TECHNICAL MANUAL

OPERATION INSTRUCTIONS

VHF TRANSMITTER

MTC-100T

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RECORD OF CHANGES

CHANGE	DATE	TITLE OF BRIEF DESCRIPTIONS	ENTERED BY

FOREWORD

SCOPE

This manual contains information to obtain best performance from the MTC-100T Transmitter. The information includes: a general description of the equipment, preparation for use and installation instructions, operating instructions, general theory of operation, maintenance instructions, preparation for reshipment, storage, and parts list.

PROPRIETARY DATA

CORRECTION NOTICE

Information contained in this document is believed to be correct as of the publication date. If a variation is noted between the information in this manual and the equipment in your possession, contact the factory for clarification. Future issues will be updated if necessary.

RIGHTS RESERVED

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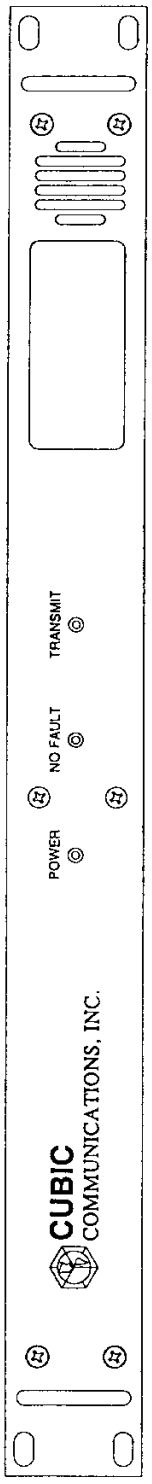


Figure 1-1 MTC-100T Front View

CHAPTER 1
GENERAL DESCRIPTION

1-1 INTRODUCTION.

This chapter contains an equipment description, equipment supplied and required, storage data, tools and test equipment, and a summary of safety precautions.

1-2 EQUIPMENT DESCRIPTION.

The MTC-100T Transmitter (figure 1-1) is a superheterodyne design using digital signal processing (DSP) and direct I&Q digital modulation in transmit. The DSP gives superior accuracy and flexibility for modulation. The MTC-100 T has a frequency range from 150 MHz to 174 MHz with 12.5 kHz channel spacing.

The transmitter contains circuit card assemblies and modules mounted in a 19" wide by 1.75" (1U) high by 19.5" deep rack-mount chassis.

The transmitter is controlled through a remote interface by any suitable bus controller using an RS-232 serial interface bus, using specific command messages to request status or change conditions of the transmitter. There are three LED indicators on the front panel which provide power, no-fault and transmit status.

The Power LED is green or off. Green indicates that power is being supplied to the unit. If the power LED is off, there is no power being supplied to the unit.

The No Fault LED is green, flickering, or off. Green indicate that the unit is working perfectly. Flickering indicates the power supply or voltage control oscillator (VCO) is not working correctly. If the No Fault LED is off and the Power LED is green (on), then various fault conditions can exist. Refer to paragraph 3-3 for fault determination.

The Transmit LED is red or off. Red indicates that the transmitter is keyed and a signal is being emitted. When the LED is off no signal is being emitted.

The 600 Ω balanced line audio input is available on the rear Audio 15 pin D-subminiature connector.

An internal 10 MHz reference frequency is used.

1-3 SPECIFICATIONS.

Refer to table 1-1 for specifications of the equipment.

1-4 EQUIPMENT FURNISHED.

Table 1-2 lists the items furnished, items required but not furnished, and optional items.

1-5 STORAGE DATA.

Refer to Chapter 6 for storage data.

1-6 TOOLS AND TEST EQUIPMENT.

Table 1-3 lists recommended tools and test equipment for operational level maintenance. There are no special tools or test equipment required.

1-7 SAFETY PRECAUTIONS.

Safety precautions are presented in this manual preceded by the word WARNING or CAUTION just prior to the point where the hazard is likely to be encountered. Warnings and cautions are defined as follows:

WARNING

Refers to a procedure or practice that, if not correctly followed, could result in injury, death, or long term health hazard.

CAUTION

Refers to a procedure or practice that, if not correctly followed, could result in equipment damage or destruction.

Table 1-1 MTC-100T Specifications.

Item	Specification
FREQUENCY	
Tuning Range	150 MHz - 174 MHz
Tuning Time	Can tune to any of the 12.5 kHz channels within 100 ms
Channel Spacing	12.5 kHz
Frequency Stability	2 ppm (0°C to +40°C)
TRANSMIT FUNCTION	
Antenna Impedance	50 ohms nominal
Channel Spacing	12.5 kHz
Control	Remote RS-232
Load VSWR Capacity	Operates into any passive load
Transmitter Total Harmonic Distortion	THD <5% across 300 Hz to 3400 Hz
Radiated Spurious Emissions	<-37 dBm
Modulation	FM (F3E), 750 ms pre-empahsis
RF Carrier Power	+20 dBm maximum
Power Settings	Adjustable from 0 dBm to +20 dBm in 1 dBm steps
Operation Duty Cycle	Continuous
Intermodulation Attenuation	At least -40 dBc
Audio Frequency Response	@ 25 kHz 300 to 3400 Hz: ≤ 4 dB (+1, -3 dB/ref 1 kHz) ≤ -15 dB at 100 Hz: ≤ -20 dB at 5000 Hz
Turnaround Time	< 1.5 msec (Going from Transmit → idle or idle → Transmit)
Test Generator	Built in tone and noise source for modulation analysis. Tone frequency adjustable from 50-6000 Hz
GENERAL DATA	
Power Requirements	90 - 260 VAC, 47 -63 Hz, 100 W
Dimensions	19" (48.26 cm) wide, 1.75" (4.45 cm) high, 19.5" (49.55 cm) deep
Weight	10.7 lbs. (4.85 kg) (Unpackaged)
Temperature Range	-20 to +40°C Operating, -20 to +60°C Storage.
Humidity	Per method 507.3, procedure I, Natural table 507.3-I, five cycles total
Shock	Method 516.4, procedure VI
Vibration	Method 514.4, procedure I, category 9 figure 514.4-15
Fault Monitoring	Fault detectors continuously monitor voltage levels and phase lock.
Reliability	61,800 hours MTBF

Table 1-2 Items Furnished.

Part No.	Nomenclature	Furn./Optl.
3003-1000-8	MTC-100T VHF Transmitter	Furn.
696-012	AC power cord	Furn.
3003-1021-8	Technical manual	Furn.

Table 1-3 Recommended Tools and Test Equipment (Or Equivalent).

Part No.	Nomenclature	Manufacturer
-	Screwdriver, Phillips 6 inch, No. 1	Any
-	Screwdriver, Phillips 6 inch, No. 2	Any
-	Driver, nut, 1/4 inch	Any
-	Wrench, open end, 5/16 inch	Any
-	Wrench, open end, 9/16 inch	Any
2598-5400-54	Engage/Disengage OSMT Cable Tool	M/A COMM OMNI Spectra

CHAPTER 2
PREPARATION FOR USE AND INSTALLATION INSTRUCTIONS

2-1 INTRODUCTION.

This chapter contains unpacking, inspection, installation, connections, and initial alignment procedures.

2-2 UNPACKING AND INSPECTION.

To unpack and inspect the transmitter for damage, perform the following procedures:

WARNING

Do not drop the equipment when lifting or carrying. Personnel injury or equipment damage may occur.

1. Inspect the shipping carton for damage before unpacking the transmitter.

NOTE

If the carton is damaged, open the carton in the presence of a shipping carrier agent if possible. If damage is found after the transmitter is unpacked, retain the carton and packing materials for inspection.

2. Open the carton and remove the foam packing material on top of the transmitter.

3. Lift the transmitter from the carton.

NOTE

Save carton for possible reshipment.

4. Inspect the transmitter for external damage including dents and scratches.

CAUTION

Do not attempt to operate the transmitter if major damage is found.

2-3 INSTALLATION.

The transmitter is designed for 19-inch rack mount operation in a relatively dust free environment with an ambient temperature range between 0 and +40°C. No special tools or additional materials are required for installation.

NOTE

See figure FO-1 for clearance requirements and mounting details.

2-4 CONNECTIONS.

Refer to table 2-1 for a description of the rear panel connections, (see figure 2-1.)

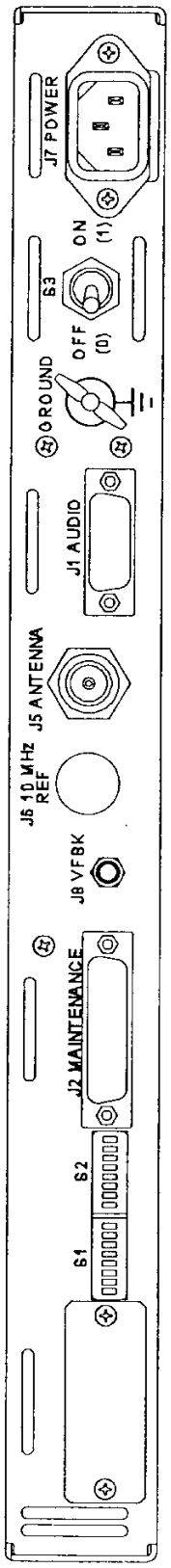


Figure 2-1 MTC-100T Rear View

Table 2-1 Rear Panel Connections.

