***Mobile* Communications**

TMX™ 8810 800 MHz
TRUNKED MOBILE RADIO

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Maintenance Manual

Ericsson GE Mobile Communications Inc.
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SPECIFICATIONS*

GENERAL

Operating Voltage	13.8 Volts ±20%
Battery Drain	
Receiver (13.8 Vdc)	
Off	0.01 Amperes (maximum)
Squelched	0.60 Amperes (maximum)
Unsquelched	1.80 Amperes (maximum at 3 Watts audio)
Transmitter (13.6 Vdc)	5.00 Amperes (maximum at 10 Watts RF)
Channel Spacing	25 kHz
Frequency Stability	±2.5 PPM (±0.00025%)
Temperature Range	-30°C to +60°C (-22°F to +140°F)
Dimensions (H x W x D)	
(Less Accessories)	(Fits a DIN size dash opening)
Height	54.5mm (2.15 inches)(body)/62.5mm (2.46 inches)(nose)
Width	181.5mm (7.15 inches)
Depth	216mm (8.5 inches)
Weight	2.04 kg (4.5 pounds)
Antenna Impedance	50 Ohms

TRANSMITTER

Frequency Range	806.0125-820.9875 MHz 851.0125-865.9875 MHz
Output Power	5-10 Watts adjustable
Audio Sensitivity	20-80 millivolts RMS
Spurious and Harmonics	-16 dBm max
Audio Distortion	5% maximum @ 1000 Hz
Modulation Limiting	±5 kHz (maximum)
FM Hum and Noise	-45 dB max
Audio Frequency Response	Within +1, -4.5 dB of a 6 dB/octave pre-emphasis curve from 300-3000 Hz per EIA Standards.

RECEIVER

Frequency Range	851.0125-865.9875 MHz
Acceptable Freq Displ.	±2.5 kHz min
Sensitivity (12 dB SINAD)	-116 dBm maximum
Spurious Response	-68 dB max
Adjacent Channel Selectivity	-68 dB max at 25.0 kHz
Intermodulation	-65 dB max
Audio Frequency Response	Within +2, -8dB of a 6 dB/octave de-emphasis curve from 300 to 2700 Hz.
Audio Output	3 Watts
Audio Distortion	5% maximum @ 1000Hz
Hum & Noise	-45 dB max

COMBO

*These specifications are intended primarily for use by service personnel. Refer to the appropriate Specification Sheet for complete specifications.

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GENERAL DESCRIPTION

The GE-MARC V•E TMX-8810 mobile is a synthesized, wideband radio that uses integrated circuits and microcomputer technology to provide high performance trunked operation. The radio provides 10 Watts of RF power output in the 806-821 MHz and 851-866 MHz trunking bands without re-tuning. The receiver will operate in the 851-866 MHz band without re-tuning.

All radio functions are stored in a programmable electrically erasable PROM (EEPROM). The radio is field programmable using an IBM compatible personal computer with the following equipment:

- Serial Programming Interface Module TQ3370,
- Programming Cable TQ3315, and
- TMX-8810 Programming Software TQ3344.

With the interface equipment and software, the computer can be used to program (or re-program) customer system frequencies, Channel Guard tones and options. Programming is done through the radio.

The TMX-8810 radio assembly consists of the following circuit boards and assemblies:

- RF Board A2 (19D902123)
- Interconnect Bd A4 (19C851617)
- Audio Board A3 (19D902188)
- Logic Board A1 (19D902172)
- System Board A5 (19D901891)
- Front Cap Assembly (19D901913)

The circuit boards are all mounted on a main casting to provide easy access for servicing. Interconnect plugs are used to connect the boards to eliminate pinched wires and other wiring problems.

RF BOARD

The RF board includes the programmable frequency synthesizer, transmitter exciter, receiver front end and IF circuitry, and PIN diode Tx-Rx switch.

Synthesizer Circuit

The synthesizer generates all transmit and receive RF frequencies. The synthesizer frequency is controlled by the microprocessor located on the Logic Board. Frequency stability is maintained by a temperature compensated reference oscillator module. Transmit audio is processed on the Audio and Logic Boards, and applied to the synthesizer to modulate the VCO. The buffered VCO output drives both the transmitter exciter and the receiver mixer.

Transmitter Circuit

The transmitter consists of a fixed-tuned exciter module, a PA module, a power control circuit, a PIN diode antenna switch, and a low pass filter.

The PA module provides a 10-Watt output. The power control circuit controls the PA module by sampling the RF power output to maintain constant output power across the band. The RF output level is internally adjustable for rated power. A thermistor in the control protects the PA from overheating.

Receiver Circuit

The dual conversion receiver circuit consists of a front end section, 45.0125 MHz first IF, a 455 kHz second IF, and FM detector. All audio processing and squelch functions are accomplished on the Audio Board.

INTERCONNECT BOARD

The Interconnect Board routes power from the System Board to the RF Board.

AUDIO BOARD

The Audio Board provides analog to digital and digital to analog conversion of the receive and transmit audio for digital processing by the Logic Board. The board also contains audio filtering, conventional analog tone processing, and the receiver squelch.

LOGIC BOARD

The Logic Board controls the main operation of the radio and digitally processes the receive and transmit audio. The board contains a microprocessor and associated memory circuits which include an EPROM for controlling the processor and a programmable "personality" electrically erasable PROM (EEPROM) to store customer frequencies, tones, and options. The microprocessor provides control data to the digital signal processor (DSP), conventional tone generation and detection, frequency data to the synthesizer, and sends and receives data to another microprocessor in the front cap assembly for the LCD display and the control panel commands.

SYSTEM BOARD

The system Board controls the main input power to the radio. The front panel POWER switch and the IGNITION SENSE input lead provide the necessary signals to the MOSFET switching circuit.

The board also interfaces all option connections from the internal boards in the radio with the optional items outside of the radio. All options that apply to the radio, interconnect to the System Board through the back of the radio using an optional cable.

FRONT CAP ASSEMBLY

The Front Cap Assembly containsthe Control Board, Control Panel, LCD Assembly, and houses the internal speaker.

The Control Board contains a microprocessor which interfaces the control panel keyboard and a LCD module to two serial data lines for communication with the main radio microprocessor on the Logic Board. The Control Board also contains a 3-watt audio power amplifier.

ACCESSORIES AND OPTIONS

MICROPHONES

The standard mobile combinations use a transistorized dynamic microphone with an internal hookswitch. The microphone is housed in a sturdy case, and the extendible coiled cord plugs into a jack on the bottom of the radio.

The microphone is secured to the radio by a cable clamp. A microphone hanger is supplied with the microphone.

In trunked mode, the radio may be PC programmed to originate a call when the microphone is removed from the hanger, or to terminate a call when returned to the hanger.

In conventional mode, Channel Guard is disabled when the microphone is removed from the hanger allowing the operator to monitor the channel before sending a message. Optional DTMF and desk microphones are also available.

CARRIER CONTROL TIMER (CCT)

The Carrier Control Timer turns off the transmitter after the microphone push-to-talk (PTT) switch has been keyed for a pre-programmed time period. A pulsing alert tone will warn the operator to unkey and then rekey the PTT to continue the transmission. The timer can be programmed to time out for 30 seconds to 7.5 minutes in 30 second increments. The timer can be enabled or disabled for each channel.

CHANNEL GUARD

Channel Guard provides a means of restricting calls to specific radios through the use of a continuous tone coded squelch system (CTCSS), or a continuous digital coded squelch system (CDCSS). Tone frequencies range from 67.0 Hz to 210.7 Hz in 0.1 Hz steps. There are 83 standard programmable digital codes.

The Channel Guard tone frequencies and codes are software programmable. Both tone frequencies and digital codes may be mixed on each channel. These codes and frequencies are listed in Figure 1.

SQUELCH TAIL ELIMINATION (STE)

STE is used with tone and digital Channel Guard to eliminate squelch tails. The STE burst is transmitted when the microphone PTT is released. The receiving radio decodes the burst and mutes the receiver audio for 250ms. This mute time allows the transmission to end and to mute the squelch tail. The radio looks for STE on the received signal when the microphone is either on or off-hook. The STE is enabled for transmit and/or receive by PC programming the radio's personality.

PC PROGRAMMING OPTIONS

The radio is programmed using an IBM compatible personal computer equipped with a RS-232 connector. Option TQ3370 provides the RS-232 serial interface unit and the cable between the PC and the unit. An auxiliary power supply for the unit is also included which is not needed to program the TMX-8810.

Option TQ3315 provides the radio programming cable between the PC interface unit and the radio microphone jack. PC programming software Option TQ3344 provides 5.25-inch diskettes and 3.5-inch diskettes.

NOISE SUPPRESSION KIT OPTION

Noise Suppression Kit Option PD1A (19A148539G1) is available for installations where excessive alternator or electrical noises present on the power cable do not permit the radio to operate properly. Refer to the interconnect diagram for the radio and options.

DESK MOUNTING WEDGE

Desk mounting wedge option MA1L (19C851685G2) us available for use with the AC power supply options when using the radio as a base station. The wedge mounting bracket mounts the radio with the control panel tilted up for better accessibility to the radio controls.

REMOTE MOUNT

Remote Mount Option MA1U (19A705306628G2 & G3) allows controlling the main radio assembly remotely from the Front Cap Assembly. The Front Cap is removed from the main radio assembly and mounted to a rear housing containing an interface board with the option. A new Front Cap without controls or displays containing an interface board is mounted to the radio assembly. An 18-foot system cable is normally supplied for use between the two units. A 20-foot power cable is also supplied for the radio assembly. The shorting jumper must be placed on the TMX-8825 position of the remote mount kit.

AC POWER SUPPLIES

Two AC power supplies are available for using the radio as a base station. Option PS1C (19A704647P2) is a 117-volt AC, 60-Hz power supply. Option PS1D (19A704647P3) a 120/240-volt, 50/60 Hz power supply is also available, where required.

OPTION CABLE

Option Cable Option CC3N (19C851585P3) is used to bring all option connections from the System Board through the back of the radio to the outside. This cable is required with all external options.

UNIVERSAL TONE CABLE

Universal Tone Cable Option CC3P (19C851585P5) equipped with a 9-pin Winchester connector is required when an external tone encoder or decoder is used. The tone cable interconnects the tone encoder/decoder with the radio through the cable Option CC3J. Refer to the installation diagrams in this manual for jumper modifications. A second "Y" cable is required when both encode and decode functions are used (Option CC7D).

POWER CABLE

18-foot power cable Option CC3R (19B801358P4) is available for installations requiring more than the standard 9-foot cable.

