

USER'S GUIDE

# MCP CAB RADIO A53470

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## FCC RULES COMPLIANCE

The equipment covered in this manual has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### FCC PART 90 AND PART 101 REQUIREMENTS

This device contains a radio transceiver which operates under Parts 90.210 and 101.101 of the FCC rules in a licensed part of the radio spectrum. It is the user's responsibility to obtain required licensing and authorization to operate this device. Qualified personnel must perform service or repairs to the radio portion of this device. Any unauthorized modification to the radio module, shielding, or antenna system may void the user's authority to operate this device.



#### RF EXPOSURE WARNING



All antenna installation and servicing is to be performed by qualified technical personnel only. When servicing or working at distances closer than 10 feet (3.05 meters), ensure the transmitter has been disabled. Depending upon the application and the gain of the antenna, the total composite power could exceed 200 watts EIRP. The antenna location should be such that only qualified technical personnel can access it, and under normal operating conditions no other person can come in contact or approach within 10 feet (3.05 meters) of the antenna.

This device complies with the following RF energy exposure standards and guidelines:

- United States Federal Communications Commission, 47 CFR part 2 sub-part J
- American National Standards Institute (ANSI)/Institute of Electrical and Electronic Engineers (IEEE) C95.1-1992
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998
- Ministry of Health (Canada) Safety Code 6. Limits Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz, 1999
- Australian Communications Authority Radiocommunications (Electromagnetic Radiation - Human Exposure) Standard, 2003
- ANATEL, Brasil Regulatory Authority, Resolution 256 (April 11, 2001)

## **NOTES, CAUTIONS, AND WARNINGS**

Throughout this manual, notes, cautions and warnings may be used to direct the reader's attention to specific information. Use of the three terms is defined as follows:

### **NOTE**

Generally used to highlight certain information relating to the topic under discussion.

### **CAUTION**

APPEARS IN UPPERCASE TYPE AND REFERS TO PROPER PROCEDURES OR PRACTICES WHICH IF NOT STRICTLY OBSERVED, WILL RESULT IN DAMAGE TO THE EQUIPMENT. CAUTIONS TAKE PRECEDENCE OVER NOTES AND ALL OTHER INFORMATION, EXCEPT WARNINGS.

### **WARNING**

HIGHLIGHTED IN BOLD, UPPERCASE TYPE AND APPLIES TO SAFE AND RELIABLE OPERATION OF SAFETRAN EQUIPMENT. WARNINGS ALWAYS TAKE PRECEDENCE OVER NOTES, CAUTIONS, AND ALL OTHER INFORMATION.

Refer all questions to Safetran Customer Service.

## **ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS**

Static electricity can damage electronic circuitry, particularly low voltage components such as the integrated circuits commonly used throughout the electronics industry. Therefore, procedures have been adopted industry-wide which make it possible to avoid the sometimes invisible damage caused by electrostatic discharge (ESD) during the handling, shipping, and storage of electronic modules and components. Safetran has instituted these practices at its manufacturing facility and encourages its customers to adopt them as well to lessen the likelihood of equipment damage in the field due to ESD. Some of the basic protective practices include the following:

- Ground yourself before touching card cages, modules, or components.
- Remove circuit boards (modules) from card cages by the ejector lever only.
- Handle circuit boards by the edges only.
- Never physically touch the circuit board contact fingers or allow these fingers to come in contact with an insulator (e.g., plastic, rubber, etc.).
- When not in use, place circuit boards in approved static-shielding bags, contact fingers first. Remove circuit boards from static-shielding bags by grasping the ejector lever or the edge of the board only. Each bag should include a caution label on the outside indicating static-sensitive contents.
- Cover workbench surfaces used for repair of electronic equipment with static dissipative workbench matting.
- Use integrated circuit extractor/inserters tools designed to remove and install electrostatic-sensitive integrated circuit devices such as PROMs (OK Industries, Inc., Model EX-2 Extractor and Model MOS-40 Inserter (or equivalent) are highly recommended).
- Utilize only anti-static cushioning material in equipment shipping and storage containers.

For information concerning ESD material applications, please contact the Safetran California Division Technical Support Staff in Ranch Cucamonga, California. ESD Awareness Classes and additional ESD product information are also available through the Technical Support Staff.

# TABLE OF CONTENTS

| <u>SECTION</u> | <u>TITLE</u>   | <u>PAGE</u> |
|----------------|--|-------------|
|                | PROPRIETARY INFORMATION .....                        | ii          |
|                | TRANSLATIONS .....                                   | ii          |
|                | WARRANTY INFORMATION .....                           | ii          |
|                | SALES AND SERVICE LOCATIONS .....                    | ii          |
|                | FCC RULES COMPLIANCE .....                           | iii         |
|                | FCC PART 90 AND PART 101 REQUIREMENTS.....           | iii         |
|                | RF EXPOSURE WARNING .....                            | iii         |
|                | NOTES, CAUTIONS, AND WARNINGS .....                  | iv          |
|                | ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS .....      | v           |
|                | GLOSSARY .....                                       | xi          |
| <b>1</b>       | <b>1 - INTRODUCTION .....</b>                        | <b>1-1</b>  |
| 1.1            | OVERVIEW.....  | 1-1         |
| 1.2            | EQUIPMENT DESCRIPTION.....                           | 1-2         |
| 1.3            | INDICATORS AND CONNECTORS .....                      | 1-4         |
| 1.3.1          | Pin-outs for Client Ports J1 .....                   | 1-5         |
| 1.3.2          | Pin-outs for Client Port J2.....                     | 1-5         |
| 1.3.3          | Pin-outs for Echelon® and Isolated I/O .....         | 1-6         |
| 1.3.4          | Pin-outs Diag Port (DB-9) .....                      | 1-6         |
| 1.3.5          | Radio Diag Port.....                                 | 1-7         |
| 1.3.6          | Pin-outs for Power.....                              | 1-7         |
| 1.4            | LOGIC BOARD 53076.....                               | 1-8         |
| 1.5            | SPECIFICATIONS .....                                 | 1-9         |
| 1.6            | ORDERING INFORMATION.....                            | 1-11        |
| 1.6.1          | Cab Radio Ordering Information.....                  | 1-11        |
| 1.6.2          | Cab Radio Mating Connector Ordering Information..... | 1-11        |
| <b>2</b>       | <b>2 - INSTALLATION AND SET UP .....</b>             | <b>2-1</b>  |
| 2.1            | INSTALLATION .....                                   | 2-1         |
| 2.1.1          | Grounding.....                                       | 2-2         |
| 2.1.2          | MCP Cab Radio Cabinet .....                          | 2-2         |
| 2.1.3          | Cable Installation.....                              | 2-3         |
| 2.1.3.1        | J1 Client Cable .....                                | 2-3         |
| 2.1.3.1.1      | Ferrite Installation Procedure .....                 | 2-4         |
| 2.1.3.2        | Echelon® and Isolated I/O Connection .....           | 2-4         |
| 2.1.3.3        | Antenna Connection.....                              | 2-5         |
| 2.1.3.4        | Power Connection .....                               | 2-6         |
| 2.2            | XCMMMAINT SOFTWARE .....                             | 2-6         |
| 2.2.1          | Radio Settings.....                                  | 2-7         |
| 2.2.2          | Site Settings.....                                   | 2-7         |
| 2.2.3          | Lontalk® (Echelon®) Network Configuration .....      | 2-8         |

|            |   |            |
|------------|---|------------|
| 2.2.4      | Port Information.....                                     | 2-8        |
| <b>3</b>   | <b>- OPERATION.....</b>                                   | <b>3-1</b> |
| 3.1        | OVERVIEW.....   | 3-1        |
| 3.2        | CAB RADIO FREQUENCY CONTROL.....                          | 3-3        |
| 3.3        | RADIO MESSAGES.....                                       | 3-3        |
| 3.3.1      | Temporary Speed Restriction (TSR).....                    | 3-3        |
| 3.3.2      | Interlocking Status.....                                  | 3-4        |
| 3.4        | POSITIVE TRAIN CONTROL.....                               | 3-4        |
| <b>4</b>   | <b>- SERVICE.....</b>                                     | <b>4-1</b> |
| 4.1        | OVERVIEW.....   | 4-1        |
| 4.2        | MCP DIAGNOSTICS.....                                      | 4-1        |
| 4.2.1      | Opening XCMMMAINT.....                                    | 4-1        |
| 4.2.2      | Selecting File.....                                       | 4-2        |
| 4.2.3      | Unit Configuration.....                                   | 4-2        |
| 4.2.4      | Terminal Mode.....  | 4-3        |
| 4.2.4.1    | Terminal Mode Commands.....                               | 4-4        |
| 4.2.4.1.1  | AL en/ds - Alarm Logging.....                             | 4-4        |
| 4.2.4.1.2  | DCP - Display Codeplug.....                               | 4-5        |
| 4.2.4.1.3  | DDC - DC Configuration Values.....                        | 4-6        |
| 4.2.4.1.4  | VER - Firmware Hardware Codeplug Version Information..... | 4-7        |
| 4.2.4.1.5  | BSTAT - Active Base Station Status.....                   | 4-7        |
| 4.2.4.1.6  | CSTAT - Communication Statistics.....                     | 4-8        |
| 4.2.4.1.7  | HSTAT - HDLC Statistics.....                              | 4-9        |
| 4.2.4.1.8  | MSTAT - Manufacturer Statistics.....                      | 4-9        |
| 4.2.4.1.9  | LOG - Display Log.....                                    | 4-10       |
| 4.2.4.1.10 | SL - Status Log.....                                      | 4-10       |
| 4.2.4.1.11 | TIMERS - Display Timer Configurations.....                | 4-11       |
| 4.2.4.1.12 | TEST restart - MCP Self-Test.....                         | 4-11       |
| 4.2.4.1.13 | SERV - Service Command.....                               | 4-12       |
| 4.2.4.1.14 | CHAN - Change Channel (SERV Mode Only).....               | 4-12       |
| 4.2.4.1.15 | ERT - Error Rate Test (SERV Mode Only).....               | 4-13       |
| 4.2.4.1.16 | PTT en/ds - Push To Talk (SERV Mode Only).....            | 4-15       |
| 4.2.4.1.17 | SIMP en/ds - Simplex Command (SERV Mode Only).....        | 4-16       |
| 4.2.4.1.18 | Exit SERV Mode.....                                       | 4-16       |
| 4.2.4.2    | Bit Map Display.....                                      | 4-17       |
| 4.2.4.3    | Read DC Configuration from Unit.....                      | 4-18       |
| 4.2.4.4    | Read Codeplug from Unit.....                              | 4-18       |
| 4.2.4.5    | Upload Codeplug to Unit.....                              | 4-19       |
| 4.2.4.6    | Upload DC Configuration to Unit.....                      | 4-19       |
| 4.2.4.7    | Upload Logic to Unit.....                                 | 4-19       |
| 4.2.4.8    | Upload Labels to Unit.....                                | 4-20       |
| 4.2.4.9    | Radio Diagnostics.....                                    | 4-20       |
| 4.2.4.9.1  | Activation of Radio Diagnostics Port.....                 | 4-20       |
| 4.2.4.10   | Radio Configuration Software.....                         | 4-21       |

|             |   |      |
|-------------|---|------|
| 4.2.4.10.1  | Opening Radio Configuration Software.....   | 4-22 |
| 4.2.4.10.2  | Open Com Port.....                          | 4-22 |
| 4.2.4.10.3  | Radio Information .....                     | 4-23 |
| 4.2.4.10.4  | Radio Settings.....                         | 4-23 |
| 4.2.4.10.5  | Options.....                                | 4-24 |
| 4.2.4.10.6  | Main Menu .....                             | 4-24 |
| 4.2.4.10.7  | Diagnostic Maintenance and Calibration..... | 4-25 |
| 4.2.4.10.8  | Auto-Configure .....                        | 4-26 |
| 4.2.4.10.9  | Programming Transmit Frequency.....         | 4-30 |
| 4.2.4.10.10 | Programming a Receive Frequency .....       | 4-31 |
| 4.2.4.10.11 | Setting Transmit Power Level .....          | 4-31 |
| 4.2.4.10.12 | Program Time-out Timer Delay .....          | 4-32 |
| 4.2.4.10.13 | Program Loopback Code .....                 | 4-32 |
| 4.2.4.10.14 | Program Diagnostic Mode Level.....          | 4-33 |
| 4.2.4.10.15 | Program CTS Delay .....                     | 4-33 |
| 4.2.4.10.16 | Program PTT Delay .....                     | 4-33 |
| 4.2.4.10.17 | Switched Carrier Mode.....                  | 4-33 |
| 4.2.4.10.18 | Program Modem Type.....                     | 4-33 |
| 4.2.4.10.19 | Program Emphasis.....                       | 4-33 |
| 4.2.4.10.20 | Program Owner's Name.....                   | 4-33 |
| 4.2.4.10.21 | Program Owner's Message .....               | 4-33 |
| 4.2.4.10.22 | Program Soft Carrier Dekey Delay .....      | 4-33 |
| 4.2.4.10.23 | Program Squelch Tail Eliminator .....       | 4-34 |
| 4.2.4.10.24 | Program TX Level .....                      | 4-34 |
| 4.2.4.10.25 | Program RX Level.....                       | 4-34 |
| 4.2.4.10.26 | Closing MDS Configuration Software.....     | 4-34 |



## LIST OF FIGURES

| <u>FIGURE NUMBER</u> | <u>TITLE</u>   | <u>PAGE</u> |
|----------------------|--|-------------|
| Figure 1-1           | A53470 MCP Cab Radio.....                                | 1-1         |
| Figure 1-2           | Cab Radio Block Diagram .....                            | 1-2         |
| Figure 1-3           | Cab Radio Views .....                                    | 1-3         |
| Figure 1-4           | Indicators and Connectors .....                          | 1-4         |
| Figure 1-5           | Radio Diag Port Pin-out.....                             | 1-7         |
| Figure 1-6           | Logic Board Access Panel.....                            | 1-8         |
| Figure 2-1           | Pem Nut Locations.....                                   | 2-1         |
| Figure 2-2           | Mounting Dimensions.....                                 | 2-1         |
| Figure 2-3           | Chassis Grounding Screws .....                           | 2-2         |
| Figure 2-4           | Cable Installation .....                                 | 2-3         |
| Figure 2-5           | Installing Ferrite Filter on Data Cable .....            | 2-4         |
| Figure 2-6           | Completed Ferrite Installation .....                     | 2-4         |
| Figure 2-7           | XCMMMAINT Software - Version Verification.....           | 2-6         |
| Figure 2-8           | XCMMMAINT Software - Radio Settings.....                 | 2-7         |
| Figure 2-9           | XCMMMAINT Software - Site Settings.....                  | 2-7         |
| Figure 2-10          | XCMMMAINT Software - Lontalk® Network Configuration..... | 2-8         |
| Figure 2-11          | XCMMMAINT Software - Port Information.....               | 2-8         |
| Figure 3-1           | Locomotive Configuration.....                            | 3-1         |
| Figure 3-2           | Typical Network Configuration .....                      | 3-2         |
| Figure 3-3           | Cab Radio Frequency Control .....                        | 3-3         |
| Figure 3-4           | Temporary Speed Restriction Example.....                 | 3-3         |
| Figure 3-5           | Interlocking Status .....                                | 3-4         |
| Figure 3-6           | PTC Display.....   | 3-4         |
| Figure 4-1           | Opening XCMMMAINT.....                                   | 4-1         |
| Figure 4-2           | Filename Select.....                                     | 4-2         |
| Figure 4-3           | Opening Screen .....                                     | 4-2         |
| Figure 4-4           | Terminal Mode.....                                       | 4-3         |
| Figure 4-5           | Terminal Mode - Help Screen .....                        | 4-3         |
| Figure 4-6           | Display Alarms.....                                      | 4-4         |
| Figure 4-7           | Display Codeplug Contents .....                          | 4-5         |
| Figure 4-8           | Display DC Configuration.....                            | 4-6         |
| Figure 4-9           | Version Identification.....                              | 4-7         |
| Figure 4-10          | Base Station List .....                                  | 4-7         |
| Figure 4-11          | Communication Statistics .....                           | 4-8         |
| Figure 4-12          | HDLC Statistics .....                                    | 4-9         |
| Figure 4-13          | Manufacturer Statistics.....                             | 4-9         |
| Figure 4-14          | View Log .....   | 4-10        |
| Figure 4-15          | Status Log.....  | 4-10        |
| Figure 4-16          | Timer Status.....  | 4-11        |

|             |   |      |
|-------------|---|------|
| Figure 4-17 | MCP Self-test.....  | 4-11 |
| Figure 4-18 | Service (SERV) Mode .....   | 4-12 |
| Figure 4-19 | Change RX/TX Channel .....  | 4-12 |
| Figure 4-20 | Error Rate Test Screens .....   | 4-13 |
| Figure 4-21 | PTT - Push To Talk Command .....                                      | 4-15 |
| Figure 4-22 | Simplex and Normal Mode Displays .....                                | 4-16 |
| Figure 4-23 | Exit SERV Mode .....  | 4-16 |
| Figure 4-24 | Bitmap Display .....  | 4-17 |
| Figure 4-25 | Read DC Configuration from Unit .....                                 | 4-18 |
| Figure 4-26 | Read Codeplug from Unit .....   | 4-18 |
| Figure 4-27 | Activation of Radio Diagnostics Port.....                             | 4-20 |
| Figure 4-28 | Exit XCMMMAINT .....  | 4-21 |
| Figure 4-29 | Configuration Software - Opening Screen .....                         | 4-22 |
| Figure 4-30 | Configuration Software - Open Comm Port.....                          | 4-22 |
| Figure 4-31 | Configuration Software - Radio Information Tab.....                   | 4-23 |
| Figure 4-32 | Configuration Software - Radio Settings Tab .....                     | 4-23 |
| Figure 4-33 | Configuration Software - Radio Options.....                           | 4-24 |
| Figure 4-34 | Configuration Software - Main Menu.....                               | 4-24 |
| Figure 4-35 | Configuration Software - Main Menu - Diag. Maint. & Calib.....        | 4-25 |
| Figure 4-36 | Configuration Software - Diagnostic Maintenance and Calibration ..... | 4-25 |
| Figure 4-37 | Configuration Software - Auto-Configure Current Radio.....            | 4-26 |
| Figure 4-38 | Configuration Software - Auto Configure Utility.....                  | 4-27 |
| Figure 4-39 | Configuration Software - Auto Configure Programming Example.....      | 4-29 |
| Figure 4-40 | Configuration Software - Program Transmit Frequency .....             | 4-30 |
| Figure 4-41 | Configuration Software - Program Receive Frequency .....              | 4-31 |
| Figure 4-42 | Configuration Software - Setting Transmit Power Level .....           | 4-32 |
| Figure 4-43 | Closing the MDS Configuration Software.....                           | 4-34 |

## LIST OF TABLES

| <b><u>TABLE NUMBER</u></b> | <b><u>TITLE</u></b>                              | <b><u>PAGE</u></b> |
|----------------------------|--|--------------------|
| Table 1-1                  | Pin-outs J1 Client Port .....                    | 1-5                |
| Table 1-2                  | Pin-outs J2 Client Port .....                    | 1-5                |
| Table 1-3                  | Pin-out for Echelon® and Isolated I/O .....      | 1-6                |
| Table 1-4                  | Pin-out for Diag Port .....                      | 1-6                |
| Table 1-5                  | Pin-outs for Power Connector .....               | 1-7                |
| Table 2-1                  | Length vs. Loss in Coaxial Cable at 960 MHz..... | 2-5                |

## GLOSSARY

|              |  |
|--------------|--|
| <b>AAR:</b>  | <u>Association of American Railroads</u> - An organization that establishes uniformity and standardization among different railroad systems.   |
| <b>ABM:</b>  | <u>Asynchronous Balance Mode</u> – Used as an identifier for a HDLC protocol.  |
| <b>ADM:</b>  | <u>Asynchronous Disconnect Mode</u> – Used as an identifier for a HDLC protocol.   |
| <b>AEI:</b>  | <u>Automatic Equipment Identification</u> - Equipment installed at sites along the track to read and report train consist information.   |
| <b>ARES:</b> | <u>Advanced Railroad Electronics System</u> - Made by Rockwell International as an alternative to AAR ATCS.  |
| <b>ATCS:</b> | <u>Advanced Train Control System</u> - A set of standards compiled by the AAR for controlling all aspects of train operation.  |
| <b>BCP:</b>  | <u>Base Communications Package</u> - Defined by the ATCS specifications as the transmitter / receiver base station and associated processors to handle communications between mobile and central office equipment. |
| <b>BER:</b>  | <u>Bit Error Rate</u> - Expresses the quality of a communications in the number of errors per bits sent.   |
| <b>BPSK:</b> | <u>Binary Phase Shift Keying</u> - A method of modulating a carrier signal to carry two bits of information in every cycle.  |
| <b>CBT:</b>  | <u>Common Base Technology</u> – A term referring to product design using a modular based approach.   |
| <b>CC:</b>   | <u>Cluster Controller</u> - An ATCS ground network node responsible for the control of BCP's.  |
| <b>CPC:</b>  | <u>Central Protocol Converter</u> - Modular component of Safetran's R/Link™ Radio Control System that converts CTC code line control and indication message data to ATCS-compatible data.                          |
| <b>CRC:</b>  | <u>Cyclic Redundancy Check</u> - The CRC on a data packet is normally calculated and appended to the data so that the receiver can verify that no data was lost or corrupted during transit.                       |

## GLOSSARY

|                        |   |
|------------------------|---|
| <b>CMSA/CA:</b>        | <u>Carrier-Sense-Multiple-Access/Collision Avoidance</u> - A scheme for allowing multiple transmitters sharing a single medium to cooperatively timeshare with a minimum of overlap and interference.                                       |
| <b>CTC:</b>            | <u>Central Traffic Control System</u>   |
| <b>CTS:</b>            | <u>Clear To Send</u>  |
| <b>dB:</b>             | Abbreviation for decibel. The standard unit for expressing transmission gain or loss and relative power levels. Decibels indicate the log ratio of power output to power input.   |
| <b>dB<sub>i</sub>:</b> | Abbreviation for decibels referenced to an isotropic (unipole) antenna.   |
| <b>dB<sub>m</sub>:</b> | Abbreviation for decibels above (or below) one milliwatt.   |
| <b>DCE:</b>            | <u>Data Communications Equipment</u> - A device that merely transports but does not originate or consume data.  |
| <b>DEVICE:</b>         | Specific to the Contents Listing, MCF Approval Listing, and Diagnostic Terminal Utility, a device represents the smallest possible breakdown of an ATCS address which may identify a Virtual Circuit, cut section, signal SAT, module, etc. |
| <b>DTE:</b>            | <u>Data Terminal Equipment</u> - Any device (printer, terminal, PC, host computer) that originates or consumes data over a transmission facility.   |
| <b>EIA:</b>            | <u>Electronics Industries Association</u> - A standards organization in the U.S. specializing in the electrical and functional characteristics of interface equipment.  |
| <b>ECP:</b>            | <u>Emergency Control Protocol</u>   |
| <b>ERP:</b>            | <u>Effective Radiated Power</u> - The product of the antenna power (transmitter power less transmission-line loss) times either the antenna power gain or the antenna field gain squared.   |
| <b>FEP:</b>            | <u>Front End Processor</u> - An ATCS ground network node responsible for providing network access to ground host and terminal users (provides network interfacing).   |

## GLOSSARY

|                          |  |
|--------------------------|--|
| <b>FIFO:</b>             | <u>First In, First Out</u> - A buffer or shift register configured so that the first data queued is the first data de-queued - i.e. the sequence is preserved.                               |
| <b>FSK:</b>              | <u>Frequency Shift Keying</u> - A baseband modulation technique that conveys digital information over analog facilities by associative discrete logical states with pre-defined frequencies. |
| <b>GENI (F):</b>         | <u>Genesys Field Protocol</u>  |
| <b>GENI (O):</b>         | <u>Genesys Office Protocol</u>   |
| <b>HAYES AT COMMAND:</b> | A set of commands defined by the Hayes Corporation for the control and configuration of modems.  |
| <b>HDLC:</b>             | <u>High-level Data Link Control</u> - A serial protocol for exchanging synchronous information.  |
| <b>IP:</b>               | <u>Internet Protocol</u> - ISO Model Layer 3 (network) protocol that performs proper routing of packets.   |
| <b>LAN:</b>              | <u>Local Area Network</u> - A limited network where the data transfer medium is generally wires or cable.  |
| <b>LINK MARGIN:</b>      | The amount of received signal strength beyond the receiver threshold reserved to compensate for normal signal fluctuations.  |
| <b>LSB:</b>              | <u>Least Significant Bit</u> of a binary number (having the lowest numerical weight)   |
| <b>MCP/WCP:</b>          | <u>Mobile/Wayside Communications Package</u> - The radio and associated processor used by mobile and wayside ATCS compatible equipment to communicate to the central office.                 |
| <b>MCP:</b>              | <u>Mobile Communications Package</u> - The radio and associated processor used by mobile ATCS compatible equipment to communicate to the central office.                                     |
| <b>MCS:</b>              | Harmon Protocol  |
| <b>MSB:</b>              | <u>Most Significant Bit</u> of a binary number (having the greatest numerical weight)  |
| <b>NUL:</b>              | <u>Null</u> - Used as an identifier for a HDLC protocol.   |

## GLOSSARY

|                    |  |
|--------------------|--|
| <b>NULL MODEM:</b> | A cable or other device that connects two DTE devices directly by emulating the physical connections of a DCE (the Transmit output of each DTE is connected to the Receive input of the other DTE).                        |
| <b>POL</b>         | <u>Polled</u> – Used as an identifier for a HDLC protocol.   |
| <b>RCI:</b>        | <u>Receive Clock In</u>  |
| <b>RS232:</b>      | EIA interface standard between DTE and DCE, employing serial binary data interchange.  |
| <b>RS422:</b>      | EIA interface standard that extends transmission speeds and distances beyond RS232, employing a balanced-voltage system with a high level of noise immunity.   |
| <b>RSSI:</b>       | <u>Received Signal Strength Indication</u> - A numerical value indicating the relative strength of received carrier.   |
| <b>RTS:</b>        | <u>Ready To Send</u>   |
| <b>RTU:</b>        | <u>Remote Terminal Unit</u> - Also known as Field Code Unit or Code Unit. Used to perform non-vital I/O under control of a central office unit.  |
| <b>RXD:</b>        | <u>Receive Data</u>  |
| <b>SCS:</b>        | <u>Safetran Code System</u>  |
| <b>SSI:</b>        | <u>Signal Strength Indicator</u> - A measure of the relative strength of an incoming RF signal when it was received by a BCP.  |
| <b>SSR:</b>        | <u>Spread Spectrum Radio</u> - A transmitter/receiver that uses a method of radio transmission in which the transmitted energy is evenly spread over the complete bandwidth of the radio, resulting in small RF signature. |
| <b>TCI:</b>        | <u>Transmit Clock In</u>   |
| <b>TCO:</b>        | <u>Transmit Clock Out</u>  |

## GLOSSARY

|                |   |
|----------------|---|
| <b>TCP/IP:</b> | <u>Transmission Control Protocol/Internet Protocol</u> - The Internet protocol used to connect a world-wide internetwork of universities, research laboratories, military installations, organizations, and corporations. The TCP/IP includes standards for how computers communicate and conventions for connecting network and routing traffic. |
| <b>TXD:</b>    | <u>Transmit Data</u>  |
| <b>UDP:</b>    | <u>User Datagram Protocol</u> - A transport protocol used primarily for the transmission of network management information. Not as reliable as TCP.   |
| <b>WIU:</b>    | <u>Wayside Interface Unit</u>   |

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## SECTION 1

### INTRODUCTION

#### 1 - INTRODUCTION

##### 1.1 OVERVIEW

The Mobile Communications Package (MCP) Cab Radio 53470 is a ruggedized unit for on board applications (e.g., locomotive) of the Safetran 53411 Wayside Communications Package (WCP). Mil-spec type connectors are used for power and I/O client ports. A two piece metal housing encapsulates the components.