Name	Connector On Unit	Recommended Mating Type	Description
AUDIO (J1)	15-pin "D" subminiature male (324-009)	15-pin "D" subminiature female (324-070)	Used to connect audio and control functions to the remote controller or other equipment. Table 2-2 lists the pin descriptions.
MAINTENANCE (J2)	25-pin male D subminiature connector.	25-pin female D sub-miniature connector	For RS-232C remote control functions. Table 2-3 lists the pin descriptions. Wired as DTE
ANTENNA (J5)	N Type Jack (321-006)	N Type Plug	Coaxial antenna connection. Impedance is approximately 50 ohms.
AC POWER (J7)	IEC 320-C-13 (343-008)	NEMA 5-15P (696-012, Power Cord)	90 to 260 VAC, 47 to 63 Hz, single phase 100 watts max. Figure 2-2 shows the pin descriptions.
Vector Feedback (J8)	SMA Female (321-054)	SMA Plug	Used to connect a sample of power amplifier RF output to the vector feedback system. Sample should be attenuated to +15 dBm when the power amplifier output is at +20 dBm.
ON/OFF (S3)			Power Switch. MTC-100T power on/off.
DIP Switches (S1)			Used to set the bus address. Refer to figure 3-1 for proper switch settings.
DIP Switches (S2)			Used to set the Boot/Normal, bus Share & Type, BITS/Parity/Stop and Baud Rate. Refer to figure 3-1 for proper switch settings.
NOTE: Part numbers in parenthesis (000-000) indicate CCI part number if applicable.			

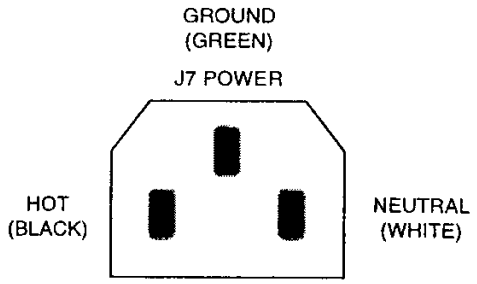


Figure 2-2 AC Power Connector (J7) Pin Descriptions.

Table 2-2 AUDIO Connector (J1) Pin Descriptions.

Pin	Signal	Remarks
1	AUDIO IN	600 ohm balanced line
2	AUDIO IN RTN	600 ohm balanced line
3	KEY	Ground to key transmitter
4	Reserved	
5	Reserved	
6	Reserved	
7,8	Reserved	
9	Reserved	
10	NC	
11	GND	
12	NC	
13	GND	
14	NC	
15	GND	

Table 2-3 MAINTENANCE Connector (J2) Pin Descriptions.

Pin	Signal	Remarks
1	NC	
2	TXD	RS-232 Transmit Data
3	RXD	RS-232 Receive Data
4	RTS	RS-232 Request To Send
5	CTS	Not used
6	NC	
7	GND	Signal Ground
8-25	NC	

NOTE: The pinout for the RS-232 interface follows the recommendations of the EIA standard.

The transmitter will operate as Data Terminal Equipment (DTE). This means that the circuits named Transmitted Data and Request to Send are outputs from the transmitter and the circuit named Received Data is an input to the transmitter. The electrical characteristics of the interface will conform to either EIA standard RS-232-C with the following exceptions.

When so configured from the rear panel DIP switches, the line drivers associated with the Transmitted Data and Request to Send circuits for the unit will be in a high impedance state except when that unit has been commanded by the system controller to transmit. When done transmitting, the line drivers will return to the high impedance state. This feature, referred to as bus sharing or party line operation, allows multiple transmitters to share a single circuit for the Transmitted Data signal to the system controller. In systems where only one transmitter is connected to the external controlling device, this feature may be disabled from the transmitter rear panel switches.

The Request to Send (RTS) handshake circuit is generally not used when the line drivers are configured for bus sharing operation. When the line drivers are not configured for bus sharing, the operation of the RTS line is as follows: When a transmitter is ready to accept remote control commands it will set the RTS circuit true. When it has received a message and is processing the commands, it will set the RTS circuit false until it is ready to receive another command.

The number of MTC-100T transmitters that may be connected to a single controller is dependent on the driver characteristics of the controller, but in general is at least 10 transmitters. The input resistance of the RXD signal is approximately 5000 Ohms.

If connected directly to a computer interface, also configured as DTE, a reversal of transmit and receive data (TXD and RXD) and request to send and clear to send (RTS and CTS) lines is necessary.

NOTE

A CTS line is not configured on the MTC-100T. Therefore, there is no CTS → RTS connection from the transmitter to the computer.

These reversals or jumpers are normally not required if units are connected through a modem. If an MTC-100T transmitter is to be connected to another DTE device as its controller, the circuits must be swapped for proper operation as follows:

MTC-100T Transmitter		*Other DTE Device*
Transmitted Data	---------->	*Received Data*
Received Data	<----------	*Transmitted Data*
Request to Send	---------->	*Clear to Send*
Signal Ground	----------	*Signal Ground*

CHAPTER 3
OPERATING INSTRUCTIONS

3-1 INTRODUCTION

The MTC-100T transmitter is remotely controlled via a serial interface on the Maintenance Port. The serial line interface standard available for the MTC-100T transmitter is RS-232.

Parameters associated with the remote control interface can be checked and changed from the rear panel of the transmitter. The bus address, bus type (RS-232), baud rate, bus sharing option, and line parameters may be set. (Line parameters include number of data bits, number of stop bits and parity options).

3-2 REMOTE OPERATION USING SERIAL BUS.

The transmitter is operated under remote control using a serial bus and a suitable controller. Ensure that the communications parameters are set in accordance with the system requirements. The bus address, baud rate, number of data bits, type of parity used, and number of stop bits must match the requirements of the system controller. The bus type selection (S2-2) should always be set to "OFF"

3-2.1 *MTC-100T Setup.*

Before operating the equipment, set the DIP switches on the rear panel for correct remote operation (refer to figure 3-1). The factory default settings provide a starting point; where all DIP switches are OFF except for S-2(5) and S-2(7), which are ON to establish the baud rate at 38,400.

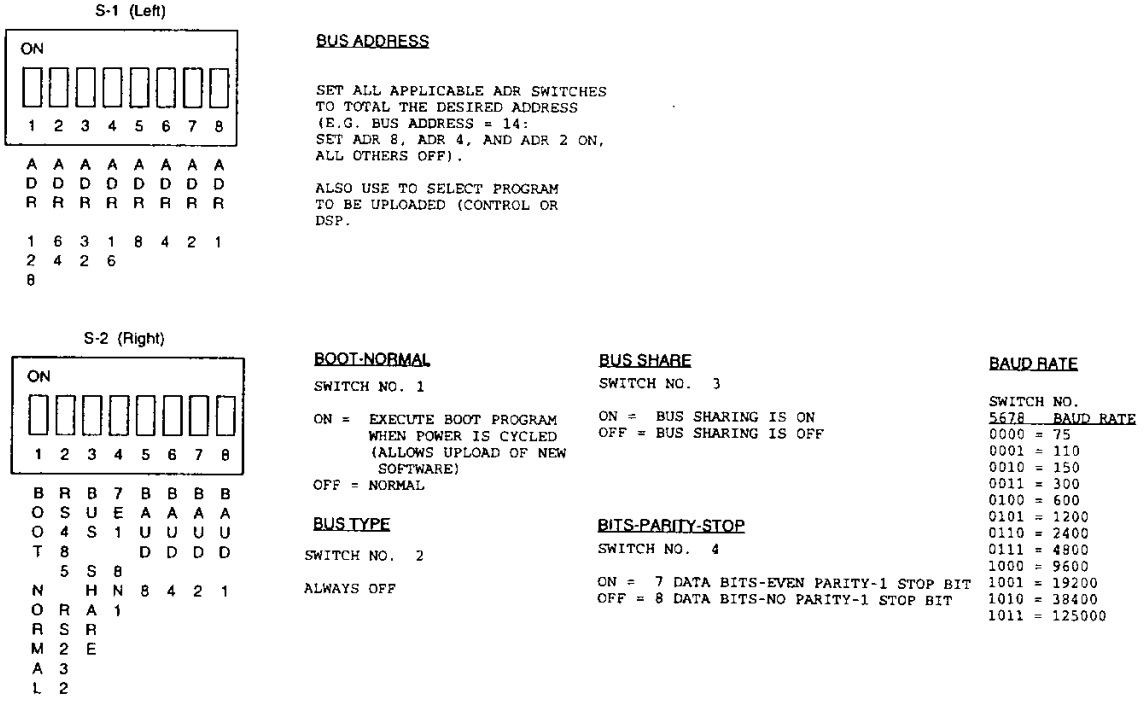


Figure 3-1 DIP Circuits - Switch Settings.

3-2.2 *Software Installation Upgrade Procedures.*

If it becomes necessary, the internal software may be upgraded by connecting the Maintenance Port to an IBM compatible PC running DOS or a DOS window under Windows™. Use the Cubic-furnished program RCOMM, and connect the computer serial port to the Maintenance Port with a suitable cable. In most cases a "Null Modem" cable or adapter is required. In some cases, a gender adapter is also required.