EXTERNAL SPEAKER OPTIONS

The external speaker options provide a five-inch speaker in a LEXAN® housing. Option LS1E (19C850550G10) provides a dash- kit for the external speaker.

The radio's 3-watt amplifier drives the speaker's 3.2-ohm impedance. The speaker leads are connected to pins 2 and 9 of option cable Option CC3J. When the External Speaker is used, refer to the Installation Instructions and Interconnection diagram for jumper modifications.

EXTERNAL ALARM

External Alarm Horn Relay Options SU1C (19A705499P1) requires External Alarm ON/OFF switch Option SU1F (19C851585P7). The relay option connects to pin 13 of option cable Option CC3J. The relay can sound the vehicle horn when a call is received. The alarm switch is used to turn the horn relay on or off.

SYSTEM DESCRIPTION

The GE-MARC V•E trunked mobile radio system permits improved access to available RF channels, freedom from annoyance by other users' conversations and a degree of privacy for the user. The trunked mobile radio system consists of a repeater for each channel and the users' mobile radio units. The system uses tone signalling with each mobile being assigned two and/or four tone group tone sequences. Groups of mobiles are assigned the same tones, so that any unit can talk to all other units in the same group.

When originating a call, the mobile identifies an idle repeater channel and interrogates it with a single burst of "busy" tone, the repeater keys its transmitter and sends a burst of "acquisition" tone back to the mobile unit. When the interrogating mobile detects the acquisition tone, it then transmits its collect and group tones, which the repeater regenerates for all idle mobile units in the system.

The idle mobiles, which continually scan all channels, will stop on the active channel if any of the programmed collect tones are detected and wait for group tone(s).

If the correct tone sequence is detected, the mobiles will alert the operator of an incoming call and open their audio circuits. If the correct sequence is not detected, the idle mobiles will resume scanning the channels. Once the mobile is "locked" on a channel, it will remain there until the repeater times out or the operator terminates the call.

TONE CG	DIG. CG	DIG. CG	DIG. CG
No. CG	023	261	654
67.0	025	263	662
71.9	026	265	664
74.4	031	271	703
77.0	032	306	712
79.7	043	311	723
82.5	047	315	731
85.4	051	331	732
88.5	054	343	734
91.5	065	346	743
94.8	071	351	754
97.4	072	364	036*
100.0	073	365	053*
103.5	074	371	122*
107.2	114	411	145*
110.9	115	412	
114.8	116	413	212*
188.8	125	423	225*
123.0	131	431	246*
127.3	132	432	252*
131.8	134	445	255*
136.5	143	464	266*
141.3	152	465	274*
146.2	155	466	325*
151.4	156	503	332*
156.7	162	506	356*
162.2	165	516	446*
167.9	172	532	452*
173.8	174	546	454*
179.9	205	565	455*
186.2	223	606	462*
192.8	226	612	523*
203.5	243	624	526*
210.7	244	627	
	245	631	
	251	632	

*Codes Unique to General Electric

NOTE

To reverse the polarity of the digital Channel Guard codes, type I ("inverted") before the code number, i.e. I023.

Figure 1 - Tone and Digital Channel Guard Codes

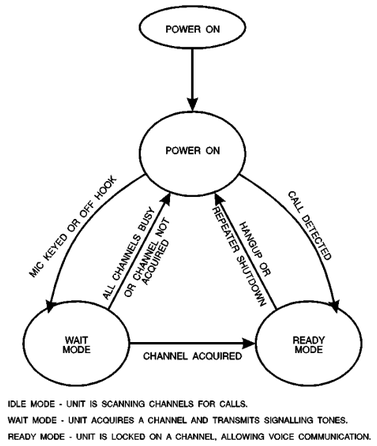


Figure 2 - Operational Modes

OPERATIONAL MODES

The radio will always be in one of three operational modes: idle, wait, or ready. The three operational modes and the conditions that cause the radio to switch from one mode to another are shown in Figure 2.

The radio enters the idle mode when power is turned on and begins scanning channels for incoming calls. The wait mode is entered when the user places a call. The radio remains in the wait mode until a channel is acquired, or if no channel is available. The ready or conversation mode is indicated by an alert tone and the mode indicator on the control panel.

A tone signalling Timing Diagram is shown in Figure 3.

Sequence Flow Charts for each operational mode are shown in Figures 4, 5, and 6.

IDLE MODE (Figure 4)

When the radio is in the Idle Mode, the audio is muted and all channels programmed for call decode are sequentially scanned for an incoming call. An incoming call is identified by detecting one of the collect tones programmed in the area. Upon receipt of a collect tone, the mobile looks for a short interval for the group or individual tones, providing that their collect tones are the same. When no valid tone is found, the mobile will resume scanning the channels for an incoming call.

If a group (or individual decode) tone is detected the mobile then looks for busy tone for a 90 millisecond period. If four tones are properly decoded, the mobile will then look for busy tone for 270 milliseconds.

When no valid tones are found, the mobile will resume scanning for a call with the next channel. When a busy tone is found, the mobile will enter the Ready Mode. If busy tone is not detected, the mobile remains in the Idle Mode and continues scanning channels looking for an incoming call.

Removing the handset from the hanger, pressing the PTT switch or pressing the SEND key on the handset, will cause the radio to enter the Wait Mode.

WAIT MODE (Figure 5)

When the user enters the Wait mode, the group tone is checked to make sure it is a valid call-originate group. If it is not a valid, a high-frequency steady tone is heard in GE-MARC™ V•E systems only. If valid, the radio will scan the call-originate frequencies for brief intervals until it finds one with no busy tone on it. If no channel is free, the radio will activate the Call Retry state if programmed for this option. This causes the radio to revert to the Idle mode and scan for a call while trying the Wait mode approximately every 20 seconds for five minute period or the Retry option is not programmed the mobile will sound a low-frequency tone, and then return to the Idle mode.

If a channel with no busy tone is found, the mobile transmits a burst of busy tone to acquire the repeater. The repeater then responds with a burst of acquisition tone. Upon receipt of the acquisition tone, the mobile proceeds to transmit the group tones (either two for four tones). If a four tone sequence is sent, the mobile must detect all four tones and busy tone before entering the Ready mode. If a two tone sequence is sent, the busy tone must be present within 90 milliseconds of the last tone in order for the radio to enter the Ready mode. If no busy tone is present, or if the four tone sequence isn't valid, the mobile will jump to the next channel in the call originate set and check for busy tone as described above.

READY MODE (Figure 6)

When an incoming call has been detected, or an idle channel has been acquired, the mobile enters the Ready mode. In this mode, the audio and push-to-talk circuits are enabled, the speaker is unmuted, and the operator is alerted an alert tone. The radio can then be used in the conventional push-to-talk manner with the radio remaining on the channel until the operator hangs up or the repeater drops the busy tone, causing the unit to revert to Idle mode.

NOTE

If a call is initiated and a sequence of five beeps is sounded, the user cannot access the radio system due to being out of mobile receive range or being inoperative. Any subsequent call will be ignored for 20 seconds.

GLOSSARY OF SYSTEM TERMS

Idle Mode

In the "standby" condition for a mobile, inactive, but prepared to call or be called, the trunked radios are IDLE until they are turned off.

Wait Mode

In the "attempting origination" condition, the Wait mode is entered from Idle mode (only) as the user presses the PTT switch on the microphone, or comes "off-hook". If successful, the unit becomes READY. Otherwise, the unit is IDLE Or IDLE/WAIT after all channels are tried.

Ready Mode

In the "operating:" condition, Ready is entered from Idle mode via Wait mode when calling, or directly from Idle when called. Ready mode ends (the ratio reverts to Idle) when the user disconnects or with loss of received Busy Tone from the repeater. This normally occurs when the repeater shuts down after communication is completed.

Busy Tone

A "Voice-plus" tone 3051.9 Hz (standard). 2918 Hz (alternate) tone modulates mobile and repeater transmitters at low level (±1 kHz deviation) continuously. This tone is filtered from received audio and is used to hold the communication channel active. It also excludes other mobiles from using the channel when a call is active.

Acquisition Tone

A tone (1962.9 Hz) sent a full deviation for 50 milliseconds from the repeater. It is used as from the repeater of a busy tone that was sent and signals the mobile that signalling tones can now be sent.

Collect Tone

A Tone chosen from 38 standardized frequencies ranging from 508.6 Hz to 2792.4 Hz is used as the first tone in the group tone sequence. The collect tone is used to gather all mobiles with the same collect tone for decoding a call. The duration of the tone varies as a function of the number of channels which are programmed into the mobile and/or repeater.

In a two tone call, the mobile sends the collected tone for a programmable duration. In the four-tone call, the mobile always sends a 90-millisecond collect tone which the repeater regenerates and sends for the correct duration.

Group/Individual Tones

Tones chosen from the 3 standard frequencies which follow the collect tone. In a two-tone call, the second tone is sent for 450 milliseconds. In a four tone call, the second, third, and fourth tones are sent for 90 milliseconds from the mobile, and 180 milliseconds from the repeater.

