



## ***MT-3 FM TRANSMITTER MAINBOARD INSTRUCTION MANUAL***

Covers Models:

VT-3H035-SXA300

VT-3H045-SXA300

© 1998–2010 Daniels Electronics Ltd. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written consent of Daniels Electronics Ltd.

The stylized “Daniels Electronics Ltd.” and “DE” logo are registered Canadian and US trademarks of Daniels Electronics Ltd.

The stylized “Daniels Electronics Ltd.” and “DE” logo are trademarks of Daniels Electronics Ltd.

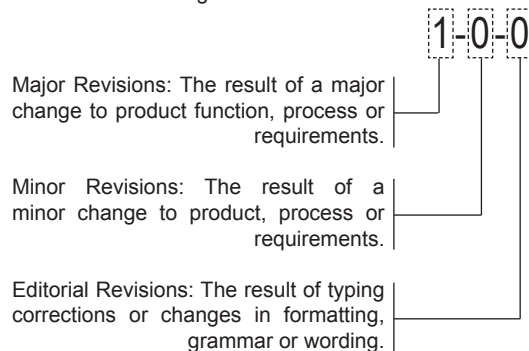
## DOCUMENT CONTROL

This document has been produced, verified and controlled in accordance with Daniels Electronics' Quality Management System requirements.

Please report any errors or problems to Daniels Electronics' Customer Service Department.

DOCUMENT REVISION  
DEFINITION

Daniels Electronics Ltd. utilizes a three-level revision system. This system enables Daniels to identify the significance of a revision. Each element of the revision number signifies the scope of change as described in the diagram below.



Three-level revision numbers start at 1-0-0 for the first release. The appropriate element of the revision number is incremented by 1 for each subsequent revision, causing any digits to the right to be reset to 0.

For example:

If the current revision = 2-1-1 Then the next major revision = 3-0-0

If the current revision = 4-3-1 Then the next minor revision = 4-4-0

If the current revision = 3-2-2 Then the next editorial revision = 3-2-3

The complete revision history is provided at the back of the document.

## NOTE

The user's authority to operate this equipment could be revoked through any changes or modifications not expressly approved by Daniels Electronics Ltd.

The design of this equipment is subject to change due to continuous development. This equipment may incorporate minor changes in detail from the information contained in this manual.

# Contents

|                                                                     |           |
|---------------------------------------------------------------------|-----------|
| <b>General Information .....</b>                                    | <b>1</b>  |
| Introduction .....                                                  | 1         |
| MT-3 VHF Low Band Performance Specifications .....                  | 3         |
| Physical Specifications .....                                       | 4         |
| <b>Theory of Operation .....</b>                                    | <b>5</b>  |
| MT-3 FM Transmitter Mainboard .....                                 | 5         |
| FM Audio Processor .....                                            | 12        |
| <b>Transmitter Alignment .....</b>                                  | <b>23</b> |
| Repair Note .....                                                   | 23        |
| Recommended Test Equipment List .....                               | 24        |
| General Information .....                                           | 24        |
| Synthesizer Module Installation and Removal .....                   | 24        |
| Standard Factory Settings and Jumper Configurations .....           | 25        |
| MT-3 FM Transmitter Mainboard Interconnection Pin Definitions ..... | 26        |
| FM Audio Processor Alignment .....                                  | 27        |
| Troubleshooting .....                                               | 31        |
| Temperature Compensation .....                                      | 32        |
| FM Audio Processor Jumper Configurations .....                      | 32        |
| <b>Illustrations and Schematics .....</b>                           | <b>35</b> |
| MT-3 FM Transmitter Block Diagram .....                             | 36        |
| MT-3 FM Transmitter Mainboard Component Layout – Top .....          | 37        |
| MT-3 FM Transmitter Mainboard Component Layout – Bottom .....       | 38        |
| MT-3 FM Transmitter Mainboard Schematic Diagram .....               | 39        |
| Front Panel Board Component Layout Diagram .....                    | 40        |
| Front Panel Board Schematic Diagram .....                           | 40        |
| FM Audio Processor Board Component Layout Diagram .....             | 41        |
| FM Audio Processor Board Schematic Diagram .....                    | 42        |
| <b>Parts List .....</b>                                             | <b>43</b> |
| MT-3 FM Transmitter Mainboard .....                                 | 43        |
| Front Panel Board .....                                             | 47        |
| FM Audio Processor .....                                            | 47        |
| <b>Revision History .....</b>                                       | <b>51</b> |





## GENERAL INFORMATION

### INTRODUCTION

The MT-3 FM Transmitter Mainboard integrates the MT-3 Front Panel Board, MT-3 FM Audio Processor, Synthesizer module and Amplifier module together to comprise a MT-3 series transmitter.

The front panel board and the audio processor are soldered directly to the transmitter mainboard while the amplifier and the synthesizer modules are frequency band sensitive, plug-in modules.

Circuitry and jumpers on the transmitter mainboard control the operation of the modules as well as the overall operation of the MT-3 FM transmitter. Power and signal connections are made through the 48-pin Type F connector on the rear of the transmitter mainboard where they are then routed to the other MT-3 modules.

The transmitter enclosure is formed by the front panel face plate and aluminum shell attached to the transmitter mainboard and the rear panel plate attached to the aluminum shell.



## MT-3 VHF LOW BAND PERFORMANCE SPECIFICATIONS

| Parameter                                  | Specification                                                             |
|--------------------------------------------|---------------------------------------------------------------------------|
| Frequency Range:                           | 29 to 38 MHz (VT-3H035-SWA300)<br>38 to 50 MHz (VT-3H045-SWA300)          |
| Carrier Frequency Stability:               | ± 5.0 ppm (-30°C to +60°C, Optional -40°C to +60°C)                       |
| Channel Spacing:                           | 20 kHz                                                                    |
| Channel Selection:                         | 5.0 or 6.25 kHz increments                                                |
| Number of Channels:                        | 16                                                                        |
| Compatibility:                             | MT-3 Series Radio Systems                                                 |
| RF Output Power:                           | 0.5 to 3.0 W                                                              |
| Emission Designator:                       | 16K0F3E                                                                   |
| Impedance (Input):                         | 50 Ω; Type-N connector                                                    |
| Duty Cycle:                                | 100 % (-40°C to +60°C)                                                    |
| Undesired Emissions (Conducted Harmonics): | <= -90 dBc                                                                |
| Undesired Emissions (Conducted Spurious):  | <= -80 dBc                                                                |
| VSWR Protection:                           | < 20:1 VSWR at all phase angles                                           |
| Operating Temperature Range:               | -30°C to +60°C                                                            |
| Operating Humidity:                        | 95% RH (non-condensing) at +25°C                                          |
| Operating Voltage:                         | +13.8 VDC nominal input (range +10 to +17 VDC)<br>+9.5 VDC regulated      |
| Transmit Current:                          | <1.2 A for 3.0 W output                                                   |
| Stand By Current:                          | 15 mA (Mode 1)<br>160 mA (Mode 2)<br>185 mA (Mode 4)                      |
| PTT Time-Out-Timer:                        | Nominal – 5 minutes<br>Range – 1 sec to 8 hours, disable                  |
| Audio Input:                               | 600 Ω balanced or unbalanced input (5 K Ohm)<br>-25 dBm to 0 dBm          |
| Audio Frequency Response:                  | Pre-emphasis: complies with TIA-603C<br>Flat: +1 dB/-3 dB 100 Hz to 3 kHz |
| Audio Deviation Limiting:                  | ± 5.0 kHz                                                                 |
| Audio Distortion:                          | <2.0% @ +23°C<br><2.5% -40°C to +60°C                                     |
| FM Hum and Noise Ratio:                    | <= -55 dB (0.3 to 3.4 kHz, de-emphasis off)                               |
| IC Certification No.:                      | 142A-VT3X0X5S (RSS-119)                                                   |
| FCC ID:                                    | H4JVT-3H040-S (FCC Parts 22, 90)                                          |

## PHYSICAL SPECIFICATIONS

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Physical Dimensions:  | Width: 7.1 cm (2.8 in)    Height: 12.8 cm (5.05 in)    Depth: 19 cm (7.5 in)                                                                                                                                                                                                                                                                                                                                                                                                             |
| Module Weight:        | 1.4 kg (3.0 lbs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Corrosion Prevention: | <ul style="list-style-type: none"> <li>• Anodized aluminum construction</li> <li>• Stainless steel hardware</li> <li>• Gold-plated module connectors</li> </ul>                                                                                                                                                                                                                                                                                                                          |
| Module Design:        | <ul style="list-style-type: none"> <li>• Compact Eurostandard modular design</li> <li>• Plug-in modules mate with the Daniels standard MT-3 Repeater Subrack</li> <li>• Subracks / modules comply with IEEE 1101, DIN 41494 and IEC 297-3 (mechanical size / modular arrangement)</li> </ul>                                                                                                                                                                                             |
| External Connections: | <p>RF Connection – Type-N connector located on the module front panel. Motherboard connections (Audio, Power, and Control) are made through a 48-pin, gold-plated, Type-F connector on the rear of the module.</p> <p>User connection is made through mated motherboard assembly of the radio subrack. Type-F connector complies with DIN 41612 Level 2 (200 mating cycles, 4-day 10 ppm SO<sub>2</sub> gas test with no functional impairment and no change in contact resistance).</p> |
| Handle Text Colour:   | Orange                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |



## THEORY OF OPERATION

### MT-3 FM TRANSMITTER MAINBOARD

#### General

Switch SW1 on the Front Panel Board is a double pole, double throw (DPDT) switch that controls the operation of the transmitter.

When SW1 is in the OFF position the transmitter is turned off; however, +13.8 VDC is still present on the transmitter mainboard as the +13.8 VDC supply is not switched. When SW1 is in the KEYED position, +9.5 VDC is supplied to the transmitter circuitry and the transmitter is continuously keyed on. When SW1 is in the NORM position, +9.5 VDC is supplied to the transmitter circuitry and the transmitter can be keyed from any of the several Push-To-Talk inputs.

## Transmitter Push-To-Talk

All three of the Push-To-Talk (PTT) inputs that key the transmitter are active low ( $< +2$  VDC). One PTT input is on the front panel microphone connector. The other two PTT inputs: PTT WTO (PTT with Time-Out-Timer) and PTT NTO (PTT No Time-Out-Timer) are on the backplane connector of the transmitter board. If required, the microphone's PTT input can be configured to activate the transmitter's Time-Out-Timer (TOT). An isolated PTT input can be made available by installing an optional relay (RELAY1) and configuring jumpers J1 to J4 so that the relay controls the PTT circuitry.

### Microphone PTT

Jumper J1 on the Front Panel Board configures the microphone's PTT input (MIC PTT) to either bypass or activate the transmitter's TOT. Installing surface mount jumper J1 in the 'X' position (default) selects the MIC PTT NTO line, which bypasses the TOT. Installing surface mount jumper J1 to the 'Y' position selects the MIC PTT WTO line, which activates the transmitter's TOT. When SW1 is in the KEYED position, the MIC PTT NTO line is automatically grounded.

### PTT With Time-Out-Timer

Pins B10 and Z10 of the backplane connector are the PTT WTO input. When the PTT WTO signal, which is normally high, falls below +2.0 VDC, the transmitter is keyed. The transmitter is disabled when the PTT WTO input rises above +2.3 VDC or if the TOT's time-out period is exceeded. If the time-out period is exceeded, the PTT WTO input must go high ( $> +2.3$  VDC) and then low again in order to re-key the transmitter.

The PTT WTO threshold of approximately +2 VDC (0.3 VDC hysteresis) is set by U1a, R1, R2, R3, R4, R9 and R10 while diodes D1 and D2 provide over-voltage protection for U1a. The PTT WTO signal output from U1a is 'AND'ed with the MIC PTT WTO by U2a. When either the PTT WTO or the MIC PTT WTO is activated, the output of U2a goes low, which triggers the transmitter's TOT located on the FM Audio Processor. The TOT's output is 'AND'ed with the MIC PTT NTO signal (U2c) and the PTT NTO signal (U2d).

When any one of the preceding three signals (TOT's output, MIC PTT NTO, PTT NTO) go low, the transmitter is activated by transistors Q1 to Q7 which switch power to the various modules.

### PTT No Time-Out-Timer

Pins B14 and Z14 of the backplane connector are the PTT NTO input. When the PTT NTO signal, which is normally high, falls below +2.0 VDC, the transmitter is keyed. As long as the PTT NTO signal remains below +2.0 VDC, the transmitter will remain keyed. The transmitter is disabled when the PTT NTO signal rises above +2.3 VDC.

The PTT NTO threshold of approximately +2 VDC (0.3 VDC hysteresis) is set by U1b, R5, R6, R7, R8, R9 and R10 while diodes D3 and D4 provide over-voltage protection for U1b. The PTT NTO signal is 'AND'ed with the output of U2c (MIC PTT NTO signal 'AND'ed with the TOT output) by U2d. When the output of U2d goes low, transistors Q1 to Q7 activate the transmitter, which switch power to the various modules.

### PTT Relay

The transmitter's PTT circuitry can be completely isolated by installing RELAY1. Jumpers J1 to J5 configure the relay to provide an isolated PTT input for either the PTT WTO line or PTT NTO line. Energizing the relay enables the isolated PTT input. The transmitter board will accept any of the Aromat TF2E line relays. These relays are DPDT, single side stable, and have coil voltages ranging from +3 VDC to +48 VDC. Only one set of relay contacts is used to activate the PTT circuitry.

To configure the isolated input for PTT WTO operation, jumpers J2, J3 and J4 must be in the 'Y' position. In this mode, pins B10 and Z10 no longer function as the PTT WTO input; however, pins B14 and Z14 continue to function as the normal PTT NTO input.

To configure the isolated input for PTT NTO operation, jumpers J2, J3 and J4 must be in the 'X' position. In this mode, pins B14 and Z14 no longer function as the PTT NTO input; however, pins B10 and Z10 continue to function as the normal PTT WTO input.

## PTT Output

Pin B24 on the backplane connector is an open drain output (Q9), which is pulled low anytime the transmitter is keyed and the synthesizer is locked. An N-channel MOSFET Q9 is capable of sinking currents up to two amps and is activated by Q8, which is activated by the Qualified PTT signal (JS2-6) of the synthesizer module. The Qualified PTT signal also controls the LED ENA line for diode D1 on the front panel board and enable line for the MT-3 Amplifier Module (JP1-1).