1. Verify that the DIP switches reflect the desired settings. In most cases the Factory Default settings will suffice, refer to paragraph 3-2.1.

2. Enter RCOMM and verify the settings. Select the Serial Interface: COM port 1 or 2 (Alt-I, 1 or 2). Then examine the serial line parameters at the bottom of the screen or window. If using the recommended Factory Default settings on the transmitter, use the following RCOMM settings:
   a. Baud Rate = 38,400
   b. Line Parameters = 8 Bits, 1Stop, No parity
   c. Address = 0
   d. Flow Control = Disable RTS/CTS flow control
   e. Termination = <CR>
   f. STX Count = 1STX in Preamble
   g. ADR Count = 3ADR in Preamble

   If any parameters need to be changed, access the Configuration/Serial menu (Alt-C, S) and the parameter to be changed.

3. Verify communications with the transmitter by typing ID? and Return. You should see an ASCII message identifying the unit as an MTC-100T with a certain control software version and date.

4. Turn power to the MTC-100T transmitter OFF.

5. Set DIP switch S1 to the code for the program being uploaded as follows:
   - DSP program: S1-8 ON, all others OFF (Code = 1)
   - Control program: S1-7, S1-8 = ON, all others OFF (Code = 3)

6. Set DIP switch S2-1 to ON (Boot Program)

7. Power the unit on.

8. In RCOMM, select the File Upload function (Alt-F, U) and enter the path and filename of the new software in the space provided. Conclude with *Enter,* the file upload begins. Upload progress will be shown in a window in RCOMM.

9. When file upload is complete, reset all DIP switches to their operational positions, or if both programs are to be uploaded (i.e. DSP and Control), repeat steps 4-8 for the other program.

10. Cycle the power to the transmitter. Set RCOMM to the transmitter's operational address. Verify the uploads using the ID? query for control software or IDD? for the DSP software.

NOTE

When operating in the boot program, data is transmitted in Xmodem format without the formatting shown in figure 3-2. No STX or address characters should be sent. This is all handled by RCOMM automatically. The function of S1, the address switch on the rear panel, is changed to allow selection of the firmware program (Control or DSP) that is to be uploaded. Because no address information is sent, a system that is setup to use bus sharing where multiple units are connected to one controller, only one unit may be operated in the boot program at a time. Other units should be powered down or disconnected from the bus.

The boot program may be entered either by setting the rear panel DIP switch S2-1 to ON and cycling the power off and on, or by way of software command GB. When using the software command to select the boot program, a useful shortcut is to select a device address that agrees with the program select code that is used to upload the program in question. This allows switching from the main program to the boot program, uploading the new program, and re-entering the main program, all with no need to change the DIP switch settings or power cycle the unit. For example, when uploading the main program, use address 3 to communicate with the main program. This is the same number used to select main program upload. Then use the GB command to switch to the boot program, upload the control program. When uploading is complete the main program will be re-entered, and communication can continue to address 3.

3-2.3 *Serial Bus Description.*

The serial interface includes the unbalanced (RS-232) line interface. DIP switch #S2-2 at the rear of the transmitter must be set to OFF, see figure 3-1.

3-2.4 *Serial Bus Message Format.*

All transmissions, in either direction, conform to the message format shown in figure 3-2. All transmitted and received characters will be encoded and interpreted as conforming to the ASCII character code.

Each character in the message is passed in an asynchronous serial format as shown in figure 3-3. The number of data bits, number of stop bits, parity options and baud rate are all selectable from the rear panel DIP switches.

3-2.5 *Serial Bus Message Types.*

All messages are divided into two major categories: command messages and status messages. Each category is discussed in the following paragraphs:

3-2.5.1 *Serial Bus Command Messages.* Command messages are sent from the controller to the transmitter and are subdivided into two classes as follows:

3-2.5.1.1 *Serial Bus Radio Command Messages.* Radio command messages, tables 3-3 through 3-7, contain commands that are passed to the transmitter. They may command the transmitter to change operational parameters or to report back operational status.

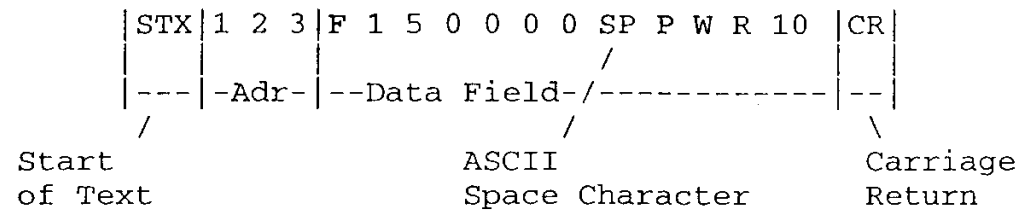
3-2.5.1.2 *Serial Bus Interface Command Messages.* Interface command messages, table 3-1, contain commands that are acted upon by the communications interface in the transmitter. These commands cause the interface to change modes or report status.

3-2.5.2 *Serial Bus Status Messages.* Status messages are sent from the transmitter to the controller and are subdivided into two classes as follows:

3-2.5.2.1 *Serial Bus Radio Status Messages.* Radio status messages, tables 3-3 through 3-7 contain information about the operational status of the transmitter. These messages are sent as a reply to radio command messages that request a status report.

3-2.5.2.2 *Serial Bus Interface Status Messages.* Interface status messages, table 3-2, contain error status information caused by a previous command message or other source. When the transmitter is in the acknowledge mode, it will respond to all command messages with an interface status message unless the command explicitly requested a status message.

If more than one (1) error has occurred, only the highest priority (most important) Interface Status Message will display. The Interface Status Messages listed in table 3-2 are listed in highest priority (most important) to lowest priority (least important)



NOTES:

The first character of a transmission will always be STX (start of text, ASCII code 02).

The second, third, and fourth characters will contain the address in decimal, with the most significant digit first, of the transmitter sending the transmission or to which it is being sent by the controller. The address code for any transmitter may be any number from 000 to 254 provided that it is not used by any other unit connected to the bus. Address 255 is reserved for "broadcasting" to all transmitters on the bus (refer to paragraph 3.2.8). The controller has no address. All three digits must be transmitted. The address is set from the rear panel DIP switch S1.

The fifth character of the transmission is the beginning of the data field. This field may contain as few as one or as many as 250 characters. The data field may contain one or more messages. If more than one message is contained in the data field, each message must be separated from the next by one or more blank (space) characters.

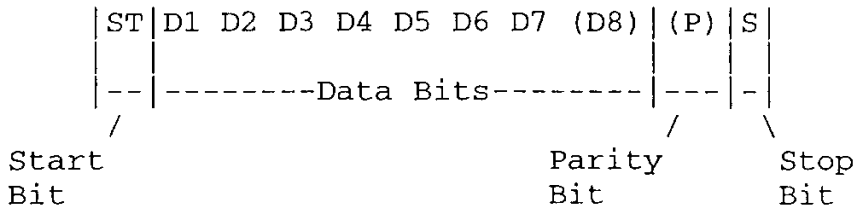
Any number of messages may be included in the data field provided that the maximum number of characters is not exceeded. Only one request for a status command may be sent in each transmission with the following exceptions: `F?`, `IS?`, `T?`, and `FS?` can be requested in the same transmission. The reply transmission will contain each of the requested status messages in the same order that they appear in the `R?` command.

The final character of the transmission will be a CR (carriage return). This character will follow the last character of the data field.

The transmission above from the controller is addressed to the transmitter with address 123 and contains two messages: "F150000" and "PWR10".

When sending messages to the transmitter that require numeric values as arguments, it is not necessary to include leading zeros. For example, to send a message to change the transmit deviation to 6 kHz, the command message "DEV60" may be given in place of "DEV060". When a request for a status message is made, the reply will always include any leading zeros so that the value may be extracted by counting characters in the message.

Figure 3-2 Serial Bus Message Format.



NOTE: Information is passed in full duplex as characters in an asynchronous serial format. Each character consists of a start bit, 7 or 8 data bits with the least significant bit sent first, an optional parity bit which provides even parity, and one stop bit. The serial transmission rate may be set to each of the following standard rates: 75, 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, and 125000 bits per second. Line parameter options and baud rate are all set via hardware configuration, Two line parameter choices are available:

- 7 bits, even parity, 1 stop bit
- 8 bits, no parity, 1 stop bit

Refer to section 3-2.1.

Figure 3-3 Serial Bus Character Format.

3-2.6 *Serial Bus Message Protocol.*

The interface system operates in one of two modes: NORMAL or ACKNOWLEDGE. These modes, table 3-1, are selected by sending the transmitter the appropriate interface command message. At power up, the interface mode is set to NORMAL by default. At power up the interface mode is set to NORMAL by default. Both modes are discussed in the following paragraphs:

3-2.6.1 *Serial Bus Normal Mode.* In Normal Mode the transmitter unit will process messages that are addressed to it but no response will be sent back unless the Command Message was a request for Status Message (Radio or Interface). The controller can verify that its Command Message(s) was received without error by sending a Command Message requesting a reply Status Message either immediately after sending the original Command Message, or after having sent Command Messages to other transmitter units. This mode allows the fastest throughput of commands to a large group of transmitters because the controller does not have to wait for each transmitter unit to process the message(s) before moving on to the next transmitter unit.