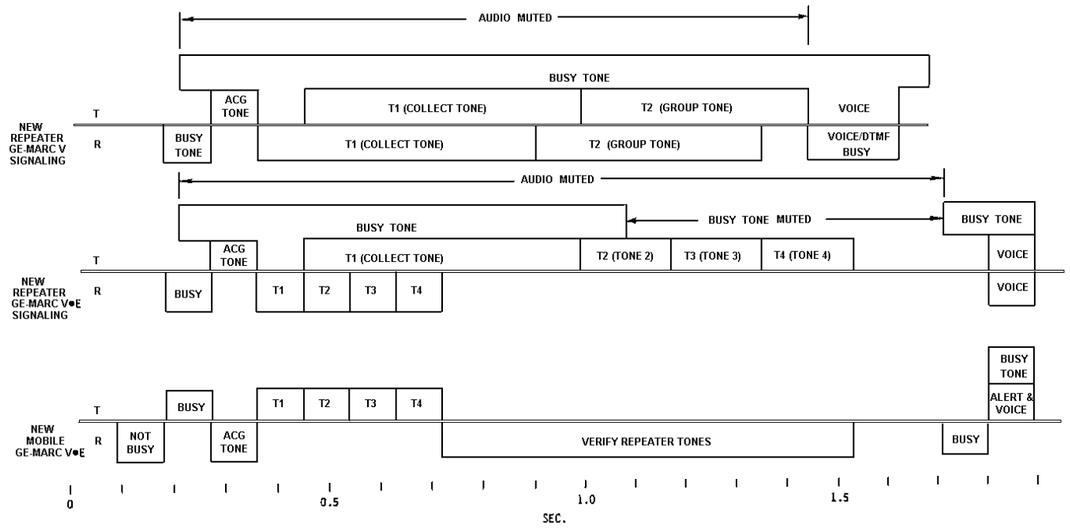


Figure 3 - Tone Signal Timing

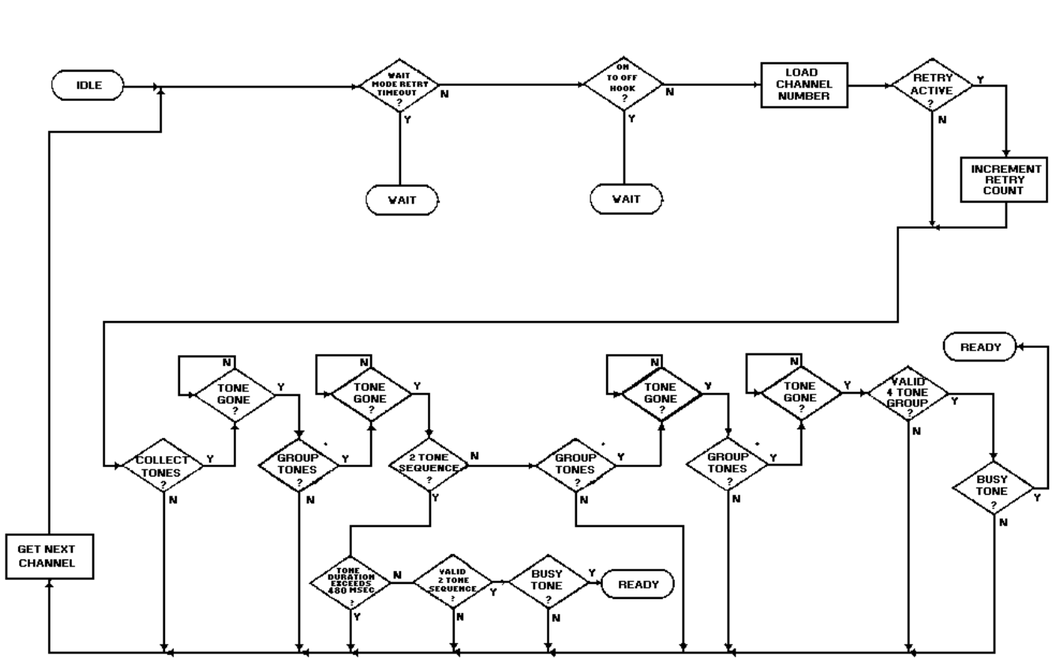


Figure 4 - Idle Mode

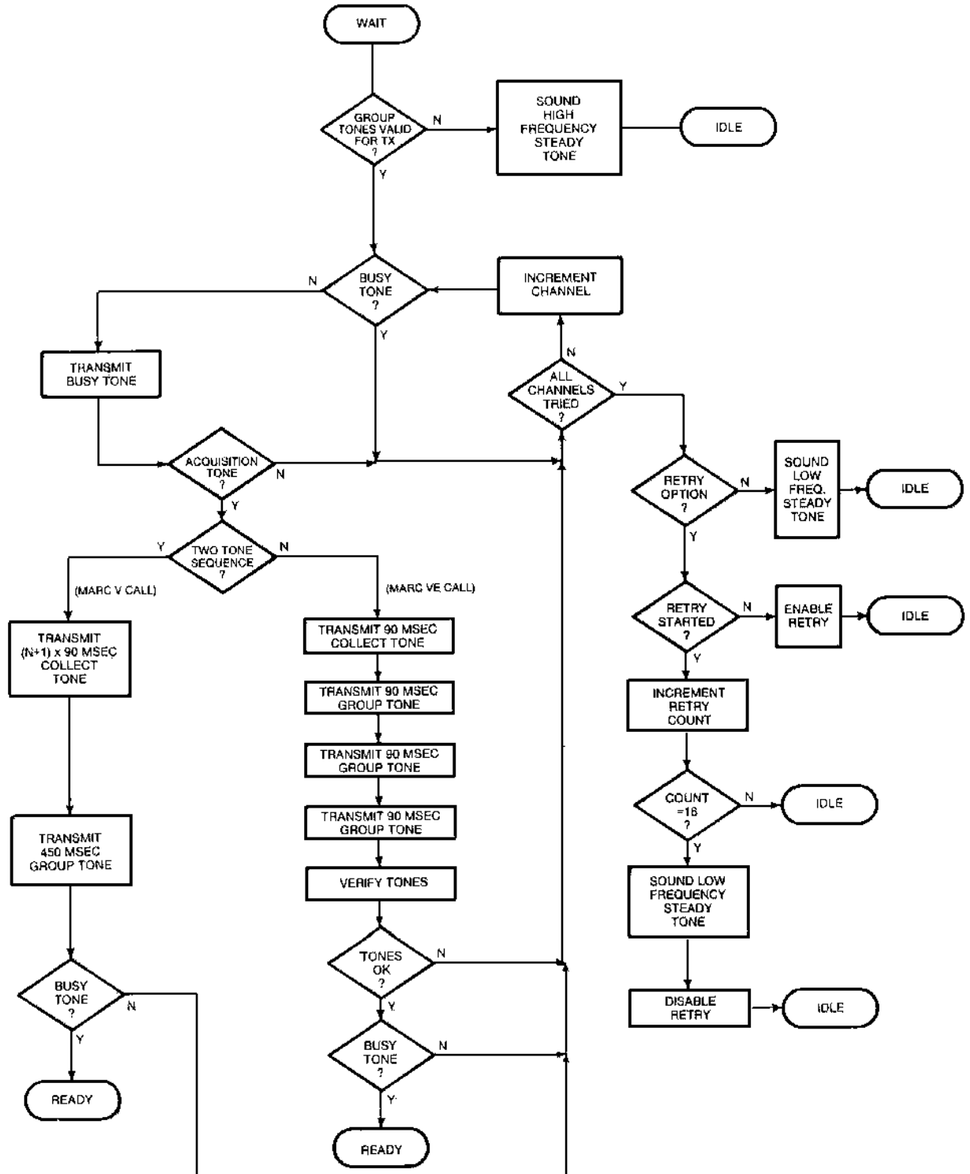


Figure 5 - Wait Mode

COMBO

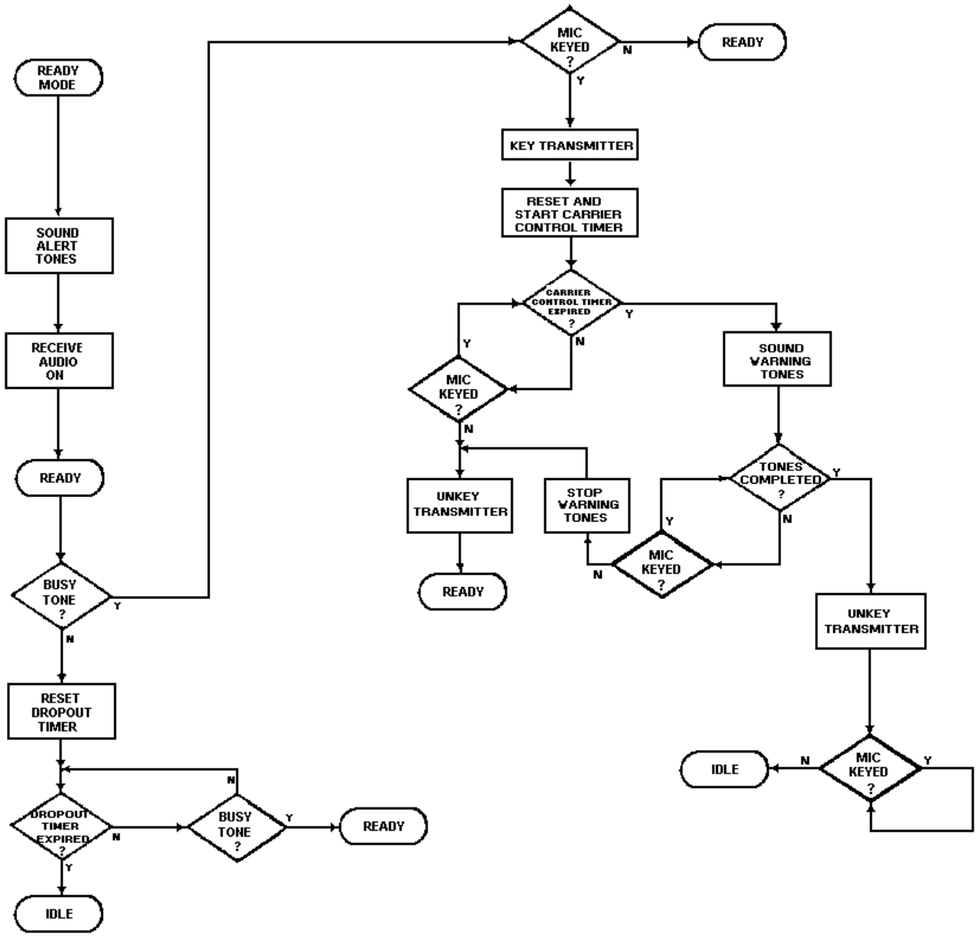


Figure 6 - Ready Mode

OPERATION

CONTROLS

The TMX-8810 trunked radio is equipped with the controls listed (see Figure 7).

POWER

Momentary switch. Press once to turn on the radio. Push again to turn off the radio. The radio will sound three beeps and the display will show PASSED followed by the area/group last selected.

VOLUME

Two momentary switches. **VOLUME UP** and **VOLUME DOWN**. Beeps are heard while stepping the volume on an inactive channel. No beeps are heard while receiving a channel.

AREA

Two momentary switches. Push **AREA UP** to increment to the next higher programmed area. Push **AREA DOWN** to decrement to the next lower area.

GROUP/SEL (GROUP/SELECT)

Two momentary switches. Increment or decrement groups, channels or menu selections.

TRUNKED MODE: Increments or decrements the group. Inoperative in areas dedicated to direct mode GE-MARC channels. NOTE: THE SPECIAL CALL function will not be selected when stepping through the groups. Press **MENU** and then simultaneously press **GROUP UP** to select SPECIAL CALL.

CONVENTIONAL MODE: Increments ore decrements the conventional channels (up to 9 Channels).

MENU OPERATION: Increments or decrements menu selections for the ALARM and PHONE menu features.

CLR/MON (CLEAR/MONITOR)

Momentary switch.

