TO-220)	1 EA	U14
5460295000	RES 50 OHM 3.25W 5%	2 EA	R96 R97
5500953000	TRIMPOT 20K OHM 1/2W 10%	2 EA	R123 R124
5740485000	RELAY 2PDT 12VDC 2A LATCHING	7 EA	K3 K4 K5 K6 K8 K9 K10
5740568000	RELAY, LATCHING 2 C/O 12V	2 EA	K1 K2
5780026000	RELAY 2PDT 12VDC 2A NON-LATCH	4 EA	K7 K11 K12 K13
6041103000	SW, TGL SPDT MOM-OFF-MOM	2 EA	S4 S5
6041104000	SW, TGL SPDT ON-NONE-ON	2 EA	S3 S6
6121499001	RECP, D, 9C RT ANG METAL	1 EA	J9
6122175002	*RECP D RT ANG 15C MET SHELL	1 EA	J1
6122243015	RECP/RECP, D, 15C/15C, METAL	1 EA	J2
6202930000	RECEPTACLE RT ANGLE BNC	3 EA	J6 J7 J8
6260104000	JACK, BNC BULKHEAD RA PCB	3 EA	J3 J4 J5
8010123841	SCH, M/A SWITCHER	0 DWG	

WARNING: Disconnect primary power prior to servicing.

Table 3-3 PWA, EXCITER M/A SWITCHER, SMT - 901 0123 842 (E)

Harris PN	Description	Qty UM	Reference Designators
3890010001	LED, RED 0805 DIFFUSED ESD	3 EA	DS2 DS11 DS14
3890010002	LED, GREEN 0805 DIFFUSED ESD	15 EA	DS1 DS3 DS4 DS5 DS6 DS7 DS8 DS9 DS10 DS12 DS15 DS16 DS17 DS18 DS19
3890010004	LED, ORANGE 0805 DIFFUSED ESD	1 EA	DS13
6030001000	DIPSWITCH, 10-SPST SMT-20	1 EA	S2
6041163000	SW, PB MOM SPST-NO TACT (SMT)	1 EA	S1
6101330000	TEST POINT, RECT-LOOP, SMT	7 EA	TP6 TP8 TP9 TP10 TP12 TP13 TP18
8010123841	SCH, M/A SWITCHER	0 DWG	
8010123843	PWB, M/A SWITCHER	1 EA	

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