

48 PIN MOTHERBOARD INTERFACE CONNECTOR

A 48 pin connector is used for interfacing the MT-3 Motherboard to the receiver and transmitter.

Receiver

Pin	Name	Pin	Name	Pin	Name
D2	Relay Normally Open 1 [O/P]	B2	+13.8 VDC [I/P]	Z2	+13.8 VDC [I/P]
D4	Relay Common 1 [O/P]	B4	Receive Secure / Clear* [O/P]	Z4	No Connect
D6	Relay Normally Closed 1 [O/P]	B6	+9.5 VDC [I/P]	Z6	+9.5 VDC [I/P]
D8	Relay Normally Closed 2 [O/P]	B8	No Connect	Z8	No Connect
D10	Relay Common 2 [O/P]	B10	Discriminator LPF [O/P]	Z10	No Connect
D12	Relay Normally Open 2 [O/P]	B12	COR* [O/P]	Z12	COR* [O/P]
D14	Clear Keys 1* [I/P]	B14	Discriminator [O/P]	Z14	Squelch Override [I/P]
D16	Clear Keys 2* [I/P]	B16	No Connect	Z16	No Connect
D18	No Connect	B18	No Connect	Z18	Bank A/B* [I/P]
D20	Channel Select 0 (LSB) [I/P]	B20	SM-3 Speaker Audio [O/P]	Z20	No Connect
D22	Channel Select 1 [I/P]	B22	No Connect	Z22	No Connect
D24	Channel Select 2 [I/P]	B24	Signal Strength (RSSI) [O/P]	Z24	A/D Receive Mode [O/P]
D26	Channel Select 3 (MSB) [I/P]	B26	Balanced Audio 1 [O/P]	Z26	Balanced Audio 2 [O/P]
D28	No Connect	B28	Mute* [I/P]	Z28	No Connect
D30	No Connect	B30	Ground	Z30	Ground
D32	No Connect	B32	Ground	Z32	Ground

Transmitter

Pin	Name	Pin	Name	Pin	Name
D2	No Connect	B2	+13.8 VDC [I/P]	Z2	+13.8 VDC [I/P]
D4	No Connect	B4	Microphone Audio Output [O/P]	Z4	Microphone Audio Input [I/P]
D6	No Connect	B6	+9.5 VDC [I/P]	Z6	+9.5 VDC [I/P]
D8	No Connect	B8	Isolated Positive PTT [I/P]	Z8	Isolated Negative PTT [I/P]
D10	No Connect	B10	PTT* [I/P]	Z10	PTT* [I/P]
D12	No Connect	B12	Bank A/B* [I/P]	Z12	Bank A/B* [I/P]
D14	Clear Keys 1* [I/P]	B14	PTT* [I/P]	Z14	PTT* [I/P]
D16	Clear Keys 2* [I/P]	B16	No Connect	Z16	No Connect
D18	No Connect	B18	Balanced Audio 2 [I/P]	Z18	Balanced Audio 1 [I/P]
D20	Channel Select 0 (LSB) [I/P]	B20	SM-3 Speaker Audio [I/P]	Z20	No Connect
D22	Channel Select 1 [I/P]	B22	Subtone [I/P]	Z22	No Connect
D24	Channel Select 2 [I/P]	B24	PTT Output* [O/P]	Z24	Transmit Secure / Clear* [I/P]
D26	Channel Select 3 (MSB) [I/P]	B26	Forward Power Alarm* [O/P]	Z26	High VSWR Alarm* [O/P]
D28	No Connect	B28	No Connect	Z28	A/D Mode Control [I/P]
D30	No Connect	B30	Ground	Z30	Ground
D32	No Connect	B32	Ground	Z32	Ground

* Indicates an active low signal.

RECEIVER TROUBLESHOOTING

The receiver is composed of 4 main components; the Receiver Main Board, the Synthesizer Module, the RF Preselector, and the Universal Daughter Board (UDB). An optional Decryption Board can be installed in the Receiver.

These steps will help you determine the most likely sub-assembly that contains a fault, and may help you determine what that fault is. The sub-assembly or the entire receiver can be sent back to Daniels Service section for repair. Contact Daniels Service section before returning any product.

Before testing, the receiver should be in the subrack, or connected to the subrack by means of an Extender card or kit, and the main power to the system (+13.8 VDC) and the +9.5 VDC regulated supply should be checked via the front panel of the System Regulator.

Complete Receiver

Flip the receiver front panel ON/OFF switch from the OFF position to the NORM position and check that the two front panel LEDs both turn ON for less than 5 seconds and then turn OFF. If this is not the case, the most likely fault is on the UDB, on the Synthesizer, or on the Receiver Main Board. At this stage make sure that the UDB and the synthesizer module are properly seated on the Receiver Main Board.

Connect the Receiver to the PC with the USB cable and run the Radio Service Software (RSS). Select (P25 or Analog) Receiver, click on Configure, then click on Read to read the Receiver configuration. If the RSS returns "Device Not Responding", physically inspect the USB cable and connection, check the Daniels USB driver, and check that the USB is recognized by the Device Manager. If the RSS still does not recognize the connection, the most likely fault is on the UDB.

Click on Rx ID, then click on Read to read the Receiver ID. Confirm that the Frequency Band in the Synthesizer ID Model Number matches the Frequency Band in the Receiver Global Settings. If the settings do not match, the synthesizer will require replacement, or the programming will need to be changed to match the synthesizer hardware.

If the receiver still is not functioning properly the module level check should be conducted in the following order:

Receiver Main Board

Check the following test points on the receiver Main Board:

Test Point	Signal Monitored	Typical Voltage
TP1	Voltage from motherboard +13.8 VDC line	+10 to +17 VDC
TP2	Regulated +9.5 VDC from motherboard	+9.5 VDC \pm 5 %
TP9	Switched +13.8 VDC line from front panel switch	+10 to +17 VDC
TP37	+6.0 VDC supply	+6.0 VDC \pm 5 %
TP38	-6.0 VDC supply	-6.0 VDC \pm 5 %
TP54	+3.3 VDC supply	+3.3 VDC \pm 5 %
TP55	+1.2 VDC supply	+1.2 VDC \pm 5 %
TP56	+1.8 VDC supply	+1.8 VDC \pm 5 %
TP57	+2.5 VDC supply	+2.5 VDC \pm 5 %
TP58	+5.0 VDC supply	+5.0 VDC \pm 5 %

Test Points are shown on the MT-4E Receiver Jumper and Test Point Locator Illustrations.

If the test point voltages are within the specified range the following tests further verify that the Receiver Main Board may not be the source of problem.

Apply an IF signal of frequency 21.4 MHz at a level of -30 dBm to the Receiver Main Board IF Input SMB connector as shown on the MT-4E Receiver Top Component View (2). If the signal is properly demodulated it proves that the Receiver Main Board and UDB are in working condition. Proceed to the following step:

Synthesizer and UDB Modules

The Synthesizer module and UDB are bound together through their communication link. At this level of fault diagnosis it is not feasible to isolate the problem between two units.

If the receiver front panel ON/OFF switch is set from the OFF position to the NORM position and the two front panel LEDs stay on, check that the Synthesizer and the UDB are properly seated on the Receiver Main Board and check the following test points on the UDB (to access the UDB, the shield lid covering the UDB will need to be removed as shown on the MT-4E Receiver Bottom Component View):

Test Point	Signal Monitored	Typical voltage
TP2	Logic power	+3.3 VDC \pm 5 %
TP3	DSP core supply	+1.2 VDC \pm 5 %
TP4	CPLD core supply	+1.8 VDC \pm 5 %

Test Points are shown on the MT-4E Receiver Jumper and Test Point Locator Illustrations.

If the UDB voltages are not within the specified tolerances, it is most likely that the Receiver Main Board (that supplies these voltages to the UDB) is faulty or there is a short within the UDB.

If the UDB voltages are within the specified tolerances, inject a -70 dBm carrier on the Receiver frequency into the RF Input and check the RSSI Meter reading in the Service section of the RSS. If the RSSI Meter reading is low (< 30), perform the following test to verify that the synthesizer is locked on frequency:

Disconnect the LO output SMB connector from the Synthesizer to the RF Preselector, as shown on the MT-4E Receiver Top Component View (1), and connect the Synthesizer LO output to a radio communication test set. Confirm that the synthesizer LO frequency matches the Target Synthesizer RF OUT found in the Reference Oscillator area of the Service section on the RSS. The LO output should be approximately +7 dBm.

Check that the LO output (21.4 MHz above or below the receiver frequency) of the synthesizer module is within the receiver frequency tolerances of ± 1.0 ppm (VHF) / ± 0.5 ppm (UHF), and that the RF frequency will change with programmed channel changes in the RSS. If this is not the case, it is most likely that the synthesizer or the UDB or both are faulty. The fault may be associated with the synthesizer code, the DSP Code or both.

Receiver RF Preselector

Check the +9.5 VDC Power Supply wire to the RF Preselector as shown on the MT-4E Receiver Top Component View (2). The supply voltage should be +9.5 VDC \pm 5 %. Inject a -30 dBm carrier on the Receiver frequency into the RF Input and check the IF Output of the RF Preselector as shown on the MT-4E Receiver Top Component View (2) is 21.4 MHz and it can be demodulated through the communication test set. If this is not the case the synthesizer, the RF Preselector or both are faulty.

To further isolate the fault, the LO output as shown on the MT-4E Receiver Top Component View (1) can be disconnected from the Synthesizer, and an LO input can be applied from an external source to the RF Preselector. The frequency of the external LO input should be the Target Synthesizer RF OUT found in the Reference Oscillator area of the Service section on the RSS. Check the 21.4 MHz output of the module using a communication test set.

TRANSMITTER TROUBLESHOOTING

The Transmitter is composed of 4 main components, the Transmitter Main Board, the Synthesizer Module, RF Power Amplifier and Universal Daughter Board (UDB). An optional Encryption Board can also be installed in the Transmitter.

These steps will help you determine the most likely sub-assembly that contains a fault, and may help you determine what that fault is. The sub-assembly or the entire transmitter can be sent back to Daniels Service section for repair. Contact Daniels Service section before returning any product.

Before testing, the transmitter should be in the subrack, or connected to the subrack by means of an Extender card or kit, and the main power to the system (+13.8 VDC) and the +9.5 VDC regulated supply should be checked via the front panel of the System Regulator. The transmitter RF output should be terminated with a 50 Ω load, or communications test set.

Complete Transmitter

Flip the transmitter front panel NORMAL/OFF/ KEY TX switch from the OFF position to the NORMAL position and check that the two front panel LEDs both turn ON for less than 2 seconds and then turn OFF. If this is not the case, or the transmitter is not functioning properly, the following steps can be taken:

Connect the Transmitter to the PC with the USB cable and run the Radio Service Software (RSS). Select (P25 or Analog) Transmitter click on Configure, then click on Read to read the Transmitter configuration. If the RSS returns "Device Not Responding", physically inspect the USB cable and connection, check the Daniels USB driver, and check the connection through the Device Manager. If the RSS still does not recognize the connection, the most likely fault is on the UDB.

Click on Tx ID, then click on Read to read the Transmitter ID. Confirm that the Frequency Band in the Synthesizer ID Model Number matches the Frequency Band in the Transmitter Global Settings. If the settings do not match, the synthesizer will require replacement, or the programming will need to be changed to match the synthesizer hardware.

If the transmitter still is not functioning properly the module level check should be conducted in the following order:

Transmitter Main Board

Check the following test points on the Transmitter Main Board:

Test Point	Signal Monitored	Typical voltage
TP1	Voltage from motherboard +13.8 VDC line	+10 to +17 VDC
TP2	Regulated +9.5 VDC from motherboard	+9.5 VDC \pm 5 %
TP3	USB connector power	+3.0 VDC or +5.0 VDC
TP4	Switched +13.8 VDC line from front panel switch	+10 to +17 VDC

Test Points are shown on the MT-4E Transmitter Jumper and Test Point Locator Illustrations.