TRUNKED MODE: Terminates a call.

DIRECT AND CONVENTIONAL MODES: Unsquelches the receiver to monitor any activity on the selected channel.

MENU OPERATION: Exits the menu when using the PHONE or ALARM options. Resets the display to the current area/group.

MENU

Momentary switch. Accesses the menu features (PHONE and ALARM). Press **MENU** again to toggle between PHONE and ALARM. Press **CLR/MON** to exit the menu mode and return the display to the current area/group.

PHONE: Allows selecting up to 10 preprogrammed telephone numbers. Press **GROUP UP** or **GROUP DOWN** to toggle between Yes or NO.

ALARM: If the Horn Alert Option is present, press **GROUP UP** or **GROUP DOWN** to toggle between Yes or No.

SHIFT KEY FUNCTIONS

MENU/GROUP UP

Momentary switches. Selects the special call function for the area in the display (trunked mode only). Press **MENU** and then **GROUP UP** simultaneously. (**MENU** is acting as a "shift" key.)

MENU/VOLUME UP

Momentary switches. Immediately places receiver volume at maximum. Press **MENU** and then **VOLUME UP** simultaneously.

MENU/VOLUME DOWN

Momentary switches. Immediately places receiver volume at minimum. Press **MENU** and then **VOLUME DOWN** simultaneously.

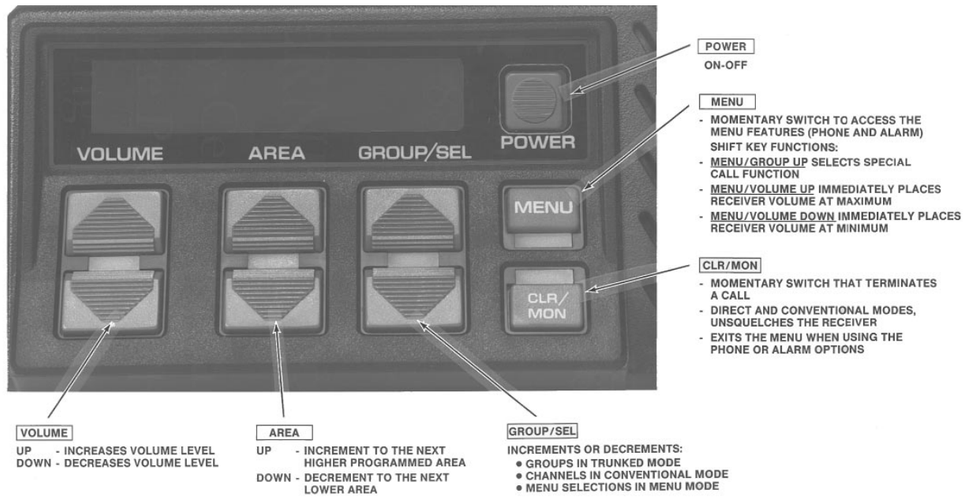


Figure 7 - TMX-8810 Controls

INDICATORS

Display Indicators

A Liquid Crystal Display (LCD) provides the operational status of the radio. The display contains TX and BSY indicators and eight alphanumeric characters (see Figure 8).

TX (Transmit)

ON: Indicates the microphone Push-to-Talk (PTT) is pushed.

FLASHING: Indicates attempting to acquire a channel in trunked mode.

BSY (Busy)

Trunked Mode:

FLASHING: Indicates radio is automatically retrying to acquire a channel while system is busy. (Radio must be pre programmed for call retry option.

ON: Indicates out-of-range of the GE-MARC system.

Conventional MODE:

ON: Indicates the channel is busy.

Display Characters

Eight alphanumeric characters. Up to 4 characters may be used for the area named followed by 4 characters for the group name.

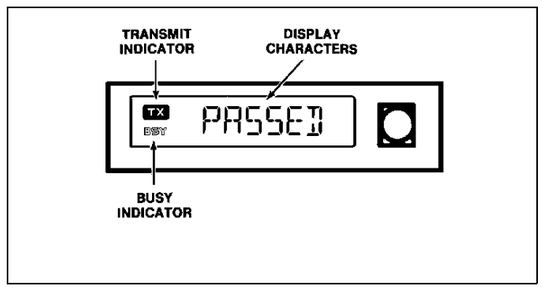


Figure 8 - TMX-8810 LCD Indicators

AUDIBLE INDICATORS

Self Check Test Alert

Three beeps are sounded a second after the radio is turned on to indicate that the radio has passed the self diagnostic test. The display will also show PASSED for one second.

Call Received Alert (Trunked Mode Only)

A short, high frequency tone is sounded when you receive a group call. A two tone alert is sounded when receiving an individual call. NOTE: The radio can be preprogrammed to mute the Call Received Alert Tones.

Call Originate Alert (Trunked Mode Only)

A three tone alert is sounded after originating a trunked call. The alert indicates a channel was acquired and is ready for normal conversation.

System Busy (Trunked Mode Only)

A low frequency tone is sounded for one second after attempting to place a trunked call. The display also shows WAIT momentarily. This tone indicates the GE-MARC system is busy and you should try again later (the call retry option will try again automatically if preprogrammed).

Out Of Range Alert (Trunked Mode Only)

Five beeps are sounded after attempting to place a trunked call. These beeps indicate that the radio is out of range of the GE-MARC system, or if the beeps sound when the radio is within known range of the system, the radio may need servicing (even though the self diagnostic test passed at power on).

Invalid Call Originate Alert (Trunked Mode Only)

A low frequency tone is sounded for one second immediately after pressing the mic PTT. The display does not show WAIT. A call was attempted with a group that is not enabled for call originate.

Carrier Control Timer (Trunked, Direct, And Conventional Modes)

A pulsed tone signal is sounded when the micro-phone PTT is pressed continuously for a preprogrammed tone. After nine seconds of pulsing the alert tone, the radio unkeys the transmitter and communications is interrupted. While the tone is pulsing, the user can release and press the PTT again to reset the timer and resume the conversation.

GE-Marc System Tones

The GE-MARC system may give other tones to alert the user of system time-out, etc. Contact your GE-MARC system operator for details about these alert tones.

BASIC OPERATION

Turning The Radio On

Push the **POWER** switch. A self diagnostic test is performed for 1 second. A 3 beep alert signal will then sound and the display will show PASSED for one second. The display will then show the AREA and GROUP which were last selected.

NOTE

Should the 3 beep alert not sound and/or the display shows ERROR, contact your service representative.

Set the volume level using the **VOLUME UP** or **VOLUME DOWN** keys. A short beep will sound to show each volume level step. The beeps will stop when maximum or minimum volume are reached or while receiving a call.

NOTE

Pushing **MENU** and the **VOLUME UP** simultaneously will immediately place the volume at maximum. Conversely, pressing **MENU** and **VOLUME DOWN** places the radio at minimum volume. The **MENU** key acts as a "shift" key for these functions.

Turning The Radio Off

Push the **POWER** switch or if the radio is connected to the vehicle ignition switch, turn the vehicle ignition off. When the vehicle ignition is turned back on, the radio power and all other radio settings will return to the same condition last selected.

TRUNKED MODE OPERATION

Placing A Dispatch Call

NOTE

If you plan on a lengthy call (or several calls), the vehicle engine should be running to maintain battery charge.

1. Select the desired trunked mode AREA and GROUP using the **AREA** and **GROUP** keys. If the SPECIAL CALL (SPC) feature is desired, select the area followed by simultaneously pressing **MENU** and then **GROUP UP.** The display will show SPC after the area name. If the area has no programmed groups, SPC selection is automatic.

COMBO

2. Momentarily press the microphone push-to-talk (PTT) switch to acquire a channel. The display will show WAIT momentarily. A 3 tone alert signal will then signal when you can being the conversation. If the "off-hook call originate" option is preprogrammed, the radio will automatically attempt to acquire a channel when the microphone is removed from the hanger without pressing the PTT.

   A steady one second low frequency tone will sound if the call cannot be completed due to all available channels busy. Press the PTT again later to retry the call.

NOTE

If the call retry option has been preprogrammed in the radio, the radio will automatically try to acquire a channel every 5 seconds for up to 15 times unless the area is changed or an out-of-range condition occurs.

A sequence of five beeps will sound if the radio cannot access a channel due to being out of range of the GE-MARC system or an inoperative radio. Any subsequent call request will be ignored for 20 seconds. However, if the area is changed, a call request may be initiated in the new area.

RECEIVING A CALL (TRUNKED MODE OPERATION)

When a call is received by the radio, alert tones are sounded to inform the user of the incoming call (unless the "mute received alert tone" option has been preprogrammed).

A single tone alert indicates a group call. A two tone alert indicates call. The display will flash the area and group of the received call. Press the microphone PTT to answer the incoming call.

Incoming telephone interconnect calls will be indicated with a two tone alert followed by telephone ringing tones. The display will show an individual decode call. Press the microphone PTT to answer the call.

ENDING A CALL (TRUNKED MODE OPERATION)

The call can be ended in one of three ways:

a. pressing the **CLR/MON** key,

b. returning the microphone to the hanger (if the preprogrammed option "on-hook call terminate" is enabled), or

c. waiting for a channel disconnect or system time-out after 6 seconds of no channel activity (PTT).

NOTE

If a channel disconnect occurs before the conversation has ended, the call must be initiated again. To avoid confusion, a procedure should be set up so that the originator of the call is the one designated to re-establish communications. Two or more operators originating a call simultaneously may acquire two different channels making communication impossible.

DIRECT MODE OPERATION

The Direct Mode provides short range, line of sight communications. In the Direct Mode, the radio is not operational on the GE-MARC System.

1. Press the **AREA UP** or **DOWN** keys to select the direct mode area. The **GROUP** keys have no affect in the Direct Mode.

2. Before making a call, determine if the channel is in use. Press **CLR/MON** to momentarily disable the squelch to monitor the channel. Also, removing the microphone from the hanger allows you to monitor the channel without disabling the squelch (Busy Tone is disabled). The BSY indicator in the display will also show is the channel is in use.

CONVENTIONAL MODE OPERATION

1. Press the **AREA UP** or **DOWN** keys to select the conventional mode area. If more than one channel is available in the conventional area, press the **GROUP UP** or **DOWN** keys to select the channel (up to 9 channels may be available in one conventional area).

2. Before making a call, determine if the channel is busy. Press **CLR/MON** to momentarily disable the squelch to monitor the channel for any activity. Also, removing the microphone from the hanger allows you to monitor the channel without disabling the squelch (Channel Guard is disabled). The BSY indicator in the display will also show if the channel is in use.

