HARRIS®
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Installation Manual
MM-014714-001
Rev. H, Oct/11

CS7000 Control Station

Local-Control Desktop CT-013892-001
Remote-Control Desktop CT-013892-002

MANUAL REVISION HISTORY

REV.	DATE	REASON FOR CHANGE
E	Mar/10	Revised remote control configuration section, added preventive maintenance section, and added information on CS7000 Fan Upgrade Kit KT-018569-002.
F	Sep/10	Revised related documentation section, antenna information, and configuration section.
G	Feb/11	Revised information on connecting Tone Remote Controllers (TRCs), corrected accessory part numbers, and added Appendix B.
H	Oct/11	Updated to include Unity XG-100M information.

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or
e-mail us at: PSPC_TechPubs@harris.com

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Repairs to this equipment should be made only by an authorized service technician or facility designated by the supplier. Any repairs, alterations or substitutions of recommended parts made by the user to this equipment not approved by the manufacturer could void the user's authority to operate the equipment in addition to the manufacturer's warranty.

This product conforms to the European Union WEEE Directive 2002/96/EC. Do not dispose of this product in a public landfill. Take it to a recycling center at the end of its life.

TABLE OF CONTENTS

Section *Page*

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES

Page

LIST OF FIGURES

Page

LIST OF TABLES

Page

1 REGULATORY AND SAFETY INFORMATION

1.1 MAXIMUM PERMISSIBLE EXPOSURE LIMITS

DO NOT TRANSMIT with this Control Station and antenna when persons are within the Maximum Permissible Exposure (MPE) radius of the antenna. The MPE radius is the minimum distance from the antenna axis that ALL persons should maintain in order to avoid RF exposure higher than the allowable MPE level set by the FCC.

FAILURE TO OBSERVE THESE LIMITS MAY ALLOW ALL PERSONS WITHIN THE MPE RADIUS TO EXPERIENCE RF RADIATION ABSORPTION, WHICH EXCEEDS THE FCC MAXIMUM PERMISSIBLE EXPOSURE (MPE) LIMIT. IT IS THE RESPONSIBILITY OF THE CONTROL STATION OPERATOR TO ENSURE THAT THE MAXIMUM PERMISSIBLE EXPOSURE LIMITS ARE OBSERVED AT ALL TIMES DURING CONTROL STATION TRANSMISSION. THE CONTROL STATION OPERATOR IS TO ENSURE THAT NO BYSTANDERS ARE WITHIN THE RADIUS LIMITS.

1.1.1 Determining MPE Radius

Maximum Permissible Exposure (MPE) radius is unique for each site. It is determined during site licensing time based on the complete installation environment (i.e., co-location, antenna type, transmit power level, etc.). Determination of the MPE distance is the responsibility of the installation licensee. Calculation of the MPE radius is required as part of the site licensing procedure with the FCC.

1.1.2 Safety Training Information

THIS CONTROL STATION GENERATES RF ELECTROMAGNETIC ENERGY DURING TRANSMIT MODE. THIS CONTROL STATION IS DESIGNED FOR AND CLASSIFIED AS "OCCUPATIONAL USE ONLY" MEANING IT MUST BE USED ONLY IN THE COURSE OF EMPLOYMENT BY INDIVIDUALS AWARE OF THE HAZARDS AND THE WAYS TO MINIMIZE SUCH HAZARDS. THIS CONTROL STATION IS NOT INTENDED FOR USE BY THE "GENERAL POPULATION" IN AN UNCONTROLLED ENVIRONMENT. IT IS THE RESPONSIBILITY OF THE CONTROL STATION OPERATOR TO ENSURE THAT THE MAXIMUM PERMISSIBLE EXPOSURE LIMITS DETERMINED IN THE PREVIOUS SECTION ARE OBSERVED AT ALL TIMES DURING TRANSMISSION. THE CONTROL STATION OPERATOR IS TO ENSURE THAT NO BYSTANDERS COME WITHIN THE RADIUS OF THE MAXIMUM PERMISSIBLE EXPOSURE LIMITS.

When licensed by the FCC, this Control Station complies with the FCC RF exposure limits when persons are beyond the MPE radius of the antenna. In addition, the CS7000 Control Station installation complies with the following Standards and Guidelines with regard to RF energy and electromagnetic energy levels and evaluation of such levels for exposure to humans:

FCC OET Bulletin 65 Edition 97-01 Supplement C, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

American National Standards Institute (C95.1 – 1992), IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

American National Standards Institute (C95.3 – 1992), IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave.

To ensure that your exposure to RF electromagnetic energy is within the FCC allowable limits for occupational use, do not operate the control station in a manner that would create an MPE distance in excess of that allowable by the FCC.

This equipment generates or uses Radio frequency energy. Any changes or modifications to this equipment not expressly approved by Harris Corporation may cause harmful interference and could void the user's authority to operate the equipment.

1.2 SAFETY SYMBOL CONVENTIONS

The following conventions are used throughout this manual to alert the user to general safety precautions that must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere violates safety standards of design, manufacture, and intended use of the product. Harris Corporation assumes no liability for the customer's failure to comply with these standards.

The WARNING symbol calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING symbol until the conditions identified are fully understood or met.

The CAUTION symbol calls attention to an operating procedure, practice, or the like, which, if not performed correctly or adhered to, could result in damage to the equipment or severely degrade equipment performance.

The NOTE symbol calls attention to supplemental information, which may improve system performance or clarify a process or procedure.

The ESD symbol calls attention to procedures, practices, or the like, which could expose equipment to the effects of Electro-Static Discharge. Proper precautions must be taken to prevent ESD when handling circuit boards or modules.

The electrical hazard symbol is a WARNING indicating there may be an electrical shock hazard present.

1.3 IMPORTANT SAFETY INSTRUCTIONS

- Read these instructions.
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.
- Do not use this apparatus near water.
- Clean only with dry cloth.
- Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
- Only use attachments/accessories specified by the manufacturer.
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as the power supply cord, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
- Warning: The lightning bolt signifies an alert to the user of the presence of un-insulated "dangerous voltage" within the product's enclosure that may be of significant magnitude to constitute a risk of electric shock to persons.

- Warning: The exclamation point alerts the user to the presence of important operation and maintenance (service) instructions in the literature accompanying the product.
- Outdoor Use Warning: To reduce the risk of Fire or Electric Shock, Do Not Expose This Apparatus to Rain or Moisture.
- Wet Location Warning: Apparatus shall not be exposed to dripping or splashing and no objects filled with liquids, such as vases, shall be placed on the apparatus.

The CS7000 contains no user-serviceable parts. Only authorized service personnel should open the unit. Obey all warning labels. If you do not follow these instructions you may risk electric shock, and/or damage to the equipment.

2 SPECIFICATIONS[1]

HOUSING CONFIGURATION

CT-013892-001:	Control Station, Local-Control, Desktop
CT-013892-002:	Control Station, Remote-Control, Desktop**FRONT PANEL CONTROLS AND FEATURES**
Local Control Desktop Station:	DC Power LED, Speaker
Remote Control Desktop Station:	DC Power LED, Speaker, Station Microphone Jack, Station Volume Control, VU Meter, Intercom Switch, Remote Switch**REAR PANEL CONNECTORS AND FEATURES**

Local and Remote Models (Standard on All Models):

AC Power Input:	IEC-302, Unified Power Connector/Fuse/ON-OFF Switch
Main Antenna:	Type-N, Female, 50 Ohm
Optional Antenna:	BNC, Female, 50 Ohm (for XG-100M Low Band operation)
External I/O (P3):	DB-25F, I/O, Small Signal – Direct Function
Serial A (P2):	USB, 2.0 Type B, 12 Mbps, Radio Programming Port
Serial B (P6):	DB-9F, RS-232C (DCE), Serial Interface, Full Duplex, Hardware Flow Control, ASYNC and SLIP at 19.2kbps

Remote Models (Standard on Remote Models):

CAN Link (J15):	2-Wire Differential, 120 ohms, V2.0B 500kbps
LINE Input (J18):	RJ-11 Tone Remote, 600 ohm Line-Input: -30 to 0 dBm (-20 to +11 dBm Securitone level) Line-Output: 0 dBm
Computer (J1):	RJ-45, 10/100BaseT, Ethernet, to Local PC
LAN (J6):	RJ-45, 10/100BaseT, Network, to VoIP Remote Controllers

DIMENSIONS (H x W x D)

Desktop:	3.5 x 17 x 13.1 inches (8.9 x 43.2 x 33.3 cm) (excludes 1 inch (2.54 cm) rubber feet)
Rack Mount:	3.5 x 17 x 13.1 inches (8.9 x 43.2 x 33.3 cm)

WEIGHT

Without Transceiver:	18 lbs (8.2 kg)
With Transceiver:	24 lbs (11 kg)

[1] Specifications listed herein are intended primarily for the use of the service technician. See the appropriate Specifications Sheet for complete specifications.

AC INPUT

Maximum:	120 VAC (240VAC), 4.0 Amps (2 Amps), 400 Watts, 50/60 Hz
Transmit (typical):	120 VAC (240VAC), 2.5 Amps (1.25 Amps), 300 Watts, 50/60 Hz
Receive (typical):	120 VAC (240VAC), 1.2 Amps (0.6 Amps), 100 Watts, 50/60 Hz

ENVIRONMENTAL

Operating Temperature:	CT-013892-001: -30 to +40ºC @ 50 % duty cycle -30 to +60ºC @ 20 % duty cycle CT-013892-002: -0 to +40ºC @ 50 % duty cycle -0 to +60ºC @ 20 % duty cycle
Storage Temperature:	-40 to +70ºC

STANDARDS MIL-STD-810F and EN 61000-4-2

Test Methods:

Low Pressure:	500.4/I&II
High Temperature:	501.4/I&II
Low Temperature:	502.4/I&II
Temperature Shock:	503.4/I
Basic Transportation Vibration:	514.5/I Category 4
Functional/Basic Shock:	516.5/I
Humidity:	507.4
ESD (2001):	EN 61000-4-2

DUTY CYCLE

Receiver:	100% (per EIA-603)
Transmitter:	20 % (per EIA-603), from -30 to +60ºC (model CT-013892-001) 20 % (per EIA-603), from 0 to +60ºC (model CT-013892-002)

SPEAKER

Impedance:	12 ohms
Rated Power:	3 W RMS
Distortion:	5% at rated power from 300-3000 Hz
Buzzes/Rattles:	None
Acoustic Output:	95 dB SPL @ 3 W @ 12 inches @ 1 KHz
Acoustic Response:	± 5 dB from 300-3000 Hz

REMOTE CONTROL MODES (Model: CT-013892-002)

Tone Remote Control:	2 or 4-wire tone remote control interface with maximum number of Tone Remote Controllers (TRCs) limited only by line conditions (loss, loading, noise, etc.); Modes: EDACS, P25, OpenSky, and Conventional
Voice over IP:	VoIP audio with PTT control interface supports up to five (5) VoIP Remote Controllers; Modes: EDACS, P25, OpenSky, and Conventional
Controller Area Network:	CAN interface supports up to five (5) CAN-based Remote Controllers; Modes: OpenSky and Conventional

As of the publication of this manual, the CS7000 Remote Control Station may be configured for Tone Remote Control or VoIP Remote Control, but not both at the same time. Contact the Technical Assistance Center for additional information.

TRANSCEIVER Specifications determined by the mobile radio's specifications. Refer to the applicable M5300/M7300 mobile radio maintenance manual.

REGULATORY

FCC Part-15 Class B Compliant

FCC Part 90 Compliant (refer to mobile radio manual)

Industry Canada RSS-119 (refer to mobile radio manual)

EN60950 Compliant

CSA22.2 Compliant

3 INTRODUCTION

The CS7000 Control Station provides the latest in digital radio technology using a Harris' M5300, M7300, or Unity XG-100M mobile radio installed into the Control Station. The station may be equipped to support one or more of the following operating modes:

- OpenSky® digital operation (M5300 or M7300).
- Enhanced Digital Access Communications System (EDACS®) or ProVoice™ trunked modes (M5300 or M7300).
- APCO Project 25 Phase I compliant Common Air Interface (P25 CAI) trunked radio networking.
- Conventional analog mode.

The CS7000 Control Station is typically used for voice and data dispatch communications via optional remotely-connected Desktop Controllers. Remote Desktop Controllers may be connected via any of the following remote control formats:

- Controller Area Network (CAN) link connection.
- Tone controlled line input.
- LAN-based Voice over Internet Protocol (VoIP) connection.

CAN links are generally limited to 250 feet end-to-end line length, but may utilize an optional fiber-optic-based CAN Bus Extender for increased separation between the CS7000 Control Station and a CAN-based Desktop Controller(s). Tone Remote Controllers connect via 2-wire or 4-wire line audio connections. VoIP requires connectivity to a Wide Area Network (WAN) or Local Area Network (LAN).

Figure 3-1: CT-013892-001 Local Control Station with Scan Head (Front View)

Figure 3-2: CT-013892-002 Local/Remote Control Station with System Head (Front View)

3.1 VOICE OPERATION

The voice path operates like a traditional FM analog dispatch radio, with a microphone to transmit (Push-To-Talk) and a speaker to receive. In OpenSky Trunked Protocol (OTP) and P25 modes, all transmissions are in digital mode. Speech heard by the microphone is converted and transmitted over-the-air as a digitized signal, and re-converted back to analog and heard over the speaker by the receiving unit. Systems operating in EDACS mode may employ analog or digital voice modes.

3.2 OPTIONAL REMOTE CONTROL (WITH INTERCOM)

The CS7000 Control Station may be equipped with the Remote Control Option. As illustrated in Figure 3-2, the Remote Control Option consists of a enhanced faceplate with intercom controls, and a Remote Control (Plus) Board which provides the ability to remotely control the station features such as PTT (transmit), group and/or channel control, and intercom.

3.2.1 Intercom Operation

Control Stations equipped with the optional Remote Control (Plus) Board is also equipped with an intercom function. The intercom function allows voice communications between the Control Station's operator and operators at Desktop Controllers connected via the CAN link, VoIP link, or Tone Remote Controllers connected to the line connector. Even when intercom is activated, incoming network radio calls are still routed to the speaker in the Desktop Controllers in receive mode (not keyed). In other words, radio calls are not muted when the Desktop Controller's intercom function is active, unless the remote is keyed and making an intercom transmission.

3.3 RELATED DOCUMENTATION

The following documents contain additional information relative to the CS7000 Control Station. These documents may be helpful during the installation and maintenance of this equipment.

Table 3-1: Reference Documents

DOCUMENTATION	MANUAL NUMBER
CS7000 Control Station Operator's Manual	MM-014713-001
USB Communications Port Driver Software Installation Manual	MM-015245-001
M5300 Transceiver Operator's Manual	MM-012125-001
M5300 Transceiver Quick Guide when using OpenSky Systems	MM-012997-001
M5300 Transceiver Quick Guide when using P25, EDACS, or Conventional Systems	MM-013232-001
M7300 Transceiver Operator's Manual	MM-014716-001
M7300 Transceiver Quick Guide when using OpenSky Systems	MM-014368-001
M7300 Transceiver Quick Guide when using P25, EDACS, or Conventional Systems	MM-014369-001
Unity XG-100M Transceiver Operator's Manual	14221-1200-2000
Unity XG-100M Transceiver Quick Guide	14221-1200-1000
M5300/P5300 Software Release Notes for Software Media Kits SK-012724-001 and SK-012720-001 (OTP Releases R13A through R15W)	MS-014467-001

Table 3-1: Reference Documents (Continued)

DOCUMENTATION	MANUAL NUMBER
M5300/M7300 Software Release Notes for Software Media Kits SK-012724-016 and SK-015406-016 (OTP Release R16D = 16.4)	MS-018835-001
M5300 Software Release Notes for Software Media Kit SK-012724-016 (M5300 OTP Release R16F = 16.6)	MS-018988-001
M7300 Software Release Notes for Software Media Kit SK-015406-009 (M7300 OTP Rear Panel Software Releases R15A through R15C)	MS-018245-001
M7300 Software Release Notes for Software Media Kit SK-015406-016 (M7300 OTP Release R16F = 16.6)	MS-018990-001
M5300/M7300 MCU Software Release Notes for Software Media Kit SK-018180-001	MS-018458-001
Unity XG-100M Mobile Radio Software Release Notes for Software Media SK-018940-001	14221-1200-8050
Unity DES Encryption Module Software Release Notes for Software Media SK-019406-002	14221-1100-8050
OpenSky Mobile-End System (MES) AT Command Manual	MM-016649-001
M5300 EDACS/ProVoice, Conventional, and P25 Software Release Notes for Software Media Kits SK-010365-001, SK-011983-001, SK-012721-001, SK-012725-001, and SK-018180-001	MS-010366-001
CH-721 Control Head Software Release Notes for Software Distribution Kit ST-011241-001	MS-013563-001
VHF M7300 Maintenance Manual	MM-017065-001
800 MHz M5300 and 700/800 MHz M7300 Maintenance Manual	MM-014718-001
900 MHz M5300 Maintenance Manual	MM-012126-001
Unity XG-100M Maintenance Manual	14221-1200-5000
CH-721 Maintenance Manual	MM-008918-001
Site Grounding and Lightning Protection Guidelines	AE/LZT 123 4618/1
Tower Requirements and General Specifications	LBI-39185
Antenna Specifications	LBI-38983
CAN Bus Extender User's Manual	MM-009088-001
CS7000 Fan Upgrade Kit KT-018569-002 Installation Manual	MM-018569-002

3.4 CUSTOMER RESOURCE INFORMATION

3.4.1 Technical Support

The Technical Assistance Center (TAC) is available to help with overall system operation, maintenance, upgrades and product support. TAC is the point of contact when answers are needed to technical questions.

Product specialists, with detailed knowledge of product operation, maintenance and repair provide technical support via a toll-free (in North America) telephone number. Support is also available through mail, fax and e-mail.

For more information about technical assistance services, contact your sales representative, or contact the Technical Assistance Center at the following:

North America:	1-800-528-7711
International:	1-434-385-2400
Fax:	1-434-455-6712
E-mail:	PSPC_tac@harris.com

3.4.2 Tech-Link

For more information about this and other Harris PSPC products, check out our online Tech-Link service at:

https://premier.pspc.harris.com/

Tech-Link is a one stop link to Technical Documentation (downloadable PDFs), Software Revisions, Feature Encryption, pictorials of parts and accessories, and other information pertaining to our products. It's information that will enhance your service efforts, 24 hours a day, 7 days a week.

3.4.3 Customer Care

If any part of the system equipment is damaged on arrival, contact the shipper to conduct an inspection and prepare a damage report. Save the shipping container and all packing materials until the inspection and the damage report are completed. In addition, contact the Customer Care center to make arrangements for replacement equipment. Do not return any part of the shipment until you receive detailed instructions from a Harris representative.

Contact the Customer Care center at http://www.pspc.harris.com/CustomerService or:

North America:

Phone Number:	1-800-368-3277
Fax Number:	1-321-409-4393
E-mail:	PSPC_CustomerFocus@harris.com

International:

Phone Number:	1-434-455-6403
Fax Number:	1-321-409-4394
E-mail:	PSPC_InternationalCustomerFocus@harris.com

4 UNPACKING AND CHECKING EQUIPMENT

4.1 MATERIALS

The CS7000 Control Station includes an AC Power Cord for connecting to standard AC power (120 VAC, 60 Hz). No installation kit is available, as every installation is custom. Remote control models of the CS7000 may be used in conjunction with a Desktop Controller, and may include other accessories that can be installed. Table 4-1 lists equipment top-level part numbers, and Table 4-2 lists available accessories.

The CS7000 must not be powered up unless an antenna is installed and connected. An antenna and its cabling must be purchased separately. Antennas and coaxial cables are typically customized to the installation site. Have site surveys performed to identify an appropriate antenna and antenna feed line requirements.

4.2 MATERIAL INSPECTION

After removal from the carton, examine the components and installation items for broken, damaged, loose or missing parts. If any are noted, contact the Customer Care center immediately to discuss and arrange for the return of the equipment to Harris for replacement. Refer to Section 3.4.3 on page 19 for Customer Care center contact information. Any unauthorized attempts to repair or modify this equipment will void the warranty and could create a safety hazard.

Upon removing items from the carton and verifying all equipment is accounted for, proceed with the installation.

Table 4-1: CS7000 Control Station Part Numbers

DESCRIPTION	PART NUMBER
CS7000 Control Station, Desktop Configuration, Local Control	CT-013892-001
CS7000 Control Station, Desktop Configuration, Remote Control	CT-013892-002

Table 4-2: CS7000 Control Station Accessories

DESCRIPTION	PART NUMBER
Desktop Microphone	MC-014121-001
Desktop Microphone	MC-014121-002
Antenna, 800 MHz Yagi with 10 dBd (12 dBi) Gain	AN-025137-008
Cable, Coax: Antenna Jumper Kit	MAMROS0095
Lightning Protection Device, DC Blocked, (Sim. to. PolyPhaser: DSXL-MA-BF), 700 to 2700 MHz, N-male (ant.) to N-female (eq.)	DSXL-MA-BF
CAN Terminator	CD-014027-001
Cable, CAN; 0.6 feet, Black, Right-Angle-to-Straight Connectors	CA-009562-0R6
Cable, CAN; 6 feet, Black, Right-Angle-to-Straight Connectors	CA-009562-006
Cable, CAN; 30 feet, Black, Right-Angle-to-Straight Connectors	CA-009562-030
Cable, CAN; 90 feet, Black, Right-Angle-to-Straight Connectors	CA-009562-090
Cable, CAN; 250 feet, Black, Right-Angle-to-Straight Connectors	CA-009562-250
CAN Y-cable, Black, Right-Angle-to-Two Straight Connectors	CA-011344
Kit, CAN Bus Extender (Includes CAN Bus Extender MD-008577 and AC Wall Power Supply) [2 required per optical CAN link]	MAA7-NSU5C
USB Communications Port Driver Software	SK-015121-001
Radio Personality Manager (SK-104768-001: Programming Software for P25, EDACS, OpenSky)	TQS3385 Rev. B (minimum)
Radio Personality Manager (SK-012177-001: Programming Software for Analog Conventional and P25 Conventional)	TQS3389 Rev. A (minimum)
Tone Remote Controller: IDA Model 24-66 with Desk Mic (Used with CS7000 Control Station CT-013892-002)	ID-431-24-66M
Tone Remote Controller: IDA Model 24-66 with Handset (Used with CS7000 Control Station CT-013892-002)	ID-431-24-66H
VoIP Remote Controller: IDA Model ID-431-24-66M-VOIP, w/Handset (Used with CS7000 Control Station CT-013892-002)	CU-017947
VoIP Remote Controller: IDA Model ID-431-24-66H-VOIP, w/ Desk Mic (Used with CS7000 Control Station CT-013892-002)	CU-017948
Wall Mount Bracket for IDA 24-66 series remotes	431-RBC-001
Rack Mount Kit for CS7000	HD-014666-001
Headset/Footswitch option for IDA 24-66 series remotes w/Desk Mic	431-RBC-007
CS7000 Fan Upgrade Kit	KT-018569-002

5 INSTALLATION

Harris recommends the buyer use only an authorized representative to install and service this product. The warranties provided to the buyer under the terms of sale shall be null and void if this product is installed or serviced improperly, and Harris shall have no further obligation to the buyer for any damage caused to the product or to any person or personal property.

Prior to installation, ensure that the CS7000 has been configured for customer usage such as channels and personality.

5.1 REQUIRED TOOLS AND EQUIPMENT

5.1.1 Tools and Shop Supplies Required to Install the CS7000

The following is a list of tools required to complete a standard installation:

- Phillips screwdriver, size #2 (for cabinet screws).
- 5/32” Hex key (for radio mounting screws).
- 3/8” Nut driver (for rear panel-mounted ground screw).
- Various fasteners; as required.

Special tools needed to construct and/or install optional cables and accessories are listed in the installation and configuration sections for the option or accessory.

5.1.2 Equipment Required for CS7000 Configuration

The following is a list of additional equipment needed to configure the CS7000:

- Personal Computer (PC) with an available USB communication port and running Microsoft® Windows® XP or Windows Server 2003. OpenSky programming requires a terminal application software program such as Windows HyperTerminal, and P25, EDACS, and Conventional requires the programming software listed in Table 4-2 on page 21.
- Standard USB 2.0B computer cable, USB-A to USB-B connectors.
- See Table 9-1 on page 115 for a list of test equipment required to perform antenna tests procedures.
- TQS3385 Rev. B (min): Radio Personality Manager (Programming Software for P25, EDACS, OpenSky).
- TQS3389 Rev. A (min): Radio Personality Manager (Programming Software for Analog Conventional and P25 Conventional).
- TQS3416 Rev. B (min): Key Manager (Key Administrator application Key Loader application.
- SK-015121-001: USB Communications Port Driver Software.

5.2 PLANNING THE CS7000 INSTALLATION

Plan the mounting locations of all components (CS7000, antenna, and cables) and determine the routes for all wiring and cables. Consider also the connection of desktop remotes for planning purposes. Follow all manufacturer requirements and guidelines for the location of components.

NOTE

For installations with CAN-based Desktop Controllers which require connection through the CAN (Controller Area Network) digital interface, pay particular attention to the routing of CAN cable in the facility. It may be necessary to use plenum-rated cable for in-building installations. Refer to Section 0 that begins on page 35 and/or consult with TAC to identify the proper cabling.

CAUTION

All cables should be installed with a service loop at each end. During the installation, do NOT bend any cable at a severe angle near a connector. When the installation is complete, verify no cable is under any tension. Failure to do so may lead to damaged cables, causing intermittent operation, or complete equipment failure.

CAUTION

Optimal performance is based upon proper mounting techniques. An improperly installed unit may experience degradation in the quality of communication with the OpenSky network.

5.3 CS7000 INSTALLATION

Determine the customer's preferences, if any, including location of components. Comply with these preferences insofar as they are consistent with safety, manufacturer specifications, and generally accepted professional practices.

5.3.1 Desktop Installations

CS7000 Control Station CT-013892-001 and CT-013892-002 can be placed upon a desktop, tabletop, or another flat horizontal surface with an adequate size and weight rating. Unit dimensions are 3.5 x 17 x 13.1 inches. (8.9 x 43.2 x 33.3 cm), excluding the 1-inch (2.54 cm) rubber feet, and the weight is approximately 24 pounds (11 kg.) with the mobile radio installed.

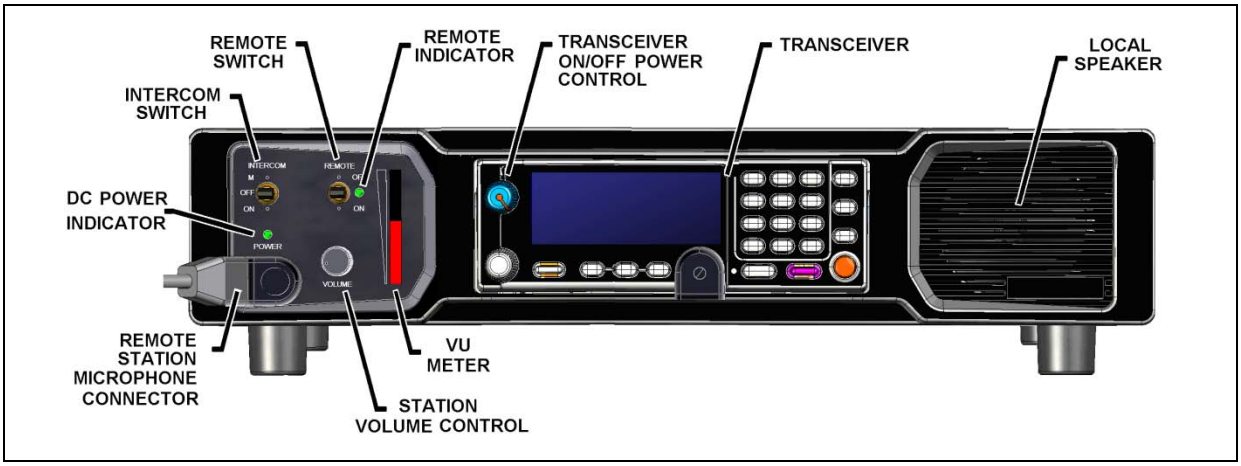


Figure 5-1: CS7000, Front View of Remote Control, Desktop Configuration

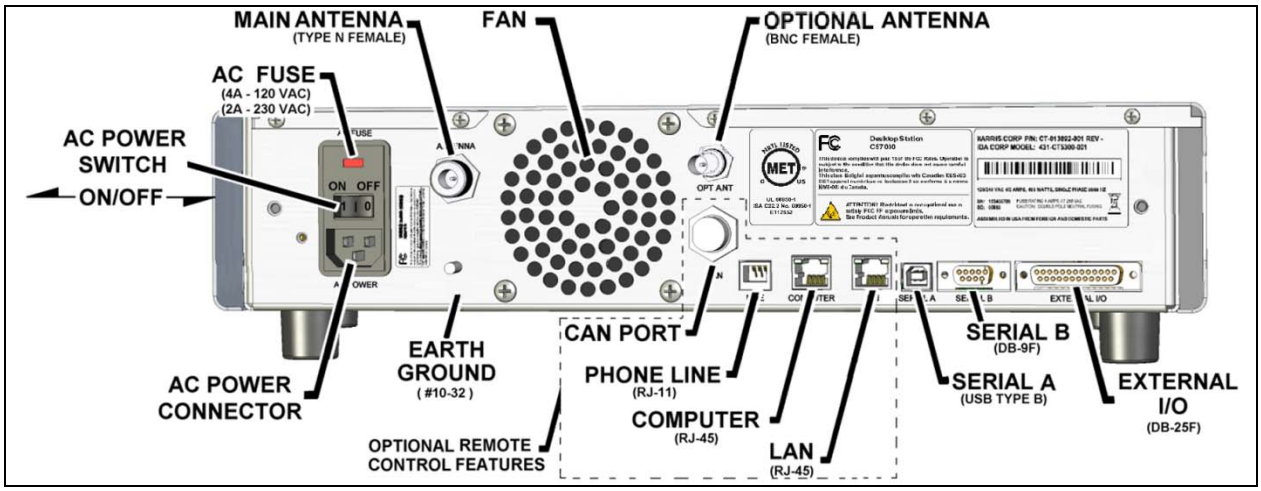


Figure 5-2: CS7000 Rear Panel (shown with Remote Control (Plus) Board installed)

CAUTION

Never place any other equipment directly on top of the CS7000. The case is not designed to handle the weight of other equipment.

WARNING

The CS7000 must be kept away from sources of heat. Adequate ventilation must be provided to the air inlet at the rear of the unit where the fan is located and to the ventilation holes on the rear-sides of the unit.

5.3.2 AC Power Connection

The CS7000 only supports an AC power connection. Follow these general guidelines:

- Ensure familiarity with AC power input connection, including maintenance of the fuse; and,
- Make certain that cable routing will not damage or interfere with any existing wiring at the installation location.

In order to accommodate both U.S. and other standards, the CS7000 can be used at voltages in the range of 110 – 120 VAC (50/60 Hz) and 220 – 240 VAC (50/60 Hz). The power cord for U.S. applications (110 – 120 VAC) is included with the CS7000 when it ships from the factory. For other applications, the appropriate power cord must be purchased separately. The receptacle at the back of the CS7000 is an IEC-320 C14-type connector for accepting a cord with an IEC-320 C13-type plug.

5.3.3 AC Fuse Replacement

In the event that a fuse blows in the CS7000, disconnect AC power from the unit by unplugging the cord from the AC power source or by unplugging the cord from the IEC-320-type AC power connector on the CS7000's rear panel, and follow this replacement procedure:

1. As shown in Figure 5-3, slip the tip of a small flat-blade screwdriver into the pry slot at the top of the AC Power Module and open the fuse assembly door.
2. Remove the fuse holder and replace the blown fuse with a new 4-amp, 250-volt fuse.
3. Re-insert and reseat the fuse assembly until the panel snaps back into place.
4. Reconnect AC power to the unit.

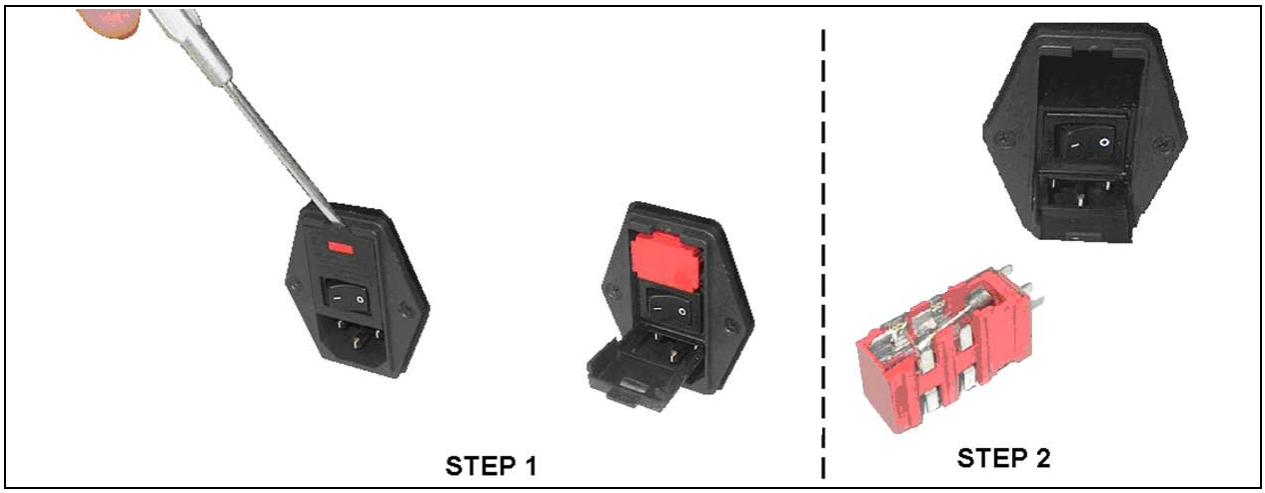


Figure 5-3: CS7000 Fuse Replacement (Rear Panel Views)

5.4 ANTENNA INSTALLATION

Antenna installations vary greatly depending on the type of antenna mounting structure, height, and the surrounding environment. Professional antenna installation services are highly recommended when installing and maintaining communications antenna systems. This manual makes no attempt to provide step-by-step instructions for installing the antenna and supporting structure. Rather, general recommendations and considerations are provided. Further, where installation instructions provided by antenna and other related antenna equipment manufacturers differ from this manual, the manufacturer's instructions are to be followed at all times. When in doubt, always contact the equipment manufacturer or the Technical Assistance Center for further assistance. Follow all national and local building code requirements when installing antenna systems.

5.4.1 RF Safety Information

WARNING

The antenna must be installed by a qualified antenna professional. Improper installation of the antenna may lead to poor radio performance, and harmful exposure to RF electromagnetic energy.

The CS7000 antenna installation must comply with the FCC RF exposure limits as discussed in Section 1.1. Installation of the antenna for the CS7000 is to be performed so that no person is within the distance of maximum permissible exposure limits specified in the FCC regulations. The CS7000 must be disabled before antenna maintenance is performed.

5.4.2 General Information

Several manuals are available that provide useful information during the installation process. General antenna installation specifications may be found in the Antenna Systems Manual, publication number LBI-38983. Tower Requirements and General Specifications may be found in the Specifications, Guidelines and Practices Manual, publication number LBI-39185. In addition, site grounding must conform to the requirements found in the Site Grounding and Lightning Protection Guidelines Manual, publication number AE/LZT 123 4618/1.

Failure to follow these instructions will void the product warranty and may expose the end user and others to excessive radio frequency hazards. Antennas should be installed outdoors.

5.4.3 Building Installation Considerations

The length of antenna cable should be kept as short as possible to minimize cable loss. Therefore, the CS7000 should be installed within the building in a location as close to the location of the outside antenna's cable entry as reasonably possible. Remote control options (remote desktop controllers) should be utilized when the most suitable station installation location is impractical for the intended user(s) access. Consult with RF equipment installation professionals for more information.

NOTE

If routed through walls, plenums, or other channeling aids, the cable must be protected from excessive handling, bending, or rubbing.

5.4.4 Base Station Antennas

The CS7000's antenna can be roof-top mounted or mounted on the side of a building. The rooftop-mount yagi antenna listed in Table 4-2 on page 21 is recommended for an 800 MHz control station. Side-mounting onto a building with other types of directional antennas is also acceptable as long as proper line-of-sight alignment can be achieved.

For best performance, the antenna should be placed as far away as practical from any other antennas or structures, and high enough to clear the line-of-sight of major obstructions.

CAUTION

Ensure that feed lines, lightning protection devices, coaxial jumpers, and any other inline RF devices meet frequency and RF power requirements for the specific installation.

5.4.5 Transmission Lines

Many different RF coaxial cable types can be used for the antenna connection as long as the utilized cable meets the following minimum requirements. Cable loss, length of cable, antenna type used, etc., are issues to consider when selecting the type of cable needed. Minimum cable specifications are:

- 50 ohm nominal impedance;
- Minimal RF Loss at frequency range;
- 1.5:1 VSWR (typical);
- 3 dB/100 feet cable loss (maximum); and,
- Weatherproof construction.

CAUTION

Always hand-tighten RF connectors. Do not tighten RF connectors with tools unless recommended by the connector manufacturer. The use of a torque wrench is acceptable when the manufacturer of the connector has specified a torque value.

5.4.5.1 Minimum Transmission Line Bending Radius

When Heliax, Superflex, or another similar transmission line is used, always adhere to the minimum bending requirements provided by the manufacturer (refer to Table 5-1).

Table 5-1: Minimum Bend Radius Values for RF Transmission Lines

CABLE SIZE	TYPE	PART NUMBER	MINIMUM-BEND RADIUS
Andrews Corp.			
1/4 inch	Superflex	FSJ1-50A	1 in (25 mm)
1/2 inch	Superflex	FSJ4-50B	1.25 in (32 mm)
1/2 inch	Heliax	LDF4-50A	5.0 in (125 mm)
7/8 inch	Heliax	LDF5-50A	10 in (250 mm)
1-1/4 inch	Heliax	LDF6-50	15 in (380 mm)
1-5/8 inch	Heliax	LDF7-50A	20 in (510 mm)
1/4 inch	Superflexible	SCF14-50J	1 in (25 mm)
RFS Cablewave Corp.			
1/2 inch	Superflexible	SCF12-50J	1.25 in (32 mm)
1/2 inch	Hardline	LCF12-50J	5.0 in (125 mm)
7/8 inch	Hardline	LCF78-50J	10 in (250 mm)
1-1/4 inch	Hardline	LCF114-50J	15 in (380 mm)
1-5/8 inch	Hardline	LCF158-50J	20 in (510 mm)

5.4.6 Tower Installations

While most Control Station antenna installations are building and roof mounted, occasionally Control Stations are installed at sites with towers. Always observe all safety instructions and ensure a safe and proper antenna installation by following all tower manufacturers' recommendations. In addition to local building codes, the most current revision of industry standard TIA/EIA-222: Structural Standards for Steel Antenna Towers and Antenna Supporting Structures must be adhered to during tower and antenna installations.

5.5 GROUNDING AND LIGHTNING PROTECTION

Proper grounding is necessary, not only for correct functionality and maximum performance, but also for minimizing damage that may occur from lightning strikes and personnel safety.

Assuming the facility where the CS7000 Control Station is installed is protected properly from lightning strikes on the AC power line, the station is still susceptible to damage from lightning through the RF antenna port, LAN, and phone line inputs. The CS7000 Control Station does not include an integrated lightning protection device at the antenna port, so it is recommended to install an external lightning protection device. Lightning protection devices are only effective if the connections are made as their design intended. Follow the manufacturer's mounting instructions to ensure a properly grounded unit.

A #10 grounding stud is located at the rear of the CS7000 Control Station. For safety purposes, connect it to a suitable earth ground using 14-AWG (or larger) wire. For additional information, refer to the applicable instructions in the Site Grounding and Lightning Protection Guidelines Manual, publication number AE/LZT 123 4618/1.

5.6 BACKUP POWER SOURCES

Due to the great advancements in the industry's backup power resources, the CS7000 Control Station does not provide connections for backup AC or DC power resources. Rather, it is recommended to utilize commonly available resources discussed in the following sub-sections.

5.6.1 Uninterruptible Power Supplies

It is recommended when a backup AC power source is required for a CS7000 Control Station installation to use an Uninterruptible Power Supply (UPS) system. These systems can vary greatly in price, size, and run time. Well engineered UPS systems monitor the commercial AC power mains for harmful changes in the power being supplied. Some UPS systems run in "hot standby" mode providing even greater protection to the equipment connected to the UPS.

5.6.2 Gas/Propane Generators

Generators may be used when the AC power mains are expected to be down for extended periods of time. However, generators can occasionally produce unwanted fluctuations and power surges that can potentially damage the power supply in electronic devices. If generators are used, it is strongly recommended to also use a UPS inline between the generator and CS7000 Control Station as an added layer of protection from potentially damaging changes in generator power.

5.6.3 Hydrogen Power Systems

Many alternative power products are available in today's marketplace. Hydrogen power systems are quickly becoming the main and backup power source of choice for some customers. Hydrogen power systems are inherent to high reliability with few moving parts, require lower capital costs than combustion engine generators, and typically have lower life cycle costs than combustion engine generators. They are environmentally friendly, produce no toxins, can be installed indoors or outdoors, typically have a smaller footprint and weight than combustion engine generators, and run silently. Hydrogen fuel and replacement tanks are commonly available in most all locations.

5.7 CONNECTING VoIP DESKTOP REMOTE CONTROLLERS

The IDA model 24-66 VoIP Remote Base Controller is supported for VoIP operations with the CS7000 Control Station. The CS7000 Control Station's Remote Control (Plus) Board provides VoIP and control capability to the station. When equipped with the Remote Control (Plus) Board, the rear panel of the station is equipped with a standard RJ-45 Ethernet Local Area Network (LAN) jack. This jack provides standard Internet Protocol (IP) based connectivity, and may connect to an Ethernet LAN via hub or switch equipment. Up to twenty-one (21) VoIP Remote Controllers can be connected to a CS7000 Control Station.

Establishing Ethernet connectivity between the CS7000 Control Station and a VoIP Remote Base Controller may be accomplished by one of the following methods:

- Local Ethernet cabling.
- Public accessed Internet Service Providers (ISP).
- Privately managed (non-public) ISP.
- Wireless routers.
- Any combination of the above.

Each method listed above will present unique setup and configuration requirements too numerous to cover in this manual. Remember, the CS7000 Control Station and the IDA model 24-66 Remote Base Controller operate via standard Ethernet technology. When choosing the connectivity method, compatibility issues such as network security, VPN access, firewalls, and port forwarding must be pre-determined. While these issues affect the operation of VoIP systems, they are not usually base station or remote issues, they are network related issues.

However, Harris will make every effort to provide technical assistance. Our system engineering team and our Technical Assistance Center (listed in Section 3.4) are great system integration resources. Additionally, the ISP, or the manufacturer of the hub, switch, or router equipment affecting the operation may be able to provide assistance. Other information about the IDA 24-66 VoIP Remote Base Controller not mentioned in this manual may be obtained from http://www.idaco.com/.

NOTE

As of the publication of this manual, the CS7000 Remote Control Station may be configured for Tone Remote Control or VoIP Remote Control, but not both at the same time. Contact the Technical Assistance Center for additional information.

5.7.1 Local Ethernet Connectivity (no Hub or Switch)

For installations where the CS7000 Control Station and the VoIP remote(s) are co-located at the same location, one (1) IDA 24-66 VoIP Remote Base Controller may be connected directly to the CS7000 Control Station via an Ethernet cable. See Figure 5-4. Additional VoIP Remote Controllers may be connected in a daisy chain fashion to the first remote by using the 2nd Ethernet port built into each IDA 24-66 VoIP Remote Base Controller. This configuration is desirable when all equipment is located together in a relatively small area, such as an office or small business location. This configuration minimizes the need for routers, hubs, and other potentially costly hardware, and offers increased security (when needed) since the Ethernet wiring is localized.

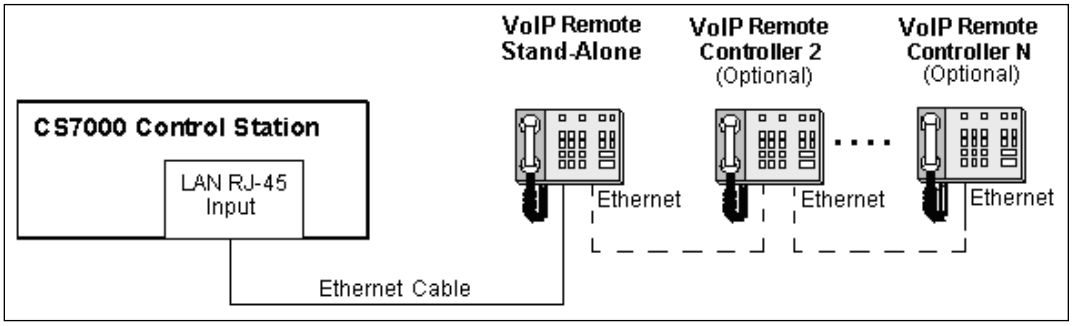


Figure 5-4: CS7000 Installed Locally using Ethernet Connectivity (no Hub or Switch)

5.7.2 Ethernet Connectivity using a Hub or Switch

For installations where the CS7000 Control Station and the VoIP remote(s) are co-located at the same location, and LAN Ethernet connectivity is already established within the building, it is possible for the CS7000 Control Station and the remote(s) to utilize the existing network (refer toFigure 5-5). This configuration may also be beneficial in larger buildings to overcome Ethernet line length limitations.

When considering any Ethernet connectivity method other than local Ethernet cabling as discussed in Section 5.7.1, it is recommended to discuss setup, configuration, and hardware requirements with all service and hardware providers to establish any incompatibility issues (refer to Section 5.7).