Figure 1-1 A53470 MCP Cab Radio

## 1.2 EQUIPMENT DESCRIPTION

The 53470 Cab Radio consists of a UHF radio and 30 watt RF power amplifier. The Safetran 53076 Logic Board serves as an interface between the radio and the I/O data as well as a control head for radio operation. Mil-spec Client I/O ports A Type-N RF connector is provided for an external antenna. Diagnostic ports are panel mounted for the radio (RJ-11) and the logic card (DB-9).

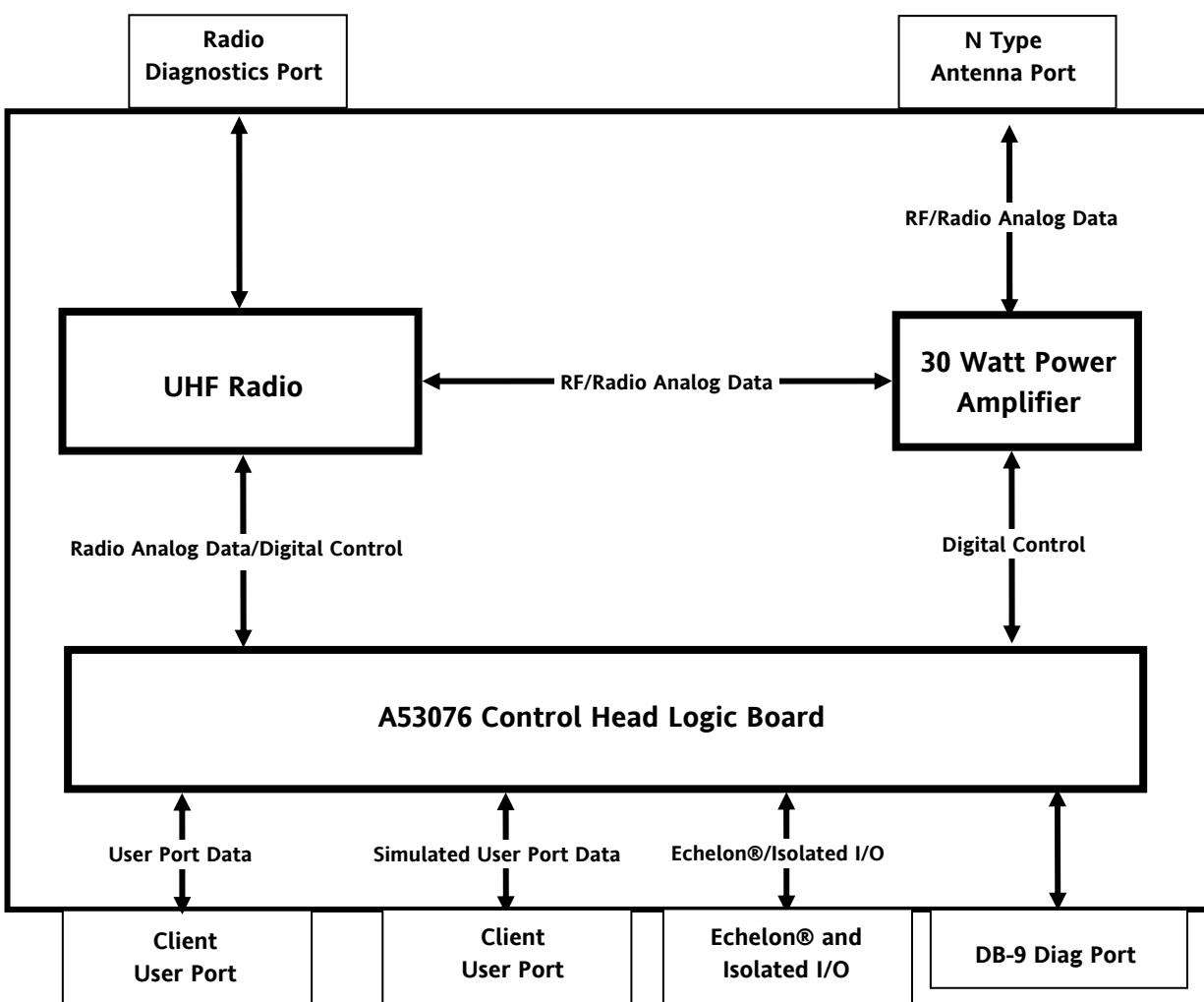


Figure 1-2 Cab Radio Block Diagram

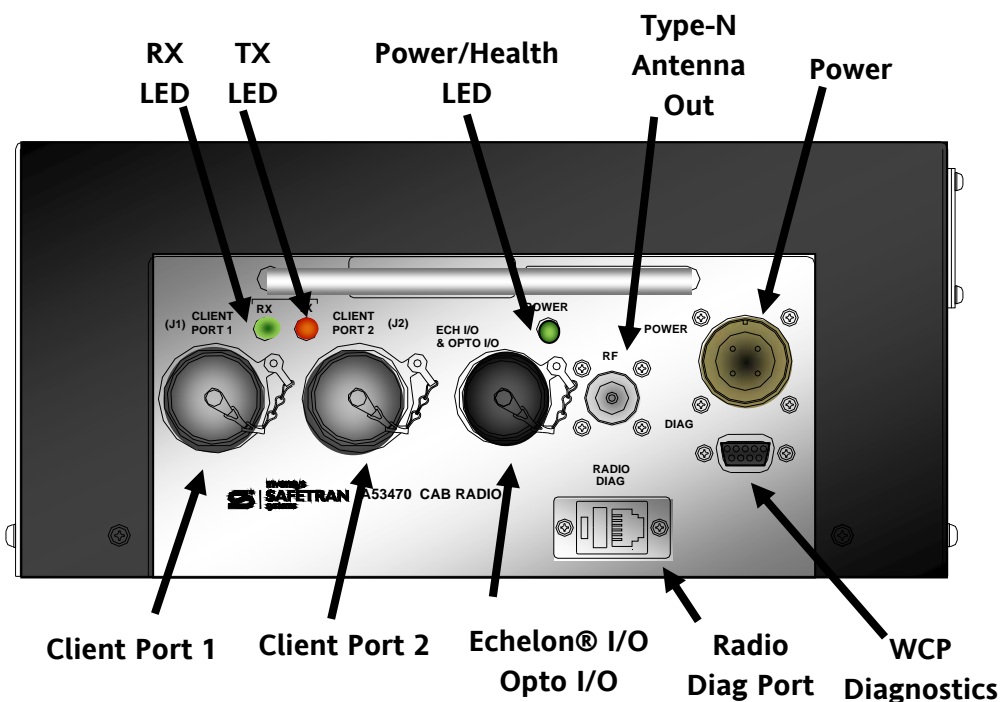
Three LEDs have been extended from the logic card to the cabinet front panel for RF Transmit, RX Receive, and Power/Health Check indications. Other indicators and switches used on the WCP CPU-II are accessible via a panel on the side of the unit.



Figure 1-3 Cab Radio Views

### 1.3 INDICATORS AND CONNECTORS

Figure 1-4 details the indicators and connectors on the 53470 Cab Radio.



**Figure 1-4 Indicators and Connectors**

| INDICATOR/CONNECTOR      | DESCRIPTION  |
|--------------------------|--|
| RX LED (Green)           | Illuminates when signal is being received.   |
| TX LED (Red)             | Illuminates when transmitter is active.  |
| Power/Health LED (Green) | Illuminates when power is on and flashes at 1 Hz indicating good health.                                       |
| Antenna                  | Type-N RF connector for external antenna.  |
| Power                    | Mil-Spec 4-pin male connector for 12 VDC input power.  |
| Client Port 1            | Mil-Spec 15-pin male connector for Data I/O  |
| Client Port 2            | Mil-Spec 15-pin male connector for Data I/O  |
| Echelon®/Opto I/O        | Mil-Spec 10-pin male connector for Echelon® I/O  |
| Radio Diagnostics        | RJ-11 connector for connection of computer to radio internal diagnostics using applicable software.            |
| Logic Board Diagnostics  | DB-9 female connector for connection to the Logic Board diagnostic program for set up Logic Control functions. |

### 1.3.1 Pin-outs for Client Ports J1

The following is the pin-out description for the J1 Client Port.

**Table 1-1 Pin-outs J1 Client Port**

| Pin           | Signal Name | I/O | Description |
|---------------|-------------|-----|-------------|
| B             | TXCO1-      | O   | Tx Clock -  |
| C             | TXCO+       | O   | Tx Clock +  |
| D             | TXD1-       | O   | Tx Data -   |
| E             | TXD1+       | O   | Tx Data +   |
| F             | RXC1-       | I   | Rx Clock -  |
| G             | RXC1+       | I   | Rx Clock +  |
| H             | RXD1-       | I   | Rx Data -   |
| J             | RXD1+       | I   | Rx Data +   |
| P             | Shield      | -   | -           |
| R             | Ground      | -   | -           |
| A, K, L, M, N | Not Used    | -   | -           |

### 1.3.2 Pin-outs for Client Port J2

The following is the pin-out description for the J2 Client Port.

**Table 1-2 Pin-outs J2 Client Port**

| Pin           | Signal Name | I/O | Description |
|---------------|-------------|-----|-------------|
| B             | TXCO2-      | O   | Tx Clock -  |
| C             | TXCO2+      | O   | Tx Clock +  |
| D             | TXD2-       | O   | Tx Data -   |
| E             | TXD2+       | O   | Tx Data +   |
| F             | RXC2-       | I   | Rx Clock -  |
| G             | RXC2+       | I   | Rx Clock +  |
| H             | RXD2-       | I   | Rx Data -   |
| J             | RXD2+       | I   | Rx Data +   |
| P             | Shield      | -   | -           |
| R             | Ground      | -   | -           |
| A, K, L, M, N | Not Used    | -   | -           |

### 1.3.3 Pin-outs for Echelon® and Isolated I/O

The following is the pin-out description for the Echelon® and Isolated I/O port.

**Table 1-3 Pin-out for Echelon® and Isolated I/O**

| Pin        | Signal Name | I/O | Description                                    |
|------------|-------------|-----|--|
| A          | IA          | I   | General Purpose Input                          |
| B          | IB          | I   | General Purpose Input                          |
| C          | OC          | O   | General Purpose Output                         |
| D          | OD          | O   | General Purpose Output                         |
| E          | ECH 1A      | I/O | Echelon Twisted Pair<br>Not Polarity Sensitive |
| F          | ECH 1B      | I/O | Echelon Twisted Pair<br>Not Polarity Sensitive |
| G, H, J, K | Not Used    | -   | -  |

### 1.3.4 Pin-outs Diag Port (DB-9)

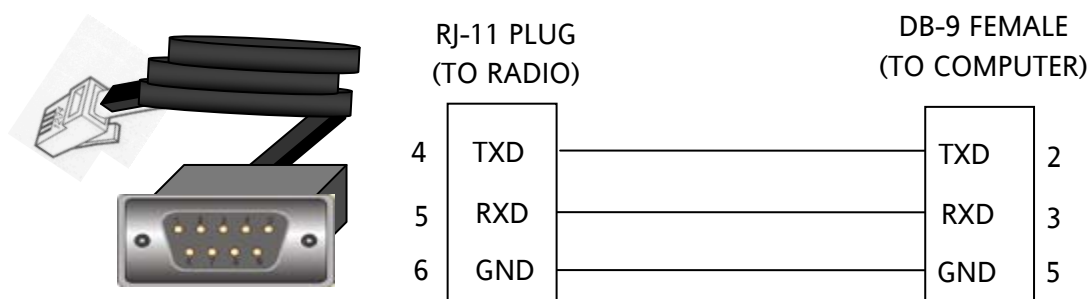
The following is the pin-out description for the DB-9 Diag Port.

**Table 1-4 Pin-out for Diag Port**

| Pin         | Signal Name    | I/O | Description                                   |
|-------------|----------------|-----|---|
| 1           | Chassis Ground | -   | Chassis Ground                                |
| 2           | TXD            | O   | RS-232 Transmit Data<br>RS-232 Voltage Levels |
| 3           | RXD            | I   | RS-232 Receive Data<br>RS-232 Voltage Levels  |
| 5           | Digital Ground | -   | Digital Ground                                |
| 7           | CTS            | I   | Clear To Send<br>RS-232 Voltage Levels        |
| 8           | RTS            | O   | Request To Send<br>RS-232 Levels              |
| 4, 6, and 9 | Not Used       | -   | -   |

### 1.3.5 Radio Diag Port

The following is the pin-out description for the Radio Diag Port.



**Figure 1-5 Radio Diag Port Pin-out**

### 1.3.6 Pin-outs for Power

The following is the pin-out description for the Power connector.

**Table 1-5 Pin-outs for Power Connector**

| Pin | Signal Name | I/O | Description    |
|-----|-------------|-----|----------------|
| B   | Batt/Pwr-   | -   | Battery/Power- |
| D   | Batt/Pwr+   | -   | Battery/Power+ |

## 1.4 LOGIC BOARD 53076

The Cab Radio 53076 Logic Board is the control interface that directs data flow and controls the radio operations. An access panel on the side of the cab radio enclosure for setup and servicing. Normal operation does not require access to the Logic Board. The access panel has a gasket seal out dirt and moisture. Figure 1-6 displays the Logic Board indicators and controls used for setup and troubleshooting.

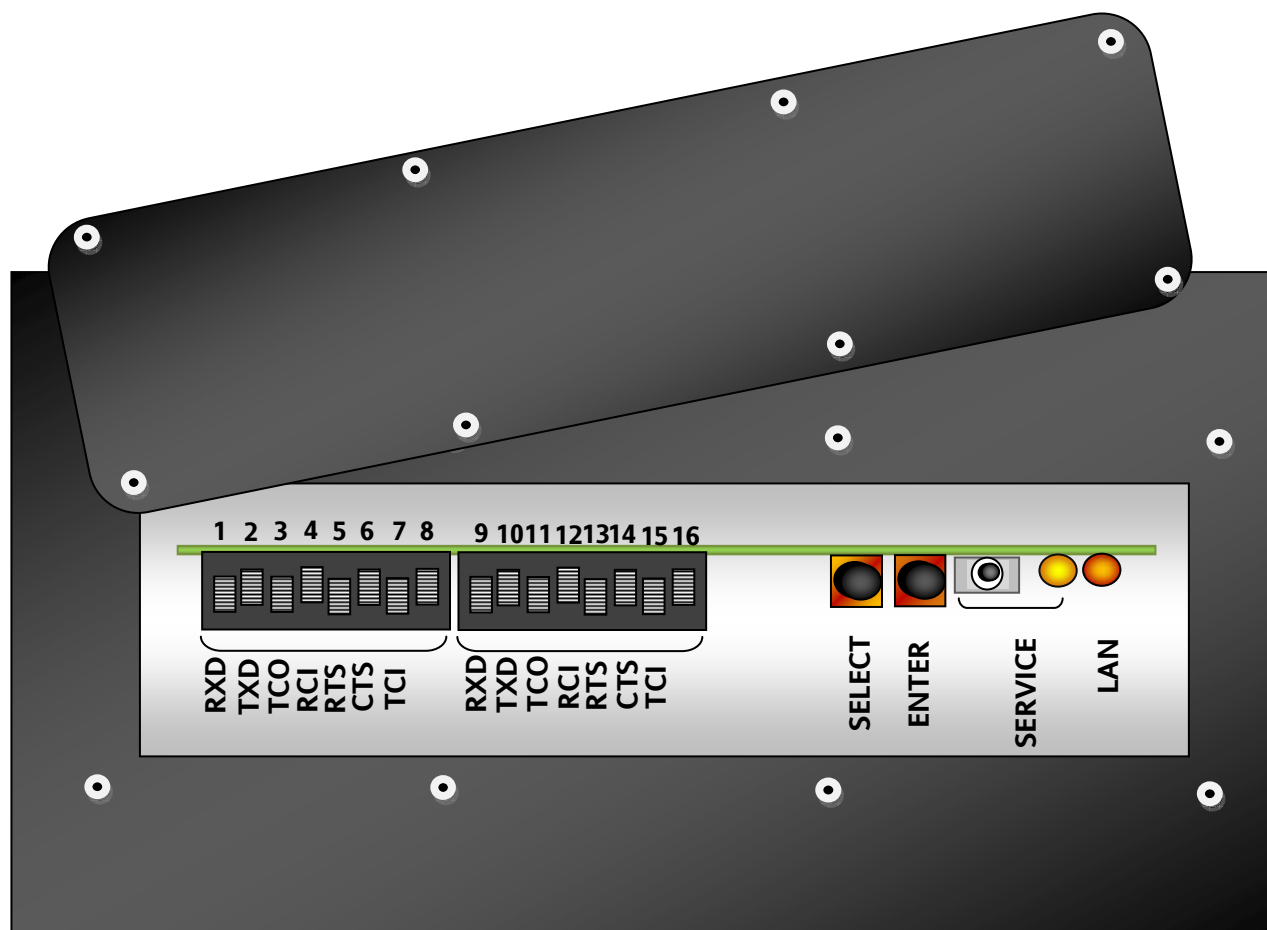


Figure 1-6 Logic Board Access Panel



## 1.5 SPECIFICATIONS

### PRIMARY POWER

|                             |  |
|-----------------------------|--|
| Input Voltage:              | 13.8 VDC Nominal (11.5 to 16.0 VDC)        |
| Input Isolation:            | Non-isolated                               |
| Power Consumption:          | Rx: 400 mA @ 12V<br>Tx @ 30 W: 10.8A @ 12V |
| Reverse Polarity Protection | Diode across primary input                 |

### PHYSICAL

|                 |  |
|-----------------|--|
| Dimensions:     | 11.25 inches (28.58 centimeters) wide<br>4.25 inches (10.80 centimeters) high<br>9.75 inches (24.77 centimeters) deep<br>10.75 inches (27.31 centimeters) deep (with handle) |
| Package Weight: | 12 pounds (5.44 kilograms)   |

### ENVIRONMENTAL

|                              |                                      |
|------------------------------|--------------------------------------|
| Operating Temperature Range: | -22 °F to +140 °F (-30 °C to +60 °C) |
| Humidity:                    | 95% @ 40° C non-condensing           |

### TRANSMITTER

|                          |                                    |
|--------------------------|------------------------------------|
| Frequency Range:         | 800-960 MHz                        |
| Modulation Type:         | Binary CPFSK                       |
| Audio Input Level:       | -20 dBm to +5 dBm                  |
| Carrier Power            |                                    |
| Transmitter Exciter:     | Maximum 5 Watts (+37 dBm)          |
| Power Amplifier:         | Maximum 30 Watts (+45 dBm)         |
| Duty Cycle:              | Continuous                         |
| Output Impedance:        | 50 ohms                            |
| Frequency Stability:     | 1.5 ppm, - 30 ° C to +60° C        |
| Channel Spacing:         | 12.5 kHz                           |
| Spurious & Harmonic:     | -65 dBc per EIA test specification |
| Intermodulation          | -40 dBc                            |
| Time-out Timer:          | 1-255 seconds (30 seconds default) |
| Transmitter:             | Data Activated or RTS              |
| Response Time:           | 5 ms                               |
| Maximum FM modulation    | ±2.5 kHz                           |
| FCC Emission Designators | E5MDS9710N-1 (806-940 MHz)         |

**RECEIVER**

|                             |   |
|-----------------------------|---|
| Type:                       | Double conversion super-heterodyne                |
| Frequency Range:            | 800-960 MHz                                       |
| Frequency Stability:        | $\pm 1.5$ ppm, $-30^{\circ}$ C to $+60^{\circ}$ C |
| Sensitivity:                | 12 dB SINAD @ -110 dBm                            |
| Spurious & Image Rejection: | 70 dB Minimum                                     |
| Inter-modulation Response   |   |
| Rejection:                  | 65 dB Minimum per EIA specification               |
| Selectivity:                | 65 dB Minimum, 12.5 kHz channel                   |
| Bandwidth:                  | 12.5 kHz  |
| Desensitization:            | 65 dB Minimum, 12.5 kHz channel                   |
| Bit-Error Rates:            | 1200 bps: $1 \times 10^{-6}$ @ -110 dBm           |
|                             | 4800 bps: $1 \times 10^{-6}$ @ -110 dBm           |
|                             | 9600 bps: $1 \times 10^{-6}$ @ -108 dBm           |

**POWER AMPLIFIER**

|                                  |                                |
|----------------------------------|--------------------------------|
| Frequency                        |                                |
| Forward:                         | 896.5-898 MHz                  |
| Reverse:                         | 935.5-937 MHz                  |
| Carrier Power (5 watts drive):   | 30 watts                       |
| Forward Gain:                    | 8 dB                           |
| Forward Gain Variation           |                                |
| Over Operating Temperature:      | $\pm 0.25$ dB                  |
| Input VSWR (50 ohms):            | 1.5:1 Typical, 2:1 Maximum     |
| PTT Delay:                       | 10 $\mu$ S Maximum             |
| PTT Logic (Forward Path Select): | 0.8 V Maximum                  |
| PTT Logic (Reverse Path Select): | 2.8 V Minimum to 5.5 V Maximum |
| RF Rise/Fall Time:               | 1 $\mu$ S                      |
| RF Input Level:                  | 20 watts Maximum               |
| Duty Factor:                     | 20%                            |
| Transmit Duration:               | 5 Minutes                      |
| Harmonics:                       | 60 dBc                         |
| Spurious:                        | 60 dBc                         |
| Maximum VSWR                     | Infinite                       |
| Reverse Insertion Loss:          | 2.0 dB Maximum                 |
| Reverse Amplitude Variation:     | $\pm 0.25$ dB Maximum          |
| Reverse Amplitude Variation      |                                |
| Over Operating Temperature:      | $\pm 0.25$ dB Maximum          |

## 1.6 ORDERING INFORMATION

The following is ordering information for the MCP Cab Radio and optional cabling.