TELEPHONE INTERCONNECT CALLS

The radio may be preprogrammed with up to 10 telephone numbers. Each dialer number may contain up to 15 digits. Place a Telephone Interconnect Call as follows:

1. Select the AREA and GROUP which are valid for interconnect calls. If the SPECIAL CALL (SPC) feature is desired in trunked mode, select the area followed by simultaneously pressing **MENU** and then **GROUP UP**. The display will show SPC after the area name. If the area has no programmed groups, SPC selection is automatic.

2. Momentarily press the **MENU** key. If ALARM appears in the display, press **MENU** a second time until PHONE appears. PHONE will remain in the display for one second and then the telephone number which was last selected will be displayed. Use the **GROUP UP** or **GROUP DOWN** keys to step to the desired telephone number. If you desire to cancel the PHONE mode, press **CLR/MON** at any time to reset the display to the current area/group.

NOTE

If a number contains more than 7 digits, the radio displays the first digits of the number for one second followed by displaying the last 7 digits.

3. With the desired phone number in the display, momentarily press the microphone PTT. The radio will acquire a channel and dial the number. When using the trunked mode, the radio will give the same alert tones to show if a channel was not available as described under the section PLACING A DISPATCH CALL (TRUNKED MODE OPERATION).

NOTE

After dialing the first number, if another number must now be sent (for credit card calls, etc.), first press MENU, select the other number using GROUP UP or DOWN, and then momentarily press the microphone PTT.

4. To end a call, momentarily push **CLR/MON** once to disconnect the telephone interconnect only. If desired, another interconnect call may now be placed before the system times out in 6 seconds by pressing **MENU** and selecting the number. Push **CLR/MON** a second time to disconnect from the system immediately.

NOTE

When the radio is first turned on, momentarily pressing MENU will always select ALARM first. Pressing MENU a second time will select the PHONE mode with the first of the 10 dialer numbers. While operating the radio, the radio will remember the menu mode and the dialer number last selected. However, after the radio is turned off, the menu mode will again be ALARM and the dialer number will be the first in the list.

HORN ALERT OPTION

If the Horn Alert Option is present, the radio can be preprogrammed to beep the vehicle horn when a call is received (in trunked mode operation only).

To enable the Horn Alert Option, momentarily press the **MENU** key until ALARM appears in the display. (If PHONE appears, press **MENU** a second time). Use the **GROUP UP** or **GROUP DOWN** keys to toggle between Y or N (Yes or No) to enable or disable the alarm.

If desired, after enabling the alarm, press the **CLR/MON** key to leave the menu mode and return the display to the current area/group. The alarm will re-main enabled on the area/group selected in the display.

With the alarm enabled, when a call is received, the radio will first sound a pulsed alert warning tone for three seconds and then begin blowing the horn five times (one second on, three seconds off, for 20 seconds). Pressing the microphone PTT during the pulsed alert tone will prevent blowing the horn. The horn alert will remain enabled for subsequent calls.

MAINTENANCE

This section contains information required to service the radio. Included are preventive maintenance checks, procedures for replacing transistors, Integrated Circuits (ICs) and chip components. Refer to the Service Section for transmitter and receiver alignment procedures, and service checks for the transmitter and receiver.

INITIAL ADJUSTMENT

After the radio has been installed (as described in the Installation Manual), the following adjustments should be made by a certified electronics technician.

TRANSMITTER ADJUSTMENT

The adjustment for the transmitter includes measuring the forward and reflected power, and setting the transmitter to rated power output. Then, measure the frequency and modulation and record these measurements for future reference. For the complete transmitter adjustment, refer to the Alignment Procedure.

RECEIVER ADJUSTMENT

No adjustment for the input circuit is required. For complete receiver adjustment, refer to the Receiver Alignment Procedure.

SERVICE OPTIONS

To facilitate troubleshooting of problems on the printed circuit board assemblies, the following service accessories are available:

TMX Handset Option 19B801596P1 allows accessing the radio test mode functions for radio alignment and testing. Requires Test Point Adapter Option TQ0615. The handset from a TMX-8510 or TMX-8712 may be used if available.

Test Point Adapter Option TQ0615 allows connecting a TMX handset to the radio microphone connector for accessing the test mode functions. The adapter also provides receive audio monitoring, transmit audio injection, and test points for all 10 pins of the mic connector.

Service cable 19A704875P1 provides an extension between the Audio Board and the Logic Board. Both sides of the Audio Board are available for servicing using the cable.

Service Cable 19B801348P4 provides a 2 foot extension between the 9 pin "D" connectors (J701 and P701) on the Logic Board and Control Board. The Front Cap Assembly may be serviced using this cable.

To allow easier servicing of the Front Cap Assembly, service cable 19A705235P2 provides a longer ribbon cable (2 feet) between the System Board and the Control Board connectors J902 and J901. This longer cable is not required for most servicing. The radio's ribbon cable is usually adequate in length if the cable is not looped through the front of the radio's assembly.

PREVENTIVE MAINTENANCE

To ensure high operating efficiency and to prevent mechanical and electrical failures from interrupting system operations, routine checks should be made of all mechanical and electrical parts at regular intervals. This preventive maintenance should include the checks as listed in Table 1 Maintenance Checks.

REMOVING IC's

Removing IC's (and most other soldered-in components) can be easily accomplished by using a vacuum desoldering tool. To remove an IC, heat each lead separately on the solder side and remove the old solder with the desoldering tool.

CHIP COMPONENTS

Replacement of chip components should always be done with a temperature-controlled soldering iron at 700°F (371°C). However, do not touch the black metal film of the resistors or the ceramic body of capacitors with the soldering iron.

CAUTION

The CMOS Integrated Circuit devices used in this equipment can be destroyed by static discharges. Before handling one of these devices, the serviceman should discharge himself by touching the case of a bench instrument that has a 3-prong power cord connected to an outlet with a known good earth ground. When soldering or desoldering a CMOS device, the soldering iron should also have a 3-prong power cord connected to an outlet with a known good earth ground. A battery-operated soldering iron may be used in place of the regular soldering iron

Table 1 - Maintenance Checks

MAINTENANCE CHECKS	INTERVAL	
	6 Months	As Required
CONNECTIONS - Ground connections and connections to the voltage source should be periodically checked for tightness. Loose or poor connections to the power source will cause excessive voltage drops and faulty operation. When ground connections are not made directly to the battery, the connection from the battery to vehicle chassis must be checked for low impedance. A high impedance may cause excessive voltage drops and alternator noise problems.	X	
ELECTRICAL SYSTEM - Check the voltage regulator and alternator or generator periodically to keep the electrical system within safe and economical operating limits. Overvoltage is indicated when the battery loses water rapidly. Usage of 1 or 2 ounces of water per cell per week is acceptable for batteries in continuous operation. A weak battery will often cause excessive noise or faulty operation.		X
MECHANICAL INSPECTION - Since mobile units are subject to constant shock and vibration, check for loose plugs, nuts, screws and parts to make sure that nothing is working loose. Be sure that all screws are properly torqued.	X	
ANTENNA - The antenna, antenna base and all contacts should be kept clean and free from dirt or corrosion. If the antennas or its base should become coated or poorly grounded, loss of radiation and a weak signal will results.	X	
ALIGNMENT - The transmitter and receiver meter readings should be checked periodically, and the alignment "touched up" when necessary. Refer to applicable Alignment Procedure and troubleshooting sheet for typical voltage readings.		X
FREQUENCY CHECK - Check transmitter frequency and deviation, as required by FCC. Normally, these checks are made when the unit is first put into operation, after the first six months and once a year thereafter.		X

Removing Chip Components

1. Using two soldering irons heat both ends of the chip at the same time until solder flows, and then remove and discard the chip.

2. Remove excess solder with a vacuum solder extractor.

3. Carefully remove the epoxy adhesive and excess flux to prevent damage to the printed board.

NOTE

The metalized end terminations of the parts may be touched with the soldering iron without causing damage.

Replacing Chip Components

1. Using as little solder as possible, "tin" one end of the component and one of the pads on the printed wiring board.

2. Place the "tinned" end of the component on the "tinned" pad on the board and simultaneously touch the component and the pad with a well "tinned" soldering iron while pressing the component down on the board.

3. Place the "tinned" soldering iron on the other end of the component and the pad simultaneously. Apply solder to the top of the end of the component until the solder starts to flow. Use as little solder as possible while getting a good joint.

4. After the component has cooled, remove all flux from the component and printed wiring board area with alcohol.

REMOTE MOUNT OPTION

Precaution should be observed for TMX-8810 radios with Remote Mount Option 19A705306G3 when the radios are to be programmed using the PC (personal computer) programming software.

The programming cable TQ3315 (part of programmer equipment) must be connected to the microphone jack J725 on the remote control unit. If the cable is connected to the microphone jack on the main radio unit, the radio cannot be programmed correctly. Refer to appropriate maintenance manuals for programming instructions.