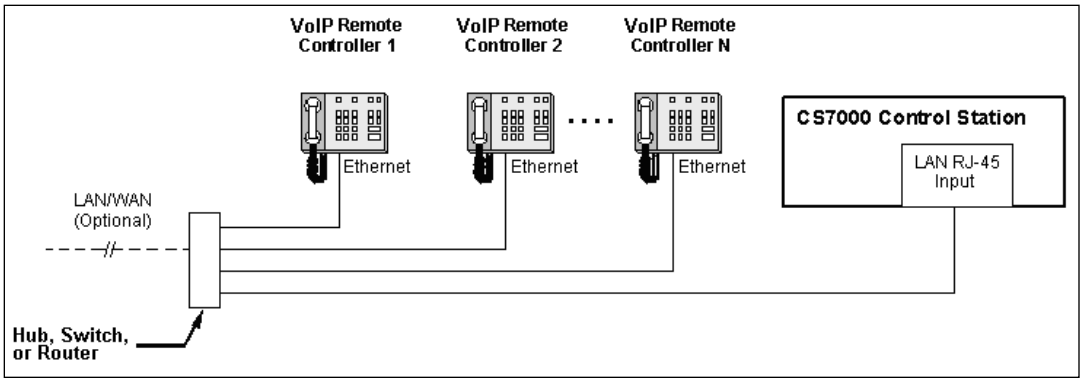


Figure 5-5: CS7000 Installed Locally using Ethernet Hub or Switch

5.7.3 Remote Control via LAN/WAN Ethernet Connectivity

For installations where the CS7000 Control Station and the VoIP remote(s) are located at different locations, Wide Area network (WAN) Ethernet connectivity must be utilized. WAN connectivity may be in the form of a publically accessible ISP (the internet), or a privately managed ISP (refer to Figure 5-6).

In this configuration, one remote may be directly connected to the WAN's Ethernet connection, and more remotes may be daisy chained to the first remote similar to the method shown in Figure 5-4. Or, a multi-connection Ethernet device, such as a hub, switch, or router may be used to connect multiple remotes to the station (refer to Figure 5-6). This configuration is beneficial by providing connectivity to more than one location, and multiple remotes, over great distances.

When considering any Ethernet connectivity method other than local Ethernet cabling as discussed in Section 5.7.1, it is recommended to discuss setup, configuration, and hardware requirements with all service and hardware providers to establish any incompatibility issues (refer to Section 5.7).

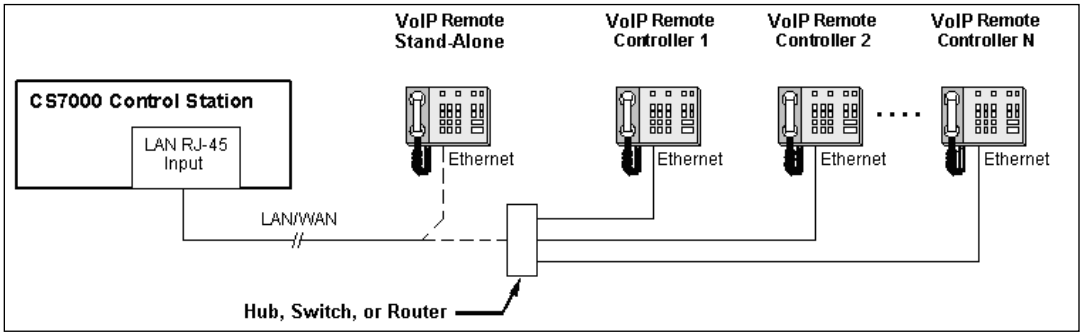


Figure 5-6: CS7000 Installed Remotely Using VoIP Using LAN/WAN Connectivity

5.7.4 Ethernet via Wireless Connectivity

When practical, it is possible to utilize 802.11, 802.16, or other similar wireless services for connectivity between any combination of CS7000 Control Station or IDA 24-66 Remote Base Controllers (refer to Figure 5-7). These devices are not provided with the CS7000 Control Station, or with the IDA 24-66 VoIP Remote Base Controller.

Wireless routers provide easier installation in buildings where adding Ethernet cabling is costly and difficult. Since no physical connection exists when using wireless, off-the-shelf consumer wireless hardware is usually an inexpensive way of providing an extra layer of lightning/surge protection to more expensive communications equipment like the CS7000 Control Station or VoIP Remote Base Controllers.

However, since the wireless platforms are transmitted over-the-air, consideration must be placed on network security, and other connectivity issues such as VPN access, firewalls, and port forwarding.

When considering any Ethernet connectivity method other than local Ethernet cabling as discussed in Section 5.7.1, it is recommended to discuss setup, configuration, and hardware requirements with all service and hardware providers to establish any incompatibility issues (refer to Section 5.7).

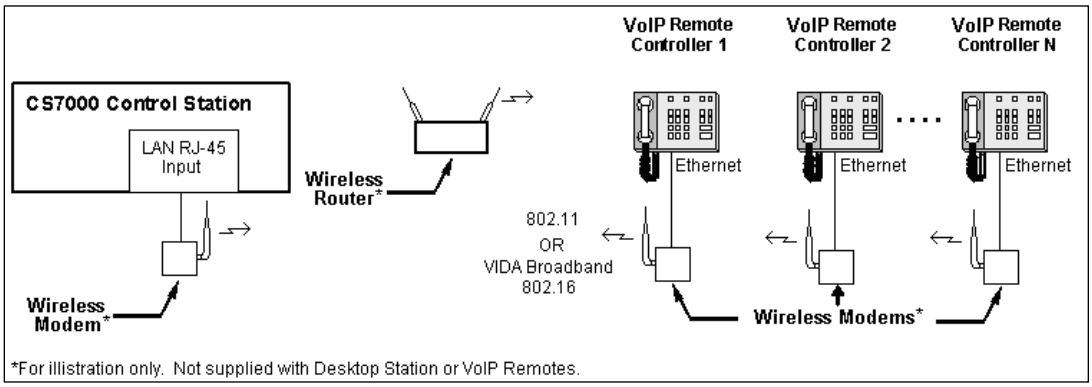


Figure 5-7: CS7000 Installed Locally using Wireless Ethernet Connectivity

5.8 CONNECTING TONE REMOTE CONTROLLERS

The CS7000 Control Station's Remote Control (Plus) Board has an RJ-11 LINE input connector for interfacing one or more Tone Remote Controllers (TRCs) to the station. The maximum number of TRCs that can be connected to a CS7000 Control Station is limited only by line conditions/characteristics of the utilized telephone line(s), such as loss, loading and noise. The Secur-It tone from any connected TRC must arrive at the station at a level of –20 dBm (or greater).

The term "two-wire" describes a single pair of dedicated metallic wires in the form of discrete 600-ohm telephone-grade wire provided by a customer, 600-ohm dry (quiet line only) telephone-grade line provided by a telephone company, or the multiplexed equivalent provided by customer owned equipment. This type of circuit will support the bi-directional transmission of audio signals in the nominal 300 to 3000 Hz frequency range.

The term "four-wire" describes two pairs of (usually) multiplexed dedicated telephone-grade circuits with one pair going each way. Each pair will support uni-directional transmission of audio signals in the nominal 300 to 3000 Hz frequency range. One pair is usually designated as the SEND pair while the other is designated as the RECEIVE pair. These circuits may be obtained for voice applications.

NOTE

As of the publication of this manual, the CS7000 Remote Control Station may be configured for Tone Remote Control or VoIP Remote Control, but not both at the same time. Contact the Technical Assistance Center for additional information.

5.8.1 Tone Signaling

In tone remote applications, Tone Remote Controllers send specific audio tones at pre-defined levels and time lengths down the line where the station assigns the decoded tones to control various functions of the station. The format of the signaling is an industry standard that has been used for many years. The remote board of the station decodes the sequence of tones and then it instructs the mobile radio installed in the CS7000 to perform a specific function. The remote board may be programmed to allow control of the following functions of the radio or desktop station:

- Select a Specific System and Group (SG function);
- Transmit on a Specific System and Group;
- Channel Guard Monitor; and,
- Turn Scanning Off or On.

Other possible actions include:

- Remote Board Output Selection and,
- Control Other Keyboard Functions of the Radio.

Signaling from a TRC consists of a high-level Secur-it or Guard tone, followed by the appropriate medium-level function tone, followed by a hold tone if the transmitter is keyed. The tone control sequence is shown in Figure 5-8.

The level of the function tone is sent at the same level as the average voice test tone and is the reference for the level of the other tones. Secur-it tone is a +10 dB, 2175 Hz tone present for 125 milliseconds. The Secur-it tone is followed by a 40 millisecond, 0 dB Function tone. The Function tone is followed by a 2175 Hz Hold tone at -20 dB level for as long as the PTT is pressed.

The CS7000 has the ability to decode a dual-function TRC, where there are two functions tones of 40 milliseconds each. This increases the possible functions greatly, but does add an increase in the time of action by 40 milliseconds.

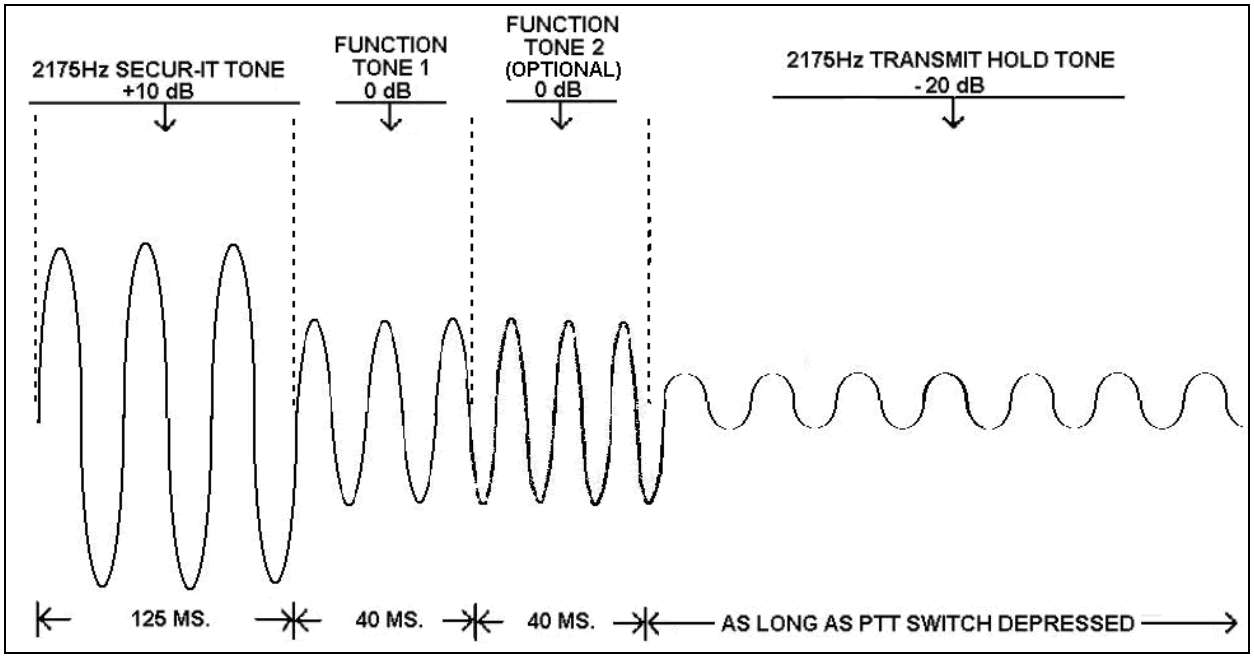


Figure 5-8: Tone Remote Control Signaling

The configuration and selected function of the TRC determines the frequency of the function tone. Industry standard function tones range from 1050 Hz to 2050 Hz, and are spaced 100 Hz apart. The CS7000 has the capability of extending this range and intervals when configured.

Table 5-2: Example* Tone Functionality for Tone Remote Control Signaling

TONE (Hz)	FUNCTION	TONE (Hz)	FUNCTION
2175	Sercur-It / Tx Hold	1550	Channel Guard Decode On
2050	RX Channel Guard Monitor (Reset by PTT)	1450	Channel Guard Decode Off
1950	System/Group 1	1350	System/Group 5
1850	System/Group 2	1250	System/Group 6
1750	System/Group 3	1150	System/Group 7
1650	System/Group 4	1050	System/Group 8

NOTE: Use of tones below 1050 Hz may degrade system performance due to low frequency noise components on telephone-grade wire connections.

* The functionality listed for each tone is an example – see station remote programming for specific information.

5.8.2 Connecting One Tone Remote Controller

Line loading characteristics of the LINE input of the Control Station must be properly setup. If only one TRC is connected, the CS7000 Control Station and the TRC are both considered line terminating end points. Both devices must have their line impedance set to the low impedance (600 ohm) state for proper termination. This line interface configuration is illustrated in the following figure:

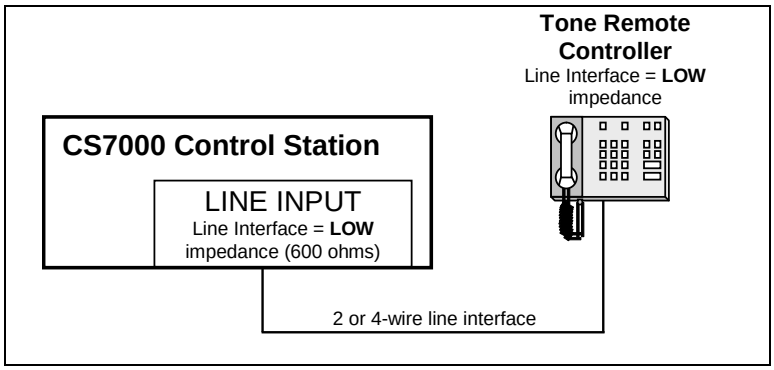


Figure 5-9: Line Input Configured as an Endpoint and Interfaced to One TRC

Refer to Section 8.12 for instructions on configuring the CS7000 Control Station's line inputs. Consult installation instructions for the Tone Remote Controller for configuration instructions.

5.8.3 Connecting More than One Tone Remote Controllers

The following figure illustrates the CS7000 Control Station at the end of a "chain" of paralleled TRCs. In this configuration, the Control Station and the TRC that is farthest away from the Control Station in physical cable distance must have their line impedance set to the low impedance (600 ohm) state for proper termination. All other TRCs must be set to the high impedance state.

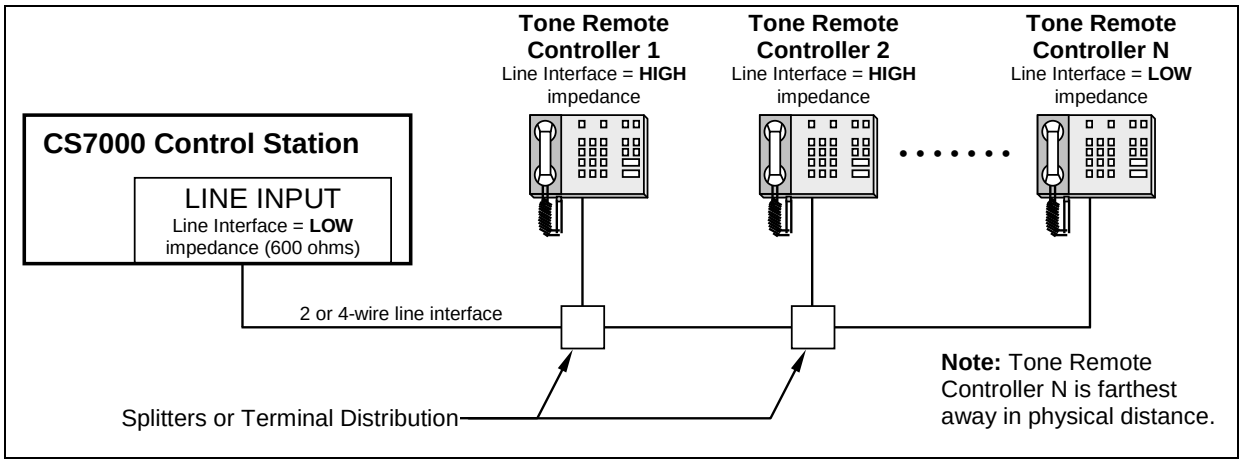


Figure 5-10: Configured as an Endpoint and Interfaced to Multiple Paralleled TRCs

The next figure illustrates the CS7000 Control Station in the middle of a "chain" of TRCs. In this configuration, the two TRCs farthest away from each other in physical cable distance must have their line impedance set to the low impedance (600 ohm) state for proper termination. The Control Station and all other paralleled TRCs must be set to the high impedance state.

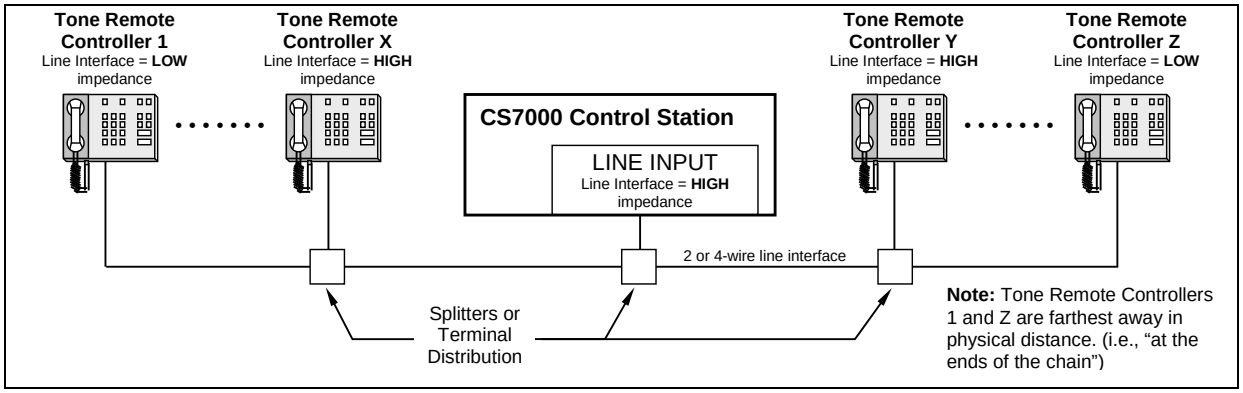


Figure 5-11: Control Station in the Middle of a Chain and Interfaced to Multiple Paralleled TRCs

5.8.4 LINE Input Connector

Table 5-3 describes the pins of the CS7000 Control Station's RJ-11 modular jack used for 2-wire and 4-wire line connections. If both 2-wire and 4-wire connections are available at the TRC, the customer is free to choose either connection as the CS7000 Control Station is factory set for 4-wire operation, 4-wire is recommended, though not required. Choosing 2-wire for trunking operation will not allow the alert tones during radio transmission to be heard at the TRC. A phone-line crossover cable (refer to Figure 5-13) may be required in some installations.

CAUTION

In all 4-wire TRC installations, connect the Control Station Rx audio lines to TRC Tx audio lines, and connect the Control Station Tx audio lines to TRC Rx audio lines. This may require a phone-line crossover cable (refer to Figure 5-13). Line misconnections will cause control failures.

Table 5-3: CS7000 Desktop Station LINE Connector Pinout (RJ-11 Modular Jack Labeled "LINE")

RJ-11 PIN	SIGNAL
1	(No Connection)
2	4-Wire +Audio Input
3	4-Wire +Audio Output or 2-Wire +Input/Output
4	4-Wire -Audio Output or 2-Wire -Input/Output
5	4-Wire -Audio Input
6	(No Connection)

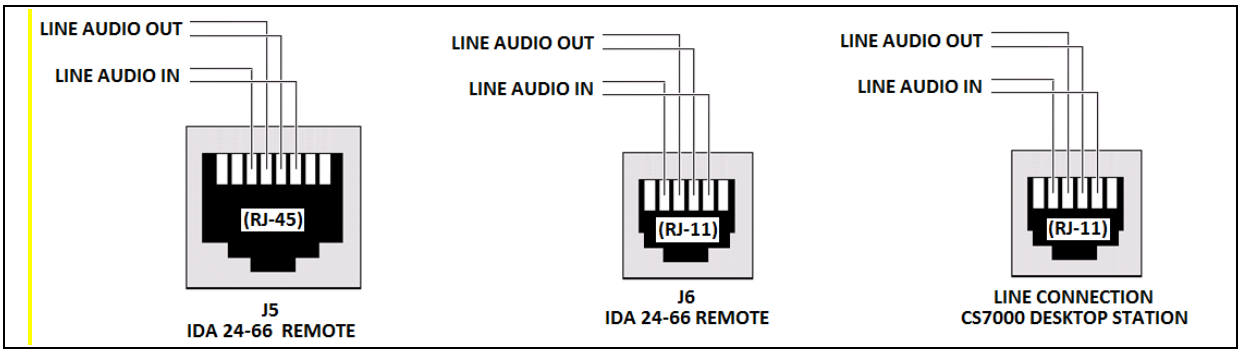


Figure 5-12: Line Functionality of Connectors on CS7000 Desktop Stations and 24-66 Remotes

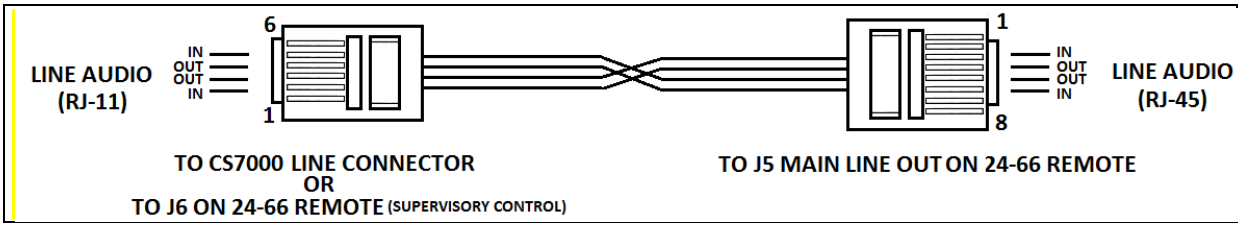


Figure 5-13: 4-Wire Phone Line Crossover Cable

5.8.4.1 TRC Physical Connections

A variety of Tone Remote Controllers (TRCs) may be interfaced to the CS7000 Control Station. The TRC supported by Harris is the IDA model 24-66. The IDA model 24-66 has two (2) RJ-type modular jacks for connections to 600 ohm lines. The eight pin RJ-45 jack is normally connected to the desktop station. Using 2-wire remote operation requires minimal effort to connect remotes to the desktop station; each device uses Line 1 for connectivity. Systems configured for 4-Wire operation over leased conditioned lines from a 3rd party (such as a telephone company) should be equally as simple to connect as traditional telco MUX equipment at each end of the network typically uses Line 1 for outbound audio and Line 2 for inbound audio functionality, a perfect match at all demarcation points.

However, local connection of 4-wire remotes use the same Line Input and Line Output scheme (pinout) at the RJ connectors as the CS7000 (refer to Figure 5-12). This requires the reversal (crossover) of Line 1 and Line 2 functionality at one or more devices making up the tone remote system.

Crossover of Line 1 and Line 2 may be accomplished by one of several methods:

- Using a phone-line crossover cable connected to the CS7000 (preferred method).
- Reversing Line 1 and Line 2 connections within a telco junction box connected to the CS7000 (alternate method).
- Configuring the line input jumpers inside a IDA 24-66 remote (not recommended).

Method 1 reverses Line 1 and Line 2 connections within a specially constructed 4-Wire phone line crossover cable (refer to Figure 5-13) connected to the CS7000. This supports the installation method illustrated in Figure 5-9. This method also sets up the desktop station for local direct connection from one or more 4-wire remotes as illustrated in Figure 5-10 and Figure 5-11. This method allows remotes to be connected using pre-assembled commercial off-the-shelf telephone cables. This method is also acceptable when a supervisory remote configuration is not required (refer to the remote controller manufacturer's installation manual for supervisory installations).

Method 2 reverses Line 1 and Line 2 connections within a telco junction box connected to the CS7000. This method also sets up the desktop station for direct connection to one or more 4-wire remotes as illustrated in Figure 5-10 and Figure 5-11. This method allows remotes to be connected using pre-assembled commercial off-the-shelf telephone cables. This method is also acceptable when a supervisory remote configuration is not required (refer to the remote controller manufacturer's installation manual for supervisory installations).

Method 3 reverses the Line 1 and Line 2 connections presented to J5 and J6 inside a 24-66 Tone Remote Controller. This method may be desirable in applications where more than one remote is connected to a control station and supervisory control of additional remotes is desired. Refer to APPENDIX B for additional information on reconfiguring the supervisory remote in this configuration.

In all cases, the Tone Remote Control manufacturer's instructions provide the ultimate guidelines for connection and interconnecting parallel remote controllers.

5.9 CONNECTING CAN–LINKED REMOTE CONTROLLERS

5.9.1 General Information

Each CS7000 remote model may be installed using the Controller Area Network (CAN) connection. The CS7000 is considered a CAN device, and each CAN-based Desktop Controller in the installation is also considered a CAN device. Because CAN devices do not have internal terminators, the CAN link must be terminated at both ends via a CAN terminator. Up to five (5) CAN-based Desktop Controllers can be connected to the CS7000 Control Station.

Typically, CAN-based Desktop Controllers and other devices have two (2) CAN ports to support "daisy-chaining" of multiple CAN-based Desktop Controllers, or other CAN devices. The M5300 or M7300 mobile radio installed into the CS7000 has two can ports on the rear of the mobile radio. Because CAN devices do not have internal terminators, the CAN link must be terminated at both ends via a CAN terminator. A terminator should always be installed on the second CAN port on the rear of the mobile radio (refer to Figure 5-14 and Figure 5-15) unless an Y-cable is used on the rear of the CS7000 Control Station (refer to Figure 5-16). When using a Y-cable at the Control Station, it may be necessary to remove the CAN terminator on the rear of the mobile radio when CAN cable lengths approach 250 foot. In all cases, the farthest CAN device on each side of the Y-cable must be terminated.

NOTE

Figure 5-14 through Figure 5-16 assumes the total CAN link connections are less than 250 feet in length. If the total connection length must exceed 250 feet, use the optional fiber-optic-based CAN Bus Extender to extend the CAN link beyond this normal 250-foot limit. Refer to Section 5.9.3 for additional information.

To make CAN connections, visually align the 3-pin male connectors of the cable to the 3-pin female connectors on each unit. Connect by pushing and twisting the outer housing of the cable connector until a click is sensed. Do not use excessive force when twisting.

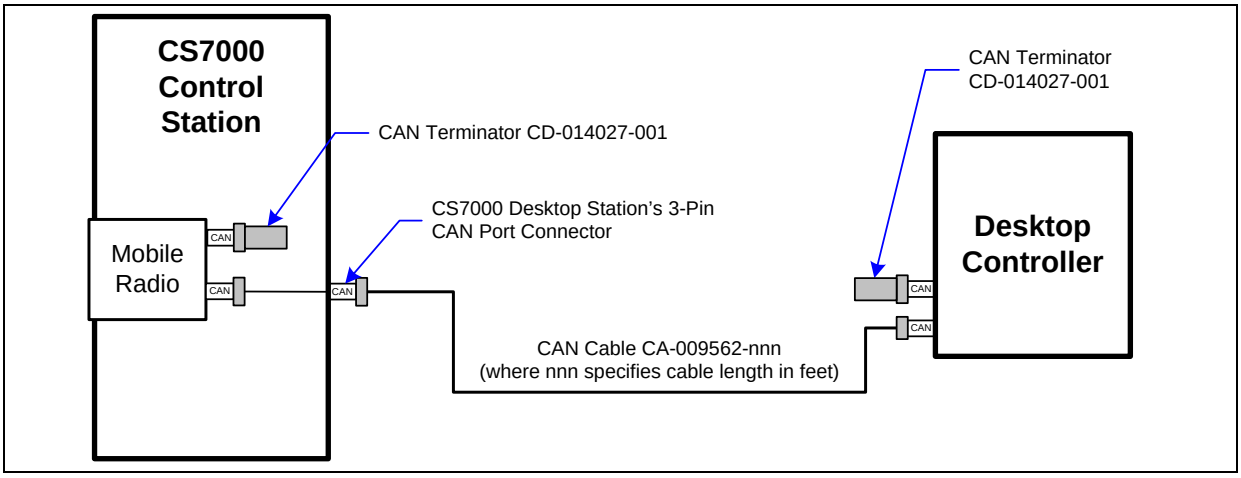


Figure 5-14: Connecting a CAN-Based Desktop Controller

NOTE

A CAN link must be terminated properly at both ends of a CAN link. The CS7000 has an internal CAN terminator on the second radio CAN port. A terminator must be used on the CAN-based Desktop Controller farthest from the Control Station as shown in Figure 5-14 and Figure 5-15.

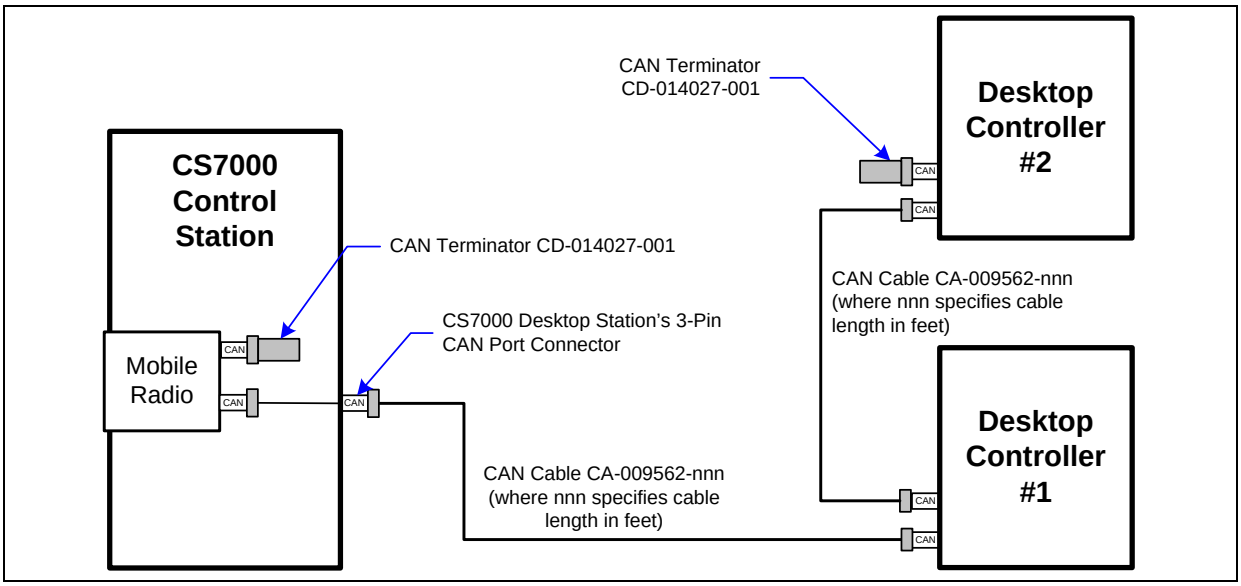


Figure 5-15: Connecting Two or More CAN-Based Desktop Controllers

NOTE

A CAN link must be terminated properly at both ends. The CS7000 has an internal CAN terminator on the second radio CAN port which must be removed when using a CAN Y-cable at the Control Station. A terminator must be used on the CAN-based Desktop Controller farthest from the Control Station on each leg of the Y-cable (refer to Figure 5-16).

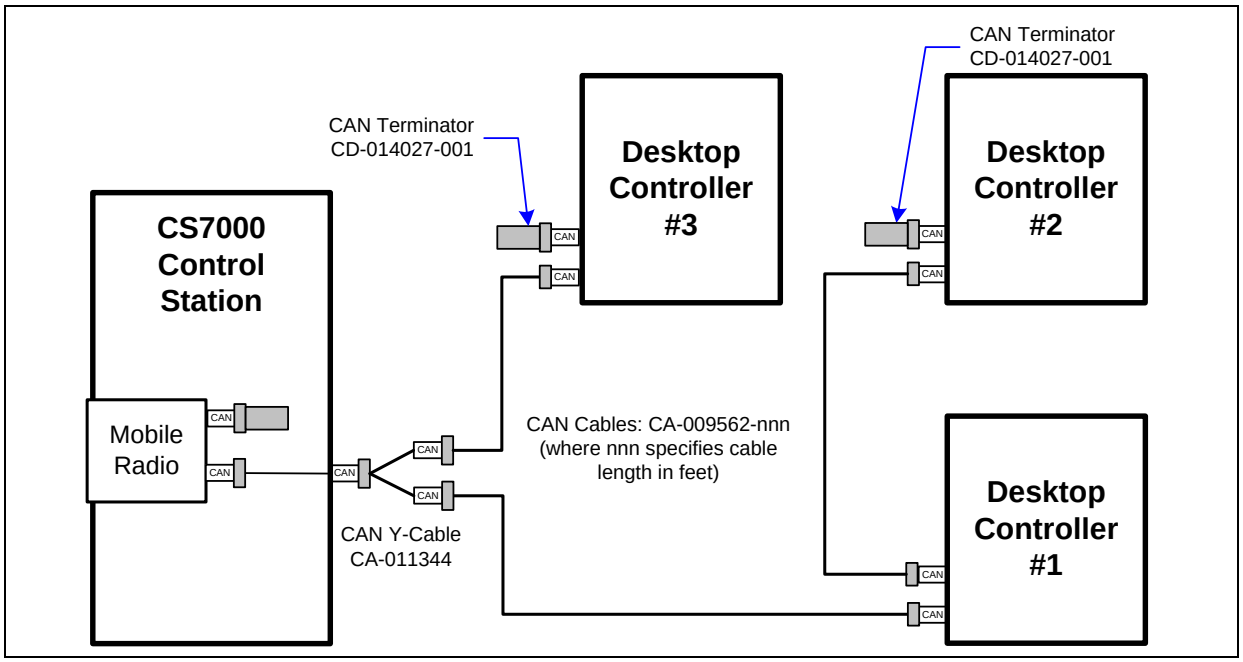


Figure 5-16: Connecting a CAN Y-Cable at the Control Station

5.9.2 CAN-Based Desktop Controller Connections

A CAN-based Desktop Controller has two CAN ports on its rear panel to support "daisy-chaining" of multiple CAN devices. When a controller is in the middle of a daisy chain, two separate CAN cables connect to the Y-cable (optional, not supplied). When the controller is at the end of a chain of devices, one CAN port connects to the previous CAN device and the other port must be terminated with a CAN Terminator (part number CD-014027-001).

5.9.2.1 Collocated Installations

For installations where a CAN-based Desktop Controller is near the same location as the CS7000 and no routing of cables into walls or through plenums is required, a standard CAN cable can be used. For cables whose connectors can be routed without the fear of being damaged in routing (e.g., cables do not need to be snaked through holes), the molded CAN cables are preferred, part number series CA-009562-nnn. The "nnn" suffix specifies cable length in feet. See Table 4-2 on page 21 for specific cable part numbers.

If cable connectors might get snagged or damaged during routing, but a non-plenum-rated cable can be used, it is recommended that spooled Belden cable part number 1800B (or equivalent) be purchased separately. However, a CA-009562-nnn CAN cable must also be purchased, as its molded connectors must be spliced to both ends of the spooled Belden #1800B cable. Recommended splicing instructions are presented on page 40.

5.9.2.2 In-Wall/Plenum CAN Cable Installations

5.9.2.2.1 Cable Requirements and Routing

As described in the previous section, various lengths of molded CAN cables are available. The standard molded CAN cable, part number CA-009562-030, is for general use. However, for in-building applications, this cable does not meet certain safety agency codes for routing through walls and plenums. For this reason, a plenum-rated cable, Belden cable part number 1801B (or equivalent), can be purchased separately, by the spool. This cable is recommended for in-wall/plenum CAN cable installations because of its properties of impedance, shielding, flexibility, and resistance to flame. In-wall/plenum routing faces the rigors of "snaking" and pulling of the cable. These actions can damage installed connectors. Therefore, a procedure for routing raw cable through the walls and mating connections reliably is necessary.

Figure 5-17 illustrates the general concept for connecting the CS7000 Control Station to the CAN-based Desktop Controller via in-wall/plenum CAN cabling. Follow these requirements:

- Materials (e.g., junction boxes, cabling, etc) must meet all building codes.
- The in-wall/plenum cable must be a plenum-rated, shielded, twisted-wire pair of 22-AWG. Belden part number 1801B cable (or equivalent) is recommended. If the utilized cable does not meet building codes, it must be dressed or placed inside a conduit (not provided), or some other installation method must be employed so that it does meet building codes.
- Total physical length of a CAN link, including any amount of cable daisy-chained through multiple CAN devices cannot exceed 250 feet (76.2 meters). This maximum length assumes the optional fiber-optic-based CAN Bus Extenders are not employed; see Section 5.9.3 for additional information.

The standard (non-plenum) CAN cable, part number CA-009562-030 for example, is spliced to the plenum cable using 3-position terminal blocks placed inside junction boxes. Plenum-rated cable is needed for in-wall/plenum routing, but the standard cable, as long as it isn't routed through a wall or concealed ducting, is acceptable for connections to the wall. The standard cable is needed because its solder-type molded connectors do not accommodate customary in-field installation.

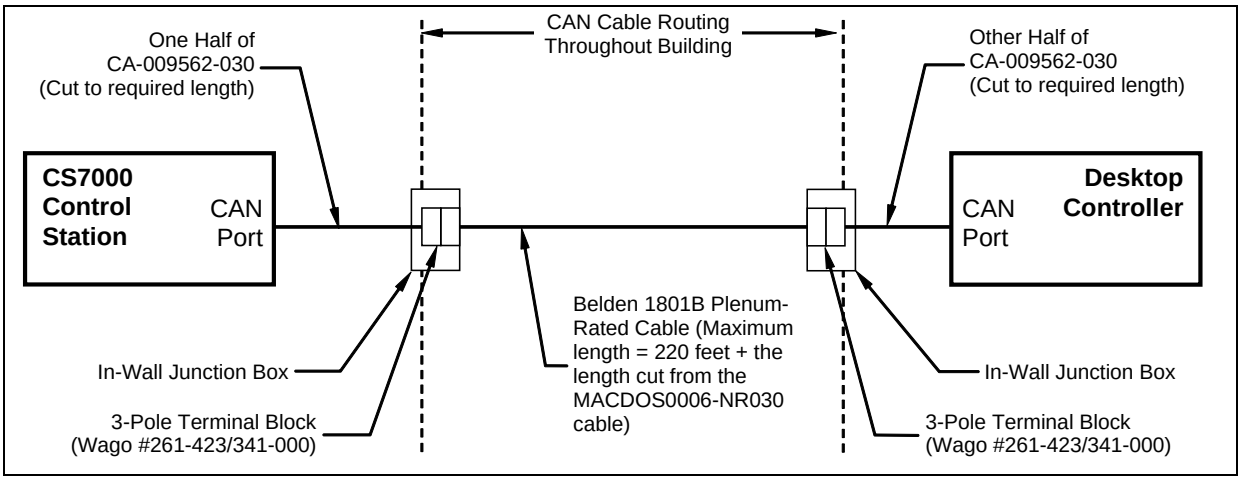


Figure 5-17: Connecting In-Wall/Plenum CAN Cable Connections

5.9.2.2.2 Installation Materials

The following materials are required:

- 3-Pole 2-Conductor Terminal Blocks, WAGO part number 261-423/341-000, or equiv. (2 required);

- Junction boxes (2 required); and,
- Assorted tools for routing cable through walls/plenums and mounting junction boxes.

5.9.2.2.3 Splicing CAN Cables

The following procedure is recommended for splicing plenum-rated cable to the standard CAN cable:

1. Cut the standard CAN cable (part number CA-009562-030) approximately in half.
2. If not already, power-off both the CS7000 and the other CAN devices. Both units should remain off until after the cable installation is complete.
3. Connect each end of the cut CAN cable to the CS7000 Control Station's CAN port and to the CAN-based Desktop Controller's CAN port.
4. Using the cut ends of the cable, determine acceptable locations for wall junction boxes and mount the two junction boxes using an approved method.
5. Route the cables into the junction boxes and anchor according to building codes.
6. Cut off any excess cable length, allowing at least one foot (0.3 meters) for splicing and servicing. The total amount of cable removed from both halves is an amount that can be added to the 220 feet of plenum cable, if needed. For example, if 10 feet of excess length is cut from the standard 30-foot CAN cable, the plenum cable is allowed to be as long as 230 feet. In any case, do not exceed 250 feet (76.2 meters) of total CAN cable length.
7. Measure out an amount of spooled plenum cable needed to reach the two junction box splice points and route it through the building walls, plenums, etc. using approved methods.
8. Route the cable's ends into the junction boxes and anchor according to building codes.
9. Cut off any excess cable length, allowing a foot or so of length for splicing.
10. With a 14-AWG wire stripper, strip off 3/4-inch of the cable's outer jacket and remove any shield foil. This dimension is critical, as too much unexposed lead length can have an adverse effect on performance. Ensure no damage was done to the individual wires.
11. With a 22-AWG wire stripper, strip off 5/16-inch of insulation from each individual wire in the shielded pair. The third wire in the cable is the shield/ground wire; do not cut it. See Figure 5-18.

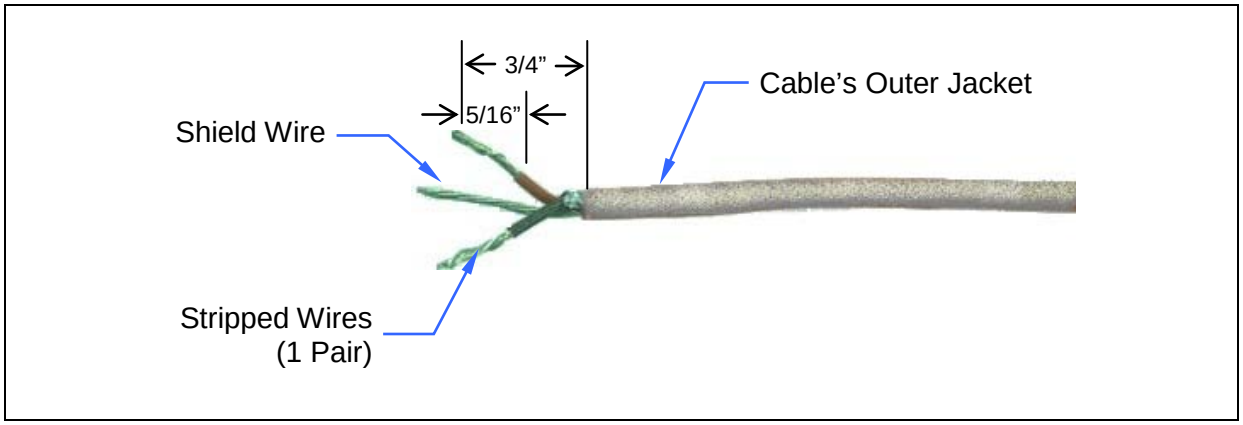


Figure 5-18: Dimensions for Stripping 2-Wire (with Shield) CAN Cables

12. At both ends of the spooled plenum cable, simultaneously insert the red and black wires into two poles of the terminal block by simultaneously pushing two adjacent buttons down with a large #2 flathead screwdriver, and guiding the bare end of the wire into the side openings of the terminal

block. Next, release pressure on the buttons while ensuring the bare wires are visible entering the block's clamping mechanisms. See Figure 5-19. The order of wires in the terminal block housing does not matter, but the red and black wires must be next to each other. Consistency between the two blocks is recommended.

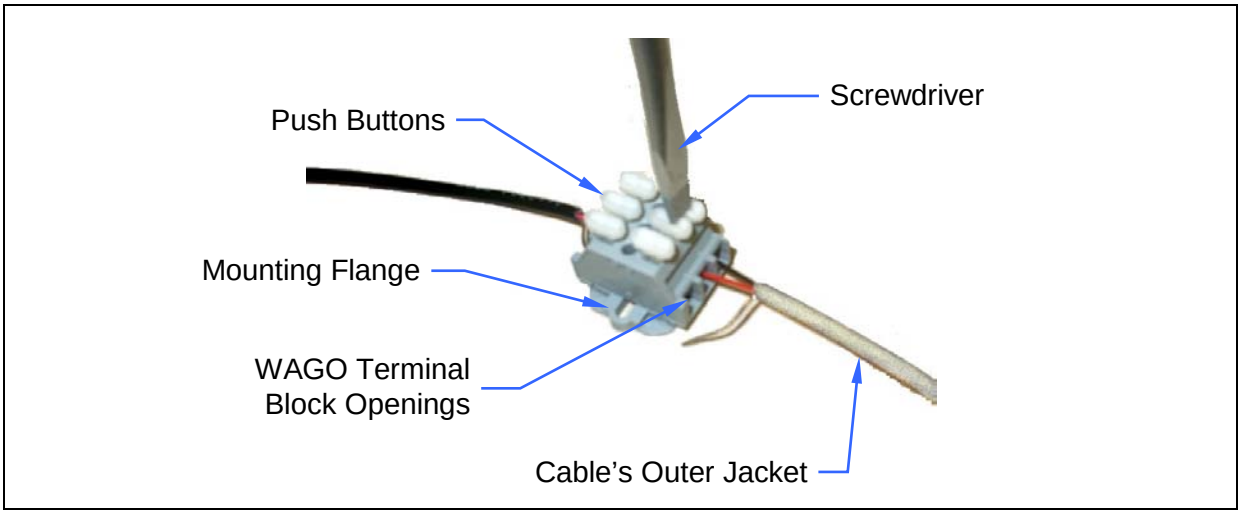


Figure 5-19: 3-Position Terminal Strip Connections

13. Insert the bare shield wire into the third pole of the terminals block by pushing the button down with the screwdriver, guiding the wire into the opening, and releasing pressure on the button.
14. At the CS7000 Control Station's standard CAN cable, strip and connect the wires of the cable to the respective terminal block so matching wire colors on this half of the cable are electrically connected.
15. At the CAN-based Remote Controller, repeat the previous step for the other half of the standard CAN cable.
16. Finish the installation by pushing the terminal blocks into the junction boxes and covering the boxes appropriately. Alternatively, the terminal blocks may be secured with small screws (not supplied) at the mounting flanges.

5.9.3 Connecting a CAN Bus Extender (Fiber Optic Cable Installations)

The optional fiber-optic-based CAN Bus Extenders must be employed in any connection exceeding 250 feet. When using CAN Bus Extenders to connect a CAN-based Desktop Controller to the CS7000, one extender must be co-located and connected to the CS7000. Another CAN Bus Extender must be co-located with and connected directly to the CAN-based Desktop Controller. For installation-related information, refer to publication number MM-009088-001.

5.10 CONNECTING DEVICES TO THE EXTERNAL I/O PORT

A 25-pin D-subminiature female (DB-25F) connector is located on the rear panel of the CS7000 Control Station. This connector is an interconnection point for various external connections to the station such as auxiliary audio inputs, external PTT, etc.

Additionally, both the Local Control Board and the Remote Control (Plus) Board have board-mounted jumpers used to configure board operation, including certain I/O connections. Jumper settings and I/O connector pin-out differs slightly between the local and remote boards. The following sub-sections provide an overview of jumper settings and I/O connector pin-out for local and remote models.

5.10.1 Local Control Board Jumper Settings

Jumpers on the Local Control Board configure various board settings are defined in Table 5-4. This information only applies to CS7000 Local Control Station model CT-013892-001. See Figure 5-20 for jumper locations.