### 1.6.1 Cab Radio Ordering Information

| Description   | Safetran Order Number |
|---------------|-----------------------|
| MCP Cab Radio | 9000-53470-0001       |

### 1.6.2 Cab Radio Mating Connector Ordering Information

| Description  | Quantity Included | Safetran Order Number                               |
|--|-------------------|---|
| 10-pin I/O Port mating connector                   | 0                 | Z701-00061-3116<br>(Mfg. Part No. MS3116F12-10S-SR) |
| 15-pin Client Port mating connector                | 0                 | Z714-9024-3116<br>(Mfg. Part No. MS3116F14-15SR)    |
| 4-pin Power mating connector and power Cable 3 ft  | 0                 | 9000-26697-0001                                     |
| 4-pin Power mating connector and power Cable 5 ft  | 0                 | 9000-26697-0002                                     |
| 4-pin Power mating connector and power cable 10 ft | 0                 | 9000-26697-0003                                     |

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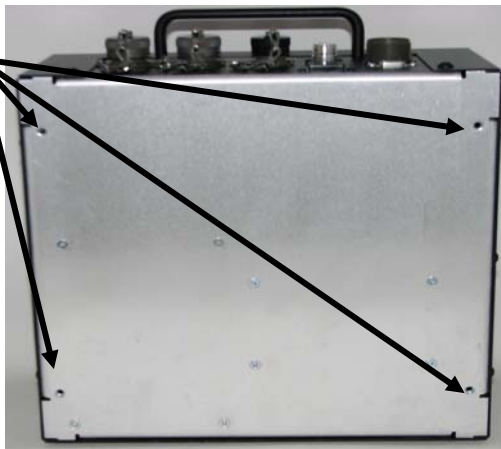
## SECTION 2 INSTALLATION AND SETUP

### 2 - INSTALLATION AND SET UP

#### 2.1 INSTALLATION

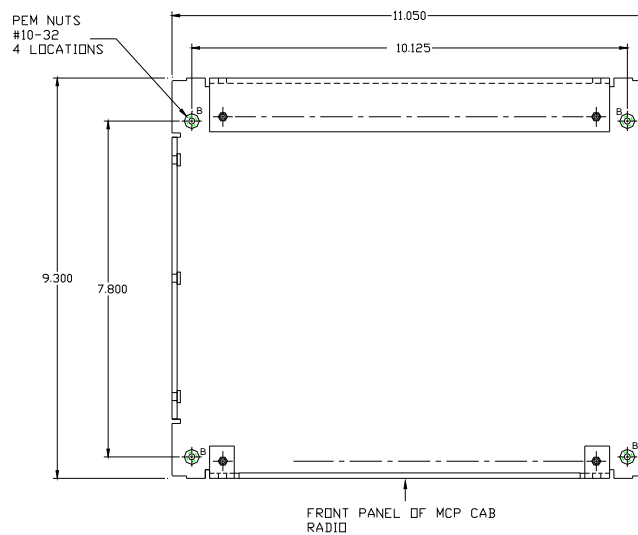
The MCP Cab Radio is equipped with four (4) #10-32 pem nuts to secure the unit to a wall or shelf as shown in Figure 2-1.

**PEM NUTS #10-32  
4 Locations**



**Figure 2-1 Pem Nut Locations**

Figure 2-2 displays the pem nut dimensions in addition to the dimensions of the MCP Cab Radio cabinet. Provide ample space for installation of the power, antenna, and client port connectors



**Figure 2-2 Mounting Dimensions**

### 2.1.1 Grounding

A grounding screw is located on each side of the unit as shown in Figure 2-3. The radio must be grounded to the locomotive chassis to avoid undesired ground loops with peripheral equipment connected to the MCP Cab Radio and maintain lightening and power transients.

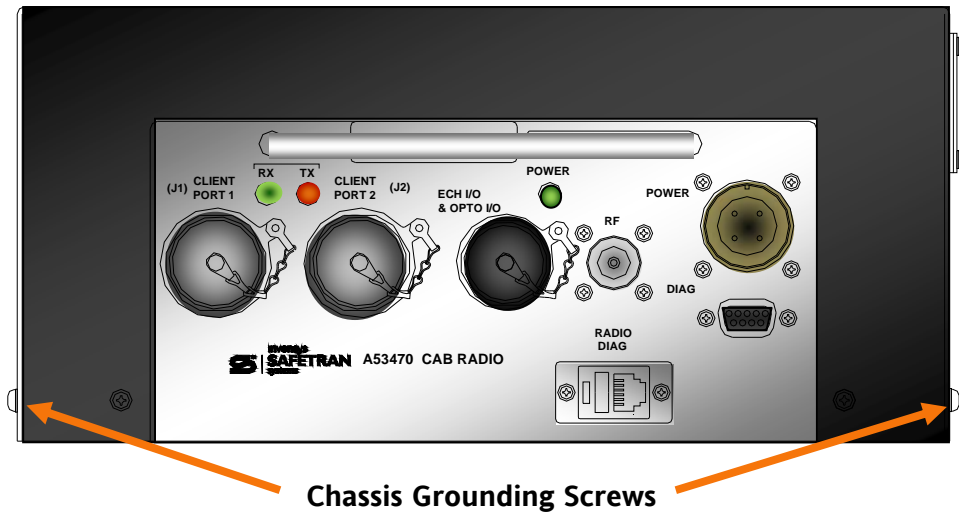


Figure 2-3 Chassis Grounding Screws

### 2.1.2 MCP Cab Radio Cabinet

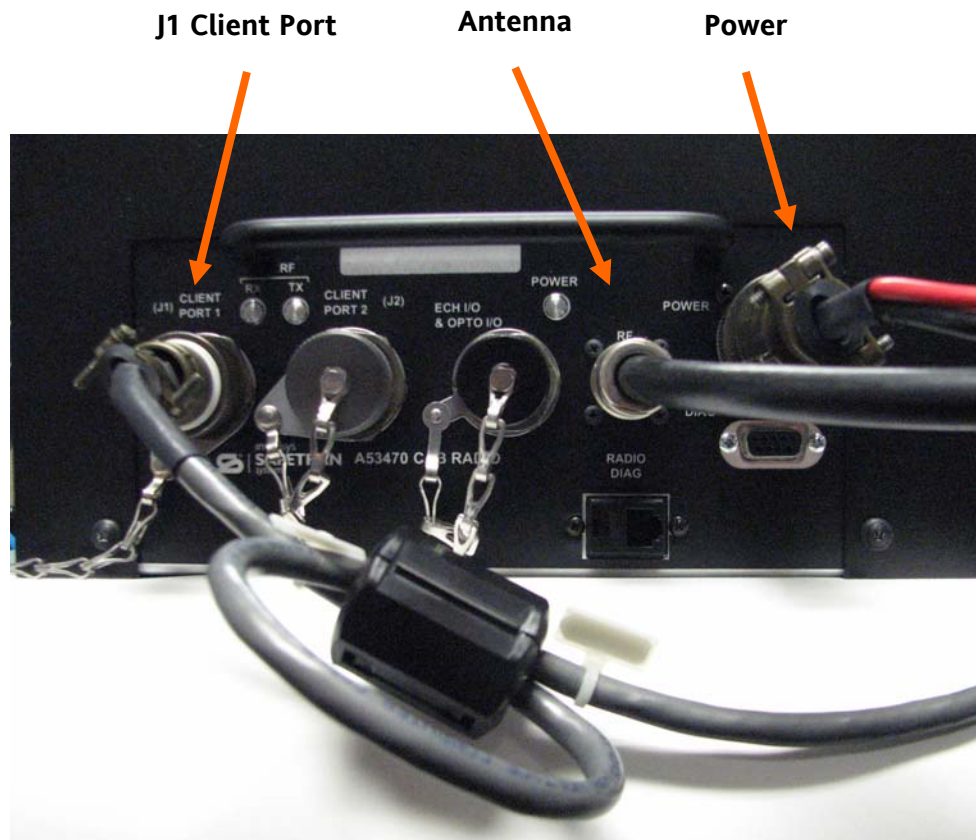
#### NOTE

Tighten all cabinet screws by hand. Do not use power screw drivers or over-tighten screws. Ensure all screws are in place and secure to maintain physical and electrical seal.

The MCP Cab Radio is secured with two screws on the front and rear and three screws on each side with the front screw on each side equipped for grounding the cabinet. It is important to not to over tighten these screws. Use of power screw drivers is not advised.

### 2.1.3 Cable Installation

The MCP Cab Radio uses Mil-spec type twist connectors for Client ports, Echelon®/Opto-I/O, and Power. The MCP Cab Radio is equipped with an N-Type RF connector for connecting the external antenna to the radio. In most applications, Client Port J1, Antenna, and Power will be used as shown in Figure 2-4.



**Figure 2-4 Cable Installation**

#### 2.1.3.1 J1 Client Cable

The J1 Client Cable interfaces the MCP Cab Radio to the locomotive on-board computer (or other peripheral equipment if used in another application). The default protocol for this port is RS-422 or as configured in the unit's codeplug. A ferrite filter is required on the J1 Client Cable to eliminate EMI/RFI interference. Use the following procedure to install the filter on to the data cable.

### 2.1.3.1.1 Ferrite Installation Procedure

1. Using the ferrite filter provided with the MCP Cab Radio (Fairrite Model 0431164181), open the ferrite case and loop the data cable through the filter so the cable goes through the filter core twice as shown in Figure 2-5. Mount the ferrite filter as close to the connector as possible. Figure 2-6 shows the completed ferrite filter installation.



**Figure 2-5 Installing Ferrite Filter on Data Cable**



**Figure 2-6 Completed Ferrite Installation**

### 2.1.3.2 Echelon® and Isolated I/O Connection

A 10-pin mil-spec connector provides an Echelon® I/O connection and two (2) isolated inputs and outputs.



### 2.1.3.3 Antenna Connection

#### **WARNING**

**ALL ANTENNA INSTALLATION AND SERVICING IS TO BE PERFORMED BY QUALIFIED TECHNICAL PERSONNEL ONLY. WHEN SERVICING OR WORKING AT DISTANCES CLOSER THAN 3.05 METERS, ENSURE THE TRANSMITTER HAS BEEN DISABLED. DEPENDING UPON THE APPLICATION AND THE GAIN OF THE ANTENNA, THE TOTAL COMPOSITE POWER COULD EXCEED 200 WATTS EIRP. THE ANTENNA LOCATION SHOULD BE SUCH THAT ONLY QUALIFIED TECHNICAL PERSONNEL CAN ACCESS IT, AND UNDER NORMAL OPERATING CONDITIONS NO OTHER PERSON CAN COME IN CONTACT OR APPROACH WITHIN 10 FEET (3.05 METERS) OF THE ANTENNA.**

The MCP Cab Radio is equipped with an N-Type antenna connector. Selection of an antenna feed line is important. A high quality low-loss cable should be used. Poor quality cable will result in power losses that may reduce the range and reliability of the radio system. Table 2-1 shows the losses that will occur when using various types and lengths of cable at 960 MHz. Cable length should be kept as short as possible to minimize signal loss.

**Table 2-1 Length vs. Loss in Coaxial Cable at 960 MHz**

| <b>Cable Type</b> | <b>10 Feet<br/>(3.05 Meters)</b> | <b>50 Feet<br/>(15.24 Meters)</b> | <b>100 Feet<br/>(30.48 Meters)</b> | <b>500 Feet<br/>(152.4 Meters)</b> |
|-------------------|----------------------------------|-----------------------------------|------------------------------------|------------------------------------|
| RG08A/U           | 0.51 dB                          | 2.53 dB                           | 5.07 dB                            | 25.35 dB                           |
| 1/2 inch HELIAX   | 0.12 dB                          | 0.76 dB                           | 1.15 dB                            | 7.55 dB                            |
| 7/8 inch HELIAX   | 0.08 dB                          | 0.42 dB                           | 0.83 dB                            | 4.15 dB                            |
| 1-1/4 inch HELIAX | 0.06 dB                          | 0.31 dB                           | 0.62 dB                            | 3.10 dB                            |
| 1-5/8 inch HELIAX | 0.05 dB                          | 0.26 dB                           | 0.52 dB                            | 2.60 dB                            |

### 2.1.3.4 Power Connection

The input power is connected via the Safetran part number 9000-26697-000X, which includes a mil-spec 4-pin connector and 14 AWG cable in 3 foot, 5 foot and 10 foot lengths. Ensure the polarity of the connection to the power source is correctly polarized. The MCP Cab Radio is equipped with reverse polarity protection.

## 2.2 XCMMMAINT SOFTWARE

MCP Cab Radios are pre-configured at the factory per user specifications. No further configuration is required. The following information is provided for reference purposes. Refer to the Service portion of this manual (Section 4) for detailed features of this software utility. To review configuration setup parameters, the Safetran XCMMMAINT Version 1.18.00 or later software is used. Older versions of the XCMMMAINT software do not include the MDS radio information.

### NOTE

When upgrading a MCM II to version 1.18.00 from a version older than 1.17.30, also upgrade the Debugger from version 1.00 to 2.00 to enable the MCM II to operate properly.

Verify the proper version software is installed by clicking on **“Version”**. A dialog box will appear with the software information as shown in Figure 2-7.

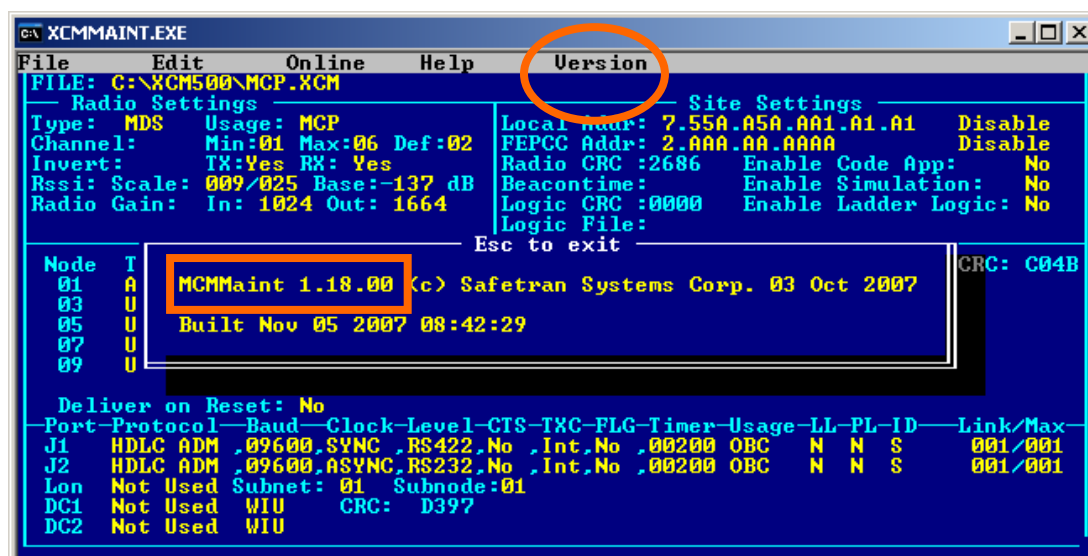


Figure 2-7 XCMMMAINT Software - Version Verification

## 2.2.1 Radio Settings

Figure 2-8 displays the MDS Radio Settings.

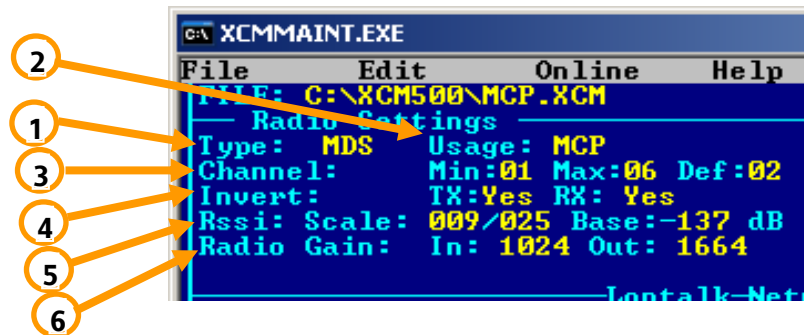


Figure 2-8 XCMMAINT Software - Radio Settings

- ❖ 1 – Type: **MDS**
- ❖ 2 – Usage: **MCP** or BCP
- ❖ 3 – Channel: Min: **01** Max: **06** Def: **02**
- ❖ 4 – Invert: TX: **YES** or NO RX: **YES** or NO
- ❖ 5 – Rssi: Scale: **009/025** Base: **-137** dB
- ❖ 6 – Radio Gain: In: **1024** Out: **1664**

Note: Default settings are in **BOLD**.

## 2.2.2 Site Settings

Figure 2-9 displays the default Site Settings for the MCP Cab Radio.

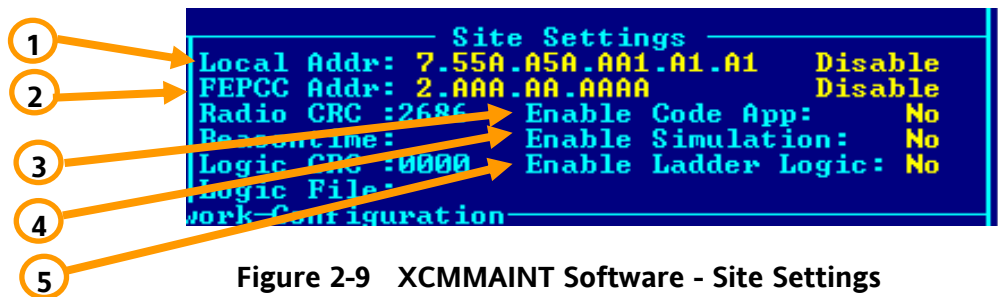


Figure 2-9 XCMMAINT Software - Site Settings

- ❖ 1 –Local Addr: **7.55A.A5A.AA1.A1.A1** Disable
- ❖ 2 – FEPC Addr: **2.AAA.AA.AAAA** Disable
- ❖ 3 – Enable Code App: **NO**
- ❖ 4 – Enable Simulation: **NO**
- ❖ 5 – Enable Ladder Logic: **NO**

Note: Default settings are in **BOLD**.

### 2.2.3 Lontalk® (Echelon®) Network Configuration

Figure 2-10 displays the Lontalk® (Echelon®) Network Configuration. The MCP Cab Radio uses Node 01 only in this application.

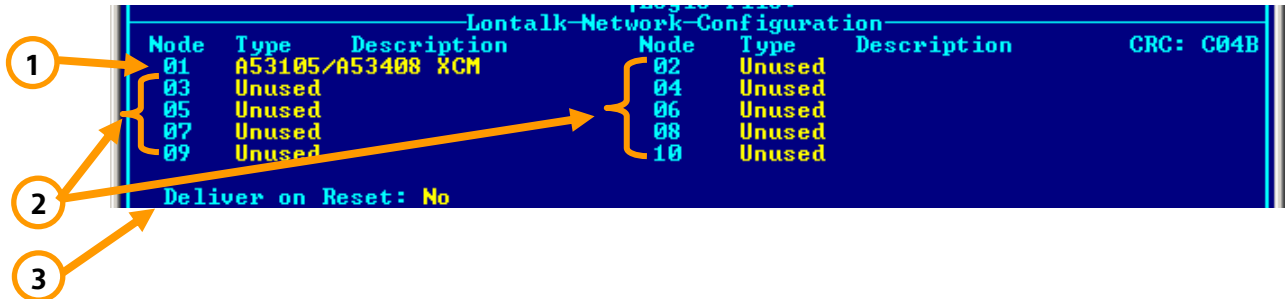


Figure 2-10 XCMMAINT Software - Lontalk® Network Configuration

- ❖ 1 –Node 01: **A53105/A53408 XCM**
- ❖ 2 – Nodes 02-10: **Unused**
- ❖ 3 – Deliver on Reset: **NO**

Note: Default settings are in **BOLD**.

### 2.2.4 Port Information

Figure 2-11 Displays the Port information of the MCP Cab Radio. In this application only J1 and J2 are used with J1 set up in a RS-422 configuration and J2 in a RS-232 configuration.

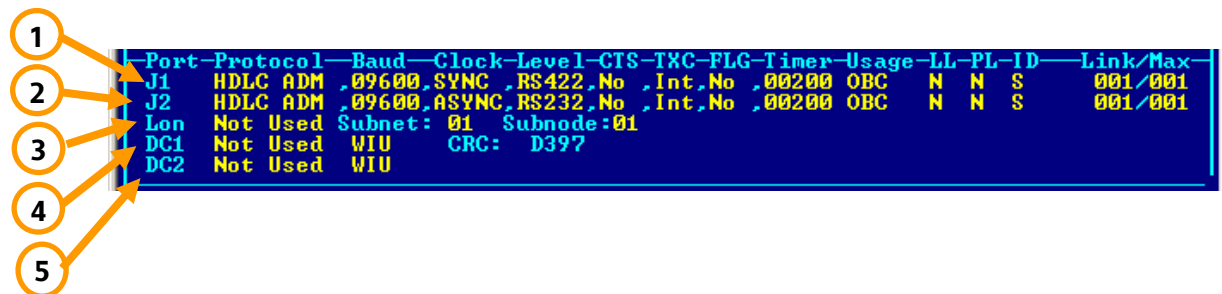


Figure 2-11 XCMMAINT Software - Port Information

- 1 – J1: **HDLC ADM, 09600, SYNC, RS-422, No, Int, No, 00200 OBC N N S 001/001**
- 2 – J2: **HDLC ADM, 09600, ASYNC, RS-232, No, Int, No, 00200 OBC N N S 001/001**
- 3 – Lontalk®: **Not Used Subnet: 01 Subnode: 01**
- 4 – DC1: **Not Used WIU**
- 5 – DC2: **Not Used WIU**

Note: Default settings are in **BOLD**.

## SECTION 3

### OPERATION

#### 3 - OPERATION

##### 3.1 OVERVIEW

The MCP Cab Radio operates transparently in conjunction with the locomotive on-board computer. The Cab Radio receives and transmits information between the ATCS base and wayside stations to the locomotive on-board computer using the six ATCS UHF frequency pairs authorized for data communications. A typical locomotive configuration is shown in Figure 3-1.