If the test point voltages are within the specified range, it is most likely that the Transmitter Main Board is not the source of problem. Proceed to the following step:

Synthesizer and UDB Modules

The Synthesizer module and UDB are bound together through their communication link. At this level of fault diagnosis it is not feasible to isolate the problem between two units.

If the transmitter front panel NORMAL/OFF/ KEY TX switch is set from the OFF position to the NORMAL position and the two front panel LEDs stay on, check that the Synthesizer and the UDB are properly seated on the Transmitter Main Board and check the following test points on the UDB (to access the UDB, the Amplifier sub-assembly and the shield lid covering the UDB will need to be removed as shown on the MT-4E Transmitter Amplifier Removed View):

Test Point	Signal Monitored	Typical Voltage
TP2	Logic power	+3.3 VDC \pm 5 %
TP3	DSP core supply	+1.2 VDC \pm 5 %
TP4	CPLD core supply	+1.8 VDC \pm 5 %

Test Points are shown on the MT-4E Transmitter Jumper and Test Point Locator Illustrations.

If the UDB voltages are not within the specified tolerances, the Transmitter Main Board (that supplies these voltages to the UDB) is most likely faulty. If the UDB voltages are within the specified tolerances, it is most likely that the synthesizer or the UDB or both are faulty. The fault may be associated with the synthesizer code, the DSP Code or both.

If the transmitter front panel NORMAL/OFF/ KEY TX switch is set from the OFF position to the NORMAL position and the two front panel LEDs both turn ON for less than 2 seconds and then turn OFF and the RF output power control is set at its maximum in the Power Levels area of the Service section on the RSS, but the RF output power is considerably less than 8 W:

check that the synthesizer Reference Oscillator is set to internal reference in the System Setup; Jumper Settings area of the Service section on the RSS.

check that the output of the synthesizer module on the RF cable as shown on the MT-4E Transmitter Bottom Component View is 0 dBm (± 2 dBm) and that the RF frequency will change with programmed channel changes in the RSS. If this is not the case, it is most likely that the synthesizer or the UDB or both are faulty. The fault may be associated with the synthesizer code, the DSP Code or both.

Transmitter Amplifier

Set the front panel switch on the transmitter to KEY TX and check that the Transmitter Output Power is set appropriately (0.5 to 8.0 W). The output power can be adjusted in the Power Levels area of the Service section on the RSS.

Check the following pins on connector J1 (while the transmitter is keyed):

Pin	Signal Monitored	Typical voltage
1	RF Enable / Power Control (+0.5 to +3.0 VDC corresponds to 0.5 to 8.0 W RF Power Output)	+0.5 to +3.0 VDC
2	Regulated +9.5 VDC from motherboard	+9.5 VDC ± 5 %
3	Voltage from motherboard +13.8 VDC line	+10 to +17 VDC

Pins are shown on the MT-4E Transmitter Bottom Component View.

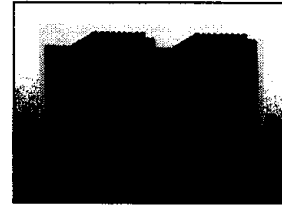
If Pin 1 is not within tolerance, the most likely fault is in the UDB or Synthesizer module. If Pins 1, 2 and 3 are within the specified tolerances, and there is no RF output power, the most likely fault is in the Amplifier.

To test the RF power amplifier sub-assembly, set the output power to maximum, using the Power Level Adjustments in the Service mode of the RSS software and drive the input of the amplifier with a 0 dBm RF signal. Check that the RF power output is 8.0 W when the front panel switch is set to KEY TX.

SYSTEM TROUBLESHOOTING

If the radio system is not receiving or transmitting on the right frequency, check the Channel and Bank select lines of the Receiver and Transmitter modules. The Motherboard has jumpers that allow one of 16 channels to be selected on a receiver or transmitter. The factory default is to have them all set to ground the channel select lines CSEL0-3, forcing the radio to operate on channel 1. On the receiver and transmitter there is also a Bank A/B line which usually floats high selecting Bank A. The receiver and transmitter have separate control of their channel select lines, so changing receiver channels does not affect the transmitter channel.

If the Radio Service Software is failing partway through a read or write of the receiver, check that the receiver is not squelching and unsquelching repeatedly during the read or write operation. Disconnect the RF signal source from the receiver during the read or write operation.



RADIO SYSTEM CONFIGURATIONS

REPEATER

The MT-4E series Receivers and Transmitters may be configured in a repeater configuration. The standard way of setting up a repeater system is to connect the receiver to the transmitter through a Radio Interconnect Cable plugged into the RJ45 CNTL BUS connectors on the front panels of each radio module. This cable routes Analog and Digital COR / PTT signals and LVDS Serial Data from the receiver to the transmitter in both Analog and P25 Digital mode. The Radio Interconnect Cable may be connected directly from the receiver to the transmitter, or may be routed through a Repeater Control Card.

A typical configuration is to set up the repeater to re-transmit an incoming signal in the same mode as it is received (i.e. normally, you would want a received analog signal to be repeated as analog and a received digital signal to be repeated as digital). This requires the Receiver and Transmitter modules to be programmed in Mixed Mode of operation through the RSS software. The repeater may also be programmed to operate in analog or P25 digital mode only.

Mixed Mode Repeat operation occurs as follows:

1. The receiver determines whether an incoming signal is analog or digital and asserts either the ANALOG COR or DIGITAL COR signal line on the front panel RJ45 CNTL BUS connector. LVDS Serial Data is sent to the RJ45 CNTL BUS connector as well.
2. The COR signal and LVDS Serial Data is transferred over the Radio Interconnect Cable directly to the Transmitter or is routed through a Repeater Control Card.
3. The transmitter senses the incoming ANALOG PTT or DIGITAL PTT signal from the front panel RJ45 CNTL BUS connector and keys up in analog mode or P25 digital mode. LVDS Serial Data is routed through the transmitter for transmission.

An alternate way of setting up a repeater system is to connect the receiver to the transmitter through an Audio Control Card or Base Controller. These control cards route analog audio and a single COR / PTT signal from the receiver to the transmitter. This configuration is recommended for analog repeater systems only.

The receiver and transmitter have no connection between them apart from the audio (Audio Control Card or Base Controller only), COR / PTT signals and LVDS Serial Data lines. The transmitter does not get any information from the receiver about which frequency or channel number to key up on. The receiver and transmitter channel is determined by the state of the channel select lines and bank select line.

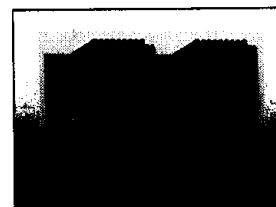
ANALOG FIXED (BASE) STATION INTERFACE

The MT-4E series Receivers and Transmitters may be configured in a fixed (or base) station configuration with an analog interface. An Audio Control Card or Base Controller is added to the system for E & M control. For Tone Remote control of the system, a Tone Remote Adapter is added to the system along with the Controller. The Audio Control Card or Base Controller will also allow for repeat capability of the system using analog audio as the repeat path.

The Base Controller is used for system control of encryption and decryption of the P25 digital voice messages (the optional decryption / encryption boards are required in the receiver / transmitter modules).

DIGITAL FIXED (BASE) STATION INTERFACE

The MT-4E series Receivers and Transmitters may be configured in a fixed (or base) station configuration with a digital interface. A Universal Interface Card is added to the system for Ethernet control.



ILLUSTRATIONS

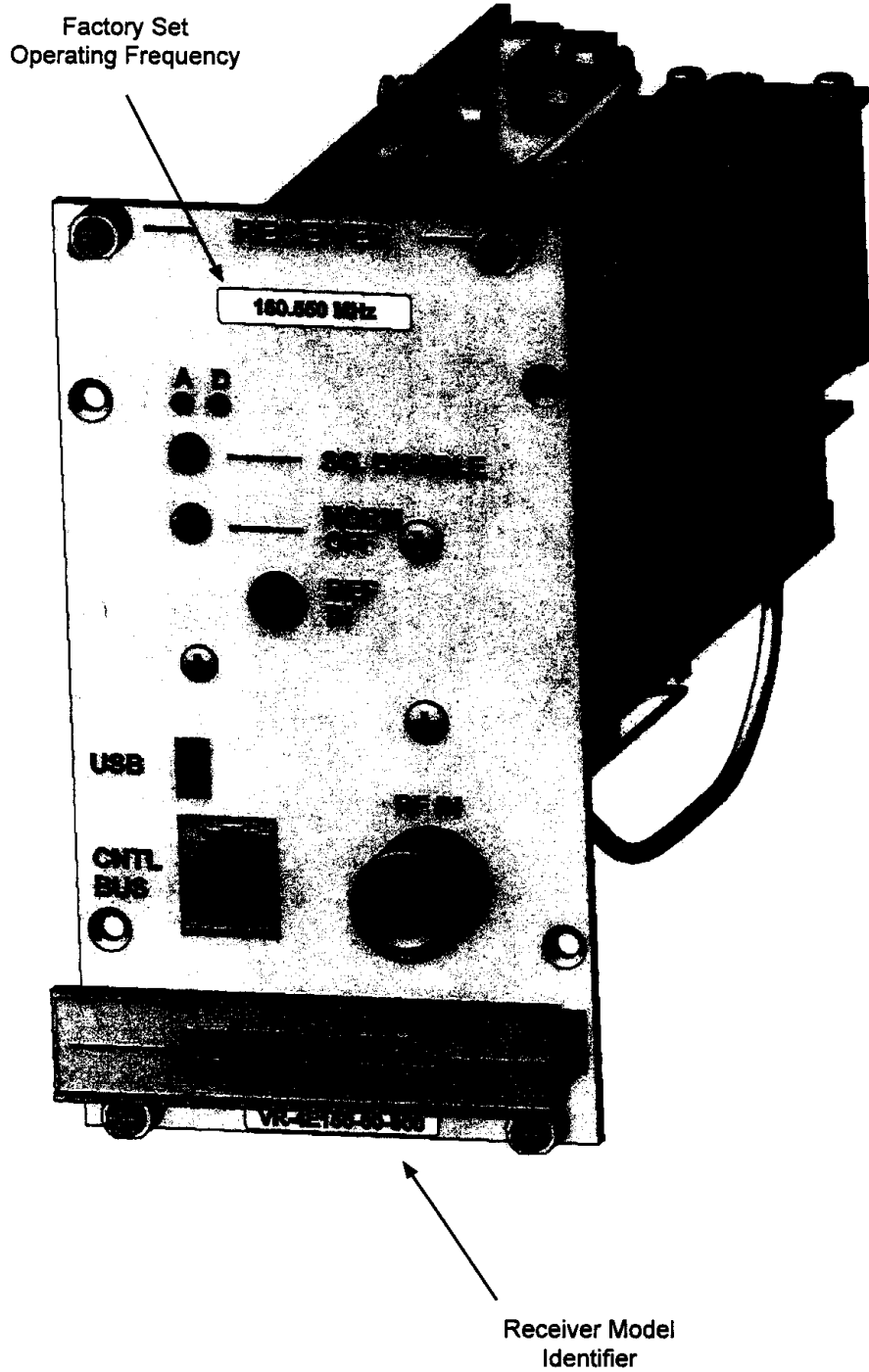
PRINTED CIRCUIT BOARD NUMBERING CONVENTION

Daniels Electronics Ltd. has adopted a printed circuit board (PCB) numbering convention in which the last two digits of the circuit board number represent the circuit board version. All PCB's manufactured by Daniels Electronics Ltd. are identified by one of the following numbering conventions:

PCB number	43-9120 <u>10</u> Indicates circuit board version 1.0
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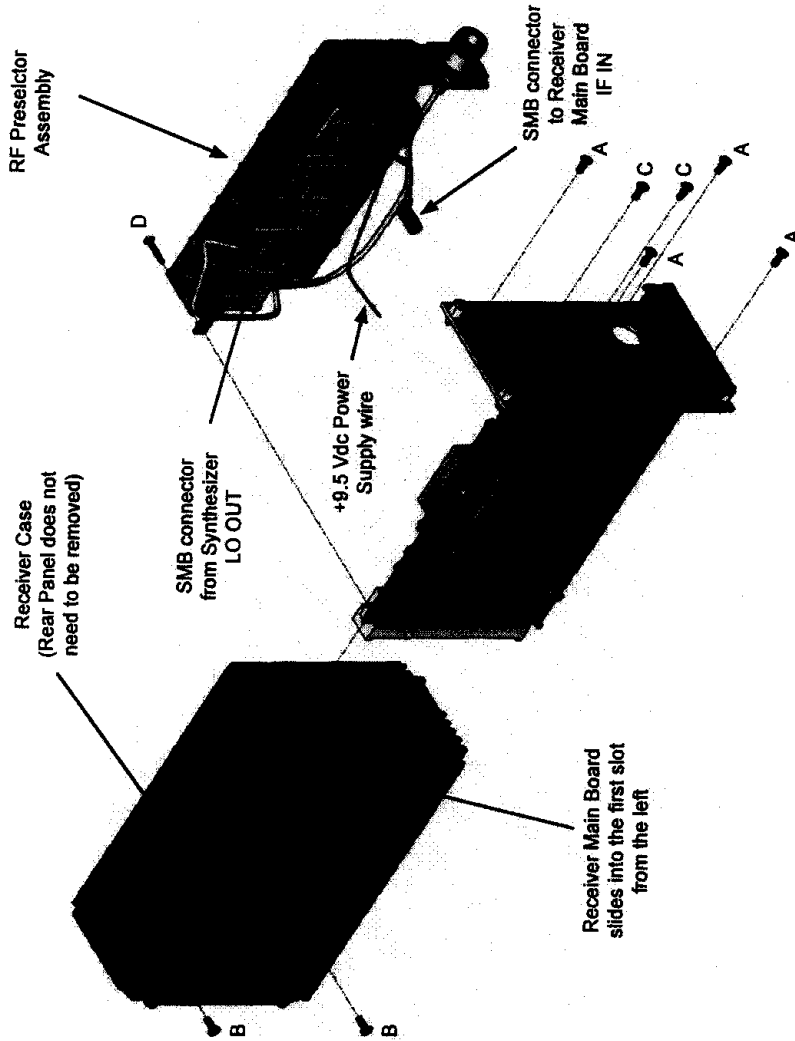
PCB number	50002- <u>02</u> Indicates circuit board version 2 (no decimal version)
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MT-4E RECEIVER FRONT VIEW

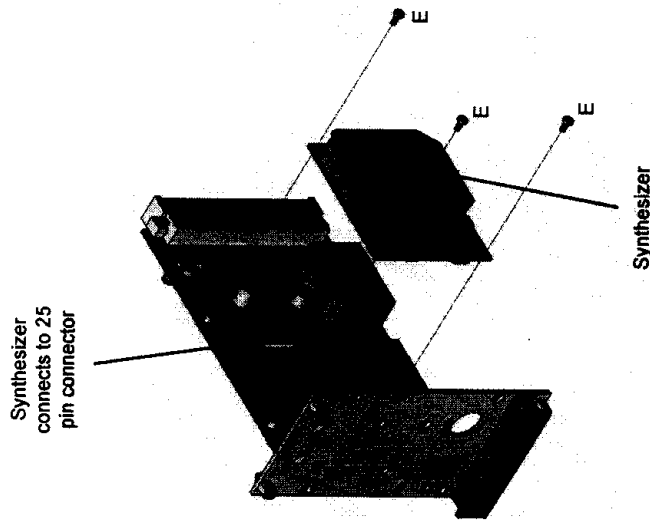


MT-4E RECEIVER EXPLODED VIEW DIAGRAM

To Remove the Receiver Case:
 1. Remove the four Front Panel screws (A - 5812-3M0VP08S).
 2. Remove the two Side Case screws (B - 5812-3M0VP08S).

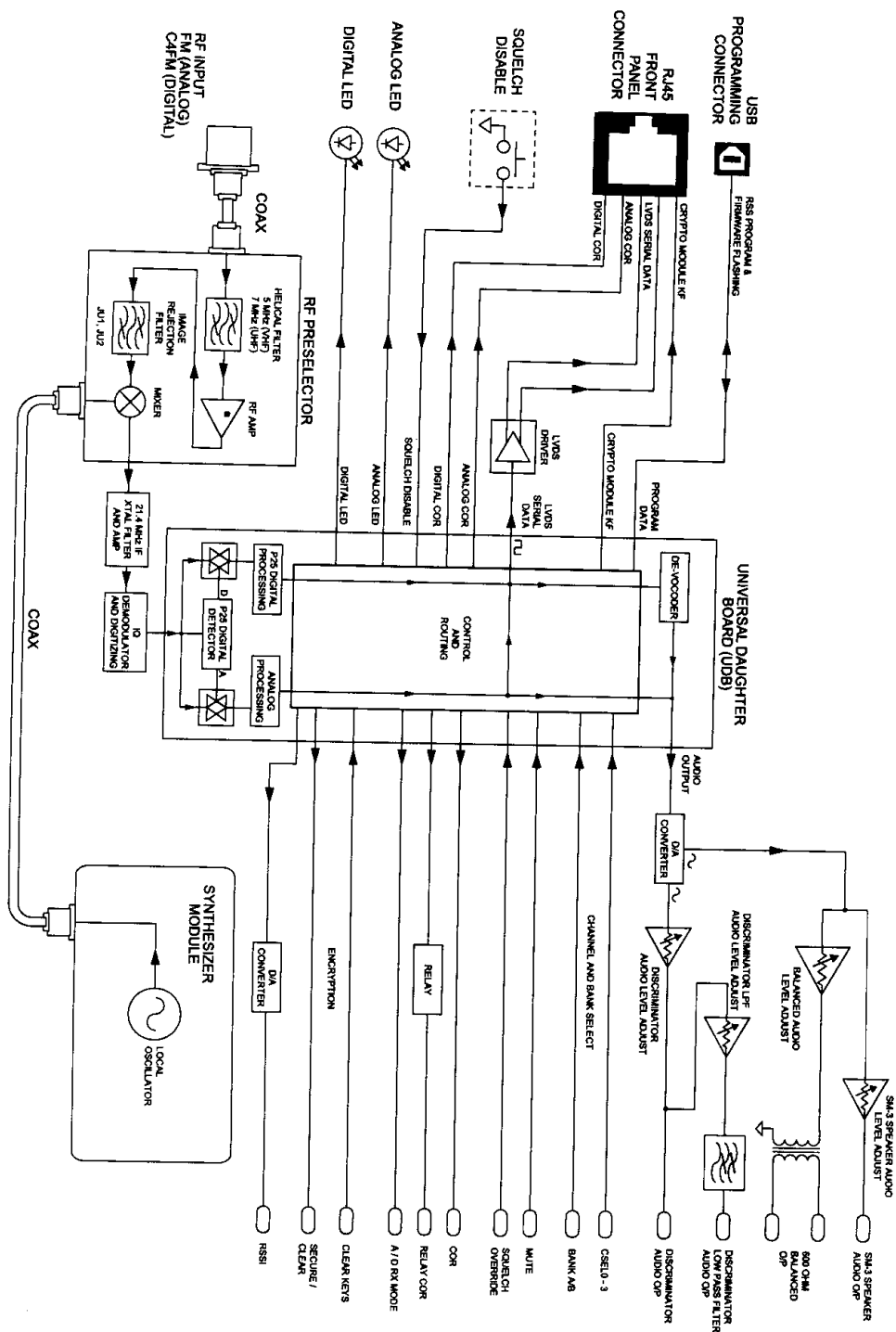


To Remove the RF Preselector Assembly:
 1. Remove the two Front Panel screws (C - 5812-3M0VP08S).
 2. Remove the RF Preselector screw (D - 5812-2M5PP14S).
 3. Remove the SMB connector from the Receiver Main Board IF IN.
 4. Remove the SMB connector from the Synthesizer LO OUT.
 5. De-solder the +9.5 Vdc Power Supply wire from the Receiver Main Board

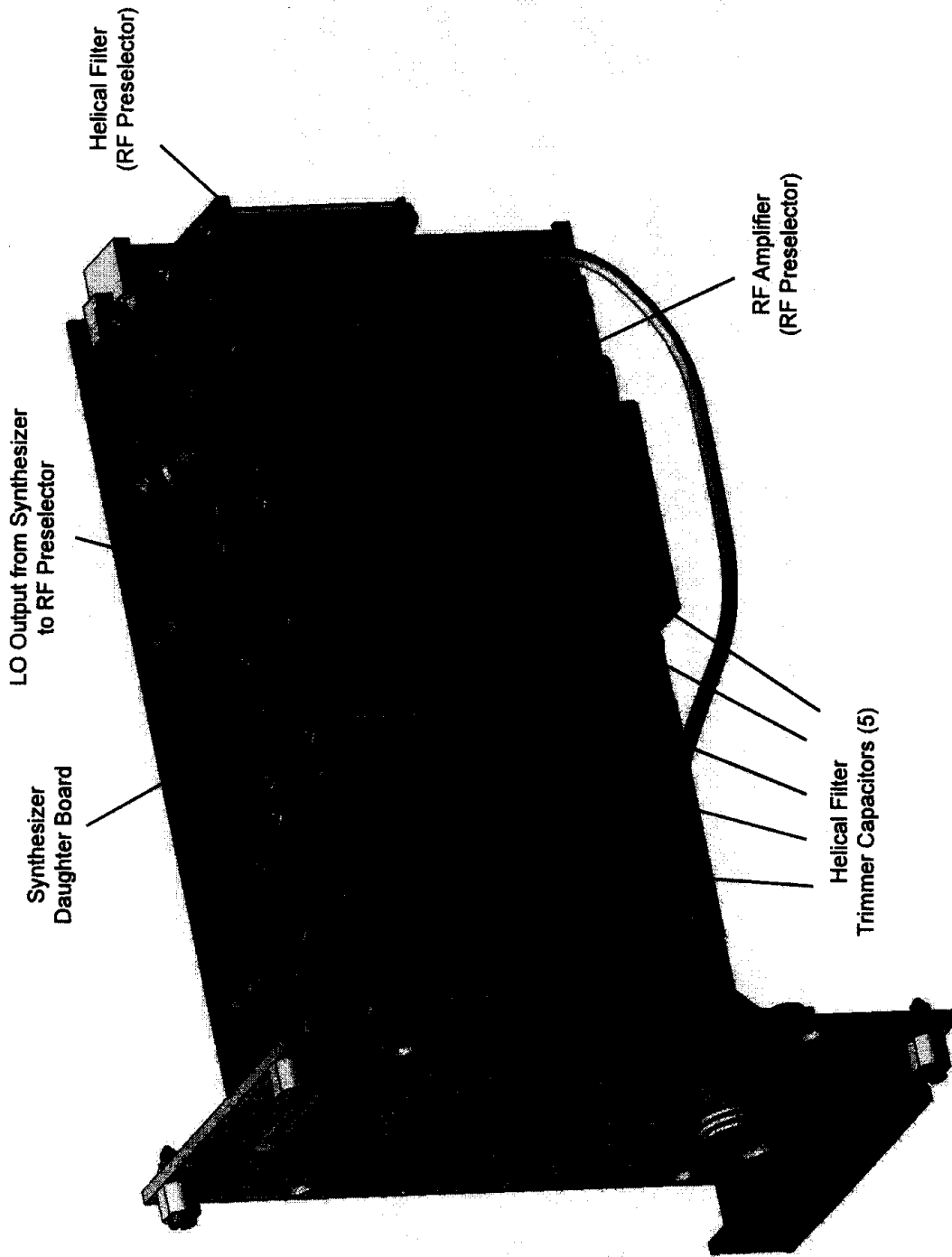


To Remove the Synthesizer:
 1. Remove the three Synthesizer screws (E - 5812-2M5PP06S).