Table 5-4: Local Control Board Jumper Settings

JUMPER	FUNCTION	JUMPER CONFIGURATION*	
JP1	EXT_MIC_HI_1 Bias Voltage Select	**Installed:**	Applies DC bias voltage.
		Uninstalled:	No DC bias voltage applied.
JP2	EXT_MIC_HI_2 Bias Voltage Select	Installed:	Applies DC bias voltage.
		Uninstalled:	No DC bias voltage applied.
JP3	Clock Line Enable	**Installed:**	EEPROM clock line enabled.
		Uninstalled:	Factory use only. Always install jumper when in operation.
JP4	Speaker Select	**Pins 1 and 2:**	Internal speaker selected.
		Pins 2 and 3:	External speaker selected.
JP5	Mobile Radio Power-up Select	**Installed:**	Mobile radio powered up when AC power is turned ON (Mobile radio's ON/OFF switch disabled).
		Uninstalled:	Mobile radio's ON/OFF switch enabled.
JP6	USB Port Power (Serial A)	Pins 1 and 2:	USB interface obtains DC power from PC.
		Pins 2 and 3:	USB interface obtains DC power from station.
JP7	Station Speaker 2	Pins 1 and 2:	Speaker driven by single-ended (unbalanced) audio output.
		Pins 2 and 3:	Speaker driven by balanced audio output.
JP8	Ground Select	**Installed:**	Earth (chassis) GND connected to digital/analog GND.
		Uninstalled:	Factory use only. Always install jumper when in operation.

* Jumper positions shown in **bold print** indicate the factory default jumper position.

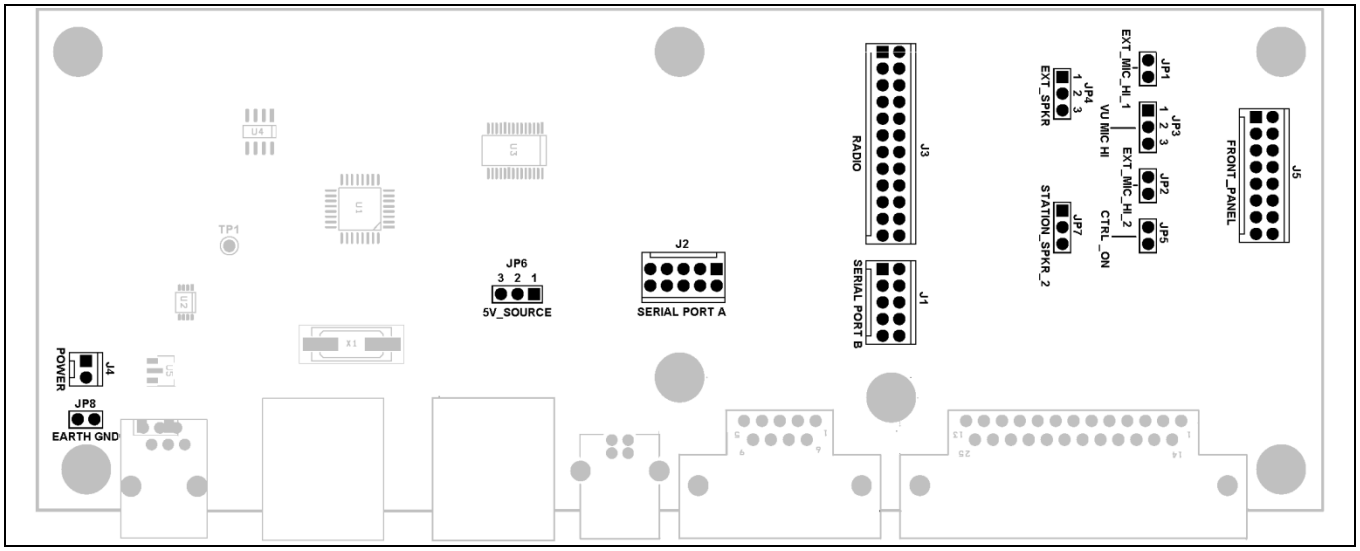


Figure 5-20: Local Control Board – Jumpers and Connectors

5.10.2 Remote Control (Plus) Board Jumper Settings

Jumpers on the Remote Control (Plus) Board configure various board settings as defined in Table 5-5. This information only applies to CS7000 Remote Control Station model CT-013892-002.

Table 5-5: Remote Control (Plus) Board Jumper Settings

JUMPER	FUNCTION	JUMPER CONFIGURATION*	
JP1	Flash PROM Chip Select	**Installed:**	Flash PROM chip-select line set for normal operation.
		Uninstalled:	Do not use this setting. A jumper must always be installed on JP1 during station operation.
JP3	EEPROM Clock Line Enable	**Installed:**	EEPROM clock line enabled.
		Uninstalled:	Do not use this setting. A jumper must always be installed on JP3 during station operation.
JP4	Speaker Select	**Pins 1 and 2:**	Internal speaker selected.
		Pins 2 and 3:	External speaker selected.
JP5	USB Serial Port A Source	Installed:	USB serial converter serial port source.
		Uninstalled:	Serial port A (primary radio serial port).
JP6	USB Serial Port A Power	Pins 1 and 2:	USB interface obtains DC power from PC.
		Pins 2 and 3:	USB interface obtains DC power from station.
JP7	Station Speaker 2	Pins 1 and 2:	Speaker driven by single-ended (unbalanced) audio output.
		Pins 2 and 3:	Speaker driven by balanced audio output.
JP8	Ground Select	**Installed:**	Earth (chassis) GND connected to digital/analog GND.
		Uninstalled:	Factory use only. A jumper must always be installed on JP8 during station operation.
JP9	ATTiny Reset Line	**Installed:**	ATTiny reset line.
		Uninstalled:	Do not use this setting. A jumper must always be installed on JP9 during station operation

* Jumper positions shown in **bold print** indicate the factory default jumper position.

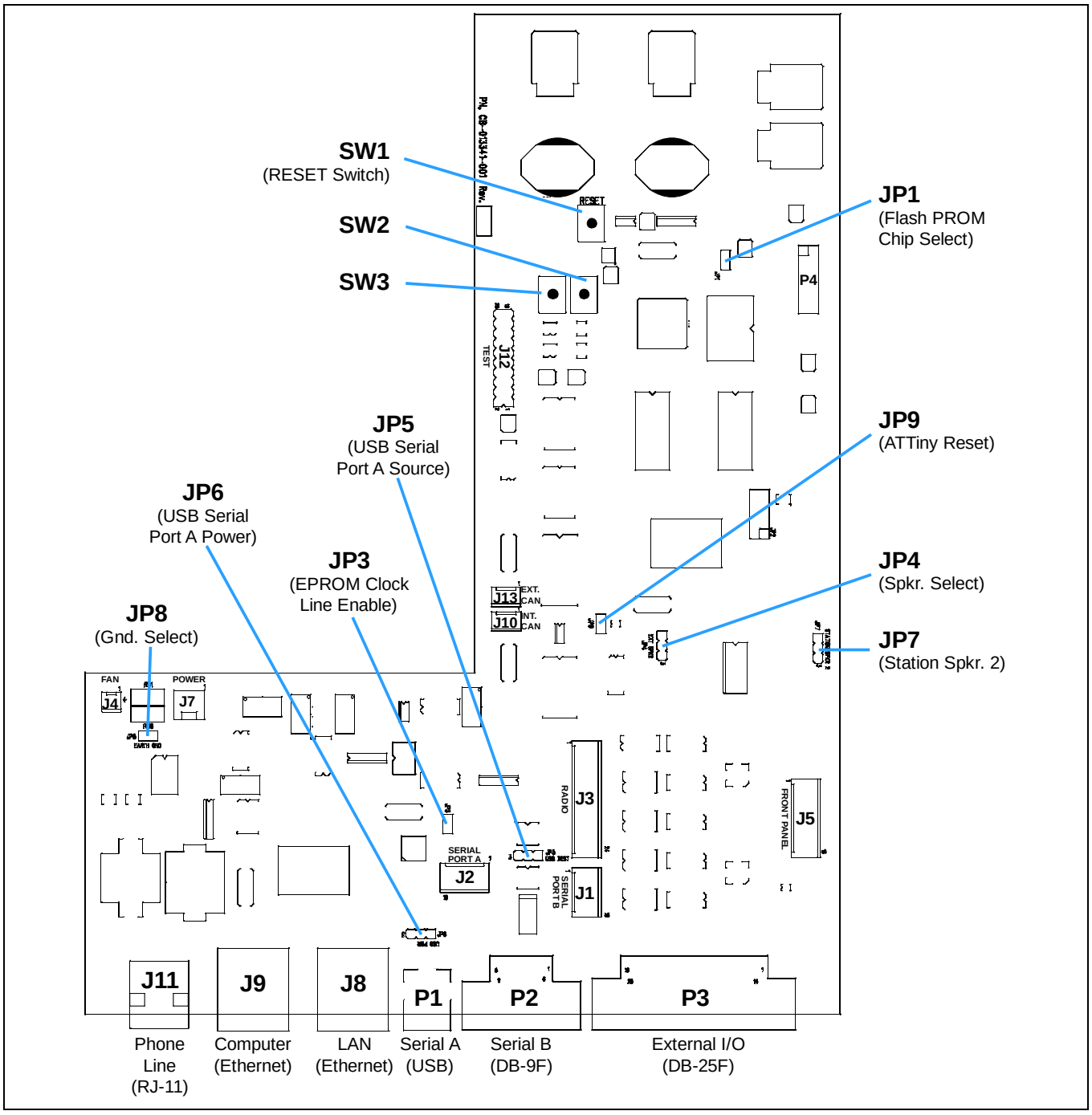


Figure 5-21: Remote Control (Plus) Board – Jumpers, Connectors/Jacks and Switches

5.10.3 External I/O Connector (P3) Pin-Out

Table 5-6 defines the pin-out of the External I/O connector on the rear of local-control CS7000 Control Station CT-013892-001 (i.e., a station that has the Local Control Board).

Table 5-7 on page 46 defines the pin-out for the External I/O connector on the rear of remote-control CS7000 Control Station CT-013892-002 (i.e., stations that have Remote Control (Plus) Boards).

Table 5-6: Local Control Station—External I/O Connector (P3) Pin-Out

PIN	FUNCTIONALITY	IN/OUT	PIN-OUT
1	External Microphone High #1 (Pair to pin 14)	Input	
2	Hookswitch (Input)	Input	
3	External Microphone High # 2 (Pair to pin 15)	Input	
4	No Connection	—	
5	Fused A+ from Station PSU, 1.1 Amp Maximum (Paralleled with pin 17)	Output	
6	No Connection	—	
7	Chassis Ground	—	
8	External Logic Input 2 (Radio INP2)	Input	
9	No Connection		
10	Fixed Low Level Receiver Audio Output High 1 (Pair to pin 23)	Output	
11	Low Level Receiver Audio Output High 2 (Pair to pin 24)	Output	
12	Internal Speaker (See Jumper Chart)	Input/Output	
13	External Speaker Output (See Jumper Table)	Output	
14	External Microphone Low # 1 (Pair to pin 1)	Input	
15	External Microphone Low # 2 (Pair to pin 3)	Input	
16	External Microphone PTT (Radio INP1)	Input	
17	Fused A+ from Station PSU, 1.1 Amp Maximum (Paralleled with pin 5)	Output	
18	No Connection	—	
19	Chassis Ground	—	
20	Radio OUT2 (Open Collector)	Output	
21	No Connection	—	
22	External Mute Control (Radio OUT1)	Output	
23	Low Level Rx Audio Output Low 1 (Pair to pin 10)	Output	
24	Low Level Rx Audio Output Low 2 (Pair to pin 11)	Output	
25	Internal Speaker Output (+) (See Jumper Table)	Output	

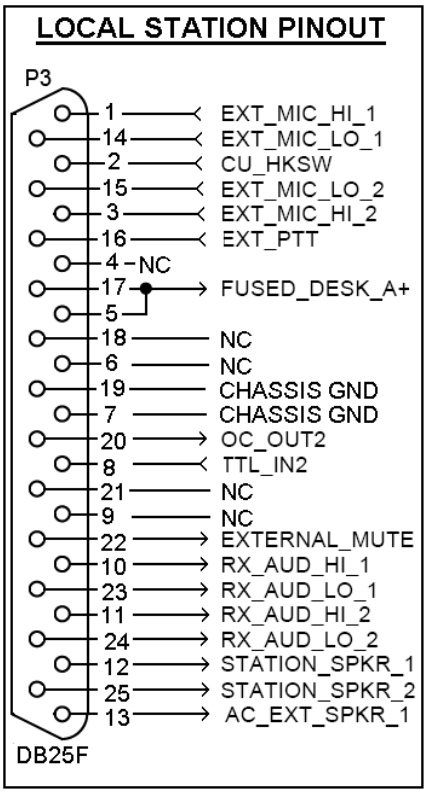
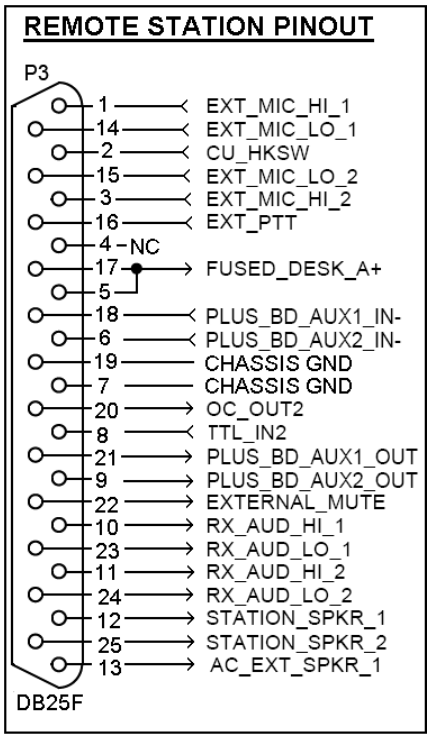


Table 5-7: Remote Control Station—External I/O Connector (P3) Pin-Out

PIN	FUNCTIONALITY	IN/OUT	PIN-OUT
1	Auxiliary/External Microphone High #1 (Pair to pin 14)	Input	
2	Hookswitch (Input)	Input	
3	Auxiliary/External Microphone High # 2 (Pair to pin 15)	Input	
4	No Connection	—	
5	Fused A+ from Station PSU, 1.1 Amp Maximum (Paralleled with pin 17)	Output	
6	Remote Control (Plus) Board Auxiliary Input 2	Input	
7	Chassis Ground	—	
8	External Logic Input 2 (Radio INP2)	Input	
9	Remote Control (Plus) Board Auxiliary Output 2	Output	
10	Fixed Low Level Receiver Audio Output High 1 (Pair to pin 23)	Output	
11	Low Level Receiver Audio Output High 2 (Pair to pin 24)	Output	
12	Internal Speaker (See Jumper Chart)	Input/Output	
13	External Speaker Output (See Jumper Table)	Output	
14	Auxiliary/External Microphone Low # 1 (Analog Ground; pair to pin 1)	Input	
15	Auxiliary/External Microphone Low # 2 (Analog Ground; pair to pin 3)	Input	
16	Auxiliary/External Microphone PTT (Radio INP1)	Input	
17	Fused A+ from Station PSU, 1.1 Amp Maximum (Paralleled with pin 5)	Output	
18	Remote Control (Plus) Board Auxiliary Input 1	Input	
19	Chassis Ground	—	
20	Radio OUT2 (Open Collector)	Output	
21	Remote Control (Plus) Board Auxiliary Output 2	Output	
22	Auxiliary/External Mute Control (Radio OUT1)	Output	
23	Low-Level Rx Audio Output Low 1 (Analog Ground; pair to pin 10)	Output	
24	Low-Level Rx Audio Output Low 2 (Analog Ground; pair to pin 11)	Output	
25	Internal Speaker Output (+) (See Jumper Table)	Output	



6 POWER-UP PROCEDURE

After installing the CS7000 Control Station per Section 5 in this manual, and installing related equipment such as remote controllers per Section 5 and the instructions supplied with the equipment, the station is ready to power-up. Follow this procedure:

1. Connect AC power to the CS7000 Control Station. See Section 5.3.2 on page 24 for details.
2. Turn on the station via its rear panel-mounted power switch.
3. Verify power is applied by checking for an illuminated power LED on the left-front panel of the station.
4. If the optional CAN Bus Extender is employed, connect its "wall cube" power supply to an appropriate AC power source and then connect the supply's 24-volt DC cable to the extender's DC power input jack. Repeat this for the CAN Bus Extender at each remote CAN-based Desktop Controller location.
5. If using a remote CAN-based Desktop Controller, follow the instructions supplied with the controller and power-up the unit.
6. If using a third-party Tone Remote Controller (TRC), follow manufacturer's instructions regarding TRC power-up.
7. For a local control station, continue with the configuration procedures presented in Section 7 that follows.
8. For a remote control station, continue with the configuration procedures presented in Section 8 which begins on page 50.
9. For a local-control CS7000 Control Station (part number CT-013892-001), connect the desk microphone directly to the radio/control head on the station.

   For a remote-control CS7000 Control Station (part number CT-013892-002), connect the desk microphone to the station's control panel microphone connector (not to the radio/control head).

Inside a remote-control CS7000 Control Station (part number CT-013892-002), switch SW3 on the Remote Control (Plus) Board is used to enable a flash programming upgrade mode. For software upgrade information, contact the Technical Assistance Center. TAC contact information is listed in Section 3.4 (page 19).

7 LOCAL CONTROL CONFIGURATION

7.1 PROGRAMMING THE RADIO FOR EXTERNAL I/O OPERATION

A local control CS7000 Control Station requires no additional configuration or alignment when used with the supplied microphone. However, if the External I/O port is utilized, several programming features may need to be verified and reconfigured for proper operation.

1. Power-up the CS7000 Control Station per Section 6.
2. Connect a PC running Radio Personality Manager (RPM) programming software to the Serial A USB programming port on the rear panel of the station.

NOTE

It may be necessary to install USB Port Driver Software SK-015121-001. This driver configures the PC to recognize the CS7000 Control Station allowing assignment of a COM Port number to the USB port. The assigned COM Port number is loaded into the RPM programming software to communicate with the Control Station. Refer to the USB Driver Installation Manual, publication number MM-015245-001, and the help menu within RPM for more information about setting up RPM and the COM Port.

3. Read and save the existing radio personality from the station using RPM. Refer to help screens if necessary.
4. Within RPM, click **Options > External IO Options** to open the External I/O dialog box.
5. Set the following parameters as shown in Figure 7-1:
   a. In the dialog box's External Output Control Line 1 section, set Alarm Output to **External Mute**, and Active to **Low**. This configures the operation of the Local Control Station's external mute output logic line at rear panel connector P3 pin 22.
   b. Near the bottom of the dialog box, set Auxiliary Input 1's Keycode to **PTT**, and set its Control Unit to **A**. This configures the operation of the Local Control Station's external PTT logic input logic line at rear panel connector P3 pin 16.
   c. Near the bottom of the dialog box, set Auxiliary Input 2's Keycode as required, and set its Control Unit to **A**. This input can be used for additional features such as a hookswitch (HKSW), an inverted hookswitch (IHKSW), or not at all (disabled). This configures the operation of the Local Control Station's logic input line at rear panel connector P3 pin 8.
6. Click OK, and then save the changes to the Control Station personality. After verifying updates, it is recommended to save the updated personality to an archive.

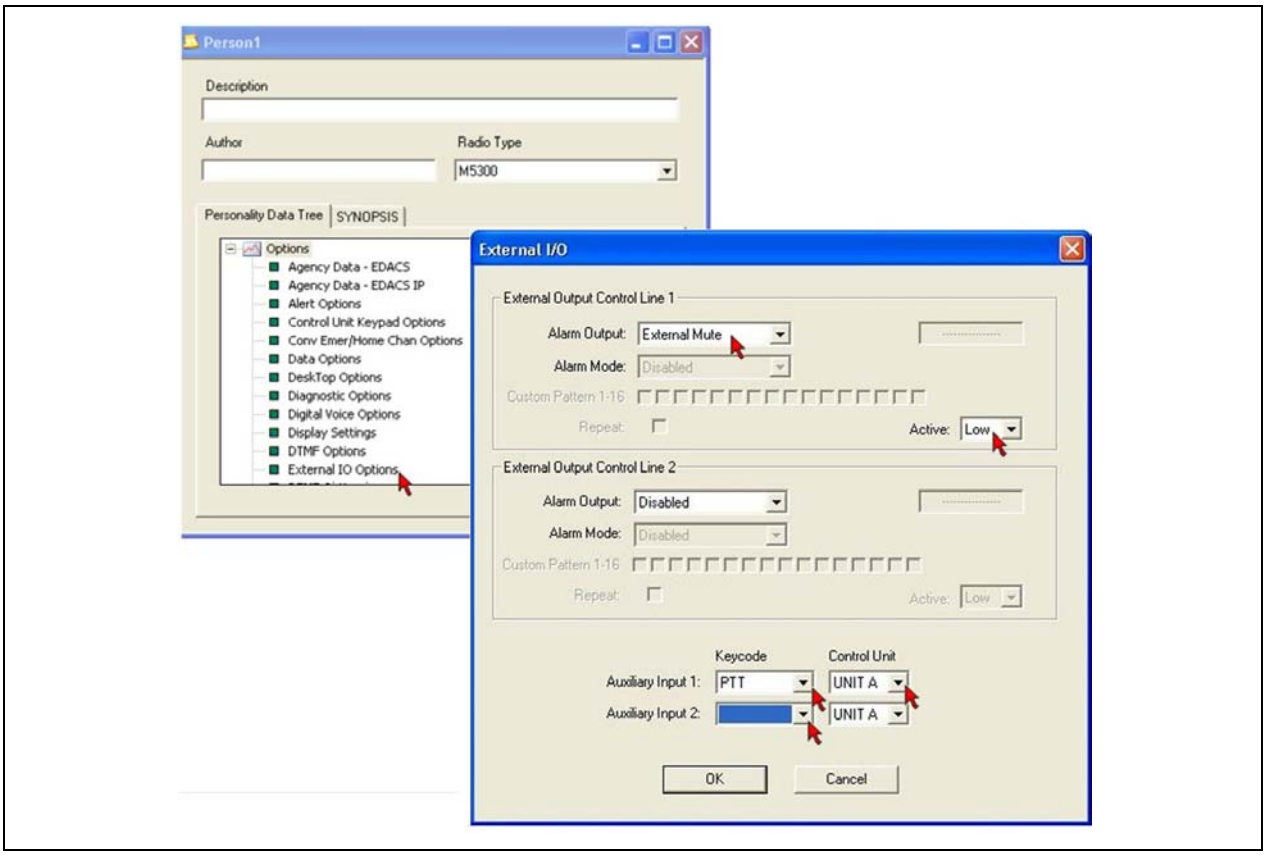


Figure 7-1: Setting Up the Mobile Radio for Control Station Operation using RPM Software

CAUTION

DO NOT set the mobile radio's volume to a fixed level in RPM's Desktop Options menu. The mobile radio's volume control shall remain active on Local Control Stations, and will not affect any audio level settings on Remote Control Stations.

8 REMOTE CONTROL CONFIGURATION

8.1 GENERAL INFORMATION

A remote-control CS7000 Control Station is equipped with the optional Remote Control (Plus) Board. This board must be configured to meet the specific requirements of the installation and the specific needs of the customer. Since the board is an integral part of a remote-control CS7000 Control Station, configuring the board configures the station. In addition, mobile radio personality programming changes may also be required, as discussed later.

Configuration is accomplished via an IP-based Ethernet connection and web browser software running on a computer. The web browser communicates with a configuration program running in the station's Remote Control (Plus) Board. To the web browser, this program appears as an Internet web site.

The computer can be linked directly to the CS7000 Control Station using a standard straight-through Ethernet cable and a static IP address. This is the recommended method when using the configuration program. Alternately, the computer can be remotely linked to the station via an IP-based network access point (i.e., via switches and/or routers), with appropriate interconnections and network access/settings.

8.2 TOOLS REQUIRED

The following tools are required to use the CS7000 Control Station's configuration program:

- **Lap-top or Desktop Computer** — A computer with web browser software installed is required. For configuration via direct Ethernet cable connection, the computer must have an RJ-45 Ethernet port/jack. Alternately, if configuration is done over an IP-based network, the computer must be capable of accessing the network (i.e., have either wired or wireless access to the network). A lap-top type Personal Computer (PC) running Microsoft Windows XP (or later) operating system software is recommended, but not required.
- **Web Browser Software installed on the Computer** — Microsoft Internet Explorer version 7 (or later) is recommended. Other web browsers may be used. However, as of the publication of this manual, the station's configuration program has only been tested with Internet Explorer version 7. Therefore, compatibility cannot be guaranteed with other web browsers.
- **Ethernet Cable(s)** — A standard straight-through Cat5 type (or better) Ethernet cable is required. This cable is used to connect an RJ-45 Ethernet jack on the rear of the station to an RJ-45 Ethernet jack at the computer (or network switch/router). Two cables of this type are required if the configuration will be done over the IP-based network and the computer does not have wireless access.

8.3 ESTABLISHING A COMMUNICATION LINK

8.3.1 Configuring the Computer's Network Parameters

To configure the CS7000 Control Station for remote control operation, the computer must be able to communicate with the Remote Control (Plus) Board in the station via the board's static IP address. This typically requires configuring the computer with a static IP address, and on the same network (subnet) as the Remote Control (Plus) Board.

On a computer running Windows XP, this configuration is accomplished via the Internet Protocol (TCP/IP) Properties dialog box for the respective network card (i.e., the network card with the Ethernet port/jack that the CS7000 Control Station will be connected to). Follow this procedure:

1. Access the Windows Control Panel. Typically, this can be accomplished by clicking the Start button, clicking Settings, and then clicking Control Panel.
2. In Control Panel, double-click Network Connections to open the Network Connections window.
3. In the Network Connections window, double-click the Local Area Connection shortcut corresponding to the computer's network card (having the Ethernet port/jack that the station will be connected to). This will open the respective Local Area Connection Properties dialog box for this network card. An example is shown in Figure 8-1 (left image).
4. In the Local Area Connection Properties dialog box's connection list, click Internet Protocol (TCP/IP) to select it, and then click the Properties button. This will open the Internet Protocol (TCP/IP) Properties dialog box.
5. Enter the computer's required IP address via the IP address text box. The computer must have a unique IP address that is not used by the CS7000 Control Station, or by any other IP-based device (such as a VoIP Remote Controller) in the same subnet.
6. Enter the required subnet mask via the Subnet mask text box. This mask should be the same as subnet mask used by the CS7000 Control Station's Remote Control (Plus) Board (default = 255.255.255.0). At a minimum, the subnet mask should be set so the CS7000 Control Station and the configuring computer are on the same "network." An example is shown in Figure 8-1 (right image).
7. Enter the gateway IP address via the Default gateway text box. This address should be set to the desired gateway IP address, if it exists, and if there are VoIP Remote Controllers outside of the CS7000 Control Station's "network."
8. The DNS Server IP Addresses typically does not need to be set.
9. Click the dialog box's OK button and if prompted, re-start the computer.

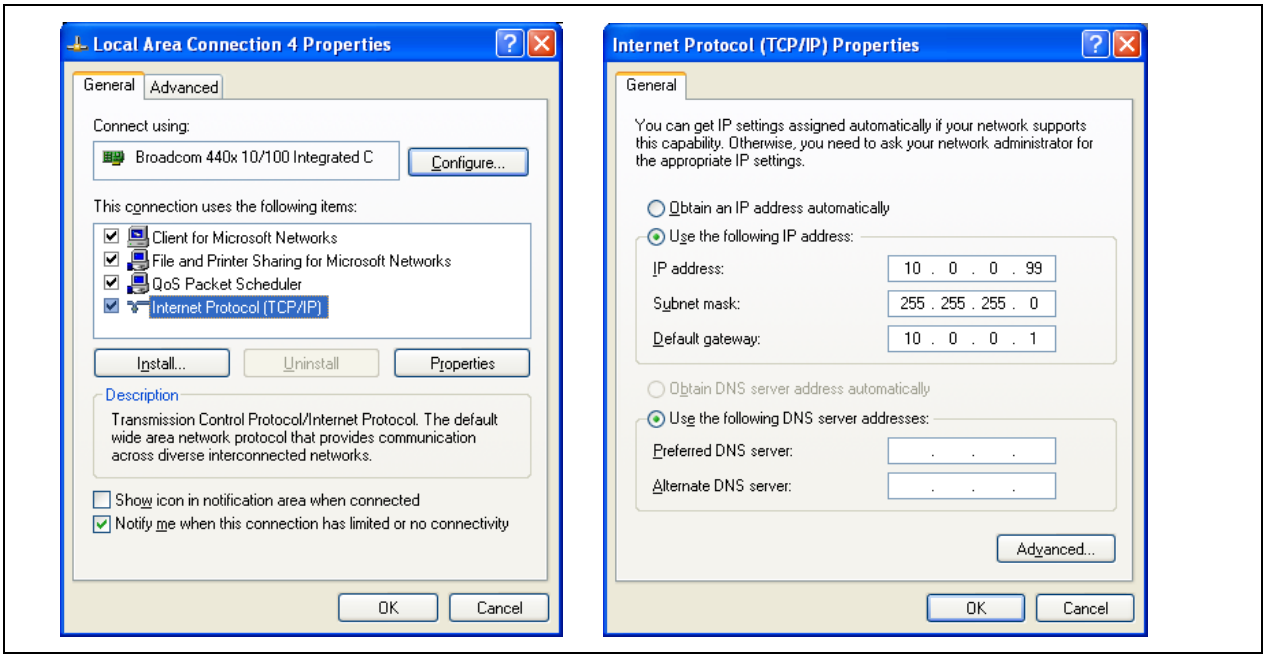


Figure 8-1: Computer Network Configuration for Static IP Address (Examples)

8.3.2 Establishing a Communication Link between the Computer and the Control Station

Follow this procedure to establish a communication link between the computer and the CS7000 Control Station's Remote Control (Plus) Board:

1. For a local Ethernet link, connect a straight-through Cat5 (or better) Ethernet cable between the computer's RJ-45 Ethernet jack and the **COMPUTER** RJ-45 Ethernet jack on the rear of the station.

   For a remote link over an IP-based network, connect the computer to a network switch/router as required, and use a straight-through Cat5 (or better) Ethernet cable to connect the **COMPUTER** RJ-45 Ethernet jack on the rear of the station to the co-located switch/router on the same IP network. Configure network parameters as necessary.

2. At the RJ-45 Ethernet jack on the rear of the station, verify the two LED's on the jack are on. They should turn on within seconds of being connected to an operating computer/switch/router. This indicates the CS7000 Control Station's Remote Control (Plus) Board and the computer/switch/router have established a hardware communications path.


NOTE

Having LEDs in the "on" state does not mean the computer can access the station's configuration programming running in the Remote Control (Plus) Board. There can be network parameter incompatibilities that can inhibit communications even though there is a functional hardware path. If the two LEDs do not turn on, try using to the CS7000 Control Station's **LAN** RJ-45 Ethernet jack, instead of the **COMPUTER**'s RJ-45 Ethernet jack.

3. At the computer, start-up the web browser.
4. In the web browser's address bar, enter the CS7000 Control Station's IP address. The default address is 10.0.0.201. When communication is established between the station and the computer, a small login dialog box will appear in the web browser session. This dialog box has text boxes for entering a user name and a password. See Figure 8-2.
5. If the login dialog box does not appear, verify the address in the web browser's address bar is entered correctly. See Sections 8.3.3 and 8.3.4 for additional information.

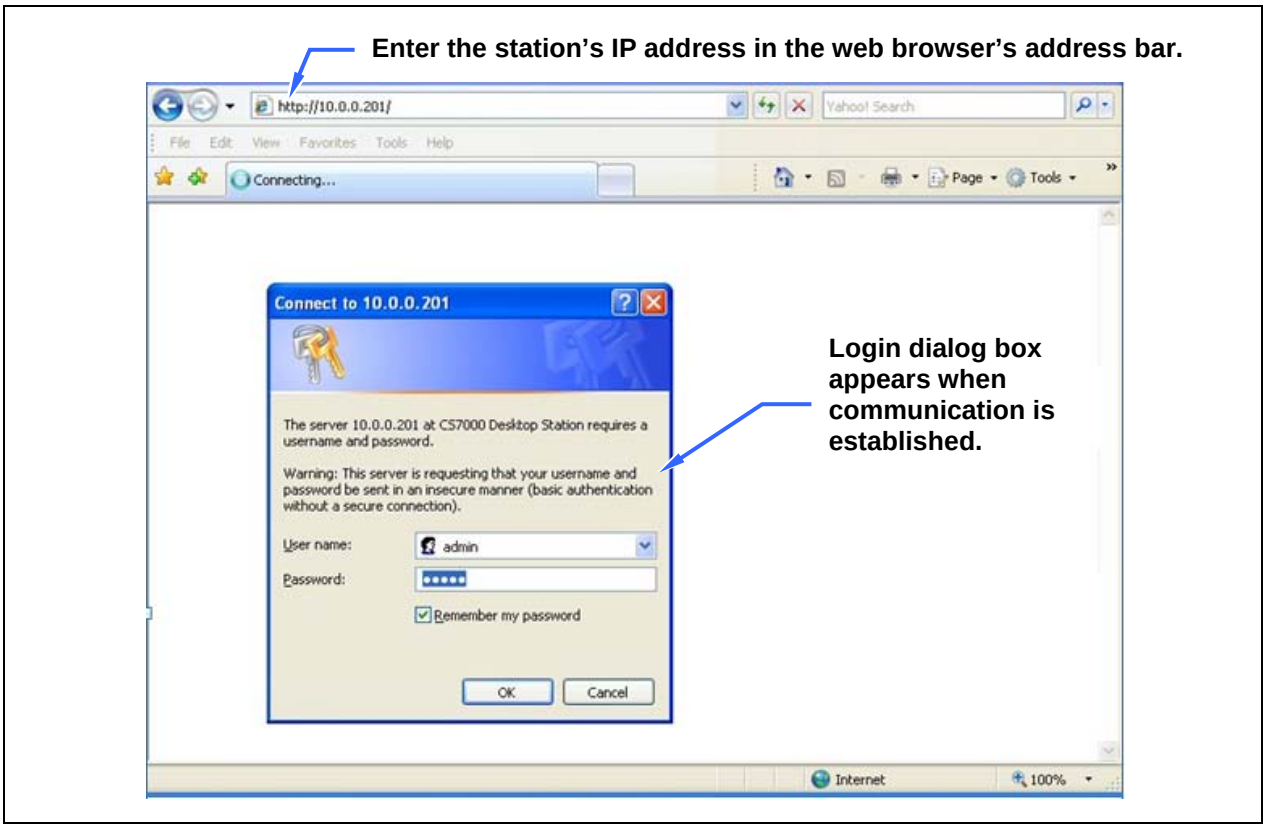


Figure 8-2: Establishing Communication between the Computer and the CS7000 Control Station

NOTE

If a communication link between the CS7000 Control Station and the computer cannot be established, first try resetting the station's IP network parameters to factory default settings by following the procedure in Section 8.3.4. Next, repeat the procedure in this section using the default IP address (listed in Section 8.3.3) in the web browser's address bar. If a communication link still cannot be established, contact the Technical Assistance Center (TAC) for assistance. TAC contact numbers are listed in Section 3.4 on page 19.

8.3.3 Control Station's Factory Default Network Parameter Settings

The CS7000 Control Station's factory default IP network parameter settings are:

- **IP Address:** `10.0.0.201`
- **Subnet Mask:** `255.255.255.0`
- **Gateway:** `10.0.0.1`
- **User Name:** `admin`
- **Password:** `admin`

8.3.4 Resetting the Control Station's Network Parameters to Factory Defaults

The CS7000 Control Station's IP network parameters can be reset to factory default settings as follows:

1. Remove the station's top cover.
2. Inside the station, locate the Remote Control (Plus) Board at the rear panel.
3. Press and hold switch SW2 on the board.
4. Press and release the board's RESET switch.
5. Wait for LEDs D3 and D4 on the board to begin to blink. This should begin approximately eight (8) seconds after the release of the RESET switch.
6. Release switch SW2. The CS7000 Control Station will automatically restart and resume normal operation, with the default settings as listed in Section 8.3.3.
7. Re-install the station's top cover.

NOTE

When the Remote Control (Plus) Board is reset, it will clear the login dialog box's "Remember my password" checkbox. In this case, the password will need to re-entered the next time the configuration program is run.

NOTE

Non-network related parameters of the board can be reset to default settings using the configuration program's Backup and Restore web page. See Section 8.18 (page 108) for additional information.

8.4 VOIP REMOTE CONTROLLER IP ADDRESS REQUIREMENTS

Each VoIP Remote Controller interfaced with the CS7000 Control Station requires a static IP address which is unique within the IP network (subnet). This static IP address must be specifically programmed into each VoIP Remote Controller.

There must be a unique static IP address and a static TCP/IP port assignment for audio. In "multicast" applications, this IP address is in addition to the IP addresses of the VoIP Remote Controllers and the Radio Panel. All devices use this IP address for their audio. In "unicast" operations, the Radio Panel sends audio to the VoIP Remote Controllers individually using each controller's IP address.

Installation of a VoIP Remote Controller and CS7000 Control Station equipment on a current corporate network will almost certainly involve of the network's IT personnel.

8.5 RADIO PERSONALITY PROGRAMMING REQUIREMENTS

The CS7000 Control Station uses the internal mobile radio's rear external I/O connector for radio audio, PTT, external mute, and possibly the hookswitch line. This functionality is defined in the radio's personality. Radio personality is configured with the Harris' Radio Personality Manager (RPM) software application. The CS7000 Control Station makes the following assumptions about the personality programming of the CS7000 Control Station's internal mobile radio.

- The radio's OUT1 Programmable Output Function must be programmed for "External Mute".
- The radio's INP1 Programmable Input Function must be set to "PTT".

- The CS7000 Control Station's Remote Control Systems can only use the System / Group Key (SGn Key) to select the radio's selected system and group. Ideally, these SG Key mapped systems and groups should be the only systems and groups programmed into the radio. This effectively restricts a CS7000 Remote Control Control Station to sixteen System and Group combinations.

If there are additional non-SG Key mapped systems and groups within the radio personality, there is a strong potential for a Remote Control System user to become very confused. If the radio's selected system and group is not one of the SG Key mapped systems and groups, a VoIP Remote Controller will treat the radio as being on a "Disabled" channel. The VoIP Remote Controller will not transmit until the radio's selected system and group is changed to a SG Key mapped system and group, either by the VoIP Remote Controller or by a radio control head.

In the case of a Tone Remote Control System, the TRC user may be confused as to the source of the audio they are listening to. Transmitting from a TRC will always change the radio's selected system and group to the TRC's selected system and group.

- If the Remote Control System is configured to manage an Emergency, then the radio's Emergency Key Delay parameter must be set to zero seconds. This is the time the control head's Emergency Key must be held down before the radio will recognize the Emergency function. The default value is one second.
- Radio Hookswitch functionality is programmable.
- Radio Output Function OUT2 should be programmed to "Tx Indicator" when the radio uses trunked radio systems. This is especially important in the case of the VoIP Remote Control System where the VoIP Remote Controller users do not hear radio-generated Call Progress Alert Tones.


NOTE

When using RPM software version R04 or earlier, a 'SC5' file may be required to enable OUT2 as a "Tx Indicator" function. Refer to Section 8.5.5 for additional information. RPM software version R05 and later includes this setting on the External I/O screen.

8.5.1 External I/O Settings

From Radio Personality Manager (RPM), access the External I/O dialog box and configure the following parameters within the radio personality. An example dialog box is shown in Figure 8-3:

- In the dialog box's External Output Control Line 1 section, set Alarm Output to **External Mute**, and Active to either **Low** or **High**, as required: The station's COR function can be set with either polarity. This configures the operation of the Remote Control Station's external mute output logic line at rear panel connector P3 pin 22 (radio OUT1).
- If desired, enable the Tx indicator function on OUT2 as follows: In the dialog box's External Output Control Line 2 section, set Alarm Output to **Extern. Tx Indicator** (Control Line 1 must first be set to **External Mute**). This station COR function is an active-low function. If and external Tx indicator function is not required, this output can be programmed for other functions, such as speaker relay control. This configures the operation of the Remote Control Station's logic line at rear panel connector P3 pin 20 (radio OUT2).
- Near the bottom of the dialog box, set Auxiliary Input 1's Keycode to **PTT**, and leave its Control Unit setting at **A** (the default). This configures the operation of the Remote Control Station's external PTT logic input logic line (radio INP1) at rear panel connector P3 pin 16 (radio INP1).

- Near the bottom of the dialog box, set Auxiliary Input 2's Keycode as required, and leave its Control Unit setting at **A** (the default). This input can be used for additional features such as a hookswitch (HKSW), an inverted hookswitch (IHKSW), or not at all (disabled). This configures the operation of the Local Control Station's logic input line at rear panel connector P3 pin 8 (radio INP2).

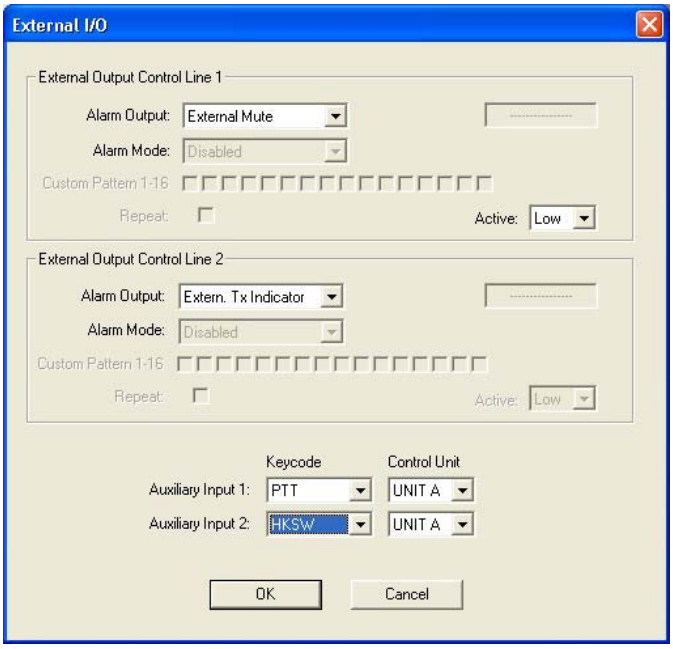


Figure 8-3: RPM's External I/O Dialog Box

8.5.2 System / Group Key (SG Key) Settings

Configure one or more of the SG Keys for a specific System and Group. The CS7000 Control Station's Remote Control Systems can only select a SG Key mapped System and Group.

Further, the "Home" and "Forced Emergency" channels, if used, must be mapped to a SG Key mapped System and Group. The VoIP Remote Control system will then automatically be updated to that System and Group. However, the Tone Remote Control System will require one of the Remote Update controls on the Remotes Web Page Tone Options Tab be selected and Tone Remote Controllers that are compatible with these Remote Update functions for the radio's "Home" and "Forced Emergency" channels to function properly.

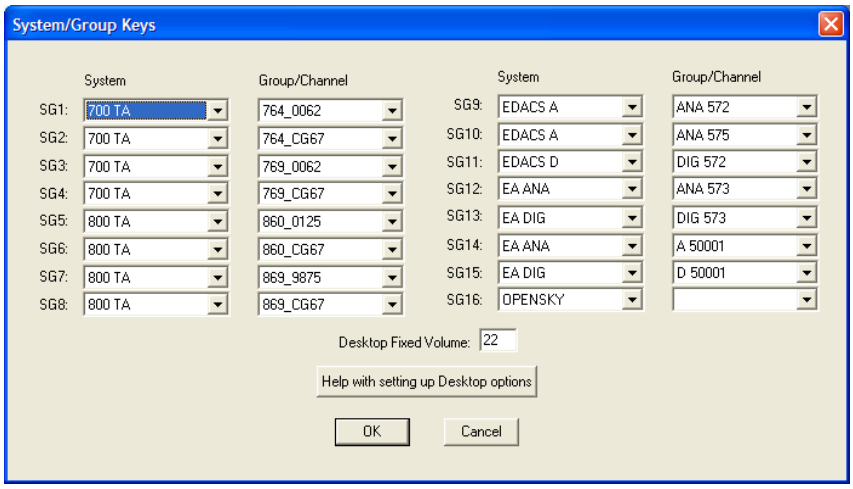


Figure 8-4: RPM's System/Group Keys Dialog Box

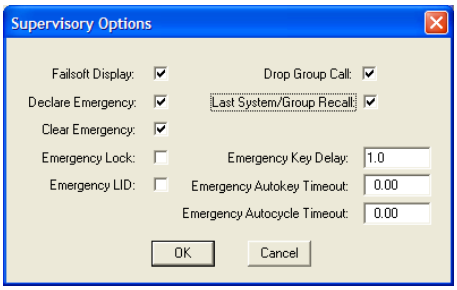


Figure 8-5: RPM's Supervisory Options Dialog Box

The Desktop Fixed Volume setting is not used in the CS7000 Control Station.

8.5.3 Supervisory Screen Settings

Enable or disable the radio's EDACS Failsoft display. When enabled, the radio will display the Failsafe icon when it is on an EDACS system and it detects the system is operating in Failsoft mode.

Enable or disable the "Last SG" key functionality. When this function is enabled, the Last SG button will toggle the radio's Selected System and Group between the current SG Key mapped system and group and the previous SG Key mapped System and Group. The Last SG Key will also toggle between the previous SG Key mapped System and Group and the "Home Channel" mapped System and Group.

Enable or disable the radio's ability to declare an Emergency.

Enable or disable to the radio's ability to clear a currently declared Emergency.

If the radio is programmed to declare an Emergency, the Emergency Key Delay parameter must be set to zero. This is necessary in order to work with the CS7000 Control Station's key press and key release functionality.

The Emergency Key Delay parameter will also affect the Emergency Key on any attached control heads. The Emergency button on a CH-721 control head will also have use of the zero Emergency Key Delay parameter. The Emergency button on a CH-721 control head will then be a normal press and release

button where the Emergency function goes active on the key press and where the button's down time is ignored. In a typical CS7000 Control Station dispatch environment, this is felt to be acceptable.

If this is unacceptable and the control head's Emergency Button must be set for a significant down time debounce value, then the CS7000 Control Station can not be configured to use its Emergency Actions. However, it is possible for a CS7000 Control Station to declare on Emergency by configuring the CS7000 Control Station to a MACRO Action and then defining the corresponding MACRO number within the radio to generate the properly timed Emergency Key Press and Release.

8.5.4 Keypad Option Settings

Configure Hookswitch functionality. RPM's Keypad Options dialog box mainly defines the radio's functionality when its Hookswitch input is active. A sample dialog box is shown in Figure 8-6.