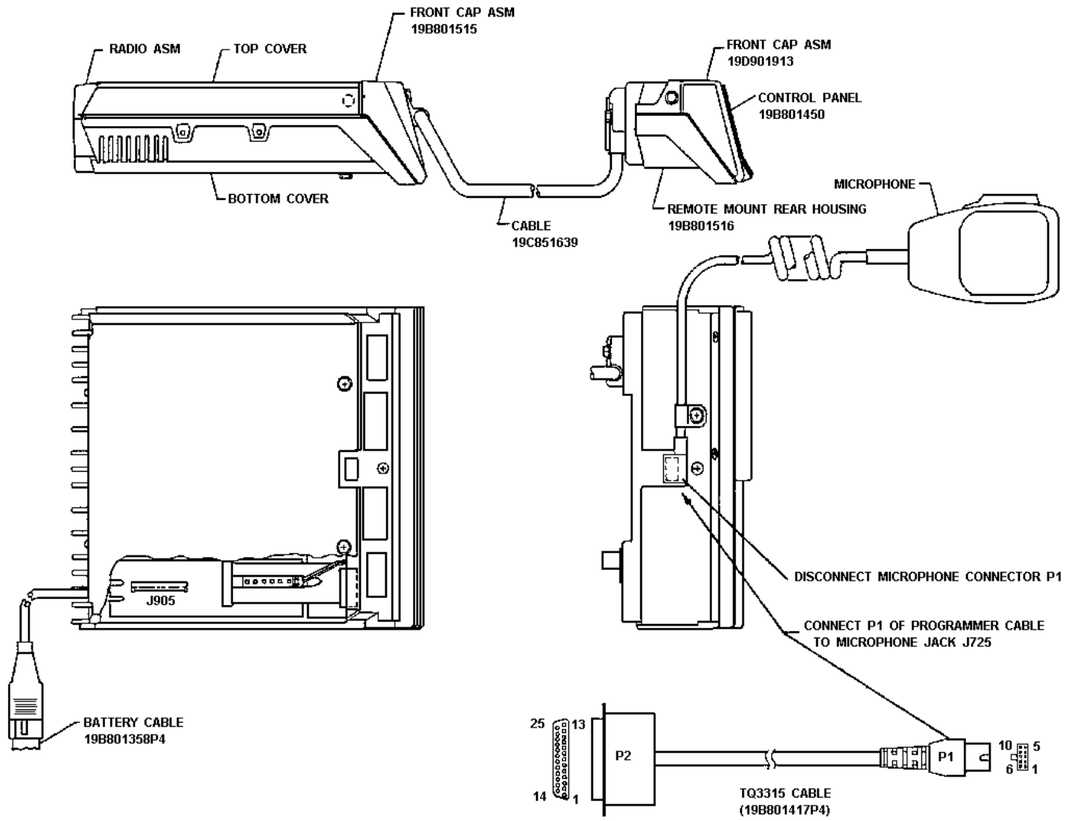
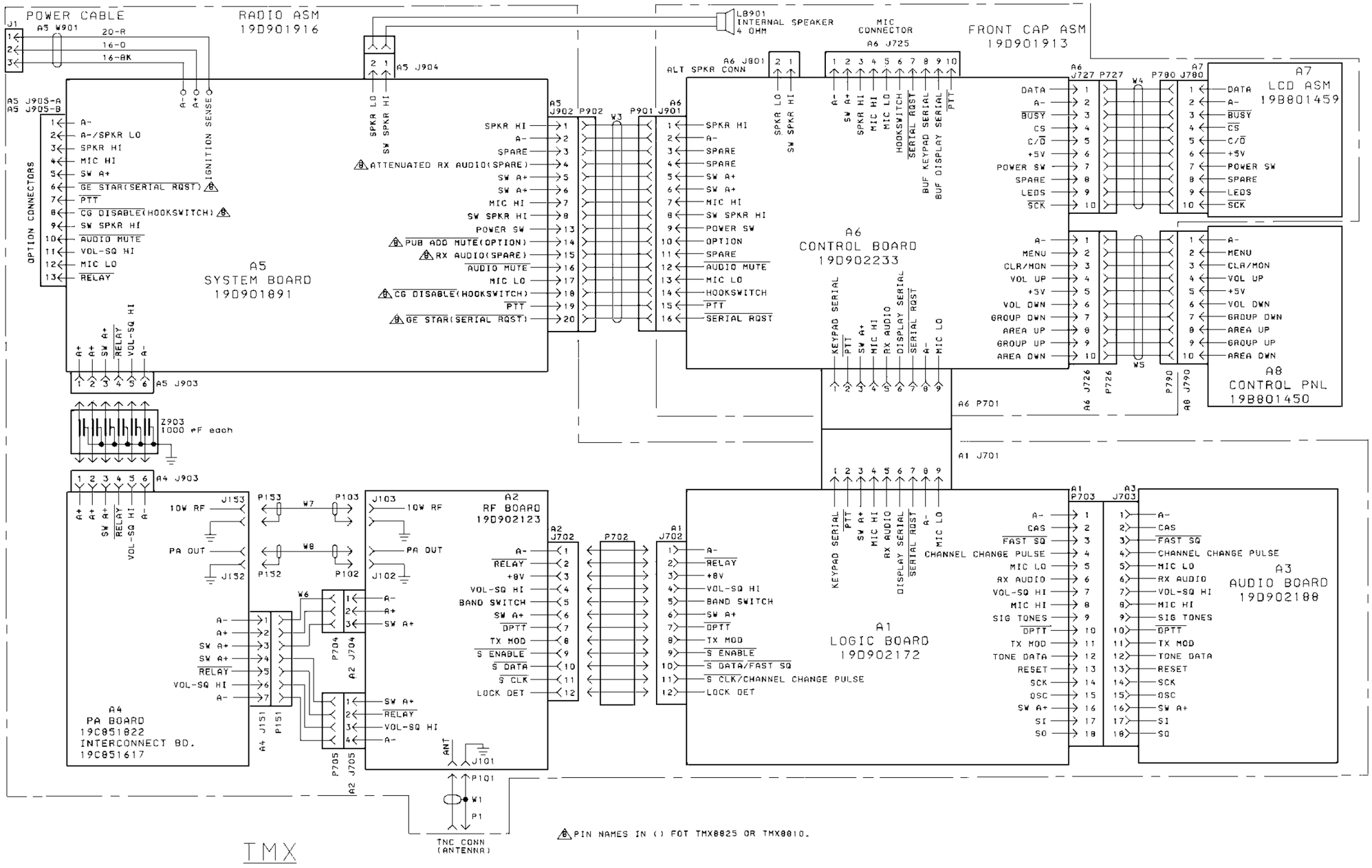


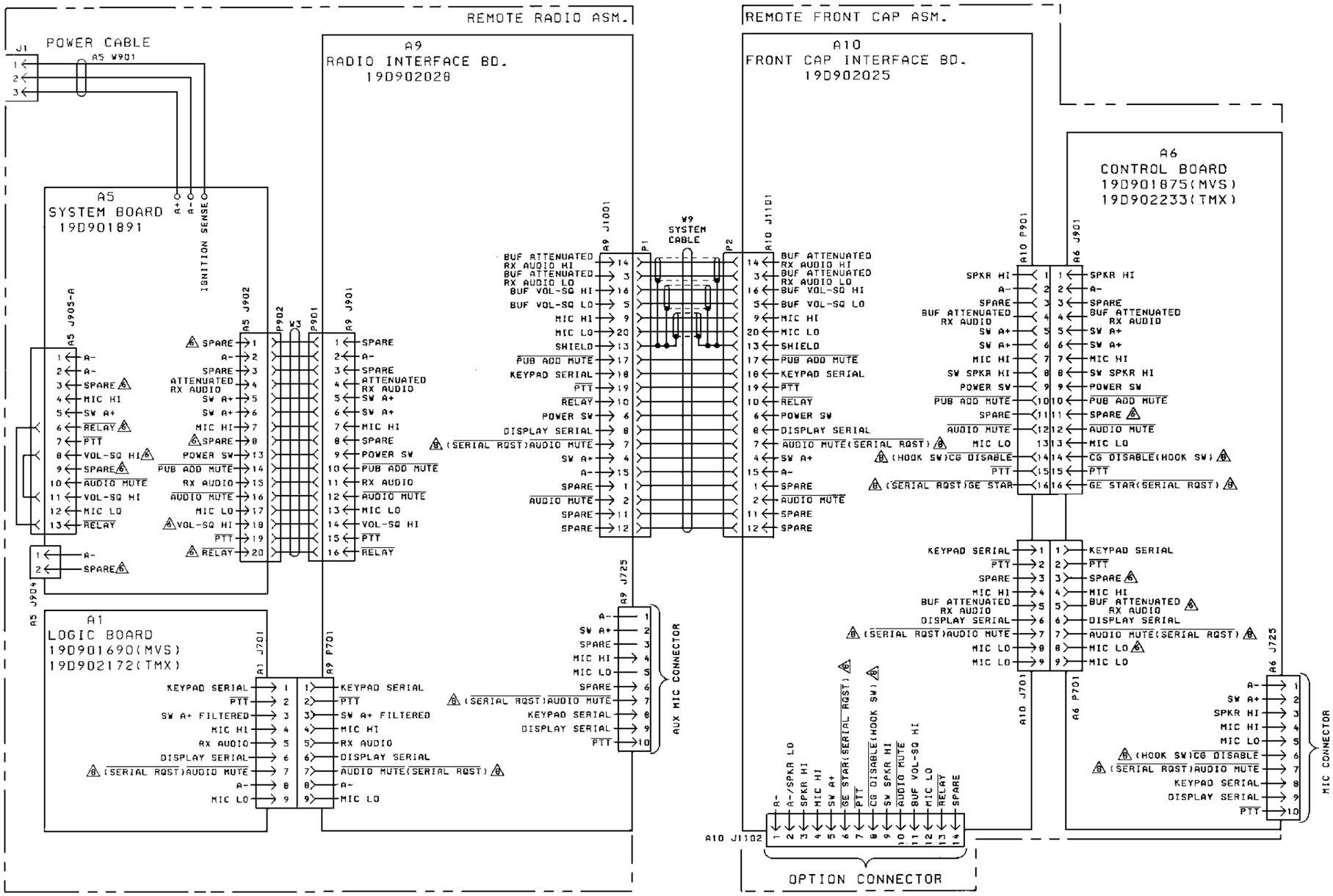
Figure 9 - Programmer Connection, Remote Mount Installation



COMBO

RADIO INTERCONNECT

(19D901983, Sh. 5, Rev. 5)