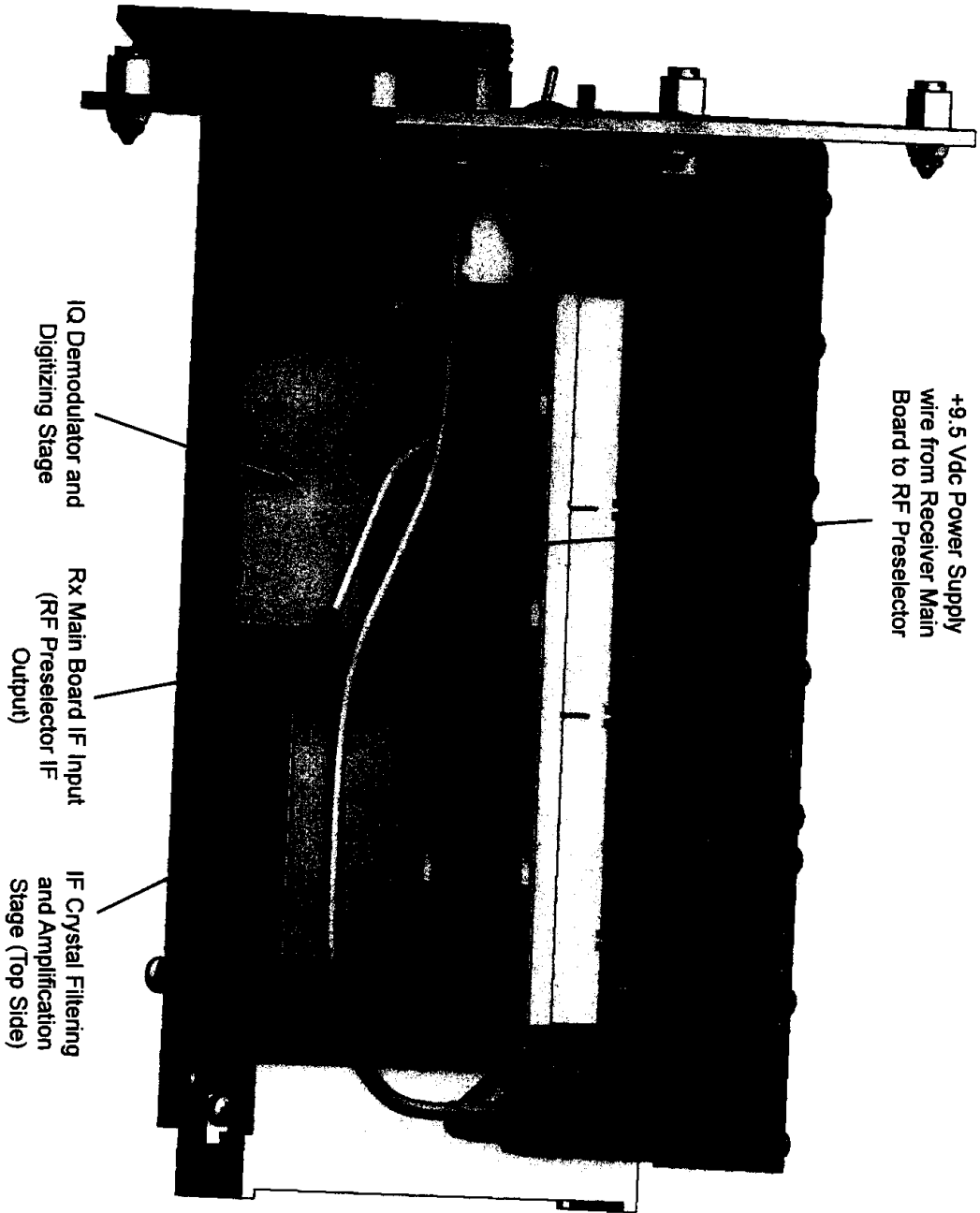
MT-4E RECEIVER BLOCK DIAGRAM



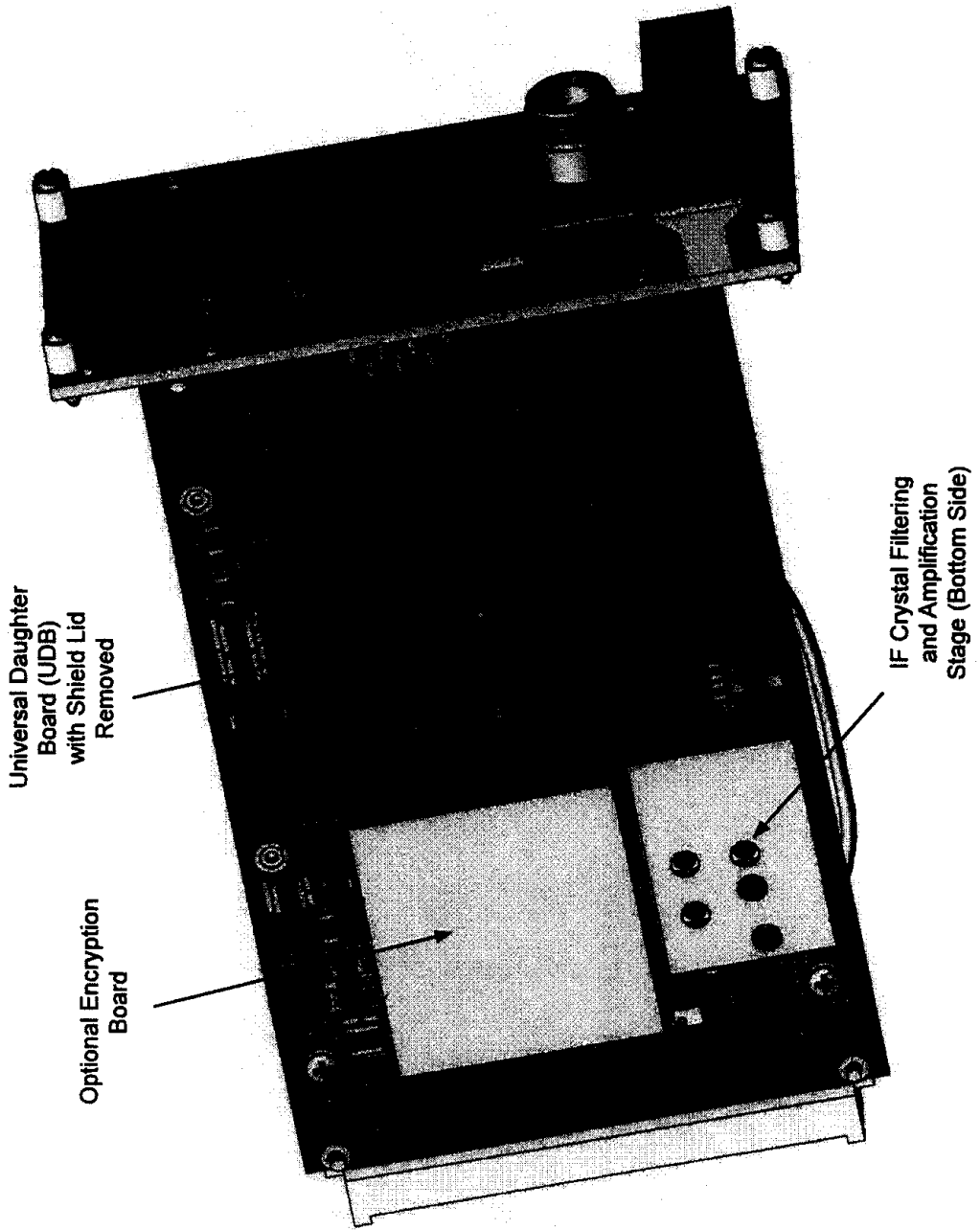
MT-4E RECEIVER TOP COMPONENT VIEW (1)



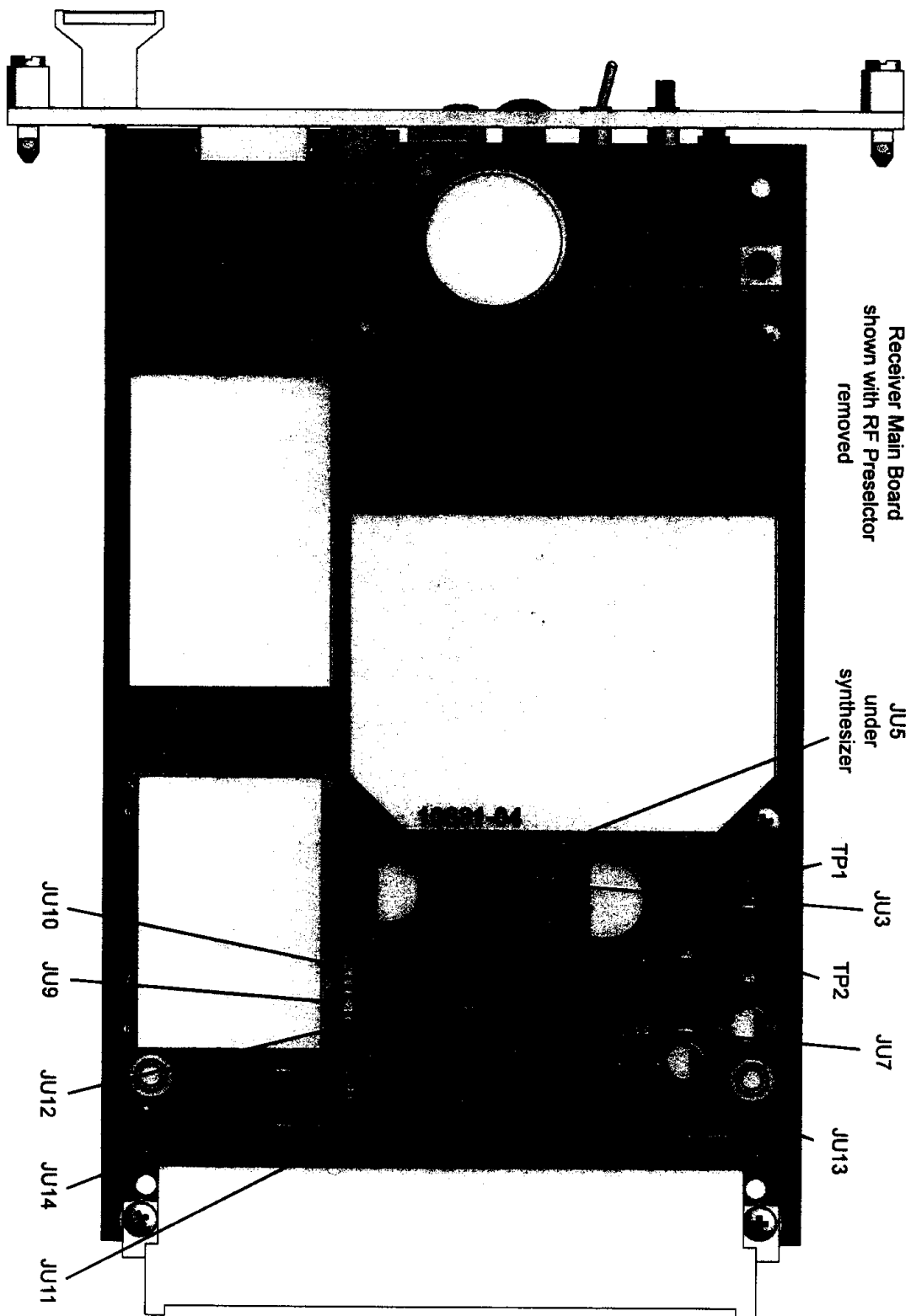
MT-4E RECEIVER TOP COMPONENT VIEW (2)