8.5.5 General Options Screen (TX Indicator SC5 File)

When using RPM software version R04, it may be necessary to specify a .sc5 file in order to configure the radio's Tx Indicator function. To do so, press the button to the right of the SC5 File Name text box. This will bring up a Browse File dialog box that can then be pointed to the desired .sc5 file. Additionally, RPM must be specifically enabled to allow the use of a .sc5 file.

When using RPM version R05 or later, the External I/O screen provides the TX Indicator feature as shown in Figure 8-3.

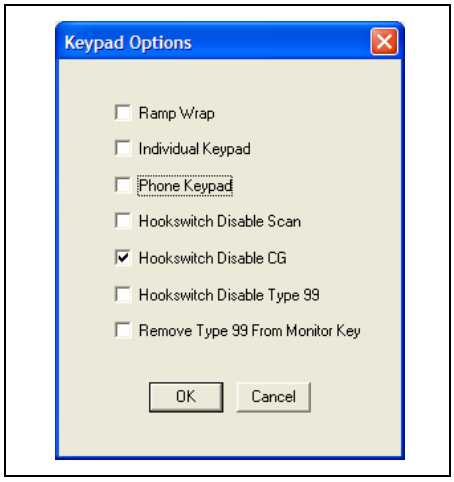


Figure 8-6: RPM's Keypad Options Dialog Box

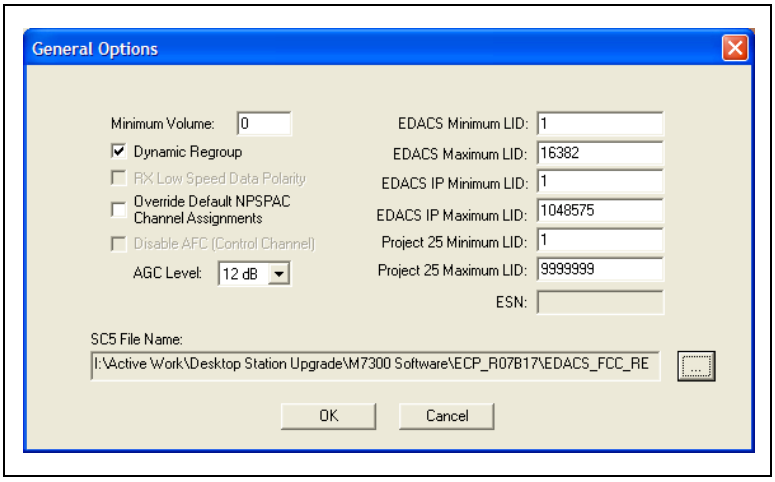


Figure 8-7: RPM's General Options Dialog Box

8.5.6 Radio Software Requirements

The CS7000 Control Station's internal mobile radio requires application software (i.e., flash code) that recognizes and operates with the CS7000 Control Station. The minimum required application software versions are listed in Table 8-1. It is recommended that the mobile radio be flashed with the latest released radio application software.

Table 8-1: Required Minimum Mobile Radio Application Software

MOBILE RADIO	ECP APPLICATION VERSION	OTP APPLICATION VERSION
M5300	M53U0715 with Tx Indicator SC5 file	V15.93
M7300	M72U0715 with Tx Indicator SC5 file	V15.93

8.6 LOGGING INTO THE STATION'S CONFIGURATION PROGRAM

To login to the CS7000 Control Station's configuration program, follow this procedure:

1. At the computer, start-up the web browser application.
2. As illustrated in Figure 8-2 on page 53, enter the CS7000 Control Station's IP address in the browser's address bar. The default address is 10.0.0.201. When communication is established between the CS7000 Control Station and the computer, a small login dialog box will appear in the web browser session. This dialog box has text boxes for entering a user name and password.
3. Enter the user name and password and then click the dialog box's OK button.

NOTE

Entry of the password is case sensitive. The default user name and password are listed in Section 8.3.3 on page 53.

CAUTION

Login information is sent over the network in a non-secure format. Therefore, use caution when assigning a new password.

NOTE

When the Remote Control (Plus) Board is reset, it will clear the login dialog box's "Remember my password" checkbox. In this case, the password will need to re-entered the next time the configuration program is run.

Following a successful login, the configuration program's top-level web page will appear.

8.7 CONFIGURATION PROGRAM'S TOP-LEVEL WEB PAGE

After logging into the configuration program, the program's top-level page will appear, as illustrated in Figure 8-8. The eight (8) buttons on the left-hand side will bring up the configuration web pages. Most of the program's configuration web pages have a tab-format which divides related configuration tasks.

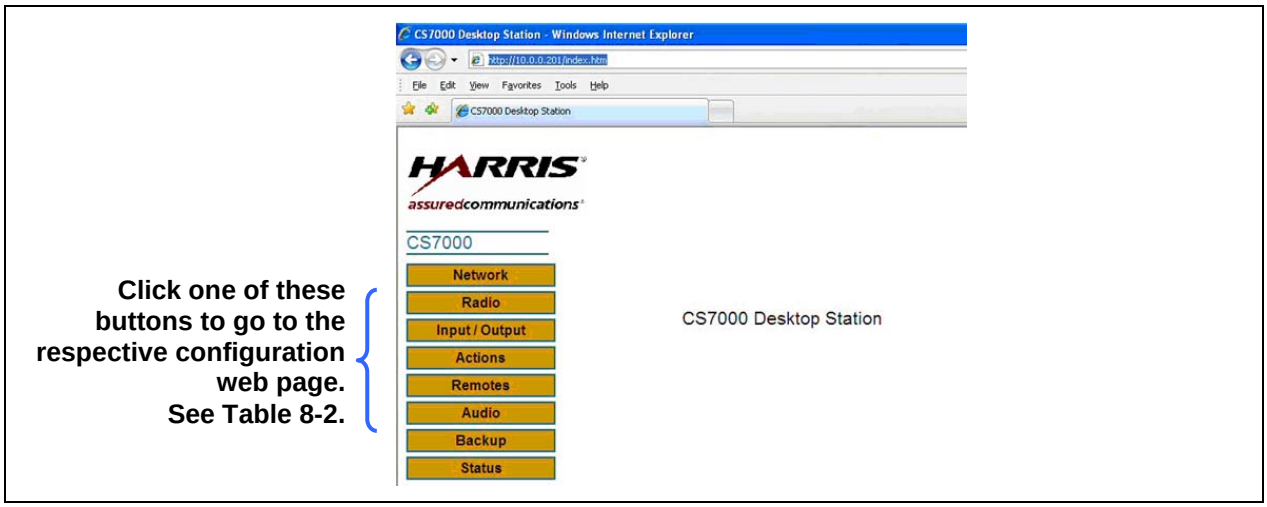


Figure 8-8: Configuration Program's Top-Level Web Page

Table 8-2 briefly describes what each configuration web page is used for:

Table 8-2: Configuration Program's Configuration Web Pages

PAGE BUTTON NAME	USE	SEE SECTION (PAGE)
Network	The Network Configuration web page configures the identification of the CS7000 Control Station's configuration program and its VoIP operation. It also allows changing of the password to access the station's configuration program.	8.8 (62)
Radio	The Radio Configuration web page is used to configure the Remote Control (Plus) Board's interface to the mobile radio.	8.9 (63)
Input / Output	The CS7000 Input/Output Configuration web page is used to configure the functionality of the Remote Control (Plus) Board's External I/O connector and its digital I/O interface with the radio. External I/O pins are assigned to specific "actions."	8.10 (67)
Action	The Action Configuration web page is used to assign radio button functions to an "Action." An "Action" is a CS7000 Control Station function that does a specific task.	8.11 (75)
Remotes	The Remote Configuration web page is used to configure the Remote Control (Plus) Board's remote control parameters.	8.12 (78) thru 8.16 (95)
Audio	The Audio Matrix Configuration web page configures the audio paths and audio levels through the Remote Control (Plus) Board's audio matrix. The board's audio matrix can be thought of as a patch panel where any combination of audio matrix inputs can be connected to a specific audio matrix output.	8.17 (101)
Backup	The Backup and Restore web page allows the user to backup and restore the Remote Control (Plus) Board's configuration.	8.18 (108)
Status	The CS7000 Status web page displays identifying information about the Remote Control (Plus) Board and it lists VoIP Remote Controllers which are currently attached to the CS7000 Control Station. All items on this web page are read-only.	8.19 (110)

8.7.1 Saving Changes and Resetting the Station via the Configuration Program

Most configuration web pages have a Save Changes button and a Save Changes and Reset Unit button. To save any changes made on a page, click one of these buttons before leaving the page. Otherwise changes will be lost when browsing to a new page.

The Save Changes button does not change the CS7000 Control Station's configuration. It simply saves the changes that have been made in the Remote Control (Plus) Board. Changes will not become active until after the station is reset.

The Save Changes and Reset Unit button implements all current and "saved" web page changes into the CS7000 Control Station's configuration. This will also restart the station. This must be done before ending the configuration program. The CS7000 Control Station essentially does a power-up reset.

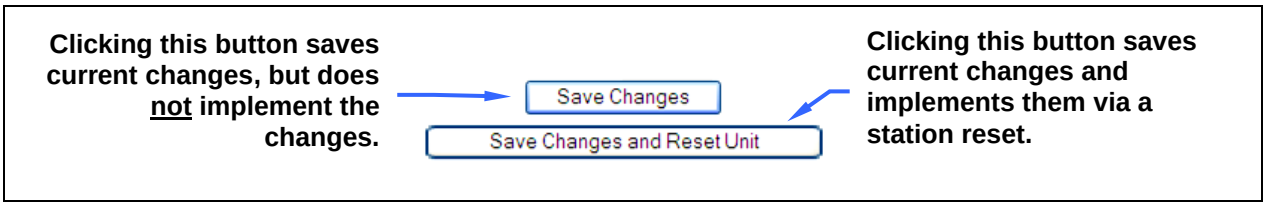


Figure 8-9: Buttons for Saving Changes and Resetting the Station

NOTE

After clicking the Save Changes and Reset Unit button, allow the station time to automatically reset, and then power-cycle the CS7000 Control Station.

Just after clicking the Save Changes and Reset Unit button, the current web page will indicate the CS7000 Control Station is resetting.

As part of this process, if the station's Remote Switch is on, the station will turn off its Remote LED. When the station is again fully operational, this LED will turn on.

The station will provide the login dialog box when it becomes fully operational.

It is normal for a computer to flash a "Network Cable Unplugged" message during a station reset. This message should disappear when the station becomes active.

8.8 NETWORK CONFIGURATION WEB PAGE

The Network Configuration web page configures the identification of the CS7000 Control Station's configuration program and its VoIP operation. It also allows changing of the password to access the station's configuration program. An example web page is shown in Figure 8-10.

NOTE

Changing the CS7000 Control Station's network identification information from the factory default settings is highly recommended.

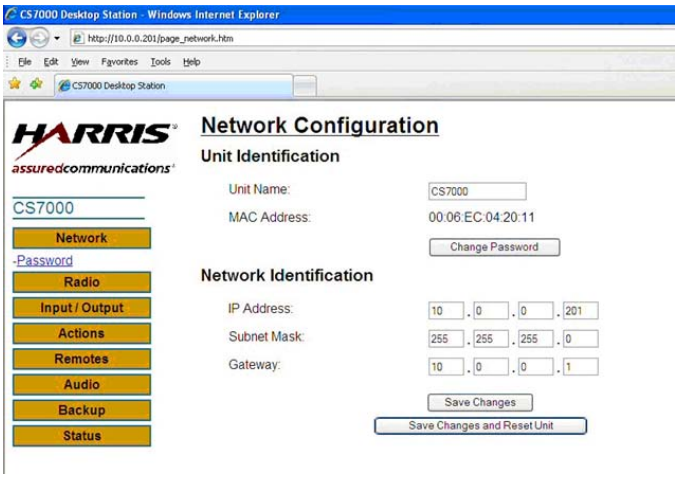


Figure 8-10: Network Configuration Web Page (Example)

8.8.1 Unit Identification Section

The Unit Name text box is used to define a name for the CS7000 Control Station. The name can be up to sixteen (16) alphanumeric characters in length.

MAC Address is a read-only field that displays the CS7000 Control Station's Ethernet MAC address (serial number). The MAC address is set at the factory. It cannot be changed.

8.8.2 Network Identification Section

The IP Address, Subnet Mask, and Gateway text boxes in this section are used to define the CS7000 Control Station's Ethernet IP address parameters. As described in Section 8.3.1 of this manual, a static IP address must be used.

After the network settings are configured, this IP address is may be used from a web browser to run the station's configuration program. VoIP Remote Controllers in a VoIP Remote Control System also use this IP address as their "Panel Address" to communicate with CS7000 Control Station.

8.8.3 Change Password Button

To change the CS7000 Control Station configuration program's password, click the Change Password button on the Network Configuration web page. A secondary page will appear that allows entering of and confirmation of a new password via two text boxes. Afterwards, click the Save Changes and Reset Unit button.

If the passwords entered in the two text boxes do not match, the CS7000 Control Station will not change the password. In this case, an error screen will appear and the user will be directed to re-enter the new password.

The new password will be required after the CS7000 Control Station restarts.

8.9 RADIO CONFIGURATION WEB PAGE

The Radio Configuration web page is used to configure the Remote Control (Plus) Board's interface to the mobile radio. This page has three (3) tabs: Hardware, Radio Control, and Software (Version). Each tab is described in the following subsections.

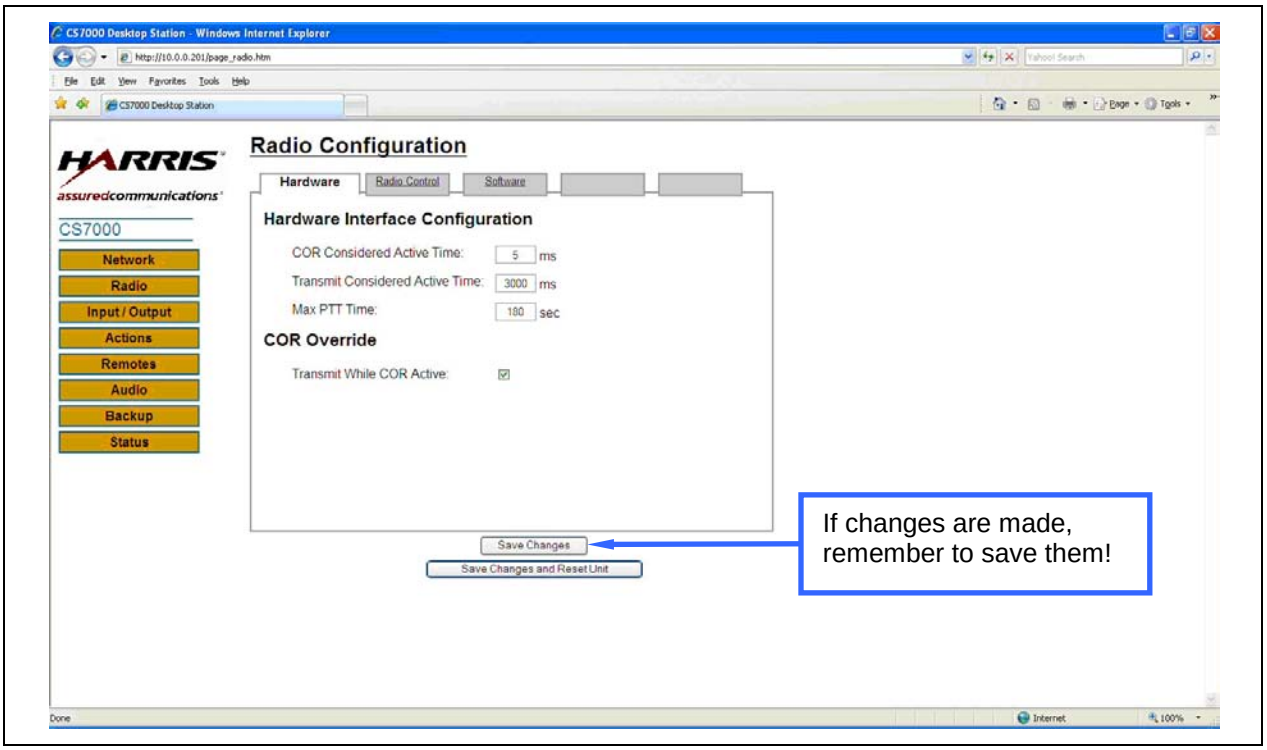


Figure 8-11: Radio Configuration Web Page—Hardware Tab (Example)

8.9.1 Hardware Tab

8.9.1.1 Hardware Interface Configuration Section

COR Considered Active Time

The COR Considered Active Time parameter is the time in milliseconds that the radio's COR output must be active before the Remote Control (Plus) Board concludes the radio is receiving audio. If the radio's COR output remains high after this time interval, the Remote Control (Plus) Board will process the radio's receive (speaker) audio for as long as the radio's COR output remains active.

When set to zero (milliseconds), the Remote Control (Plus) Board does not debounce the radio COR output.

Setting this timer too large may prevent the CS7000 Control Station from playing short radio alert tones. For example, the radio's transmit grant tone typically lasts only 50 milliseconds.

The M5300, M7300, and Unity XG-100M mobile radios use OUT1 as the radio COR output. The OUT1 output must be assigned to the External Mute function.

Transmit Considered Active Time

The Transmit Considered Active Time parameter is the time in milliseconds that the radio's transmit indicator output must be active before the Remote Control (Plus) Board concludes the radio is transmitting on a voice channel after the board initiates a transmission. If the radio's Transmit Indicator output is active when the timer expires, the board will begin transmitting audio on the radio's external microphone input.

The purpose of this timer is to differentiate between a radio transmitting on a control channel to acquire a voice channel on a trunked system and a radio that is then transmitting on the assigned voice channel. The period should then be set so that the Transmit Indicator output will go active before the timer times out on a channel acquisition transmission.

If the radio's Transmit Indicator goes active immediately when the radio is transmitting, as on a non-trunked system conventional channel, then this period can be set to zero.

This timer does not function when the Transmit Indicator Polarity (Digital Output tab on the Radio Configuration web page) is set to "Ignore."

The M5300, M7300, and Unity XG-100M mobile radios use OUT2 as the radio's Transmit Indicator Output. The radio's OUT2 output must be assigned to the "OK To Talk" function.

Max PTT Time

The Max PTT Time parameter is the time in seconds that the Remote Control (Plus) Board will allow for a Remote Control (Plus) Board-initiated transmission. The timer starts when a board PTT input becomes active. If the timer expires, the board will stop transmitting. The main purpose of this timer is to prevent a failed Remote Controller from locking the radio in transmit.

A value of 0 disables the timer.

It is recommended that this time period be set in excess of the radio personality's CCT timer value.

8.9.1.2 COR Override

Transmit While COR Active

When the Transmit While COR Active checkbox is checked, the Remote Control (Plus) Board will transmit while the radio's COR output is active. A board transmission will have priority over receive audio. This is particularly desirable on a conventional radio system where it may be necessary to transmit over an unsquelched receiver.

When the checkbox is not checked, the board will not transmit while the radio's COR output is active. Radio receive audio will have priority over a board transmission.

8.9.2 Radio Control Tab

The Radio Configuration web page's Radio Control tab is shown in Figure 8-12.

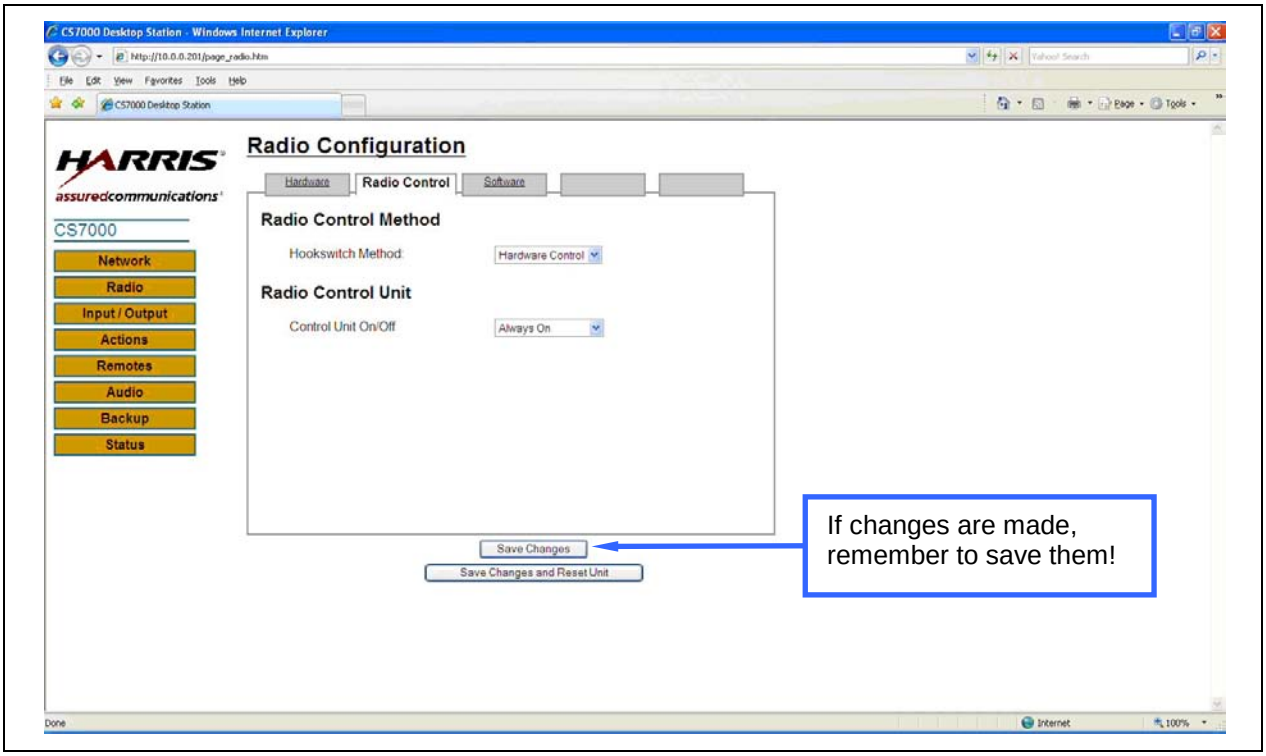


Figure 8-12: Radio Configuration Web Page—Radio Control Tab (Example)

8.9.2.1 Radio Control Method

Hookswitch Method

The Hookswitch Method parameter selects how the Remote Control (Plus) Board hookswitch information is communicated to the radio. Selections are:

- Hardware: The radio's connector Hookswitch line (radio connector J3 pin 6) is used. This is the default setting.
- CAN Control: CAN bus messaging is used.

The radio's Hardware Hookswitch input is actually processed in the radio's front-mount CH-721 control head. If the radio inside the CS7000 Control Station does not have a CH-721 control head, for example, a remote-control-only rack-mount CS7000 Control station, then the CAN Control setting must be used.

8.9.2.2 Radio Control Unit

Control Unit On/Off Switch

The Control Unit On/Off Switch parameter selects how the Remote Control (Plus) Board handles the control head's CTRL_ON line on the radio connector. This logic signal is effectively paralleled with the control head's power switch. Selections are:

- Always On: The board holds the control head's CTRL_ON line at ground, effectively forcing the radio always on. Station and radio power are both controlled only by the station's AC power switch. This is the default setting.

- Controlled By Radio: The board floats the control head's CTRL_ON line, allowing the radio's power to be controlled by the control head's power switch.

8.9.3 Software (Version) Tab

The Radio Configuration web page's Software (Version) tab is shown in Figure 8-13.

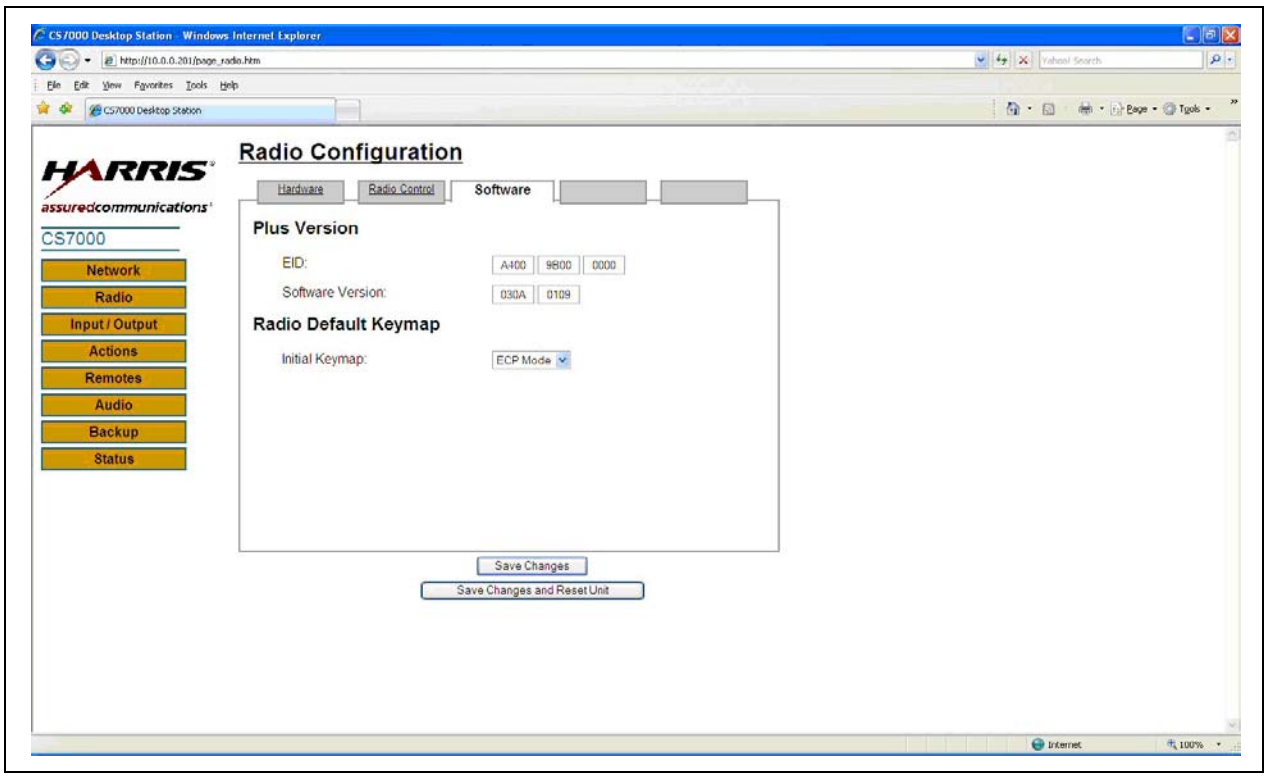


Figure 8-13: Radio Configuration Web Page—Software Tab (Example)

8.9.3.1 Plus Version

EID

EID is an electronic identification number assigned to the Remote Control (Plus) Board. The board uses this number to identify itself to the radio via the CAN bus network. This value is assigned at the factory and it should not be changed unless specifically directed to do so. Changing it may make the board unable to communicate with the radio.

Software Version

This is the Remote Control (Plus) Board's software version number. This number is reported to the radio when the board establishes communications with the radio. It should not be changed unless specifically directed to do so. Changing it may make the board unable to communicate with the radio.

8.9.3.2 Radio Default Keyboard

Initial Keymap

The Initial Keymap parameter defines which key-map the CS7000 Control Station will use when it initially powers up. Selections are:

- ECP Mode: With this setting, the station uses the ECP key codes and the ECP radio mode for conventional, EDACS (not available on Unity XG-100M), and P25 functionality.
- OTP Mode: With this setting, the station uses the OTP key codes and the OTP radio mode for OpenSky Trunking Protocol functionality (not available on Unity XG-100M).

This parameter is typically defined by the radio and it is sent to the CS7000 Control Station at power-up or when the radio changes between ECP and OTP (not available on Unity XG-100M) modes. It provides some protection from the CS7000 Control Station and the radio being out of sync at power-up, in a case where the station (i.e., Remote Control (Plus) Board) misses the radio's key-map defining CAN bus message.

8.10 CS7000 INPUT/OUTPUT CONFIGURATION WEB PAGE

8.10.1 General Information

The CS7000 Input/Output Configuration web page is used to configure the functionality of the Remote Control (Plus) Board's External I/O connector and its digital I/O interface with the radio. External I/O pins are assigned to specific "actions." These inputs and outputs are listed in the following tables:

Table 8-3: Remote Control (Plus) Board's Digital Inputs from Radio

NAME	M5300/M7300 SIGNAL NAME	RADIO CONNECTOR
COR Indicator	OUT1 (External Mute output)	J3 pin 11
Tx Indicator	OUT2	J3 pin 20

Table 8-4: Remote Control (Plus) Board's Digital Outputs to Radio

NAME	M5300/M7300 SIGNAL NAME	RADIO CONNECTOR
External PTT	INP1	J3 pin 14
Radio Hookswitch	CU HKSW	J3 pin 6
Radio Accessory	INP2	J3 pin

Table 8-5: Remote Control (Plus) Board's Inputs from Station's External I/O Connector

NAME	NOTES	STATION'S EXTERNAL I/O CONNECTOR
Auxiliary PTT	Dedicated PTT Function	P3 pin 16
Auxiliary Hookswitch	General Purpose Function	P3 pin 2
Auxiliary In 1	General Purpose Function	P3 pin 18
Auxiliary In 2	General Purpose Function	P3 pin 6

Table 8-5: Remote Control (Plus) Board's Inputs from Station's External I/O Connector

NAME	NOTES	STATION'S EXTERNAL I/O CONNECTOR
Auxiliary In 3	General Purpose Function	P3 pin 8

NOTE

The complete pin-out for the CS7000 Control Station's External I/O connector P3 is listed in Table 5-7 on page 46.

Table 8-6: Remote Control (Plus) Board's Outputs to Station's External I/O Connector

NAME	NOTES	STATION'S EXTERNAL I/O CONNECTOR
External Mute	Dedicated Mute Function	P3 pin 22
Auxiliary Output 1	General Purpose Function	P3 pin 21
Auxiliary Output 2	General Purpose Function	P3 pin 9
Auxiliary Output 3	General Purpose Function	P3 pin 20

8.10.1.1 Input Operation

A Remote Control (Plus) Board input can be assigned to set a board "Action." This Action can then be assigned to a board output. When the board input is active, the assigned board Action is active. When the board input is inactive, the assigned board Action is inactive. The active voltage level of an input is a configurable parameter.

A Remote Control (Plus) Board's Action can also be configured to generate a radio button function to the radio over the CAN bus. This configuration is accomplished via the Actions web page. Generally, it is not desirable to assign an Action to both set a hardware input and to generate a radio button function.

8.10.1.2 Output Operation

A Remote Control (Plus) Board output can be assigned to follow a board "Action." When the board's Action is active, the assigned board output is active. When the board's Action is inactive, the assigned board output is inactive. The active voltage level of an output is a configurable parameter.

A Remote Control (Plus) Board's Action can also be configured to generate a radio button function to the radio over the CAN bus. This configuration is accomplished via the Actions web page. Generally, it is not desirable to assign an Action to both set a hardware output and to generate a radio button function.

8.10.1.3 Input/Output Configuration Example

For example, to assign the Remote Control (Plus) Board's COR Indicator input (the radio's External Mute output) to the board's Auxiliary Output 1:

1. On the CS7000 Input/Output Configuration web page's Inputs tab, assign the Remote Control (Plus) Board's COR Indicator Sets pull-down list to Action 1. See Figure 8-14.
2. On the CS7000 Input/Output Configuration web page's Outputs tab, assign the Remote Control (Plus) Board's Auxiliary Output 1 Will Follow pull-down list to Action 1. See Figure 8-15 on page 72.

3. Configure the polarity for the COR Indicator input on the Input Levels tab. See Figure 8-16.
4. Configure the polarity for Auxiliary Output 1 on the Output Levels Tab. See Figure 8-17.

With this configuration, when the board's COR Indicator input is active, the board's Auxiliary Output 1 is active. Also, when the board's COR Indicator input is inactive, the board's Auxiliary Output 1 is inactive.

8.10.2 Inputs Tab

The CS7000 Input/Output Configuration web page's Inputs tab is shown in Figure 8-14.

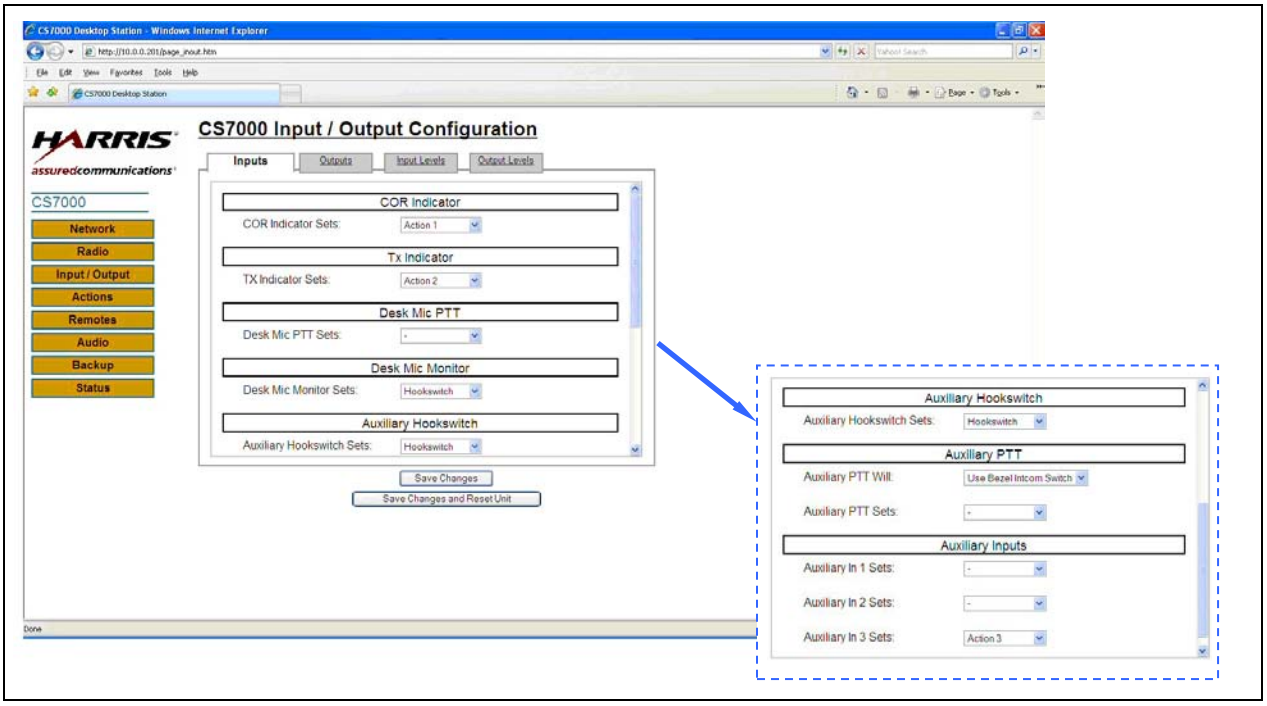


Figure 8-14: CS7000 Input/Output Configuration Web Page—Inputs Tab (Example)

8.10.2.1 COR Indicator

The COR Indicator input is a radio output that is active when the radio's speaker is not muted. This is a dedicated input. When active, the CS7000 Control Station will go into its radio receive audio state. The COR Indicator input will also be active when while the radio generates an alert tone.

COR Indicator Sets

COR Indicator Sets settings are:

- – (Disabled): This is the default setting.
- Action (Number): Select an Action number to assign to the COR Indicator.

8.10.2.2 Tx Indicator

The Tx Indicator Input is a radio output that is active while the radio is transmitting on a voice channel. The Tx Indicator input should be inactive while the radio is transmitting on a control channel on a trunked system. This is a dedicated input. When active, the CS7000 Control Station treats the radio as transmitting on a voice channel.

Tx Indicator Sets

Tx Indicator Sets settings are:

- – (Disabled): This is the default setting.
- Action (Number): Select an Action number to assign to the Tx Indicator.

8.10.2.3 Desk Mic PTT

The Desk Mic PTT is the PTT switch input from the CS7000 Control Station's front panel microphone connector.

Desk Mic PTT Sets

Desk Mic PTT Sets settings are:

- – (Disabled): This is the default setting.
- Action (Number): Select an Action number to assign to the mic's PTT switch.

8.10.2.4 Desk Mic Monitor

Desk Mic Monitor is the monitor switch input from the CS7000 Control Station's front panel microphone connector.

Desk Mic Monitor Sets

Desk Mic Monitor Sets settings are:

- – (Disabled): This is the default setting.
- Action (Number): Select an Action number to assign to the desk mic's monitor switch input.

8.10.2.5 Auxiliary Hookswitch

Auxiliary Hookswitch is the External Hookswitch input on the CS7000 Control Station's rear DB25 External I/O Connector (P3 pin 2). Auxiliary Hookswitch can also be a general purpose input into the CS7000 Control Station.

Auxiliary Hookswitch Sets

Auxiliary Hookswitch Sets settings are:

- – (Disabled): This is the default setting.
- Action (Number): Select an Action number to assign to the auxiliary hookswitch.

8.10.2.6 Auxiliary PTT

Auxiliary PTT is a dedicated External PTT input on the CS7000 Control Station's rear DB25 External I/O Connector (P3 pin 16). An active Auxiliary PTT will initiate a transmission.

The Auxiliary PTT input can be configured to use or ignore the Front Panel Intercom Switch. For example, if an external paging terminal is connected to the External I/O Connector, it may be desirable for the paging terminal to always transmit regardless of the Intercom Switch's position. If a headset is connected to the External I/O Connector, it may be desirable for the headset's PTT to be controlled by the Intercom Switch's position.

Auxiliary PTT Will

Auxiliary PTT Will settings are:

- Use Bezel Intercom Switch: This is the default setting.
- Always PTT

Auxiliary PTT Sets

The Auxiliary PTT Sets settings are:

- – (Disabled): This is the default setting.
- Action (Number): Select an Action number to assign to the Auxiliary PTT.

8.10.2.7 Auxiliary Inputs

The CS7000 Control Station has three general purpose inputs, Auxiliary Input 1 (P3 pin 21), Auxiliary Input 2 (P3 pin 9), and Auxiliary Input 3 (P3 pin 8). These inputs can be assigned a CS7000 Control Station Action.

Auxiliary In 1 Sets

Auxiliary In 1 Sets settings are:

- – (Disabled): This is the default setting.
- Action (Number): Select an Action number to assign to the Auxiliary Input 1.

Auxiliary In 2 Sets

The Auxiliary In 2 Sets settings are:

- – (Disabled): This is the default setting.
- Action (Number): Select an Action number to assign to the Auxiliary Input 2.

Auxiliary In 3 Sets

The Auxiliary In 3 Sets settings are:

- – (Disabled): This is the default setting.
- Action (Number): Select an Action number to assign to the Auxiliary Input 3.

8.10.3 Outputs Tab

The CS7000 Input/Output Configuration web page's Outputs tab is shown in Figure 8-15.

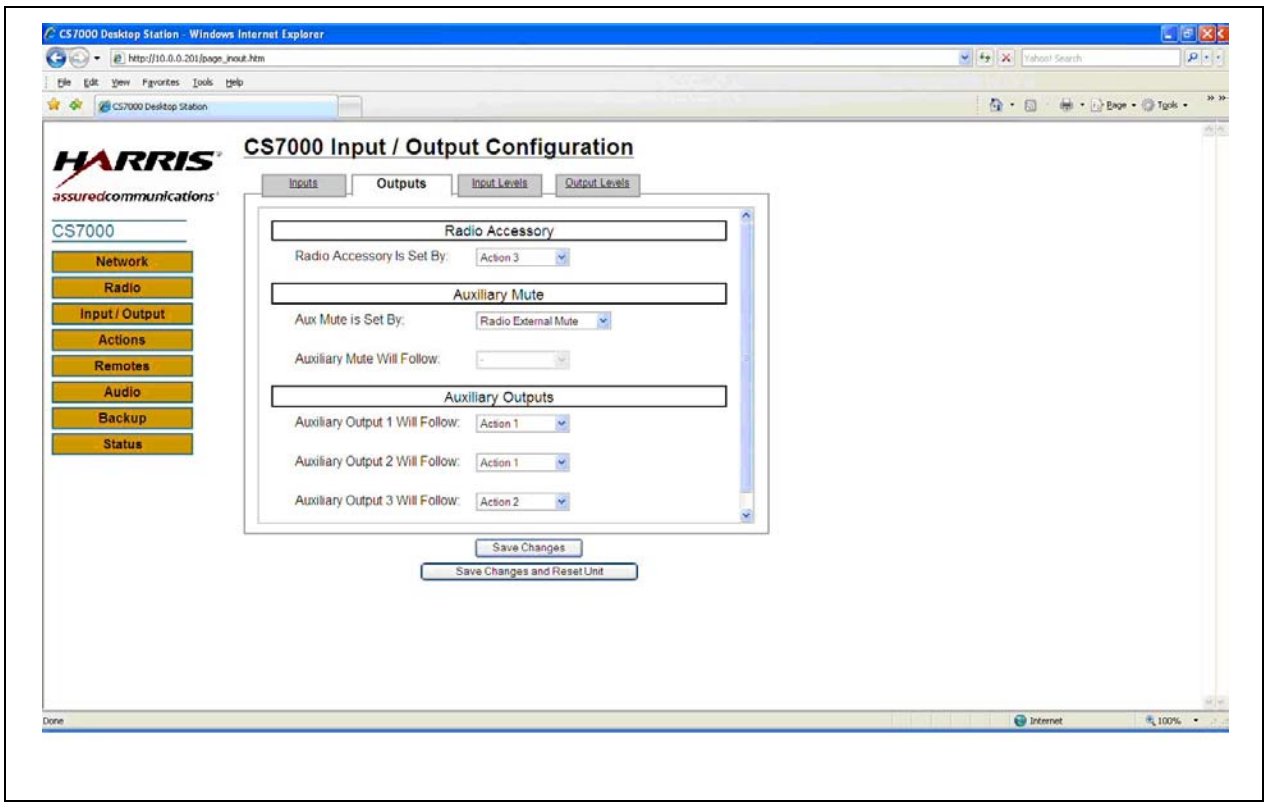


Figure 8-15: CS7000 Input/Output Configuration Web Page—Outputs Tab (Example)

8.10.3.1 Radio Accessory

Radio Accessory Is Set By

Radio Accessory maps to INP2 on the J3 radio Connector (Pin 9). Radio Accessory can be assigned a CS7000 Control Station Action. The Action is selectable from a pull-down list. The default setting is disabled.

8.10.3.2 Auxiliary Mute

Aux Mute Is Set By

Aux Mute maps to Auxiliary Mute on the P3 CS7000 Control Station's External I/O Connector (Pin 22). Using Aux Mute Is Set By parameter, the Aux Mute can be mapped to:

- – (None): The CS7000 Control Station will not modify the Auxiliary Mute Line. This is the default setting.
- Radio External Mute: The Auxiliary Mute line's active state follows the active state of the radio's External Mute output (radio connector J3 pin 11.) The Auxiliary Mute line essentially follows the Remote Control (Plus) Board's COR Indicator input.

- Control Station Speaker Mute: The Auxiliary Mute line's active state follows the active state of the CS7000 Control Station's Mute control. This causes Auxiliary Mute to be active when the CS7000 Control Station's Mute control is active. The CS7000 Control Station's speaker may be unmated while the radio is muted. An example of this is a Remote Control initiated transmission.
- An Action: The Auxiliary Mute line will follow an Action assigned by the Auxiliary Mute Will Follow pull-down list.

Aux Mute Will Follow

The Aux Mute Will Follow setting is grayed out and inactive until the Aux Mute Is Set By pull-down list is set to "Action". When Aux Mute is set by an Action, the Aux Mute Will Follow pull-down list defines the Action that the Aux Mute line will follow. When the assigned Action is Active, Aux Mute will be Active. When the assigned Action is Inactive, Aux Mute will be Inactive.

8.10.3.3 Auxiliary Outputs

Aux Output (n) Will Follow

The Aux Output (n) Will Follow settings each define which Action that an Aux Output line will follow. When the assigned Action is Active, the Aux Output line will be Active. When the assigned Action is Inactive, the Aux Output line will be Inactive. The default setting is disabled.

8.10.4 Input Levels Tab

The CS7000 Input/Output Configuration web page's Inputs Levels tab is shown in Figure 8-16.

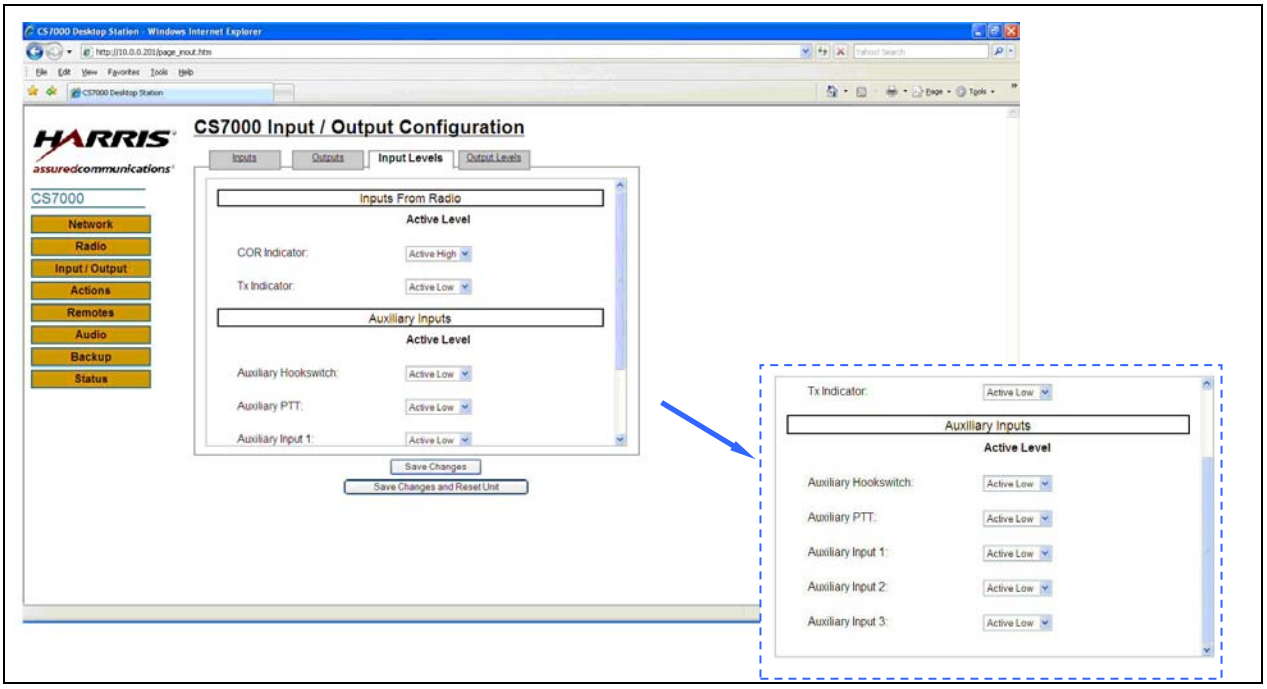


Figure 8-16: CS7000 Input/Output Configuration Web Page—Inputs Levels Tab (Example)

The Input Levels tab defines the polarity of CS7000 Control Station's digital inputs. When set to "Active High", the input's state will be Active when the voltage at the input is high. When set to "Active Low", the input's state will be Active when the voltage at the input is ground. The default setting is Active Low.