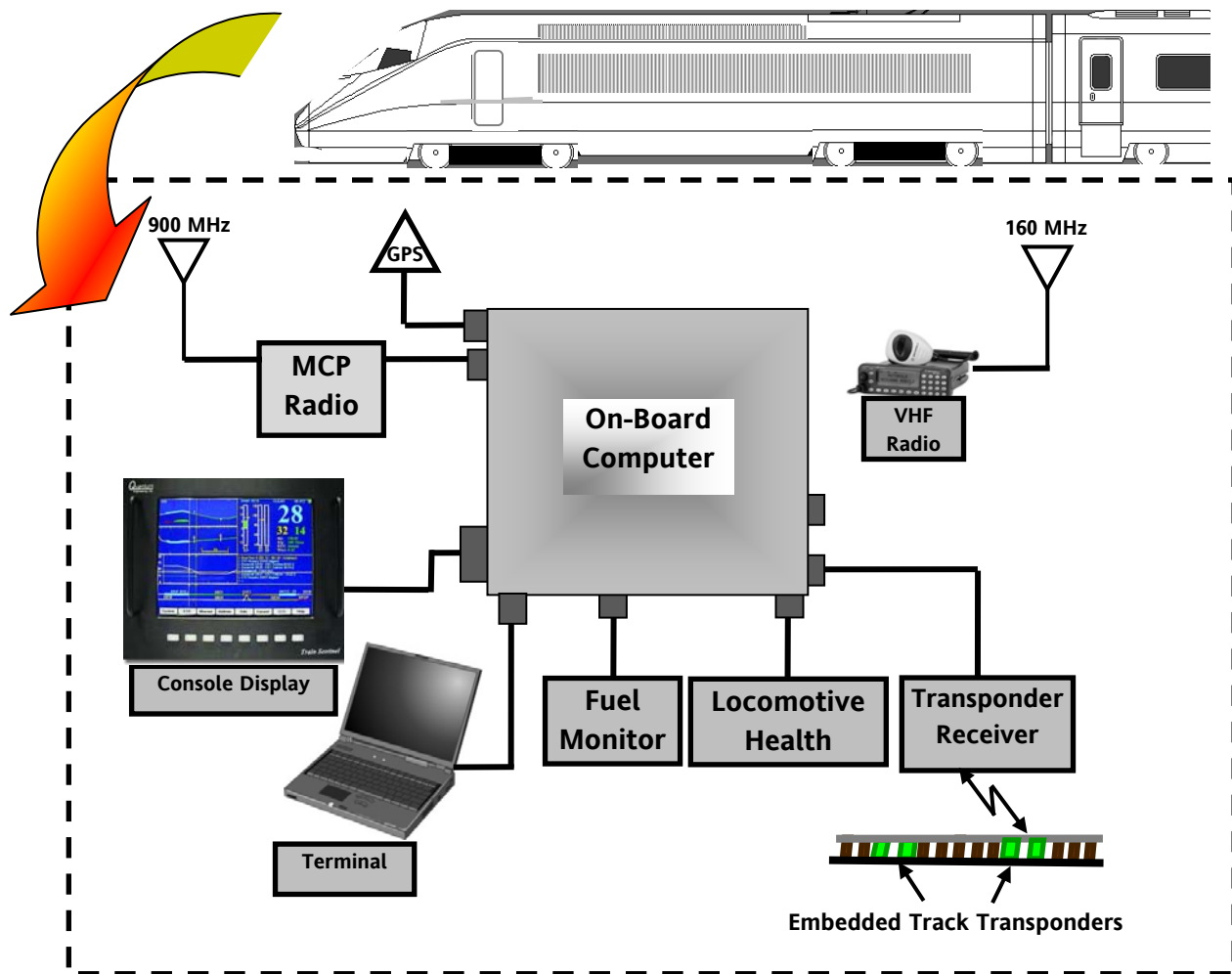


Figure 3-1 Locomotive Configuration

A typical network configuration is displayed in Figure 3-2, showing the control center network connection to field wayside stations which in turn communicate with the locomotive.

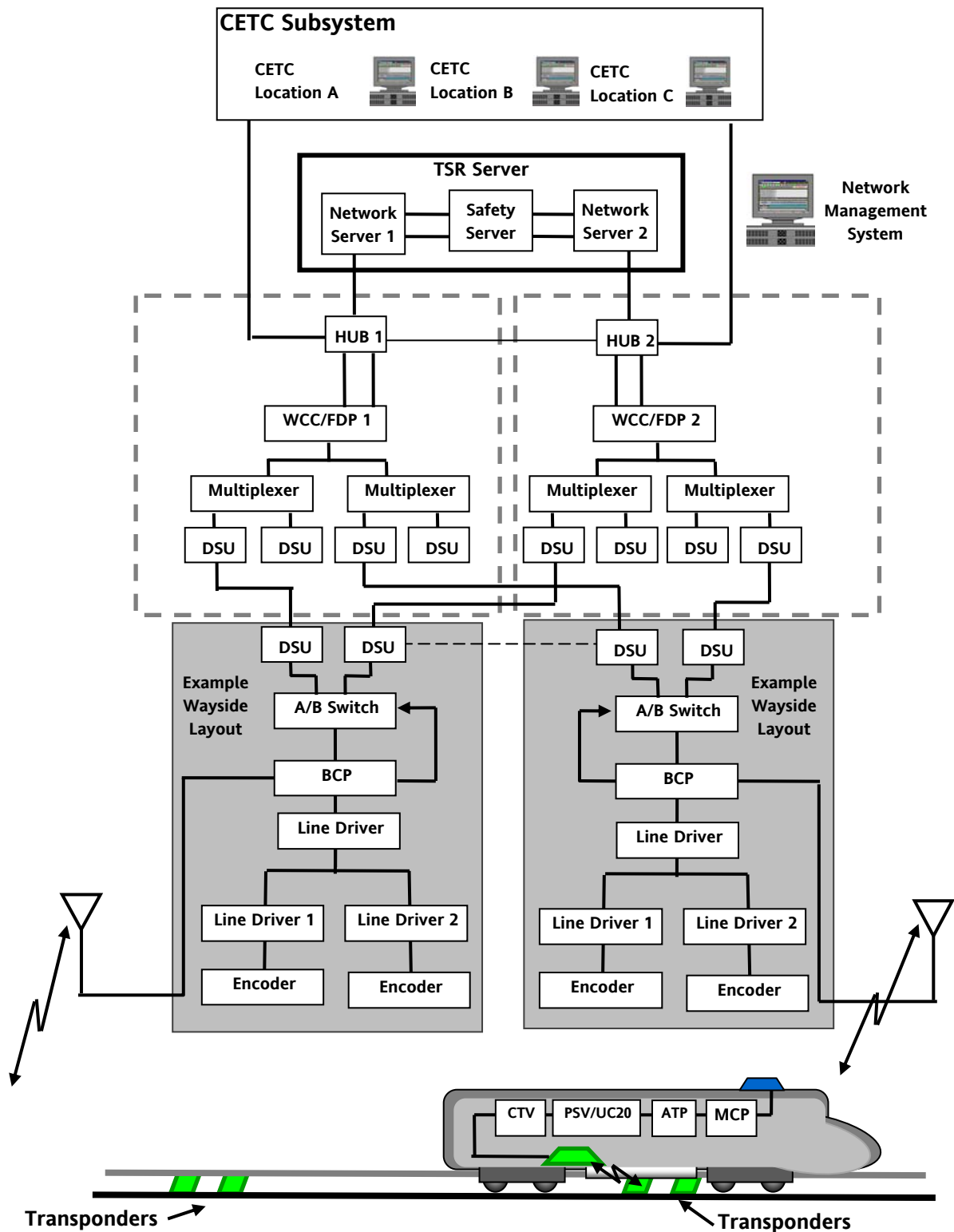


Figure 3-2 Typical Network Configuration

### 3.2 CAB RADIO FREQUENCY CONTROL

The locomotive cab radio generates an ATCS address and receives frequency assignments from the MCP client via the locomotive on-board computer. The radio broadcasts data packets to establish available links. The radio will continue this process until a link or links have been established. In the event all links are lost, the radio reverts to the broadcast process until a link is established. When entering another railway's territory the on-board computer will signal the MCP client to change frequencies if applicable. Figure 3-3 displays a typical frequency change process.

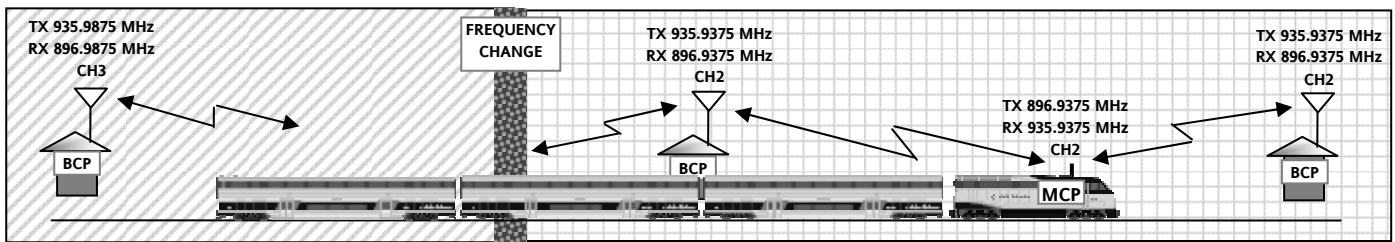


Figure 3-3 Cab Radio Frequency Control

### 3.3 RADIO MESSAGES

The MCP Cab Radio can handle a variety of messages between the ATCS center and the Locomotive. The radio communicates with the network using the High Level Data Link Control (HDLC) protocol and is linked to the locomotive on-board computer using a RS-422 link.

#### 3.3.1 Temporary Speed Restriction (TSR)

Temporary Speed Restriction (TSR) orders are sent from the base station and received by the MCP. The MCP can send to the on-board computer. Data derived from GPS, transponders, and wayside station established the locomotive location, thus enabling the on-board computer to advise the locomotive's location in reference to the TSR boundaries. Figure 3-4 displays a TSR example.

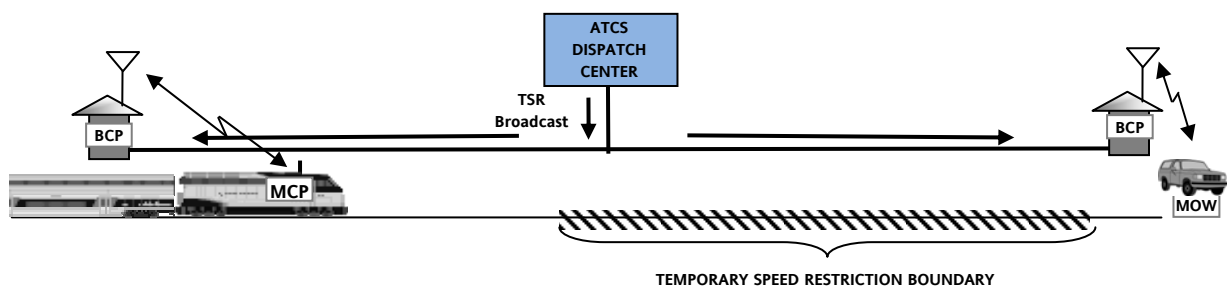


Figure 3-4 Temporary Speed Restriction Example

### 3.3.2 Interlocking Status

Interlocking Status is sent from the base station and received by the MCP is sent to the on-board computer. In some cases (i.e. dark territory), remote control interlocks can be controlled from the locomotive cab. The MCP can serve as a primary or secondary communication source. Figure 3-5 displays an example of an interlock status exchange.

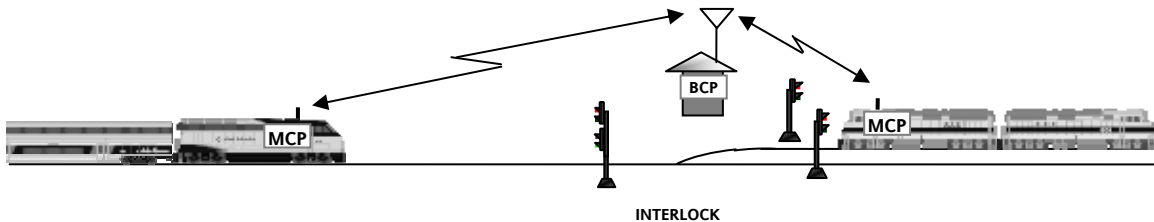


Figure 3-5 Interlocking Status

### 3.4 POSITIVE TRAIN CONTROL

As Positive Train Control systems develop, the MCP Cab Radio will play a key role. Data gathered from wayside sources can be combined with other data sources and displayed on the locomotive console.

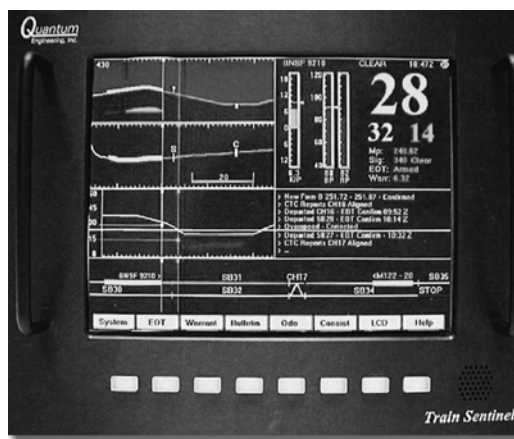


Figure 3-6 PTC Display



## SECTION 4

### SERVICE

#### 4 - SERVICE

##### 4.1 OVERVIEW

Routine service of the MCP Cab Radio is performed by qualified personnel as specified by standard railroad or agency standards and procedures. The Logic Board information is accessed via the 9-pin Diagnostic Port on the face of the Cab Radio unit. Diagnostic testing of the UHF Radio is performed using the RJ-11 Radio Diagnostic port and Radio Configuration software for the MDS UHF Radio. The Logic Board is accessible via a service panel on the side of the unit.

#### NOTE

Testing and service of the radio component must be performed by qualified technical personnel as defined in FCC Rules, Part 90 and Part 101.

##### 4.2 MCP DIAGNOSTICS

Diagnostic of the MCP are performed using the User Diagnostic port which is a DB-9 connector mounted on the front panel of the unit connected to a PC or Laptop computer using the Safetran XCMMMAINT software.

##### 4.2.1 Opening XCMMMAINT

Open the XCMMMAINT software by opening the XCMMMAINT.EXE file. The opening screen in Figure 4-1 will appear.

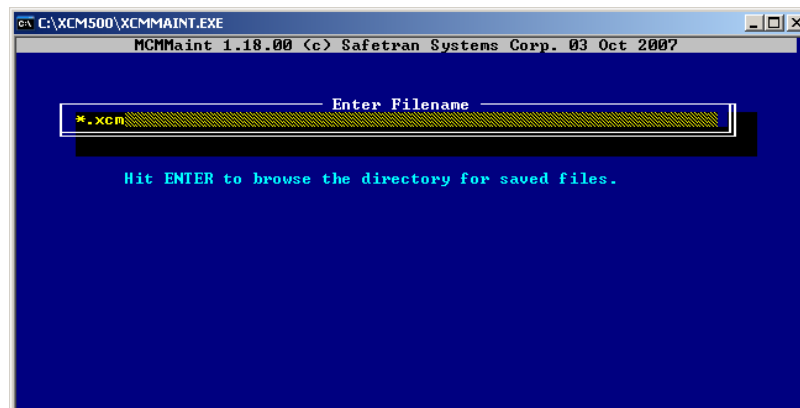


Figure 4-1 Opening XCMMMAINT

## 4.2.2 Selecting File

Hit the **ENTER** key to display the available configuration files. If a Codeplug file has been saved for the unit being tested use the **ARROW KEYS** to highlight the appropriate file. Hit the **ENTER** key to load the file. If the codeplug file is not available or to view a programmed unit press ESC to enter the default screen. Section 4.2.4.4 details how to read the Codeplug information in the unit.

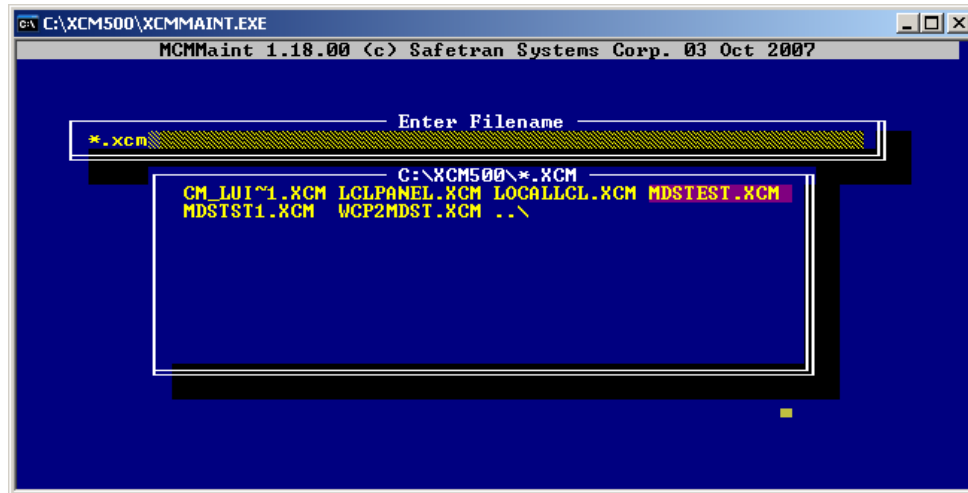


Figure 4-2 Filename Select

## 4.2.3 Unit Configuration

The opening screen will display the configuration of the MCP. Changes should not be initiated unless the unit is being updated or reconfigured. Changing these settings may render the unit inoperable.

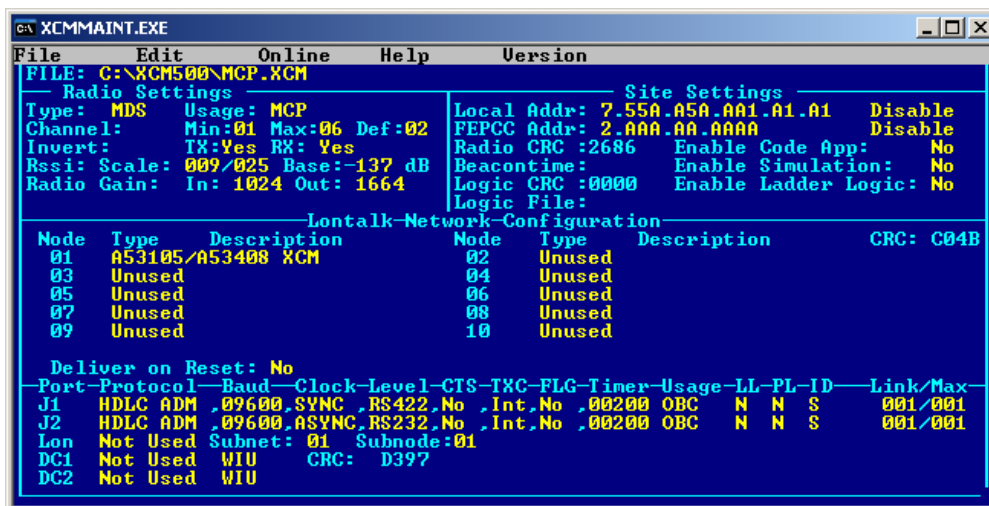


Figure 4-3 Opening Screen

#### 4.2.4 Terminal Mode

The terminal mode opens a utility application to review various logs as well as make desired changes to the logic board and view basic radio functions. Type **ALT-O**, the drop menu will appear, highlight **TERMINAL** and press **ENTER** to start the terminal mode.

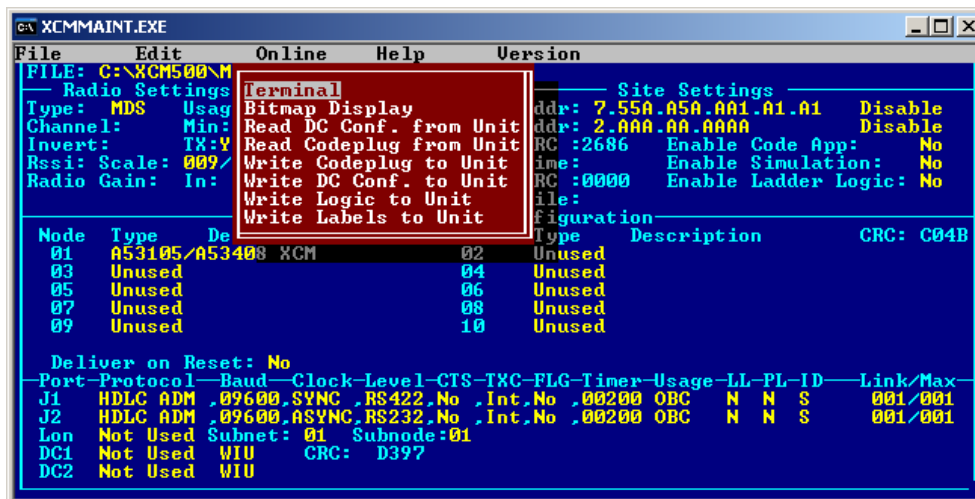


Figure 4-4 Terminal Mode

The Terminal mode opens with a blank screen. Hit the **ENTER** key and an asterisk (\*) will display. Type **HELP** for a list of available commands as displayed in Figure 4-5.

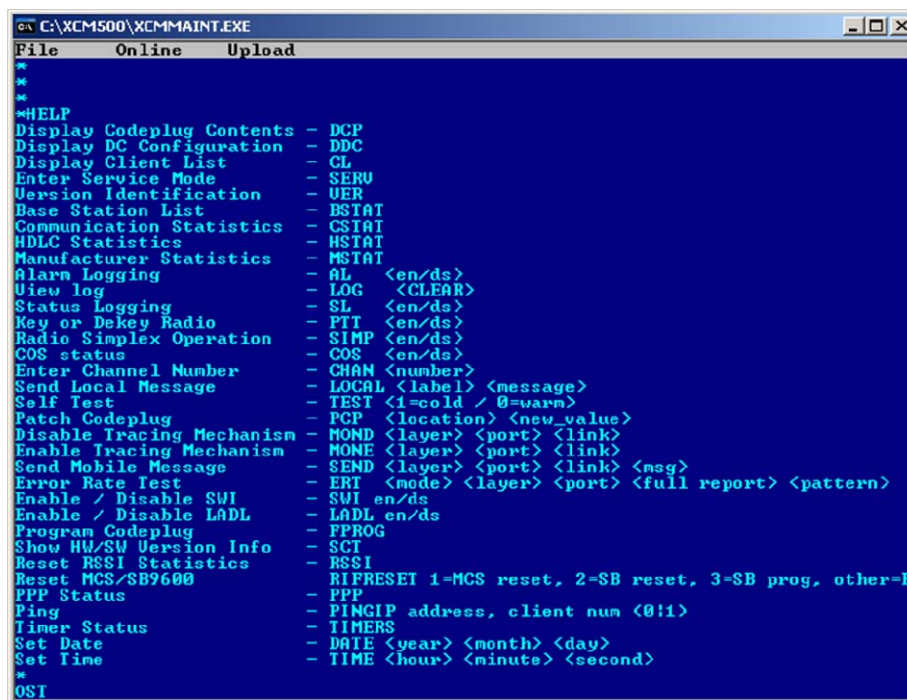


Figure 4-5 Terminal Mode - Help Screen

#### 4.2.4.1 Terminal Mode Commands

##### 4.2.4.1.1 AL en/ds - Alarm Logging

Alarm logging is initially enabled. When the command is first entered, all alarms and their respective states are displayed. After alarm logging is enabled, any subsequent changes to any of the alarms are displayed individually as they occur. If the command is re-entered to enable logging, the display reflects the present state of the alarms.

```

XCMMAINT.EXE
File      Online      Upload
*
*AL
Radio Alarm Off
R1 Alarm Off
R2 Alarm Off
R3 Alarm Off
Codeplug Alarm Off
Cos Without Data Alarm Off
Modulator Alarm Off
Ground Contact Alarm Off
Codefail Alarm Off
Mobile Channel Usage Alarm Off
Out Of Coverage Alarm Off
A/D Hardware Alarm Off
Lon L/P Alarm Off
External 0 Alarm Off
External 1 Alarm Off
External 2 Alarm Off
External 3 Alarm Off
External 4 Alarm Off
External 5 Alarm Off
External 6 Alarm Off
External 7 Alarm Off
External 8 Alarm Off
External 9 Alarm Off
Port Contact 0 Alarm On
Port Contact 1 Alarm On
Port Hardware 0 Alarm Off
Port Hardware 1 Alarm Off
Port Token 0 Alarm Off
Port Token 1 Alarm Off
*
MCB 00/00/00 00:01:12 Port Contact 1 Alarm On

```

**Figure 4-6 Display Alarms**

The following alarms are monitored by the function:

|                                   |  |
|-----------------------------------|--|
| RADIO ALARM                       | The entire radio has failed  |
| RADIO PA ALARM                    | Radio power amplifier failure  |
| RADIO POWER ALARM                 | Radio is operating on battery power  |
| CODEPLUG ALARM                    | Codeplug CRC comparison failure or write failure   |
| COS WITHOUT DATA ALARM            | The RF channel has been asserted without data for longer than the allowable time limit   |
| MODULATOR ALARM                   | The RF modulator has failed  |
| GROUND CONTACT ALARM              | Ground contact was not established at start up   |
| ANALOG TO DIGITAL CONVERTER ALARM | The A/D converter selftest has failed  |
| MOBILE CHANNEL USEAGE ALARM       | Generated by the BCP when a MCP violates channel usage restrictions                      |
| OUT OF COVERAGE ALARM             | Contact with ground network has been lost  |
| EXTERNAL ALARM                    | External alarm (0 through 3) generated by parallel input lines                           |
| PORT CONTACT ALARM                | Alarm (0 through 3) indicating loss of contact with client at the remote end of the link |
| PORT HARDWARE FAIL                | Alarm (0 through 3) indicating hardware failure of a client link port                    |

#### 4.2.4.1.2 DCP - Display Codeplug

Enter **DCP** and press **ENTER** to display codeplug values currently programmed into the unit. The contents of the codeplug are displayed as bytes in hex format. The leftmost column is the location of the first value on that line. The locations of the other values on that line are offset from the first position.

```

C:\XCM500\XCMMAINT.EXE
File      Online      Upload
*
*
*
*DCP
Codeplug Values:
$0000 FF 01 75 5A A5 AA A1 A1 A1 00 00 00 00 00 00 00
$0010 00 00 00 01 00 00 17 70 00 00 00 00 00 00 17 70
$0020 2A AA AA AA AA 00 00 00 02 01 01 01 01 01 01 01
$0030 01 01 01 01 01 01 01 01 01 01 01 01 01 15 00
$0040 00 00 17 70 00 00 17 70 00 00 00 00 00 01 90
$0050 00 00 01 EA 00 00 02 F8 00 00 03 D4 00 00 04 7E
$0060 00 00 05 14 00 00 05 DC 00 00 07 6C 00 00 00 5B
$0070 00 00 00 1E 00 00 01 F4 00 00 03 E8 FF FF FF FF
$0080 00 00 03 E8 00 05 00 06 2A AA AA 99 99 00 00 0A
$0090 01 00 00 00 00 00 05 DC 00 00 00 00 00 00 00
$00A0 00 00 00 00 00 00 12 C0 38 40 04 00 06 80 00 00
$00B0 00 01 00 00 00 82 00 00 00 01 00 00 00 50 00 00
$00C0 00 01 00 00 00 C8 00 00 00 01 00 00 05 00 FF FF
$00D0 FF FF FF FF FF FF 00 00 17 70 00 00 00 4B 00 00
$00E0 00 96 00 8D 10 00 00 00 00 04 00 00 00 04 08 05
$00F0 01 06 02 00 00 00 00 00 89 00 09 19 FF FF FF 02
$0100 00 00 02 58 00 01 FF FF 00 06 02 01 20 06 01 FF
$0110 FF FF 00 00 00 C8 00 00 02 58 00 01 FF FF 00 06
$0120 08 01 20 07 01 FF FF FF 00 00 00 C8 00 00 17 70
$0130 01 01 FF FF 00 12 00 00 00 00 00 FF FF FF FF FF
$0140 FF FF 00 01 00 23 00 25 00 27 00 FF 00 FF 5E 00
$0150 00 00 00 00 00 00 00 00 00 01 00 04 00 03 00 05
$0160 00 23 00 25 00 27 00 FF 00 00 00 00 4E 56 5E EE
$0170 F6 FE 00 00 00 00 10 AE 90 E0 22 54 00 F6 4A 41
$0180 71 41 0D 01 00 00 00 00 00 00 02 00 00 00 00
$0190 00 00 2E ED 00 00 17 70 FF FF 00 00 00 00 23 28
$01A0 00 00 00 0C AA AA AA AA AA 00 00 0A 00 00 00
$01B0 01 03 03 00 00 00 00 00 00 00 00 00 00 26 86
$01C0 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
$01D0 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
$01E0 FF FF FF FF 00 15 FF FF FF FF FF FF FF FF FF
$01F0 FF FF FF FF FF FF FF FF FF FF FF FF FF 2E C8
MC0 00/00/00 00:02:23 Sent Codeplug Values to Host

```

Figure 4-7 Display Codeplug Contents

#### 4.2.4.1.3 DDC - DC Configuration Values

Enter **DDC** and press **ENTER** to display the DC Configuration of the unit. The DC Configuration is displayed as bytes in hex format. The leftmost column is the location of the first value on that line. The locations of the other values on that line are offset from the first position.