## PTT Voltage Switching

The PTT voltage switching circuitry is comprised of transistors Q1 through Q7 and the associated resistors. The base of Q1 is driven by the output of U2d, which is the combined PTT signal from all of the PTT inputs. When the transmitter is keyed, Q1 is turned off and subsequently transistors Q3, Q4 and Q6 are turned on.

Transistors Q3, Q4 and Q6 provide three separate functions:

---

**Q3** Provides the active low signal for the synthesizer module PTT input.

---

**Q4** Turns on Q5, which turns on the +9.5 VDC Switched supply.

---

**Q6** Turns on Q7, which turns on the +9.5 VDC PTT Switched supply.

---

The +9.5 VDC Switched supply (Q5) can also be activated by installing jumper J6 or by externally grounding the TX Standby Line (pins B12 and Z12). The +9.5 VDC PTT Switched supply and the +9.5 VDC Switched supply both provide +9.5 VDC but, depending on how jumpers J6, J7 and J18 are configured, the transmitter's standby mode will change.

## Front Panel Board

The Front Panel Board is attached to the MT-3 FM Transmitter Mainboard and is used to mount the front panel switch, diode and microphone connector. The main purpose of the board is to eliminate a wiring harness for the front panel components. Jumper J1, located on the rear of the circuit board, is used to select whether or not the MIC PTT line activates the transmitter's TOT. Jumper J2 is used to select whether or not RX Audio or 13.8 Volt is supplied to Pin 4 of the microphone.

|    |            |                                                   |
|----|------------|---------------------------------------------------|
| J1 | X position | MIC PTT NTO – no time-out-timer (factory setting) |
|    | Y position | MIC PTT WTO with time-out-timer                   |
| J2 | X position | RX Audio enabled to MIC-4 pin (factory setting)   |
|    | Y position | +13.8 Volts supplied to MIC-4 pin                 |

## Transmitter Standby Modes

The MT-3 series transmitters have eight different standby modes that trade off standby current consumption for start-up speed.

Three jumpers are found on the transmitter mainboard:

---

J6      Continuously enables the +9.5 VDC switched supply.

---

J7      Selects the power source for the FM Audio Processor.

---

J18     Selects the enable line for the Synthesizer module.

---

Additionally, there is a jumper on the FM Audio Processor Board:

JU36   Determines the power source for the dual compression amplifiers.

If JU36 is not installed on the FM Audio Processor, both microphone and balanced audio compression amplifiers will be disabled, eliminating the use of the front panel microphone jack for local microphone operations. With this configuration, the balanced audio is routed around the compression circuitry via JU11 (installed) with JU1 and JU2 removed.

---

## Mode Condition Table

| Mode # | J6  | J7 | J18 | Synthesizer/<br>Osc. State | Audio Processor State<br>(8 V Switched) | Audio Processor<br>Compression JU36 |
|--------|-----|----|-----|----------------------------|-----------------------------------------|-------------------------------------|
| 1a     | OUT | Y  | Y   | PTT Switched               | PTT Switched                            | Switched +8.0 V (X)                 |
| 1b     | OUT | Y  | Y   | PTT Switched               | PTT Switched                            | Continuous 9.5 V (Y)                |
| 1c     | OUT | Y  | Y   | PTT Switched               | PTT Switched                            | Disabled (Not Installed)            |
| 2a     | IN  | Y  | X   | Always Enabled             | PTT Switched                            | Switched +8.0 V (X)                 |
| 2b     | IN  | Y  | X   | Always Enabled             | PTT Switched                            | Continuous 9.5 V (Y)                |
| 2c     | IN  | Y  | X   | Always Enabled             | PTT Switched                            | Disabled (Not Installed)            |
| 3      | IN  | X  | Y   | PTT Switched               | Always Enabled                          | Doesn't Matter                      |
| 4      | IN  | X  | X   | Always Enabled             | Always Enabled                          | Doesn't Matter                      |

The actual current and start-up time depend on the oscillator source and amplifier module. The current and start-up times given below are representative values intended only as guidelines. For further information, refer to the appropriate modular instruction manuals for specific oscillator and amplifier types.

Standby Mode Selection Table

| Mode # | Standby Current | Turn-on Time |
|--------|-----------------|--------------|
| 1a     | 14 mA           | 150 mS       |
| 1b     | 21 mA           | 10 mS        |
| 1c     | 14 mA           | 10 mS        |
| 2a     | 166 mA          | 150 mS       |
| 2b     | 173 mA          | 10 mS        |
| 2c     | 167 mA          | 10 mS        |
| 3      | 29 mA           | 10 mS        |
| 4      | 181 mA          | 10 mS        |

**NOTE:** Standby Current is the total current drawn by the synthesizer and FM Audio Processor from the +9.5 VDC supply.

FM Audio Processor Total Current Consumption

| Compression Configuration                       | Audio Processor Current Draw Keyed / Unkeyed |
|-------------------------------------------------|----------------------------------------------|
| Compression enabled (JU36 X)                    | 15 mA / 0.45 mA                              |
| Compression and microphone disabled (JU36 Open) | 9.2 mA / 0.45 mA                             |
| Compression enabled (JU36 Y)                    | 15 mA / 9.2 mA                               |

## Audio Circuits

The FM Audio Processor performs audio signal conditioning (e.g., limiting, filtering and pre-emphasis). The transmitter mainboard routes the audio lines from the backplane connector to the audio processor and then to the synthesizer.

The audio lines routed to the audio processor are two subtone inputs (backplane pins B22 and Z24), a direct modulation input (pin Z28), a squelched / flat audio input (pin Z20), a 600  $\Omega$  balanced input (pins B18 and Z18), and an audio control line (pin Z22). The audio processor's balanced input pins are isolated from pins B18 and Z18 by a transformer (T1).

Two audio outputs from the FM Audio Processor are routed to the synthesizer modules.

## Microphone Audio

Normally the microphone audio is sent from the attached transmitter, however the MIC IN and MIC OUT lines can be configured on the transmitter mainboard such that the microphone audio modulates a different transmitter. The configuration of the MIC IN (pin Z4) and MIC OUT (pin B4) lines on the MT-3 FM Transmitter Mainboard are controlled by jumpers J16 and J17 respectively. Jumper J16 selects the audio source for the FM Audio Processor's microphone input. Jumper J17 is used to enable or disable the MIC OUT line. Normally the transmitter's microphone is selected (J16 in the X position) and the MIC OUT line is enabled (J17 is installed).

## Received Audio

Pin B20 is the audio input from the transmitter's corresponding receiver. The default setting for this line is to have it AC coupled (Jumper J9 is out) and directly connected to the front panel board RX AUDIO line.

## Channel Selection

### Synthesized Transmitter

Seven backplane connections are used to communicate with the synthesizer unit. Pins D28, D30 and D32 are used (in house) to program the synthesizer. Channel select lines CSEL 0 (least significant bit) through CSEL 3 (most significant bit), which are available at pins D20, D22, D24 and D26, are used once the synthesizer is programmed to select one of 16 channels. If the channel select lines are all low (Channel 1) the channel for the synthesizer is read from switches FSW1 (most significant), FSW2, FSW3 and FSW4 (least significant); otherwise one of 15 pre-programmed frequencies is selected. Refer to the channel designation tables (manual IM20-VT3H040CT) to set the operating frequency.

## Amplifier Circuits

The MT-3 series Amplifier has six connections that are cabled to the transmitter board:

- +13.8 VDC
- +9.5 VDC
- Enable
- Forward Power Sense
- Reverse Power Sense
- Ground

The +13.8 VDC supply (JP1-3) is always on while the +9.5 VDC supply (JP1-2) is always switched by a PTT signal. The enable line (JP1-1) is active low and is controlled by the Qualified PTT signal from the synthesizer module.

Jumpers J12, J13, J14 and J15 are used to configure the amplifier's forward and reverse power sense lines (JP1-4 and JP1-5). Normally jumpers J13, J14 and J15 are in the X position, which directly connects the amplifier's forward and reverse power sense lines to the backplane connector (pins B26 and Z26 respectively).

The forward and reverse power sense lines from the amplifier can be open collector or linear outputs depending on how they are configured in the amplifier module. In open collector configuration, the lines are active low, that is, the output will go low when a "fail" condition is detected. If both lines from the amplifier module are configured as open collector outputs, the power sense lines can be 'OR'ed together to make a general fail indicator (jumper J12 in, jumpers J13, J14 and J15 in the Y position).

The Fail Indicator is also an open collector output; however, the Fail Indicator is active high (the output goes high when a "fail" condition is detected). When the transmitter is configured with the general fail indicator option, pin Z26 (VSWR reverse) is not used and pin B26 becomes the Fail Indicator output.

## Time-Out-Timer Circuitry

The MT-3 FM Transmitter also has an associated programmable push-to-talk (PTT) time-out-timer (TOT) circuitry on the transmitter mainboard. The TOT circuitry is powered via J34 from the continuous +9.5 VDC supply and is programmable for various time-out periods.

The TOT input trigger (enabled by J33) is normally high and in this state the timer is disabled. When the input trigger level falls below +2.0 VDC, the timer is activated, the TOT output trigger (enabled by J35) is pulled low and the transmitter is keyed. If the input trigger rises above +2.4 VDC or if the time-out period is exceeded, the output trigger will go high, disabling the transmitter. If the time-out period is exceeded, the TOT input trigger must go high and then low again in order to re-key the transmitter.

The time-out duration is jumper selectable from 1 second to 8 hours (see Table 1). The positions of the jumpers are on the top (through-hole component) side of the transmitter mainboard.

TABLE 1: Time-out Jumper Settings and Duration

| J32        | J31      | J29      | J28        | J26      | J27        | Minutes    |
|------------|----------|----------|------------|----------|------------|------------|
| I          | I        | I        | I          | I        | I          | 0.01       |
| I          | I        | I        | I          | I        | N/I        | 0.01       |
| I          | I        | I        | I          | N/I      | I          | 0.01       |
| I          | I        | I        | N/I        | I        | I          | 0.01       |
| I          | I        | I        | N/I        | I        | N/I        | 0.02       |
| I          | I        | N/I      | I          | I        | I          | 0.02       |
| I          | I        | I        | N/I        | N/I      | I          | 0.03       |
| I          | I        | N/I      | I          | I        | N/I        | 0.04       |
| I          | I        | N/I      | N/I        | I        | I          | 0.05       |
| I          | I        | N/I      | I          | N/I      | I          | 0.06       |
| I          | I        | N/I      | N/I        | I        | N/I        | 0.08       |
| I          | N/I      | I        | I          | I        | I          | 0.10       |
| I          | I        | N/I      | N/I        | N/I      | I          | 0.12       |
| I          | N/I      | I        | I          | I        | N/I        | 0.15       |
| I          | N/I      | I        | N/I        | I        | I          | 0.19       |
| I          | N/I      | I        | I          | N/I      | I          | 0.23       |
| I          | N/I      | I        | N/I        | I        | N/I        | 0.31       |
| I          | N/I      | N/I      | I          | I        | I          | 0.38       |
| I          | N/I      | I        | N/I        | N/I      | I          | 0.47       |
| I          | N/I      | N/I      | I          | I        | N/I        | 0.62       |
| I          | N/I      | N/I      | N/I        | I        | I          | 0.75       |
| I          | N/I      | N/I      | I          | N/I      | I          | 0.94       |
| I          | N/I      | N/I      | N/I        | I        | N/I        | 1.25       |
| N/I        | I        | I        | I          | I        | I          | 1.5        |
| I          | N/I      | N/I      | N/I        | N/I      | I          | 1.88       |
| N/I        | I        | I        | I          | I        | N/I        | 2.5        |
| N/I        | I        | I        | N/I        | I        | I          | 3.0        |
| N/I        | I        | I        | I          | N/I      | I          | 3.75       |
| <b>N/I</b> | <b>I</b> | <b>I</b> | <b>N/I</b> | <b>I</b> | <b>N/I</b> | <b>5.0</b> |
| N/I        | I        | N/I      | I          | I        | I          | 6.0        |
| N/I        | I        | I        | N/I        | N/I      | I          | 7.5        |
| N/I        | I        | N/I      | I          | I        | N/I        | 10         |
| N/I        | I        | N/I      | N/I        | I        | I          | 12         |
| N/I        | I        | N/I      | I          | N/I      | I          | 15         |
| N/I        | I        | N/I      | N/I        | I        | N/I        | 20         |
| N/I        | N/I      | I        | I          | I        | I          | 24         |
| N/I        | I        | N/I      | N/I        | N/I      | I          | 30         |
| N/I        | N/I      | I        | I          | I        | N/I        | 40         |
| N/I        | N/I      | I        | N/I        | I        | I          | 48         |
| N/I        | N/I      | I        | I          | N/I      | I          | 60         |
| N/I        | N/I      | I        | N/I        | I        | N/I        | 80         |
| N/I        | N/I      | N/I      | I          | I        | I          | 96         |
| N/I        | N/I      | I        | N/I        | N/I      | I          | 120        |
| N/I        | N/I      | N/I      | I          | I        | N/I        | 160        |
| N/I        | N/I      | N/I      | N/I        | I        | I          | 192        |
| N/I        | N/I      | N/I      | I          | N/I      | I          | 240        |
| N/I        | N/I      | N/I      | N/I        | I        | N/I        | 320        |
| N/I        | N/I      | N/I      | N/I        | N/I      | I          | 480        |

N/I = Not Installed

I = Installed

**Bold** text represents default settings.

## FM AUDIO PROCESSOR

### Introduction

The FM Audio Processor is a versatile circuit board that can provide several types of audio processing for voice or data transmission (see Figure 1).