The CS7000 Control Station's Front Panel Desk Mic PTT input and the Desk Mic Monitor Switch input polarity is Active Low and is not configurable.

8.10.5 Output Levels Tab

The CS7000 Input/Output Configuration web page's Output Levels tab is shown in Figure 8-17.

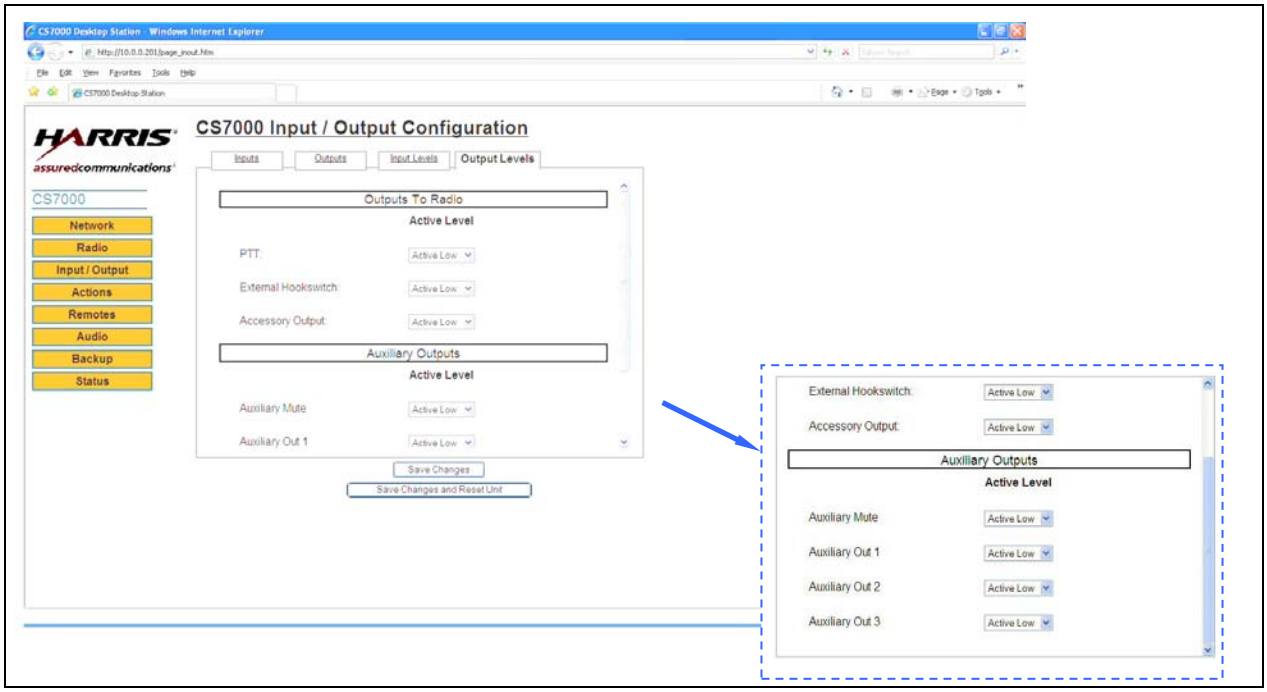


Figure 8-17: CS7000 Input/Output Configuration Web Page—Outputs Levels Tab (Example)

The Output Levels tab defines the polarity of CS7000 Control Station's digital outputs. When set to "Active High", the output's state will be floating or at a high voltage when the defining Action is Active. When set to "Active Low" the output's state will be ground when the defining Action is Active. The default setting is Active Low.

8.10.6 Auxiliary I/O Example

Configure radio Input INP2 to follow the CS7000 Control Station's DB25 External I/O Connector Auxiliary Input 3 input:

1. On the CS7000 Input / Output Web Page Inputs Tab, configure *Auxiliary In 3 Sets* to "Action 3". Action 3 will now follow the active state of Auxiliary Input 3.
2. On the CS7000 Input / Output Web Page Outputs Tab, configure *Radio Accessory Is Set By* to "Action 3". The CS7000 Control Station's Radio Accessory output connects to the radio's INP2 input. The CS7000 Control Station's Radio Accessory output's state will not follow Action 3's state.
3. On the CS7000 Input / Output Web Page Input Levels Tab, configure *Auxiliary Input 3* to "Active Low". When Auxiliary Input 3 is high, Action 3 will be inactive. When Auxiliary Input 3 is low, Action 3 will be active.
4. On the CS7000 Input / Output Web Page Input Levels Tab, configure *Radio Accessory* to "Active Low". When Action 3 is inactive (from Auxiliary Input 3 being high), the CS7000 Control Station's Radio Accessory Output (and hence, the radio's INP2 input) is high. When Action 3 is active (from

Auxiliary Input 3 being low), the CS7000 Control Station's Radio Accessory Output (and hence, the radio's INP2 input) is low.

8.11 ACTION CONFIGURATION WEB PAGE

The Action Configuration web page is used to assign radio button functions to an "Action." An "Action" is a CS7000 Control Station function that does a specific task. An Action can be assigned a state by a hardware digital input, a remote controller button press, or by the radio. An Action can define the state of a hardware digital output, a remote controller function, or a radio key press and release.

The page is used to configure radio button functions to an Action. The result of this analogous to a user pressing and releasing a CH-721 control head button. The configured Action can then be assigned to CS7000 Control Station inputs and outputs.

Information on the radio button functions functionality is available in the RPM Help functions.

Both a radio button function and a CS7000 Control Station Hardware I/O Input can be assigned to an Action. If Action 1 is configured on the Input / Output Web Page to follow the COR Indicator input, Action 1 will be assigned "-" (disabled) on the web page. It is then possible, though not desirable, to assign a radio function to Action 1.

8.11.1 Remote Controller Button and CH-721 Control Head Button Differences

8.11.1.1 Monitor / Clear (CH-721 CLR Button)

The Monitor / Clear function, is a true momentary button on the CH-721 control head. On the CH-721 control head, the button's function is active while the button is held down and goes inactive when the button is released.

In the CS7000 Control Station's Remote Control System, the Monitor / Clear function is a toggle function. If the function is inactive, a remote controller button press and release will make the function active. If the function is active, a remote controller button press and release will make the function inactive.

One effect of this is that Monitor / Clear functionality where the CLR button is treated as a key press and a key release, such as dropping an EDACS Group Call, requires two distinct button presses of a CS7000 Control Station's Remote Control System Remote Controller button.

On a Conventional Channel, pressing and holding Monitor / Clear active for over about two seconds will permanently toggle the Channel Guard Decode function if the channel is programmed with Receive Channel Guard. When this occurs, a Remote Controller user will have no indication that the channel's Channel Guard function has been changed.

8.11.1.2 Emergency (CH-721 EMGR Button)

On the CH-721 control head, a user typically has to hold the Emergency Button down for an extended period of time to declare an Emergency and must simultaneously press the CLR and Emergency Buttons to clear an Emergency.

Emergency functionality is implemented in two ways in the CS7000 Control Station. First, there can be a momentary Set Emergency button that declares an Emergency and another momentary Clear Emergency button that clears an Emergency.

Secondly, Emergency can be set up on the CS7000 Control Station to be an On/Off toggle function. When there is no active Emergency, pressing the CS7000 Control Station's Remote Controller

Emergency Button will declare an Emergency. When there is an active Emergency, pressing the CS7000 Control Station's Remote Controller Emergency Button will clear the Emergency.

A disadvantage of the second method is that the CS7000 Control Station does not have knowledge of other devices declaring an Emergency. It is possible for the CS7000 Control Station to get out of sync with the radio. Another device clearing an Emergency may leave the CS7000 Control Station still in an active Emergency Stage while the radio is not in an Emergency state. Likewise, a remote controller user may not know the CS7000 Control Station is in an active Emergency state if the emergency was declared by another device.

An Action can be an On / Off Action or a Momentary Action. These are explained in the following sections.

8.11.2 On/Off Actions Tab

The Action Configuration web page's On/Off Actions tab is shown in Figure 8-18.

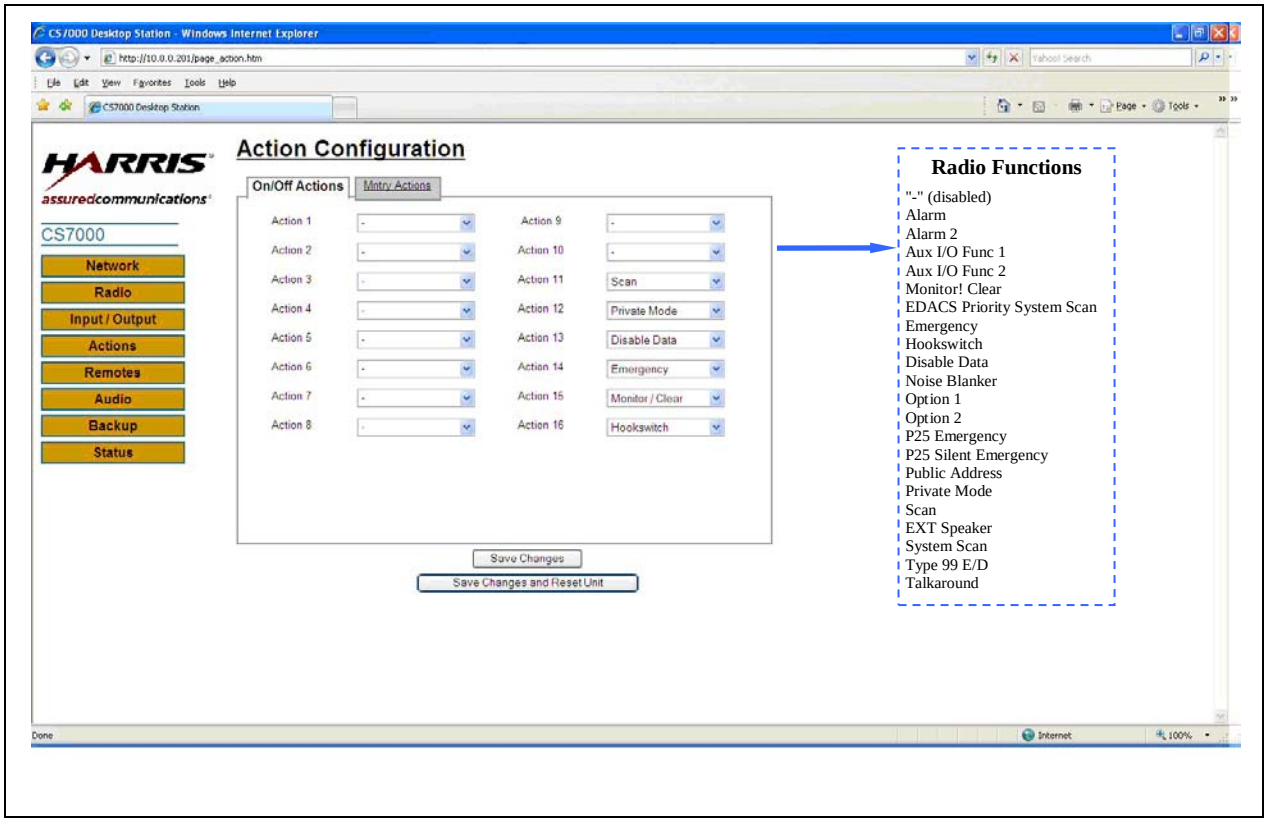


Figure 8-18: Action Configuration Web Page—On/Off Actions Tab (Example)

An On/Off Action controls a toggle function that is made active by one event and made inactive by another event. An example of an On/Off Action is Scan, where one key press and release turns Scan on and another key press and release is then necessary to turn Scan off. On/Off Actions can be configured for the radio functions side-listed in Figure 8-18.

8.11.3 Momentary Actions Tab

The Action Configuration web page's Momentary Actions tab is shown in Figure 8-19.

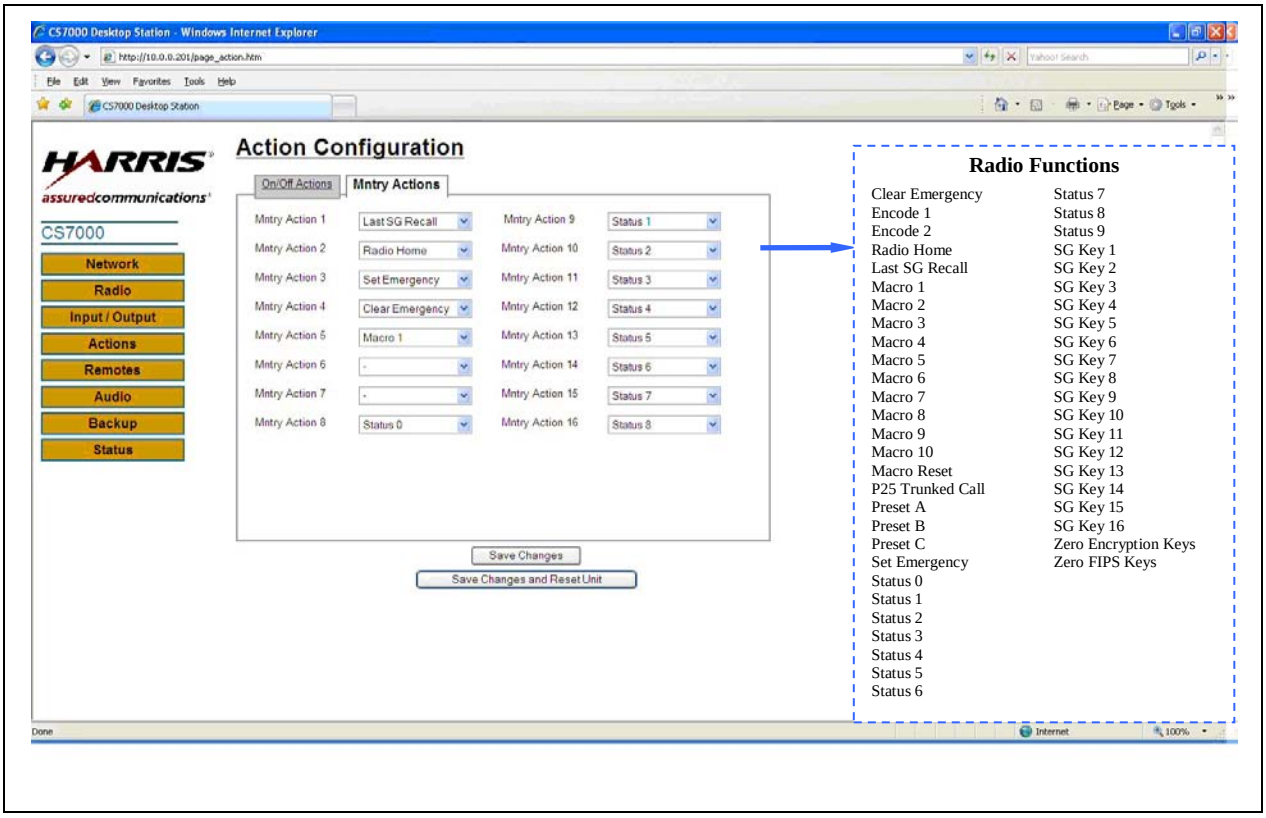


Figure 8-19: Action Configuration Web Page— Momentary Actions Tab (Example)

A Momentary Action does something once. An example is the Last SG function. A key press and release causes the radio to change its Selected System and Group to the last selected SG Key mapped system and group. Momentary Actions can be configured for the radio functions side-listed in Figure 8-19.

8.11.4 Using the ECP Radio's Macro Key Functions to Extend Remote Control (Plus) Board Action Functionality

Currently, a CS7000 Control Station Action generates an ECP radio key press and key release radio action. However, there are useful radio functions that do not follow this pattern.

An example involves the radio's Emergency Button. In a mobile radio environment, it is desired to depress the Emergency Button for a programmed period of time before the radio considers the function active. If the radio sees a button release before this timer expires, the function is considered inactive and the radio does not declare an emergency. See Figure 8-20.

An ECP radio's MACRO Key Functions can be used to implement the above functionality that is not readily available with a Control Station Action. In this case, the CS7000 Control Station key press and key release can be used to initiate a MACRO function then provides the necessary delay between the Emergency button press and release.

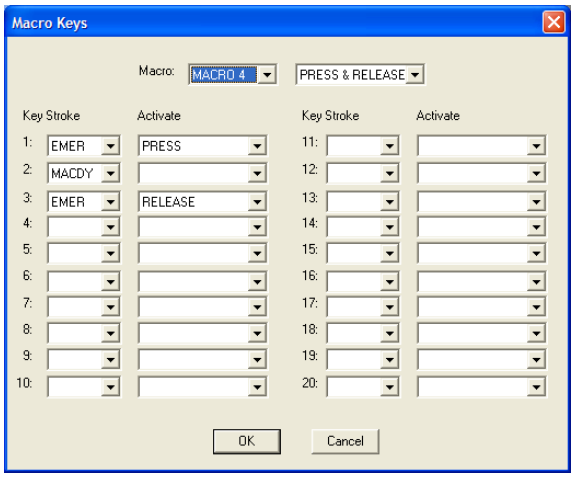


Figure 8-20: RPM's Macro Keys Dialog Box (Example)

8.12 REMOTE CONFIGURATION WEB PAGE: BASIC TRC SETTINGS

The Remote Configuration web page is used to configure the Remote Control (Plus) Board's remote control parameters. This web page consists of several different tabulated sub-pages for selecting TRC vs. VoIP remote control, telephone line audio mode parameters, TRC function tone parameters, TRC remote update parameters, and telephone line audio level adjustments.

8.12.1 Tone/VoIP Tab

The Remote Configuration web page's Tone/VoIP tab is shown in Figure 8-21.

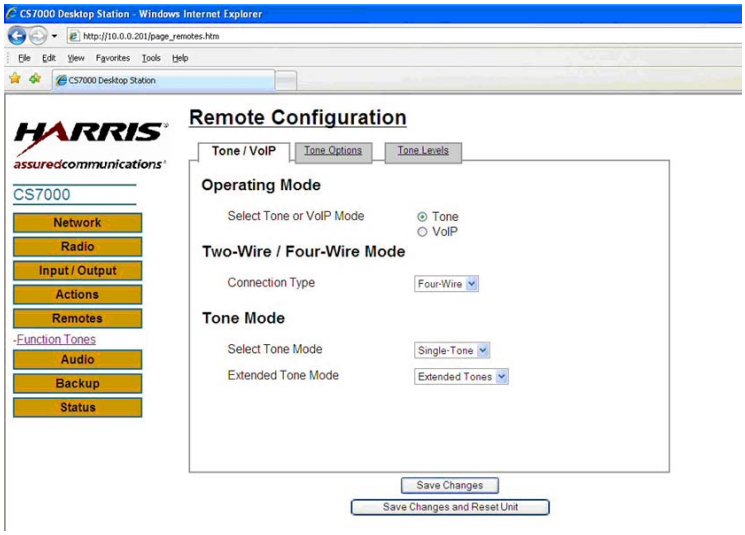


Figure 8-21: Remote Configuration Web Page—Tone/VoIP Tab (Example)

8.12.1.1 Operating Mode

Select Tone or VoIP Mode

The Select Tone or VoIP Mode radio buttons select the Remote Control System to configure. When "Tone" is selected, the configuration pages for Tone Remote Control Operation become available. When "VoIP" is selected, the configuration pages for VoIP Remote Control Operation become available.

The Select Tone or VoIP Mode radio buttons also define the Remote Control (Plus) Board's current Remote Control System. Only one of the two Remote Control Systems can be active. When "Tone" is checked, the Remote Control (Plus) Board's Tone Remote Control Operation will become available and the Remote Control (Plus) Board's VoIP Remote Control Operation will not be available. When "VoIP" is checked, the Remote Control (Plus) Board's VoIP Remote Control Operation will become available and the Remote Control (Plus) Board's Tone Remote Control Operation will not be available.

8.12.1.2 Two-Wire / Four-Wire Mode

Connection Type

The Connection Type pull-down list defines the Tone Remote Control Telephone Line Audio Interface. Settings are:

- Two Wire
- Four Wire: This is the default setting.

When Two-Wire is selected, the Remote Control (Plus) Board's Tone Remote Control Line Out is connected to RJ-11 Telephone Line Connector J11's inner pair (pins 3 and 4) and the Remote Control (Plus) Board's Tone Remote Control Line In is also connected to RJ-11 Telephone Line Connector J11's inner pair (pins 3 and 4). The Line Out Line Driver is only enabled when the Remote Control (Plus) Board is sending audio to the Tone Remote Controllers. The Audio Matrix's "Audio From The Tone Remotes" Audio Input to the "Audio To The Tone Remotes" Audio Output path is disabled to prevent a positive feedback loop.

When Four Wire is selected, the Remote Control (Plus) Board's Tone Remote Control Line Out is connected to RJ-11 Telephone Line Connector J11's inner pair (pins 3 and 4) and the Remote Control (Plus) Board's Tone Remote Control Line In is connected to RJ-11 Telephone Line Connector J11's middle pair (pins 2 and 5). The Line Out Line Driver is always enabled. The Audio Matrix's "Audio From The Tone Remotes" Audio Input to the "Audio To The Tone Remotes" Audio Output path is enabled by default to support Tone Remote To Tone Remote Intercom Audio.

8.12.1.3 Tone Mode

The Tone Mode selections control Tone Remote Control Function Tone options. These selections define the Function Tones that are available for mapping to Remote Control (Plus) Board Actions in the "Function Tone" screens.

Select Tone Mode

The Select Tone Mode pull-down list defines the maximum number of Function Tones that are allowed in a Tone Remote Control function. The options are:

- Single Tone: This is the default setting.
- Dual Tone

When set to Single Tone, the Remote Control (Plus) Board will only attempt to decode one Function Tone after receiving a Guard Tone. The Function Tone To Remote Control (Plus) Board Action Mapping

Configuration screens will only allow configuring a Remote Control (Plus) Board Action to one Function Tone.

When set to Dual Tone, the Remote Control (Plus) Board will attempt to decode two Function Tones after receiving a Guard Tone. The Function Tone To Remote Control (Plus) Board Action Mapping Configuration screens will only allow configuring a Remote Control (Plus) Board Action to two Function Tones.

Extended Tone Mode

The Extended Tone Mode configures the number of available Function Tone Frequencies. Settings are:

- Standard Tones
- Extended Tones: This is the default setting.

When set to "Standard Tones", only the eleven traditional Tone Remote Control Function Tone frequencies from 1050 Hz through 2050 Hz inclusive (in 100 Hz steps) are decoded.

When set to "Extended Tones", an additional five Function Tone Frequencies from 550 Hz to 950 Hz inclusive (in 100 Hz steps) are allowed.

Remote Control (Plus) Board Actions can only be mapped to valid Function Tone frequencies. If the Extended Tone Mode parameter is set to "Standard Tones", a Remote Control (Plus) Board Action can not be mapped to a sub 1050 Hz Function Tone.

8.12.2 Tone Options Tab

The Remote Configuration web page's Tone Options tab is shown in Figure 8-22.

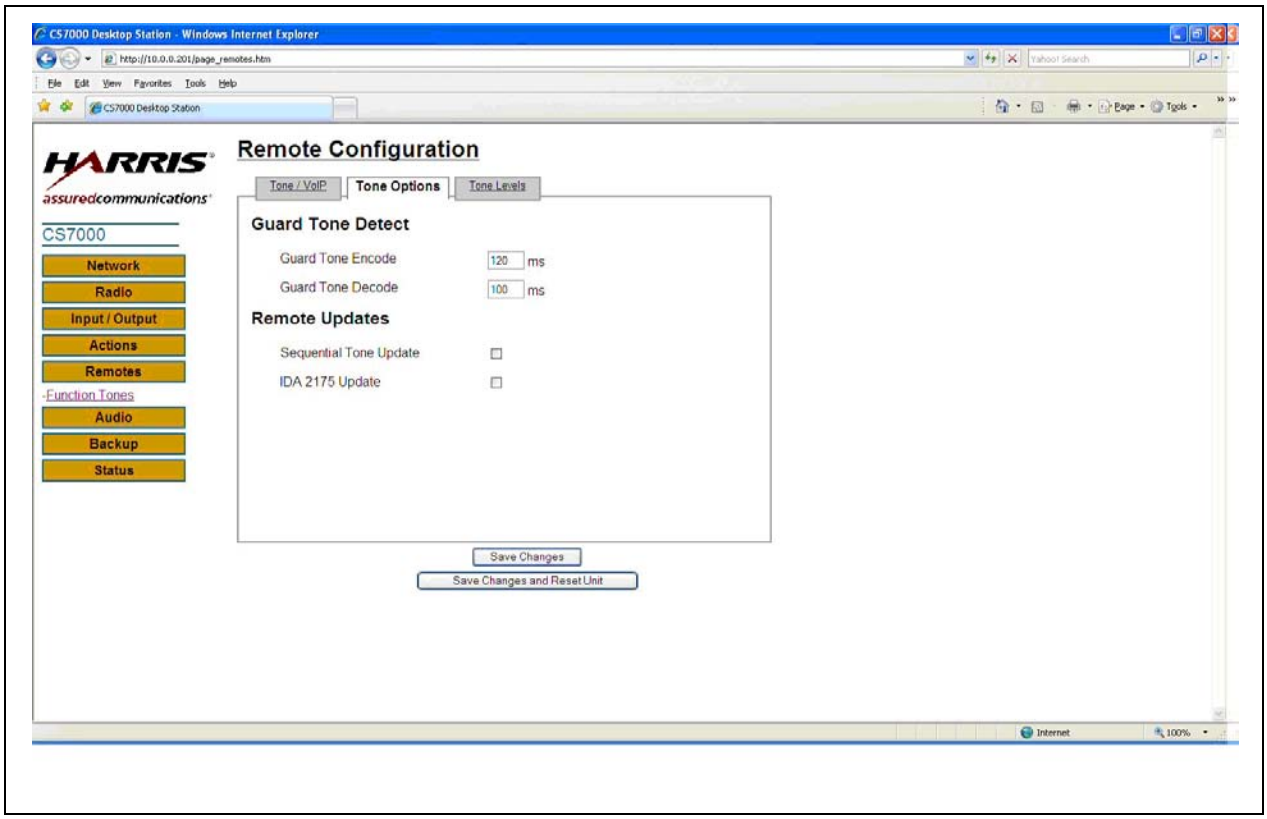


Figure 8-22: Remote Configuration Web Page—Tone Options Tab (Example)

8.12.2.1 Guard Tone Detect

Guard Tone, also called "Secur-it Tone", is the high-level (10 dB above Voice Level) period of 2175 Hz tone that initiates a Tone Remote Control sequence. The Remote Control (Plus) Board allows timing to be configured on both encode and decode.

Guard Tone Encode

The Guard Tone Encode parameter is the time in milliseconds that the Remote Control (Plus) Board will encode high-level 2175 Hz Guard Tone during a Remote Control (Plus) Board originated Tone Remote Control sequence. The default period is 125 milliseconds.

Guard Tone Decode

The Guard Tone Decode parameter is the time in milliseconds that the Remote Control (Plus) Board will require high-level 2175 Hz Guard Tone to be present during a Tone Remote Controller originated Tone Remote Control sequence before the Remote Control (Plus) Board considers the Guard Tone valid. The default period is 100 milliseconds.

8.12.2.2 Remote Updates

The Remote Control (Plus) Board supports two methods of providing status information from the CS7000 Control Station to the Tone Remote Control Remote Controllers. Each method is selected by a checkbox. When neither checkbox is checked, there is no Tone Remote Control Remote Updating.

The default setting is No Tone Remote Control Remote Updating. Both checkboxes will default to unchecked.

Sequential Tone Update

The first method, Sequential Tone Update, basically repeats any incoming Tone Remote Control sequence. The Remote Control (Plus) Board also generates a Tone Remote Control Sequence when an Action mapped to a Tone Remote Control Function Tone changes.

When the Sequential Tone Update checkbox is checked, this method of Tone Remote Control updates is enabled.

IDA 2175 Update

The second method, IDA 2175 Update, sends a on/off 2175 Hz Tone to send a one/zero serial word to the Tone Remote Controllers.

When the IDA 2175 Update checkbox is checked, this method of Tone Remote Control updates is enabled.

8.12.3 Tone Levels Tab

The Remote Configuration web page's Tone Levels tab is shown in Figure 8-23.

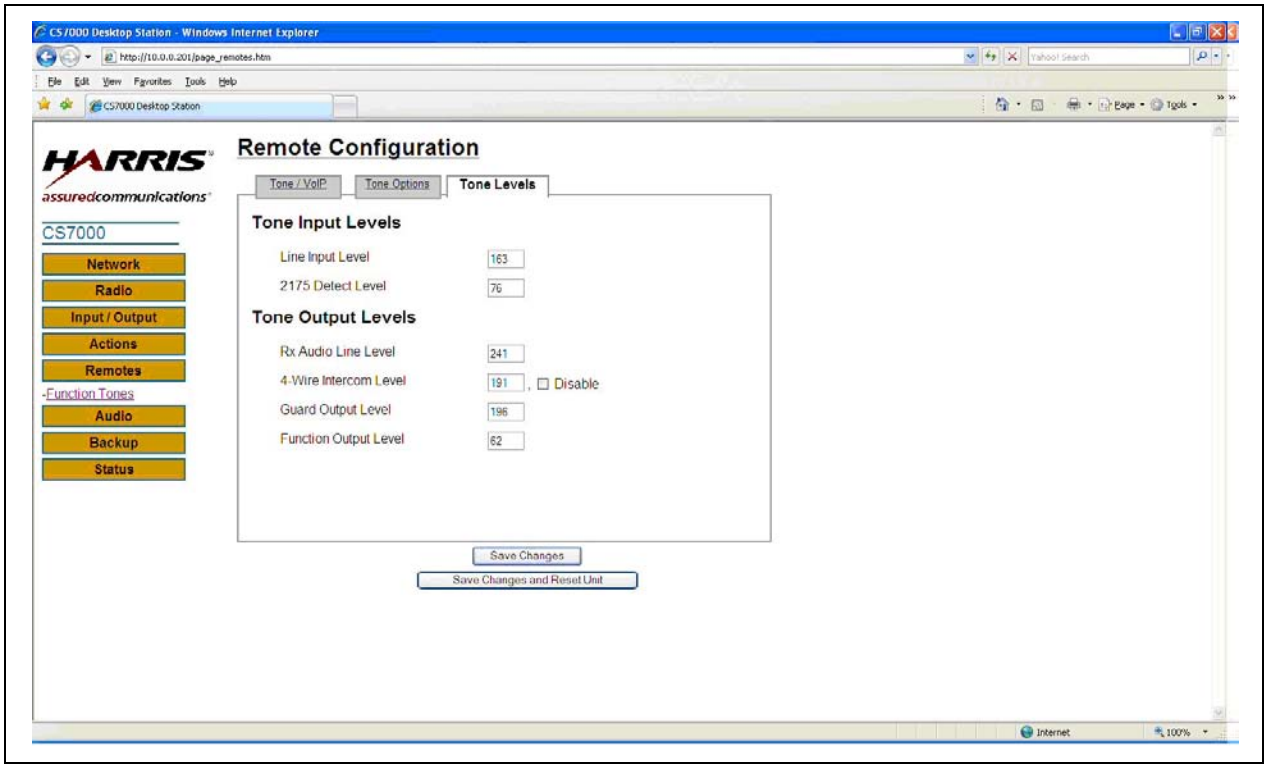


Figure 8-23: Remote Configuration Web Page—Tone Levels Tab (Example)

The Tone Levels tab is used to adjust the gain in the Tone Remote Control Line In and Line Out paths. The gain control ranges from 1 through 254. Higher gain values result in higher levels.

8.12.3.1 Tone Input Levels

Line Input Level

The Line Input Level Gain Control adjusts the gain of Line In Op Amp U43A. The output of Line In Op Amp U43A basically feeds the incoming side of the Tone Remote Control System. This can include the Compressor Circuitry, the Receive 2175 Hz Notch Filter before the Audio Matrix Input, the Hardware 2175 Hz Tone Detector, and the MX 803 Tone Remote Control Audio Processor Circuitry.

Line In Op Amp U43A is meant to compensate for telephone line losses that result in a less than 0 dBm Voice Level at the CS7000's J11 RJ-11 Telephone Line Connector.

The Line Input Level Gain Control should be adjusted for 300 mV rms at 1000 Hz at TP93.

2175 Detect Level

The Hardware 2175 Detect Level Gain Control adjusts the gain of Op Amp U48A, an input buffer into the Hardware 2175 Hz Tone Detector circuitry. The Hardware 2175 Detect Level Gain Control should be adjusted for reliable decoding of the Tone Remote Control Guard and Keying Tones.

Hardware 2175 Hz Tone Detector Op Amp U48A is in series with Line In Op Amp U43A. The gain adjustment of U43A then directly affects the gain adjustment of U48A. The Hardware 2175 Detect Level Gain Control should be set after the Line Input Level Gain Control gain is set.

The 2175 Detect Level Gain Control should be adjusted for reliable transmit operation when there is voice audio on the line.

8.12.3.2 Tone Output Levels

The Telephone Line's Line Out path includes Audio Summing Op Amp U42A. Three (3) sources feed U42A: The Rx Audio Source to the Tone Remote Controllers from the Audio Matrix (through the Transmit 2175 Hz Notch Filter), the Line In to Line Out Four Wire Audio Intercom Loopback path, and the output of the MX-803 Tone Remote Control Audio Processor Circuitry.

Guard Output Level

The 2175 Guard Tone Level Gain Control adjusts the audio level out of the MX-803 Tone Remote Control Audio Processor when the MX-803 is encoding Guard Tone or Hold (Keying) Tone.

The 2175 Hz Hold Tone Level is fixed at three percent (- 30dB) of the Guard Tone level.

The 2175 Detect Level Gain Control should be adjusted for desired Guard Tone Output Level at the J11 RJ-11 Connector. The maximum supported Line Out Level is +11 dBm into 600 Ohms.

Rx Audio Line Level

The Rx Audio Line Level Gain Control adjusts the Line Out level from the Tone Remote Control Audio Matrix Output.

The Rx Audio Line Level Gain Control should be adjusted for the desired Voice Audio Line Out Level at the J11 RJ-11 Telephone Line Connector. This is typically thirty three percent (-10 dB) of the Guard Tone Level.

4-Wire Intercom Level

The 4-Wire Intercom Level Gain Control adjusts the Line Out level from the Four Wire Audio Intercom Loopback path. This path connects Line In audio to Line Out.

The Four Wire Audio Intercom Loopback path is affected by the Line Input Level Gain Control on Line In Op Amp U43A. The 4-Wire Intercom Level Gain Control should be set after the Line Input Level Gain Control gain is set.

The 4-Wire Intercom Level Gain Control should be adjusted for the desired Voice Audio Line Out Level at the J11 RJ-11 Telephone Line Connector with nominal Voice Audio Line In level incoming audio.

The Four Wire Audio Intercom Loopback path can be enabled or disabled by the Disable checkbox adjacent to the Four Wire Intercom Level control. When checked, the Four Wire Audio Intercom Loopback path is enabled and Line In audio will be played on Line Out. When unchecked, the Four Wire Audio Intercom Loopback path is disabled and Line In audio will not be played on Line Out. The Four Wire Audio Intercom Level control is not accessible when the Disable checkbox is checked.

The desired Four Wire Audio Intercom Loopback Disable setting is dependent upon the application. In a hardwired Tone Remote Control application, it is desirable for paralleled remote controllers to hear the active tone remote controller's audio, not to mention its Tone Control Sequences. In this situation, the checkbox should be unchecked.

In an Interoperability application, the CS7000 Control Station will typically be connecting a RF radio channel (or trunked system and group) to switch or multiplexer (mux) equipment. In this application, it is usually desired to keep the Four Wire Audio Interface's LINE IN and LINE OUT audio isolated. This is especially the case where there may be a noticeable delay through the switch or mux equipment. This delay could appear as an undesirable echo to users at the destination end of the switch or mux equipment. In this situation, the checkbox should be checked.

Line In can be connected to Line Out in the Audio Matrix. However, the Line In input to the Audio Matrix is after the 2175 Hz Notch Filter. Consequently, the Audio Matrix will not properly repeat an incoming Tone Remote Control Tone Sequence. If it is desired for paralleled Tone Remote Controllers to hear and act upon Tone Remote Control Tone Sequences, then the 4 Wire Intercom path must be enabled.

Function Output Level

The Function Output Level Gain Control adjusts the Line Out level from the MX-803 Tone Remote Control Audio Processor when the MX-803 is encoding Function Tone.

The Function Output Level should be adjusted for thirty three percent (-10 dB) of the Guard Tone level.

8.13 REMOTE CONFIGURATION WEB PAGE: TRC FUNCTION TONE CONFIGURATIONS

The Function Tone web page is opened by clicking the link underneath the Remotes button. The web page has two tabs. One tab (Set Tone Function) configures function tones that the Remote Control (Plus) Board will decode and assigns Remote Control (Plus) Board Actions to those function tones. The second tab (Enabled Tone Functions) displays a table of already configured function tones.

8.13.1 Available Function Tone Frequencies

Available Function Tone Frequencies depends on the setting of the Remotes web page's Tone / VoIP Tab's Extended Tone Mode setting. If "Standard" Tone Frequencies are selected, there are eleven Function Tone Frequencies. If "Extended" Tone Frequencies are selected, there are sixteen Function Tone Frequencies. The available Function Tone Frequencies are:

2050 Hz	1950 Hz	1850 Hz	1750 Hz
1650 Hz	1550 Hz	1450 Hz	1350 Hz
1250 Hz	1150 Hz	1050 Hz	950 Hz
850 Hz	750 Hz	650 Hz	550 Hz

Function Tone frequencies between 550 Hz and 950 Hz (inclusive) require the Extended Tone Mode setting on the Remotes Web Page's Tone / VoIP Tab set to "Extended Tones". If set to "Standard Tones," these function tones cannot be assigned.

8.13.1.1 Single Function Tone Operation

If the Remotes web page's Tone / VoIP Tab's Select Tone Mode setting is set to "Single Tone", a Tone Remote Control tone sequence's Guard Tone is expected to be followed by a single forty millisecond Function Tone.

Both "Standard" and "Extended" Function Tone Frequencies are available depending on the setting of the Remotes Web Page's Tone / VoIP Tab's Extended Tone Mode setting.

8.13.1.2 Dual Function Tone Operation

If the Remotes web page Tone / VoIP Tab's Select Tone Mode setting is set to "Dual Tone", a Tone Remote Control tone sequence's Guard Tone is expected to be followed by one or two 40-millisecond Function Tones.

"No Second Function Tone" is a valid second Function Tone frequency.

The first and second function tones can be the same frequency.

The Web Page is set up to allow up to 150 distinct Function Tone combination functions Note this is well in excess of the number of possible assignable Actions and SG keys. Any valid Function Tone frequency can be used in these functions, depending upon the setting of the Remotes Web Page's Tone / VoIP Tab's Extended Tone Mode setting.

If a Function Tone combination's frequencies are duplicated, the resultant Action is the last enabled Action for that Function Tone frequency combination.

8.13.1.3 Single Function Tone Operation in When Configured for Dual Function Tones

The Function Tone of a non-transmit single Function Tone Tone Control Sequence will be interpreted as the first Function Tone. The quiet line during the second function tone period will be interpreted as the "No Second Function Tone" function tone frequency.

However, Keying Tone within the second Function Tone period is not interpreted as "No Second Function Tone". Consequently, a transmit single Function Tone Tone Control Sequence will be treated as invalid and will not initiate a transmission.

8.13.2 Set Tone Function Tab

The Remote Configuration web page's Set Tone Function tab is shown in Figure 8-24.

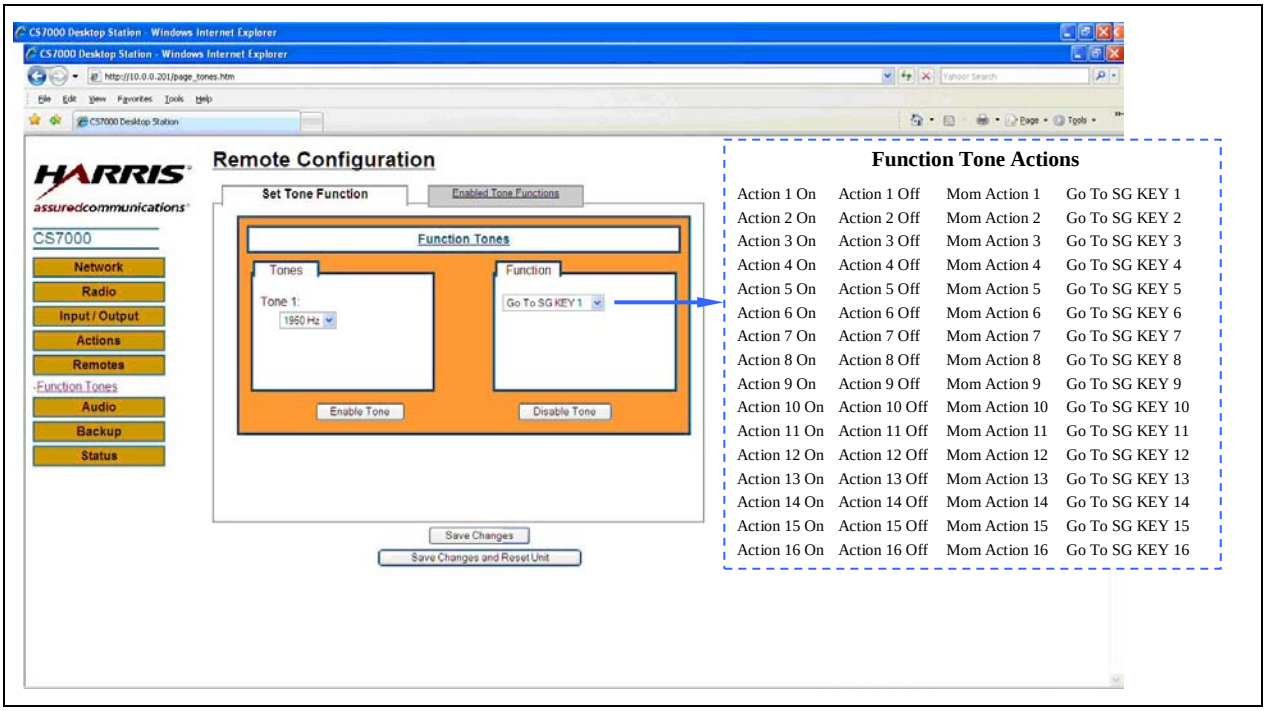


Figure 8-24: Remote Configuration Web Page—Set Tone Function Tab (Example)

8.13.2.1 Function Tones

The Set Tone Function tab is used to assign a Tone Remote Control Function Tone (or Tones) to a Remote Control (Plus) Board Action. The procedure to do so is:

1. Define the desired Function Tone Frequency. Begin by assigning the "Tone 1" frequency in the Tones box on the left side of the page.

- Tone 2 will normally be grayed out and not accessible.
- If the Select Tone Mode setting on the Remotes Web Page's Tone / VoIP Tab is set to "Dual Tone", the Tone 2 setting will become available after the Tone 1 Function Tone frequency is assigned. A second Function Tone frequency must then be assigned. It is acceptable to assign Tone 2 to the same Function Tone frequency as Tone 1.
- If the Select Tone Mode setting on the Remotes Web Page's Tone / VoIP Tab is set to "Single Tone", the Tone 2 box will always be inaccessible.
- The choice of Function Tone frequencies will be controlled by the Extended Tone Mode setting on the Remotes Web Page's Tone / VoIP Tab.

2. Assign the Remote Control (Plus) Board Action for the desired Function Tone (or Tones) in the Function box on the right side of the screen. The options are:
   - Disabled (-) (Default)
   - On / Off Action On
   - On / Off Action Off
   - Momentary Action
   - SG Keys

   A Remote Control (Plus) Board On / Off Action requires one Function Tone frequency to turn the Action "On" and another, different, Function Tone frequency to turn the Action Off. Momentary Actions and SG Keys use one Function Tone frequency.
3. After the Function Tone frequency (ies) and the Remote Control (Plus) Board Action have been assigned, click the "Enable Tone" button. The Remote Control (Plus) Board will now initiate the Function Tone's assigned Action when a Tone Control Sequence containing the assigned Function Tone (s) is decoded.
4. Clicking the "Disabled Tone" Button with a Function Tone frequency defined in the left hand Tones box will clear all entries in the Set Tone Function Tab. Further, an already assigned Function Tone Frequency to Remote Control (Plus) Board Action for that Function Tone Frequency will also be removed when the "Disabled Tone" Button is clicked.

If an Action has been assigned a function on the Actions Web Page, then the assigned function for that action will be displayed in the list of mappable Actions. For example, if the Hookswitch function was assigned to Action 13, then the Action 13 entry in the list of mappable Actions will display "Hookswitch". If Action 13 is not currently assigned, the Action 13 entry in the list of map able Actions will display "Action 13".

The CS7000 Control Station's Hookswitch Action's On/Off active state is opposite to the physical state of the Remote Controller's Hookswitch. If it is desired for the Hookswitch Action to be active when the Tone Remote Controller's hand set is physically "Off Hook", then the Off Hook Function Tone must be set to "Hookswitch On" and the On Hook Function Tone must be set to "Hookswitch Off".

For example, if a remote controller generates a 2050 Hz Function Tone when its handset physically comes off hook, then the CS7000 Control Station's 2050 Hz Function Tone should be configured to "Hookswitch On". Likewise, if a remote controller generates a 550 Hz Function Tone when its handset physically goes back on hook, then the CS7000 Control Station's 550 Hz Function Tone should be configured to "Hookswitch Off".

8.13.3 Enabled Tone Functions Tab

The Remote Configuration web page's Enabled Tone Functions tab is shown in Figure 8-25.