3-2.6.2 *Serial Bus Acknowledge Mode.* In Acknowledge Mode a transmitter unit will always respond to Command Messages with a Status Message after it has processed the Command Message. If the Command Message was for a reply Radio Status Message, and no errors or faults have been detected, the reply will be the requested Status Message. In all other cases, the transmitter unit will respond with an Interface Status Message. This mode reduces maximum throughput because the controller must wait for the reply Status Message before issuing another command, but it simplifies the controller's job when it wants to verify the reception of its Command Messages and maximum throughput is not needed.

3-2.7 *Line Driver Operation.*

When bus Sharing is enabled through the transmitter's DIP switch S2, that transmitter's Transmitted Data and Request to Send line drivers are maintained in a high impedance state at all times except when it is required for that unit to transmit. In Normal Mode operation, this only occurs when the unit has received a Command Message that requests a reply Status Message. In Acknowledge Mode, all commands will caused the addressed unit to transmit.

The line drivers will be turned on and placed into the mark state for at least one full character time before the first character (the STX) is transmitted.

3-2.8 *Broadcast Address.*

All transmitters will respond to address 255 the same as their actual configured address. This is referred to as the broadcast address. If a single transmission is sent to this address, each transmitter on the bus will respond to the commands in the transmission as if they were sent to it individually. This feature may be used to cause a group of transmitters to act in unison, or to reduce the time it takes to initialize a group of transmitters to a set of common parameters.

The broadcast address must not be used to request status from a group of transmitters or when the transmitters are operating in the acknowledge mode, since this would cause bus contention as all transmitters would reply at the same time. With only one transmitter on the bus it is possible for the controller to determine the unit's address by sending a status request to the broadcast address and examining the address field in the reply, since the reply message contains the unit's configured address. This can be used during system integration as a troubleshooting aid.

3-2.9 *Serial Bus Message Definition.*

All messages are ASCII encoded and inserted into the data field of transmissions as defined in paragraph 3-2.4. Messages from the controller may use lower or upper case for all alphabetic characters. The transmitter always uses upper case.

Each message that can be sent using the bus controller is listed in the following tables:

- Table 3-1. Serial Bus Interface Command Messages. (Refer to para 3-2.5.1.2 & 3-2.6)
- Table 3-2. Serial Bus Interface Status Messages. (Refer to para 3-2.5.2.2)
- Table 3-3. Primary Operational Commands. Commands frequently used to change the fundamental parameters of the transmitter.
- Table 3-4 Secondary Operational Commands. Commands occasionally used to change the fundamental parameters of the transmitter
- Table 3-5 Utility Commands. Commands used to set non-operational parameters.
- Table 3-6 Measurement Request Commands. Commands used to request measurement reports on specific transmitter parameters.
- Table 3-7 Built In Test and Diagnostics. Commands used to verify performance and identify faults.

Most Radio Status Messages use the same format as the Radio Command Message for that parameter. For

example, the reply to the Radio Command Message "F?" (request current frequency setting) is "Fnnnnnnnn" in the same format as the Radio Command Message to change the Frequency.

All Radio Status Messages, except C?, are made up of fixed length strings so that values may be parsed by counting the characters of the Status Message. Messages which return a numeric value will be padded with zeros on the left to give the same number of characters as the same message with the maximum value. When more than one parameter is being reported, the individual parameters are separated by a blank (space) character.

Table 3-1 Serial Bus Interface Command Messages.

Message	Definition
:NORM	Set NORMAL interface mode. The transmitter will not send a reply message unless a command is sent that explicitly request a reply. This is the default interface mode.
:ACKN	Set ACKNOWLEDGE interface mode. The transmitter will send a reply message in response to every command. If the command does not request a reply, the transmitter will send the Interface Status reply message as if : ? was sent.
:?	Request Interface Status Reply Message. Reports information about errors detected by the remote control interface or other sections of the MTC-100T. If an error is detected, the replies will be as listed in table 3-2

Table 3-2 Serial Bus Interface Status Messages.

Message Reply	Definition
LE:OVRN	Line error, serial port overrun error
LE:FRMG	Line error, serial port framing error
LE:PRTY	Line error, serial port parity error
IE:OVFL	Interface error, buffer overflow
IE:UNKN	Interface error, unknown command, or command not allowed
IE:IVAL	Interface error - illegal argument value
RE:FALT	Radio error - fault has been detected
OK:NORM	No errors, interface in NORMAL Mode
OK:ACKN	No errors, interface in ACKNOWLEDGE Mode

Table 3-3 Primary Operational Commands.

Syntax	Reply	Description
Fnnnnnn **Fnnnnnnnnn**		Change Operating Frequency. Set the operating frequency. The first form **Fnnnnnn** is for frequency in kHz, the second form **Fnnnnnnnnn** is for frequency in 10 Hz units. The first form may be used for frequencies that are an even number of kilohertz. Otherwise, the second form must be used. The range is 150000 to 174000 for the first form and 15000000 to 17400000 for the second form. Frequencies must be a multiple of the basic step size, currently 12.5 kHz (See the **FP?** command) The query command (**F?**) always returns the long (8 digit) form. Example: 1. Desired frequency = 157.675 MHz (25 kHz step size) Using the 1st form enter: F157675 Using the 2nd form enter: F15767500 2. Desired frequency = 157.6875 MHz (12.5 kHz step size) Using the 1st form enter: Not applicable, must use 2nd form. Using the 2nd form enter: F15768750
F?	**Fnnnnnnnnn**	Request the current frequency. The reply format is the same as for the "Change Operating Frequency" above.
Tn		Turn transmitter output on or off of the transmitter. Where n is: 0 = off 1= on
T?	**Tn**	Request the current transmitter output status (on or off). The reply format is the same as for **Tn** above.

Table 3-4 Secondary Operational Commands.

Syntax	Reply	Description
PWRnn		Change Power Output. Set the transmitter carrier output power level. nn is the desired power level in units of 1 dBm. Range is 0 to 20 (1 to 100mW).
PWR?	**PWRnn**	Request the current transmitter output power level. The reply format is the same for PWRnn above

Table 3-4 Secondary Operational Commands.

Syntax	Reply	Description
DEVnnn		Change Transmit Deviation. Set the transmitter deviation. nnn is the desired peak deviation in units of 100 Hz. Range is 0 to 50 (0 to 5.0 kHz)
DEV?	DEVnnn	Request the transmitter deviation status. The reply format is the same for DEVnn above
ISn		Change Audio Input Source. Set the source of modulation Where n is: 0 or M: Microphone (not currently used) 1 or L: Line input connector 2 or T: Internally generated Tone 3 or N: Internally generated Noise source 4 or C: None (Unmodulated Carrier)
IS?	ISn	Request the transmitter Audio Input Source status. The reply format is the same for ISn above, returns number style arguments.
VFn		Change Vector Feedback. Set the on/off status of the vector feedback. Where n is 0 = off 1 = on At power up vector feedback is turned off by default. **Note:** When enabling the vector feedback or changing frequencies, if the table of vector feedback constants contains zeros, the vector feedback circuit is not actually enabled, although the response to the VF? request will still be VF1. If the frequency is then changed to a frequency for which the table does contain valid data, the circuit will be enabled (if VF = 1).
VF?	VFn	Request the Vector Feedback status. The reply format is the same for VFn above.
FP?	FPnnnn	Request the frequency step size (tuning resolution). The return message is FPnnnn where the nnnn is replaced with the step size in unit of 10 Hz. Current versions return FP1250 for 12.5 kHz steps, but this may change in future versions.

Table 3-4 Secondary Operational Commands.

Syntax	Reply	Description
R?	Fnnnnnnnn ISn Tn FSn	Request a report of the current values of selected operating parameters. The parameters are: Fnnnnnnnn = frequency, ISn = input selection, Tn = transmitter state, and FSn = fault status.
C?	Variable responses	Request a report of parameters that have changed. Same as R? except only contains items that have changed since the last time that parameter was reported. If there have been no changes since the last report (i.e. R?) then the response will be the same as if a : ? were sent, (refer to table 3-1). The reply format is variable.