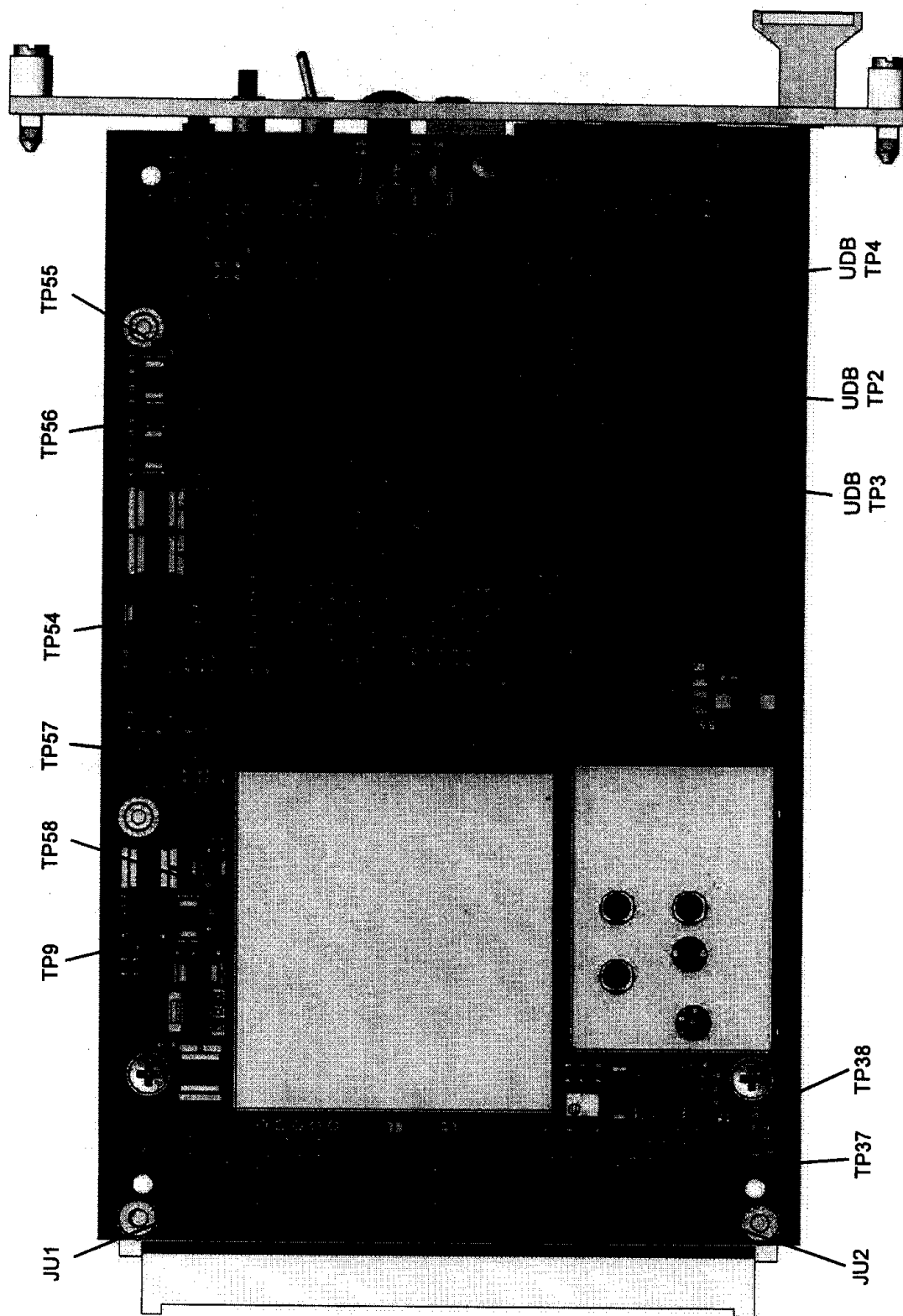
MT-4E RECEIVER BOTTOM COMPONENT VIEW



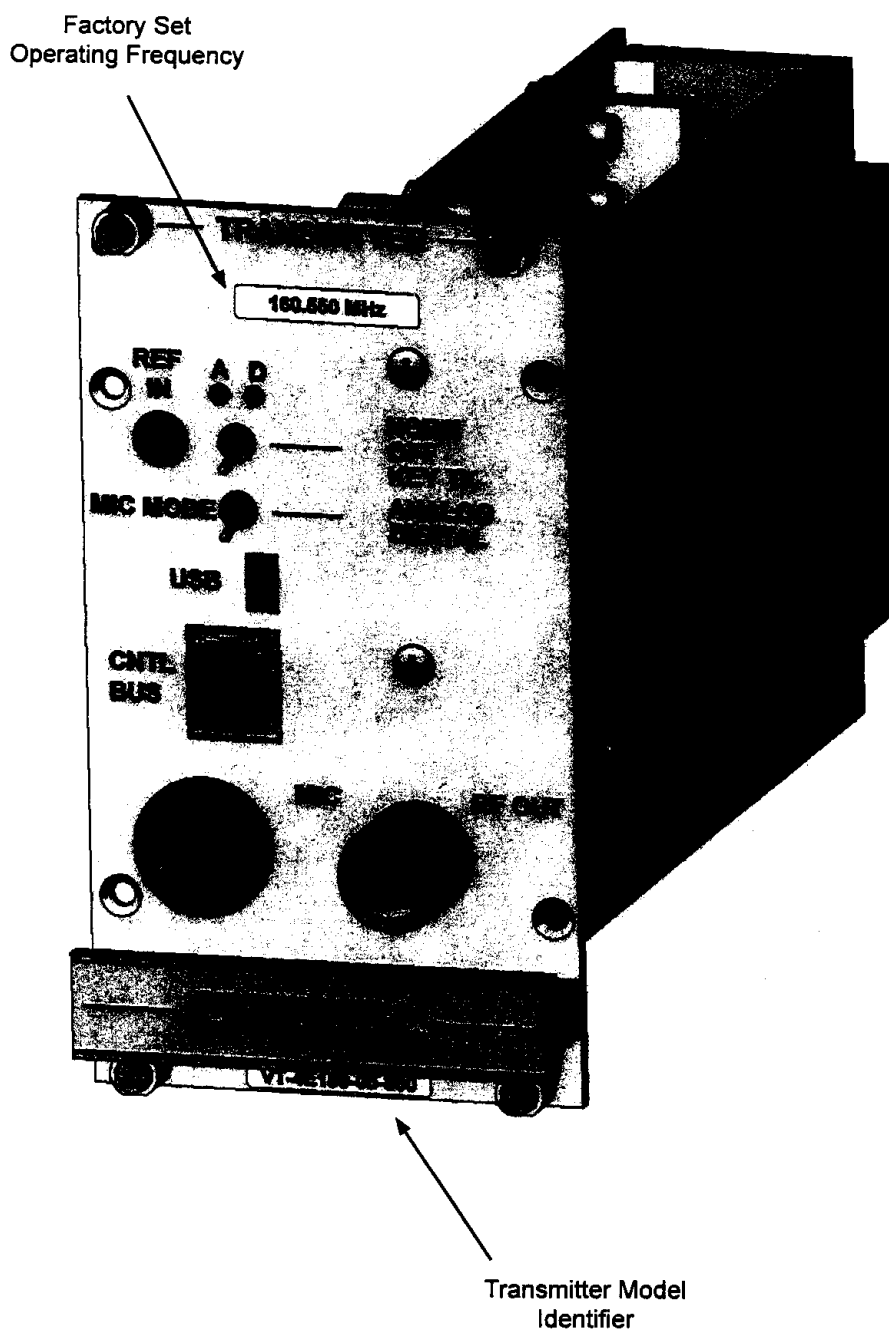
MT-4E RECEIVER TOP JUMPER AND TEST POINT LOCATOR



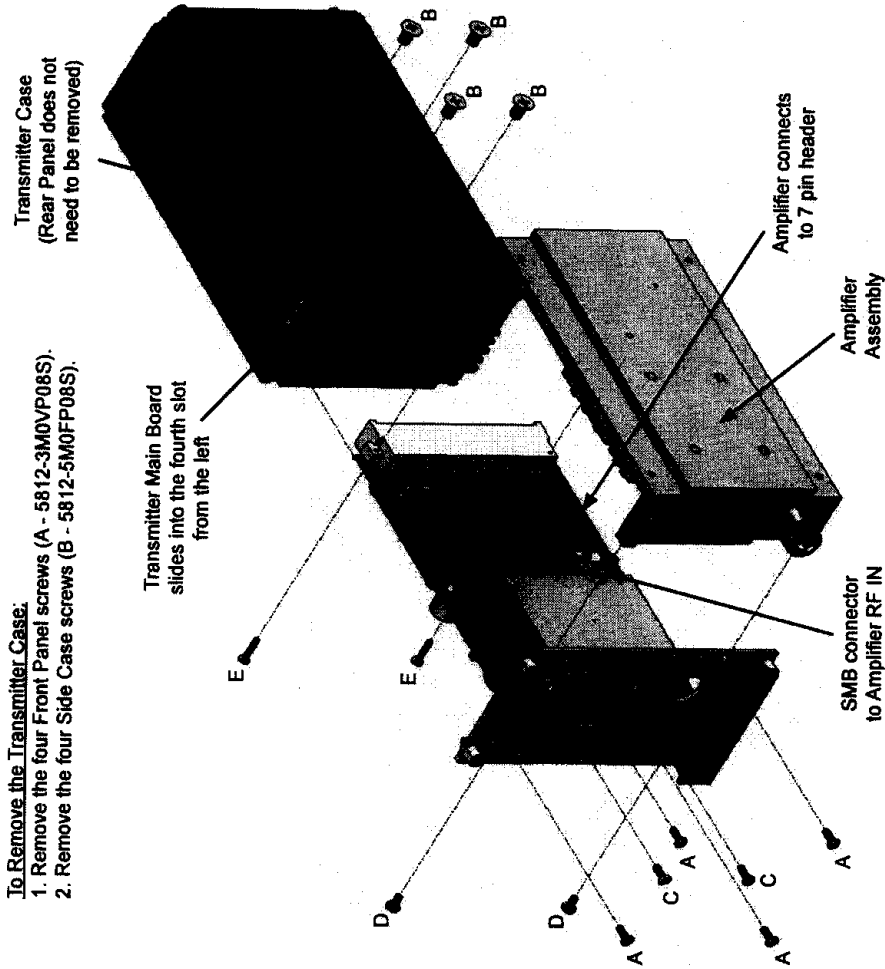
MT-4E RECEIVER BOTTOM JUMPER AND TEST POINT LOCATOR