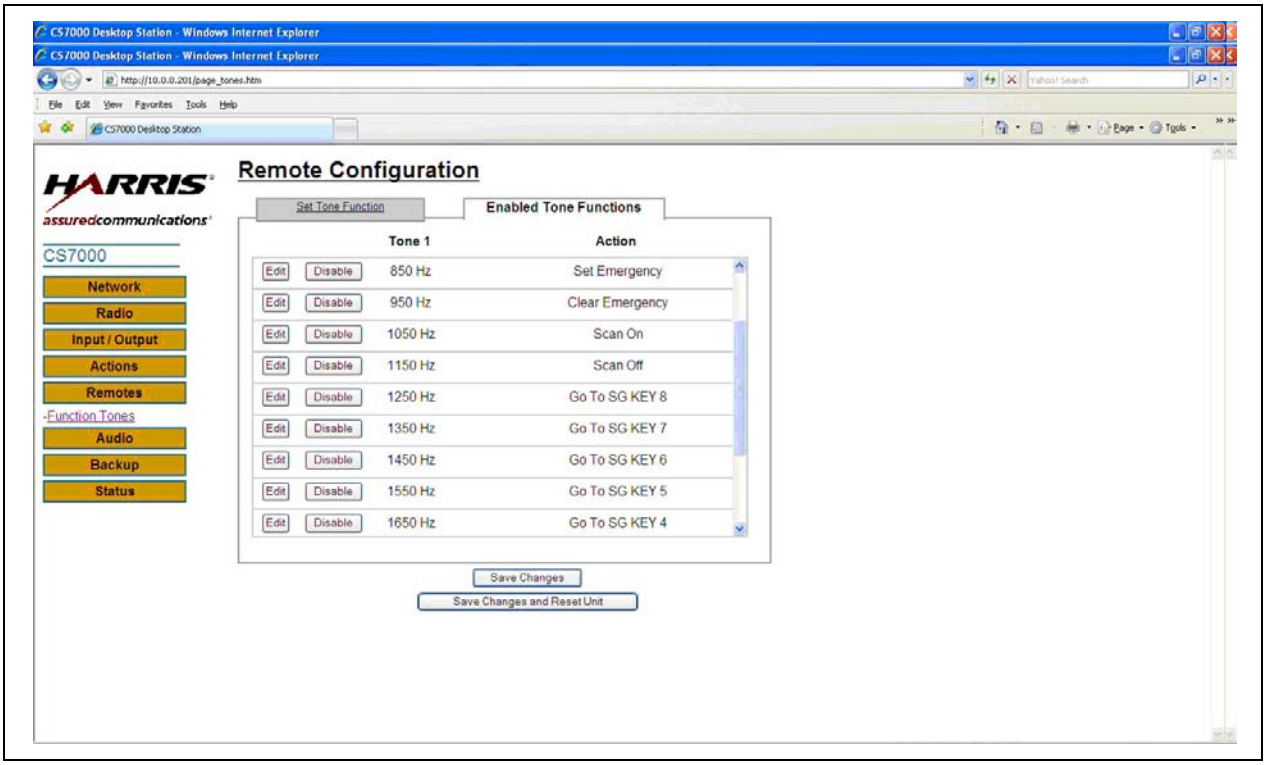


Figure 8-25: Remote Configuration Web Page—Enabled Tone Functions Tab (Example)

The Enabled Tone Functions tab displays a table of currently assigned Function Tone Frequency to Remote Control (Plus) Board Action assignments. The tab also provides provisions for modifying an entry. These are described as follows:

8.13.3.1 Edit Button

Clicking the Edit button will open the Set Tone Function Tab with the table entry's information entered into the proper Set Tone Function Tab's fields.

8.13.3.2 Disable Button

Clicking the Disable button removes the table entry from the Remote Control (Plus) Board's list of Function Tone Frequency to Remote Control (Plus) Board Action assignments.

8.13.3.3 Action Menu Item

Clicking an entry's Action menu item allows reassignment of a Remote Control (Plus) Board Action to the table entry's Function Tone Frequency.

8.14 REMOTE CONFIGURATION WEB PAGE: VOIP REMOTE CONTROL SETTINGS

The Remote Configuration web page is used to configure the CS7000 Control Station's VoIP Remote Control System parameters. Sub-pages allow configuration of network parameters, audio parameters, and the CS7000 Control Station's I/O parameters.

Most of a VoIP Remote Controller's personality is stored within the CS7000 Control Station. This includes keypad information, audio information, and Alert Tone information. The personality is transferred to the VoIP Remote Controller when the VoIP Remote Controller first connects with a CS7000 Control Station.

8.14.1 Tone/VoIP Tab

The Remote Configuration web page's Tone/VoIP tab is shown in Figure 8-26.

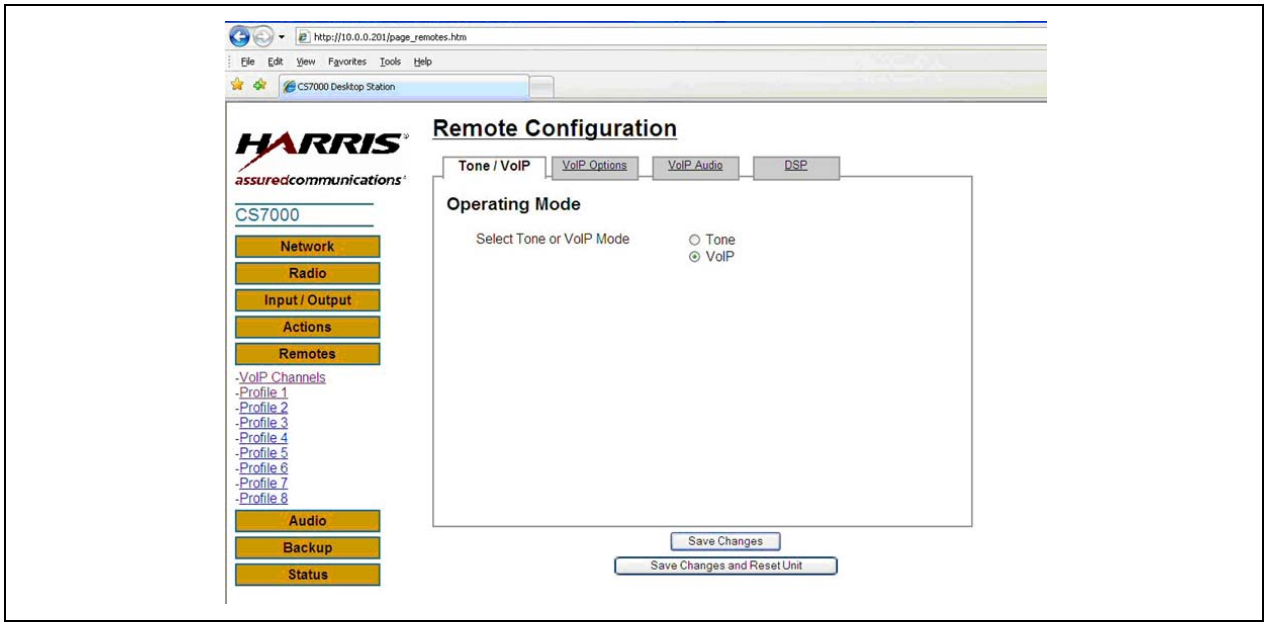


Figure 8-26: Remote Configuration Web Page—Tone/VoIP Tab (Example)

8.14.1.1 Operating Mode

Select Tone or VoIP Mode

The Select Tone or VoIP Mode radio buttons define the Remote Control System to configure. When "Tone" is checked, the configuration screens for Tone Remote Control Operation will become available. When "VoIP" is checked, the configuration screens for VoIP Remote Control Operation will become available.

The Select Tone or VoIP Mode radio buttons also define the CS7000 Control Station's current Remote Control System. Only one of the two Remote Control Systems can be active. When "Tone" is checked, the Remote Control (Plus) Board's Tone Remote Control Operation will become available and the Remote Control (Plus) Board's VoIP Remote Control Operation will not be available. When "VoIP" is checked, the Remote Control (Plus) Board's VoIP Remote Control Operation will become available and the Remote Control (Plus) Board's Tone Remote Control Operation will not be available.

Selecting the VoIP Option creates a "VoIP Channels" link and "Profile" links underneath the VoIP Button on the left side of the web page.

8.14.2 VoIP Options Tab

The Remote Configuration web page's VoIP Options tab is shown in Figure 8-27.

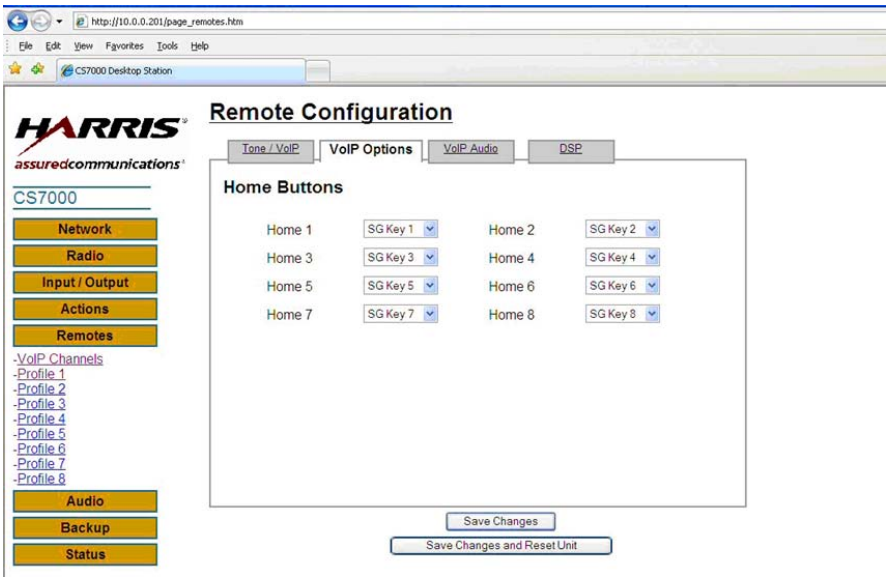


Figure 8-27: Remote Configuration Web Page—VoIP Options Tab (Example)

8.14.2.1 Home Buttons

Home 1 through Home 8

The Home 1 through Home 8 buttons can be mapped to one of the sixteen SG System / Group functions. The Home 1 through Home 8 buttons can then be mapped to one of the buttons on the VoIP Remote Controller's keypad. This will allow one key selection of a specific SG System / Group. The default mapping for all eight buttons is SG1.

8.14.3 VoIP Audio Tab

The Remote Configuration web page's VoIP Audio tab is shown in Figure 8-28.

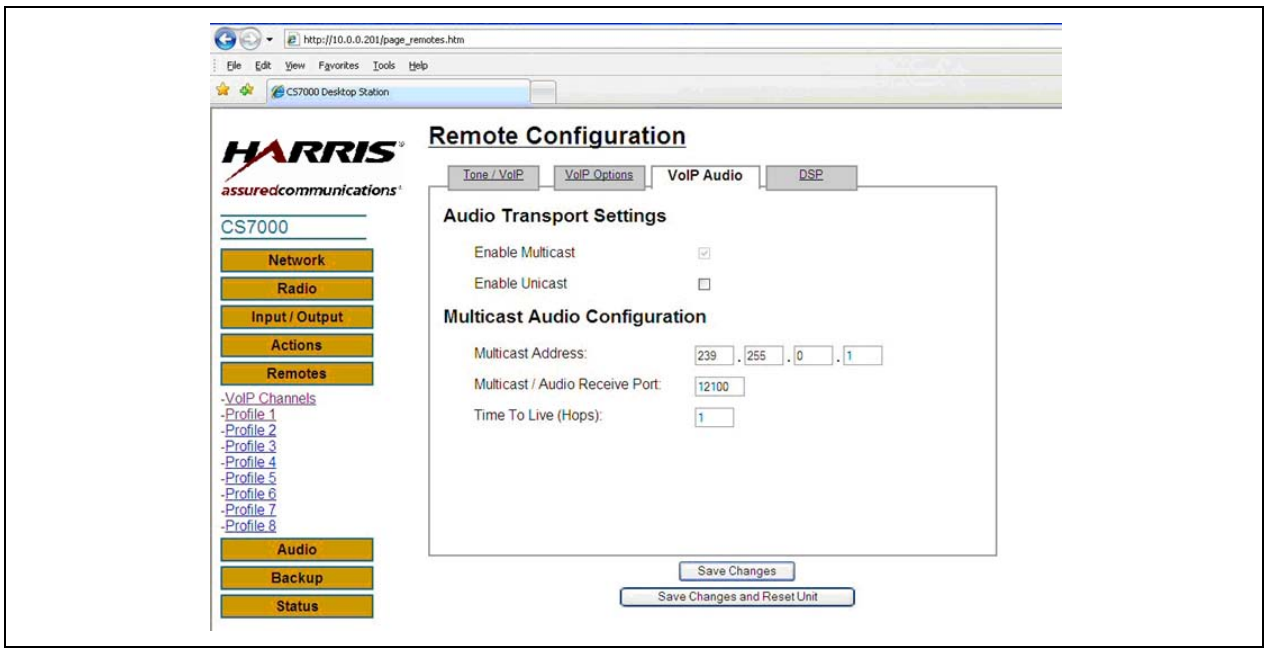


Figure 8-28: Remote Configuration Web Page—VoIP Audio Tab (Example)

8.14.3.1 Audio Transport Settings

Multicast and Unicast

The CS7000 Control Station supports two methods of audio distribution on an IP-based network. The first method is multicast, which is the preferred method of audio distribution. The second is unicast.

Multicast is an extension to UDP/IP. When enabled, the VoIP Remote Controllers and CS7000 Control Station broadcast data packets that have multiple recipients. This is an ideal model for radio communications when multiple people need to monitor the audio. Since any enabled VoIP Remote Controllers can receive the multicast packets, all VoIP Remote Controllers that are monitoring the audio can receive and decode the packets for playback.

In addition to simplifying monitoring of audio traffic by multiple VoIP Remote Controllers, multicast also greatly cuts the bandwidth requirement on the network. Instead of having to regenerate the received audio into a unicast UDP/IP data stream to each individual VoIP Remote Controllers, which would use additional bandwidth multiplied by the number of monitoring VoIP Remote Controllers, a single data stream is generated and monitored by all VoIP Remote Controllers.

Multicast allows audio distribution over a large network while minimizing the consumed bandwidth. On a multicast enabled network, a multicast sender sends a single multicast packet to the multicast address and the routers forward that packet (with replication as needed) to all multicast receivers. This is the least bandwidth intensive form of media distribution possible. However, multicast is newer technology and individual network support may be questionable.

The unicast option is a combination of multicast and unicast. When unicast is enabled, unicast is used send audio to all VoIP Remote Controllers that are operating in unicast mode. However, multicast is still used for audio distribution to the local network. For each VoIP Remote Controller that is operating in unicast mode, a unique packet must be sent directly to the VoIP Remote Controller. Thus, each additional

VoIP Remote Controller will require one packet's worth of additional bandwidth. To minimize bandwidth, a feature has been added to the VoIP Remote Controllers that will allow a single unicast transmission per remote LAN to that VoIP Remote Controller. That VoIP Remote Controllers will then send multicast packets to other VoIP Remote Controllers on its local network.

The multicast and unicast parameters are controlled by a pull-down list with enable and disable selections. By default, multicast is enabled and the unicast is disabled. Currently, multicast cannot be disabled.

8.14.3.2 Multicast Audio Configuration

Multicast Address

The Multicast Address parameter is a specific type of reserved IP address and must be of the correct scope and type for the desired distribution method. It is recommended that the factory default multicast IP address not be changed. This address is 239.255.0.1.

Multicast packets are defined to be all packets with a destination address of between 224.0.0.0 and 239.255.255.255. Some are commonly used for Internet broadcast audio and are not necessarily available. When a 24-66 VoIP and Control Station opens a UDP/IP port within this address range, it will also join the group. By joining the group, a packet is sent out to all addresses saying that it is interested in seeing the traffic on this particular multicast address. Routers that receive this broadcast message to join a particular multicast address will then pass packets through because the router is now aware that a listener is interested in this traffic.

The routers utilized in the network must support this. The protocol used to alert routers to parties who are interested in certain multicast address traffic is IGMP or Internet Group Management Protocol.

The multicast IP address is specified by entering the desired decimal numbers between 0 and 255 in each of the four multicast IP address text boxes.

Multicast/Audio Receive Port

The Multicast/Audio Receive Port parameter sets the port used to pass all multicast audio between the CS7000 Control Station and the VoIP Remote Controllers in Multicast mode. This port must be opened bi-directionally in any firewall or routers that exist between the CS7000 Control Station and the VoIP Remote Controllers. The port is defined by entering a decimal number between 0 and 65534 in the Multicast/Audio Receive Port text box. The default setting is 12100.

Time To Live (Hops)

The Time To Live (Hops) parameter sets the timeout period for multicast packets. Due to the nature of multicast distribution, it is possible to send packets to a network that has no active multicast receivers to remove the packet from the network. Time To Live ensures that multicast packets will eventually be removed from the network by allowing the packets to expire after a certain number of "hops," whose number is hopefully in excess of any VoIP Remote Controllers interested in receiving the audio packets.

The Time To Live (Hops) parameter is defined by entering a decimal number in the Time To Live (Hops) Text Box. The default setting is "1". It may be necessary to raise this setting for large networks.

8.14.4 Unicast Network Identification

Unicast Network Parameter Configuration web pages become visible when the Enable Unicast option is enabled and are invisible when the Enable Unicast option is disabled.

8.14.4.1 Unicast IP Address

The Unicast IP Address parameter sets the IP address that the CS7000 Control Station will use to send and receive VoIP audio packets from/to a VoIP Remote Controller.

The Unicast IP Address is specified by entering the desired decimal numbers between 0 and 255 in each of the four Multicast IP Address text boxes. The default value is the CS7000 Control Station's IP address.

8.14.4.2 Unicast Port

The Unicast Port parameter sets the port used to pass all unicast audio between the CS7000 Control Station and the VoIP Remote Controllers that are in unicast mode. This port must be opened bi-directionally in any firewall or routers that exist between the station and the IDA 24-66 VoIP Remote Controllers.

The Unicast Port is defined by entering a decimal number between 0 and 65534 in the Unicast Port text box. The default setting is 12101.

8.14.4.3 Time To Live (Hops)

Time To Live (Hops) parameter sets the timeout period for unicast packets. Due to the nature of unicast distribution, it is possible to send packets to a network that has no active unicast receivers to remove the packet from the network. Time To Live ensures that these packets will eventually be removed from the network by allowing the packets to expires after a certain number of "hops", whose number is hopefully in excess of any VoIP Remote Controllers interested in receiving the packets.

The Time To Live (Hops) parameter is defined by entering a decimal number in the Time To Live (Hops) text box. The default setting is 1. It may be necessary to raise this setting for large networks.

8.14.5 DSP Tab

The Remote Configuration web page's DSP tab is shown in Figure 8-28.

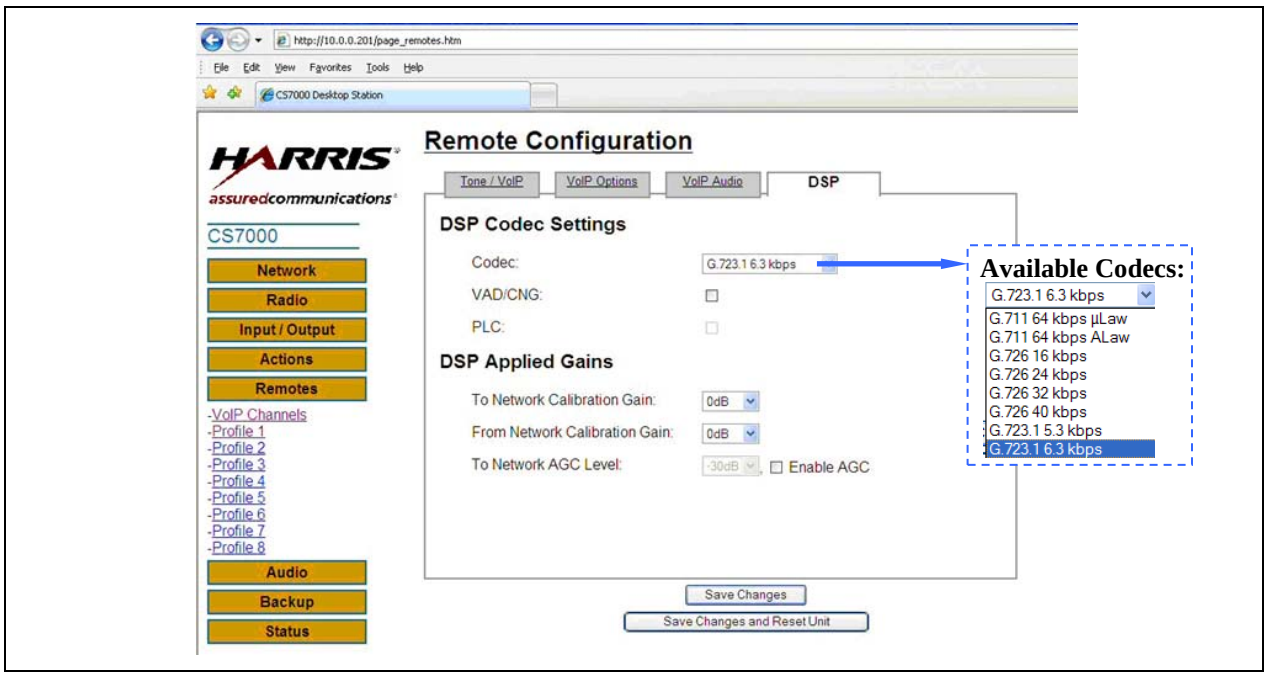


Figure 8-29: Remote Configuration Web Page—DSP Tab (Example)

8.14.5.1 DSP Codec Settings

Codec

The Codec parameter sets the voice-coder (vocoder) method used by the DSP to process audio. A wide range of codecs are available for selection via the respective pull-down list. Available codecs are indicated in the side-list shown in Figure 8-29. These codecs provide a wide range of vocoder quality. G.723 6.3 kbps is the default setting for the Codec parameter. Codecs with a higher kbps rating will consume more bandwidth than those with a lower.

Usage of the G.723.1 6.3 kbps codec is recommended. This codec provides excellent reproduction of voice with minimal usage of bandwidth.

VAD/CNG

The VAD/CNG parameter is an additional DSP codec option designed for additional audio control. Use of this option is not recommended. The parameter is enabled and disabled via a checkbox. The default option is disabled (not checked).

PLC

The PLC parameter is a DSP processing option. As of the publication of this manual, enabling PLC will not benefit CS7000 Control Station operation. The parameter is enabled and disabled via a checkbox. The default option is disabled (not checked).

8.14.5.2 DSP Applied Gains

To Network Calibration Gain

The To Network Calibration Gain parameter sets a DSP applied gain (in dB). This gain increases the level of the audio passed to the link. Applying gain at this point can result in audio degradation at high levels, but allows much finer gain control than the radio Rx Audio Output Gain control.

This parameter's setting is controlled by a pull-down list containing "Default" and values from +10 dB to -48 dB in 2 dB increments. The default setting is 0 dB.

From Network Calibration Gain

The From Network Calibration Gain parameter sets a DSP applied gain (in dB). This gain increases the level of the audio received from the link. Applying gain at this point can result in audio degradation at high levels, but allows much finer gain control than the radio Tx Audio Output Gain control.

The parameter's setting is controlled by a pull-down list containing "Default" and values from +10 dB to -48 dB in 2 dB increments. The default setting is 0 dB.

To Network AGC Level and Enable AGC

If enabled via the Enable AGC checkbox, the To Network AGC Level parameter sets an Automatic Gain Control (AGC) level for digitized audio being passed to the network. This AGC is a DSP-applied normalization that ensures the volume of all audio passed to the network is equal volume. Overly weak or strong signals will exceed the DSP normalization abilities and will result in distortion, clipping, and feedback.

The To Network AGC Level parameter is controlled by the Enable AGC checkbox next to it. The default setting is disabled (unchecked).

To Network AGC Level is the level to which all audio from the DSP to the network will be normalized. This option will attenuate or amplify all signals as needed to ensure that all output audio is of approximately the same volume before it is passed to the network.

The To Network AGC Level parameter is controlled by a pull-down list containing "Default" and values from 0 dB to -30 dB. The default setting is 0 dB.

8.15 VOIP CHANNELS WEB PAGE

The VoIP Channels web page is shown in Figure 8-30. This page is accessible when the operating mode is set to VoIP via the respective parameter in the Remote Configuration web page's Tone/VoIP tab.

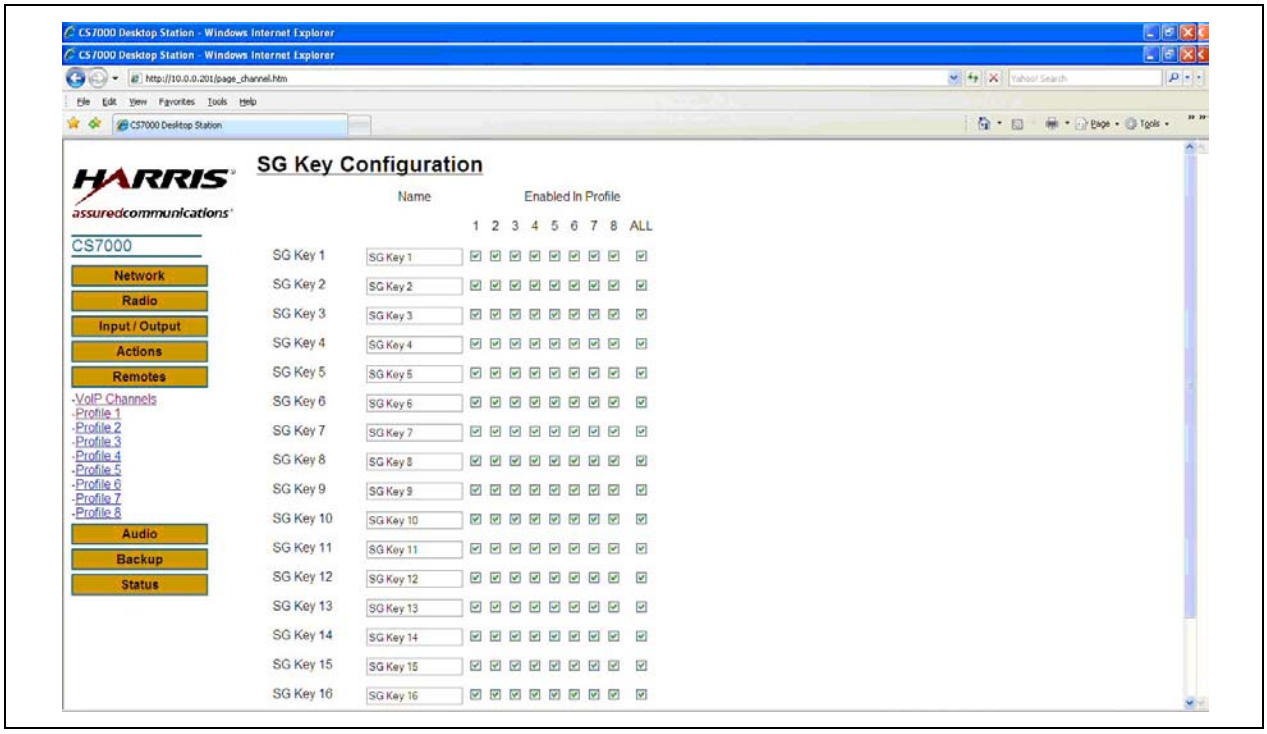


Figure 8-30: VoIP Channels Web Page—SG Key Configuration (Example)

8.15.1 SG Key Configuration

8.15.1.1 Name

Text entered into an SG Key's Name text box is the text that will be written to the top line of the respective VoIP Remote Controller's display when the CS7000's selected system and group is the SG Key's assigned system and group.

An SG Key Name can use any alphanumeric characters, and it can be up to sixteen (16) characters in length. The text box functions with the Windows clipboard.

8.15.1.2 Enabled In Profile

An Enabled In Profile checkbox defines whether or not a channel is available for use in the respective VoIP Remote Controller Profile. If the checkbox is not checked within a VoIP Remote Controller's Profile, the VoIP Remote Controller will not have access to CS7000 Control Station's radio when the CS7000 Control Station's Selected System and Group is the SG Key System and Group. The VoIP Remote Controller's top line display will show "Disabled" when the CS7000 Control Station's Selected System and Group is the unchecked SG Key System and Group.

Checking the All checkbox enables that SG Key in all eight (8) Profiles.

8.16 PROFILE WEB PAGES: VOIP REMOTE CONTROLLER

A "Profile" defines the configuration for a VoIP Remote Controller. A VoIP Remote Controller's Profile is stored in the CS7000 Control Station and it transfers to the VoIP Remote Controller when the VoIP Remote Controller connects to the CS7000 Control Station.

A Profile defines a VoIP Remote Controller's accessible SG Key Systems and Groups, the VoIP Remote Controller's keypad, VoIP Remote Controller-generated Alert Tones, and the VoIP Remote Controller's I/O functionality.

The CS7000 Control Station supports up to eight individual Profiles. One of the few configuration parameters stored locally on a VoIP Remote Controller is the Profile used when it connects to the CS7000 Control Station.

8.16.1 Buttons Tab

A Profile web page Buttons tab is shown in Figure 8-31.

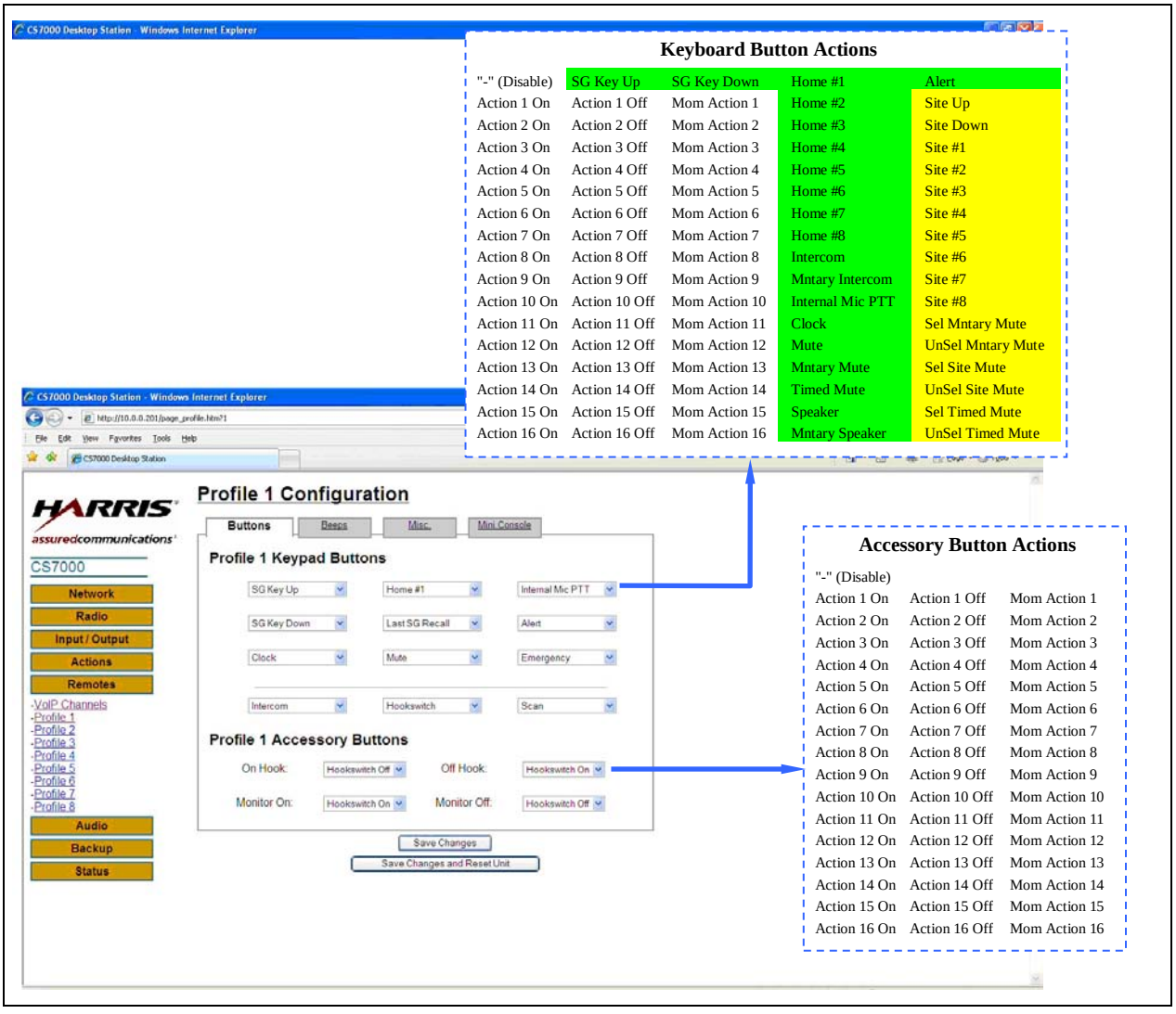


Figure 8-31: Profile Web Page—Buttons Tab (Example)

8.16.1.1 Profile (n) Keypad Buttons

A VoIP Remote Controller can be configured to any of the CS7000 Control Station's Actions. A VoIP Remote Controller's keypad button is configured by assigning a pull-down list to the desired VoIP Remote Controller keypad button.

If an Action has been assigned a function on the Actions Web Page, then the assigned function for that Action will be displayed on the keypad button's list of mappable Actions. For example, if the Hookswitch function is assigned to Action 13, then the Action 13 entry in the keypad button's list of Actions will display "Hookswitch". If Action 13 is not currently assigned, the Action 13 entry in the keypad button's list of Actions will display "Action 13."

A VoIP Remote Controller keypad button can be assigned an Action that is assigned to a hardware input function. When this is done, the VoIP Remote Controller keypad button's LED will be on when the Action is Active and off if the Action is inactive. For example, it an Action assigned to a VoIP Remote Controller keypad button follows the radio's Tx Indicator output, the keypad button's LED will be on when the radio is transmitting on a Voice Channel and off when the radio is not transmitting on a Voice Channel. This button is not disabled and when pressed, will toggle the active state of the Action.

Likewise, a VoIP Remote Controller keypad button can be assigned to an Action that is assigned to a hardware output. In this case, the VoIP Remote Controller keypad button will toggle the active state of the Action's assigned hardware output. For example, this allows a VoIP Remote Controller keypad button to control External I/O Connector Auxiliary Output 1.

In addition to the Remote Control (Plus) Board Actions, a VoIP Remote Controller's keypad button can be configured to a VoIP Remote Controller specific Action. Buttons unique to the VoIP Controllers are shaded in green in the above Keyboard Button Actions table. Buttons unique to the IDA VoIP Mini Console are shaded in yellow in the above Keyboard Button Actions table.

VoIP Remote Controller Specific Buttons

Alert

Alert generates a PTT request and once access is granted outputs a tone to both the radio and the Remotes. The output level of the generated tone can be adjusted in the Remote audio settings.

Clock

The Clock button allows the user to set the internal time of the Remote. Pressing and holding the button will bring up the time set menu and increment the displayed time. Once the time is correct, simply release the button to set the time.

Home #1, Home #2, ... , Home #8

Home provides similar functionality to a radio's Home Channel button. Using the Home button, the radio can be set to the button's programmed SG Key System and Group with a single button press.

Intercom

Intercom is an On/Off button that will enable Intercom mode in place of standard PTT. When a PTT occurs with Intercom active, the audio is still sent to all active Remotes, but the radio is not placed into transmit mode. Thus, the audio will not be sent over the air. Intercom allows communication between the Remotes without occupying the currently selected frequency. Leaving the Intercom button active will prevent communication with the tower as the Remote will be unable to transmit.

Internal Mic PTT

Internal Mic PTT performs a PTT with the Remote's internal mic as its audio source. Unlike the other VoIP Remote Controller buttons, the Internal PTT Action will remain active as long as the button is held.

Mntary Intercom

Mntary Intercom will enable Intercom for a single PTT. To do this, the Mntary Intercom button is pressed and held. The user then PTTs and the Remote will enter Intercom instead of performing a standard PTT. Once the PTT has gained transmit access (success tone), the Mntary Intercom button can be released and the Intercom mode will remain active for the entire transmission. However, as soon as the transmission ends, the Remote will exit Intercom mode. If the user wishes to use the Intercom again, all listed steps will have to be repeated.

Mntary Mute

Mntary Mute will attenuate the audio sent to the internal speaker by the amount indicated in the Remote audio settings as long as the button is held. As soon as the button is released, the audio settings will be restored to their levels.

If the "MAX" setting is used, the speaker will be turned off rather than attenuated.

Mntary Speaker

Mntary Speaker will enable the internal speaker while the handset is off hook. When the handset is returned to the cradle, Mntary Speaker will turn off.

Mute

Mute is an On/Off button that will attenuate the audio sent to the internal speaker by the amount indicated in the Remote audio settings. If the "MAX" setting is used, the speaker will be turned off rather than attenuated.

No Function

When no valid selection exists, "No Function" is displayed. If this selection is used in a profile, the result will be a non-functional button. This is the default setting for the VoIP Remote Controller buttons.

SG Key Down

SG Key Down will decrement to the next available radio SG Key System and Group (with wraparound). If the button is held, the available SG Key System and Group will begin scrolling. Releasing the button will select the currently displayed SG Key System and Group. If no other SG Key System and Groups besides the current SG Key System and Group are defined, the currently selected SG Key System and Group will not be changed.

SG Key Up

SG Key Up will increment to the next available SG Key System and Group (with wraparound). If the button is held, the available SG Key System and Groups will begin scrolling. Releasing the button will select the currently displayed SG Key System and Group. If no other SG Key System and Group besides the current SG Key System and Group are defined, the currently selected SG Key System and Group will not be changed.

Speaker

Speaker enables the internal speaker while the handset is off hook. This is an On/Off operation and will remain active until the button is pressed again.

Timed Mute

Timed Mute will attenuate the audio sent to the internal speaker by the amount indicated in the Remote audio settings for the time period indicated in the miscellaneous section of the panel profile. Once the time has expired, the audio will be restored to prior levels. If the "MAX" setting is used for the mute attenuation level, the speaker will be turned off rather than attenuated.

IDA VoIP Mini Console Buttons

Sel Mntary Mute

Sel Mntary Mute will apply the level of attenuation set in the Mini Console's mute setting to the audio received from the currently selected site for as long as the button is held. (If mute setting is MAX, the audio is ignored.) Once the button is released, the audio will be restored to prior levels. (If mute is MAX, the highest priority audio will be selected for output.)

Sel Site Mute

Sel Site Mute is an On/Off button that will apply the level of attenuation set in the Mini Console's mute setting to all audio from the currently selected site. (If mute setting is MAX, the selected audio will be disabled.) Pressing the button again will restore the audio to previous levels. (If mute setting is MAX, the highest priority audio will be selected for output.) If the selected site changes while Sel Site Mute is active, the mute will adjust so that the selected audio remains muted and the unselected audio remains unmuted.

Sel Timed Mute

Sel Timed Mute is a timed button that will apply the level of attenuation set in the Mini Console's mute setting to all audio from the currently selected site for the time set in the currently loaded profile. (If mute setting is MAX, the selected audio will be disabled.) Pressing the button again will reset the timer to its intial value and restart the countdown. Once the timer expires, the audio will be restored to its previous levels. (If mute setting is MAX, the highest priority audio will be selected for output.) If the selected site changes while Sel Timed Mute is active, the mute will adjust so that the selected audio remains muted and the unselected audio remains unmuted.

Site #1, Site #2, ... , Site #8

Direct Site Buttons allow user-defined control and access of the enabled sites. Three modes are available. The modes are as follows.

Direct Connect:

Direct Connect mode will immediately set the associated site to active. The LED associated with this site button will be turned on (non-flashing) to indicate that this site is the active site. Any active mutes will be updated.

Mute:

When using Mute mode, a single button press will apply the attenuation level set in the Mini Console's audio settings to all audio received from this site. (If mute setting is MAX, the audio will be disabled.) The LED associated with this button will flash with the mute pattern to indicate that this site is muted. To restore audio from this site, simply press the site button again. This will set the associated site to active and remove any site specific mutes. The LED associated with this site button will be turned on (non-flashing) to indicate that

this site is the active site. All other active mutes will be updated.

Timed Mute:

When using Timed Mute mode, a single button press will apply the attenuation level set in the Mini Console's audio setting to all audio received from this site and set a countdown timer using the user defined time. (If mute setting is MAX, the audio will be disabled.) The LED associated with this button will begin to flash with the mute pattern to indicate that this site is muted. If the button is not pressed again and the timer expires, the audio will be restored to prior levels. However, if the site button is pressed again while the timer is active, the associated site will be set to active, the associated LED turned on (non-flashing), the timer disabled, and the audio restored to prior levels. Any other active mutes will be updated as well.

The remaining operation of the site buttons is independent of the selected operating mode. This operation indicates which site's audio is currently being heard by flashing the LED of the site whose audio is currently being outputted. The LED is flashed using the active audio pattern. The active audio pattern is different from the mute pattern. If the audio that is currently being outputted is from the selected site, the LED will not flash but remain solid.

Site Down

Site Down will decrement to the next available site (with wraparound) and display the currently associated channel (sys/grp) for that site (default is used if no prior selection has been made). If the button is held, the available sites will begin scrolling. Releasing the button will select the currently displayed site. If no other sites besides the current site are defined, the currently selected site will not be changed.

Site Up

Site Up will increment to the next available site (with wraparound) and display the currently associated channel (sys/grp) for that site (default is used if no prior s election has been made). If the button is held, the available sites will begin scrolling. Releasing the button will select the currently displayed site. If no other sites besides the current site are defined, the currently selected site will not be changed.

UnSel Mntary Mute

Unsel Mntary Mute will apply the level of attenuation set in the Mini Console's mute setting to all audio from the currently unselected sites for as long as the button is held. (If mute setting is MAX, the audio will be disabled.) Once the button is released, the audio will be restored to prior levels. (If mute setting is MAX, the highest priority audio will be selected for output.)

UnSel Site Mute

Unsel Site Mute is an On/Off button that will apply the level of attenuation set in the Mini Console's mute setting to all audio from currently unselected sites. (If mute setting is MAX, the unselected audio will be disabled.) Pressing the button again will restore all audio to previous levels. (If mute setting is MAX, the highest priority audio will be selected for output.) If the selected site changes while Unsel Site Mute is active, the mute will adjust so that the unselected audio remains muted and the selected audio remains unmuted.

UnSel Timed Mute

Unsel Timed Mute is a timed button that will apply the level of attenuation set in the Mini Console's mute setting to all audio from currently unselected sites for the time set in the currently loaded profile. (If mute setting is MAX, the unselected audio will be disabled.) Pressing the button again will reset the timer to its initial value and restart the countdown. Once the timer expires, the audio will be restored to its previous levels. (If mute setting is MAX, the highest priority audio will be selected for output.) If the selected site changes while Unsel Timed Mute is active, the mute will adjust so that the unselected audio remains muted and the selected audio remains unmuted.

The default settings match the keypad button labels on the VoIP Remote Controller's keypad. Unlabeled buttons default to "Disabled".

8.16.1.2 Profile (n) Accessory Buttons

The On Hook and Off Hook options configure Hookswitch functionality when a VoIP Remote Controller uses a handset. The Monitor On and Monitor Off options configure a microphone's Monitor Switch functionality when the VoIP Remote Controller uses a Desk Microphone.

The Profile (n) Accessory Button's use an Action On and Action Off configuration. Further, an On or Off Action can be assigned to each edge (Off To On and On to Off) of an input. Any of the CS7000 Control Station or VoIP Remote Controller Actions can be configured in one of Profile (n) Accessory Button options. However, the most practical use is the Hookswitch Action.

The CS7000 Control Station's Hookswitch Action's On / Off active state is the opposite to the physical state of the VoIP Remote Controller's Hookswitch. If it is desired for the Hookswitch Action to be active

when the VoIP Remote Controller's handset is physically "Off Hook", then the On Hook function's action must be set to "Hookswitch Off" and the Off Hook action must be set to "Hookswitch On".

The Monitor Function active state, when configured, got the Hookswitch action, is the same as the Hookswitch's active state. As illustrated in Figure 8-31, the Monitor On function should be assigned the "Hookswitch On" action. Likewise, the Monitor Off function should be assigned to the "Hookswitch Off" action.

8.16.2 Beeps Tab

A Profile web page Beeps tab is shown in Figure 8-32.

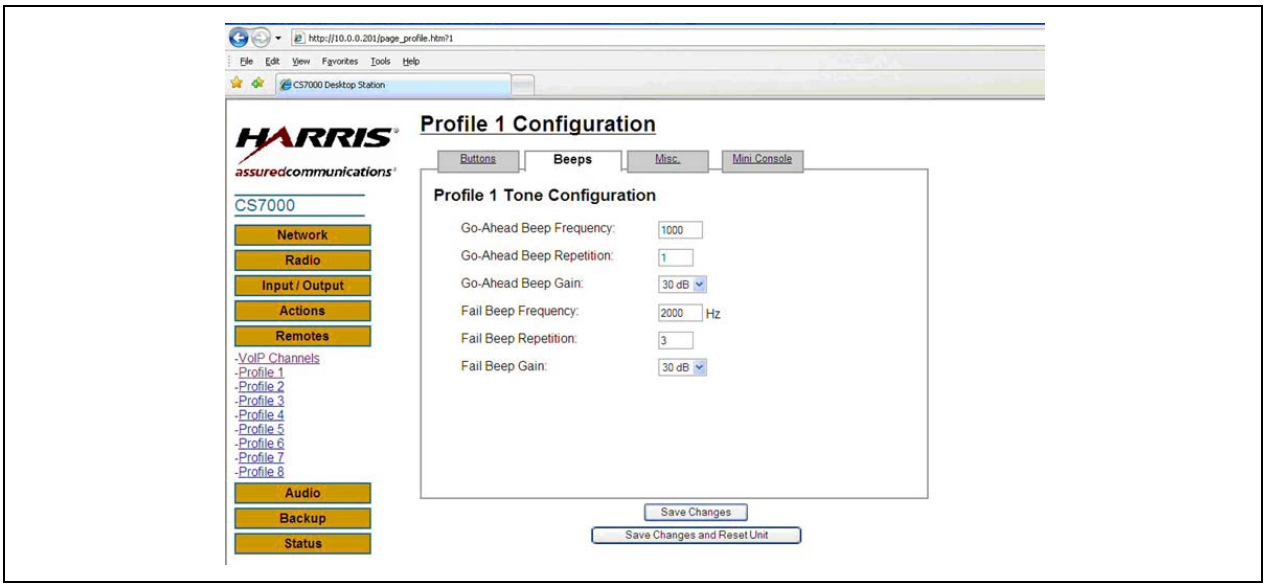


Figure 8-32: Profile Web Page—Beeps Tab (Example)

8.16.2.1 Profile (n) Tone Configuration

The Go-Ahead Alert Tone and the Failed Alert Tone are typically used on a trunked radio system to indicate whether or not the trunked system assigned the Control Station a Voice Channel transmitter in response to a Control Station initiated PTT. These Alert Tones are used when the "Tx Available Option" option set up on the Radio Configuration Parameters page is set to a value other than "Ignore".