Table 3-5 Utility Commands

Syntax	Reply	Description
GB		Go to boot program. The control processor immediately switches to the boot program for uploading new control and DSP programs.
SPD		This command reverts the power up default operating parameters, that may have been saved into non-volatile memory, back to the factory default settings: Factory default settings are as follows: Frequency 170.000 MHz Input Selection Line Input (IS1)
SPO		This command saves the current operating parameters into non-volatile memory as default parameters. Whenever power to the unit is switched on, the operating parameters will be set to the values saved with the last SPO command The Current operating parameters are: Frequency Input Selection Note: USAGE RESTRICTIONS Based on the operational requirements placed on the unit, the user may use the SPO command following every update to any of the above parameters so that in the event of a power failure the unit will return to the saved parameters when power is restored. However, if the unit's parameters are changed more than a few times per day, the user may wish to restrict the usage of the SPO command to prevent damage to the memory device. The lifetime usage of the SPO command is limited to 100,000 writes. Therefore, the programmer should be careful when using this command as part of a program

Table 3-5 Utility Commands

Syntax	Reply	Description
TNnnnn		Change Frequency Tone Set the frequency of the tone used for modulation when the Input Selection is IS2 (IST). nnnn is replaced with the tone frequency in hertz. Range is 50 to 6000 Hz.
TN?	**TNnnnn**	Request the frequency tone status. The reply format is the same for TNnnnn above.
TTnnnn		Change the Transmitter Timeout Value. Set the transmitter timeout value. This sets the maximum number of seconds that the transmitter may be left in the keyed state. If the timeout is exceeded the transmitter will be unkeyed. After the timeout has occurred, the unit must be unkeyed before it can be keyed again. If nnnn is replaced with a value of 0, the transmit time is unlimited. Range 0 to 1020 seconds (17 minutes).
TT?	**TTnnnn**	Request the transmitter timeout value. The reply format is the same for TTnnnn above.
SERNOnnnnnn		Set the unit's serial number. This command may only be used if the serial number is cleared to 00000 with EEPCLR
SERNO?	**SERNOnnnnnn**	Request the unit's serial number. The format of the reply is the same as for SERNOnnnnnn command above.
EEPCLR		This command clears all values stored in the non-volatile memory (EEPROM) to default values. Values stored in the non-volatile memory are the power-up operating parameters, and the serial number.
ID?	**Cubic Communications VHF Transmitter Ver n.n.n mm-dd-yyyy Copyright yyyy CCI**	Request the unit's identification message. This message contains an identification string, the control processor software version number and date, and a copyright notice of the program. The length of the reply message is variable. The version number's three fields may consist of 1, 2, or 3 digits.
IDD?	**DSP firmware: Ver nn.nn mm-dd-yyyy**	Request the DSP processor software version number and date.

Table 3-5 Utility Commands

Syntax	Reply	Description
VFCAL		Perform the vector feedback calibration routine and program the non-volatile lookup table of vector feedback constants. Before performing this command a dummy load must be connected to the antenna connector. This command may take over 30 seconds to complete. The unit will click for every frequency that it adds to the table. The command is completed when the clicking stops. When this command has completed, the vector feedback is turned on. **Note**: This operation must be repeated after the power amplifier or any RF cabling is changed. **This command is used for installation and maintenance of the transmitter.**
VFONE		Perform the vector feedback calibration routine for only the current operating frequency, and update the non-volatile lookup table. A dummy load must be connected while performing this command. **Note:** The current operating frequency must be set to a multiple of 25 kHz before performing this command. If it is not, an illegal value error will result **This command is used for installation and maintenance of the transmitter.**
The following commands are documented here for factory use only:		
VFI±nnnnn VFQ±nnnnn		Program the non-volatile memory for the current frequency to the I value or Q value in decimal given as ±nnnnn. The plus sign may be omitted for values ≥ 0. This new value is not sent to the vector feedback circuit immediately.
VFC?	VFC I=±nnnnn Q=±nnnnn	Report the I and Q vector feedback constants for the current frequency.
VFCLR		Clear the non-volatile memory table of vector feedback constants to all zeros. This prevents the vector feedback from operating on all channels. **Note:** The VFCAL command should be used to rebuild the table.

Table 3-6 Measurement Request Commands

Syntax	Reply	Description
VPS?	VPS±nnn ±nnn ±nnn ±nnn	Request a report of the power supply output voltages in units of 0.1 volts. Nominal values are: VPS+280 +175 +095 -175

Table 3-7 Built In Test Diagnostics

Syntax	Reply	Description
FS?	FSn	Request the summary status of all the fault detectors. Where n is: 0 = No faults are detected (FS0) 1 = Any of the 16 fault detectors indicates a fault (FS1) This is an abbreviated version of the FC? command.
FC?	FCnnnnnnnnnnnnnnnn	Request a report of all current faults. The 16 n characters represent the current status of the fault conditions with each n replaced with a 1 to indicate a fault conditions exists, or a 0 to indicate a fault condition does not exist. Starting with the first (left most) n character, the definition of each fault bit is as follows: 1. Error interrupt has occurred 2. Not currently used 3. Not currently used 4. DSP clock fault 5. Transmit Synthesizer fault 6. No reply from DSP 7. Timeout waiting for EEPROM data polling 8. Timeout waiting for serial bus transmitter to finish 9. Power supply voltage out of tolerance 10. Not currently used 11. Serial bus overrun error 12. Serial bus parity error 13. Serial bus framing error 14. Not currently used 15. Not currently used 16. Not currently used All bits except bit 1 will be cleared to 0 whenever the associated fault condition goes away. Serial port faults are cleared when subsequent serial data is received without the error condition. All bits of this message may be cleared with the CFC command. Example: FC? >\ FC0000000100010000 Indicates fault 8 (Timeout waiting for serial bus transmitter to finish) and fault 12 (Serial bus parity error) have occurred.
FA?	FAnnnnnnnnnnnnnnnn	Request a report of all accumulated faults. Once a fault condition has occurred, it will be reported as 1 even though the fault condition may no longer exist. The meaning of the 16 n characters is the same as for the FC? command. All bits may be cleared to 0 with the CFA command.
CFn		Clear all current or accumulated fault status bits. This command clears all of the bits of the FC? or FA? message to 0. Replace the n with C for current faults or A for accumulated faults. If fault conditions persist, they may be read as 1 when again read with the FC? or FA? command.

Table 3-7 Built In Test Diagnostics

Syntax	Reply	Description
PO		Run the power-on self test (POST) manually. This test, which is run automatically at power-on, checks various systems in the control and DSP processors for normal operation.
PO?	POnnnnnn	Request the results of the most recent power-on self test (POST) sequence. Each of the n characters represents one of the tests performed when the POST sequence is run and is replaced with a 1 to indicate test passed, or a 0 to indicate test failed. Starting with the first (left most) n character, the 5 tests are, from left to right: 1. ROM checksum test 2. RAM read/write test 3. DSP self test 4. Not currently used, (always reports 0) 5. Power Supply voltages limit test Example: PO? >\ PO11001 Indicates the DSP self test failed.
DS?	DSnnnnnn	Report the results of the most recent DSP processor self test. The reply format is DSnnnnnn where each n represents one test performed. A test which was passed is shown as a 1 and a test that was failed is shown as a 0. Starting with the first (left most) n character, the 6 tests are, from left to right: 1. Not currently used, (always reports 1) 2. Program ROM sumcheck 3. Not currently used, (always reports 1) 4. Not currently used, (always reports 1) 5. External RAM test 6. Internal RAM test Example: DS? >\ DS111101 Indicates External RAM test failed..
DACn		Turns on or off the DAC (digital-to-analog converter) test. This test produces a 1 kHz audio tone from the transmitter audio port. Replace n with 1 to enable the DAC test, or 0 to disable the DAC test. While the DAC test is enabled, the transmitter's normal operation is suspended and the response to other commands (except **DAC?**) is unpredictable.
DAC?	DACn	Requests the condition of the DAC test. 1 indicates the DAC test is on and 0 indicates the DAC test is off.

Table 3-7 Built In Test Diagnostics

Syntax	Reply	Description
PS?	PSnnnnnnnn	Request a report of the in or out of tolerance status of each power supply voltage. The reply format is: PSnnnnnnnn. The n characters in the reply message are grouped into four pairs. Each nn pair represents the over and under status of one voltage. The left n of each pair is a 1 if that voltage is above the tolerance limit or a 0 if not. The right n of each pair is a 1 if that voltage is below the tolerance limit or a 0 if not. Note that for a negative voltage, above means too much negative voltage, and below means too close to zero. The MTC-100T may be configured with power supplies that have different voltages and tolerance limits. Nominal power supply voltages are: +28, +17.5, +9.5, -17.5 The four voltages for each type correspond from left to right with the bit pairs in the reply message. Example: If the reply to PS? is PS01000010 it indicates that the +28 volt supply is too low, and that the –17.5 volt supply is too high (too much negative voltage).

3-3 POWER UP AND TESTING CONSIDERATIONS.

Whenever power is applied to the transmitter it will execute a Power On Self Test sequence. This sequence tests several functions inside the transmitter including memory tests, a confidence test of the configuration options stored in non-volatile memory, and a DSP test.

When structuring a User Operating Program, it should send the PO? command before entering NORMAL operation. If any failures are indicated, the DS? and PS? commands may be used to isolate the failure. After entering normal operation the program may periodically send FS? to monitor the units Fault Status. If FS? returns FS1, the FC? and FA? command may be used to isolate the problem. After extended periods of operation, the user program can use the PO command to re-run the Power On Self Test.

NOTE:

In the event of a POST failure, the transmitter will emit a sequence of failure codes in morse code. These codes should be relayed to CCI in order to assist in troubleshooting.

CHAPTER 4
MAINTENANCE INSTRUCTIONS

Section I. PREVENTIVE MAINTENANCE

4-1 INTRODUCTION.

This chapter contains both preventive and corrective operational level maintenance instructions. The information includes cleaning and lubrication, inspection, performance verification, and troubleshooting. If subassembly removal and replacement is required, refer to FO-3, MTC-100T Interconnect Diagram for cable connections.

4-2 CLEANING AND LUBRICATION.