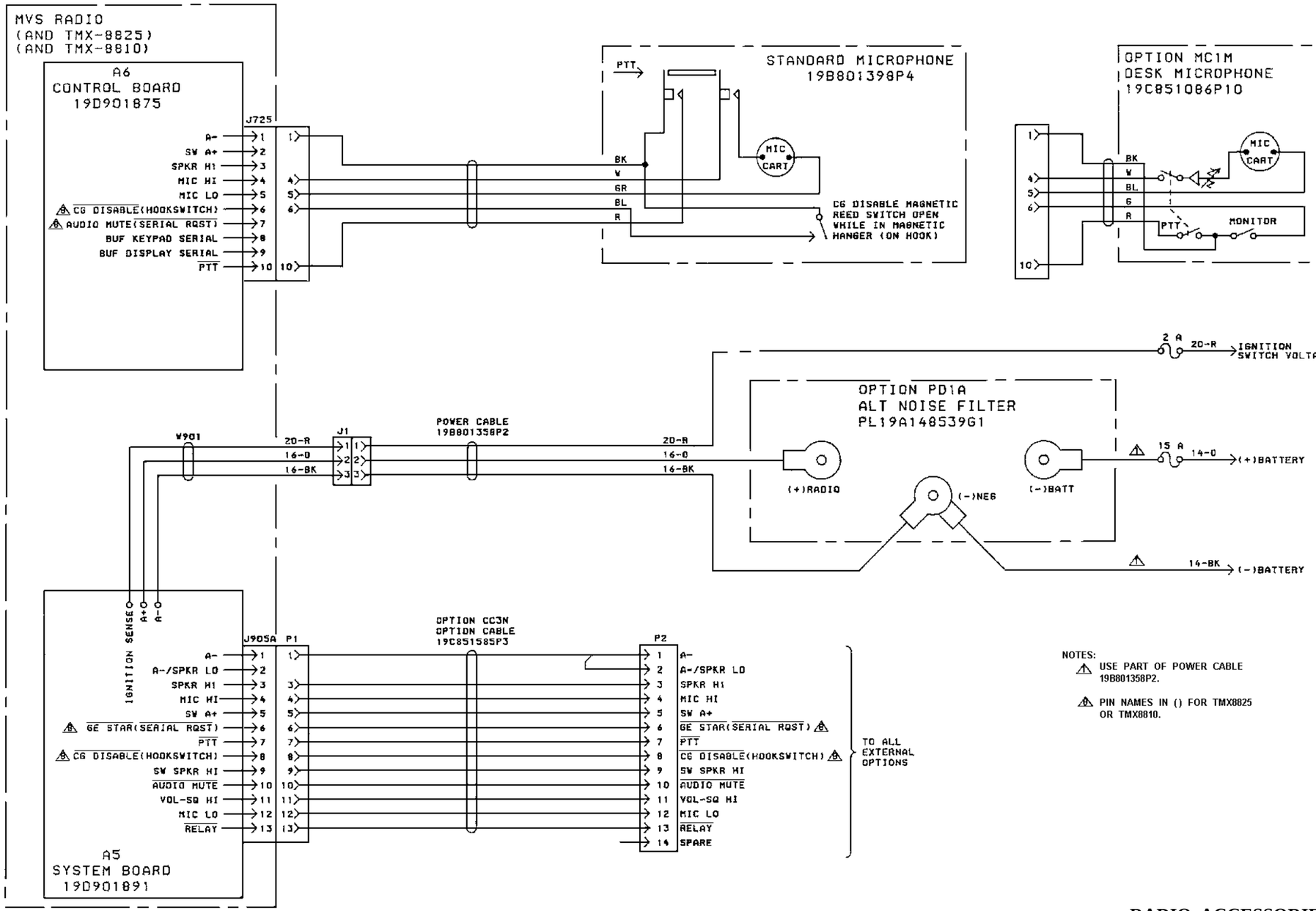
NOTES:

6 NEW PIN NAMES FOR REMOTE MOUNT.

8 PIN NAMES IN ( ) FOR TMX-8825 OR TMX-8810.

RADIO INTERCONNECT

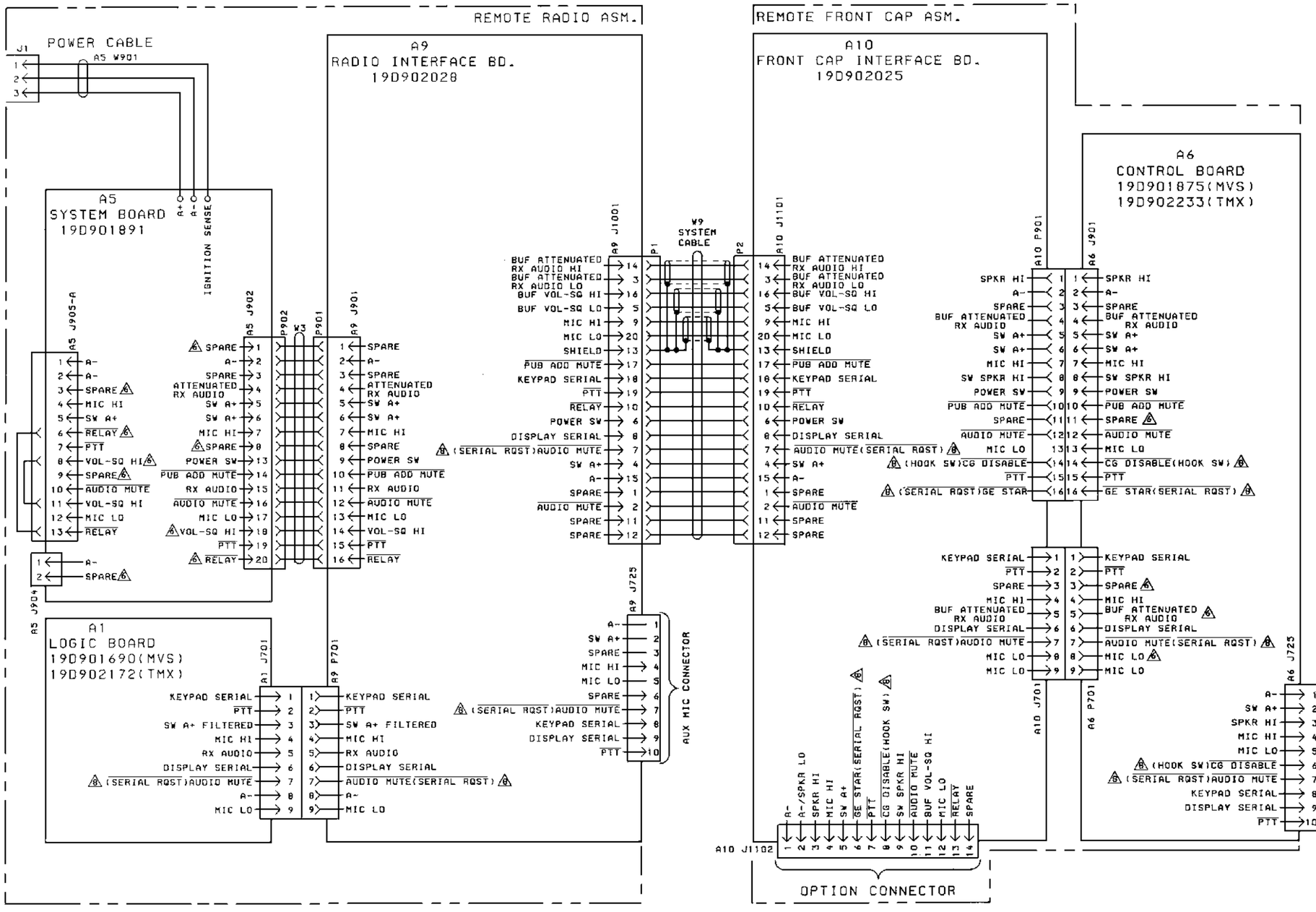
(19D901983, Sh. 4, Rev. 3)



RADIO, ACCESSORIES AND OPTIONS

(19B901983, Sh. 2, Rev. 4)

COMBO



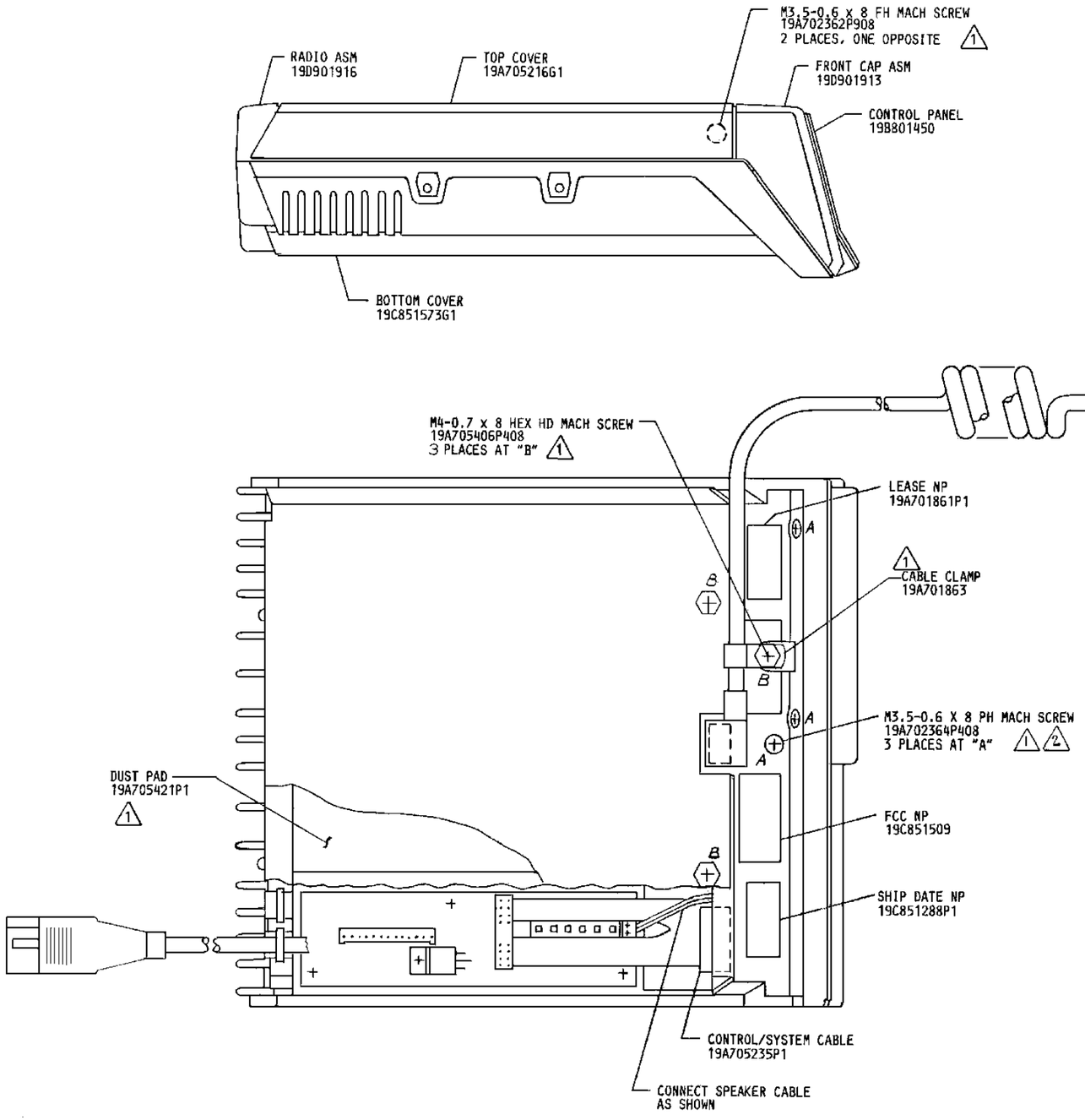
NOTES:

6 NEW PIN NAMES FOR REMOTE MOUNT.

8 PIN NAMES IN ( ) FOR TMX-8825 OR TMX-8810.

RADIO AND OPTIONS

(19D901983, Sh. 3, Rev. 4)