### Bandwidth Table

| Term           | Channel Spacing  | Rated System Deviation |
|----------------|------------------|------------------------|
| Wide band (WB) | 25 kHz or 30 kHz | ±5.00 kHz              |

### Features include:

- Automatic level control using a compression amplifier with a 25 dB dynamic range
- Limiter and splatter filter that removes noise and harmonics
- Selectable pre-emphasis or flat audio response
- Temperature compensated audio output
- Ability to transmit data and voice switched by a single control line
- Multiple jumpers that can be configured to allow maximum flexibility in routing signals from inputs to outputs and disabling selected circuits to reduce operating current
- Dual microphone and balanced audio compression circuits
- On-board multi-configurable temperature compensation to correct for changes in transmitter deviation over temperature caused by changing characteristics of synthesizers and oscillators

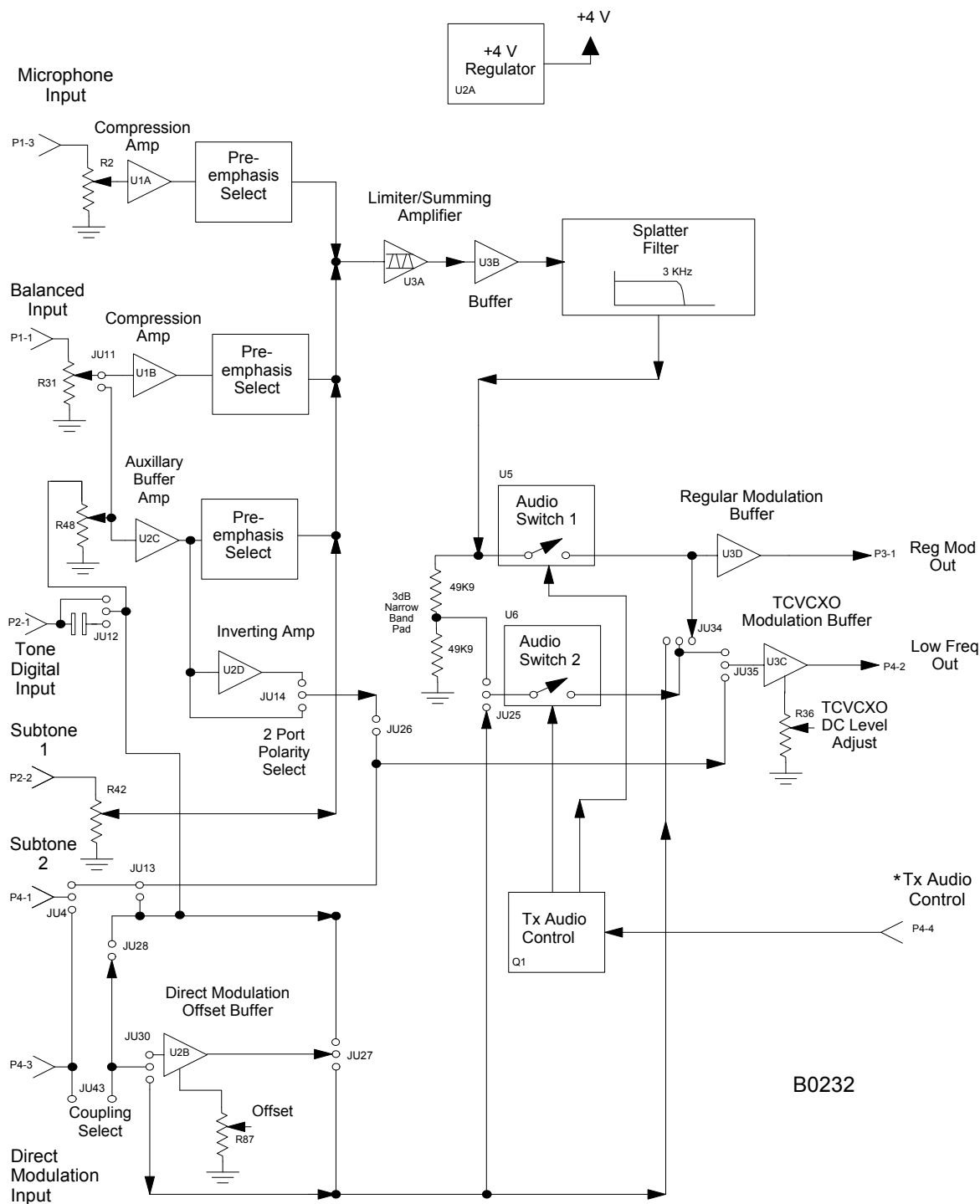
- A single chip 10<sup>th</sup> Order Linear Phase Low Pass Splatter Filter for increased cut-off attenuation responses
- Separate voice and direct modulation outputs, each individually configurable
- Direct modulation input for LTR®, DCS, paging and other digital modulations that require very low frequency modulation to the synthesizer module
- Multiple audio inputs for various audio filter or modulation configurations

**NOTE:** If dual mode CTCSS and LTR® / DCS is desired in the same transmitter, it may be possible with dual port modulation synthesizers. It is not feasible with single port modulation synthesizers. These synthesizers are characterized by the lack of a modulation port in their VCO circuit. Contact the Daniels factory for further details.

A continuous +9.5 VDC supply and a switched +8.0 VDC supply are required to power the module which is normally supplied by the transmitter mainboard.

The FM Audio Processor's balanced input pins are isolated by a transformer (T1) on the transmitter mainboard. Two audio outputs from the FM Audio Processor are routed to the synthesizer module.

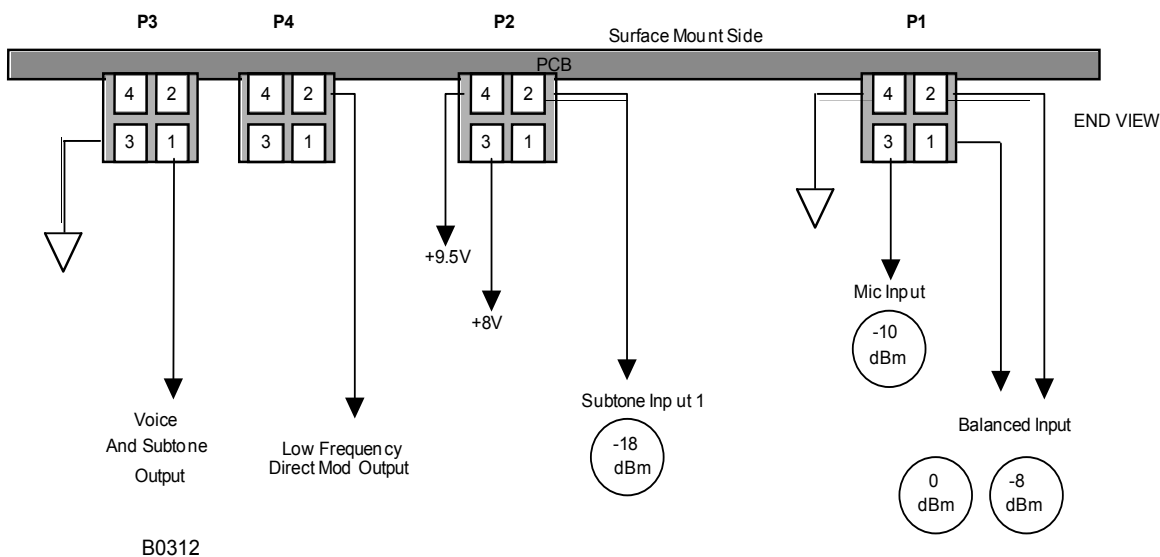
## FM Audio Processor Block Diagram



B0232

FIGURE 1

For the interconnections and functions of the FM Audio Processor external connections, see Figure 2. Connectors P1, P2, P3, and P4 are four-pin audio processor headers soldered directly to the transmitter mainboard. For troubleshooting isolation, the audio processor could be unsoldered from the mainboard and analyzed. Power and I/O connections, as well as their expected levels, are shown in this diagram.



Interconnection Pin Layout Diagram

FIGURE 2

## Factory Configuration

The FM Audio Processor is factory configured as follows:

| Parameter              | Specification                                                                                                                                                                                       |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Maximum Deviation      | ±5.0 kHz                                                                                                                                                                                            |
| Microphone Input       | <ul style="list-style-type: none"> <li>1 kHz signal at -10 dBm gives ±60% rated system deviation</li> <li>1 kHz signal compression set at ±84% rated system deviation</li> </ul>                    |
| Audio Balanced Input   | <ul style="list-style-type: none"> <li>1 kHz tone at -8 dBm gives pre-emphasis response ±60% rated system deviation</li> <li>1 kHz signal compression set at ±84% rated system deviation</li> </ul> |
| Subtone Input 1        | 100 Hz tone at -18 dBm gives ±500 Hz                                                                                                                                                                |
| All Other Audio Inputs | Disabled                                                                                                                                                                                            |

## Turn on Time

| Mode                           | Turn-on Time  | Audio Processor Standby Current |
|--------------------------------|---------------|---------------------------------|
| Fast turn on – higher current  | Approx 1 mS   | 15 mA                           |
| Current save – slower response | Approx 150 mS | 450 $\mu$ A                     |

## Turn-on Time

Turn-on Time is the time it takes the FM Audio Processor to output a stable audio signal to P3-1 once the +8.0 VDC power is enabled. The turn-on time can be virtually eliminated by configuring the audio processor for continuous audio standby; however, this results in increased current consumption. Powering of the compression amplifier contributes to most of the time delay, so transmitters configured with the compression amplifier disabled (for data or non-compressed audio) will exhibit the fast turn-on time. The response measurement is made with the standard factory settings with a 1 kHz tone applied to the balanced input.

## Low Frequency Modulation

The transmitter has an additional option to address low frequency user modulation requirements. A phase modulated bandwidth from 0 (DC) to 100 Hz (PLL loop filter bandwidth) allows specialized applications such as paging or trunking where a separate low frequency digital / analog modulation channel is required. Low Frequency Modulation allows external access to the low frequency modulation capabilities of the synthesizer module. The DIRECT MODULATION inputs on the J1 control connector of the MT-3 Motherboard will be used (B20 for TX A, and A20 for TX B).

## FM Audio Processor Signals

The FM Audio Processor has six audio inputs, two audio outputs and one audio control input. Five of the audio inputs are used primarily for voice and tone signals. The sixth, the Direct Modulation Input, is used primarily for data signals. The audio control input is used to switch audio outputs so the transmitter can transmit voice or data.

The audio inputs on the audio processor are:

- Dynamic microphone input
- 600  $\Omega$  balanced input
- Subtone inputs
- Auxiliary input
- Direct modulation input for data signals

## FM Audio Processor Outputs

Both the audio outputs, Modulation Output (P3-1) and Low Frequency / Direct Modulation Output (P4-2), are gated by audio switches U5 and U6 respectively which are controlled by the Transmit Audio Control Input (P4-4). The audio switches can be operated complimentary to each other so that only one source modulates the transmitter. In standard configuration, the Modulation Output port is used so switch U5 is always on.

### FM Audio Processor Modulation Outputs

The Modulation Output port is used by all voice input signals. The voice inputs are passed to U1A and U1B, a dual programmable compressor-expander that is configured as an automatic level control amplifier. Op-Amp U3A provides the limiting action for the audio processor.

After the audio signals have been combined, limited and buffered, they are filtered by a 10th order Linear Phase Low Pass Filter (U4). The output signal from the filter is then level adjusted by the deviation control pot, R29, at the input of buffer amplifier U3D. In special applications, jumper JU6 can be disabled and JU7 enabled allowing the transmitter to be modulated directly from the auxiliary input. External filtering may be required since jumper JU7 bypasses the limiting and filter circuits.

The Low Frequency / Direct Modulation Output port has two functions depending on whether the transmitter is synthesized. In a synthesized transmitter, this port is used to modulate the synthesizer reference frequency. The frequency response of this port is typically DC to 300 Hz.

### FM Audio Processor Microphone Input

The microphone input has an automatically level controlled (ALC) pre-amplifier U1 whose input level is controlled by R2. The microphone input level control (R2) can accommodate a -25 dBm to 0 dBm input signal. The microphone input is limited and filtered and is output at the standard modulation output port. The microphone input can have a standard 6 dB/octave pre-emphasis response or a flat-audio response, jumper JU1 at Y and X position respectively.

### FM Audio Processor Balanced Input

The 600  $\Omega$  balanced input uses the ALC pre-amplifier U1B with input level control pot (R31). The balanced input level control can accommodate a -25 dBm to 0 dBm input. (Install JU17 when using the lower input levels). Like the microphone input, the balanced input is limited and filtered and is output at the standard modulation output port.

If no compression is required (i.e., customer is providing their own), JU11 can be enabled providing a path through R48 (Auxiliary Input Level Control) to amplifier U2C where pre-emphasis or flat audio can then be selected from its output.

### FM Audio Processor Auxiliary Input

The auxiliary input is a special input and does not have an ALC. This input can be configured for a pre-emphasis response (enable JU9 Y) or a flat-audio response (enable JU9 X). The level for this input is set by R48. The auxiliary output is normally summed with the voice signals by Op-Amp U3A, limited, then filtered and output at the standard modulation output port. The value of R57 (Select) can be tailored for specific applications.

When jumper JU6 is disabled and jumper JU7 is enabled, the auxiliary input can be used to directly modulate the transmitter. Care should be taken when directly modulating the transmitter with the auxiliary input because the MT-3 transmitters use direct FM modulation and there is no filtering or limiting action provided by the auxiliary input. The input level to the auxiliary input should be -18 dBm and can be driven by one of three inputs:

- 
- balanced input – JU11
- 
- tone / digital input – JU12 X or Y enabled
- 
- direct modulation input – through JU28
- 

When the 600  $\Omega$  balanced input is connected to the auxiliary input, the balanced input level control can be used to adjust the level for the auxiliary input.

### FM Audio Processor Subtone Inputs

There are two subtone inputs available on the FM Audio Processor. Both subtone inputs can be individually configured to be output from the standard Modulation Output port or to be output from the Low Frequency / Direct Modulation Output. In standard configuration, Subtone 1 is summed with the voice signals to be output from the standard Modulation Output port while Subtone 2 is used for DCS. Both subtone inputs have an input level control.

In order to maintain a uniform frequency response from 50 Hz to 300 Hz, dual-port modulation techniques are used. Refer to the schematic diagrams and alignment procedures included in this manual.