Clean the external surfaces, every 2 weeks using a vacuum cleaner or small soft brush to remove any dirt or dust. Do not use any cleaning agents. There are no lubrication requirements.

4-3 INSPECTION.

If the unit is faulty or suspected to be faulty perform a visual inspection as follows:

4-3.1 *External Inspection.*

1. Check front panel for physical damage.
2. Check external case for physical damage.
3. Check rear panel for physical damage.
4. Check rear panel connectors for corrosion and loose connectors.
5. Check rear panel cables for frayed or broken wires.

4-3.2 *Internal Inspection.*

WARNING

With the rear panel power switch set OFF and the power cord plugged into the power source, high voltage shock danger is present internally at the rear panel POWER receptacle/RFI filter, AC Line Filter board, and the rear panel circuit breaker.

CAUTION

When working on the transmitter with covers removed and power applied, do not allow tools or metal objects to come in contact with transmitter components. Equipment damage may occur.

CAUTION

Unit contains parts and assemblies sensitive to damage by electrostatic discharge (ESD). Use ESD precautionary procedures when touching removing or inserting parts.

1. Turn the unit off, and remove the power cord from the power source.
2. Using a no. 2 Phillips screwdriver, remove cover screws counter-clockwise, and remove the cover.
3. Check for loose connectors, corrosion, or burn marks.
4. Check for frayed or broken wires and cable ribbons.
5. If any signs of internal damage exist, contact CCI for disposition.

4-4 PERFORMANCE VERIFICATION.

The following sections describe in detail the procedures to run the MTC-100T self verification tests.

4-4.1 *External Connections.*

1. Connect the power input to a suitable power source. Leave the power switched off at this time.
2. Connect a 50-ohm dummy load capable of dissipating 1 watt continuously to the Antenna jack.
3. Connect a serial COM1 or COM2 port of a DOS-based computer or a Windows™-based computer running a DOS window to the Maintenance port. In most instances a "Null Modem" cable or adapter is required. In many instances a gender adapter is required. Set the transmitter's rear panel DIP switches for the desired communications parameters as described in Chapter 3.

4. Power on the transmitter.

5. On the computer, run the Cubic-furnished program, RCOMM, and verify the settings. RCOMM remembers the settings the last time it was run. If running it for the first time, be sure to select the Serial interface: COM port 1 or 2 (Alt-I, 1 or 2). Then examine the serial line parameters at the bottom of the screen or window. If using the recommended Factory Default settings, insure the settings are:

   a. Baud Rate = 38,400
   b. Line Parameters = 8 Bits, 1Stop, No parity
   c. Address = 0
   d. Flow Control = Disable RTS/CTS flow control
   e. STX Count = 1STX In Preamble
   f. ADR Count = 3 Address Digits in Preamble
   g. Open the CONFIG menu:
      Select 'Termination' = <CR>

   If any parameters need to be changed, access to the 'Configuration' and 'Serial' menus can be gained by using a mouse or pressing (Alt-C, S) and using the arrow and 'ENTER' keys to select and change the parameter(s).

6. Verify communications with the transmitter by typing ID? and Return. You should see an ASCII message identifying the unit as an MTC-100T with a control software version and date. If so, proceed to paragraph 4-4.2.

4-4.2 *Transmitter Performance Verification.*

Use the **PO?** query to obtain the results of the Power On Self Test. Refer to Table 3-7 for the meaning of the individual result bits. If desired, use the **PO** command to repeat the tests.

Section II. CORRECTIVE MAINTENANCE

4-5 TROUBLESHOOTING.

4-5.1 *Troubleshooting Philosophy.*
Certain assumptions are made concerning the troubleshooting approach as applied to the transmitter as follows:

1. All point-to-point wiring is correct. Therefore, no malfunction is the result of a wiring (or cable connector) fault.

NOTE
Suspected failure of cables or connectors require visual inspection and continuity tests using the appropriate diagram. See FO-3 for interconnecting, schematic.

2. Malfunctions are non-interactive. Each symptom of a problem is caused by a single malfunction and no additional failures occurred during the troubleshooting process.
3. Multiple faults can be isolated if they are non-interactive.
4. Preventive maintenance has been performed (Section I).

4-5.2 *Built-In Tests.* The MTC-100T provides two types of testing: power-on self test (POST), and built-in test (BIT). Each is discussed below.

4-5.2.1 *POST.* The POST is performed automatically each time the transmitter is powered on. Under firmware control, the POST sequences through a series of tests that checks the Control and DSP section of the Digital module. If a failure is detected, the unit generates an audio tone in morse code describing error. Record the failure data. Depending on the failure, transmitter functions may or may not be possible. POST results are also reported over the remote control bus.

4-5.2.2 *BIT.* During normal transmitter operation, fault detectors are operating in the background. If a fault is detected, the Control section stores the information in memory, causes the NO FAULT LED to extinguish , and makes the fault information available over the remote control bus. The operator can view the current or cumulative faults (since power up) using the FC? or FA? command.

4-5.3 *Troubleshooting Procedure.* Equipment troubleshooting should be performed in the following order:

1. Initial checks.
2. Fault identification

4-5.3.1 *Initial Checks.* If a problem is suspected conduct the following:

1. Check that the power switch is on and the Power and No Fault LED's on the front panel are lighted. If the Power and No Fault LED's are off, and the power switch is set to on, ensure that input power is correct.
2. Check for air flow into the unit from the front panel. The interior fans draw air through the grill on the front panel to the exhaust slits on the rear panel.

4-5.3.2 *Fault Identification.* Should the transmitter identify a fault, the "No Fault" LED on the front panel of the transmitter will extinguish.. Since the transmitter is designed to be operated remotely verification of the "No Fault" LED may not be a viable option. If a malfunction is suspected several radio command messages are available to help localize and determine the cause of the problem. These command messages are:

:?	Request Interface Status Messages.
DACn	Initiate DAC test.
DS?	Request a report of the DSP self test
FA?	Request a report of all accumulated faults.
FC?	Request a report of all current faults.
FS?	Request a fault summary report.
PO?	Request results of the most recent POST.
PS?	Request status of the power supply voltages.
VPS?	Displays the current power supply voltages.

A more detailed description of these commands is provided in chapter 3.

NOTE
When using the FA? or FC? Radio Commands the operator can determine the fault from table 3-7. To determine the meaning and the maintenance action to take in response to these fault messages, refer to table 4-1.

Table 4-1 Fault Messages.

Message	Meaning	Action To Take
Error interrupt has occurred	Divide by zero or other software error has occurred. May indicate a software problem.	If condition recurs, report to CCI factory engineers. Use `R?` query to identify all operation conditions at time of error.
DSP clock fault	Phase Lock Loop (PLL) malfunctioning.	1. Recycle power. 2. If problem persists or recurs, replace RF Analog board.
Transmit Synthesizer fault	Phase Lock Loop (PLL) malfunctioning.	1. Recycle power. 2. If problem persists or recurs, replace RF Analog board.
No reply from DSP	Digital Signal Processor or DSP Clock malfunctioning.	1. Recycle Power. 2. If problem persists or recurs, check 49.152 MHz DSP clock: a. If bad, replace RF Analog board. b. If good, replace Digital board.
Timeout waiting for EEPROM data poling	EEPROM does not accept programming. EEPROM faulty.	Replace Digital board.
Timeout waiting for serial bus transmitter to finish.	The serial port has timed out while transmitting Hardware handshake has prevented timely transmission of a message from the transmitter	1. Check handshake lines. 2. Check host software. 3. Try different baud rate. 4. Replace Digital board
Power supply voltages out of tolerance	One or more of the DC voltages (+28, +17.5, +9.5, -17.5) is at fault.	1. Replace power supply module. 2. If only the +28 VDC is at fault, replace the DC/DC Converter.
Serial bus overrun error	Character received too fast for transmitter to process.	1. Verify that host respects RTS handshake. 2. Reduce baud rate.
Serial bus parity error	Character received with incorrect parity.	1. Check line parameter settings. 2. Choose host line settings. 3. Choose no-parity mode of transmission 4. Check bus capable and connectors for bad connections or noise pickup.
Serial bus framing error	Character received without required stop bit.	1. Check transmitter line parameter settings. 2. Check host line parameter settings for match.

4-6 SOFTWARE UPLOADING.

The transmitter's control and DSP software may be replaced using the Maintenance connector J2 on the rear of the unit to gain access to the unit's flash memory. The upload may be done using a DOS-based personal computer with a serial bus null-modem cable and one of the COMM ports on the PC.

To upload software to the transmitter control and DSP processors, refer to section 3-2.2 of the manual.

CHAPTER 5
PREPARATION FOR RESHIPMENT

5-1 INTRODUCTION.

This chapter contains information to prepare the unit for reshipment including disassembly and removal from the rack mount, packaging, and shipping.

5-2 DISASSEMBLY AND REMOVAL.

To disassemble and remove the unit from the rack mount, perform the following procedures:

1. Ensure the power is set to off.
2. Disconnect the input power cable.
3. Disconnect all cables from the rear panel.
4. Remove the unit from the rack mount if used.

5-3 PACKAGING.

NOTE
The unit should be packed in the original shipping container if available.