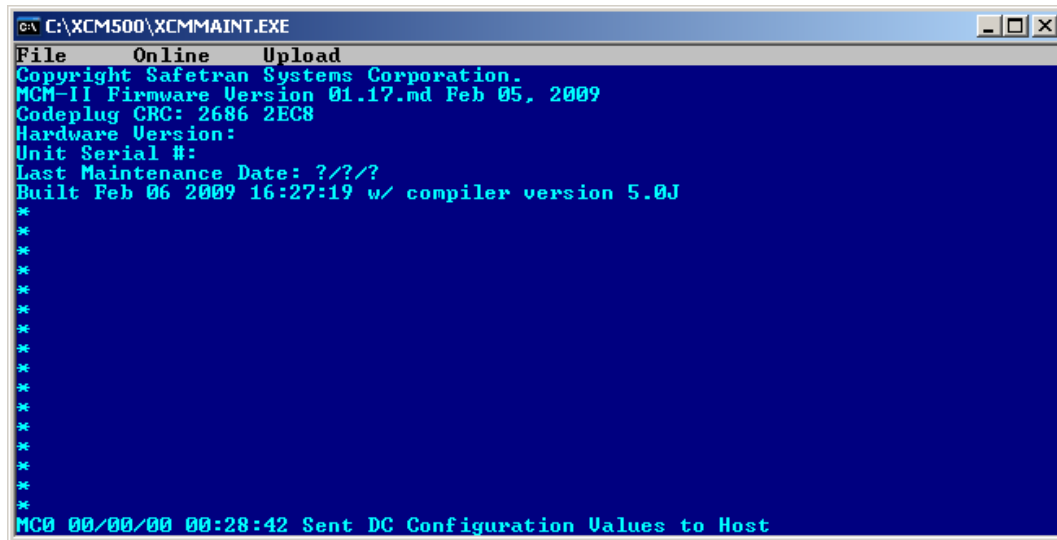
```

C:\XCM500\XCMMMAINT.EXE
File      Online  Upload
*DDC
DC Configuration Values:
$0000  00 00 00 2A 00 28 00 0A 00 5A 00 5A 00 61 00 05
$0010  00 5A 00 4B 00 19 00 05 00 07 07 00 94 10 10 00
$0020  00 08 07 00 00 08 07 00 00 08 07 00 00 08 07 00
$0030  00 08 07 00 00 08 07 00 00 08 07 00 00 08 07 00
$0040  00 08 07 00 00 08 07 00 00 08 07 00 00 08 07 00
$0050  00 08 07 00 00 08 07 00 00 08 07 00 00 08 07 00
$0060  00 08 07 00 00 08 07 00 00 08 07 00 00 08 07 00
$0070  00 08 07 00 00 08 07 00 00 08 07 00 00 08 07 00
$0080  00 08 07 00 00 08 07 00 00 08 07 00 00 08 07 00
$0090  00 08 07 00 00 08 07 00 00 08 07 00 00 08 07 00
$00A0  00 08 07 00 00 FF 01 0A 00 00 00 00 00 00 00 00
$00B0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$00C0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$00D0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$00E0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$00F0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$0100  00 00 00 2A 00 28 00 0A 00 5A 00 5A 00 61 00 05
$0110  00 41 00 4B 00 19 00 05 54 07 07 00 00 08 07 00
$0120  00 08 07 00 00 08 07 00 00 08 07 00 00 08 07 00
$0130  00 08 07 00 00 08 07 00 00 08 07 00 00 08 07 00
$0140  00 08 07 00 00 08 07 00 00 08 07 00 00 08 07 00
$0150  00 08 07 00 00 08 07 00 00 08 07 00 00 08 07 00
$0160  00 08 07 00 00 08 07 00 00 08 07 00 00 08 07 00
$0170  00 08 07 00 00 08 07 00 00 08 07 00 00 08 07 00
$0180  00 08 07 00 00 08 07 00 00 08 07 00 00 08 07 00
$0190  00 08 07 00 00 08 07 00 00 08 07 00 00 08 07 00
$01A0  00 08 07 00 00 00 01 00 00 00 00 00 00 00 00 00
$01B0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$01C0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$01D0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$01E0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$01F0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
$0200  3B 9B
*
MC0 00/00/00 00:28:42 Sent DC Configuration Values to Host
  
```

Figure 4-8 Display DC Configuration

#### 4.2.4.1.4 VER - Firmware Hardware Codeplug Version Information

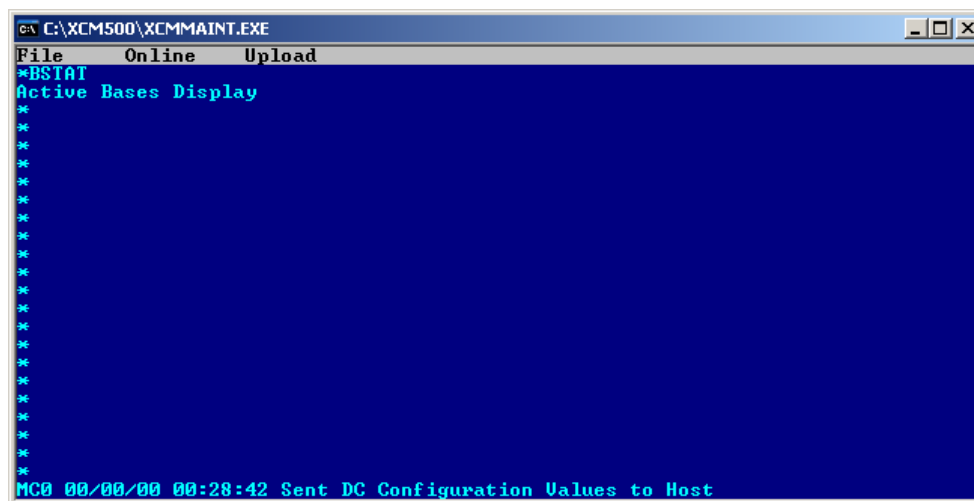
Type **VER** and press **ENTER** to view the Version information of the installed codeplug.



### Figure 4-9 Version Identification

#### 4.2.4.1.5 BSTAT - Active Base Station Status

The **BSTAT** command will display active base stations heard by the MCP. Stations are removed from the list after a period of inactivity.



### Figure 4-10 Base Station List



#### 4.2.4.1.6 CSTAT - Communication Statistics

The **CSTAT** command opens a screen with communications statistics.

```

C:\XCM500\XCMMAINT.EXE
File      Online      Upload
*CSTAT
Minutes of operation: 35
RF Logical Channel Stats
Received: 00000 00000 00000 00000 00000 00000 00000 00000
Sent:      00000 00000 00000 00000 00000 00000 00000 00000
Retries:   00000 00000 00000 00000 00000 00000 00000 00000
Failures:  00000 00000 00000 00000 00000 00000 00000 00000
Ack Only:  00000 00000 00000 00000 00000 00000 00000 00000
Port Stats      Prt 0 Prt 1 RF
Frames Sent:    00000 00000 00000
Frames Received: 00000 00000 00025
Contact Failure: 00001 00001 00000
Flow Control Entered: 0 Recoveries: 0 Re-recoveries: 0
RF Stats:
Frame Syncs:   00035 Blocks Sent: 00000 Blocks Recv'd: 00095
RS Detected:   00007 RS Corrected: 00001
Header Error:  00001 Frame Error:  00000
Radio
Channel Changes: 00001 PTT: 00000
SSI Current: -109 dB Maximum: -137 dB Minimum: -0 dB
*
MC0 00/00/00 00:28:42 Sent DC Configuration Values to Host
  
```

**Figure 4-11 Communication Statistics**

The following data is displayed on the Communications Statistics screen:

|                      |   |
|----------------------|---|
| MINUTES OF OPERATION | The number of the unit has been operational   |
| TOTAL RECEIVED       | The number of datagrams received on the respective logical channels 0 through F.  |
| TOTAL SENT           | The number of datagrams sent on the logical channels 0 through F.   |
| TOTAL RETRIES        | The number of datagrams retransmitted on the even logical channels  |
| TOTAL FAILED         | The number of datagrams that were not successfully sent on the even logical channels  |
| TOTAL ACK ONLY       | The number of ACK only datagram that were sent on the even logical channels   |
| CONTACT FAILURE      | The number of contact failures that have occurred on client port 0, client port 1, and the RF link respectively   |
| FLOW CONTROL         | The number of times flow control was entered, the number of times recovery procedures were performed, and the number of times re-recovery procedures were performed |
| SSI                  | The current value in the SSI for the last datagram received, the maximum SSI value is the highest received, and the minimum is the lowest SSI received              |



4.2.4.1.7 HSTAT - HDLC Statistics

Type **HSTAT** to display the HDLC information as shown in Figure 4-12

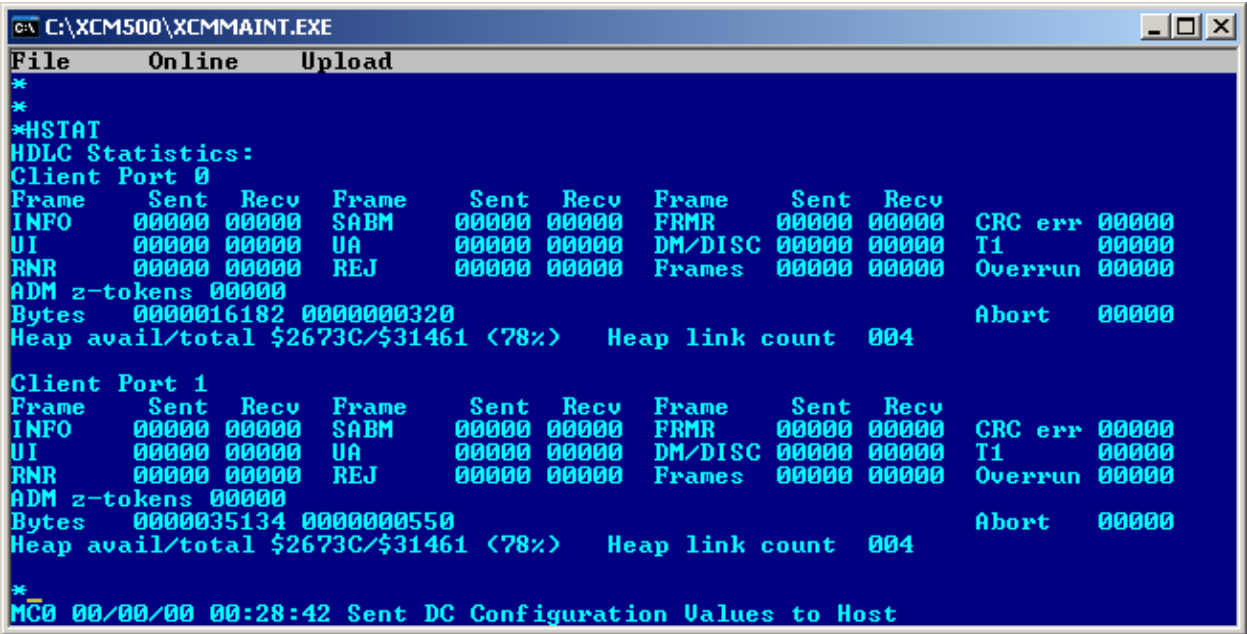


Figure 4-12 HDLC Statistics

4.2.4.1.8 MSTAT - Manufacturer Statistics

The **MSTAT** command opens a screen that lists manufacturer statistics.

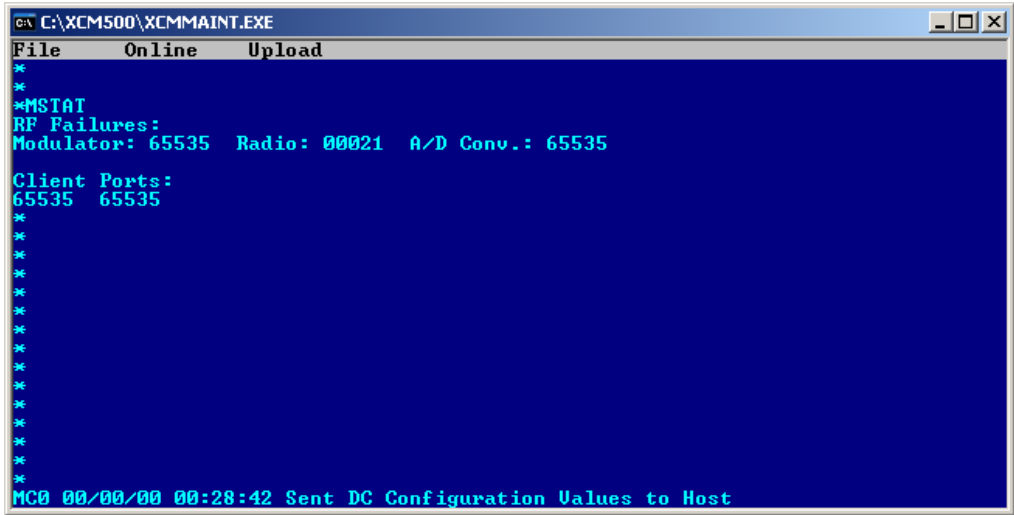
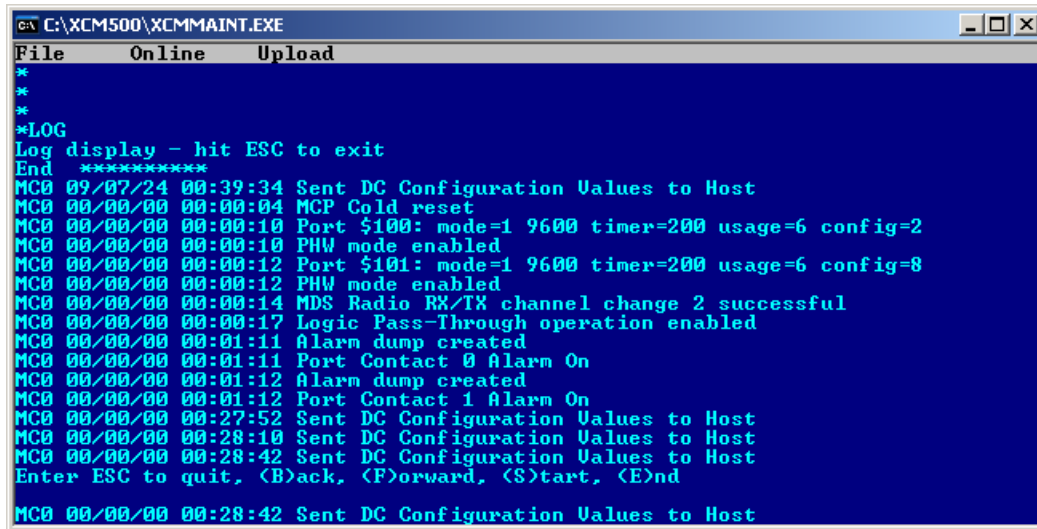


Figure 4-13 Manufacturer Statistics

#### 4.2.4.1.9 LOG - Display Log

Type **LOG** command to view the System Log. Use the **<F>** key to move forward, **<S>** key to go to the start of the log, and the **<E>** key to shift to the end of the log. Press the **ESC** key to exit the log and return to the main screen.



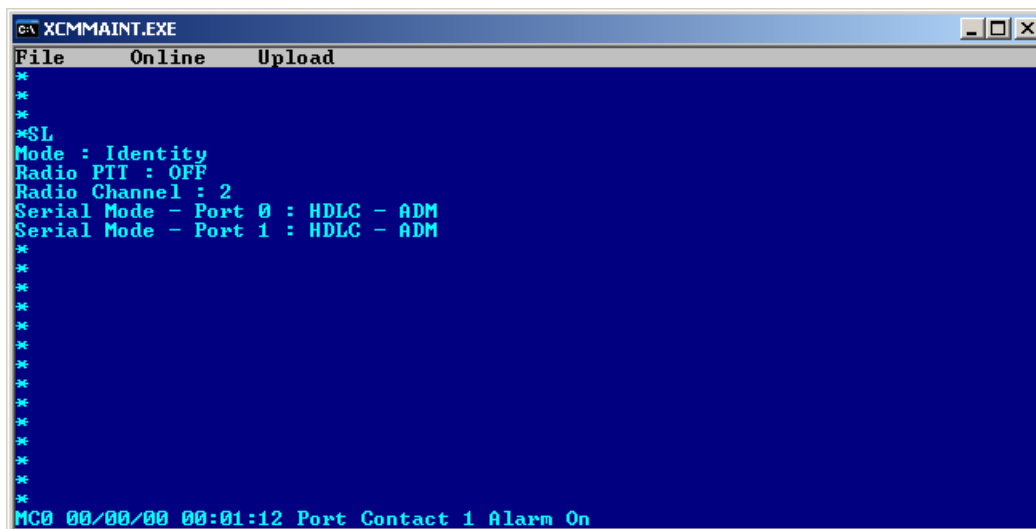
```

C:\XCMM500\XCMMMAINT.EXE
File      Online    Upload
*
*
*
*LOG
Log display - hit ESC to exit
End *****
MC0 09/07/24 00:39:34 Sent DC Configuration Values to Host
MC0 00/00/00 00:00:04 MCP Cold reset
MC0 00/00/00 00:00:10 Port $100: mode=1 9600 timer=200 usage=6 config=2
MC0 00/00/00 00:00:10 PHW mode enabled
MC0 00/00/00 00:00:12 Port $101: mode=1 9600 timer=200 usage=6 config=8
MC0 00/00/00 00:00:12 PHW mode enabled
MC0 00/00/00 00:00:14 MDS Radio RX/TX channel change 2 successful
MC0 00/00/00 00:00:17 Logic Pass-Through operation enabled
MC0 00/00/00 00:01:11 Alarm dump created
MC0 00/00/00 00:01:11 Port Contact 0 Alarm On
MC0 00/00/00 00:01:12 Alarm dump created
MC0 00/00/00 00:01:12 Port Contact 1 Alarm On
MC0 00/00/00 00:27:52 Sent DC Configuration Values to Host
MC0 00/00/00 00:28:10 Sent DC Configuration Values to Host
MC0 00/00/00 00:28:42 Sent DC Configuration Values to Host
Enter ESC to quit, <B>ack, <F>orward, <S>tart, <E>nd
MC0 00/00/00 00:28:42 Sent DC Configuration Values to Host
  
```

Figure 4-14 View Log

#### 4.2.4.1.10 SL - Status Log

Type **SL** command and press **ENTER**. The status logging is initially disabled. When the command is first entered to enable status logging (**SL en**), the status summary is displayed. After status logging is enabled, any subsequent state changes are displayed as they occur. If the command is re-entered to enable status logging, the summary reflects the present status of the MCP. The **SL ds** command disables the status log.