The Alert Tone Frequency parameter is entered into a text box as a decimal number between 500 and 3000 in Hertz.

Repetitions are the number of beeps in the alert tone. The Repetition parameter is entered into a text box as a decimal number between 0 and 255. A repetition of 0 means that no beep will be produced.

The Beep Gain parameter is the volume level of the beep referenced to the network's normalized audio level. The Beep Gain parameter is set by a pull-down list with values from 0 dB to 30 dB in 6 dB increments.

Go-Ahead Tone Configuration

The Go-Ahead Alert Tone is the tone produced when the radio has granted Voice Channel transmitter access in response to a Control Station PTT. The default Go-Ahead Alert Tone is one 1000 Hz beep with a 0 dB Volume Gain.

Fail Alert Tone Configuration

The Fail Alert Tone is the tone produced when the radio has denied Voice Channel transmitter access in response to a Control Station PTT. The default Fail Alert Tone is three 2000 Hz beeps with a 0 dB Volume Gain.

8.16.3 Miscellaneous Tab

A Profile web page Misc. (miscellaneous) tab is shown in Figure 8-33.

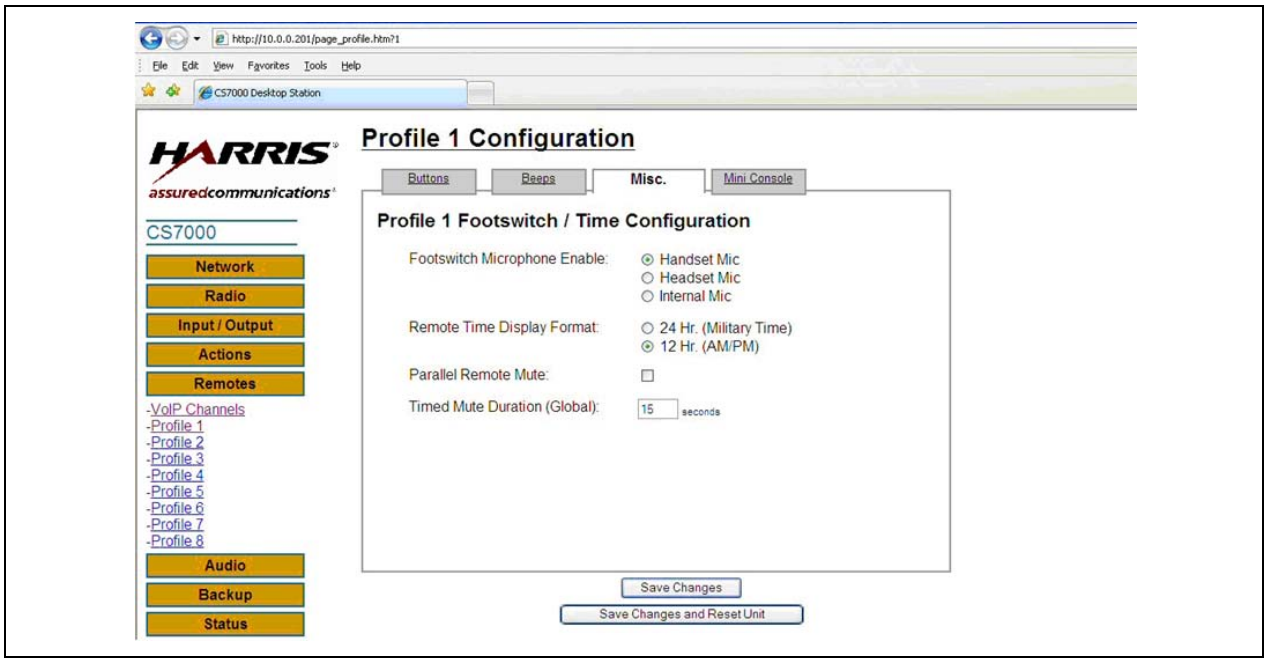


Figure 8-33: Profile Web Page—Miscellaneous Tab (Example)

8.16.3.1 Profile (n) Footswitch / Time Configuration

Footswitch Microphone Enable

The Footswitch Microphone Enable parameter allows the user to determine which microphone will be activated when the footswitch is depressed. When the Handset Microphone button is selected, the handset microphone will be activated even if the handset is currently in its cradle.

Remote Time Display Format

Use this parameter to select the preferred time display format.

Parallel Remote Mute

Enabling the Parallel Remote Mute parameter will apply the local remote's internal speaker mute option to all audio received from other remotes. Use this option to prevent feedback or audio overlap when two remotes are operated in close proximity to each other.

Timed Mute Duration (Global):

The Timed Mute Duration parameter sets the number of seconds that the VoIP Remote Controller's Timed Mute Action will be active when the Action is assigned to a keypad button and when the Action is initiated.

8.17 AUDIO MATRIX CONFIGURATION WEB PAGE

The Audio Matrix Configuration web page configures the audio paths and audio levels through the Remote Control (Plus) Board's audio matrix. The board's audio matrix can be thought of as a patch panel where any combination of audio matrix inputs can be connected to a specific audio matrix output. At any moment in time, the board is in a specific audio mode. These audio modes are:

- Idle Mode (Also Tone Remote Control Intercom Active)
- Radio Receive
- Desk Mic Transmit Active
- Desk Mic Intercom Active
- External I/O Connector (Aux Mic) Transmit Active
- External I/O Connector (Aux Mic) Intercom Active
- Paralleled Control Unit Transmit Active
- Paralleled Control Unit Intercom Active
- VoIP Remote Controller Transmit Active
- VoIP Remote Controller Intercom Active
- Tone Remote Control Transmit Active

8.17.1 Audio Matrix Tab

The Audio Matrix Configuration web page's Audio Matrix tab is shown in Figure 8-34.

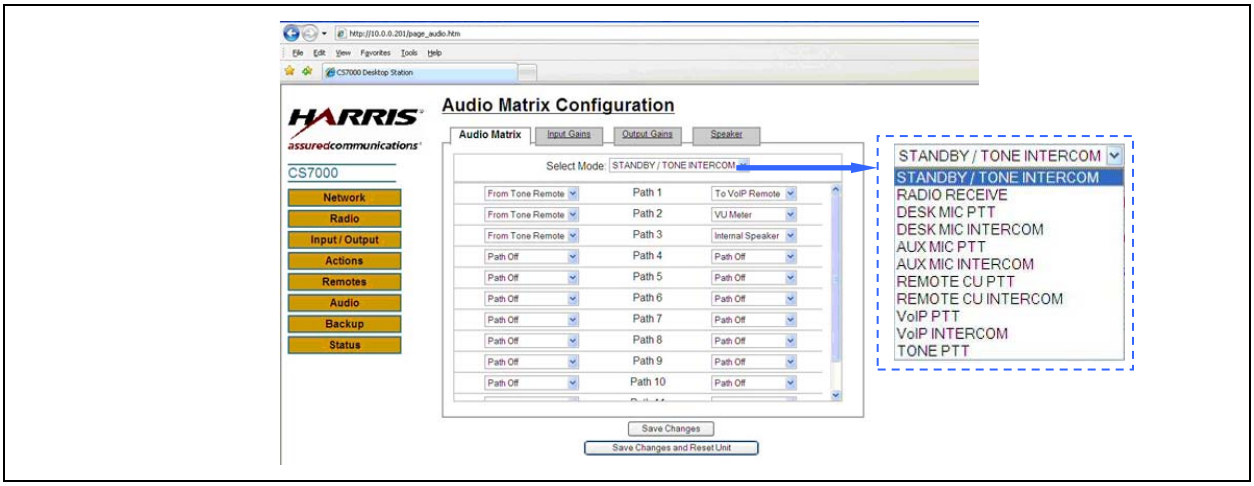


Figure 8-34: Audio Matrix Configuration Web Page—Audio Matrix Tab (Example)

8.17.1.1 General Information

Each audio mode has an independent set of Audio Paths. The paths for a mode can be displayed by selecting the mode via the Audio Matrix tab's Select Mode pull-down list. See the side listing in Figure 8-34.

An Audio Path is a connection from an Audio Matrix Input to an Audio Matrix Output. An audio mode supports up to twelve Audio Paths.

The Audio Matrix path's Audio Inputs are:

- Desk Mic Audio
- External I/O Connector Mic Hi (P3 pin 1) Audio
- Radio Connector Rx Audio Hi 1 (J3 pin 1) Audio
- Audio From VoIP Remote Controllers
- Audio From Tone Remote Controllers (LINE IN)
- Radio Connector Rx Audio Hi 2 (J3 pin 13) Audio
- Auxiliary Audio Input (P3 pin 3)
- Radio Connector CU Mic Hi Out (J3 pin 21)

A path's input is selected by the respective path's left-hand pull-down list. Available path inputs are listed in the left-most side-list in Figure 8-35.

The Audio Matrix path's Audio Outputs are:

- Radio Connector Ext Mic Hi 1 (J3 pin 5) Audio
- Audio To VoIP Remote Controllers
- Audio To V/U Meter
- Audio To Tone Remote Controllers (LINE OUT)
- CS7000 Internal Speaker Audio
- External I/O Connector Aux Audio Out 1 (P3 pin 10) Audio
- External I/O Connector Aux Audio Out 2 (P3 pin 11) Audio
- Radio Connector Ext Mic Hi 2 (J3 pin 3) Audio

A path's output is selected by the respective path's right-hand pull-down list. Available path outputs are listed in the right-most side-list in Figure 8-35.

The M5300 / M7300 radio's primary Microphone Audio Input is radio Connector Ext Mic Hi 1 (J3 pin 5). The M5300 / M7300 radio's primary Receive Audio output is radio Connector Rx Audio Hi 1 (J3 pin 13). There may be radio-generated Alert Tone audio on the radio's Receive Audio output.

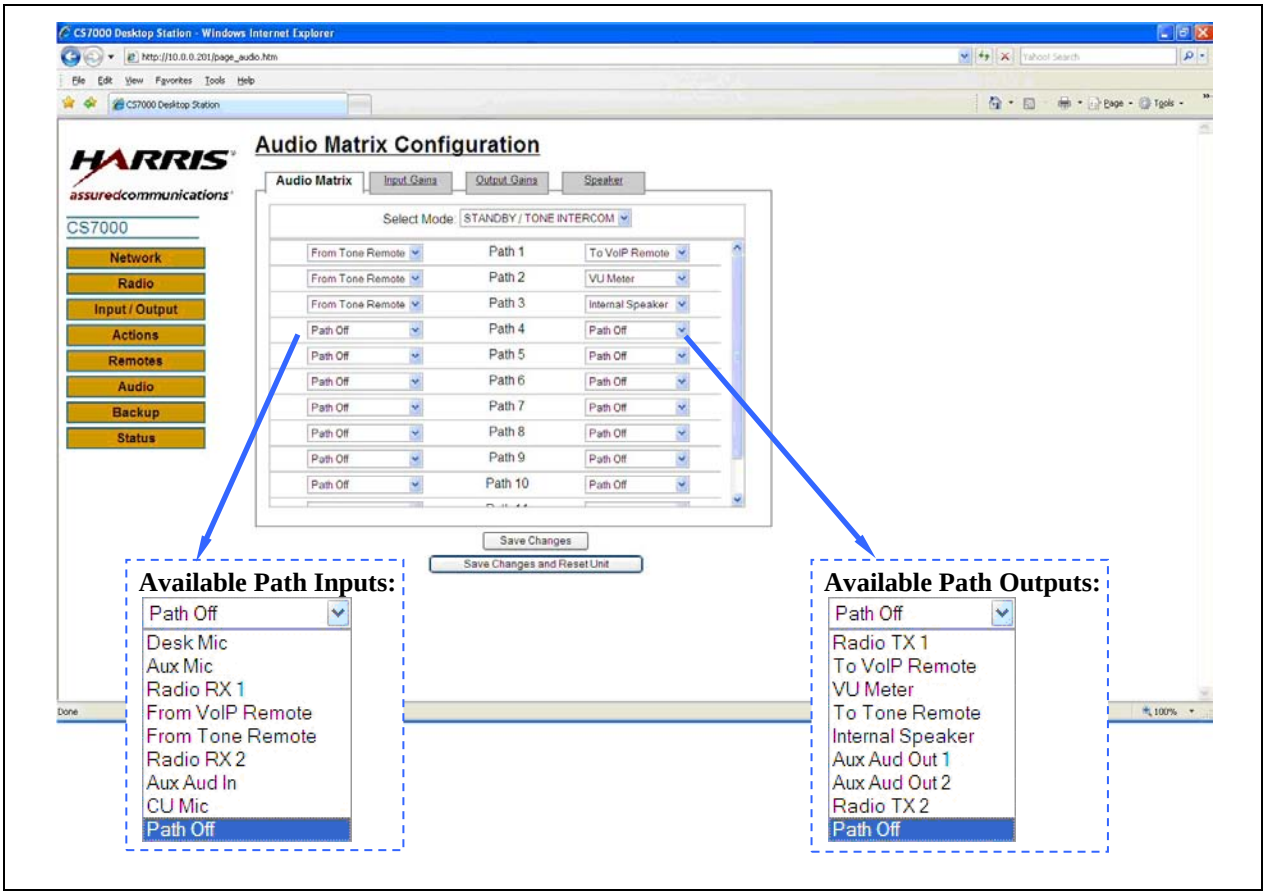


Figure 8-35: Audio Matrix Configuration Web Page—Audio Matrix Tab with Available Path I/O Lists (Example)

8.17.1.2 Configuring an Audio Matrix Path

To configure an Audio Matrix Path:

1. Select the Audio Mode that the path will be in.
2. Select the path's Audio Input.
3. Select the path's Audio Output.

Any Audio Input can be connected to any Audio Output.

A "Path Off" entry in either the Audio Input or Audio Output pull-down list disables the path. When it is not desired to use a path, both Audio Input and Audio Output should be set to "Path Off."

For radio-generated Alert Tones to be heard in a transmit Audio Mode, paths from the radio Speaker Output (radio Connector Rx Audio Hi 1 (J3 pin 13) Audio) to the desired audio outputs must be set up.

8.17.1.3 Example Application: Interfacing to a Microwave Mux

Consider interfacing to a microwave multiplexer (mux) that provides a relay closure PTT and a balanced 4-wire audio interface. The mux can be interfaced to the CS7000 Control Station with no additional hardware by appropriately configuring the Audio Matrix.

The mux's transmit relay closure can be connected between ground and the CS7000 Control Station's External I/O Connector's External PTT (P3 pin 16) input. When the mux's relay closes, the CS7000 Control Station's External I/O Connector's External PTT (P3 pin 16) input is grounded, causing the Control Station transmit and to enter its "External I/O Connector (Aux Mic) Transmit Active" audio mode.

The mux's balanced 4-wire audio interface can be connected to the J11, the RJ-11 Tone Remote Control Telephone Line Connector, on the CS7000 Control Station. This provides a balanced Four Wire Audio Interface from the CS7000 Control Station to the mux. The mux need not provide low level Keying Tone on its LINE IN audio interface for the CS7000 Control Station to transmit using the telephone line audio as its mic audio source.

The Audio Matrix can then be configured by selecting the "External I/O Connector (Aux Mic) Transmit Active" audio mode. As illustrated in Figure 8-36, the desired Transmit Audio paths can then be configured using the "Audio From Tone Remote Controllers" Audio Input to the desired Audio Outputs. In this figure, note how paths with the radio Rx Audio Input are set to allow radio-generated Alert Tones to be heard.

When the Audio Matrix is so configured, the mux's Transmit Relay Closure will cause the CS7000 Control Station to connect the mux's balanced 4-wire audio interface Line In audio to the radio's External Mic input, the VoIP Remote Controllers, the V/U Meter, and both External I/O Connector Aux Audio Outputs.

The CS7000 Control Station will then connect the radio's Receive Audio output to the VoIP Remote Controllers, to the mux's balanced 4-wire audio interface Line Out audio, and to the CS7000 Desktop's Internal Speaker so call progress Alert Tones can be heard.

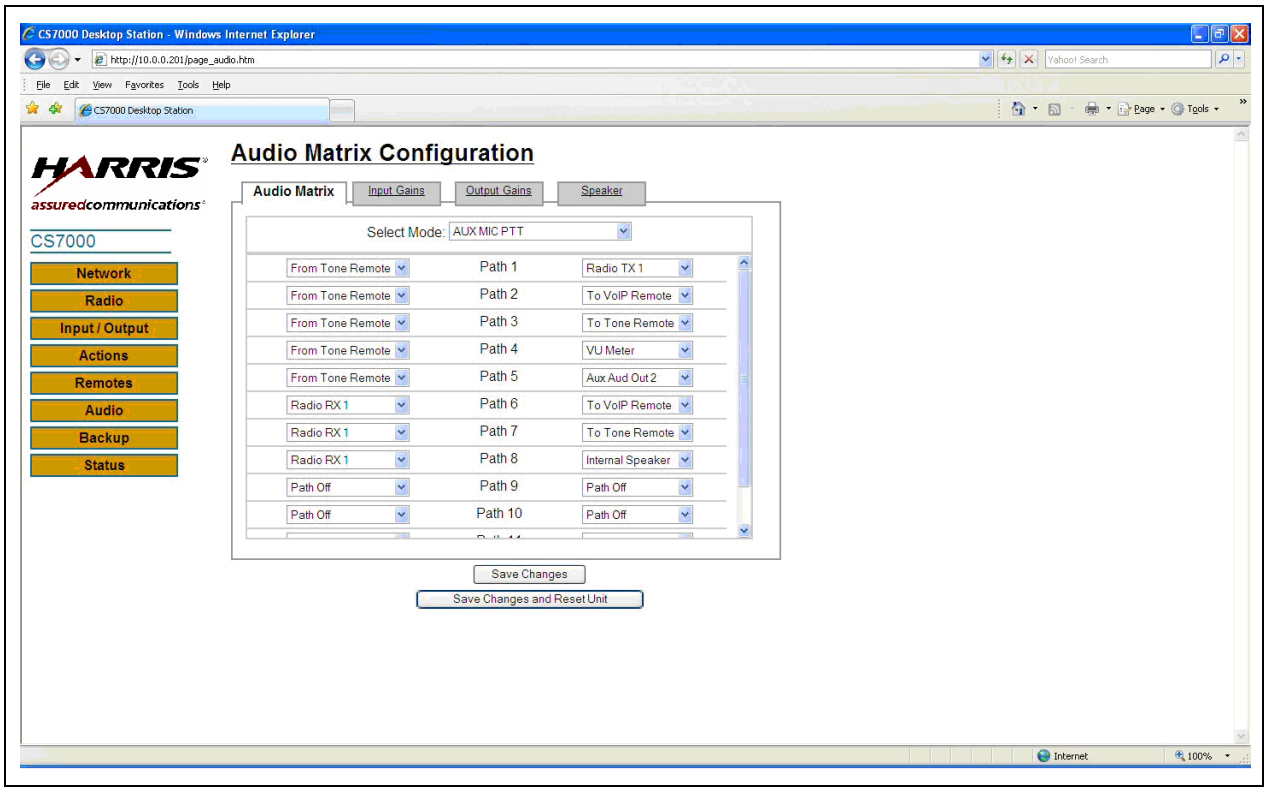


Figure 8-36: Audio Matrix Configuration Web Page—Audio Matrix Tab: Interfacing to a Microwave Mux (Example)

8.17.2 Input Gains Tab

The Audio Matrix Configuration web page's Input Gains tab is shown in Figure 8-37.

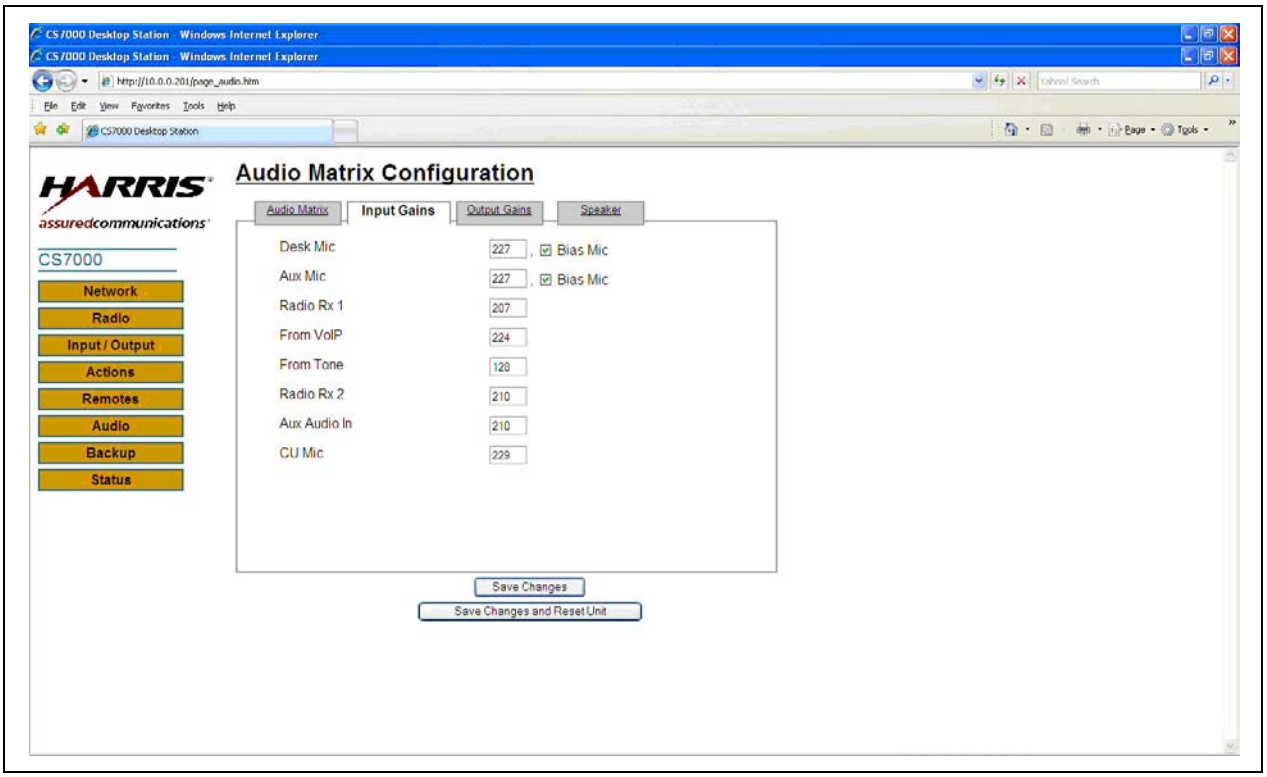


Figure 8-37: Audio Matrix Configuration Web Page—Input Gains Tab (Example)

The Input Gain Tab adjusts the levels of the Audio Matrix Audio Inputs to the Audio Matrix's Normalized Audio Level. Normally, these levels should default to standard levels for the audio input. Adjustments should be made with care.

The gain control ranges from 1 through 254. Higher numbers result in higher gain levels. There is also a checkbox to enable/disable a DC mic bias on the Desk Mic input, and on the External Mic Input Aux Mic Hi input (External I/O connector P3 pin 1).

NOTE

An error message will appear if a number outside of the 1 to 254 valid range is entered. In this case, use the web browser's back arrow (or an <Alt> left arrow keystroke) to restore/reload the web page.

8.17.3 Output Gains Tab

The Audio Matrix Configuration web page's Output Gains tab is shown in Figure 8-38.

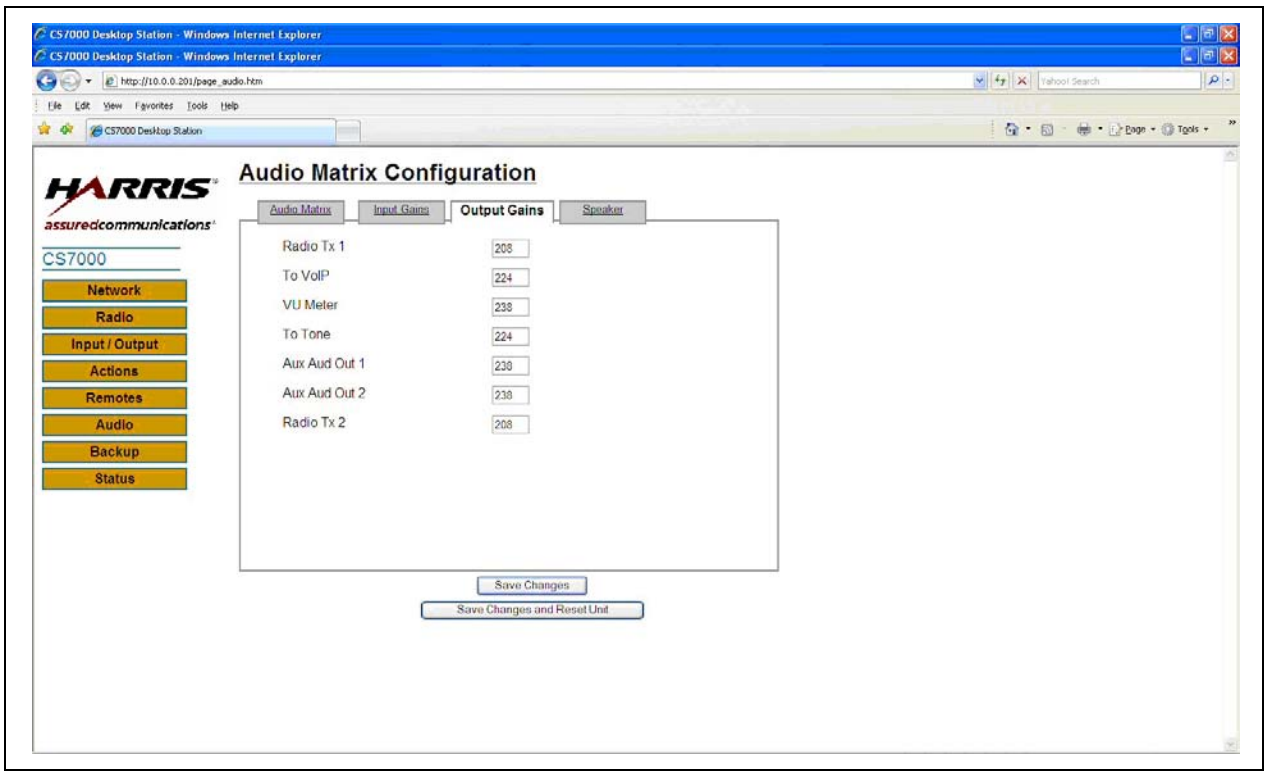


Figure 8-38: Audio Matrix Configuration Web Page—Output Gains Tab (Example)

The Output Gain Tab adjusts the levels of the Audio Matrix Audio Outputs from the Audio Matrix's Normalized Audio Level to the Audio Matrix Audio Output's level. Normally, these levels should default to standard levels for that audio output. Adjustments should be made with care.

The gain control ranges from 1 through 254. Higher numbers result in higher gain levels.

NOTE

An error message will appear if a number outside of the 1 to 254 valid range is entered. In this case, use the web browser's back arrow (or an <Alt> left arrow keystroke) to restore/reload the web page.

8.17.4 Speaker Tab

The Audio Matrix Configuration web page's Speaker tab is shown in Figure 8-39.

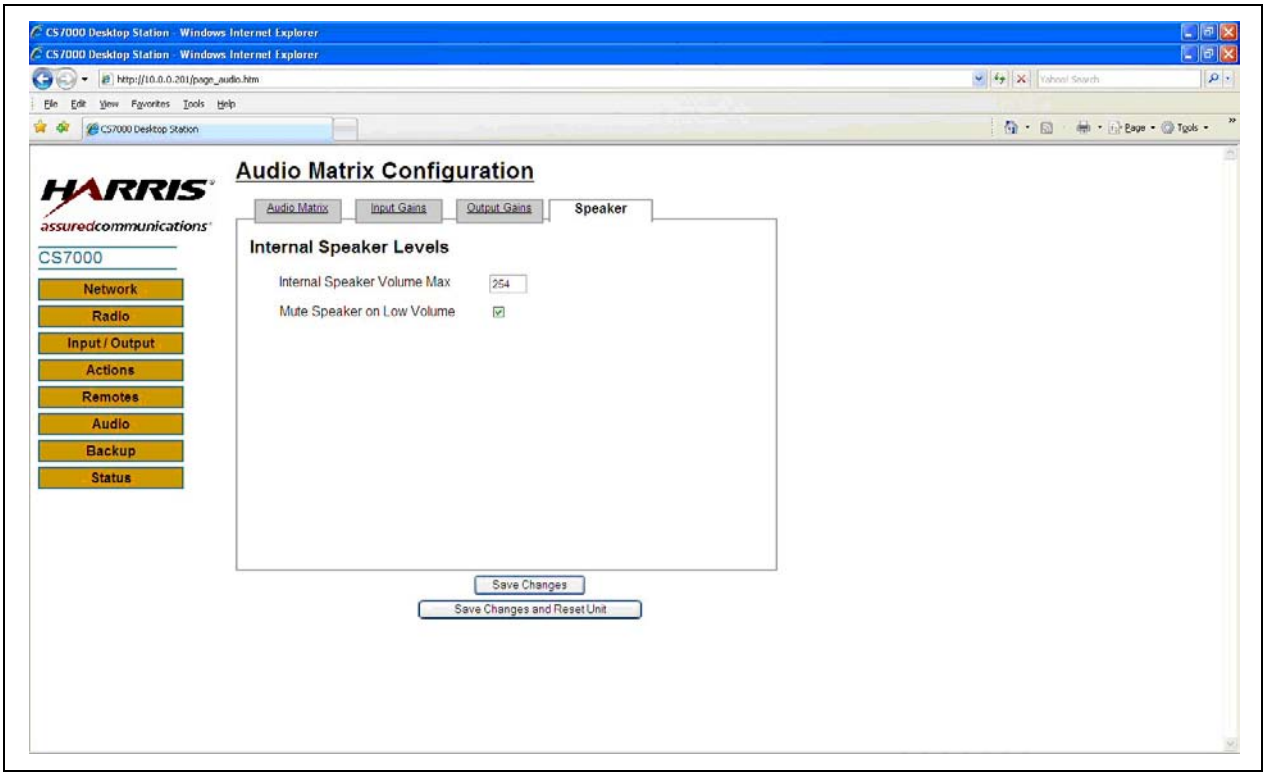


Figure 8-39: Audio Matrix Configuration Web Page—Speaker Tab (Example)

8.17.4.1 Internal Speaker Levels

Internal Speaker Volume Max

The CS7000 Control Station's electronic volume control for its internal speaker has 256 positions, numbered 0 through 255. The Internal Speaker Volume Max text box sets the speaker's maximum volume level. If the station's volume knob is turned above this setting, the speaker volume level will remain at the value established by this setting. The default value is 255, the maximum volume level.

Mute Speaker on Low Volume

When the Mute Speaker on Low Volume checkbox is checked, the CS7000 Control Station will fully mute the CS7000 Control Station's Internal Speaker when the volume knob is fully counter clockwise.

The default setting for the checkbox is checked.

8.18 BACKUP AND RESTORE WEB PAGE

The Backup and Restore web page allows the user to backup and restore the Remote Control (Plus) Board's configuration. This page has several sub-pages as shown in the following figures.

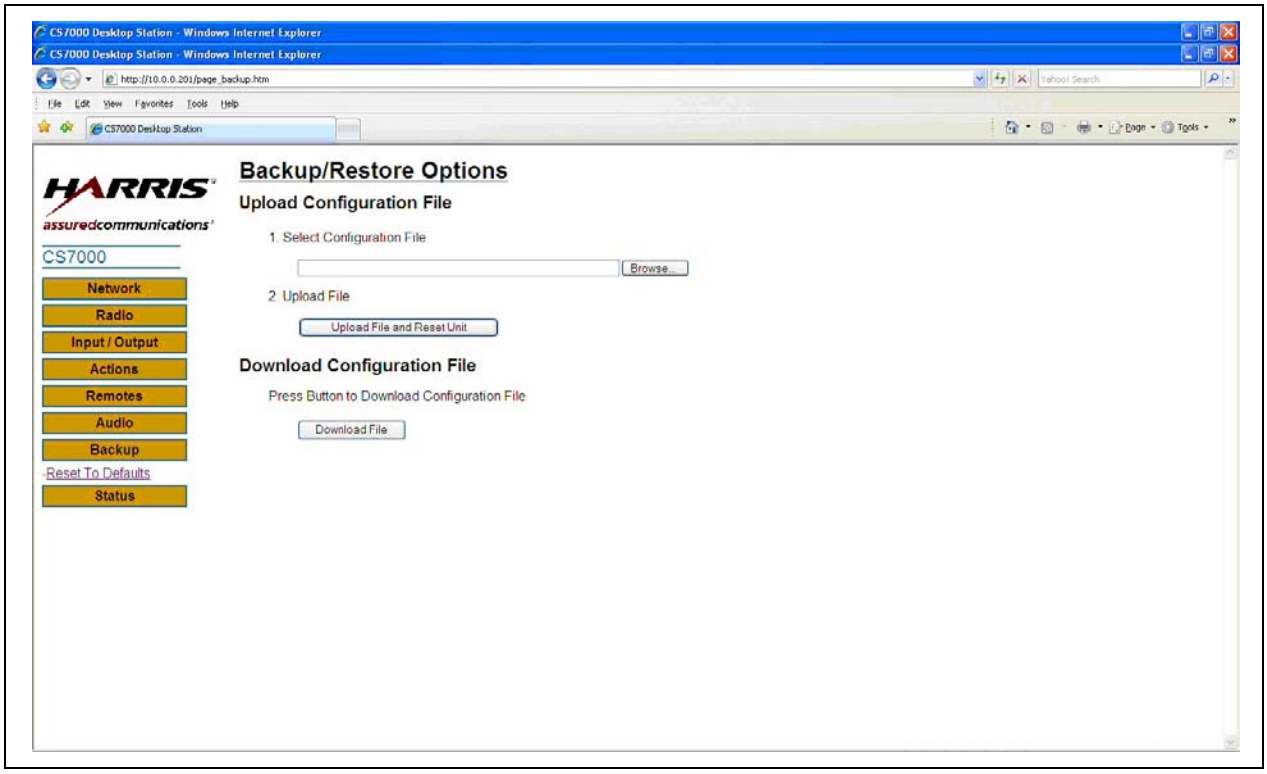


Figure 8-40: Backup and Restore Web Page—Backup/Restore Options

8.18.1 Backup/Restore Options

8.18.1.1 Upload and Download Configuration Files

The Upload Configuration File and the Download Configuration File functions provide a means for backing up and restoring the Remote Control (Plus) Board's configuration. See Figure 8-40. The Upload Configuration File and Download Configuration File functions use common Windows browse file dialog boxes to select the desired file. Configuration files have a .txt extension.

Use the Upload File function to send a Remote Control (Plus) Board configuration file to a computer to back it up.

Use the download function to restore a previously backed-up Remote Control (Plus) Board configuration file from a computer to the board.

8.18.2 Reset To Defaults

8.18.2.1 Reset Non-Network Parameters to Defaults

Clicking on the Reset To Defaults link under the Backup button will display the Reset To Defaults sub-page. Shown in Figure 8-41 and Figure 8-42, this sub-page provides a method to reset the Remote Control (Plus) Board's non-network related configuration parameters to their default settings. This includes all of the board's I/O settings, digital I/O polarity settings, the audio matrix default connections, and default audio levels. This action does not reset the network parameters, including the board's IP address.

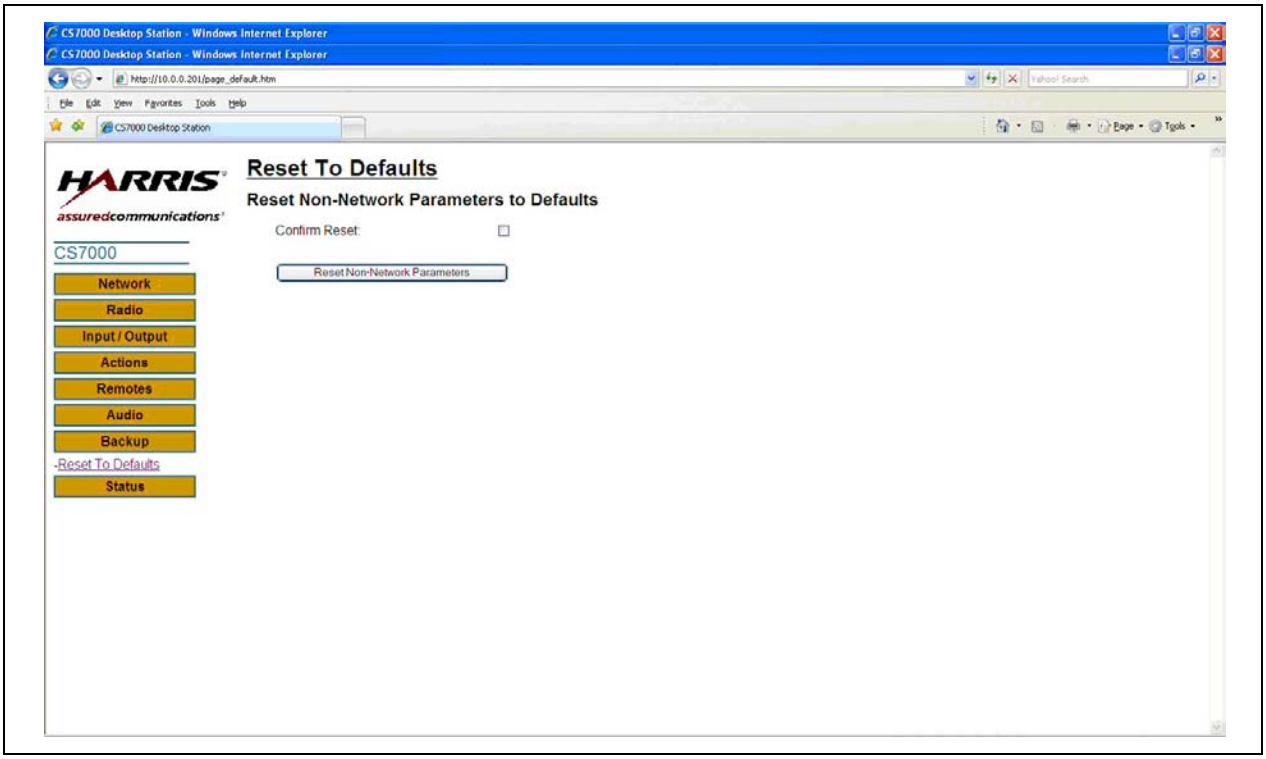


Figure 8-41: Backup and Restore Web Page—Reset To Defaults (Before Reset)

To reset the board's configuration to default settings, first check the Confirm Reset checkbox and then click the Reset Non-Network Parameters button. The following sub-page should then appear:

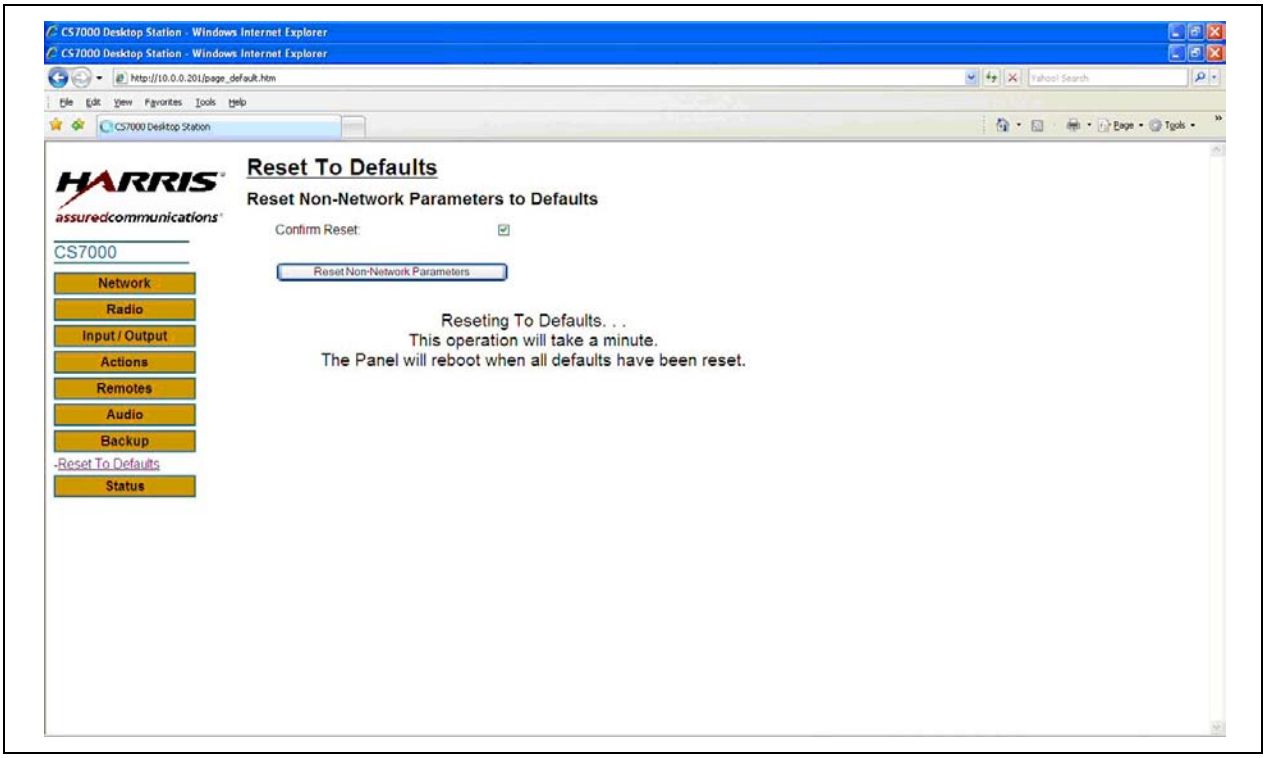


Figure 8-42: Backup and Restore Web Page—Reset To Defaults (During Reset)

After the parameters have been set to their default values, the CS7000 Control Station will automatically reset, and restart with the default settings active.

Network-related parameters can be reset to defaults settings as described in Section 8.3.4 (page 54).

8.19 STATUS WEB PAGE

The CS7000 Status web page displays identifying information about the Remote Control (Plus) Board and it lists VoIP Remote Controllers which are currently attached to the CS7000 Control Station. All items on this web page are read-only. The page is accessed by clicking the Status button on the left side of a web page.

The information on this web page is current as of the time the web page was loaded. This web page will not reflect any changes made, including VoIP Remote Controllers joining or leaving the network, since the page was loaded. Use the web browser's refresh button to update the web page to reflect any changes.

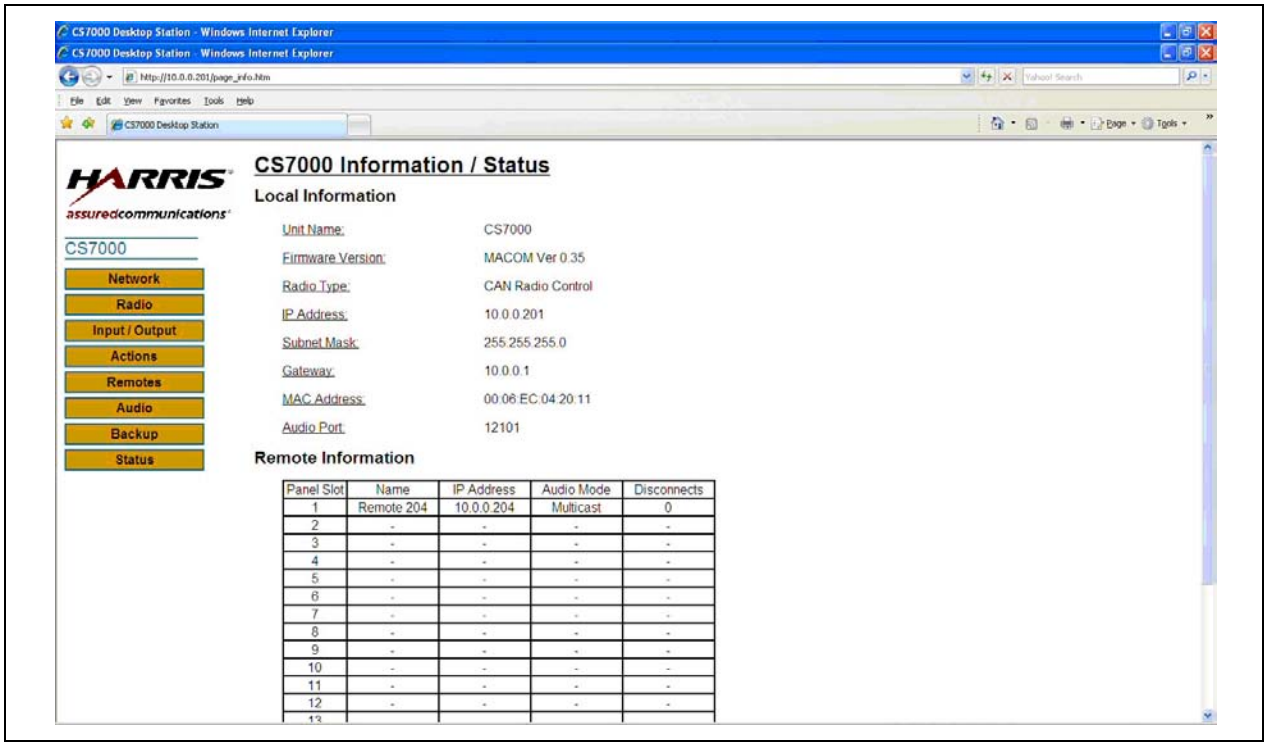


Figure 8-43: Status Web Page (Example)

8.19.1 CS7000 Information/Status

8.19.1.1 Local Information

Local Information includes the following information for the Remote Control (Plus) Board:

- **Unit Name:** Currently configured name
- **Firmware Version:** Firmware version number
- **Radio Type:** Radio type (e.g., "CAN Radio Control")
- **IP Address:** Currently configured Ethernet IP address
- **Subnet Mask:** Currently configured Ethernet IP subnet mask

- **Gateway:** Currently configured Ethernet default gateway IP address
- **MAC Address:** Ethernet MAC Address
- **Audio Port:** VoIP multicast audio port

8.19.1.2 Remote Information

For each VoIP Remote Controller, Remote Information includes the following data about the VoIP Remote Controllers that are currently connected to the Remote Control (Plus) Board:

- **Slot Number:** VoIP Remote Controller's identification number assigned by the board
- **Name:** VoIP Remote Controller's currently configured name
- **IP Address**: Currently configured VoIP Remote Controller's Ethernet IP address
- **Audio Mode:** Current operating mode of the VoIP Remote Controller—either multicast or unicast
- **Disconnects:** Number of times the board has lost communications with the VoIP Remote Controller

8.20 CS7000 CONTROL STATION WORKAROUNDS

Methods for addressing some undesirable behavior are described in the following subsections.