To package the unit for reshipment perform the following steps:

1. Ensure that there is sufficient foam packing material in the shipping container to protect the unit from any hard impact.
2. Cover the unit with foam or bubble-type packing material.
3. Place the unit in the center of the shipping container.
4. If using a cardboard packing carton, securely tape the seams of the carton's top cover, bottom cover, and side flaps with reinforced packing tape.
5. Attach labels or stamp in indelible ink the word FRAGILE on the top, bottom, and all sides of the container.

5-4 SHIPPING.

CAUTION

Unit contains parts and assemblies sensitive to damage by electrostatic discharge (ESD). Do not ship or store near strong electrostatic, electromagnetic, magnetic or radioactive fields.

There are no special shipping requirements for the unit. Commercial or military surface or air shipping services may be used.

CHAPTER 6
STORAGE

6-1 INTRODUCTION.

This chapter contains information for storage of the equipment including environmental conditions and any special preservation requirements.

6-2 STORAGE ENVIRONMENT.

The transmitter should be stored indoors in the original shipping container (or similar container) as described in chapter 5. The humidity should be between 40 and 90% (non-condensing) with a temperature range of -20 to +60°C.

CAUTION

Unit contains parts and assemblies sensitive to damage by electrostatic discharge (ESD). Do not ship or store near strong electrostatic, electromagnetic, magnetic or radioactive fields.

6-3 PRESERVATION.

There are no special coverings or preservation materials required to store the transmitter.

CHAPTER 7
PARTS LIST

7-1 INTRODUCTION.

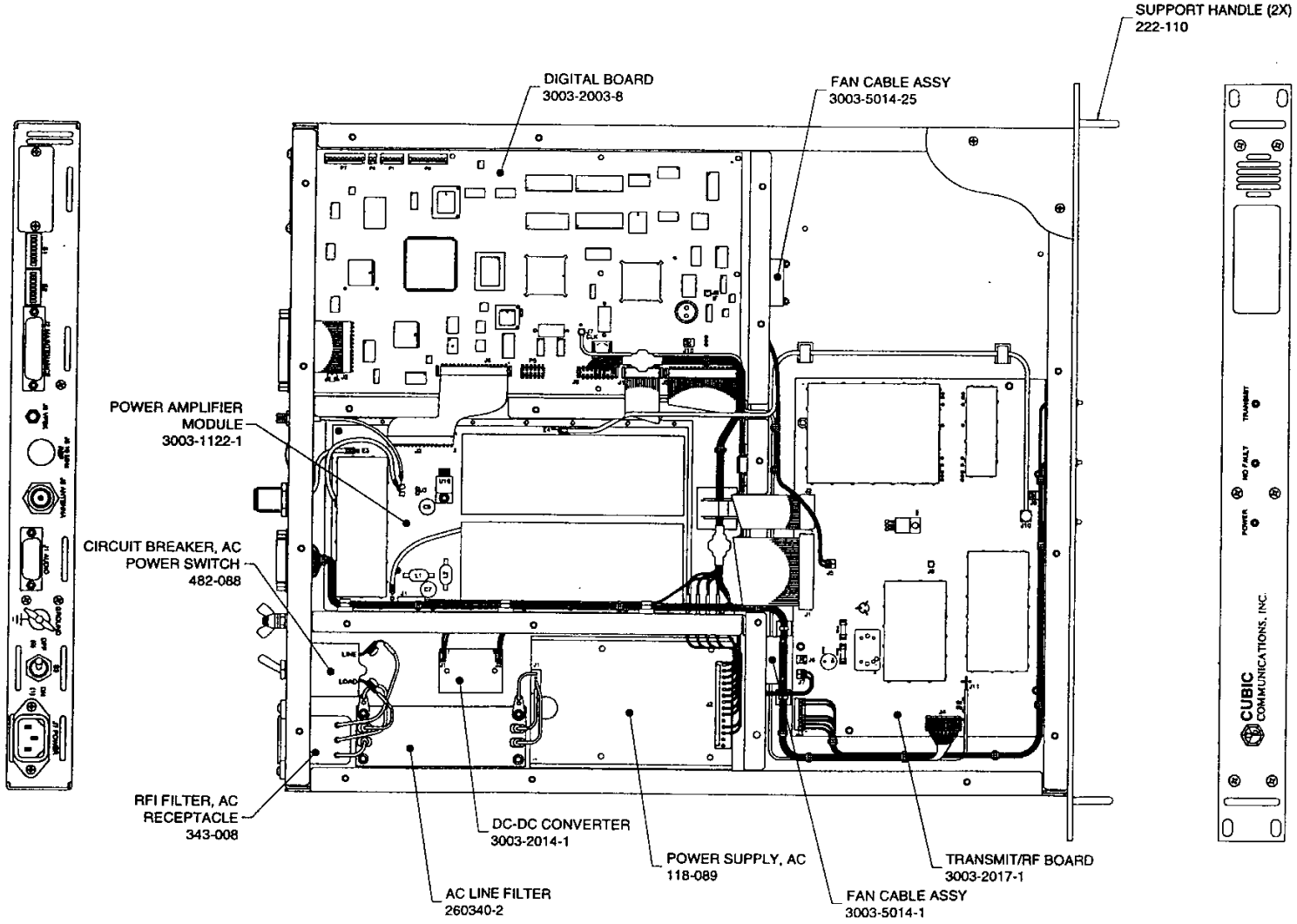
This chapter contains the parts list for replaceable modules and chassis-mounted components at the operational maintenance level.

7-2 REPLACEABLE PARTS LISTING.

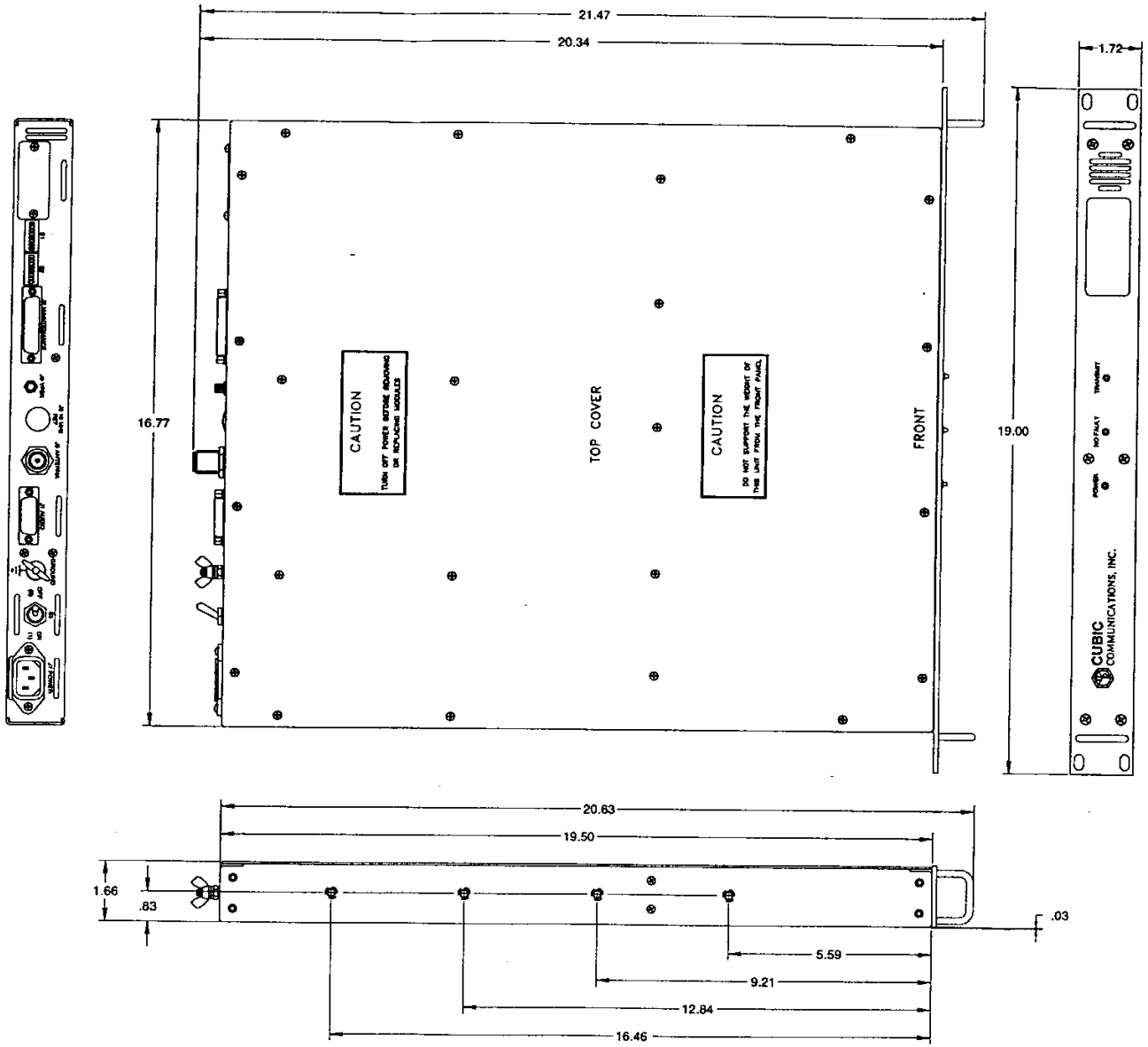
Table 7-1 lists replaceable modules and chassis-mounted components for the unit. (See figure FO-4 for locations.)