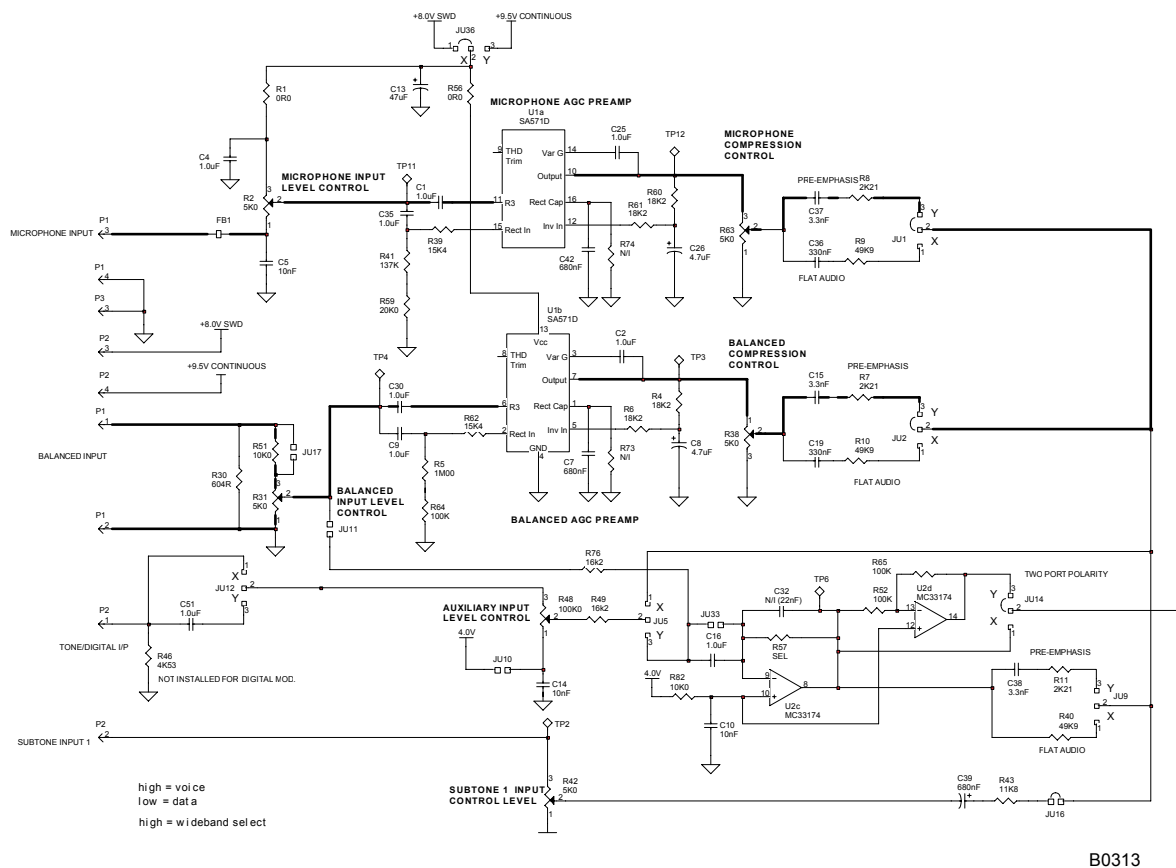
### Direct Modulation Input

The Direct Modulation Input is an extremely versatile input. This port is designed to be used for data signals. Depending on the application, the signal can be amplified, AC or DC coupled and output to the Modulation Output or the Low Frequency / Direct Modulation Output port. Please consult the factory for specific jumper settings for your application.

## FM Audio Processor Signal Paths

Voice band audio normally enters the Balanced Input at P1-1 and P1-2 on the subrack connector while microphone audio enters at P1-3. Potentiometer R31 sets the balanced compression level of U1B while R2 sets the microphone compression level of U1A (see Figure 3).

Each amplifier has a dynamic range of 25 dB. Jumper JU17 is only installed when using very low input levels (-18 to -25 dBm) and allows better tuning range for R31. The output of the compression amplifiers are normally set for pre-emphasis (6 dB/Octave) but can be set for a flat audio response using jumpers JU1 and JU2.



B0313

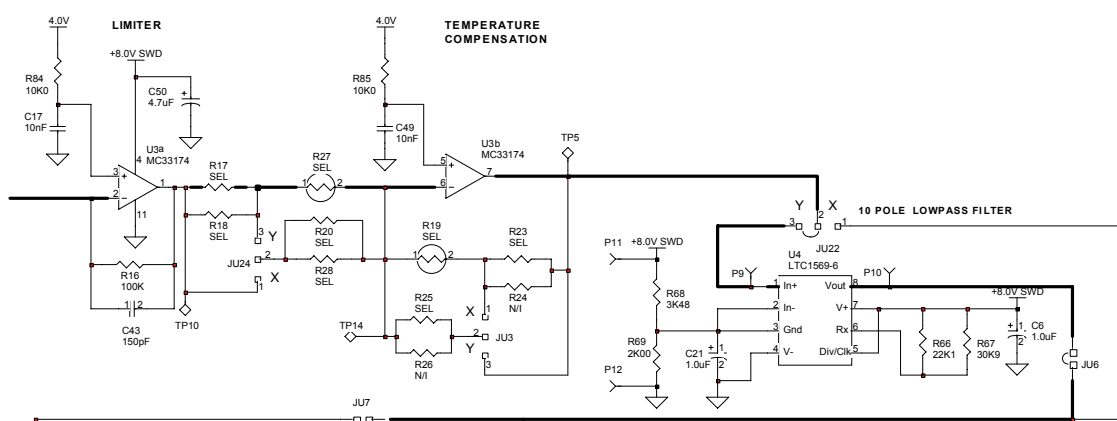
Microphone and Balanced Input Circuitry

FIGURE 3

The microphone and balanced audio signals are summed and limited by U3A. Op-Amp U3B provides audio level temperature compensation (for synthesizer sensitivity variations). Due to the many different characteristics of various synthesizers, many components are selected for best performance over the temperature range.

The audio is then filtered by a 10th order linear phase low pass splatter filter U3a and U3B (see Figure 4). This is to provide the linearity and cut-off attenuation response required for narrow band operation and digital applications.

The filter output level is set by R29, the deviation control. From this point, the signal goes to U5 a bilateral audio switch. U5 is normally configured to be always on. The output of U5 goes to the final buffer amplifier U3D. Installing JU23 lowers the audio level by one half facilitating a quick conversion of a wide band transmitter for narrow band operation. The output of U3D has many capacitors with values selected depending on the installed synthesizer module type.



B0314

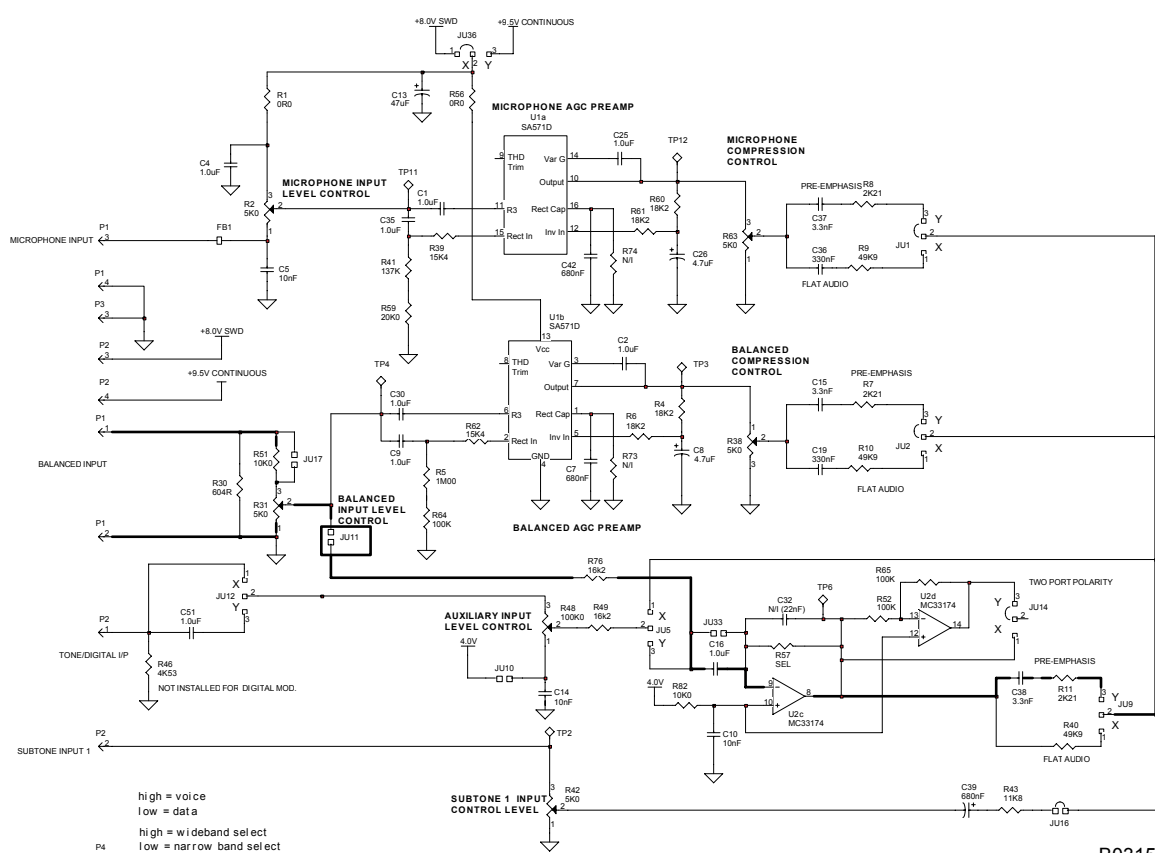
Limiter and Splatter Filter

FIGURE 4

If no compression circuitry is required, the balanced input signals can be routed around the compression circuitry using jumper JU11. Op-Amp U2C then provides buffering and amplification. Pre-emphasis filtering at the output is enabled or disabled using jumper JU9. The audio signal is then normally routed to U3A, the summing amplifier / limiter and processed as indicated previously.

**NOTE:** If compression is bypassed (see Figure 5), the THD may be higher due to the reduced dynamic input range causing more clipping. "Key down" current consumption can be reduced by 9 mA by disconnecting the compression amplifier power (removing JU36), however, the microphone circuit will be disabled.

Assuming no data modulation, a second way to route around audio compression is via the direct modulation port P4-3 and route through JU28 to R48 and Op-Amp U2C. Sub-audible tones enter at P2-2 where level is controlled by R42. A single jumper JU16 enables the audio path to U3A, the summing amplifier / limiter.



B0315

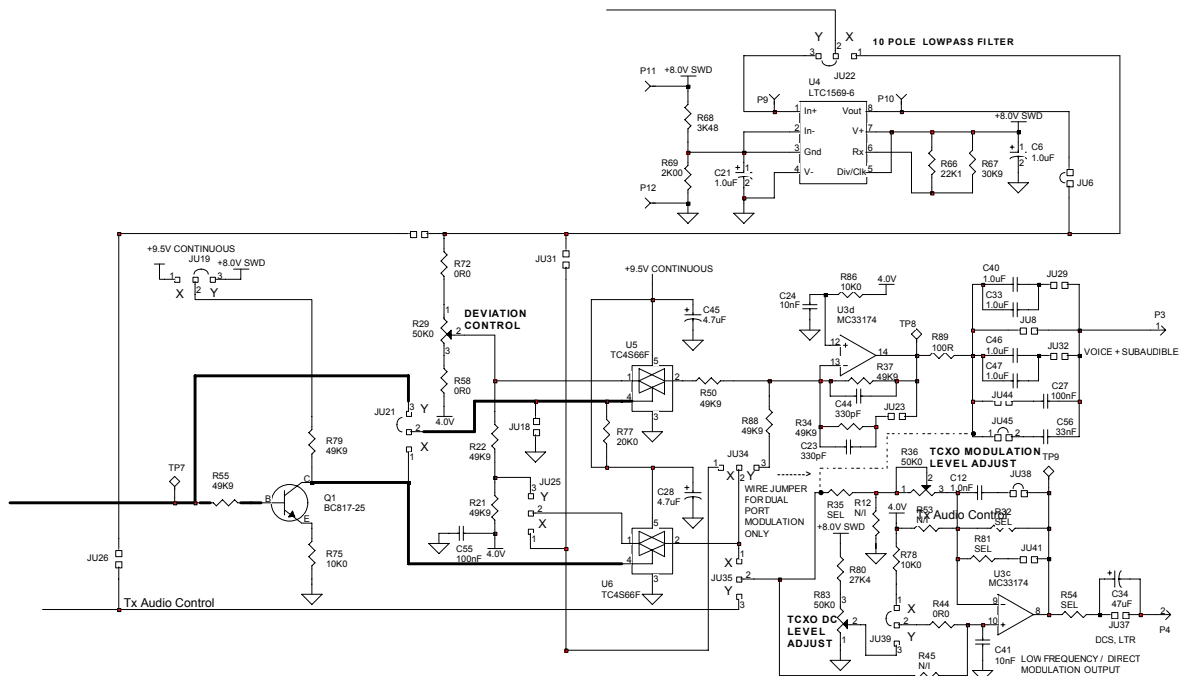
Bypassing Compression

FIGURE 5

Voltage regulator U2A provides a regulated +4.0 VDC to all Op-Amp stages. Optional potentiometer R14 can be installed (and JU15 removed) for special applications where a voltage other than +4.0 VDC is required.

Data normally enters at P4-3, the Direct Modulation Input, and is connected via many possible routes selected with jumpers. JU43 allows direct or on-board capacitor coupling. Op-Amp U2B can be configured as a buffer with a DC offset to accommodate input data that has a positive DC voltage offset. The data signals can be sent to gain buffers U2C and U2D through potentiometer R48. Jumper JU14 is normally installed so that the output from U2D provides the correct data polarity when using two-port modulation. See Figure 6.

A single TX Audio control line on P4-4 has 2 functions. It can be configured to switch U3D inputs between data and voice. Alternately, it can be configured to remotely switch between wide band and narrow band applications by switching between the regular audio path and one carrying half the audio level as determined by resistive divider comprised of R22 and R21.



B0316

TX Audio Control Circuitry

FIGURE 6





## TRANSMITTER ALIGNMENT

### REPAIR NOTE

MT-3 FM Transmitter modules are mainly made up of surface mount devices which should not be removed or replaced using an ordinary soldering iron. Removal and replacement of surface mount components should be performed only with specifically designed surface mount rework and repair stations complete with Electrostatic Discharge (ESD) Protection.

When removing Surface Mount Solder Jumpers, it is recommended to use solder braid in place of manual vacuum type desoldering tools. This will help prevent damage to the circuit boards.

## RECOMMENDED TEST EQUIPMENT LIST

Alignment of the complete transmitter requires the following test equipment or its equivalent. It is assumed that any adjustment of the transmitter mainboard will also involve the other modules.

|                                |                                                                                  |
|--------------------------------|----------------------------------------------------------------------------------|
| Dual Power Supply:             | Regulated +9.5 VDC at 2 A (e.g., Topward TPS-4000)<br>Regulated +13.8 VDC at 2 A |
| Oscilloscope:                  | 20 MHz or better (e.g., Fluke 97 Scopemeter)                                     |
| Digital Multimeter:            | For DC, RMS AC voltage and current (e.g., Fluke 75)                              |
| Radio Communications Test Set: | E.g., Marconi Instruments 2955R                                                  |
| VSWR 3:1 Mismatch Load:        | E.g., JFW 50T-035-3.0:1                                                          |
| Alignment Tool:                | Johanson 4192                                                                    |
| Audio Signal Generator:        | 600 $\Omega$ output impedance, 67 Hz to 5 kHz range                              |

It is recommended that the radio communications test set be frequency-locked to an external reference (WWVH, GPS, Loran C) so that the high stability oscillator may be accurately set to within its  $\pm 1$  ppm frequency tolerance.