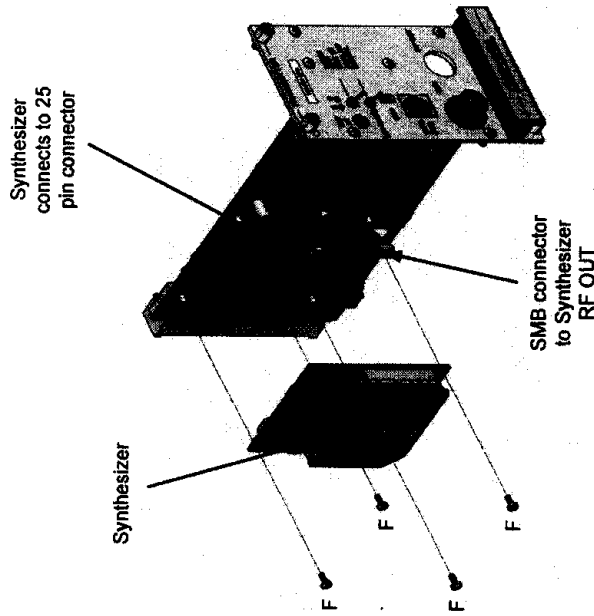
MT-4E TRANSMITTER FRONT VIEW



MT-4E TRANSMITTER EXPLODED VIEW DIAGRAM

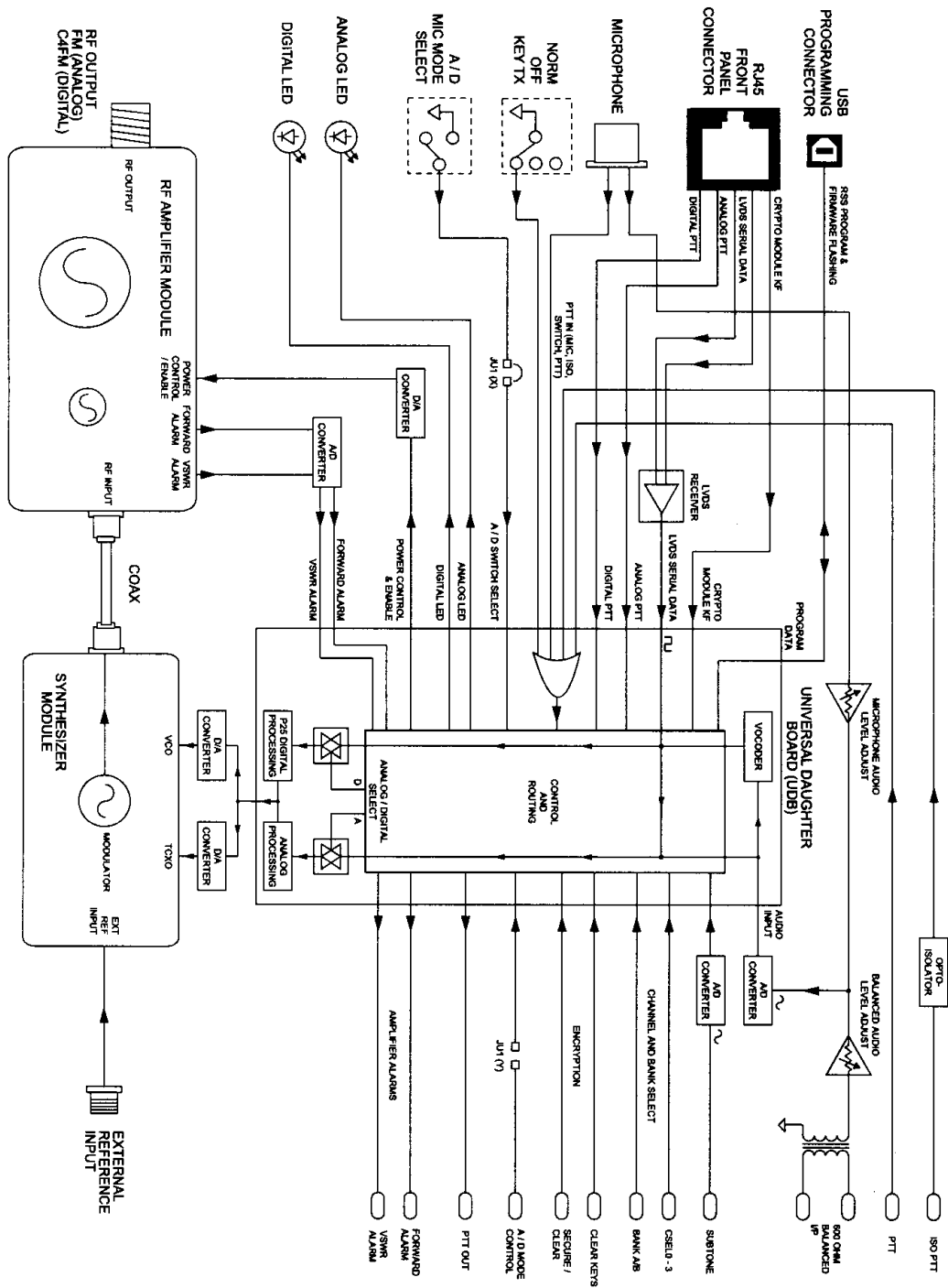


- To Remove the Amplifier Assembly:**
1. Remove the two Front Panel screws (C - 5812-3M0PP06S).
 2. Remove the two Front Amplifier Assembly screws (D - 5812-3M0PP06S).
 3. Remove the two rear Amplifier Assembly screws (E - 5812-2M5PP12S).
 4. Remove the SMB connector from the Amplifier RF IN.

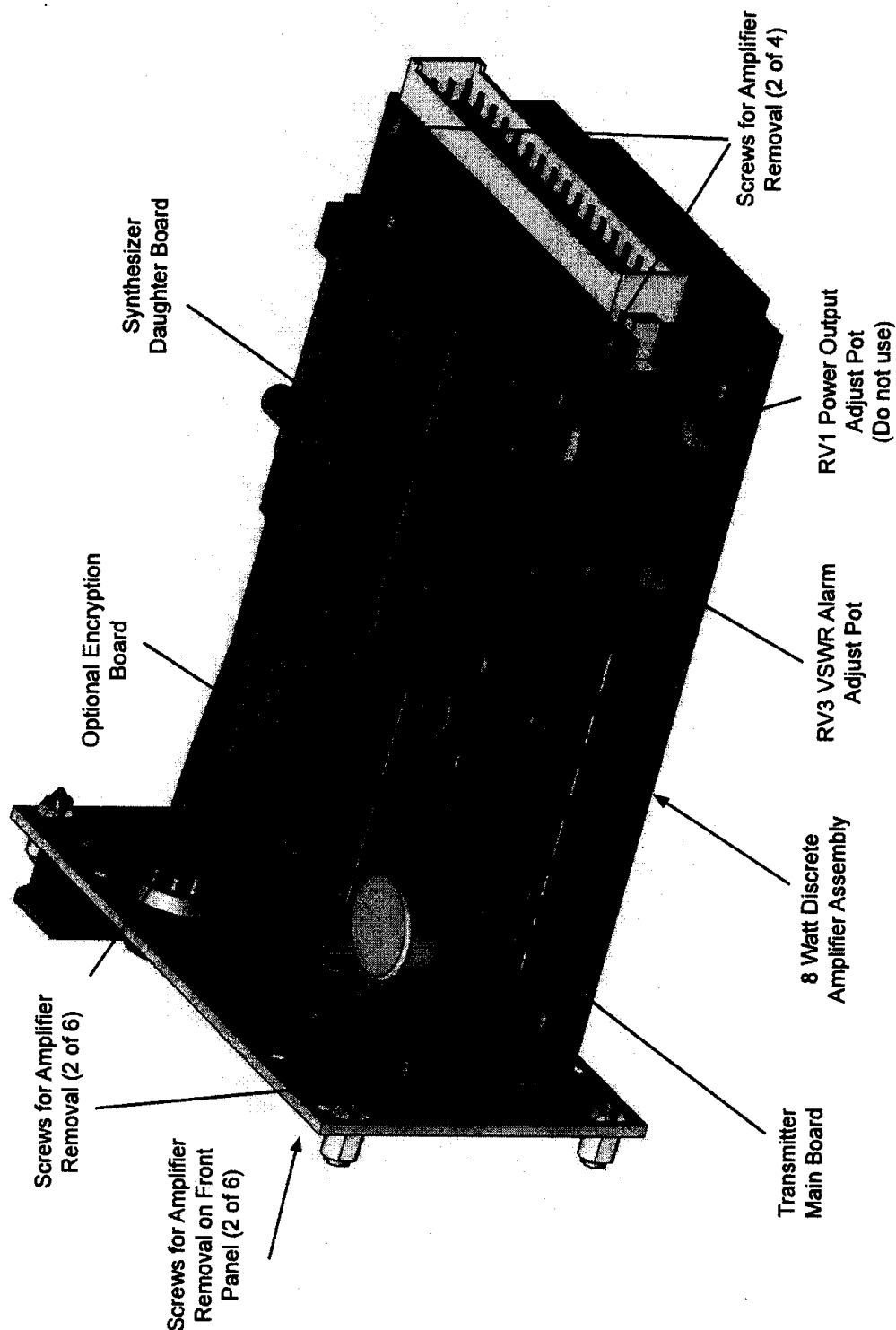


- To Remove the Synthesizer:**
1. Remove the four Synthesizer screws (F - 5812-2M5PP06S).
 2. Remove the SMB connector from the Synthesizer RF OUT.