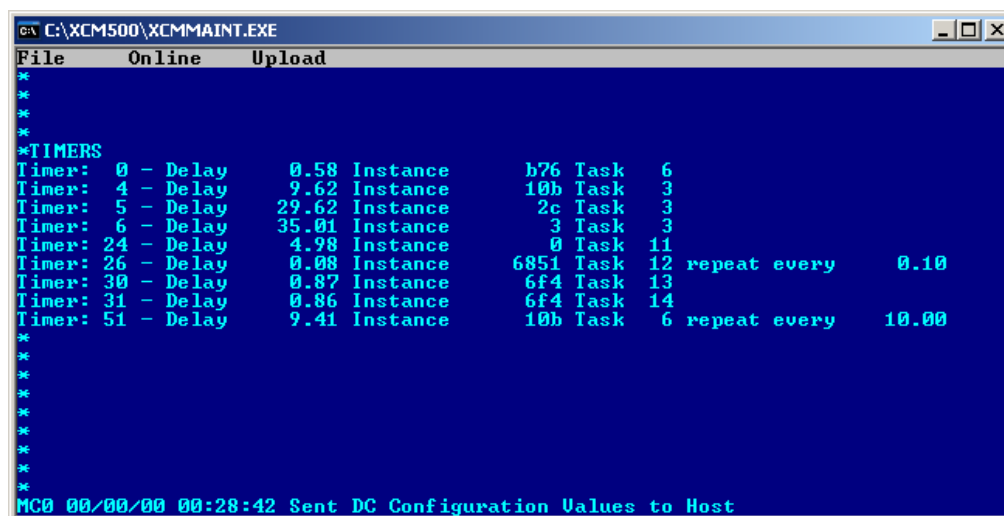
```

C:\XCMM500\XCMMMAINT.EXE
File      Online    Upload
*
*
*
*SL
Mode : Identity
Radio PTI : OFF
Radio Channel : 2
Serial Mode - Port 0 : HDLC - ADM
Serial Mode - Port 1 : HDLC - ADM
*
*
*
*
*
*
*
*
*
*
*
*
MC0 00/00/00 00:01:12 Port Contact 1 Alarm On
  
```

Figure 4-15 Status Log

#### 4.2.4.1.11 TIMERS - Display Timer Configurations

Type the **TIMERS** command and press **ENTER** to list the current configuration of the logic timers.



```

C:\XCM500\XCMMMAINT.EXE
File Online Upload
*
*
*
*TIMERS
Timer: 0 - Delay 0.58 Instance b76 Task 6
Timer: 4 - Delay 9.62 Instance 10b Task 3
Timer: 5 - Delay 29.62 Instance 2c Task 3
Timer: 6 - Delay 35.01 Instance 3 Task 3
Timer: 24 - Delay 4.98 Instance 0 Task 11
Timer: 26 - Delay 0.08 Instance 6851 Task 12 repeat every 0.10
Timer: 30 - Delay 0.87 Instance 6f4 Task 13
Timer: 31 - Delay 0.86 Instance 6f4 Task 14
Timer: 51 - Delay 9.41 Instance 10b Task 6 repeat every 10.00
*
*
*
*
*
MCM 00/00/00 00:28:42 Sent DC Configuration Values to Host

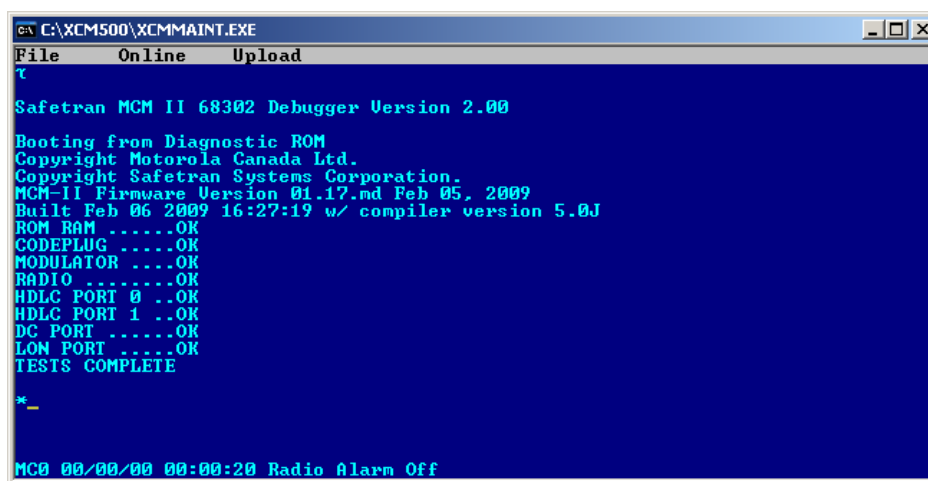
```

Figure 4-16 Timer Status

#### 4.2.4.1.12 TEST restart - MCP Self-Test

The TEST command resets the MCP and performs a series of diagnostic tests before returning to operational status. The TEST command has two arguments:

- 0 (warm) - Perform the self-tests while the MCP remains operational
- 1 (cold) - Resets the MCP and the power-up sequence is performed including the self-tests.



```

C:\XCM500\XCMMMAINT.EXE
File Online Upload
t
Safetran MCM II 68302 Debugger Version 2.00
Booting from Diagnostic ROM
Copyright Motorola Canada Ltd.
Copyright Safetran Systems Corporation.
MCM-II Firmware Version 01.17.md Feb 05, 2009
Built Feb 06 2009 16:27:19 w/ compiler version 5.0J
ROM RAM .....OK
CODEPLUG .....OK
MODULATOR ....OK
RADIO .....OK
HDLC PORT 0 ..OK
HDLC PORT 1 ..OK
DC PORT .....OK
LON PORT .....OK
TESTS COMPLETE
*
MCM 00/00/00 00:00:20 Radio Alarm Off

```

Figure 4-17 MCP Self-test

#### 4.2.4.1.13 SERV - Service Command

The **SERV** (Service) command activates certain functions and disables others for service purposes. The MCP performs functions controlled by the testport; all other functions are disabled. Once in the service mode, it is necessary to reset the MCP to return to the operational mode. Resetting of the MCP is accomplished using the **TEST** command. The following functions are activated with the MCP in the Service Mode.

- CHAN            -        Change channel number
- ERT            -        Perform error rate test
- PTT en/ds     -        Key/De-key radio
- SIMP en/ds    -        Enable/disable simplex mode

To place the MCP Cab Radio in the Service (SERV) mode type **SERV** and press **ENTER** as shown in Figure 4-18.

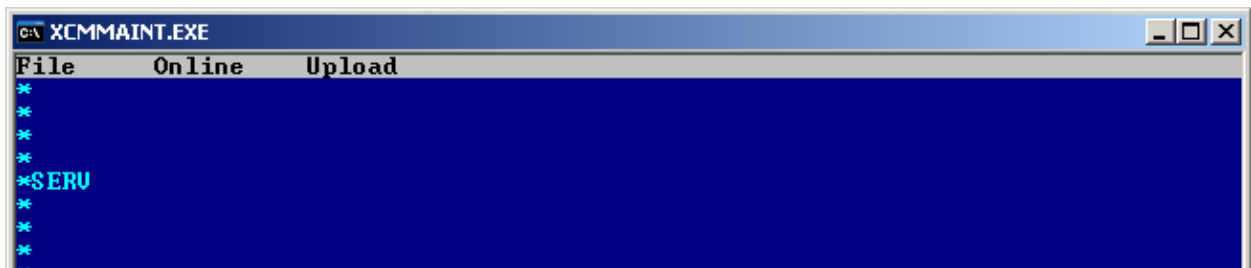


Figure 4-18 Service (SERV) Mode

#### 4.2.4.1.14 CHAN - Change Channel (SERV Mode Only)

The CHAN command changes channels between the programmed channel pairs stored in the radio. Type the command followed by the desired channel number (e.g. CHAN 2) and the screen will acknowledge the channel change as shown in Figure 4-19

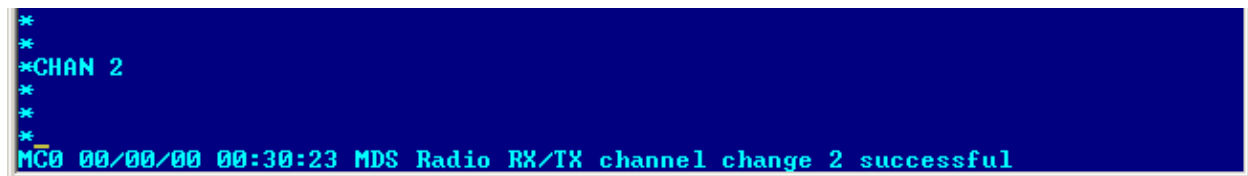


Figure 4-19 Change RX/TX Channel

The ATCS frequency pairs have been programmed into the radio codeplug as follows:

| CH. No. | Base to Mobile (RX) Frequency | Mobile to Base (TX) Frequency |
|---------|-------------------------------|-------------------------------|
| 1       | 935.8875 MHz                  | 896.8875 MHz                  |
| 2       | 935.9375 MHz                  | 896.9375 MHz                  |
| 3       | 935.9875 MHz                  | 896.9875 MHz                  |
| 4       | 936.8875 MHz                  | 897.8875 MHz                  |
| 5       | 936.9375 MHz                  | 897.9375 MHz                  |
| 6       | 936.9875 MHz                  | 897.9875 MHz                  |

#### 4.2.4.1.15 ERT - Error Rate Test (SERV Mode Only)

The Error Rate Test (**ERT** command) allows communication links to be tested and error rate figures to be calculated. The unit must be in the service (SERV) mode to operate. Type **SERV** and press **ENTER** to activate the service mode.

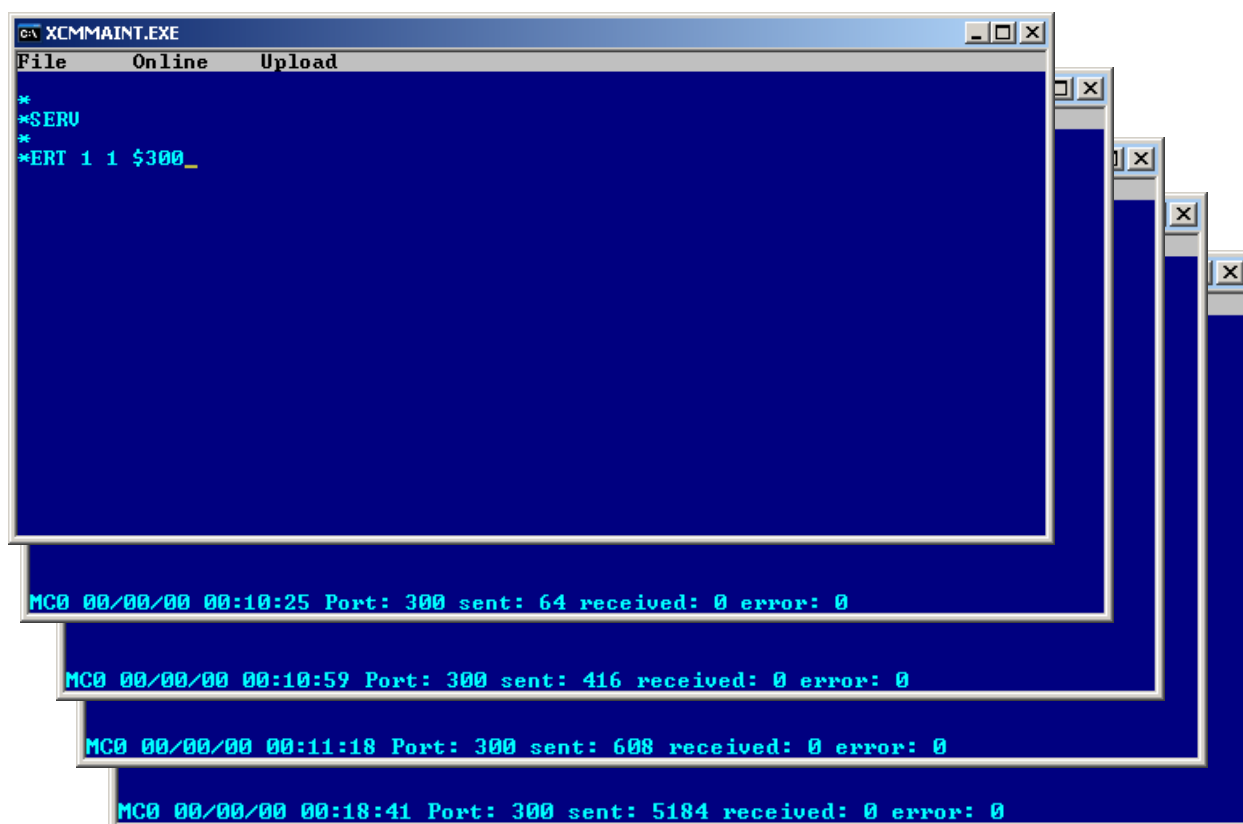


Figure 4-20 Error Rate Test Screens

The ERT command has the following arguments:

|         |       |  |
|---------|-------|--|
| Mode    | -     | Type of Loopback Mode  |
|         | 1     | = open (NO) loopback   |
|         | 2     | = digital loopback   |
|         | 3     | = analog loopback  |
|         | 4     | = open loop with RTS asserted (for wireline modem only)                          |
| Layer   | -     | Allows user to specify layer   |
|         | 1     | = physical layer - allows a bit error rate test to be done (For RF Channel Only) |
|         | 2     | = datalink layer - allows message error rate testing to be done                  |
| Port    | -     | Allows user to specify port number   |
|         | \$100 | = Client Port 0 (wireline modem port on BCP)                                     |
|         | \$101 | = Client Port 1 (spare port on BCP)  |
|         | \$300 | = RF Channel   |
| Pattern | -     | Byte pattern to send (hex or ASCII). If not defined, a default pattern is used.  |

The results will be displayed at the bottom of the screen as shown in Figure 4-20. The definitions below detail the test results displayed.

```
MC0 00/00/00 01:20:16 Port: 300 sent: 43328 received: 61 error: 6877 BER: 0.001
```

|          |   |  |
|----------|---|--|
| PORT     | - | The port for which these results apply   |
| SENT     | - | The number of patterns generated by this unit  |
| RECEIVED | - | The number of patterns correctly received by this unit   |
| ERROR    | - | The number of patterns received that do not match the generated pattern; except for RF Channel (port \$300) physical layer (layer 1) ERT commands, where this represents the number of bit errors.             |
| BER      | - | The ratio of the total error bit count over the total received bit count (i.e., [total bit errors] / [total bits received]). This calculation applies to RF channel physical layer (layer 1) ERT commands only |

#### 4.2.4.1.16 PTT en/ds - Push To Talk (SERV Mode Only)

The **PTT** command allows the user to key and dekey the radio. To verify the result of the PTT command, Status Logging (SL command) must be enabled. If the radio is already in the requested state, the command is ignored. The command remains in effect until explicitly changed. The result is displayed on the bottom of the screen as shown in Figure 4-21. The MCP transmitter time-out timer will automatically de-key the radio if allowed to expire. To rekey the MCP in this case, the radio must be first de-keyed using the de-key command (**PTT ds**), then the radio can be keyed using the key command (**PTT en**).

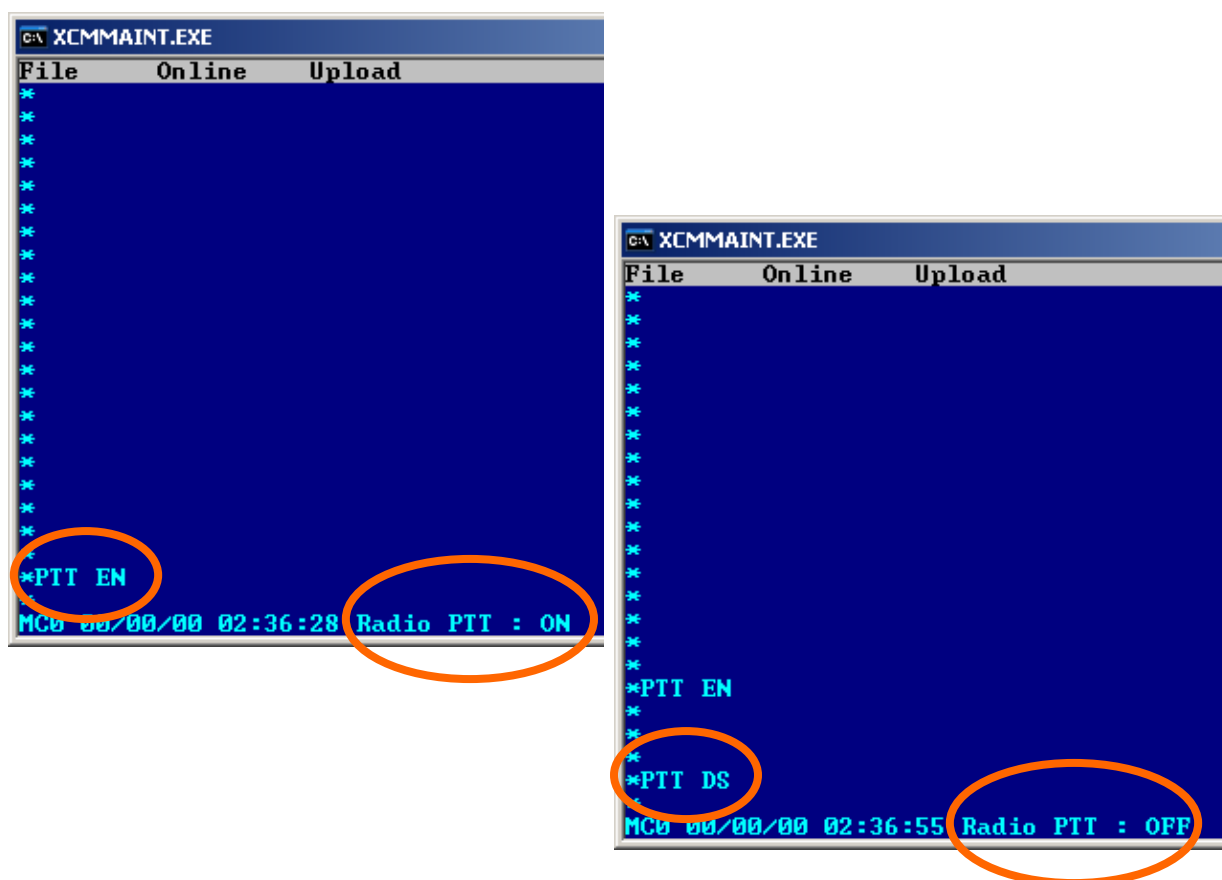


Figure 4-21 PTT - Push To Talk Command

#### 4.2.4.1.17 SIMP en/ds - Simplex Command (SERV Mode Only)

The SIMP command enables or disables the MCP radio simplex mode of operation. In the normal mode, one frequency is used for transmit and another frequency is used for receive. In the simplex mode, the normal mode receive frequency is also used for transmit. The radio is initially in the normal mode. When the MCP is in the out-of-coverage (fallback) mode, it will revert to simplex mode operation to allow direct RF-user to RF-user communication. There is no direct indication that this command has been executed. However, the simplex/normal mode status may be monitored by executing the Status Logging (SL) command. When the radio is keyed, simplex operation is indicated in the radio PTT state field as displayed in Figure 4-22.

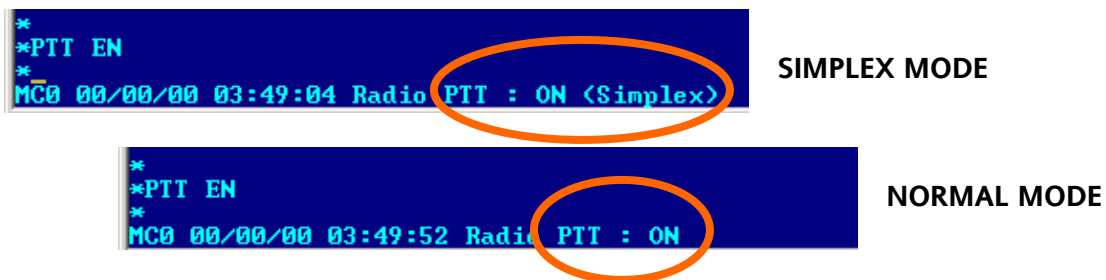


Figure 4-22 Simplex and Normal Mode Displays

#### 4.2.4.1.18 Exit SERV Mode

Once in the service mode, it is necessary to reset the MCP to return to the operational mode. Resetting of the MCP is accomplished using the **TEST** command. Type **TEST** and press **ENTER** the MCP will perform a cold start and return to normal operation.

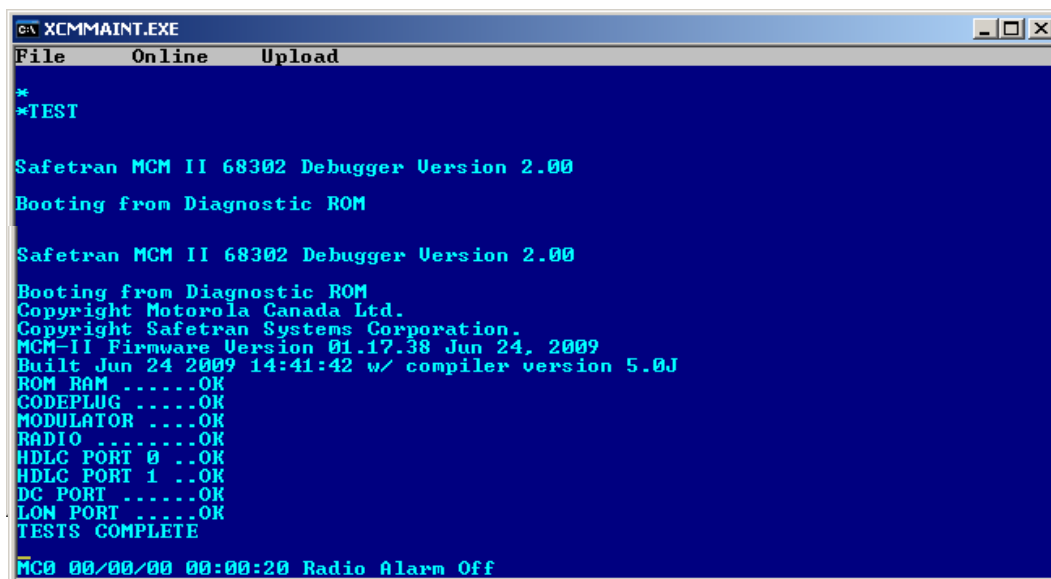


Figure 4-23 Exit SERV Mode



4.2.4.2 Bit Map Display

This entry displays the Bitmap screen, figure 6-10, which is an online dynamic display of the logic state of any physical inputs or outputs associated with the WCP CPU II via ladder logic. The logic state of all internal bit fields are displayed as well. When properly configured I/O modules are installed on the local Echelon® LAN, the current state of their inputs and outputs can be determined using this screen.

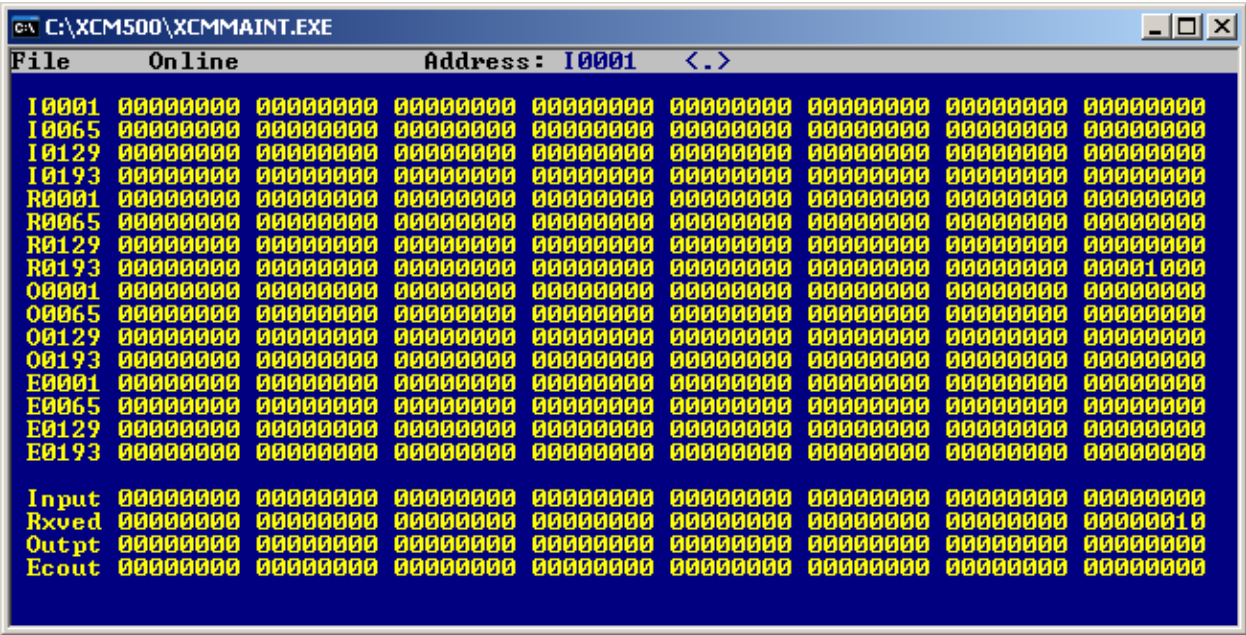
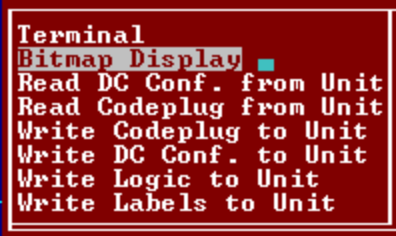


Figure 4-24 Bitmap Display

#### 4.2.4.3 Read DC Configuration from Unit

By selecting this function and pressing **ENTER**, the configuration of the DC port of the MCP is read. The **Receiving data** popup box will display briefly as the data is read. The main edit screen will be updated to reflect the configuration data that is read.

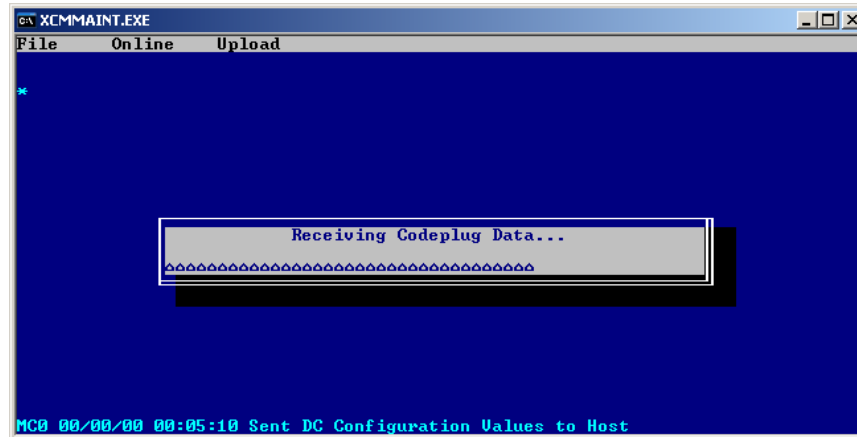
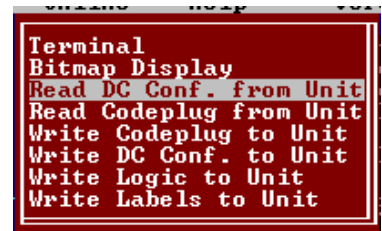


Figure 4-25 Read DC Configuration from Unit

#### 4.2.4.4 Read Codeplug from Unit

By selecting this function and pressing **ENTER**, the Codeplug portion of the MCP configuration data is read. This is a 512-byte data array that stores all the user-modifiable MCP configuration information. The **Receiving data** popup box (see above) will display briefly as the data is read. The main edit screen is updated to reflect the codeplug data that is read.