## GENERAL INFORMATION

Before proceeding with the transmitter alignment, check that the appropriate jumpers are installed. See Standard Factory Settings and Jumper Configuration section.

Transmitter alignment is simplified by using a MT-3 Subrack, SM-3 System Regulator and RF extender cable to provide transmitter power and signal interconnection. Alternatively, connect power and audio to the subrack connector as follows:

| Subrack Connector P1 Pin    |                    |
|-----------------------------|--------------------|
| +9.5 VDC                    | B6, Z6             |
| +13.8 VDC                   | B2, Z2             |
| Ground                      | B30, Z30, B32, Z32 |
| 600 $\Omega$ Balanced Audio | Across B18 and Z18 |

## SYNTHESIZER MODULE INSTALLATION AND REMOVAL

To remove the Synthesizer module, simply remove the centre screw from the module lid and pull the module out. The module should be pulled straight out so that the four alignment pins do not bend or damage the circuit board.

Installation of the synthesizer module is facilitated by alignment pins on each corner of the module. When the four pins are aligned with their corresponding hole in the transmitter mainboard, push the module down, ensuring that the connector pins on the bottom of the synthesizer module are not bent.

## STANDARD FACTORY SETTINGS AND JUMPER CONFIGURATIONS

The standard jumper configuration for the transmitter mainboard is normally employed for transmitter alignment. In a standard configuration, the only alignment required on the MT-3 FM Transmitter Mainboard for a synthesized transmitter is to set the frequency switches (FSW1, FSW2, FSW3 and FSW4) for the desired channel frequency. FSW1 is the most significant digit of the frequency switches. The switch settings for the desired channel frequency can be found in the channel designation tables (IM20-VT3H040CT).

### MT-3 FM Transmitter Mainboard Jumpers

| Jumper | Default Position | Description                                                |
|--------|------------------|------------------------------------------------------------|
| J2     | X                | Optional relay configuration                               |
| J3     | X                | Optional relay configuration                               |
| J4     | Y                | Optional relay configuration                               |
| J6     | Not Installed    | Transmitter standby mode select – Mode 1                   |
| J7     | Y                | Audio processor standby mode select                        |
| J9     | Not Installed    | Receiver audio AC/DC input coupling                        |
| J12    | Not Installed    | Amplifier power sense output configuration                 |
| J13    | X                | Amplifier power sense output configuration                 |
| J14    | X                | Amplifier power sense output configuration                 |
| J15    | X                | Amplifier power sense output configuration                 |
| J16    | X                | Microphone configuration                                   |
| J17    | Installed        | Microphone output line                                     |
| J18    | Y                | Synthesizer module standby mode select                     |
| J19    | X                | 600 $\Omega$ audio transformer enable; Y position disables |
| J20    | X                | 600 $\Omega$ audio transformer enable; Y position disables |
| J21    | Not Installed    | +8 VDC audio processor supply bypass                       |
| J22    | X                | 600 $\Omega$ audio transformer enable; Y position disables |
| J23    | X                | 600 $\Omega$ audio transformer enable; Y position disables |
| J24    | Installed        | Subtone #2 output enable                                   |
| J25    | X                | Audio output enable                                        |
| J26    | Installed        | Time-Out-Timer timing resistor select                      |
| J27    | Not Installed    | Time-Out-Timer timing resistor select                      |
| J28    | Not Installed    | Time-Out-Timer timing period output select                 |
| J29    | Installed        | Time-Out-Timer timing period output select                 |
| J31    | Installed        | Time-Out-Timer timing period output select                 |
| J32    | Not Installed    | Time-Out-Timer timing period output select                 |
| J33    | Installed        | Time-Out-Timer input enable                                |
| J34    | Installed        | Time-Out-Timer power enable                                |
| J35    | Installed        | Time-Out-Timer output enable                               |

**NOTE:** Jumpers J1, J5, J8, J10 and J11 designations are not used.

## MT-3 FM Transmitter Mainboard Standard Factory Configuration

The MT-3 FM Transmitter Mainboard is factory-configured as follows:

- Transmitter Standby Mode 1 (lowest standby current consumption)
- Receiver squelched; de-emphasized audio amplifier disabled
- Optional relay installed, but with active ground contact disabled
- Separate amplifier power sense outputs

## MT-3 FM TRANSMITTER MAINBOARD INTERCONNECTION PIN DEFINITIONS

The MT-3 series transmitter employs a 48-pin Eurostandard connector for interfacing to all transmitter power, audio and control functions. Following are the MT-3 series transmitter backplane connections to the MT-3 Motherboard:

| Pin | Name                    | Pin | Name                        | Pin | Name                     |
|-----|-------------------------|-----|-----------------------------|-----|--------------------------|
| D2  | No Connect              | B2  | +13.8 VDC                   | Z2  | +13.8 VDC                |
| D4  | No Connect              | B4  | MIC Out                     | Z4  | MIC In                   |
| D6  | No Connect              | B6  | +9.5 VDC                    | Z6  | +9.5 VDC                 |
| D8  | No Connect              | B8  | Relay Positive              | Z8  | Relay Negative           |
| D10 | No Connect              | B10 | PTT WTO                     | Z10 | PTT WTO                  |
| D12 | No Connect              | B12 | TX Standby                  | Z12 | TX Standby               |
| D14 | No Connect (IMC1)       | B14 | PTT NTO                     | Z14 | PTT NTO                  |
| D16 | No Connect (IMC2)       | B16 | No Connect (MT-2 +9.5 V)    | Z16 | No Connect (MT-2 +9.5 V) |
| D18 | No Connect (IMC3)       | B18 | Balanced Input 2            | Z18 | Balanced Input 1         |
| D20 | Channel Select 0 (LSB)  | B20 | Squelched, De-emph Audio In | Z20 | Squelched, Flat Audio In |
| D22 | Channel Select 1        | B22 | Subtone Input 1             | Z22 | TX Audio Control         |
| D24 | Channel Select 2        | B24 | PTT Output                  | Z24 | Subtone Input 2          |
| D26 | Channel Select 3 (MSB)  | B26 | Forward Power Sense         | Z26 | VSWR Reverse Sense       |
| D28 | Synth TX Data (Output)  | B28 | RX Monitor Out              | Z28 | Direct Mod Input         |
| D30 | Synth Rx Data (Input)   | B30 | Ground                      | Z30 | Ground                   |
| D32 | Synth Bootstrap (Input) | B32 | Ground                      | Z32 | Ground                   |

## FM AUDIO PROCESSOR ALIGNMENT

Prior to commencing the standard deviation adjustment procedure, determine the specific configuration of the transmitter (e.g., flat audio, pre-emphasis).

The following points should be noted:

- 
- If the transmitter's operating frequency is changed beyond the factory recommended bandwidth or if the synthesizer is changed, the FM Audio Processor should be realigned to optimize the transmitter's performance. The settings tolerance is +/- 0.1 kHz.
- 
- There are slight differences when setting up the transmitter for Flat Audio or Pre-emphasized audio. Although the tuning procedure is the same, there will be skipped sections depending on the transmitter type being tested.
- 
- Although the transmitter is most commonly set up for a single frequency operation, there are times when an application requires multiple frequencies per transmitter. This also changes the standard tuning procedure slightly.
- 
- Due to the variations in the circuitry between models of synthesizer, oscillator and audio processor, version specific tuning steps are outlined in italics.
- 
- Section C is not an alignment procedure but is included as a final performance measurement that confirms correct audio processor alignment.
- 

### Multiple Channel Transmitters

In the tuning of the FM Audio Processor for multiple channel transmitters, the procedures on the following pages apply.

---

**NOTE:** The maximum deviation is set on the channel, which gives the maximum deviation when using a 1.8 kHz tone @ +10 dBm. Once that level is set (R29), it is not adjusted again.

---

The rest of the tuning instructions are carried out while the transmitter frequency is set for the channel, which is roughly in the middle of the band of pre-programmed channels.

## Transmitters with Pre-Emphasis and CTCSS Subtone

## Section A: Balanced and Subtone Audio Setup

| Step | Reference                                                                                                                                                              | Action                                                                                                                                                                              | Desired Results                               | Notes                                                       |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------------|
| 1.   | <b>R2</b> (Mic I/P)<br><b>R29</b> (Deviation)<br><b>R31</b> (Balanced)<br><b>R38</b> (Compress)<br><b>R42</b> (Subtone1)<br><b>R63</b> (Mic Comp)<br><b>R36</b> (TCXO) | Turn Fully <b>CW</b> .<br>Turn Fully <b>CW</b> .<br>Turn Fully <b>CW</b> .<br>Turn Fully <b>CW</b> .<br>Turn Fully <b>CW</b> .<br>Turn Fully <b>CW</b> .<br>Turn Fully <b>CCW</b> . | AF Filter: Low Pass<br><b>5 kHz or 15 kHz</b> |                                                             |
| 2.   | Balanced Input<br>P1-1 and P1-2                                                                                                                                        | Set AF tone freq,<br>level and filter.                                                                                                                                              | AF Gen:<br><b>1.8 kHz @ +10 dBm</b>           |                                                             |
| 3.   | <b>R29</b> (Deviation)                                                                                                                                                 | Adjust <b>R29</b> for deviation.<br><b>Do not re-adjust.</b>                                                                                                                        | <b>± 4.4 kHz</b>                              |                                                             |
| 4.   | Subtone 1 input                                                                                                                                                        | Apply tone.                                                                                                                                                                         | AF Gen: <b>1 kHz Tone @ -18 dBm</b>           |                                                             |
| 5.   | <b>R42</b> (Subtone1)                                                                                                                                                  | Adjust and measure.                                                                                                                                                                 | <b>± 500 Hz</b>                               | Deviation Monitor                                           |
| 6.   | OST-3H035-(2-Port)<br>OST-3H045-(2-Port)                                                                                                                               | Change AF Gen. freq.                                                                                                                                                                | AF Gen:<br><b>40 Hz @ -18 dBm</b>             |                                                             |
| 7.   | <b>R36</b> (TCXO)                                                                                                                                                      | Adjust and measure.                                                                                                                                                                 | <b>± 500 Hz</b>                               |                                                             |
| 8.   | Subtone 1 input                                                                                                                                                        | Change AF Gen. freq.                                                                                                                                                                | AF Gen:<br><b>300 Hz @ -18 dBm</b>            |                                                             |
| 9.   | Deviation Monitor                                                                                                                                                      | Should measure.                                                                                                                                                                     | <b>500 Hz</b>                                 | Tolerance on this<br>measurement is <b>± 50Hz</b>           |
| 10.  | Deviation Monitor                                                                                                                                                      | Sweep AF Gen. freq.<br>between <b>67 Hz</b> and<br><b>250 Hz</b> . Measure<br>resultant deviation.                                                                                  | <b>± 300 Hz to 700 Hz</b>                     |                                                             |
| 11.  | Balanced Input<br>P1-1 and P1-2                                                                                                                                        | Change frequency and<br>level.                                                                                                                                                      | AF Gen: <b>1 kHz Tone @<br/>+10 dBm</b>       |                                                             |
| 12.  | <b>R38</b> (Compress)                                                                                                                                                  | Adjust and measure.                                                                                                                                                                 |                                               | Distortion Analyzer<br>AF Filter: <b>15 kHz</b><br>4.0% THD |
| 13.  | AF Gen.                                                                                                                                                                | Change level                                                                                                                                                                        | <b>1 kHz Tone @ -8 dBm</b>                    |                                                             |
| 14.  | <b>R31</b> (Balanced)                                                                                                                                                  | Adjust and measure.                                                                                                                                                                 | <b>± 3 kHz</b>                                | Deviation Monitor                                           |
| 15.  | AF Gen                                                                                                                                                                 | Change level.                                                                                                                                                                       | <b>1 kHz Tone @ -18 dBm</b>                   |                                                             |
| 16.  | <b>R31</b> (Balanced)                                                                                                                                                  | Measure and confirm.                                                                                                                                                                | <b>± 1 kHz</b>                                | Tolerance on this<br>measurement is <b>± 50 Hz</b>          |

## Section B: Microphone Audio Setup

| Step | Reference                             | Action                                 | Desired Results                         | Notes                                                                                                             |
|------|---------------------------------------|----------------------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| 17.  | Microphone Input<br>Front Panel Pin 2 | Apply Tone.                            | AF Gen: <b>1 kHz Tone<br/>@ +10 dBm</b> | <br>MIC Connector – Front View |
| 18.  | <b>R63 (Mic Comp)</b>                 | Adjust and measure.                    |                                         | Distortion Analyzer<br>AF Filter: <b>15 kHz</b><br>4.0% THD                                                       |
| 19.  | Microphone Input<br>Front Panel Pin 2 | Change level.                          | AF Gen: <b>1 kHz Tone<br/>@ -10 dBm</b> |                                                                                                                   |
| 20.  | <b>R2 (Microphone)</b>                | Adjust and measure.                    | <b>± 3 kHz</b>                          | Deviation monitor                                                                                                 |
| 21.  | Microphone Input<br>Front Panel Pin 2 | Change level.                          | AF Gen: <b>1 kHz Tone<br/>@ -20 dBm</b> |                                                                                                                   |
| 22.  | <b>R2 (Microphone)</b>                | Measure and confirm<br><b>± 50 Hz.</b> | <b>± 1 kHz</b>                          | Deviation monitor                                                                                                 |

## Section C: Audio Frequency Response and Deviation

| Step | Reference            | Action                                                                  | Desired Results                       | Notes                                                |
|------|----------------------|-------------------------------------------------------------------------|---------------------------------------|------------------------------------------------------|
| 23.  | AF Gen level         | Set and measure.                                                        | AF Gen: <b>+10 dBm</b>                |                                                      |
| 24.  | Balanced Audio Input | Sweep from <b>300 Hz</b> to<br><b>2.5 kHz</b> in <b>100 Hz</b> steps.   | <b>± 5.0 kHz</b>                      | Deviation should not<br>exceed maximum<br>deviation. |
| 25.  | Balanced Audio Input | Apply tone.                                                             | AF Gen <b>1 kHz<br/>@ -18 dBm</b>     |                                                      |
| 26.  |                      | Perform AF Frequency<br>Response from <b>300 Hz</b> to<br><b>5 kHz.</b> | As per test sheet limits<br>(FIT-018) |                                                      |