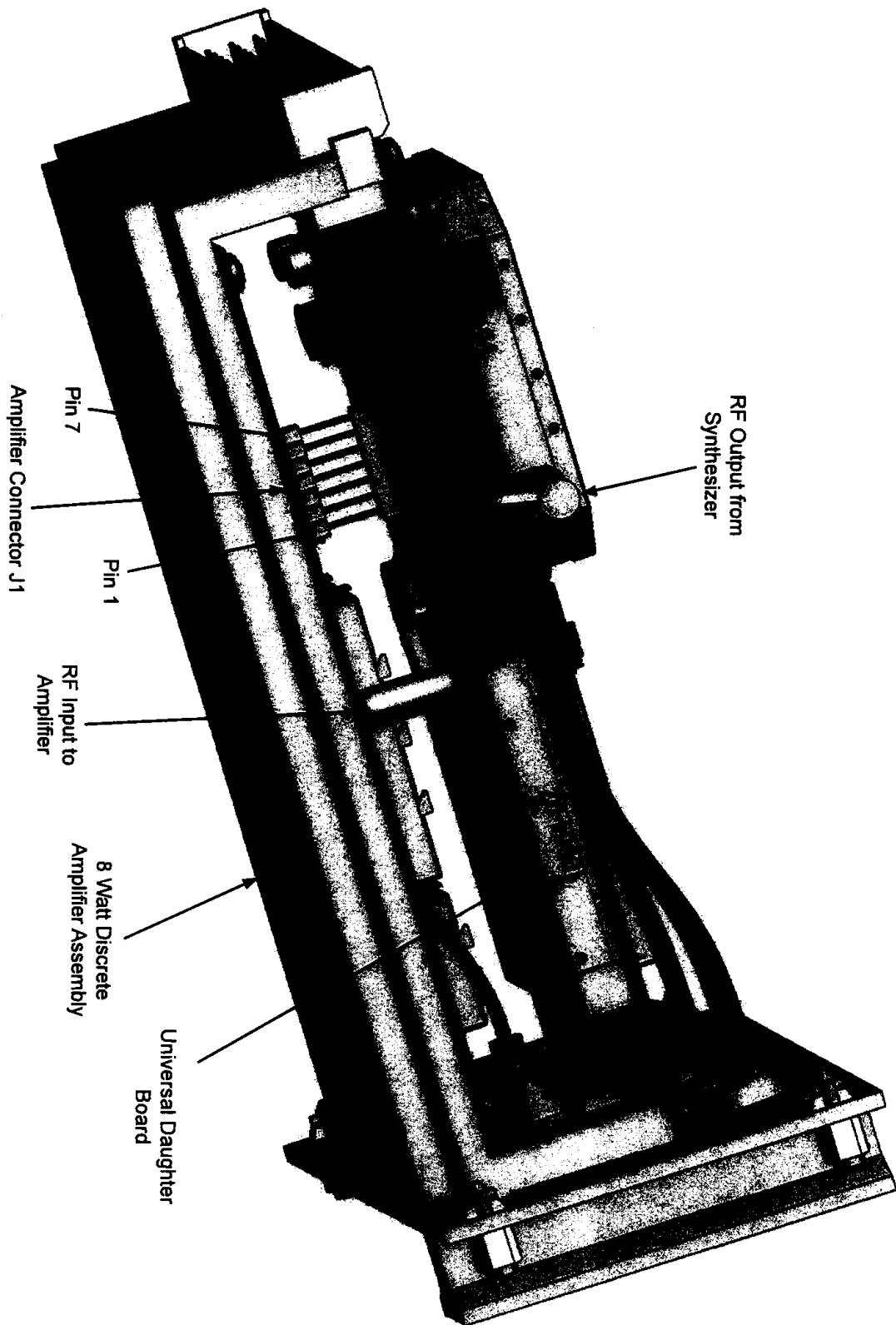
MT-4E TRANSMITTER BLOCK DIAGRAM



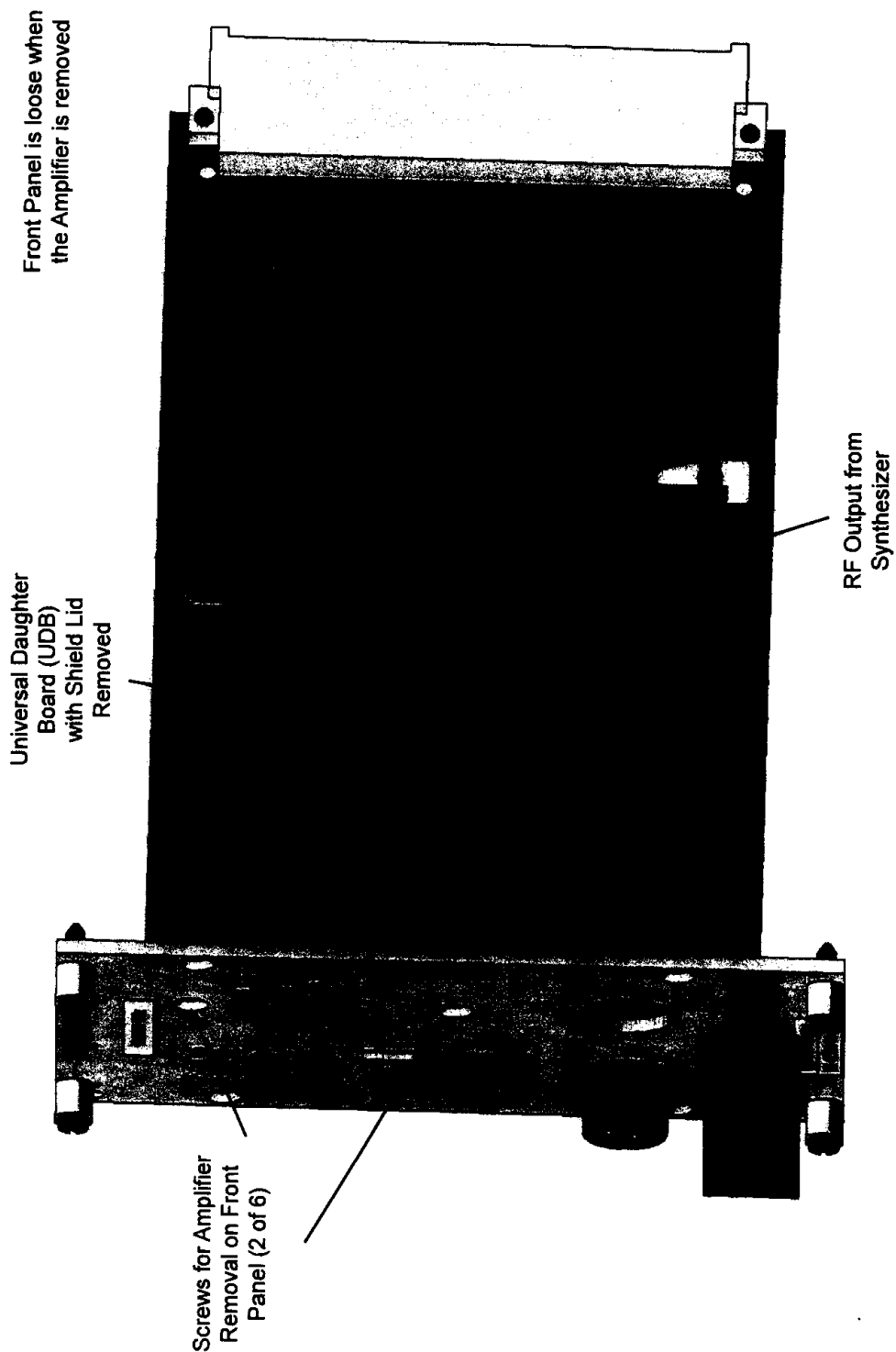
MT-4E TRANSMITTER TOP COMPONENT VIEW



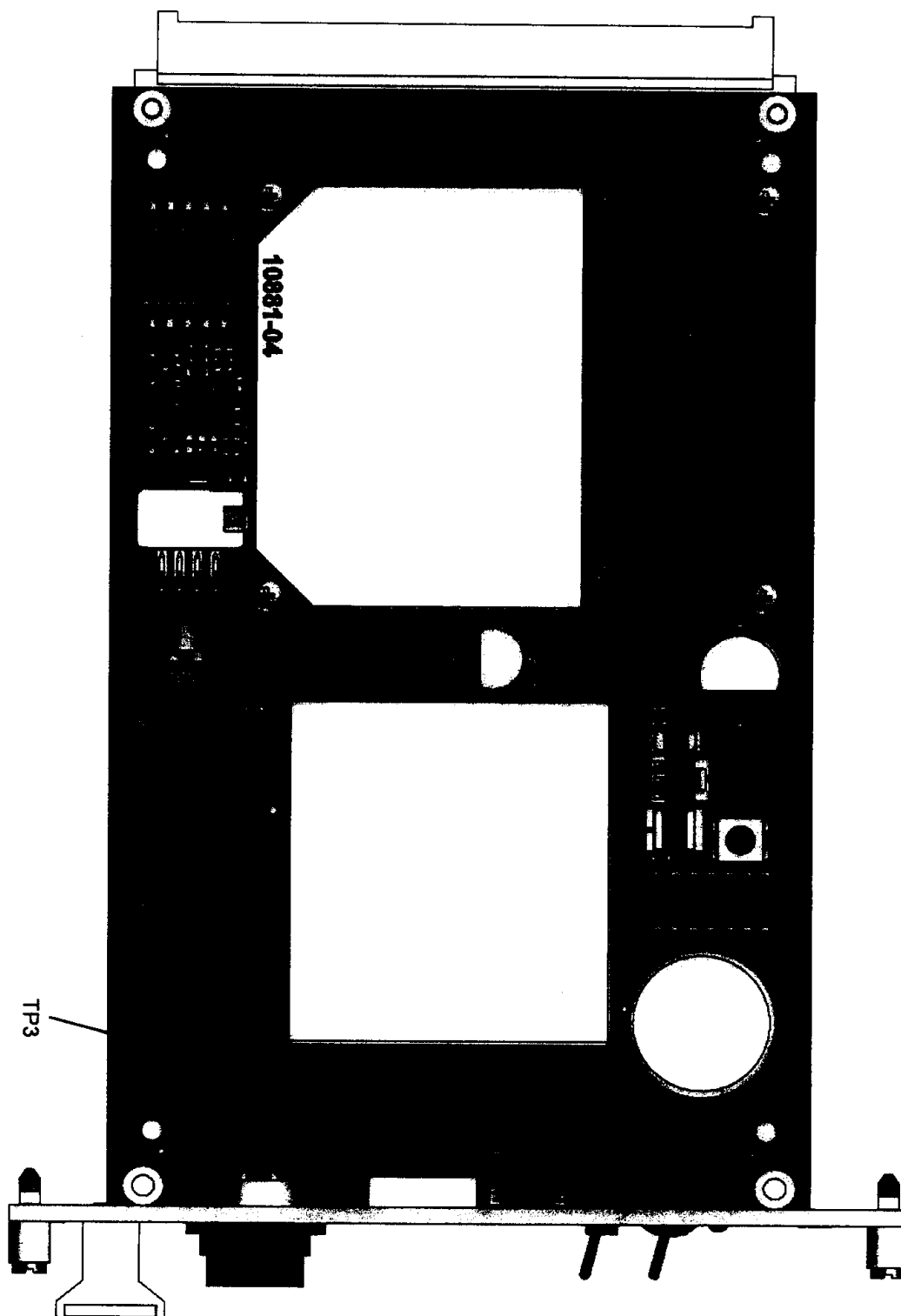
MT-4E TRANSMITTER BOTTOM COMPONENT VIEW



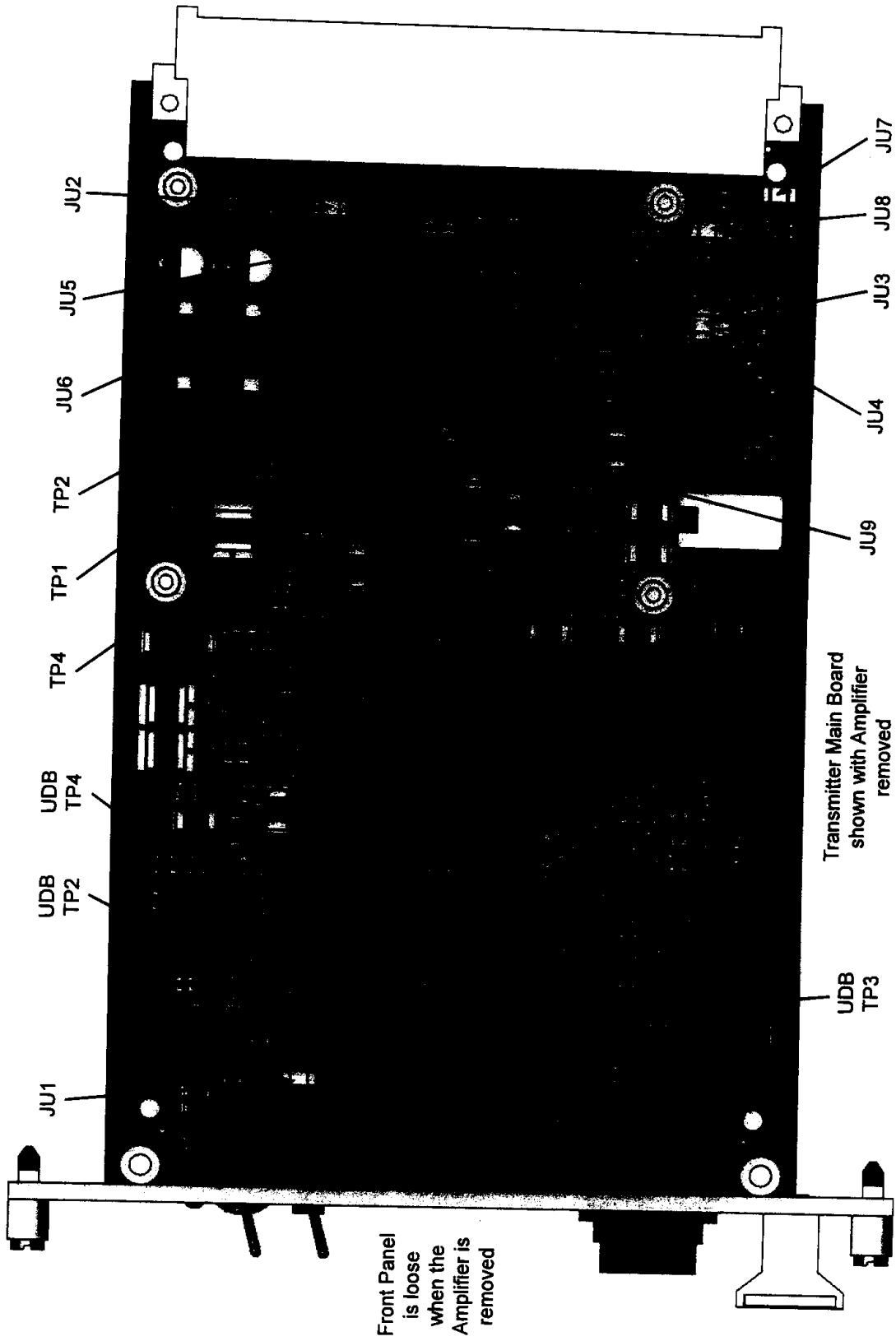
MT-4E TRANSMITTER AMPLIFIER REMOVED VIEW