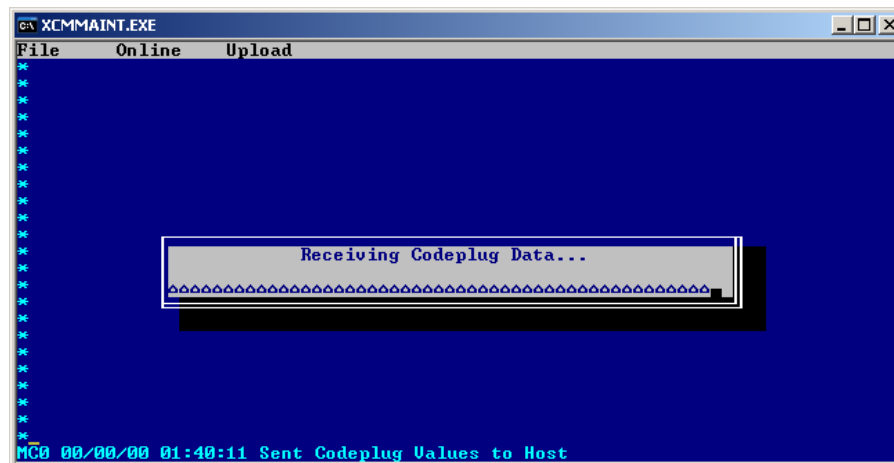
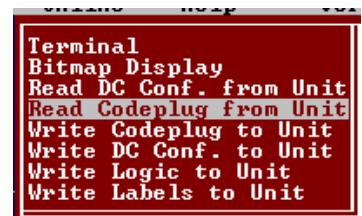


Figure 4-26 Read Codeplug from Unit

#### 4.2.4.5 Upload Codeplug to Unit

The **sending data** popup box will display briefly as codeplug data is written. By selecting this function and pressing **ENTER**, all the configuration data appearing on the main edit screen will be written to the WCP CPU II non-volatile memory.

```
Terminal
Bitmap Display
Read DC Conf. from Unit
Read Codeplug from Unit
Write Codeplug to Unit
Write DC Conf. to Unit
Write Logic to Unit
Write Labels to Unit
```

Sending data ... 60%

#### CAUTION

EXISTING CODEPLUG DATA IN THE WCP CPU WILL  
BE OVERWRITTEN AND IRRETRIEVABLY LOST.

#### 4.2.4.6 Upload DC Configuration to Unit

By selecting this function and pressing **ENTER**, the DC configuration data on the main edit screen (**DC1**) will be written to MCP.

The **Sending data** popup box may display briefly while the data is being uploaded.

```
Terminal
Bitmap Display
Read DC Conf. from Unit
Read Codeplug from Unit
Write Codeplug to Unit
Write DC Conf. to Unit
Write Logic to Unit
Write Labels to Unit
```

Sending data ... 60%

#### 4.2.4.7 Upload Logic to Unit

This function uploads compiled ladder logic to the MCP if the following conditions are met:

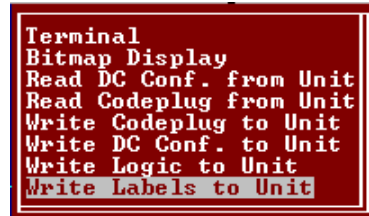
1. Appropriate ladder logic has been compiled
2. The name of the logic file generated has been entered on the main edit screen (in the Site Settings section). The file extension is omitted.

```
Terminal
Bitmap Display
Read DC Conf. from Unit
Read Codeplug from Unit
Write Codeplug to Unit
Write DC Conf. to Unit
Write Logic to Unit
Write Labels to Unit
```

After the upload sequence is complete, the WCP CPU II calculates a CRC value for the ladder logic. If this CRC value does not match the CRC embedded in the logic file, the process aborts with the WCP CPU II unchanged.

#### 4.2.4.8 Upload Labels to Unit

By selecting this function and pressing **ENTER**, the tokenized label file associated with the ladder logic is uploaded to the WCP CPU II. The conditions for uploading are the same as for the logic upload described above. The label file and the logic file are generated by the logic compiler and will have the same base filename (with different extensions). As a result, it is only necessary to specify the base filename in the **Logic File** field on the main edit screen.



```
Terminal
Bitmap Display
Read DC Conf. from Unit
Read Codeplug from Unit
Write Codeplug to Unit
Write DC Conf. to Unit
Write Logic to Unit
Write Labels to Unit
```

#### 4.2.4.9 Radio Diagnostics

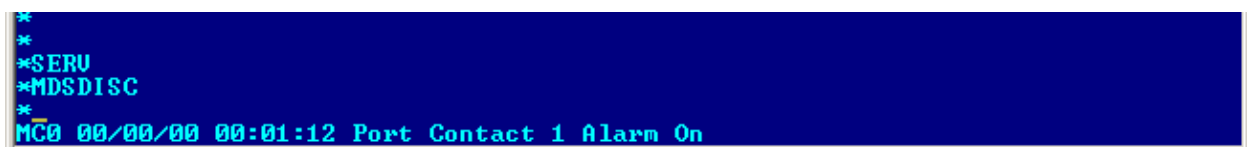
The MCP Cab Radio is equipped with a RJ-11 Radio Diagnostics port on the front panel. This port communicates with the MDS Radio directly and enables configuration of the radio as well as provide current configuration information. Radio Diagnostics requires the use of MDS Radio Configuration software (Part Number: 03-3156A01, Rev 2.4.0 or later) and a DB-9 to RJ-11 cable as described in Section 1.3.5 of this manual.

#### WARNING

**RADIO DIAGNOSTICS MUST BE PERFORMED BY QUALIFIED PERSONNEL IN ACCORDANCE WITH FCC RULES AND REGULATIONS. FAILURE TO COMPLY MAY RESULT INTERFERENCE TO OTHER EQUIPMENT AND MAY VOID USERS AUTHORITY TO OPERATE THIS DEVICE.**

##### 4.2.4.9.1 Activation of Radio Diagnostics Port

In normal operation the RJ-11 port is not active. To activate the Radio Diagnostic port it is necessary to place the MCP Cab Radio in the service mode using the XCMMAINT software. Type **SERV** to and press **ENTER** to activate the Service Mode. To activate the Radio Diagnostic Port type **MDSDISC** and press **ENTER** as shown in Figure 4-27.



```
*
*
*SERV
*MDSDISC
*
MCB 00/00/00 00:01:12 Port Contact 1 Alarm On
```

**Figure 4-27 Activation of Radio Diagnostics Port**

It is necessary to exit the XCMMAINT program before the Radio Diagnostic port will become active. Note it is necessary to exit the XCMMAINT program by type **ALT-F**, the pull down menu will appear. Highlight **EXIT** using the ARROW keys or a mouse and press **ENTER** as shown in Figure 4-28.

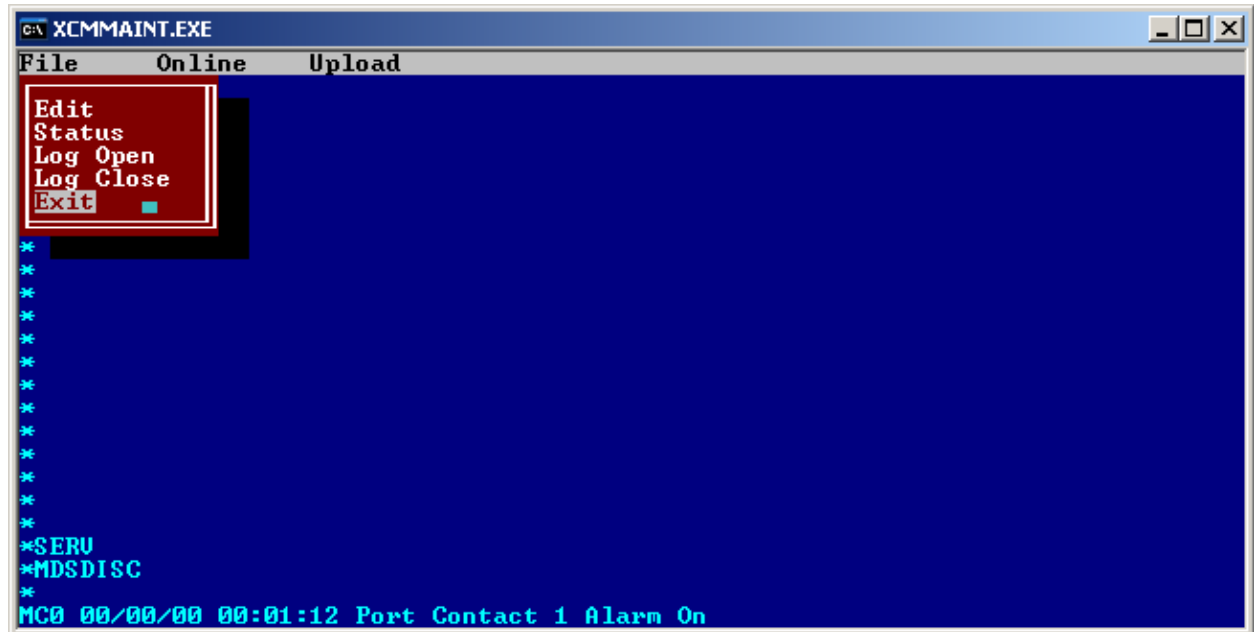


Figure 4-28 Exit XCMMAINT

#### 4.2.4.10 Radio Configuration Software

The MDS Radio Configuration Software is provided on CD media and it will be required to install the software on the PC being used to configure the radio.

#### WARNING

RADIO CONFIGURATION MUST BE PERFORMED BY QUALIFIED PERSONNEL IN ACCORDANCE WITH FCC RULES AND REGULATIONS. FAILURE TO COMPLY MAY RESULT INTERFERENCE TO OTHER EQUIPMENT AND MAY VOID USERS AUTHORITY TO OPERATE THIS DEVICE. PRIOR TO ALTERING ANY CONFIGURATION PARAMETERS ENSURE ANY CHANGES ARE COMPATIBLE WITH THIS APPLICATION.

#### 4.2.4.10.1 Opening Radio Configuration Software

With the software installed, open the application. The opening screen will appear as shown in Figure 4-29.

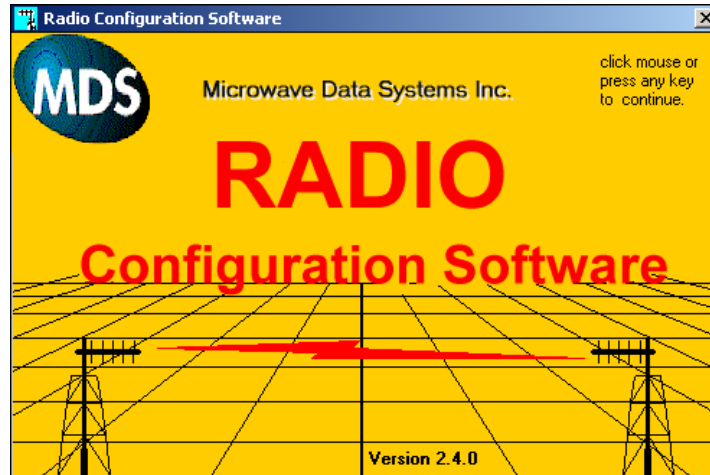


Figure 4-29 Configuration Software - Opening Screen

#### 4.2.4.10.2 Open Com Port

The software must open the communication port between the computer and the radio and read this information from the radio. Click YES on the pop-up window to open a direct line to the radio as shown in

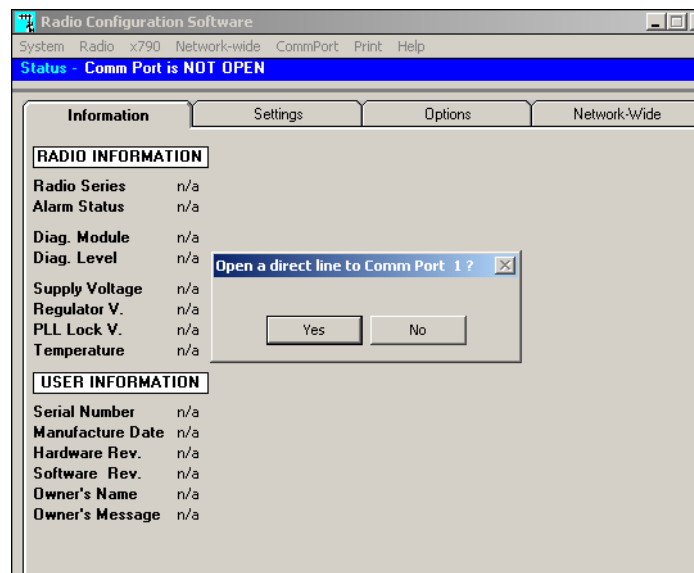


Figure 4-30 Configuration Software - Open Comm Port

#### 4.2.4.10.3 Radio Information

The Information tab displays the Radio Information and User Information as shown below.

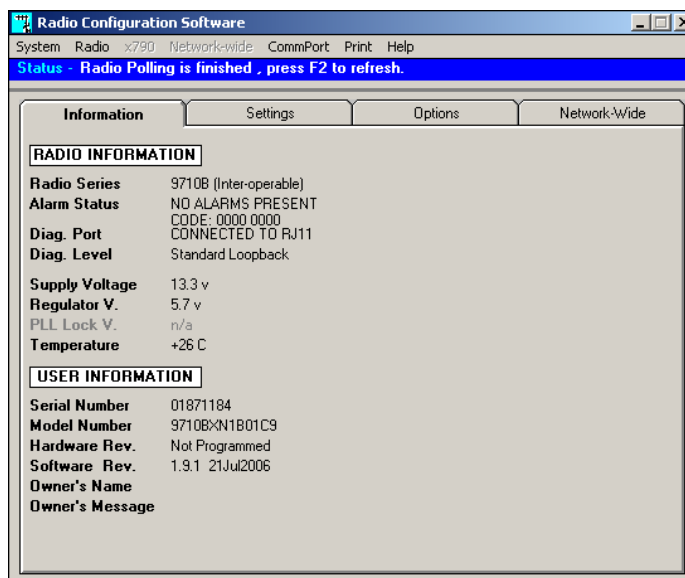


Figure 4-31 Configuration Software - Radio Information Tab

#### 4.2.4.10.4 Radio Settings

The Settings tab displays the current radio settings programmed into the radio.

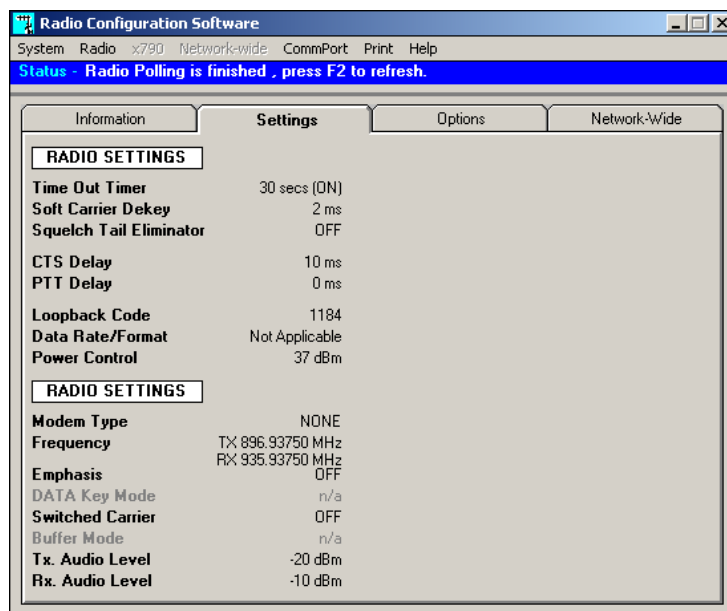


Figure 4-32 Configuration Software - Radio Settings Tab

#### 4.2.4.10.5 Options

The Options tab displays the authorized radio options available.

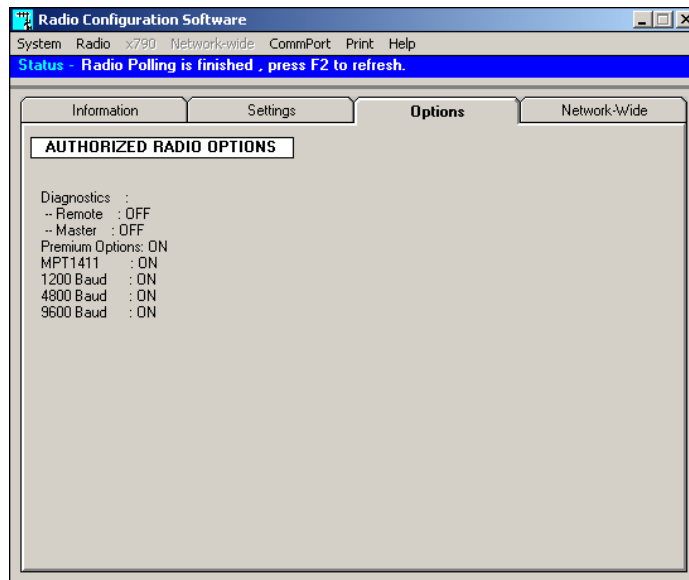


Figure 4-33 Configuration Software - Radio Options

#### 4.2.4.10.6 Main Menu

Using the the task bar click on **RADIO** to bring up the Main Menu.

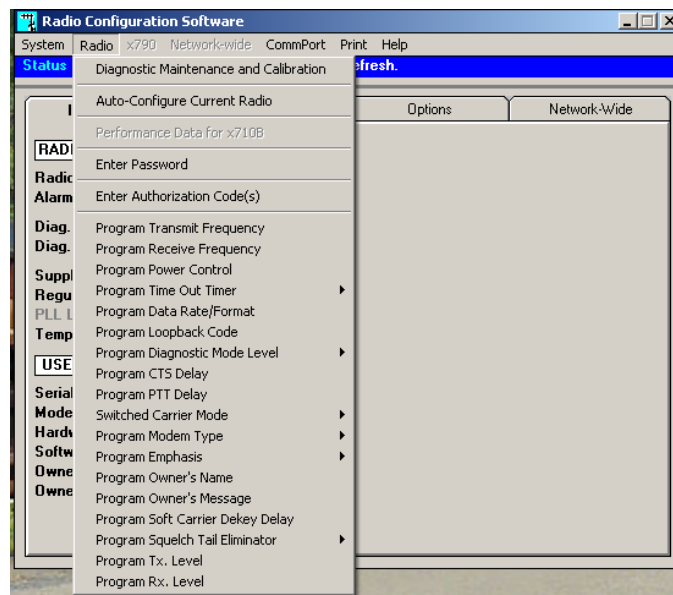
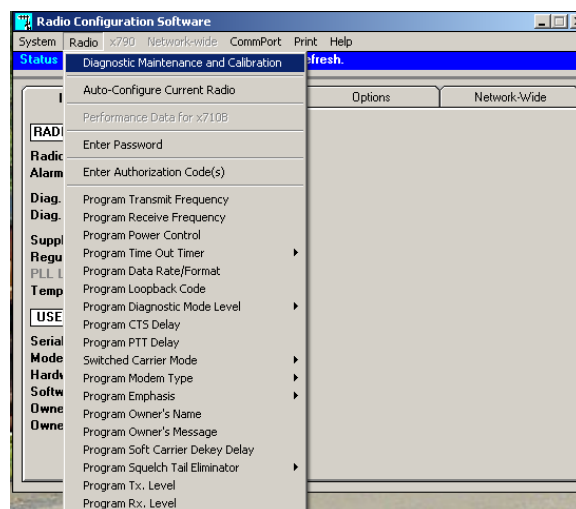


Figure 4-34 Configuration Software - Main Menu



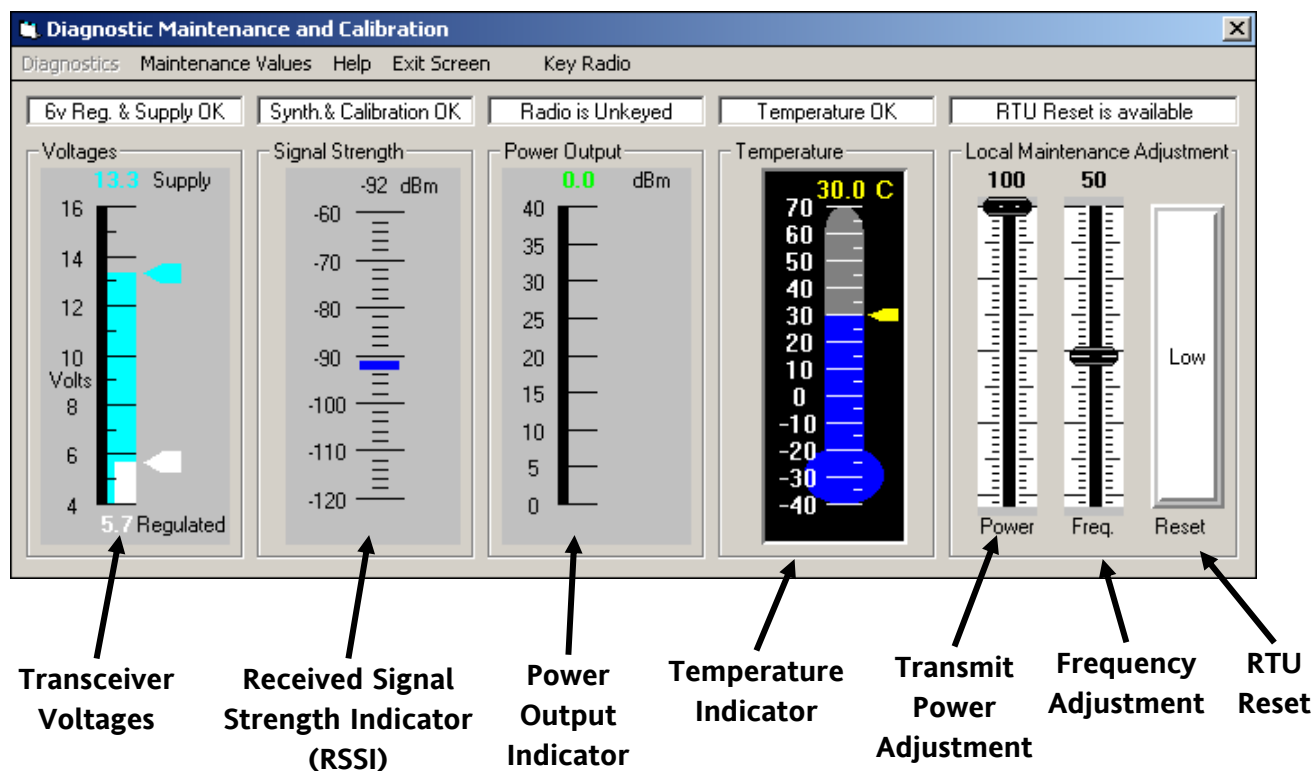
#### 4.2.4.10.7 Diagnostic Maintenance and Calibration

Click on Diagnostic Maintenance and Calibration selection from the Main Menu as shown in Figure 4-35.



**Figure 4-35 Configuration Software - Main Menu - Diag. Maint. & Calib.**

The following window opens displaying current radio status.