Table 7-1 Replaceable Parts.

Qty	Description	Part Number	Remarks	Mfr
1	Board, AC Line Filter	260340-2		CCI[1]
1	Board, Digital	3003-2003-8		CCI
1	Board, Transmit/RF	3003-2017-1		CCI
2	Cable Assy, Fan	3003-5014-1 3003-5014-25	2.5" cable assembly with fan 8.5" cable assembly with fan	CCI
1	Circuit Breaker/ AC Power Switch	482-088		CCI
1	DC/DC converter	3003-2014-1		CCI
2	Handle, Support	222-110		CCI
1	Module, Power Amplifier	3003-1122-1		CCI
1.	Power Cord, AC	696-012	Not Shown	CCI
1	Power Supply, AC	118-089		CCI
1	RFI Filter/AC Receptacle	343-008		CCI
[1]Cubic Communications, Inc. (FSCM 59532)				

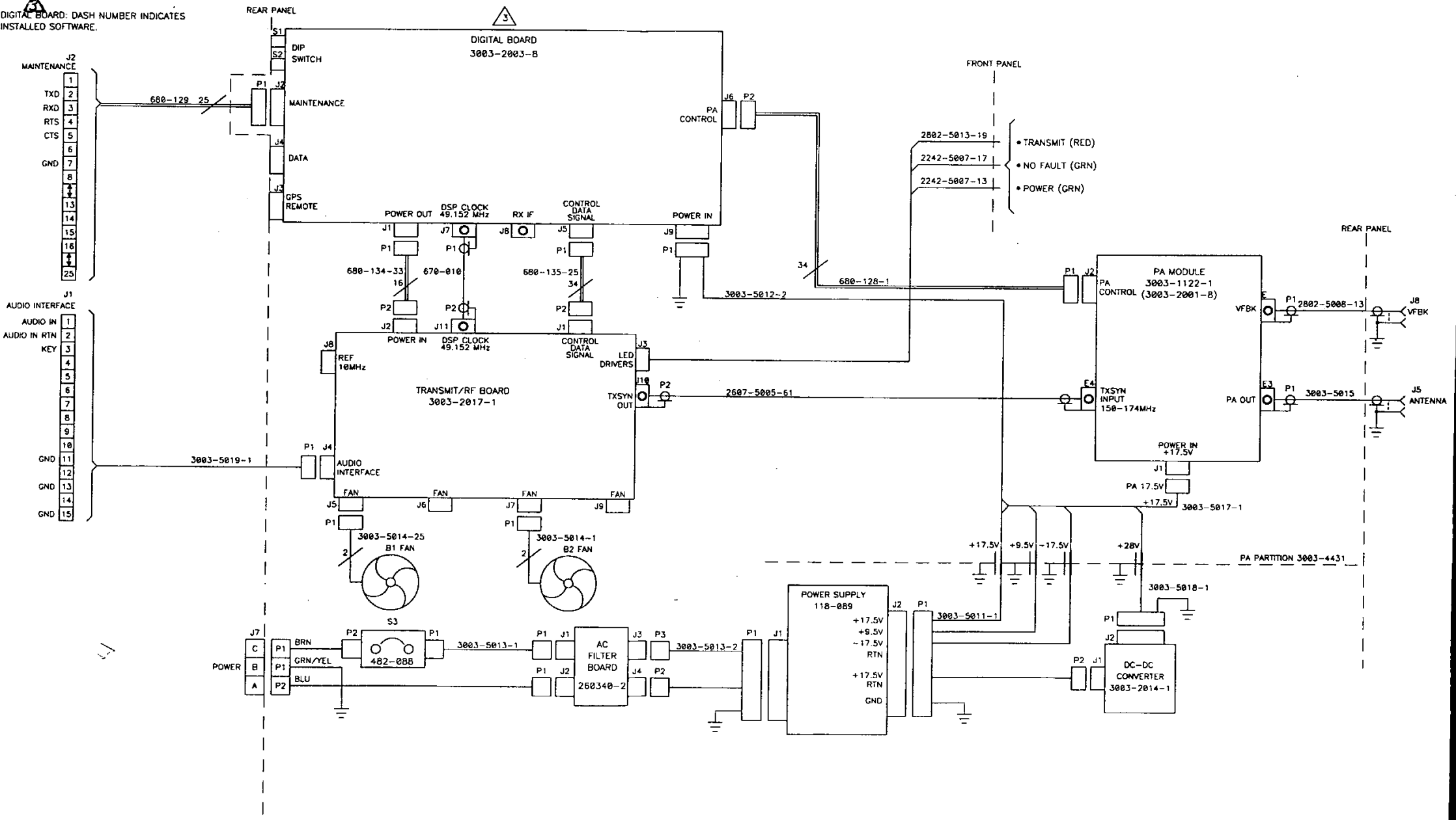


MTC-100T REPLACEABLE PARTS DIAGRAM

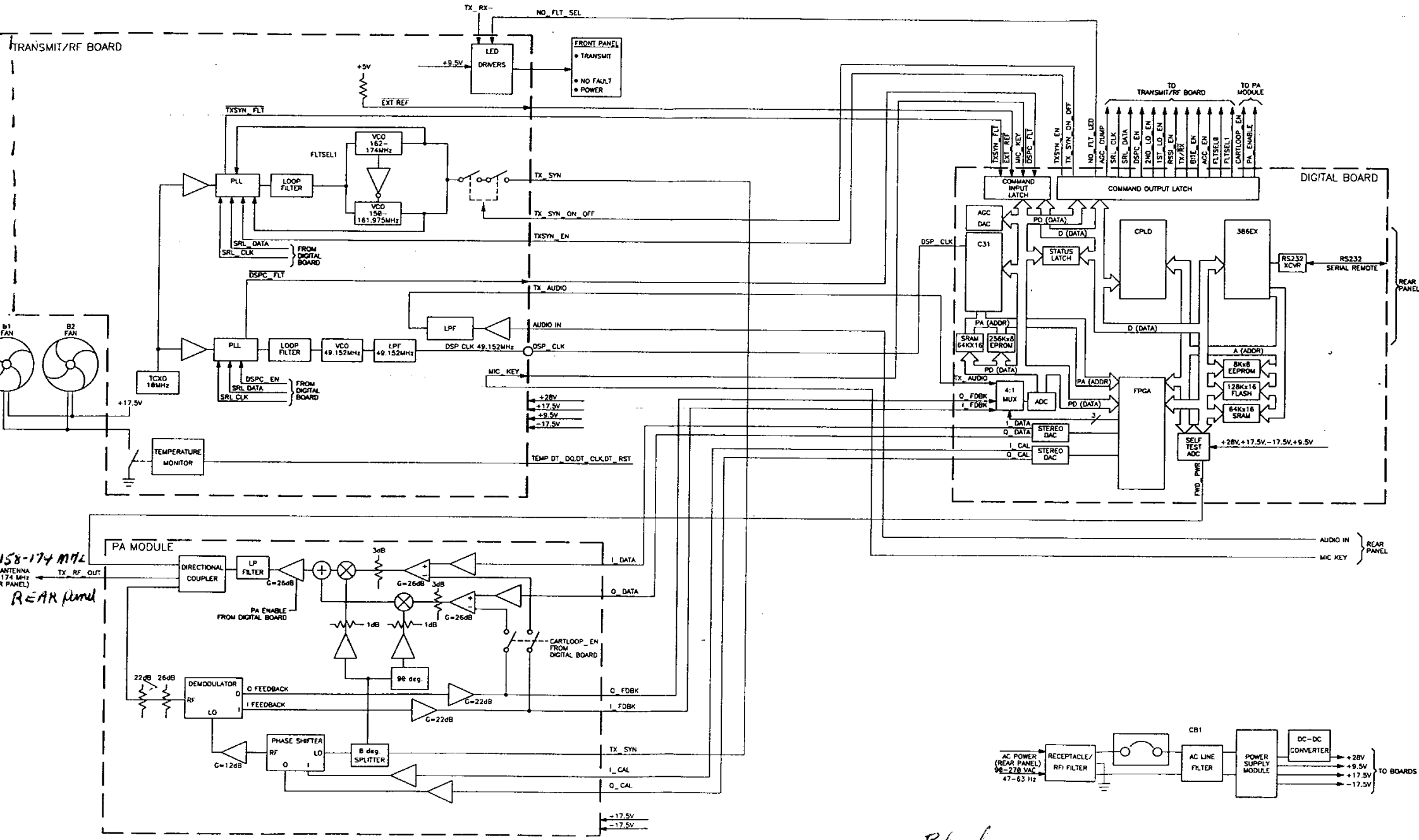


FO-1. MTC-100T Outline and Mounting

ES: UNLESS OTHERWISE SPECIFIED
XX
/ INDICATES NUMBER OF CONDUCTORS IN CABLE.
INDICATES RIBBON CABLE.
3 DIGITAL BOARD: DASH NUMBER INDICATES INSTALLED SOFTWARE.



FO-3. MTC-100T Interconnect Diagram.



Block Diagram

FO-2. MTC-100T Block Diagram.