MT-4E TRANSMITTER TOP JUMPER AND TEST POINT LOCATOR



MT-4E TRANSMITTER BOTTOM JUMPER AND TEST POINT LOCATOR

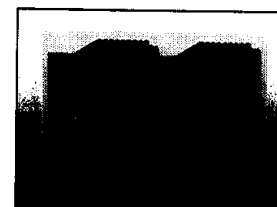


Front Panel
is loose
when the
Amplifier is
removed

Transmitter Main Board
shown with Amplifier
removed



MT-4E VHF & UHF Receiver & Transmitter Instruction Manual
IM08-MT-4E-TXR



PARTS LISTS

MT-4E RECEIVER ELECTRICAL PARTS LIST

Part Number	Description	Product	Quantity
A11-FE4-150	RF PRESELECTOR CLASS B,136-174	VHF CLASS B	1
A11-FE4A-150	RF PRESELECTOR CLASS A,136-174	VHF CLASS A	1
A13-FE4-420	RF PRESELECTOR CLASS B,406-430	UHF (406-430) CLASS B	1
A13-FE4A-420	RF PRESELECTOR CLASS A,406-430	UHF (406-430) CLASS A	1
A13-FE4-460	RF PRESELECTOR CLASS B,450-470	UHF (450-470) CLASS B	1
A13-FE4A-460	RF PRESELECTOR CLASS A,450-470	UHF (450-470) CLASS A	1
A13-FE4-500	RF PRESELECTOR CLASS B,470-520	UHF (470-520) CLASS B	1
A13-FE4A-500	RF PRESELECTOR CLASS A,470-520	UHF (470-520) CLASS A	1
A11-RX4E-MAIN	RECEIVER MAIN BOARD ASSEMBLY	ALL	1
A11-UDB	UNIVERSAL DAUGHTER BOARD	ALL	1
A64-OR4-150	SYNTHESIZER, RX, VHF,136-174	VHF	1
A64-OR4-440	SYNTHESIZER, RX ,UHF,406-470	UHF	1
A64-OR4-500	SYNTHESIZER, RX ,UHF,470-520	UHF	1

MT-4E RECEIVER MECHANICAL PARTS LIST

Part Number	Description	Product	Quantity
3536-10111405	LABEL/LEXAN, 14HP, VHF: RED	VHF	1
3536-10131410	LABEL/LEXAN, 14HP, UHF: BLACK	UHF	1
3702-10000120	FASTENER, QUICK RELEASE, GRAY	ALL	4
3702-10000614	HANDLE, FRONT PANEL, 14HP, GREY	ALL	1
3702-10001214	NAMEPLATE, BLANK, 14HP, ALUM.	ALL	1
3702-62501010	CASE, 14HP RF PLUG-IN, MT-3 RX	ALL	1
3702-63001101	PANEL, REAR, POS. 1, 14HP EXTRSN.	ALL	1
3802-61001082	PANEL/FRONT, W/IDENT: MT-4E RX	ALL	1
5630-12023250	GASKET, BeCu, 3FINGER, .71", CLIP	ALL	2
5671-250N062B	HOLE PLUG, .250" HOLE, NYL., BLK	ALL	1
5812-2M5FP14S	SCREW, M2.5 x 14 FLAT/PHIL, A2	ALL	2
5812-2M5PP06S	SCREW, M2.5 x 6, PAN/PHIL, A2 (E)	ALL	3
5812-2M5PP12S	SCREW, M2.5 x 12 PAN/PHIL, A2	ALL	1
5812-2M5PP14S	SCREW, M2.5 x 14 PAN/PHIL, A2 (D)	ALL	1
5812-2M5VP08S	SCREW, M2.5x8, OVAL C/S/PHIL, A2	ALL	1
5812-3M0PP08T	SCREW, M3 x 8, PAN/PHIL, BLACK	ALL	4
5812-3M0VP06S	SCREW, M3 x 6, OVAL C/S/PHIL, A2 (C)	ALL	2
5812-3M0VP08S	SCREW, M3 x 8, OVAL C/S/PHIL, A2 (A & B)	ALL	6
5813-2M5SQ50Z	NUT, M2.5, SQUARE-5mm, ZINC	ALL	2
5814-3M0LK00S	LOCKWASHER, M3, SPLIT, A2 STEEL	ALL	4

MT-4E RECEIVER P25 DIGITAL FIRMWARE

Part Number	Description	Product	Quantity
APP-FIRM01-W-XX	DIGITAL UPGRADE FIRMWARE, MT-4E RX	ALL	1

MT-4E RECEIVER AND TRANSMITTER ENCRYPTION

Part Number	Description	Product	Quantity
ENCRYPT-MT4E-XX	ENCRYPTION MODULE, MT-4E RX/TX	ALL	1

MT-4E RECEIVER AND TRANSMITTER RSS

Part Number	Description	Product	Quantity
APP-RSS03-WC-XX	RADIO SERVICE SOFTWARE, MT-4E	ALL	1



MT-4E TRANSMITTER ELECTRICAL PARTS LIST

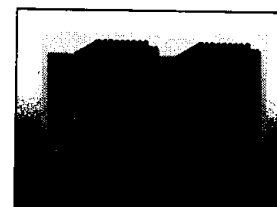
Part Number	Description	Product	Quantity
A11-USB	UNIVERSAL DAUGHTER BOARD	ALL	1
A21-TX4E-MAIN	TRANSMITTER MAIN BOARD ASSEMBLY	ALL	1
A21-VPA155-08	TX POWER AMP, VHF130-180 MHz	VHF	1
A23-UPA450-08	TX POWER AMP, UHF 380-512 MHz	UHF	1
A64-OT4-150	SYNTHESIZER, TX, VHF,136-174	VHF	1
A64-OT4-440	SYNTHESIZER, TX, UHF,406-470	UHF	1
A64-OT4-500	SYNTHESIZER, TX, UHF,470-520	UHF	1

MT-4E TRANSMITTER MECHANICAL PARTS LIST

Part Number	Description	Product	Quantity
3536-10111405	LABEL/LEXAN, 14HP, VHF: RED	VHF	1
3536-10131410	LABEL/LEXAN, 14HP, UHF: BLACK	UHF	1
3702-10000120	FASTENER, QUICK RELEASE, GRAY	ALL	4
3702-10000614	HANDLE, FRONT PANEL, 14HP,GREY	ALL	1
3702-10001214	NAMEPLATE, BLANK, 14HP, ALUM.	ALL	1
3702-62502010	CASE, 14HP RF PLUG-IN, MT-3 TX	ALL	1
3702-63002101	PANEL, REAR, POS.4, 14HP EXTRSN.	ALL	1
3802-61002121	PANEL/FRONT, W/IDENT: MT-4E TX	ALL	1
5630-12023250	GASKET, BeCu,3FINGER,.71",CLIP	ALL	2
5671-250N062B	HOLE PLUG, .250" HOLE,NYL.,BLK	ALL	1
5812-2M5FP14S	SCREW, M2.5 x 14 FLAT/PHIL, A2	ALL	2
5812-2M5PP06S	SCREW, M2.5 x 6, PAN/PHIL, A2 (F)	ALL	4
5812-2M5PP12S	SCREW, M2.5 x 12 PAN/PHIL, A2 (E)	ALL	2
5812-3M0PP06S	SCREW, M3 X 6, PAN/PHILLIPS,A2 (D)	ALL	2
5812-3M0PP08T	SCREW, M3 x 8, PAN/PHIL, BLACK	ALL	4
5812-3M0VP08S	SCREW, M3 x 8,OVAL C/S/PHIL,A2 (A & C)	ALL	6
5812-5M0FP08S	SCREW, M5 x 8, FLAT/PHIL., A2 (B)	ALL	4
5813-2M5SQ50Z	NUT, M2.5, SQUARE-5mm, ZINC	ALL	2
5814-3M0LK00S	LOCKWASHER, M3, SPLIT,A2 STEEL	ALL	4
7910-WP0WP011	CABLE,SMB PLUG-PLUG,RG316,11cm	ALL	1
A89-MIC4-08	CABLE/CONN ASSY,MICROPHONE CON	ALL	1

MT-4E TRANSMITTER P25 DIGITAL FIRMWARE

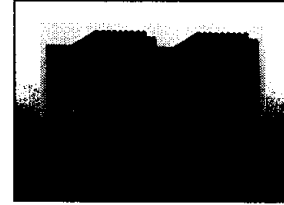
Part Number	Description	Product	Quantity
APP-FIRM02-W-XX	DIGITAL UPGRADE FIRMWARE, MT-4E TX	ALL	1



GLOSSARY OF TERMS

AMBE+2™	Abbreviation for "Advanced Multi Band Excitation".	CTCSS	Abbreviation for "Continuous Tone-Controlled Squelch System".
Bandwidth	The difference between the limiting frequencies of a continuous frequency band. Typically measured in Kilohertz. May be considered the amount in kilohertz required for a single communications channel.	DCS	Abbreviation for "Digital Coded Squelch".
BER	Abbreviation for "BIT Error Rate"	DSP	Abbreviation for "Digital Signal Processor" a specialized microcomputer.
BPS	Abbreviation for BITS Per Second, a data rate measure.	DTMF	Abbreviation for "Dual-Tone Multi-Frequency" - a signaling scheme used by the telephone system in which two voice band tones are generated for each keypad key press.
C4FM	The acronym for a 4-ary FM transmitter which uses QPSK modulation to work with a CFDD compatible receiver.	Encryption	A coding of plain text (or clear voice) into unintelligible forms for secure transmission.
Channel	A single unidirectional or bidirectional path for transmitting or receiving, or both, of electrical or electromagnetic signals.	Error Correction	Digital coding technique for detecting and correcting information transmission errors.
Channel Spacing	Typically measured in kilohertz from the center of one channel to the center of the next-adjacent-channel. May, or may not, be identical to bandwidth.	FCC	Abbreviation for "Federal Communications Commission"
Common Air Interface (CAI)	A radio to radio signal path defined in terms of Access Method, Modulation Scheme, Vocoding Method, Channel Data Rate and Channel Data Format.	Firmware	Software that is permanently stored in a hardware device which allows reading and executing the software, but not writing or modifying the software.
		Modulation	A controlled variation of any property of a carrier wave for the purpose of transferring information.

LSB	Abbreviation for "Least Significant BIT."	Squelch	A radio circuit that eliminates noise from the speaker when no transmitted signal is present.
MSB	Abbreviation for "Most Significant BIT."	Subscriber Unit	A mobile or portable radio unit used in a radio system.
NAC	Abbreviation for "Network Access Code." A twelve bit field identifying the network of the radio message. Typically used to steer repeater functions.	TGID	Abbreviation for "Talk-Group Identifier." A sixteen bit field identifying talk-group of the radio message.
PTT	Abbreviation for "Push-to-Talk", the switch on a subscriber unit which, when pressed, causes the subscriber unit to transmit.	TIA	Abbreviation for "Telecommunications Industry Association"
QPSK	Abbreviation for "Quadrature Phase Shift Keying" modulation technique. PSK using four phase states.	Time-Out-Timer	A function that limits the transmission period to a pre-defined time. The user will automatically stop transmitting when the timer goes off after the pre-defined time.
RF	Abbreviation for "Radio Frequency."	VOCODER (Voice-Coder)	A type of voice coder. Usually consisting of a speech analyzer and a speech synthesizer which convert analog speech into digital signals for transmission and digital signals back into artificial speech sounds for reception.
Signal	The detectable transmitted energy which carries information from a transmitter to a receiver.		
SINAD	Abbreviation for "Signal plus Noise And Distortion" to "noise and distortion" ratio.		



REVISION HISTORY

Revision	Date	CO	Description
1-0-0	Dec 06	*	• Product Release *CO's 6219; 6250; 6236; and 6256
1-0-1	Jan 07	- - -	• Formatting updates. IM Content remains the same.