## Transmitters with Flat Audio

### Section A: Balanced and Subtone Audio Setup

| Step | Reference                                                                                                                                                              | Action                                                                                                                                                                              | Desired Results                                                                                         | Notes                                              |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| 1.   | <b>R2</b> (Mic I/P)<br><b>R29</b> (Deviation)<br><b>R31</b> (Balanced)<br><b>R38</b> (Compress)<br><b>R42</b> (Subtone1)<br><b>R63</b> (Mic Comp)<br><b>R36</b> (TCXO) | Turn Fully <b>CW</b> .<br>Turn Fully <b>CW</b> .<br>Turn Fully <b>CW</b> .<br>Turn Fully <b>CW</b> .<br>Turn Fully <b>CW</b> .<br>Turn Fully <b>CW</b> .<br>Turn Fully <b>CCW</b> . | AF Filter: Low Pass<br><b>5 kHz or 15 kHz</b><br><br><b>NO COMPRESSION</b><br><br><b>NO COMPRESSION</b> |                                                    |
| 2.   | Balanced Input<br>P1-1 and P1-2                                                                                                                                        | Set AF Gen. freq, level<br>and filter.                                                                                                                                              | AF Gen: <b>1.8 kHz @ +10 dBm</b>                                                                        |                                                    |
| 3.   | <b>R29</b> (Deviation)                                                                                                                                                 | Adjust <b>R29</b> for deviation.<br><b>Do not re-adjust.</b>                                                                                                                        | <b>± 4.4 kHz</b>                                                                                        |                                                    |
| 4.   | Subtone 1 input                                                                                                                                                        | Apply tone.                                                                                                                                                                         | AF Gen: <b>1 kHz Tone @ -18 dBm</b>                                                                     |                                                    |
| 5.   | <b>R42</b> (Subtone1)                                                                                                                                                  | Adjust and measure.                                                                                                                                                                 | <b>± 500 Hz</b>                                                                                         | Deviation Monitor                                  |
| 6.   | OST-3H035-(2-Port)<br>OST-3H045-(2-Port)                                                                                                                               | Change AF Gen. freq.                                                                                                                                                                | AF Gen:<br><b>40 Hz @ -18 dB</b>                                                                        |                                                    |
| 7.   | <b>R36</b> (TCXO)                                                                                                                                                      | Adjust and measure.                                                                                                                                                                 | <b>± 500 Hz</b>                                                                                         |                                                    |
| 8.   | Subtone 1 input                                                                                                                                                        | Change AF Gen. freq.                                                                                                                                                                | AF Gen:<br><b>300 Hz @ -18 dBm</b>                                                                      |                                                    |
| 9.   | Deviation Monitor                                                                                                                                                      | Should measure.                                                                                                                                                                     | <b>500 Hz</b>                                                                                           | Tolerance on this<br>measurement is <b>± 50 Hz</b> |
| 10.  | Deviation Monitor                                                                                                                                                      | Sweep AF Gen. freq.<br>between <b>67 Hz</b> and<br><b>250 Hz</b> . Measure<br>resultant deviation.                                                                                  | <b>± 300 Hz to 700 Hz</b>                                                                               |                                                    |
| 11.  | AF Gen                                                                                                                                                                 | Change level.                                                                                                                                                                       | <b>1 kHz Tone @ -8 dBm</b>                                                                              |                                                    |
| 12.  | <b>R31</b> (Balanced)                                                                                                                                                  | Adjust and measure.                                                                                                                                                                 | <b>± 3 kHz</b>                                                                                          | Deviation Monitor                                  |

### Section B: Microphone Audio Setup

| Step | Reference                             | Action              | Desired Results                   | Notes                                                                                                                   |
|------|---------------------------------------|---------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| 13.  | Microphone Input<br>Front Panel Pin 2 | Change level.       | AF Gen: <b>1kHz Tone @ -10dBm</b> |  <p>MIC Connector - Front View</p> |
| 14.  | R2                                    | Adjust and measure. | <b>± 3kHz</b>                     | Deviation Monitor                                                                                                       |

## Section C: Audio Frequency Response and Deviation

| Step | Reference            | Action                                                             | Desired Results              | Notes                                          |
|------|----------------------|--------------------------------------------------------------------|------------------------------|------------------------------------------------|
| 15.  | AF Gen level         | Set and measure.                                                   | <b>+10 dBm</b>               |                                                |
| 16.  | Balanced Audio Input | Sweep from <b>300 Hz</b> to <b>2.5 kHz</b> in <b>100Hz</b> steps.  | <b>± 5.0 kHz</b>             | Deviation should not exceed maximum deviation. |
| 17.  | Balanced Audio Input | Apply tone.                                                        | AF Gen <b>1kHz @ -18 dBm</b> |                                                |
| 18.  |                      | Perform AF Frequency Response from <b>300 Hz</b> to <b>5 kHz</b> . |                              | As per test sheet limits (FIT-018)             |

## TROUBLESHOOTING

## Balanced Input Test

1. Connect an Audio Generator set for a 1.8 kHz tone @ +10 dBm output to the Balanced Input (P1-1 and P1-2). The Waveform Levels Table below (see Table 2) indicates expected levels and waveforms for various measurement points.
2. Change the Audio Generator settings for a 1 kHz tone @ +10 dBm output. Confirm the waveforms and levels using the Waveform Level Table below.
3. Repeat for the various audio frequencies and levels and compare with the levels in the table below.

TABLE 2: Waveform Levels

| Test Point<br>Measured @ | Limiting Test<br>1.8 kHz @ +10 dBm | Std Level<br>1 kHz @ -8 dBm | Mic Test<br>1 kHz @ -10 dBm | Subtone<br>100 kHz @ -18 dBm |
|--------------------------|------------------------------------|-----------------------------|-----------------------------|------------------------------|
| TP3                      | 5.2 V P-P                          | 3.8 V P-P                   | N/A                         | N/A                          |
| TP12                     | N/A                                | N/A                         | 3.8 V P-P                   | N/A                          |
| TP10                     | 6.5 V P-P                          | 4.9 V P-P                   | 4.8 V P-P                   | 1.1 V P-P                    |
| TP5                      | 2.4 V P-P                          | 1.3 V P-P                   | 1.9 V P-P                   | 0.4 V P-P                    |
| JU6                      | 2.8 V P-P                          | 1.7 V P-P                   | 1.8 V P-P                   | 0.4 V P-P                    |
| *TP8                     | 1.5 V P-P NB                       | 0.9 V P-P NB                | 0.9 V P-P NB                | 0.2 V P-P NB                 |
|                          | 3.0 V P-P WB                       | 1.8 V P-P WB                | 1.8 V P-P WB                | 0.4 V P-P WB                 |

\*These values will differ depending on the oscillator / synthesizer model.

## Frequency Response Test

Measurements are made at JU8 with respect to ground.

1. Reduce Audio Generator level to  $-18$  dBm (98 mV RMS).
2. Step frequency to 300, 500, 1000, 2000 and 2500 Hz.
3. Ensure that the results conform to the 6 dB/octave  $\pm 1$  dB from 500 Hz to 2500 Hz referenced to 1000 Hz ( $\pm 1/2$  dB at 300 Hz).

## Subtone Input Test

1. Change Audio Generator frequency to 100 Hz and maintain level at  $-18$  dBm (98 mV RMS).
2. Connect signal to Subtone Input 1 (P2-2) and ground (P1-4).
3. Refer to the Waveform Levels Table above and confirm levels.

## TEMPERATURE COMPENSATION

The FM Audio Processor includes temperature compensation circuitry to maintain a constant transmitter audio deviation with a fixed level input signal. It is capable of not only compensating for temperature related level variations within the audio processor (typically  $-0.3$  to  $-0.5$  dB at  $-40^{\circ}\text{C}$ ), but can also compensate for changes caused by the synthesizer that is not equipped with its own temperature compensation.

### Specifications:

When a 1.8 kHz tone is applied at a level of  $+10$  dBm to the balanced input of the transmitter, the transmitter deviation shall be  $\pm 4.4$  kHz at room temperature and can vary from  $\pm 4.4$  kHz to  $\pm 5.0$  kHz from  $-40^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ .

Since the specifications of the components used in the synthesizer or oscillator may change over time, changes to the temperature compensation circuit may be necessary even for the same type of equipment.

Contact the factory for more information on values used.

## FM AUDIO PROCESSOR JUMPER CONFIGURATIONS

For Default / CTCSS / LTR® / DCS configurations, see Table 3.

TABLE 3: FM Audio Processor Default / CTCSS / LTR® / DCS Configurations

| Jumper | Type   | Default Position | Description                                      | Pre-emphasis / CTCSS | Flat / CTCSS    | Pre-emphasis / LTR® / DCS |
|--------|--------|------------------|--------------------------------------------------|----------------------|-----------------|---------------------------|
| 1      | XY     | Y                | Microphone Pre-Emphasis / Flat Audio             | Y                    | X               | Y                         |
| 2      | XY     | Y                | Balanced Audio Pre-Emphasis / Flat Audio         | Y                    | X               | Y                         |
| 3      | XY     | Factory          | Custom Temperature Compensation Network          | Contact Factory      | Contact Factory | Contact Factory           |
| 4      | XY     | Open             | Subtone 2                                        | Open                 | Open            | Open                      |
| 5      | XY     | Open             | Auxiliary Input Routing                          | Open                 | Open            | X                         |
| 6      | Single | In               | Splatter Filter Output                           | Installed            | Installed       | Installed                 |
| 7      | Single | Open             | Auxiliary Input Routing                          | Open                 | Open            | Open                      |
| 8      | Single | Open             | Direct Coupled Final OP-Amp O/P                  | Open                 | Open            | Open                      |
| 9      | XY     | Open             | Auxiliary Output for Pre-Emphasis                | Open                 | Open            | Open                      |
| 10     | Single | Open             | 4 V AC Ground                                    | Open                 | Open            | Installed                 |
| 11     | Single | Open             | Balanced Input Compression Bypass                | Open                 | Open            | Open                      |
| 12     | XY     | Open             | Tone / Digital Input Audio Routing               | Open                 | Open            | Open                      |
| 13     | Single | Open             | Direct Modulation Audio Routing                  | Open                 | Open            | Open                      |
| 14     | XY     | Open             | Two Port Polarity Select                         | Y                    | Y               | Open                      |
| 15     | XY     | XY               | 4 V Regulator Adjust (Bypassed)                  | X and Y both         | X and Y both    | X and Y both              |
| 16     | Single | In               | Subaudible Enable                                | Installed            | Installed       | Open                      |
| 17     | Single | Open             | Balanced Input Adjust Range Extend               | Open                 | Open            | Open                      |
| 18     | Single | Open             | Audio Gate Disable                               | Open                 | Open            | Open                      |
| 19     | XY     | Y                | Voltage Select (+9.5 V / 8 V) Audio Gates        | Y                    | Y               | Y                         |
| 20     | XY     | Open             | Direct Modulation Audio Routing                  | Open                 | Open            | Open                      |
| 21     | XY     | X                | Audio Gate Switch                                | X                    | X               | X                         |
| 22     | XY     | Y                | Splatter Filter Enable / Bypass                  | Y                    | Y               | Y                         |
| 23     | Single | Open             | Narrow Band Gain Reduction                       | Open                 | Open            | Open                      |
| 24     | XY     | Factory          | Custom Temperature Compensation Network          | Contact Factory      | Contact Factory | Contact Factory           |
| 25     | XY     | Open             | Wide / Narrow Band Switched Select               | Open                 | Open            | Open                      |
| 26     | Single | Open             | Auxiliary Output Routing                         | Open                 | Open            | Open                      |
| 27     | XY     | Open             | Direct Modulation Input Offset Output            | Open                 | Open            | Open                      |
| 28     | Single | Open             | Direct Modulation Input Routing                  | Open                 | Open            | Installed                 |
| 29     | Single | Open             | Coupling Capacitor Selection                     | Installed            | Installed       | Installed                 |
| 30     | N/A    | N/A              | <i>This skipped designator has been deleted.</i> | N/A                  | N/A             | N/A                       |
| 31     | Single | Open             | Splatter Filter Output Routing                   | Open                 | Open            | Open                      |
| 32     | Single | Open             | Coupling Capacitor Selection                     | Installed            | Installed       | Installed                 |
| 33     | Single | Open             | Direct Input Coupling – Auxiliary amplifier      | Open                 | Open            | Open                      |
| 34     | XY     | Open             | Audio Routing                                    | Open                 | Open            | Open                      |
| 35     | XY     | Open             | Audio Routing                                    | Open                 | Open            | Open                      |
| 36     | XY     | X                | AGC Preamp Power Select                          | X                    | X               | X                         |
| 37     | Single | Open             | Direct Couple (TCXO)                             | Open                 | Open            | Open                      |
| 38     | Single | In               | Low Pass Enable                                  | Installed            | Installed       | Installed                 |
| 39     | XY     | X                | Low Frequency Amplfier Bias Select               | X                    | X               | X                         |
| 40     | N/A    | N/A              | <i>This skipped designator has been deleted.</i> | N/A                  | N/A             | N/A                       |
| 41     | Single | Open             | Narrow Band Gain Reduction                       | Open                 | Open            | Open                      |
| 42     | XY     | Open             | Direct Modulation Input Bias Select              | Open                 | Open            | Open                      |
| 43     | Single | Open             | Direct Modulation Direct / Cap Couple            | Open                 | Open            | Open                      |
| 44     | Single | Open             | Coupling Capacitor Selection                     | Installed            | Installed       | Installed                 |
| 45     | Single | In               | Coupling Capacitor Selection (Default)           | Installed            | Installed       | Installed                 |

| Audio Processor (TCXO Op-Amp) | CTCSS (Pre-Emphasis / Flat) | LTR® / DCS |
|-------------------------------|-----------------------------|------------|
| R35                           | 1K0                         | 1K0        |
| R32                           | 51K1                        | 51K1       |
| R81                           | N / I                       | N / I      |
| R54                           | 10K0                        | 10K0       |
| C34                           | 1uF                         | 47uF       |
| C56                           | 33nF                        | 33nF       |