8.20.1 VoIP Remote Controller(s) Display "Disabled" at CS7000 Control Station Power-Up

8.20.1.1 General Information

The VoIP Remote Controllers will display "Disabled" even when the radio's selected system and group is one of the SG Key-mapped systems and groups.

While displaying "Disabled," a VoIP Remote Controller will not play CS7000 Control Station audio and a VoIP Remote Controller cannot initiate a transmission. In order for the VoIP Remote Controllers to become fully active, the radio in the CS7000 Control Station must be changed to one of the SG Key-mapped systems and groups, either locally at the CS7000 Control Station or by a channel change initiated by a VoIP Remote Controller. In either case, user intervention is required before the VoIP Remote Control System becomes active.

This undesirable situation is the result of the radio not supplying all relevant initialization information to a CAN-based Desktop Controller that joins the CAN link well after the radio has powered up. In particular, the radio does not provide initial SG Key keylight information referenced to the radio's selected system and group to late joining CAN-based Desktop Controller(s).

The CS7000 Control Station, with its twenty-plus second start-up time, is a late joining CAN device. Consequently, the CS7000 Control Station does not receive SG Key keylight information. To the CS7000 Control Station, all SG Key keylights are by default off. To the CS7000 Control Station, the radio's selected system and group are then not one of the sixteen SG Key mapped systems and groups required for VoIP Remote Control System operation. Therefore, the CS7000 Control Station correctly sets the VoIP Remote Control System's channel to "Disabled."

The radio does provide valid selected system and group SG Key keylight information to the CAN-based Desktop Controllers when it powers up. The work around is then to cause the radio to power up after the

CS7000 Control Station is fully active. To do this, the CS7000 Control Station must have absolute control of the radio's power switch by way of the CH-721 control head's CTRL_ON input.

8.20.1.2 Workaround Procedure

1. On the Radio Configuration web page's Radio Control tab, set the Control Unit On/Off parameter "Always On." See Section 8.9.2.2 on page 65 for details. This gives the CS7000 Control Station the ability to control the radio's power. With this setting, while the CS7000 Control Station is starting up, the station holds radio power off. Once the station becomes active, it allows the radio to power-up.
2. Turn the radio's CH-721 control head power switch off. This prevents the head from controlling the radio power on/off.

8.20.1.3 Issues and Restrictions

- The CS7000 Control Station's radio must have an attached front-mount CH-721 control head. This work around will not work on the remote control-only CS7000 Control Station, where the radio does not have a front-mount CH-721 control head. This is because the station's radio connector CTRL_ON signal is processed in the radio's front-mount CH-721control head. CTRL_ON is not processed in the radio.
- There cannot be any remote-mount CH-721 control heads attached to the CS7000 Control Station. This is because a powered and active remote-mount CH-721 control head not currently connected to a radio's CAN bus is always attempting to establish communications with a radio over the CAN bus. This remote-mount CH-721 CAN bus activity causes the radio to power-up regardless of the radio's front-mount control head's CTRL_ON line. A remote-mount CH-721 control head will then cause the radio to power-up before the station is active, resulting in the station missing the radio's power-up SG Key keylight information.

8.20.2 Remote Controller's Hookswitch Default Functionality is Reversed with V0.35 Software

8.20.2.1 General Information

With the default configuration, as in a Reset To Defaults function, the Hookswitch functionality from Remote Controllers is opposite from the desired functionality. For example, pressing the monitor switch on a VoIP Remote Controller puts the radio on-hook and releasing the monitor switch on a VoIP Remote Controller puts the radio on-hook.

8.20.2.2 Workaround Procedure

The workaround for this problem is to change the Hookswitch functionality on the Remote Configuration web page's Enable Tone Function tab (see example in Figure 8-44), and to change the Hookswitch functionality on the VoIP Remote Control web page's Button tab for the respective profile (see example in Figure 8-45).

Tone Remote Control

Tone Remote Controller Functionality:

- 2050 Hz generated when handset removed from cradle
- 550 Hz generated when handset placed on cradle

Radio Functionality with Default Settings:
(Hookswitch Off Hook disables Channel Guard)

- Remove Handset From Cradle: Radio CG Icon Turns On = Hookswitch is On Hook
- Place Handset On Cradle: Radio CG Icon Turns Off = Hookswitch is Off Hook

Recommended Function Tone Web Page Configuration Change:

- Change the 550 Hz Function Tone from its default "Hookswitch On" action to "Hookswitch Off"
- Change the 2050 Hz Function Tone from its default "Hookswitch Off" action to "Hookswitch On"

Radio Functionality with Changed Configuration
(Hookswitch Off Hook disables Channel Guard)

- Remove Handset From Cradle: Radio CG Icon Turns Off = Hookswitch is Off Hook
- Place Handset On Cradle: Radio CG Icon Turns On = Hookswitch is On Hook

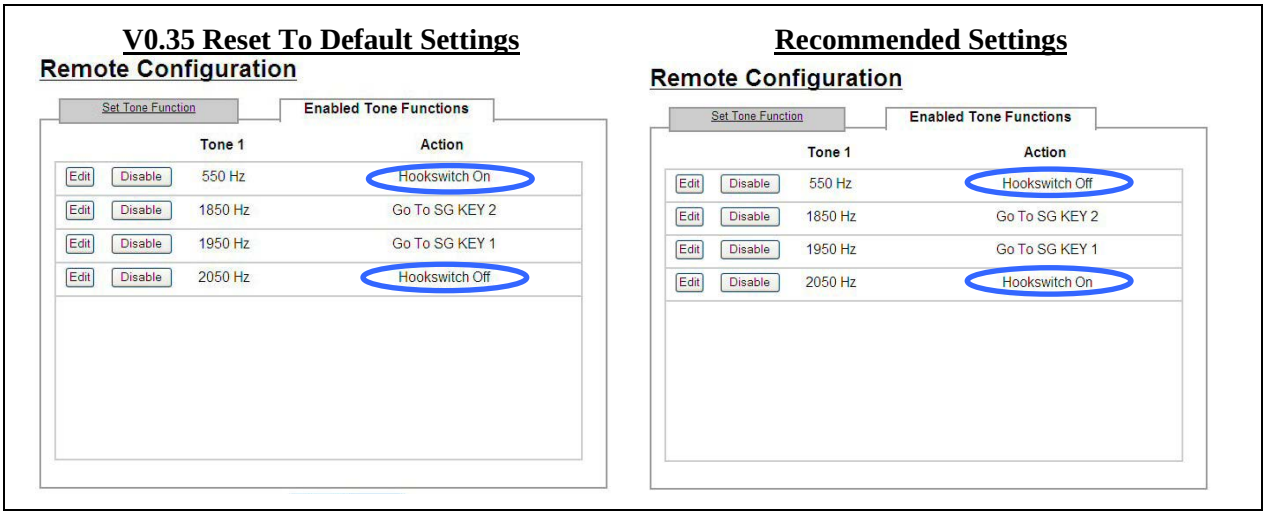


Figure 8-44: V0.35 Reset to Default Settings and Recommended Settings—Enable Tone Functions Tab

VoIP Remote Control

VoIP Remote Controller Functionality:

- VoIP Remote Controller's Monitor Button configured for Hookswitch

Radio Functionality with Default Settings:

- Press VoIP Remote Mic Monitor Switch: CG Icon Turns On = Hookswitch is On Hook (Monitor Button LED is On)
- Release VoIP Remote Mic Monitor Switch: CG Icon Turns Off = Hookswitch is Off Hook (Monitor Button LED is Off)

Recommended VoIP Remote Control Web Page Profile Button's Tab Configuration Change:

- Change the default On Hook Action to "Hookswitch Off"
- Change the default Off Hook Action to "Hookswitch On"
- Change the default Monitor On Action to "Hookswitch On"

- Change the default Monitor Off Action to “Hookswitch Off”

Radio Functionality with Changed Configuration:

- Press VoIP Remote Mic Monitor Switch: CG Icon Turns Off = Hookswitch is Off Hook
  Monitor Button LED is On
- Release VoIP Remote Mic Monitor Switch: CG Icon Turns On = Hookswitch is On Hook
  Monitor Button LED is Off

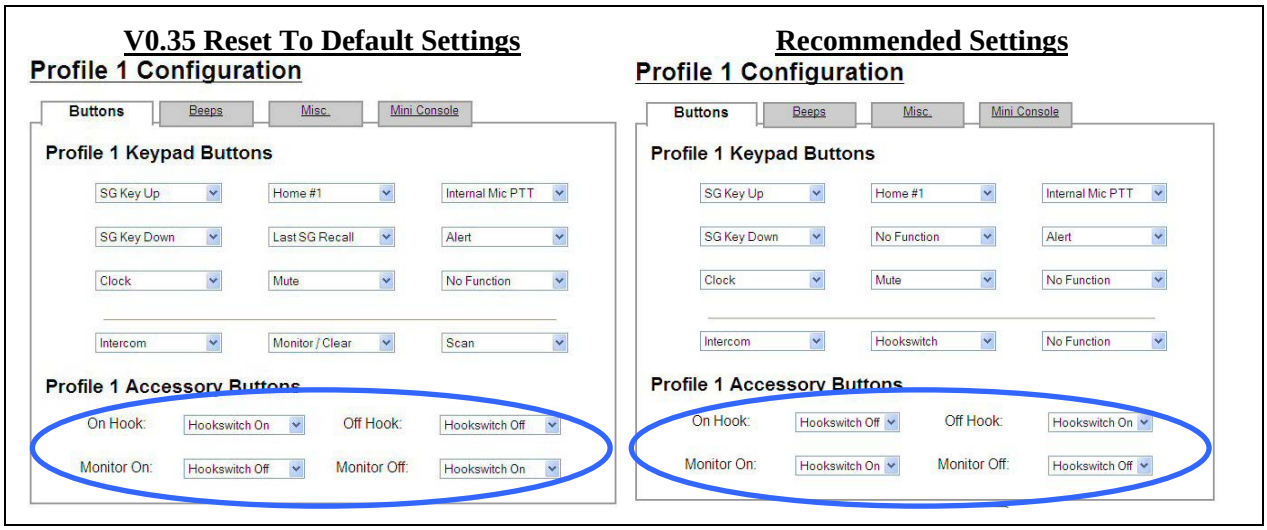


Figure 8-45: V0.35 Reset to Default Settings and Recommended Settings—Buttons Tab (Example)

9 OPERATIONAL TESTING

This section includes test procedures to verify the performance of the Control Station and its antenna system installation. Tests must be performed by qualified service personnel with sufficient training and/or knowledge to ensure the final installation meets requirements defined by the FCC and other regulatory agencies. Final testing shall ensure that the installation meets FCC MPE requirements (refer to Section 1.1), and Maximum Effective Radiated Power (ERP) requirements (refer to Section 9.2).

9.1 SETUP AND EQUIPMENT TESTING

For EDACS, P25, and OpenSky systems, it is recommended to request the system administrator designate a talk group on the system that is pre-defined for equipment testing during installation and maintenance. This will minimize interference on a user's active talk group. It is also recommended, where possible, to assign a specific RF channel at the site(s) for the equipment test group; this aides the installers and technicians by always knowing the specific RF frequency to monitor during testing. Conventional systems may be left no choice but to test on an active user channel. Is all cases, techniques should be employed to minimize transmit time during testing.

Setup also includes setting the CS7000 Control Station transmitter power output level to meet the station authorization's Maximum ERP (refer to Section 9.2). After determining the transmitter value for Maximum ERP, there are three (3) test procedures included in this section which must be performed:

- Verifying TX RF Power Output and Antenna Reflected Power
- Verifying TX RF Frequency and Modulation (Deviation)
- Over-the-Air Final Testing

9.1.1 Required Test Equipment

Table 9-1: Required Test Equipment

TEST EQUIPMENT	MODEL / PART NUMBER AND DESCRIPTION
Peak Power Wattmeter	Bird Electronic Corp. Model 4314B (or equivalent) with Type-N female connectors at input and output ports.
Wattmeter Slug	Bird Electronic Corp. Element 50E, 50 watts, 400 – 1000 MHz (or equivalent).
Service Monitor	Capable of measuring EDACS, P25 and OpenSky frequency and modulation characteristics (as applicable for the mobile installed in the CS7000).
RF Coaxial Jumper Cable	Low loss 50-Ohm Coaxial Cable with Type-N male connectors, approximately three (3) feet in length. This cable must have a VSWR below 1.2:1 within the RF pass band.
Audio Tone Generator	Audio tone generator capable of generating a 1000 Hz test tone.

9.2 MAXIMUM EFFECTIVE RADIATED POWER

The FCC and other similar regulatory agencies define during station authorization (licensing) the maximum Effective Radiated Power that may be radiated from the antenna. ERP can be determined by subtracting feed line losses and adding antenna gain to the transmitter output power.

Once determined, the transmitter's RF output power must be aligned not to exceed the pre-determined maximum transmitter power to meet ERP requirements.

9.2.1 Determining Maximum Transmitter Power that Meets ERP Requirement

Antenna gains are expressed relative to a dipole (dBd) or relative to a theoretical Isotropic antenna (dBi). Antenna gains expressed as dBi are 2.15 dB greater than the dBd value for the same antenna (e.g., 6 dBd equals 8.15 dBi). ERP values should also be expressed relative to dipoles or Isotropic antennas, EDRP for dipoles and EIRP for Isotropic antennas.

Therefore, when antenna gain is expressed as dBi, and EDRP is required, 2.15 dB is subtracted in Part 2.b. of the equation shown below. If antenna gain is expressed as dBd, and EIRP is required, 2.15 dB is added in Part 2.b. of the equation below. If both antenna gain and ERP values are expressed the same, Part 2.b. of the equation is simply skipped.

Example:

If a site requires a maximum of 50 Watts EDRP using an 8.15 dBi gain antenna, and 3 dB feed line loss, then the following equation applies:

1. Convert the ERP value from Watts to decibels (dBm): EDRP Watts = 10Log(1000 * EDRP) dBm
   50 Watts EDRP = 10Log(1000 * 50)
   50 Watts EDRP = 47.0 dBm
2. Sum the antenna gains, feed line losses and dBi or dBd correction factor:
   a. Subtract the antenna gain from the ERP value: 47.0 dBm – 8.15 dBi = 38.85 dBm
   b. Add or subtract 2.15 dB, if required: (see above, paragraph two) 38.85 dBm + 2.15 dB[2] = 41.0 dBm
   c. Add the overall feed line losses[3]: 41.0 dBm + 3 dB = 44.0 dBm
3. Convert from dBm to Watts: Maximum Transmitter POUT (Watts) = InvLog(dBm-30)/10)
   Maximum Transmitter POUT (Watts) = InvLog(44.0 – 30)/10)
   Maximum Transmitter POUT (Watts) = 25 Watts

Therefore; for a Control Station installation with an antenna gain of 8.15 dBi, and a feed line loss of 3 dB, and an EDRP requirement of 50 Watts, the transmitter power output must be set to 25 Watts.

9.2.1.1 For OpenSky Mode of Operation (Stations using M5300 or M7300)

To set the transmitter RF power output to meet the ERP requirement determined in Section 9.2.1 by performing the following:

1. Connect a wattmeter, and 50 ohm load to the CS7000 Control Station's antenna port.

[2] Only add or subtract 2.15 dB if the antenna rating (dBi or dBd) differs from the ERP requirement (EIRP or EDRP).

[3] When calculating feed line loss, be sure to include the RF losses presented by coaxial jumpers, lightning protection equipment, the main feed line and any other in-line devices.

2. Power up the CS7000 Control Station, and connect a PC running a Terminal program (19,200 kbs, 8-N-1) to the terminal port on the radio.
3. Send the command <at*****> followed by the dBm value of the desired output power (e.g., 25 Watts = 44 dBm = <at*****44>). For further setup and programming information, refer to the mobile radio's Software Release Notes, publication number MS-014467-001.
4. Send command <at&w3> to save the changed power setting.
5. Success of this setting may be verified while performing Section 9.3.

9.2.1.2 For P25, EDACS, or Conventional Mode of Operation

Set the transmitter RF power level to the ERP requirement determined in Section 9.2.1 by performing the following:

1. Connect a wattmeter, and 50 ohm load to the CS7000 Control Station's antenna port.
2. Power up the CS7000 Control Station, and connect a PC running the appropriate radio Personality Manager (RPM) software listed in the accessories Table 4-2.
3. Follow RPM's on-line help instructions to set the transmitter RF power output.
4. Verify success of this setting while performing Section 9.3.

9.3 VERIFYING TX RF FORWARD AND REFLECTED POWER

After installation of the Control Station is complete, it is required to verify the CS7000 Control Station's forward RF power output, and reflected RF power while connected to the antenna.

Perform the following tests:

1. Make sure the CS7000 Control Station's AC power is OFF.
2. Disconnect the RF coaxial antenna cable from the rear of the station and connect it to the wattmeter's output (load) connector.
3. Connect a coaxial jumper cable between the CS7000 antenna port and the wattmeter input (radio) connector.


NOTE

A peak-power reading RF wattmeter equivalent to the wattmeter specified in Table 9-1 must be used. Do not use an average or RMS-responding wattmeter.

4. Power-up the CS7000 Control Station and select the group/channel for performing equipment testing (refer to Section 9.1).
5. Position the wattmeter's slug to measure forward RF output power. Rotate it if necessary. The arrow on the face of the slug must point away from the CS7000 and towards the antenna for forward power measurements.
6. Set the wattmeter to measure peak RF power.
7. Key the CS7000's transmitter and measure the forward and reflected power; unkey the transmitter when complete. The forward power should be within the required level to meet ERP requirements determined in Section 9.2.


NOTE

Transmit only for as long as needed to take the measurement, then immediately disable the transmission.

8. If forward and reflected power measurements are within the expected ranges (forward power equal or less than the required wattage to meet ERP settings from Section 9.2, and reflected power no more than 10% of measured forward power), record the measured results in the appropriate space on the data collection form near the end of this manual.

If reflected power is greater than 10% of measured forward power, DO NOT attempt corrections to the RF output power level to meet ERP values until the high reflected power measurement is corrected.

If the reflected power measurement is greater than 10% of measured forward power, check/verify all RF connections, and measure the RF output power again. If problems persist check the following:

a. Re-check the measurements with a different wattmeter, slug, and jumper cable.

b. Verify the antenna is consistent with the specified frequency range of the CS7000. For example, if the CS7000 is configured for operations in an 800 MHz system, it must be connected to an 800 MHz-capable antenna.

c. Temporarily bypass any lightning protection or other devices installed inline with the antenna and recheck forward and reflected power.

If problems persist, contact the Technical Assistance Center for assistance. TAC contact information is listed on page 19.

If the measured forward power is outside the expected ranges, and the measured reflected power is no more than 10% of measured forward power, return to Section 9.2.1.1 or Section 9.2.1.2 and reprogram the RF power setting as necessary. If the necessary software change to obtain the expected RF power level is more than ± 2 dB from the expected range, further investigation may be required.

9. When testing is complete, turn Off the AC power to the Control Station.
10. Disconnect the coaxial cable jumper and wattmeter.
11. Re-attach the antenna coaxial cable directly to the Control Station's antenna port.
12. Turn ON the AC power to the Control Station.

To prevent RF leakage and ensure peak performance, make sure the RF connectors are tight, but do not over tighten so connector damage will not occur.

Mounting of the CS7000 and/or antenna in ways other than those described can adversely affect performance, violate FCC rules on RF exposure, and even damage the unit, posing a potential safety hazard.

Additionally, Improper antenna and/or antenna cable installation may lead not only to poor CS7000 performance, but also to harmful exposure of RF electromagnetic energy.

9.4 VERIFYING TX RF FREQUENCY

After verifying forward and reflected power per Section 9.3, verify the CS7000 Control Station's transmitter frequency. It is recommended to have the system administrator designate a talk group on the system that is pre-defined for test use.

The following frequency test should be performed over-the-air using the station's antenna while monitoring the transmitter's pre-programmed RF frequency:

1. Power-up the CS7000 Control Station and select the group/channel for performing equipment testing (refer to Section 9.1).
2. Setup the service monitor as required for measuring TX frequency of over-the-air transmissions.
3. Key up the CS7000 transmitter and measure TX frequency. Unkey the transmitter when complete.
4. If the frequency reading is within the expected ranges, record the measured results in the appropriate space on the data collection form near the end of this manual.

   If the frequency reading is not within the expected ranges, try the following:

   a. Verify the test instrument settings and calibration date.

   b. Re-check the measurement with another test instrument.

   If problems persist, contact the Technical Assistance Center for assistance. TAC contact information is listed on page 19.

9.5 VERIFYING TX MODULATION

Verify the TX modulation over-the-air using the station's antenna while monitoring the transmitter's pre-programmed RF frequency. Procedures for measuring modulation vary slightly between analog and digitally modulated transmitters. Perform the following procedure as it applies to the specific mode of operation for the CS7000 Control Station under test:

9.5.1 Digital Modulation Modes (EDACS, P25, and OpenSky)


NOTE

The following modulation test is intended to verify the maximum deviation level of the digitally modulated RF carrier for regulatory purposes and does not address the resulting analog audio levels. If the Control Station's analog levels heard at the receiving station's speaker during transmit appear incorrect while performing this test, refer to the Installation section of this manual and other equipment manufacturer's manuals to set the resulting analog audio levels.

1. Make sure the antenna is connected to the CS7000 Control Station.
2. Power-up the CS7000 Control Station and select the group/channel for performing equipment testing (refer to Section 9.1).
3. Setup the service monitor as required for measuring TX modulation of over-the-air transmissions.
4. Key up the CS7000's transmitter and measure TX modulation. Unkey the transmitter when complete.
5. If the digital modulation reading is within the expected ranges, record the measured results in the appropriate space on the data collection form near the end of this manual.

   If the digital modulation reading is not within the expected ranges, try the following:

a. Verify the test instrument settings and calibration date.

b. Re-check the measurement with another test instrument.

If problems persist, contact the Technical Assistance Center for assistance. TAC contact information is listed on page 19.

9.5.2 Analog Modulation Modes

1. Power-up the CS7000 Control Station and select the group/channel for performing equipment testing (refer to Section 9.1).
2. Setup the service monitor as required for measuring TX modulation of over-the-air.
3. Connect a tone generator to the microphone input of the transmitter, set to 1000 Hz @ 1 Vrms. Alternately connect a microphone to the Control Station's microphone connector.
4. Key up the CS7000 transmitter and measure TX modulation using the test tone or by talking into the microphone. Unkey the transmitter when complete.
5. If the modulation reading is within the expected ranges, record the measured results in the appropriate space on the data collection form near the end of this manual.

   If the modulation reading is not within the expected ranges, try the following:

   a. Verify the test instrument settings and calibration date.

   b. Re-check the measurement with another test instrument.

   If problems persist, contact the Technical Assistance Center for assistance. TAC contact information is listed on page 19.

9.5.2.1 Desktop Remote Controllers on Systems Using Analog Modes

1. If one or more Tone, VoIP, or CAN Remote Controllers are connected to the CS7000 Control Station, it is recommended to repeat Section 9.5.2: steps 3 thru 5, while modulating each Desktop Remote Controller connected to the Control Station.
2. If the modulation reading is within the expected ranges, perform the test for each Remote Controller connected to the CS7000 Control Station.

   If the modulation reading is not within the expected ranges, verify setup of each remote per the instructions supplied in the appendices of this manual, or the manufacturer's instructions supplied with the Remote Controller.

10 COMPLETING THE INSTALLATION

Review and follow guidelines presented in this list before considering the installation complete:

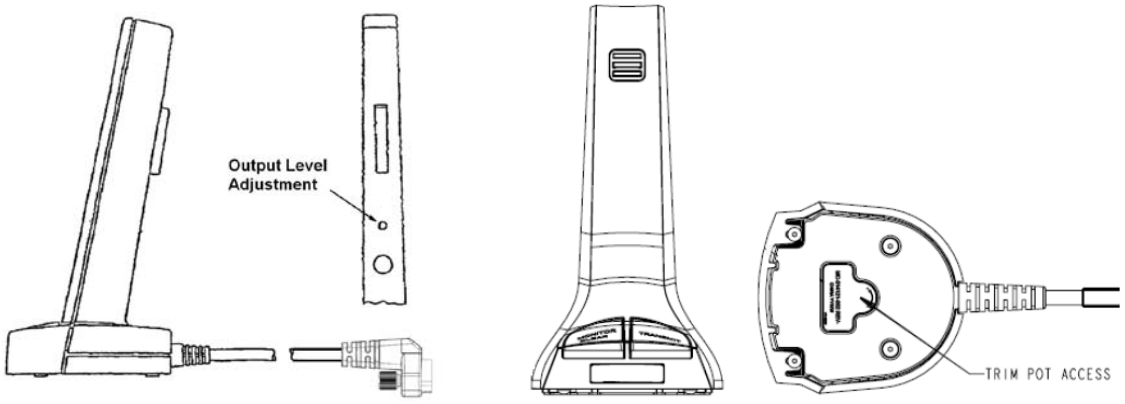
- Verify all electrical connections are connected properly and the associated connector attachment hardware is tight. Pay special attention to all RF antenna cables, chassis ground cabling, and AC power cords.
- Verify all fuses are correctly installed and properly rated.
- Verify all electrical cables and wiring are tied, stowed, and protected so they are out of the way of casual contact, away from sources of extreme heat, and wire chafing cannot occur. Pay special attention to all RF antenna cables and AC power cords.
- Verify all related mechanical hardware is mounted securely and all respective mounting hardware is tight.
- Remove all tools and unused hardware from installation area(s).
- Verify the test performance data has been recorded on the data collection form found in APPENDIX A.1 of this manual.

10.1 FINAL OVER-THE-AIR TESTING

If not already performed during setup and testing, it is recommended to perform live over-the-air testing on the customer's active group/channel from the Control Station's local microphone, and from each Desktop Remote Controller connected to the Control Station.

10.1.1 Adjusting the Desktop Microphone Audio Output Level

Desktop microphones, model MC-014121-001 and MC-014121-002, provide a built-in audio level adjustment. This setting may be adjusted to a lower (counter-clockwise) position to minimize background by; however, may require the user to speak into the microphone at a closer distance. Adjusting the setting to a higher (clockwise) position will allow the user to speak into the microphone at a more comfortable distance; however, will also increase the risk of undesirable background noise.



10.2 SWITCHING BETWEEN OPERATIONAL MODES (using M5300 or M7300 Transceiver)

At the time this manual was written, the Unity XG-100M transceiver does not support OpenSky Trunked Protocol; therefore, the following information applies only to CS7000 Desktop Stations with a M5300 or M7300 transceiver installed into the station. Radios programmed with RPM software version R05 or later may be setup to allow the user an easy *1-button* method of switching between EDACS/Conventional/P25 (ECP) and OpenSky Trunking Protocol (OTP) modes of operation.

Additionally, radios programmed with version 19.95 or later OTP software supports Quick Key functionality enabling keypad entry 1# on a System control head (**while in OTP mode**) to switch the radio from OTP mode to ECP mode. Additionally, sending the DTMF sequence 1# via various external audio input sources may also switch the radio from OTP mode to ECP mode.

NOTE

The preferred method of allowing the user to switch the radio between modes is by programming the radio control head's **Preset C** button for this action. The following sub-sections describe how to setup the CS7000 Desktop Station for this feature.

10.2.1 Programming the Preset C Control Head Button to Switch Between ECP Mode and OTP Mode

1. Power-up the CS7000 Control Station per Section 6.
2. Connect a PC running Radio Personality Manager (RPM) programming software (version R05 or later) to the Serial A USB programming port on the rear panel of the station.

NOTE

It may be necessary to install USB Port Driver Software SK-015121-001. This driver configures the PC to recognize the CS7000 Control Station allowing assignment of a COM Port number to the USB port. **The assigned COM Port number must be loaded into the RPM programming software** to communicate with the Control Station. Refer to the USB Driver Installation Manual, publication number MM-015245-001, and the help menu within RPM for more information about setting up RPM and the COM Port.

3. Determine the assigned COM Port number for the USB connection and setup RPM for communications over this port.
4. Read and save the existing radio personality from the station using RPM. Refer to help screens if necessary.

10.2.1.1 ECP Preset C Button Programming

CAUTION

If Section 10.2.1.1 is performed, it is imperative that Section 10.2.1.2 is also performed to ensure the ability of switching back and forth between operating modes.

After preparing the CS7000 for programming per instructions in Section 10.2.1, perform the following:

1. Using RPM software version R05 or later, setup the desired ECP system(s).
2. If not already, add an OTP system to the personality.

3. From RPM's Personality Data Tree (i.e., in its main dialog box), select Options > System/Group Keys, then using the drop-down menu beside SG16, select the OTP system.
4. From RPM's Personality Data Tree, select Options > Control Unit Keypad Options, then using the drop-down menu beside Button C, select SG16.
5. Program the revised personality into the radio.
6. Archive the revised personality and close RPM programming software.
7. Cycle power to the radio. Afterward, momentarily press the control head's Preset C button. Verify the radio toggles from ECP mode to OTP mode. If not, verify/repeat this section's instructions.

10.2.1.2 OTP Preset C Button Programming Setup


CAUTION

If Section 10.2.1.1 is performed, it is imperative that Section 10.2.1.2 is also performed to ensure the ability of switching back and forth between operating modes.

The preferred method for changing from OTP mode to ECP mode is through the use of the Preset C button. The following procedure describes how to program the radio for this functionality.


NOTE

OTP software version 19.95 and later support Quick Key functionality. A radio can be switched from OTP mode to ECP mode via the control head's menu structure (if enabled) or by via DTMF/keypad sequence 1#.

After programming the radio per instructions in Section 10.2.1.1, perform the following:

1. From the PC already connected to the CS7000 Desktop Station, run a terminal emulation program such as HyperTerminal.
2. Setup the terminal program's COM Port to the port assigned to the USB connection.
3. The radio must be in OTP mode to program the Preset C button for use during OTP operation. At this point, there are several ways to accomplish placing the radio in OTP mode:
   a. If the procedure in Section 10.2.1.1 was previously performed, the radio should now be in OTP mode. If not, press the Preset C button to switch to OTP mode. Or;
   b. Using the control head's Ramp Control, scroll through the menu until the OTP system name is displayed. After a few seconds, the radio will automatically transition to OTP mode. Or;
   c. From the control head's keypad, press 1#. Or;
   d. From a tone remote controller connected to a Tone Remote CS7000 Desktop Station, send DTMF command 1#.
4. Verify the radio is in OTP mode and send the following commands to the radio via the terminal program:

   ```
   at@presetc15 [ENTER]

   AT&W [ENTER]
   ```

5. Cycle power to the radio and momentarily press the Preset C button. Verify the radio toggles from OTP mode to ECP mode. If not, repeat this section's instructions.
6. Momentarily press the Preset C button again. Verify the radio toggles from ECP mode to OTP mode.

7. Close the terminal program's session.
8. Re-read the radio's personality using RPM programming software and archive the completed personality changes.

10.2.2 User's Methods of Switching Between ECP Mode and OTP Mode

After performing the programming procedures in Sections 10.2.1.1 and 10.2.1.2, the user can switch the radio between ECP mode and OTP mode by pressing the **Preset C** button on the control head's front panel. This is the preferred method for changing modes.

Additionally, several other methods are also useable when in OTP mode and desiring to switch to ECP mode:

- Pressing 1# on a System CH-721 Control Unit's Numeric Keypad.
- Sending DTMF command 1# from a M7300 Radio's rear HD-DB44 External I/O Connector's External Mic and External PTT Inputs (with proper audio levels and PTT timing).
- Sending DTMF command 1# from a CH-721 Control Unit's rear DB25 External I/O Connector's External Mic and External PTT Inputs (with proper audio levels and PTT timing).

11 PREVENTIVE MAINTENANCE

Routine preventive maintenance is one of the most important aspects in maintaining good station performance. Routine preventive maintenance adds value through reduced/eliminated outages, minimized down-time, and planned off-peak time/maintenance procedures. Preventive maintenance should include but not be limited the following listed checks. Typically these checks should be performed on an annual basis, or more often in harsh environments. Any found damage or faults must be repaired:

- Visually inspect all site equipment for any physical damage caused by weather, vandalism, lightning strikes, etc. Where possible verify the condition of all external lightning protection devices.
- Verify **all** site equipment is properly grounded. Refer to *Site Grounding and Lightning Protection Guidelines Manual* AE/LZT 123 4618/1 as necessary. Refer to Section 5.5 for additional information.
- Verify the site's antenna is securely mounted and in good physical condition from a visual standpoint. Refer to Section 5.4 for additional information.
- Verify the site's antenna system is within its Voltage Standing-Wave Ratio (VSWR) specification, and properly grounded. Refer to Section 9.3 for additional information.
- Verify all antenna-related cabling, wiring and conduits are physically secure. Refer to Section 5.4.5 for additional information.
- If employed, verify all site backhaul equipment (i.e., routers, Ethernet switches, etc.) are physically secure and properly grounded. As necessary, consult the respective vendor manual for preventive maintenance procedures.
- Verify all weatherproofing materials are in good condition. This includes cabinet door and panel seals, seals at cable feed-thrus, coaxial cable connector seals, etc.
- Inspect and clean the station's rear panel fan at least every three (3) months of continuous station use, in accordance with Section 11.1.
- Inspect and clean the interior of the station at least every twelve (12) months of continuous station use. Use an ESD-safe vacuum to clean any dust buildup or other foreign particles from the interior of the station. At this time, the 80-centimeter fan's filter (if present) should be removed and thoroughly cleaned.
- If required, verify all building/cabinet locks are present and secure.
- Complete/File records of all performed preventive maintenance checks, findings and repairs as required.

11.1 INSPECTING AND CLEANING THE REAR PANEL FAN FILTER

Approximately every three (3) months of continuous station use, the 80-centimeter fan vent hole area on the rear panel of the station should be inspected for excessive dust build-up and/or other foreign material, and cleaned as necessary. Cleaning will ensure adequate airflow through the fan. If excessive dust or other foreign material is observed during an inspection, clean this area by vacuuming it. Removal of the station's top cover is not required for external cleaning.


NOTE

CS7000 Fan Upgrade Kit KT-018569-002 is available from the Harris Customer Care center. This kit includes replacement 40-centimeter and 80-centimeter fans, and a rear panel filter for improved cooling and quieter fan operation. Refer to installation manual MM-018569-002 for additional information. Customer Care center contact information is included in Section **Error! Reference source not found.** of this manual.

APPENDIX A
INSTALLATION CHECKLIST

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A.1 INSTALLATION CHECKLIST FOR CS7000 CONTROL STATION

Fill out all information as they apply to the CS7000 Desktop installation. A copy of this must be given to the equipment owner.

CUSTOMER INFORMATION

Licensee Name: _____

FCC License ID/Call Sign: _____

Customer Contact (Name): _____

Site Address: _____

_____

Site Name: _____

Site Latitude (Deg., Min., Sec.): _____

Site Longitude (Deg., Min., Sec.): _____

INSTALLER INFORMATION

Company's Name: _____

Installer's Name(s): _____

_____

Test Technician's Name: _____

Test Equipment Used: _____

_____

_____

_____

EQUIPMENT/INSTALLATION INFORMATION

CS7000 Model Number: _____

CS7000 Serial Number: _____

Antenna Manufacturer and Model: _____

Antenna Gain: _____ dBi dBd (circle one)

Combined Feed line losses: _____ dB

Max ERP (per station authorization) _____ Watts (refer to Section 9.2)

Maximum Transmitter Power Output to meet ERP requirement: _____ Watts (refer to Section 9.2)

TRANSMITTER MEASUREMENTS (Per FCC rules 47CFR90.215 or similar)

TX RF Power out (Forward): _____ Watts (refer to Section 9.3)

TX RF Power out (Reflected): _____ Watts (refer to Section 9.3)

Transmitter Frequency: _____ MHz (refer to Section 9.4)

Transmitter Modulation (Deviation): _____ kHz (refer to Section 9.4)

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APPENDIX B
MODEL 24-66 TONE REMOTE CONTROLLER USING STRAIGHT THROUGH TELCO CABLE

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B.1 CONFIGURING MODEL 24-66 TONE REMOTE CONTROLLER TO USE PRE-MADE OFF-THE-SHELF TELEPHONE LINE CABLES DURNG LOCAL 4-WIRE OPERATION

The IDA Model 24-66 Tone Remote Controller's Telephone Line Connector is wired the same as Harris Desktop and Control Stations' Telephone Line Connectors (i.e., phone line connectors). The Model 24-66's 4-Wire Audio LINE_OUT is on RJ-11 pins 3 and 4. The Model 24-66's LINE_IN is on RJ-11 pins 2 and 5. Consequently, a standard direct-connect pin-for-pin RJ-11 telephone cable will connect the two device's outputs together and it will connect the two device's inputs together. This applies to both the CS7000 Control Station and the M7100 Desktop Station.

B.1.1 Model 24-66 Tone Remote Controller Transformer Usage

T2: 4-Wire Audio LINE_OUT and 2-Wire Audio Telephone Line

T3: 4-Wire Audio LINE_IN

B.1.2 Model 24-66 Tone Remote Controller Jumper Designations

J5 is an 8-pin RJ-45 modular connector and J6 is a 6-pin RJ-11 modular connector. Therefore, the pin numbers for each telephone line pair differ. For the following jumper table, the inner-most pair, RJ-11 pins 3 and 4, (RJ-45 pins 4 and 5), is called LINE_1. The middle pair on the RJ-11, pins 2 and 5 (RJ-45 pins 3 and 6) is called LINE_2.

Table B-1: Model 24-66 Tone Remote Controller Jumper Designations

JUMPER	2-WIRE	4-WIRE	USED FOR
JP1	•		T2 LINE_IN Input To Controller's Audio Input
JP3	•	•	J6 LINE_1 (RJ-11 pin 4) To T2-
JP4	•	•	J6 LINE_1 (RJ-11 pin 3) To T2+
JP5	•	•	J5 LINE_1 (RJ-45 pin 5 - RJ-11 pin 4) To T2-
JP6	•	•	J5 LINE_1 (RJ-45 pin 4 - RJ-11 pin 3) To T2+
JP7		•	J6 LINE_2 (RJ-11 pin 2) To T3+
JP8		•	J6 LINE_2 (RJ-11 pin 5) To T3-
JP9		•	J5 LINE_2 (RJ-45 pin 3 - RJ-11 pin 2) To T3+
JP10		•	J5 LINE_2 (RJ-45 pin 6 - RJ-11 pin 5) To T3-

• = Jumper installed

B.1.3 Suggested Solution

Two-pin jumpers JP3 through JP10 connect J5 and J6 connector pins to transformer pins. These jumpers are located in a jumper field near the two transformers. When the shorting bar is removed from the jumper, one has access to the connector pin and the transformer pin. Wire jumpers can then be made to "cross" the two telephone lines. This is shown in Figure B-1.

This configuration requires eight (8) wires. The task can be reduced somewhat by just changing the wiring for one of the connectors. Units can then be daisy-chained by the use of readily available RJ-11 adapters.

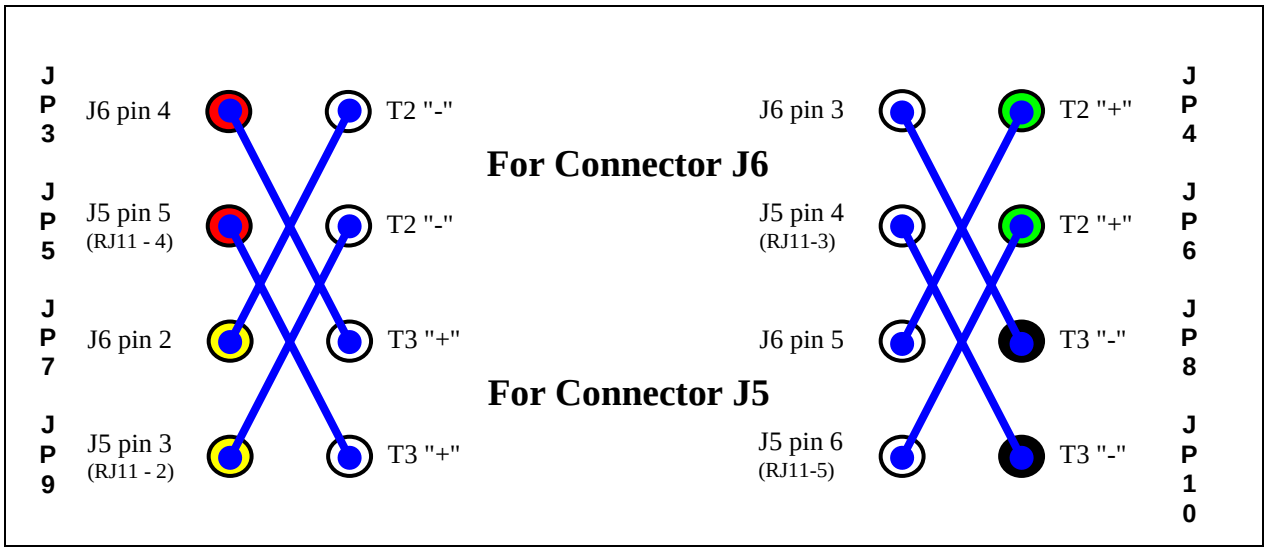

Figure B-1: Model 24-66 Tone Remote Controller Jumper Modification

B.1.4 Two-Pin Shorting Bar Implementation

Jumpers can be readily made from two-pin shorting bars. These mount conveniently when the shorting bar is oriented in the Y-axis of the TRC and where the unconnected pin of the shorting bar is facing toward the rear of the remote controller.

The preferred solution is a 2-wire cable that crosses the two pins across the cable's connector.

B.1.5 Two-Wire Operation

For 2-wire audio applications, a Model 24-66 Tone Remote Controller uses transformer T2 for both directions. As shipped, these controllers use the inner pair (RJ-11 connector pins 3 and 4) of their telephone line connectors. This is compatible with the 2-wire audio desktop station applications. Consequently, a Model 24-66 Tone Remote Controller will work as shipped with a 2-wire audio desktop/control station.

When the above configuration is made, the Model 24-66 Tone Remote Controller will use the middle pair (RJ-11 pins 2 and 5) as its 2-wire audio telephone line. This is not desirable.

The solution to this situation where a Model 24-66 Tone Remote Controller could be used in 2-wire or fore 4-wire audio applications is then to do the configuration for one telephone line connector and then set the jumpers for the other telephone line connector's inner pair to transformer T2.

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WARRANTY REGISTRATION

Please register this product within ten (10) days of purchase. Registration validates the warranty coverage, and enables Harris to contact you in case of any safety notifications issued for this product.

Registration can be made on-line at www.pspc.harris.com/CustomerService or by contacting Harris Warranty Administration at the following:

United States and Canada:

- Phone Number: 1-800-368-3277, Option 4 (toll free)
- Fax Number: 1-434-455-6821
- E-mail: WarrantyClaims@Harris.com

International:

- Phone Number: 1-434-455-6403
- Fax Number: 1-434-455-6676
- E-mail: WarrantyClaims@Harris.com

WARRANTY

A. Harris Corporation, a Delaware Corporation, through its RF Communications Division (hereinafter "Seller") warrants to the original purchaser for use (hereinafter "Buyer") that Equipment manufactured by or for the Seller shall be free from defects in material and workmanship, and shall conform to its published specifications. With respect to all non-Seller Equipment, Seller gives no warranty, and only the warranty, if any, given by the manufacturer shall apply. Rechargeable batteries are excluded from this warranty but are warranted under a separate Rechargeable Battery Warranty (ECR-7048).

B. Seller's obligations set forth in Paragraph C below shall apply only to failures to meet the above warranties occurring within the following periods of time from date of sale to the Buyer and are conditioned on Buyer's giving written notice to Seller within thirty (30) days of such occurrence:

1. for fuses and non-rechargeable batteries, operable on arrival only.
2. for parts and accessories (except as noted in B.1), ninety (90) days.
3. for P7300, P7200, P7100^{IP}, P5400, P5300, P5200, P5100, P3300, M7300, M7200 (including V-TAC), M7100^{IP}, M5300 and M3300 radios, two (2) years, effective 10/01/2007.
4. for Unity® XG-100P, three (3) years.
5. for all other equipment of Seller's manufacture, one (1) year.

C. If any Equipment fails to meet the foregoing warranties, Seller shall correct the failure at its option (i) by repairing any defective or damaged part or parts thereof, (ii) by making available at Seller's factory any necessary repaired or replacement parts, or (iii) by replacing the failed Equipment with equivalent new or refurbished Equipment. Any repaired or replacement part furnished hereunder shall be warranted for the remainder of the warranty period of the Equipment in which it is installed. Where such failure cannot be corrected by Seller's reasonable efforts, the parties will negotiate an equitable adjustment in price. Labor to perform warranty service will be provided at no charge during the warranty period only for the Equipment covered under Paragraph B.3 and B.4. To be eligible for no-charge labor, service must be performed at Seller's factory, by an Authorized Service Center (ASC) or other Servicer approved for these purposes either at its place of business during normal business hours, for mobile or personal equipment, or at the Buyer's location, for fixed location equipment. Service on fixed location equipment more than thirty (30) miles from the Service Center or other approved Servicer's place of business will include a charge for transportation.

D. Seller's obligations under Paragraph C shall not apply to any Equipment, or part thereof, which (i) has been modified or otherwise altered other than pursuant to Seller's written instructions or written approval or, (ii) is normally consumed in operation or, (iii) has a normal life inherently shorter than the warranty periods specified in Paragraph B, or (iv) is not properly stored, installed, used, maintained or repaired, or, (v) has been subjected to any other kind of misuse or detrimental exposure, or has been involved in an accident.

E. The preceding paragraphs set forth the exclusive remedies for claims based upon defects in or nonconformity of the Equipment, whether the claim is in contract, warranty, tort (including negligence), strict liability or otherwise, and however instituted. Upon the expiration of the warranty period, all such liability shall terminate. The foregoing warranties are exclusive and in lieu of all other warranties, whether oral, written, expressed, implied or statutory. NO IMPLIED OR STATUTORY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY. IN NO EVENT SHALL THE SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL, INDIRECT OR EXEMPLARY DAMAGES.

This warranty applies only within the United States.

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