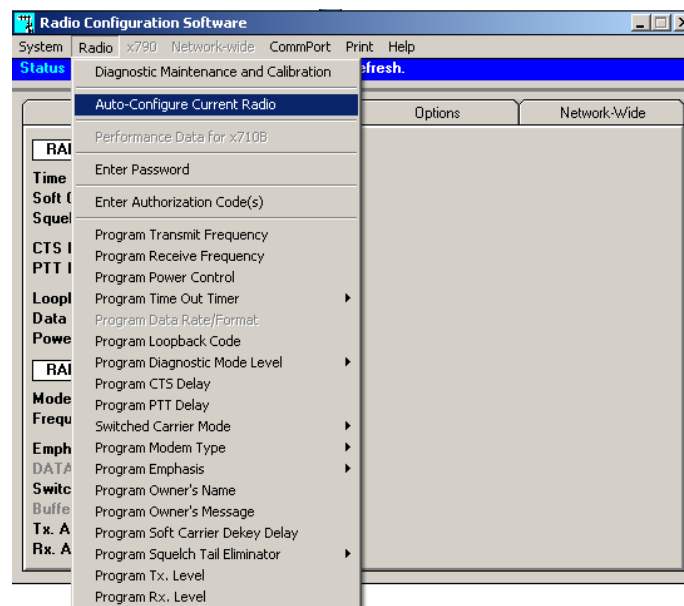
**Figure 4-36 Configuration Software - Diagnostic Maintenance and Calibration**

The Indicators and Controls on the Diagnostic Maintenance and Calibration window are as follows:

|  |  |
|--|--|
| <b>Transceiver Voltages</b>                      | This area shows the level of two voltages inside the transceiver. The input source voltage and the regulated radio voltage used by the transceiver components. |
| <b>Received Signal Strength Indicator (RSSI)</b> | This area shows the approximate strength (in dBm) of the signal being received.  |
| <b>Power Output Indicator</b>                    | This area shows the power output (in dBm) of the transceiver when the unit is in the transmit mode.  |
| <b>Temperature Indicator</b>                     | This thermometer displays the internal temperature of the radio in degrees Celsius.  |
| <b>Transmit Power Adjustment</b>                 | This slider adjusts the output of the radio.   |
| <b>Frequency Adjustment</b>                      | This slider fine-adjusts the TX-RX frequencies.  |
| <b>RTU Reset</b>                                 | Used with the Remote Terminal Unit (RTU). Click the button to set pin 15 High or Low.  |

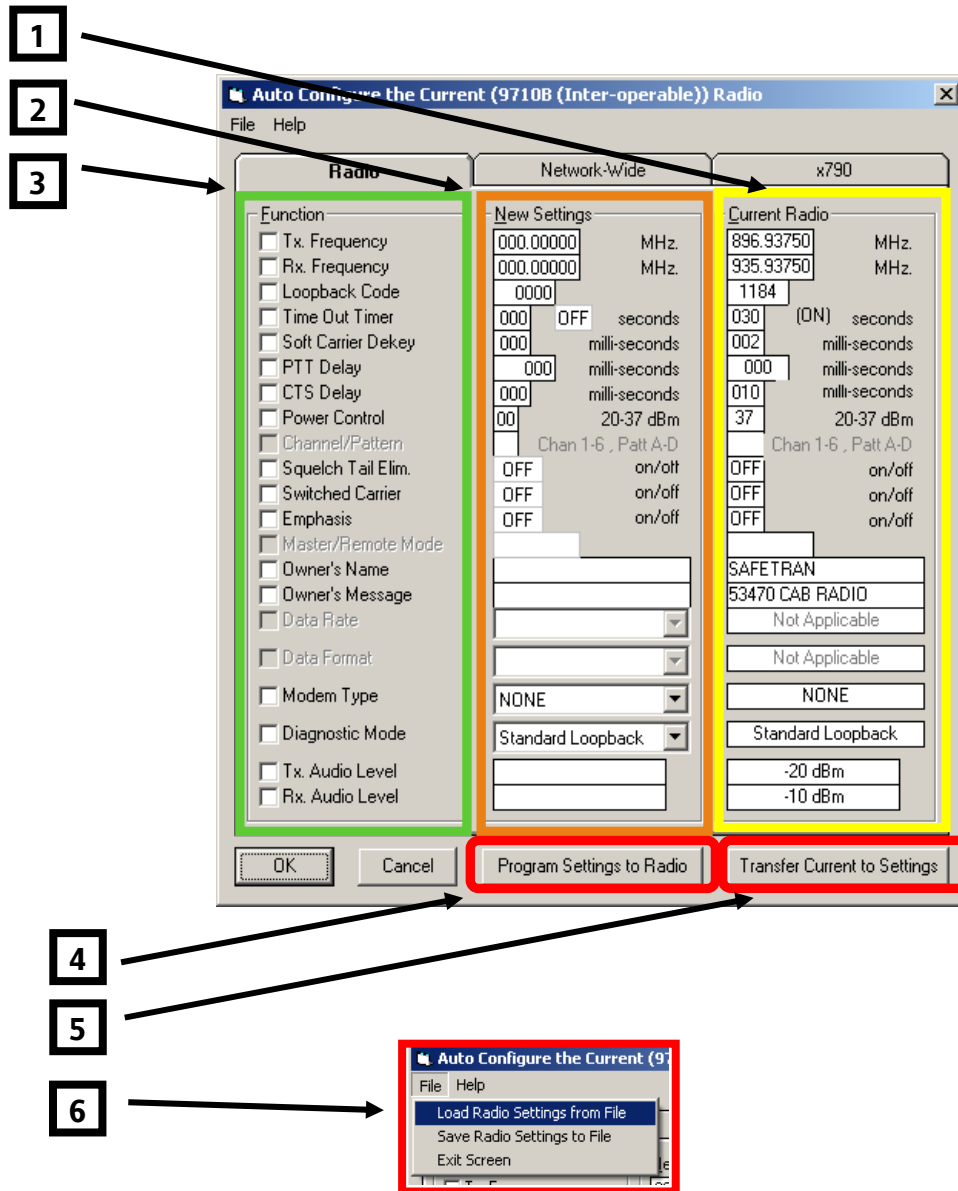
#### 4.2.4.10.8 Auto-Configure

Click on **RADIO** in the task bar and bring up the Main Menu. Highlight **Auto-Configure Current Radio** to bring up the Auto-Configure window.



**Figure 4-37 Configuration Software - Auto-Configure Current Radio**

The Auto-Configure window will appear and starts the utility. This feature allows management, storage, uploading, and downloading of transceiver parameter files. New settings may be entered in to the New Settings column. Pressing the Program Settings To Radio button will transfer the information to the radio. Pressing the Cancel button will abort the procedure. Click on the Transfer Current to Settings button will populate the New Settings column with the Current Radio Settings



**Figure 4-38 Configuration Software - Auto Configure Utility**

The Auto Configure Utility components are as follows:

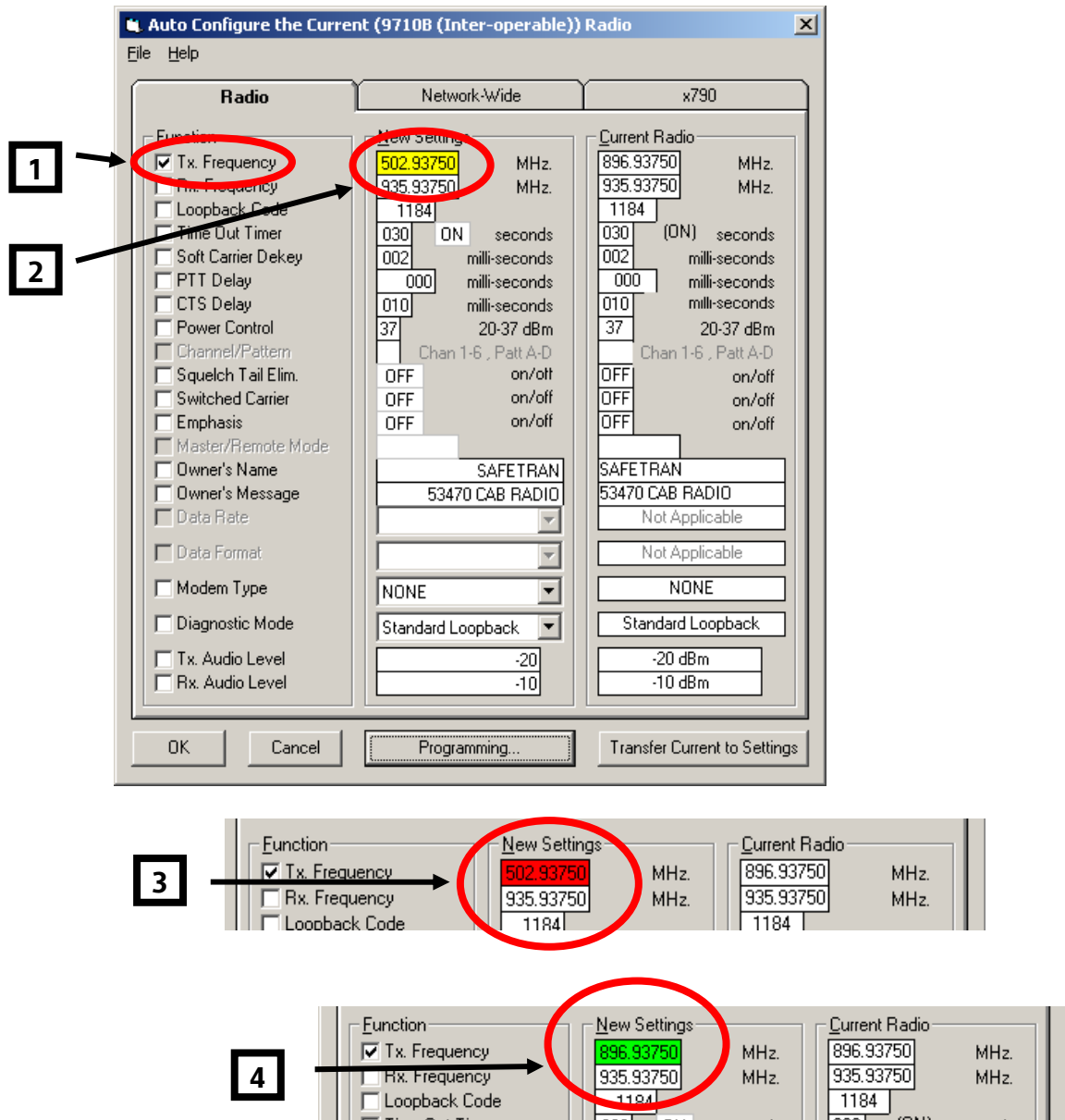
- 1** **Current Radio** - This column lists the current radio configuration as read by the utility
- 2** **New Settings** - This Column is used to enter new settings desired for the radio.
- 3** **Function** - This column has a check box for each configurable function. To configure a function, check the box and enter the new setting in the New Settings Column.
- 4** **Program Settings to Radio** - This button sends selected new settings to the radio.
- 5** **Transfer Current to Settings** - This button copies and sends all of the current data in the Current Radio column to the New Settings column.

**File Drop Menu** - The File Drop Menu has the following three functions:

- **Load Radio Settings from File** - This selection opens a standard dialog box to open a transceiver parameter file that has been stored on the computer. Notice the default suffix name is .RFP which is an abbreviation for Radio Parameter File.
- **Save Radio Settings to File** - This selection opens a standard dialog box to save a transceiver parameter file that has to be stored on the computer. Notice the default filename suffix is RPF which is an abbreviation for Radio Parameter File.
- **Exit Screen** - This function exits the Auto Configure Utility and returns control of the software to the Main Window.

### Auto Configure Programming Example

Refer to Figure 4-39 for screen examples. To program a new transmit frequency check the box **[1]** to the left of Tx Frequency in the Function column. Enter the desired transmit frequency in the Tx Frequency box **[2]** in the New Settings Column. Press the **Program Settings to Radio** button. The button will indicate programming and the parameter box will turn yellow **[2]**. In the event the parameter did not successfully program, the parameter box in the new settings column **[3]** will turn red. Check the parameter and verify it is within an acceptable range for the radio. In this example the frequency was entered wrong and is out of the range of the radio and has alarmed by turning the box red. Re-enter the parameter and press the **Program Settings to Radio** button. The button will indicate programming and the parameter box **[2]** will turn yellow. If the programming was successful the parameter box **[4]** will turn green. Click the **OK** button or use the **File** drop menu to exit the utility.

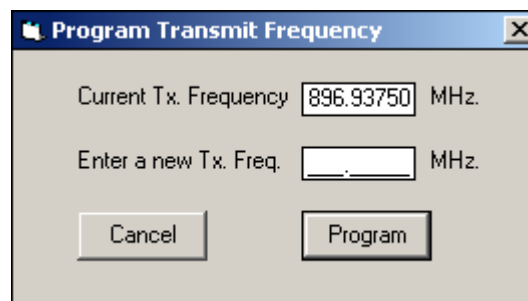
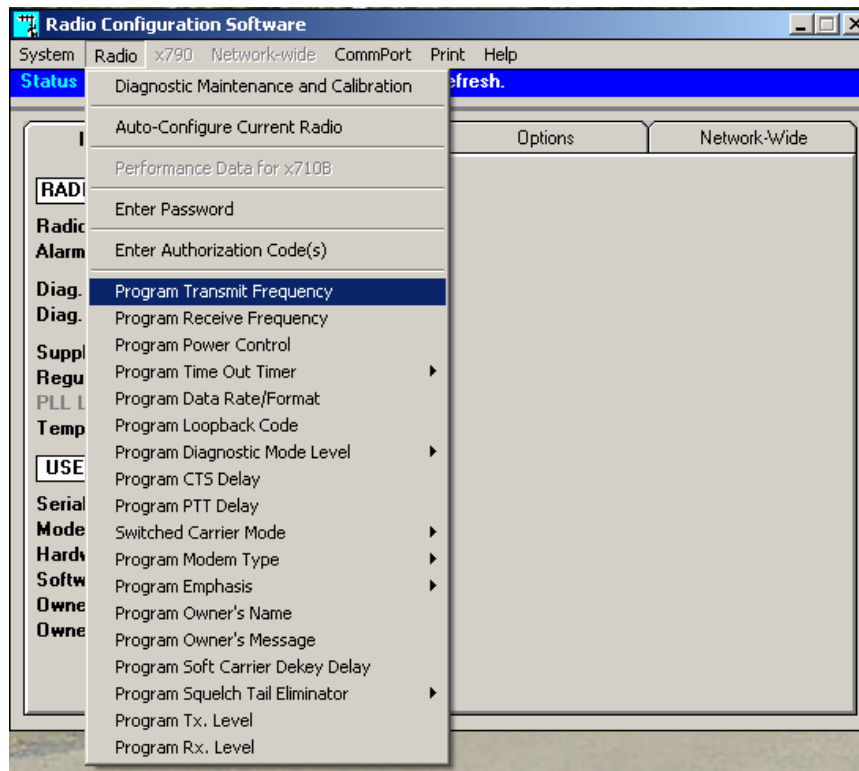


|               |  |
|---------------|--|
| <b>YELLOW</b> | A parameter box turns yellow during the transfer process.  |
| <b>RED</b>    | A parameter box that turns red indicates the parameter has not successfully transferred to the radio. Verify the parameter has been entered correctly and is within the proper limits. |
| <b>GREEN</b>  | A parameter box that turns green indicates the transfer process has been successful.   |

Figure 4-39 Configuration Software - Auto Configure Programming Example

#### 4.2.4.10.9 Programming Transmit Frequency

Using the Radio Main Menu select the Program Transmit Frequency entry as shown in Figure 4-40. A dialog box will appear with the current frequency listed and a box to enter the new frequency. Enter the new frequency and click the Program button. An error window will appear in the event the entry is not valid.



**Figure 4-40 Configuration Software - Program Transmit Frequency**

4.2.4.10.10    Programming a Receive Frequency

Using the Radio Main Menu select the Program Receive Frequency entry as shown in Figure 4-41. A dialog box will appear with the current frequency listed and a box to enter the new frequency. Enter the new frequency and click the Program button. An error window will appear in the event the entry is not valid.

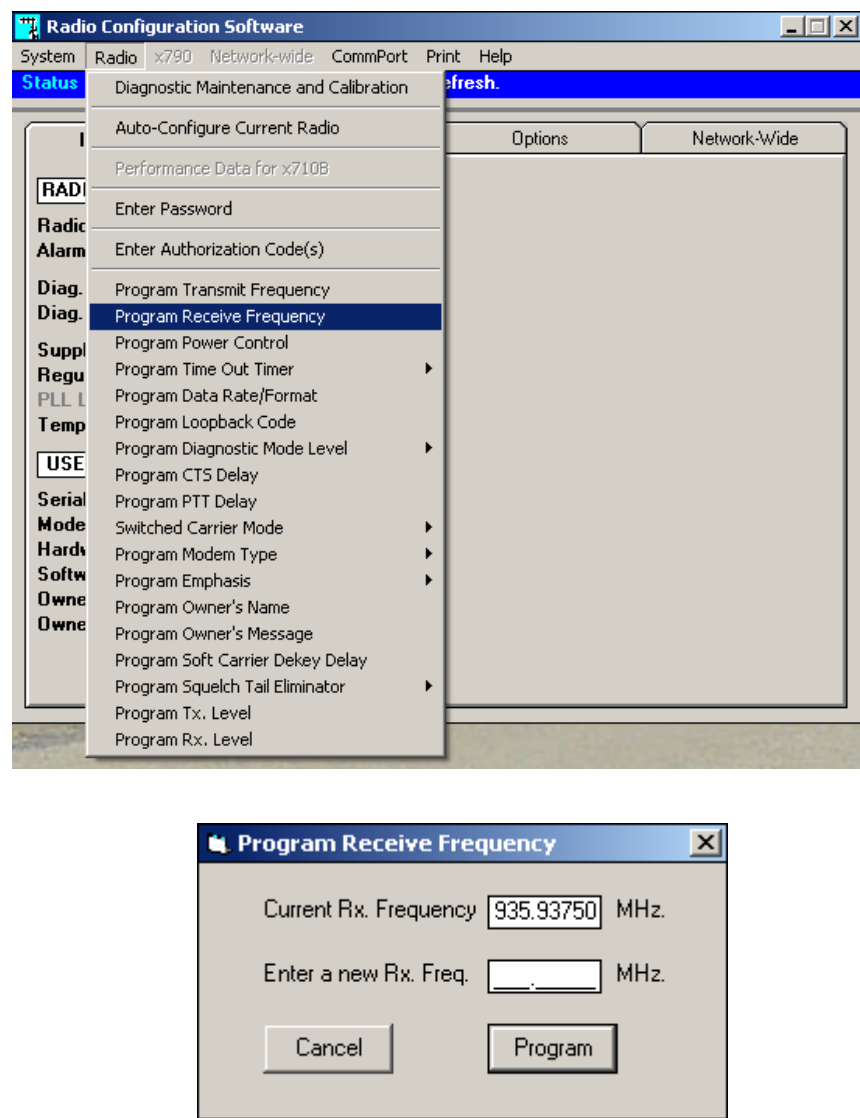
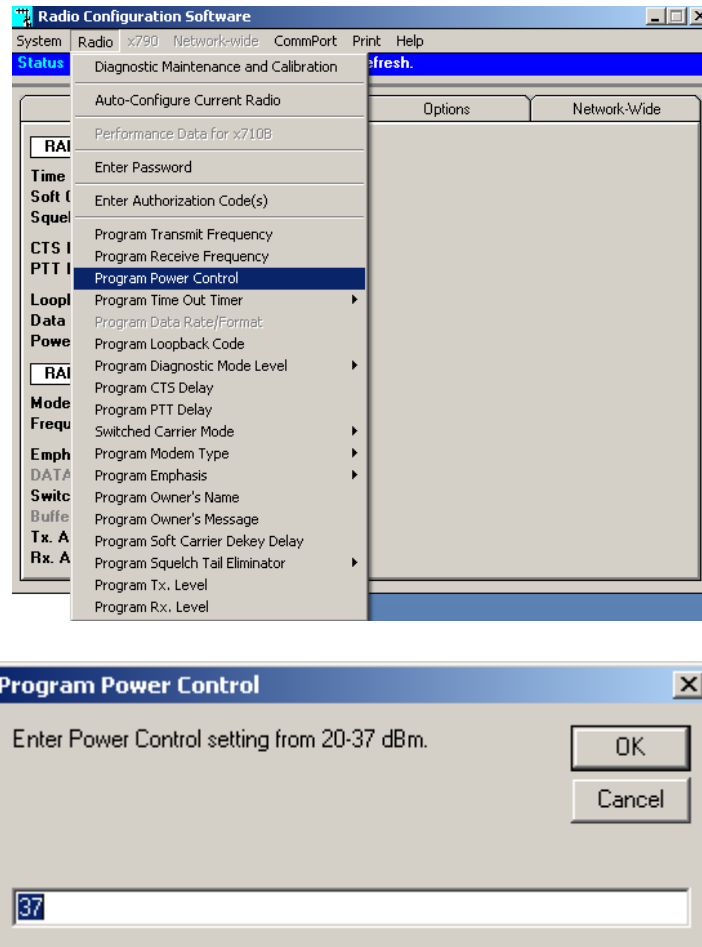


Figure 4-41    Configuration Software - Program Receive Frequency

4.2.4.10.11    Setting Transmit Power Level

Using the Radio Main Menu select the Program Power Control entry as shown in Figure 4-40. A dialog box will appear, enter the desired power level and press the OK button. The default setting for this application is full power (37 dBm).



**Figure 4-42 Configuration Software - Setting Transmit Power Level**

#### **4.2.4.10.12 Program Time-out Timer Delay**

This selection allows the Time-Out Timer (TOT) delay to be programmed

#### **4.2.4.10.13 Program Loopback Code**

This selection allows the loopback code to be programmed. Default in this application is **1184**.



#### **4.2.4.10.14 Program Diagnostic Mode Level**

This menu item allows selection of the appropriate level of diagnostics support. The transceiver must be configured for the diagnostics mode selected. This application uses **Standard Loopback** for the default setting.

#### **4.2.4.10.15 Program CTS Delay**

This selection allows the CTS (Clear to Send) delay to be programmed. Default for this application is **10 milliseconds**.

#### **4.2.4.10.16 Program PTT Delay**

This selection allows the PTT (Push to Talk) delay to be programmed. The default for this application is set at **0**.

#### **4.2.4.10.17 Switched Carrier Mode**

This setting selects the Switched Carrier Mode. Default in this application is **Off**.

#### **4.2.4.10.18 Program Modem Type**

The selection allows selection of the modem type. Default in this application is **None**.

#### **4.2.4.10.19 Program Emphasis**

This menu item selects Emphasis. This application has the default set to **Off**.

#### **4.2.4.10.20 Program Owner's Name**

This selection allows a name (up to 27 characters) to be programmed for identification purposes.

#### **4.2.4.10.21 Program Owner's Message**

This selection allows a 27 character message to be programmed.

#### **4.2.4.10.22 Program Soft Carrier Dekey Delay**

This selection allows the Soft Carrier Dekey Delay (SCD) duration to be programmed. Default in this application is **2 milliseconds**.

#### 4.2.4.10.23 Program Squelch Tail Eliminator

On and OFF pop-up choices allow the Squelch Tail Eliminator (STE) to be enabled (ON) or disabled (OFF). Default for this application is **Disabled (OFF)**.

#### 4.2.4.10.24 Program TX Level

The TX Audio Level sets the input level (in dBm) on the TX audio input line for analog functionality. Choosing a fixed input level means that the TX audio signal will be scaled to the optimum peak frequency deviation over the air. This means if a TXLEVEL is set to -10 dBm and the input signal is actually -20 dBm, then the modulated signal will have a low peak deviation. The AUTO mode will check the input TX audio signal's peaks and scale the signal accordingly so that the peak deviation is the desired value. Default in this application is **-17 dBm**.

#### 4.2.4.10.25 Program RX Level

The RX Audio Level sets the output level (in dBm) on the RX audio output line. Default in this application is **-5 dBm**.

#### 4.2.4.10.26 Closing MDS Configuration Software

To close the MDS Configuration Software, click on the System pull-down menu. Select End Program and click the selection. Allow the program to close the diagnostic port connections. Power down and restart the Cab Radio to restore normal operation.

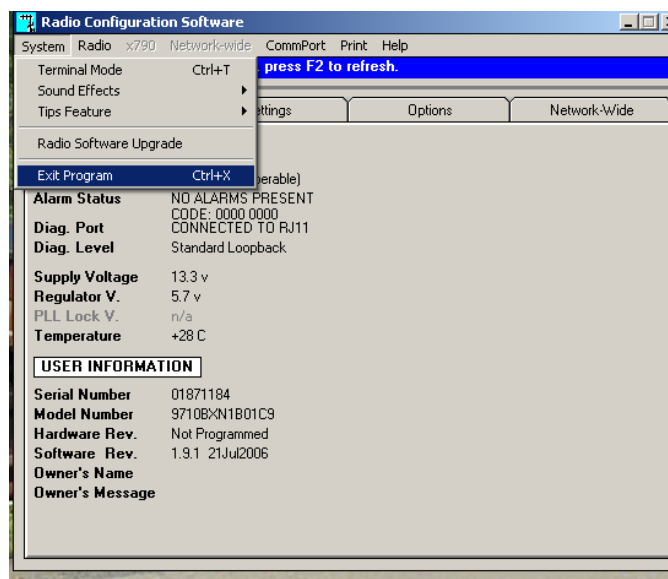


Figure 4-43 Closing the MDS Configuration Software

## NOTES



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