**NOTE:**  
Synthesizer uses Rakon TCVCXO VTXO250U-5 +/- 5 ppm stability for low band transmitter CTCSS and LTR® / DCS.





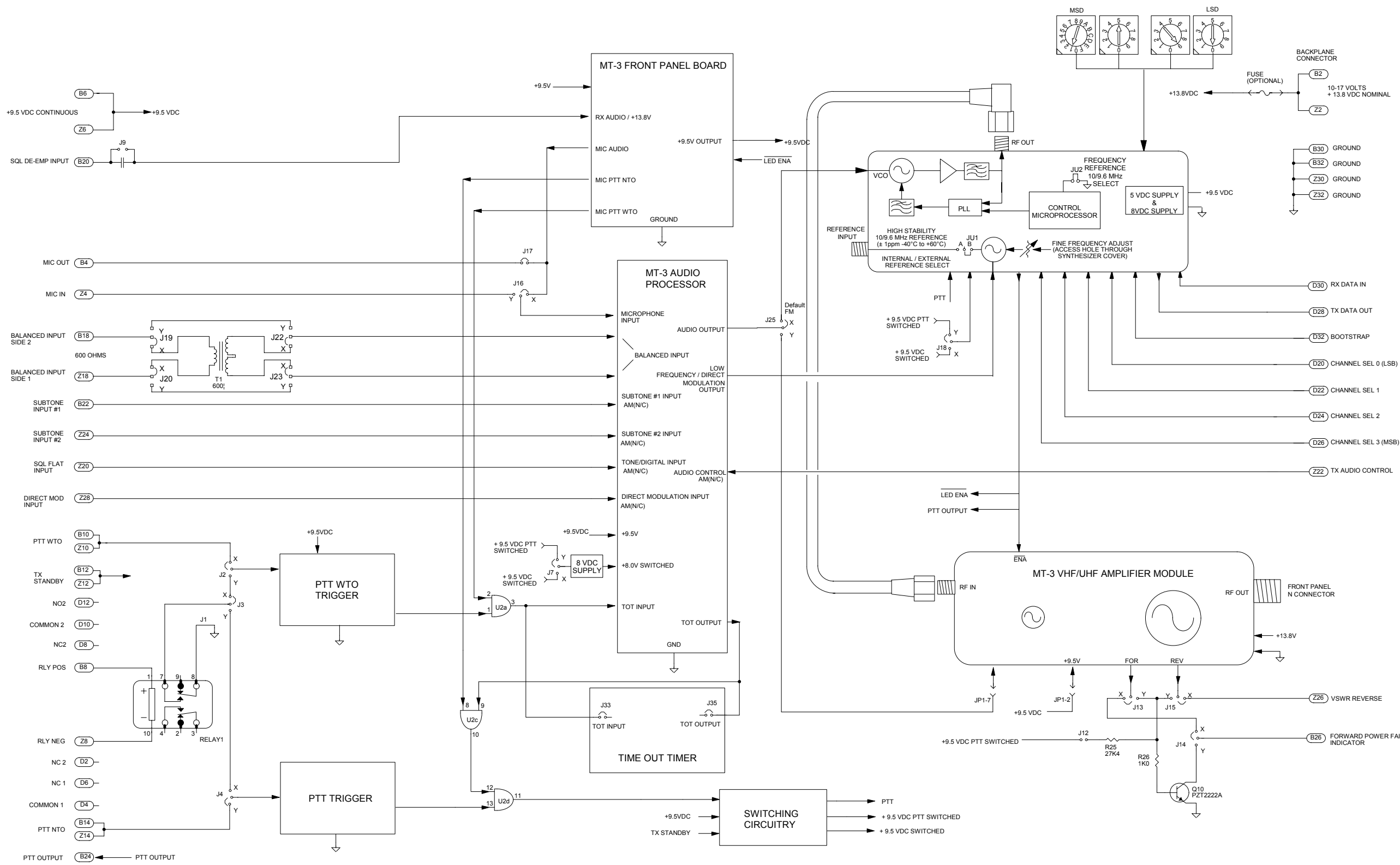
ILLUSTRATIONS  
AND SCHEMATICS

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 PCBs manufactured by Daniels Electronics Ltd. are identified by one of the following numbering conventions:

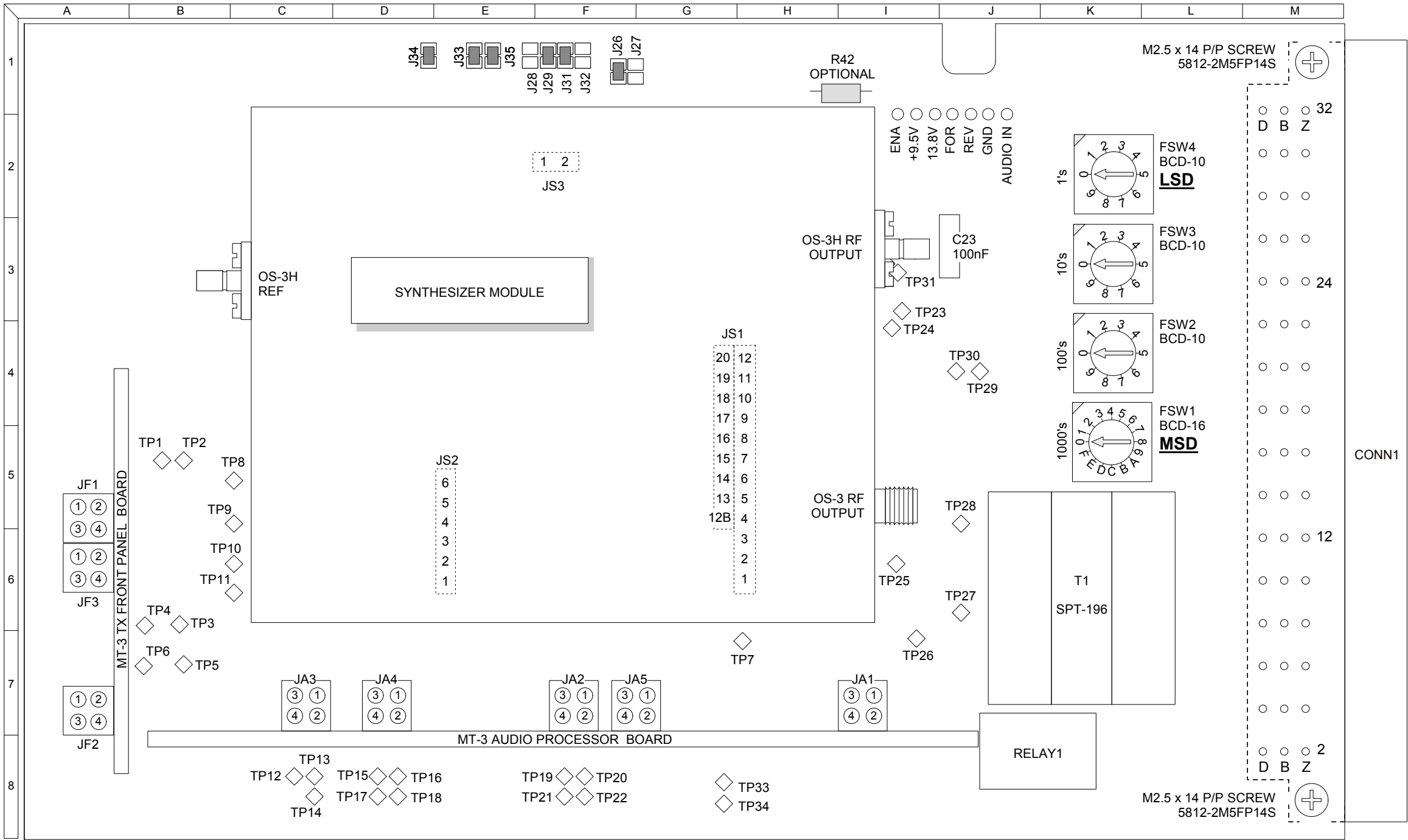
|            |                                                                               |
|------------|-------------------------------------------------------------------------------|
| PCB number | 43-9120 <u>10</u><br>Indicates circuit board version 1.0                      |
| PCB number | 50002- <u>02</u><br>Indicates circuit board version 2<br>(no decimal version) |

MT-3 FM TRANSMITTER BLOCK DIAGRAM



|                                       |  |  |  |  |  |  |  |  |  |                     |    |    |    |    |    |    |    |    |
|---------------------------------------|--|--|--|--|--|--|--|--|--|---------------------|----|----|----|----|----|----|----|----|
| <b>DE DANIELS™</b><br>ELECTRONICS LTD |  |  |  |  |  |  |  |  |  | A                   | F  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
| TITLE: MT-3 TRANSMITTER BLOCK DIAGRAM |  |  |  |  |  |  |  |  |  | 11                  | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| DATE: 25 JUN 03                       |  |  |  |  |  |  |  |  |  | 20                  | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| DWG No: B0286-04                      |  |  |  |  |  |  |  |  |  | 29                  | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 |
| DRAWN BY: S. EARTHY                   |  |  |  |  |  |  |  |  |  | REV DATE: 07 MAR 05 |    |    |    |    |    |    |    |    |

MT-3 FM TRANSMITTER MAINBOARD COMPONENT LAYOUT – TOP



FACTORY INSTALLED JUMPERS  
COMPONENTS NOT INSTALLED

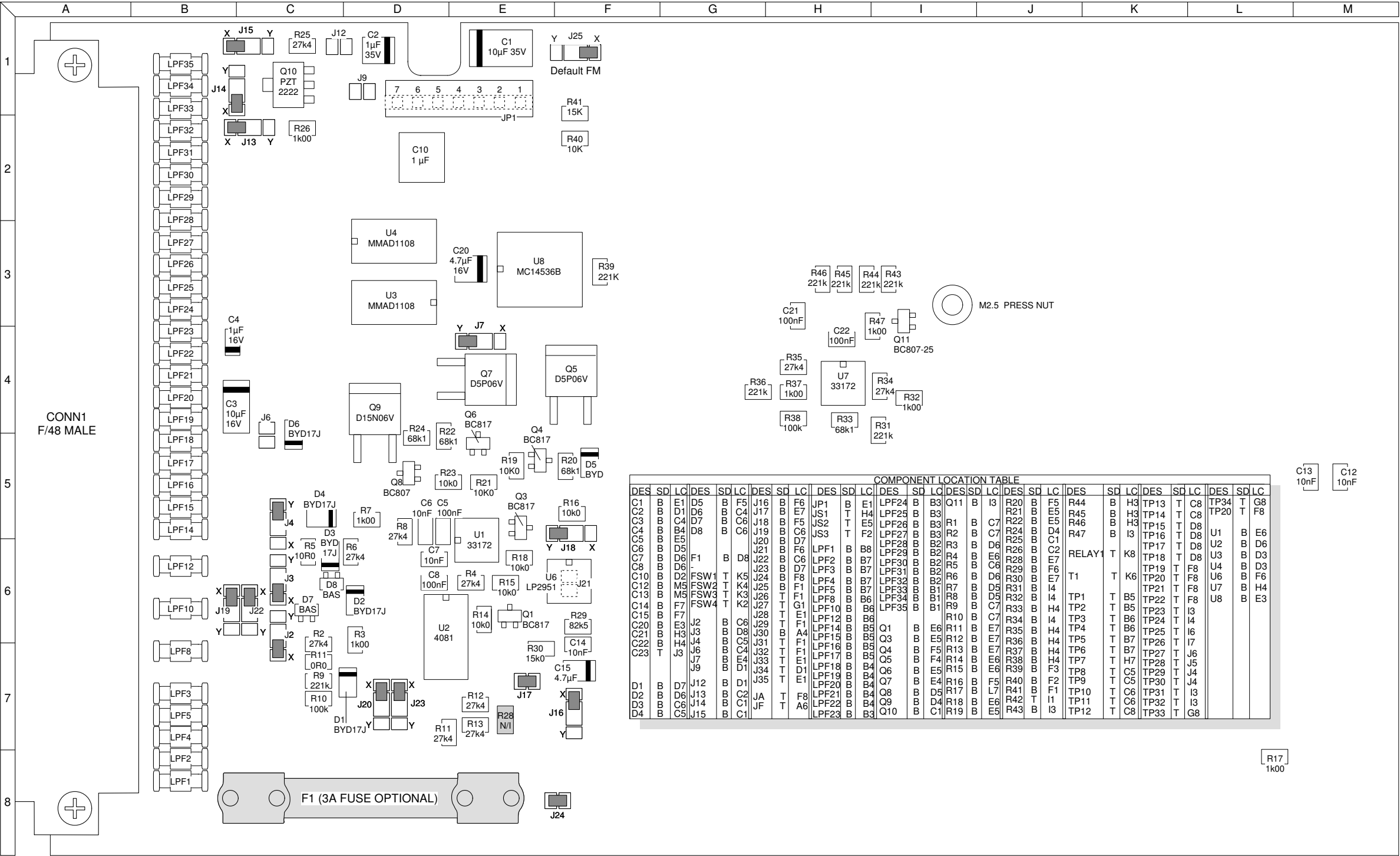
| COMPONENT LOCATION TABLE |    |    |      |    |    |     |    |    |       |    |    |       |    |    |     |    |    |     |    |    |        |    |    |
|--------------------------|----|----|------|----|----|-----|----|----|-------|----|----|-------|----|----|-----|----|----|-----|----|----|--------|----|----|
| DES                      | SD | LC | DES  | SD | LC | DES | SD | LC | DES   | SD | LC | DES   | SD | LC | DES | SD | LC | DES | SD | LC | DES    | SD | LC |
| C1                       | B  | E1 | D5   | B  | F5 | J16 | B  | F6 | J1    | B  | E1 | LPF24 | B  | B3 | Q11 | B  | I3 | R20 | B  | F5 | R44    | B  | H3 |
| C2                       | B  | D1 | D6   | B  | F5 | J17 | B  | E7 | J2    | T  | H4 | LPF25 | B  | B3 | R1  | B  | C7 | R21 | B  | E5 | R45    | B  | H3 |
| C3                       | B  | C4 | D7   | B  | C6 | J18 | B  | F5 | J2    | T  | E5 | LPF26 | B  | B3 | R2  | B  | C7 | R22 | B  | E5 | R46    | B  | H3 |
| C4                       | B  | B4 | D8   | B  | C6 | J19 | B  | C6 | J3    | T  | F2 | LPF27 | B  | B3 | R2  | B  | C7 | R24 | B  | D4 | R47    | B  | I3 |
| C5                       | B  | B  | E5   | B  | C6 | J20 | B  | D7 | J2    | B  | D7 | LPF28 | B  | B2 | R3  | B  | D6 | R25 | B  | C1 |        |    |    |
| C6                       | B  | D5 | F1   | B  | D8 | J21 | B  | F6 | LPF1  | B  | B8 | LPF29 | B  | B2 | R4  | B  | E6 | R26 | B  | C2 | RELAY1 | T  | K8 |
| C7                       | B  | D6 | F1   | B  | D8 | J22 | B  | C6 | LPF2  | B  | B7 | LPF30 | B  | B2 | R5  | B  | C6 | R27 | B  | E7 |        |    |    |
| C8                       | B  | D6 | F1   | B  | D8 | J23 | B  | D7 | LPF3  | B  | B8 | LPF31 | B  | B2 | R6  | B  | C6 | R29 | B  | F6 | TP1    | T  | B5 |
| C9                       | B  | D2 | FSW1 | T  | K5 | J24 | B  | F8 | LPF4  | B  | B7 | LPF32 | B  | B2 | R7  | B  | D6 | R30 | B  | E7 | TP2    | T  | B6 |
| C10                      | B  | M5 | FSW2 | T  | K4 | J25 | B  | F1 | LPF5  | B  | B7 | LPF33 | B  | B1 | R8  | B  | D5 | R31 | B  | I4 | TP3    | T  | B5 |
| C11                      | B  | M5 | FSW3 | T  | K3 | J26 | B  | F1 | LPF6  | B  | B6 | LPF34 | B  | B1 | R9  | B  | D5 | R32 | B  | I4 | TP4    | T  | B6 |
| C12                      | B  | M5 | FSW4 | T  | K2 | J27 | B  | F1 | LPF7  | B  | B6 | LPF35 | B  | B1 | R9  | B  | C7 | R33 | B  | I4 | TP5    | T  | B6 |
| C13                      | B  | F7 | FSW4 | T  | K2 | J28 | B  | F1 | LPF8  | B  | B6 |       |    |    | R10 | B  | C7 | R34 | B  | I4 | TP6    | T  | B6 |
| C14                      | B  | F7 | J2   | B  | C6 | J29 | B  | F1 | LPF9  | B  | B6 |       |    |    | R11 | B  | C7 | R35 | B  | I4 | TP7    | T  | B6 |
| C15                      | B  | E3 | J3   | B  | C6 | J30 | B  | F1 | LPF10 | B  | B6 |       |    |    | R12 | B  | C7 | R36 | B  | H4 | TP8    | T  | B6 |
| C16                      | B  | E3 | J3   | B  | C6 | J31 | B  | F1 | LPF11 | B  | B5 | Q1    | B  | E6 | R13 | B  | E7 | R37 | B  | H4 | TP9    | T  | B6 |
| C17                      | B  | H3 | J4   | B  | C5 | J32 | B  | F1 | LPF12 | B  | B5 | Q2    | B  | E5 | R14 | B  | E7 | R38 | B  | H4 | TP10   | T  | B6 |
| C18                      | B  | H3 | J4   | B  | C5 | J33 | B  | F1 | LPF13 | B  | B5 | Q3    | B  | E5 | R15 | B  | E7 | R39 | B  | H4 | TP11   | T  | B6 |
| C19                      | B  | H4 | J6   | B  | C4 | J34 | B  | F1 | LPF14 | B  | B4 | Q4    | B  | E5 | R16 | B  | E7 | R40 | B  | F3 |        |    |    |
| C20                      | B  | H4 | J7   | B  | C4 | J35 | B  | F1 | LPF15 | B  | B4 | Q5    | B  | E5 | R17 | B  | F5 | R41 | B  | F2 |        |    |    |
| C21                      | B  | J3 | J9   | B  | D1 | J36 | B  | F1 | LPF16 | B  | B4 | Q6    | B  | E5 | R18 | B  | F5 | R42 | B  | F1 |        |    |    |
| C22                      | B  | J3 | J9   | B  | D1 | J37 | B  | F1 | LPF17 | B  | B4 | Q7    | B  | E4 | R19 | B  | F5 | R43 | B  | I1 |        |    |    |
| C23                      | T  | J3 | J9   | B  | D1 | J38 | B  | F1 | LPF18 | B  | B4 | Q8    | B  | D5 | R20 | B  | F5 | R44 | B  | I1 |        |    |    |
| D1                       | B  | D7 | U12  | B  | C2 | J39 | B  | F1 | LPF19 | B  | B4 | Q9    | B  | D4 | R21 | B  | E5 | R45 | B  | I3 |        |    |    |
| D2                       | B  | D6 | U13  | B  | C1 | J40 | B  | F1 | LPF20 | B  | B4 | Q10   | B  | C1 | R18 | B  | E6 | R46 | B  | I3 |        |    |    |
| D3                       | B  | C8 | U14  | B  | C1 | J41 | B  | F1 | LPF21 | B  | B4 |       |    |    | R19 | B  | E6 |     |    |    |        |    |    |
| D4                       | B  | C5 | U15  | B  | C1 | J42 | B  | F1 | LPF22 | B  | B3 |       |    |    |     |    |    |     |    |    |        |    |    |
|                          |    |    |      |    |    |     |    |    | LPF23 | B  | B3 |       |    |    |     |    |    |     |    |    |        |    |    |