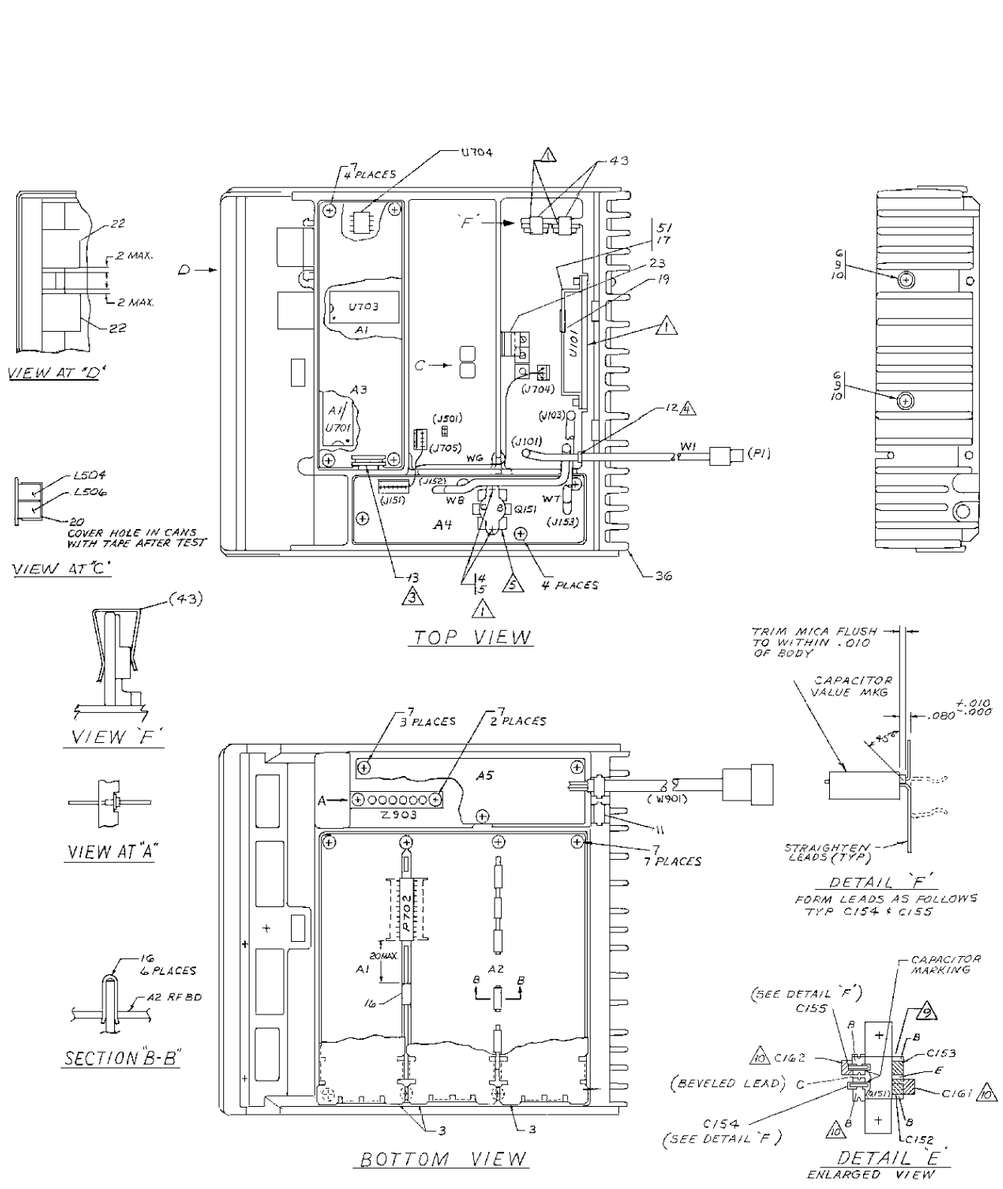
NOTES:

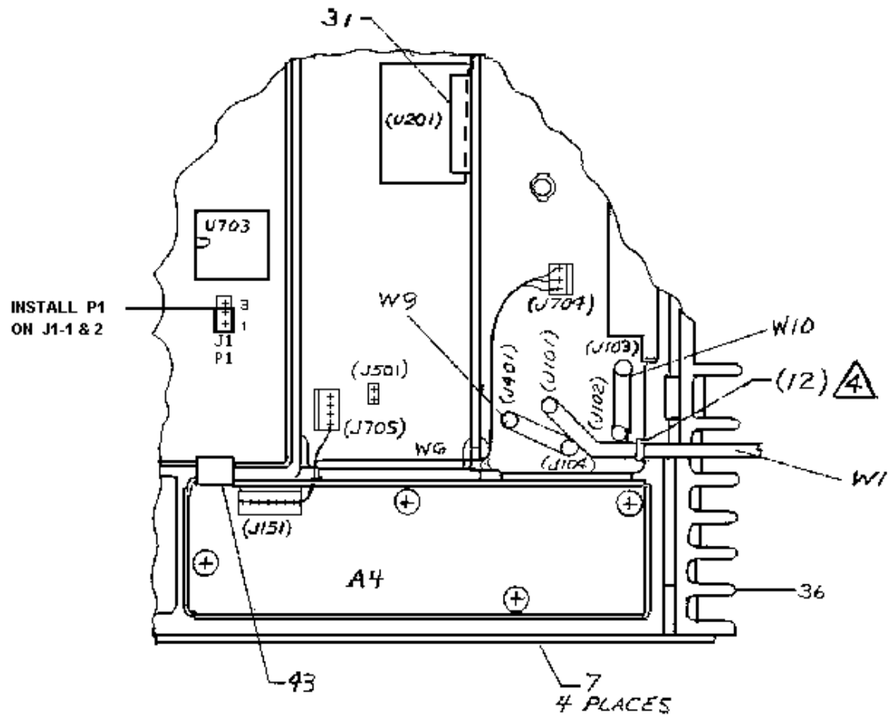
1. PART OF HDW KIT PL19A705109G1.
2. 2 OF THESE SCREWS ARE ALSO SUPPLIED AS PART OF HDW KIT PL19A138051G11 FOR FIELD ASM OF CONTROL PANEL.

COMBO

TMX-8810

(19C851620, Rev. 5)





75 SAME AS PART 1 EXCEPT AS SHOWN

NOTES:

1. APPLY SILICONE GREASE PER 19A701431 TO POWER MODULE AND TRANSISTOR/ REGULATOR ON RF BD (A2) AND Q151 ON PA BD (A4).
2. DIP ENDS OF SCREW (ITEMS 6 & 7) INTO GREASE (ITEM 5) BEFORE INSTALLING INTO CASTING TORQUE SCREW, ITEMS 6 & 7, TO 15 INCH POUNDS.
3. INSTALL CLIP (ITEM 13) SO THAT IS PRESSES U705 REGULATOR ON LOGIC BOARD (A1) AGAINST CASTING WALL.
4. LOCATE CABLE STRAP (ITEM 12) AROUND RF CABLE SO THAT IT PREVENTS CABLE FROM BEING PULLED OUT OF MATING CONNECTOR.
6. THE FOLLOWING DEVICES ARE ELECTROSTATIC SENSITIVE DEVICES REQUIRING SPECIAL CARE PER 19A701294: U703, U704, U701
7. LUBRICATE Z903 PINS WITH NYOGEL.
8. INSTALL U101 FLUSH TO PWB; AFTER SOLDERING, TOP OF U101 SHALL NOT EXTEND MORE THAN 0.25 ABOVE ADJACENT CASTING.
11. SOLDER Q151 LEADS WITH A MINIMUM AMOUNT OF SOLDER TO BD. (A1) BEFORE INSTALLING CAPACITORS. SOLDER C152-C155 AGAINST BODY OF Q151 ON TOP OF TRANSISTOR LEADS AS SHOWN. PUSH Q151 TOWARD THE COLLECTOR AND CENTER LEADS ON PWB RUNS PRIOR TO TIGHTENING ALL MOUNTING SCREWS.

TMX-8810

(19D901916, Sh. 1, Rev. 16)
(19D901916, Sh. 3, Rev. 4)

19D901916G24
TMX-8810

SYMBOL	PART NO.	DESCRIPTION
7	19D901891G7	System Board
		- - - - - - - - CABLES - - - - - - - - -
W1	19A705301P3	RF Cable Assembly.
W6	19B801467P1	Cable Assembly, electrical.
W9 and W10	19A704884P2	RF Cable.
		- - - - - - MISCELLANEOUS- - - - - - -
3	19C851442P2	Cover.
5	19A700033P3	Lockwasher, external tooth: M2.5.
6	19A702381P520	Screw, thd. form: TORX Drive, No. M3-0.6 x 20.
7	19A702381P508	Screw, thd. form: No. 3.5-0.6 x 8.
9	19A700033P6	Lockwasher, external tooth, M3.5.
10	19A701312P5	Flatwasher: M3.5.
11	19C851585P2	Cable.
12	19J706152P5	Retainer strap: sim to Panduit Corp. SST-1.
16	19A705220P1	Clip, Spring Tension.
17	19B801382G2	Power Support.
22	19A705421P2	Foam Pad.
31	19A704944P	Clip, Spring Tension.
36	19D901881G3	Casting.
43	344A3235P1	Clip, Heat Sink.

COMPONENTS, ADDED, DELETED, OR CHANGED BY PRODUCTION CHANGES

SYMBOL	PART NO.	DESCRIPTION
		19A705109G1 HARDWARE KIT
		- - - - - MISCELLANEOUS - - - - - -
1	19A705406P408	Machine bolt, hexagon: M4-0.7.
2	19A702362P908	Machine screw.
3	19A702364P408	Machine screw: TORX Drive, M3.5 - 0.6 x 8.
4	19A701863P18	Clip loop.
5	19A705421P1	Foam Pad.
9	19D902233G8	Control Board.
A7	19B801459P2	LCD Assembly.
		- - - - - - - - - - MODULE - - - - - - - - - -
B901	19A705165P1	Loudspeaker, permanent magnet.
		- - - - - - - - - CABLES - - - - - - - -
W4 and W5	19A705234P1	Cable assembly.
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
3	19D901889G1	Can, Shield.
5	19A705381P13008	Screw, thread forming.
7	19A702364P316	Machine Screw: Pan Head, Steel.
8	19A705244P2	Clip, spring tension.
11	19D901890P2	Front Cap.
13	19A702381P506	Screw, thread forming: TORX, No. M3.5-.6 x 6.
14	19A121175P5	Insulator.

COMBO