TITLE: MT-3 TRANSMITTER MAIN BOARD (TOP)

DATE: 9 OCTOBER 2001      BOARD NO: 43-920917

DWG No: 01-T-07-01      REV DATE: 8 JANUARY 2010

MT-3 FM TRANSMITTER MAINBOARD COMPONENT LAYOUT – BOTTOM



- FACTORY INSTALLED JUMPERS
- COMPONENTS NOT INSTALLED

| AM/FM MODULATION SELECT |              |              |
|-------------------------|--------------|--------------|
| DESIG                   | AM           | FM           |
| J25                     | 'Y' POSITION | 'X' POSITION |

| STANDARD / LOW FREQUENCY |               |              |
|--------------------------|---------------|--------------|
| DESIG                    | STD VERSION   | LOW FREQ.    |
| J6                       | Not Installed | Installed    |
| J7                       | 'Y' Position  | 'X' Position |
| J18                      | 'Y' Position  | 'X' Position |

| AM/FM STANDBY MODES |               |              |              |              |
|---------------------|---------------|--------------|--------------|--------------|
| DESIG               | MODE 1        | MODE 2       | MODE 3       | MODE 4       |
| J6                  | Not Installed | Installed    | Installed    | Installed    |
| J7                  |               | 'Y' Position | 'X' Position | 'X' Position |
| J18                 |               | 'X' Position | 'Y' Position | 'X' Position |

1112131415161718192021222324252627282930

TITLE: MT-3 TRANSMITTER MAIN BOARD (BOTTOM)

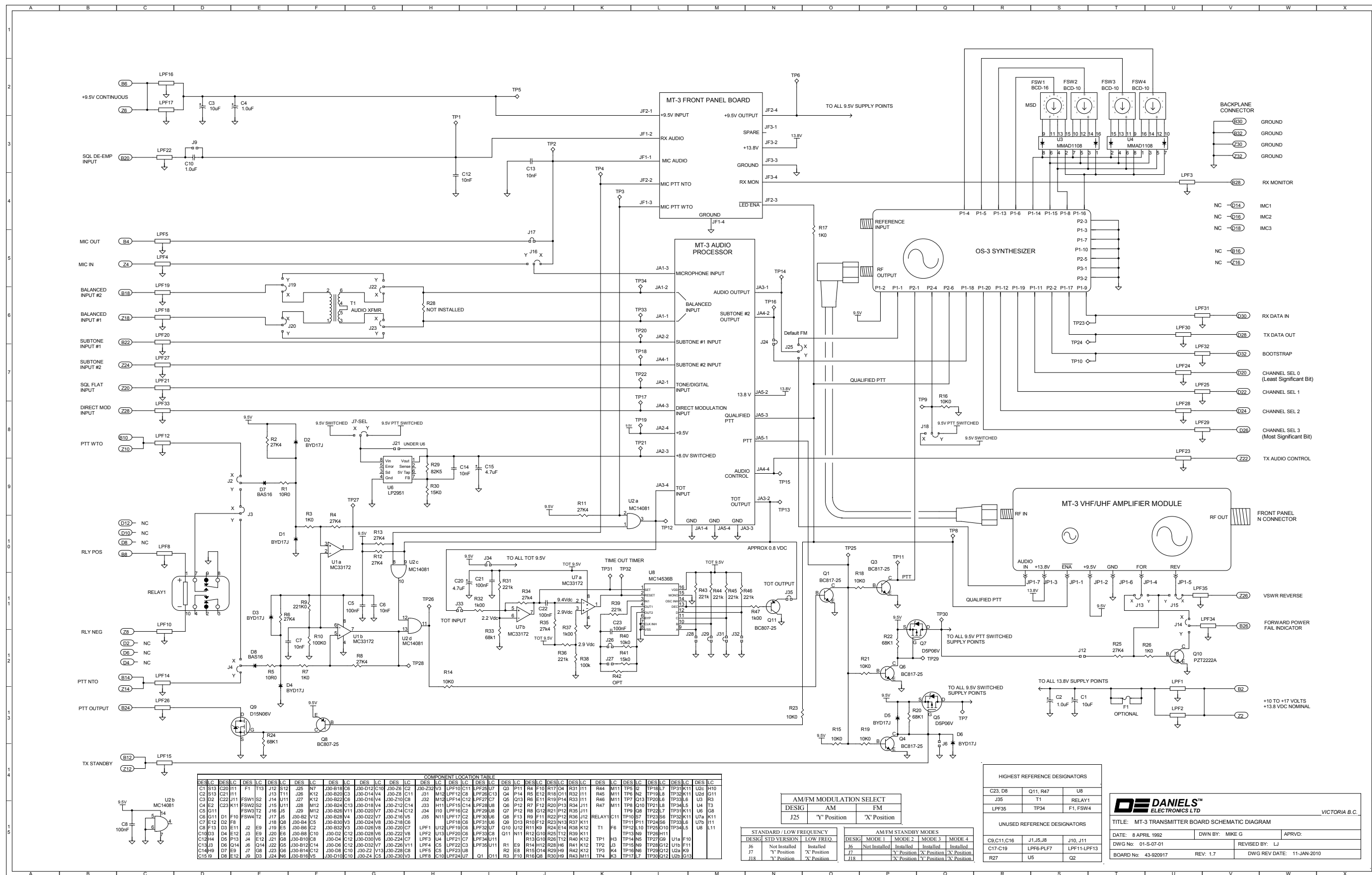
DATE: 9 OCTOBER 2001

DWG No: 01-B-07-05

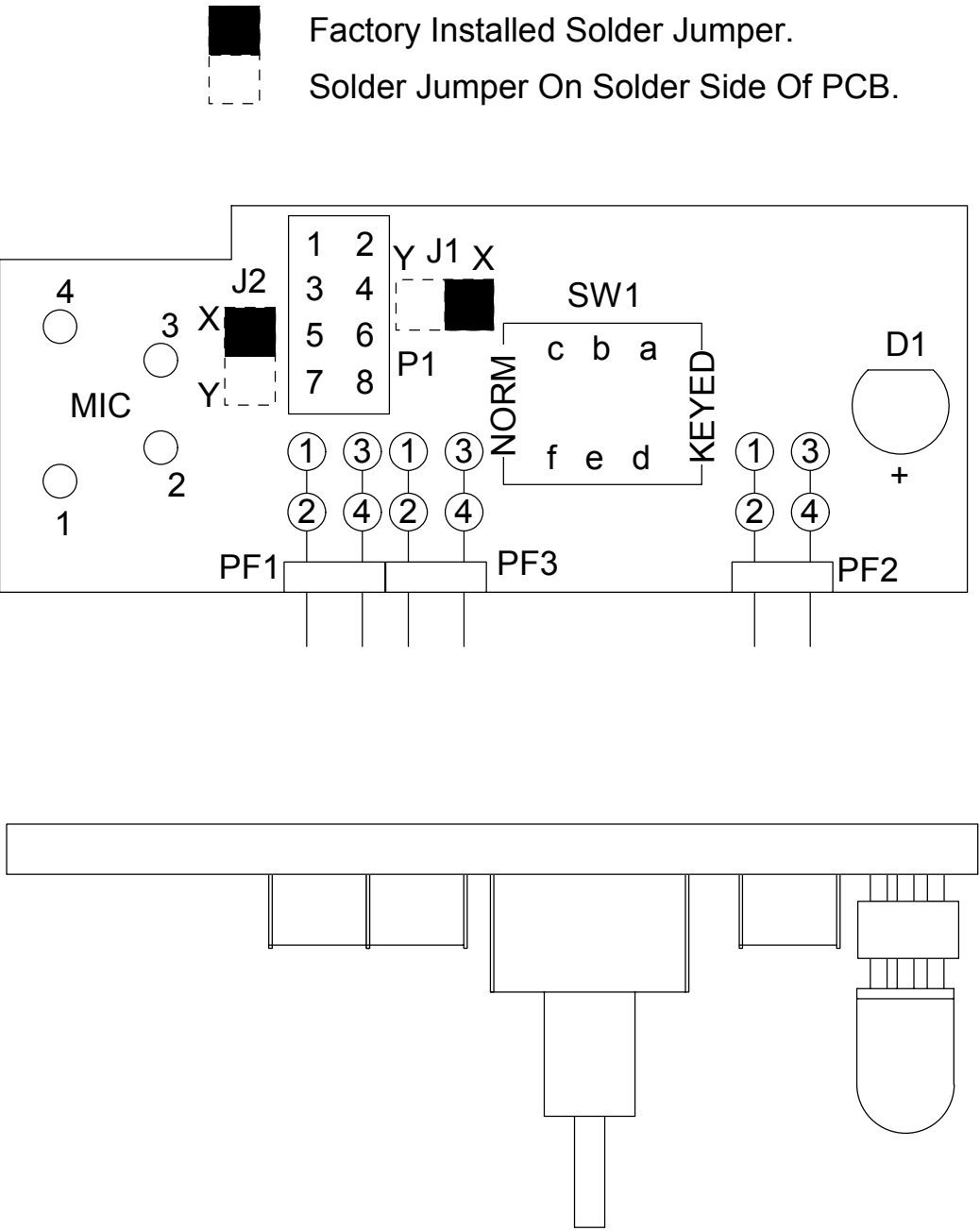
BOARD NO: 43-920917

REV DATE: 12 MAR 2007

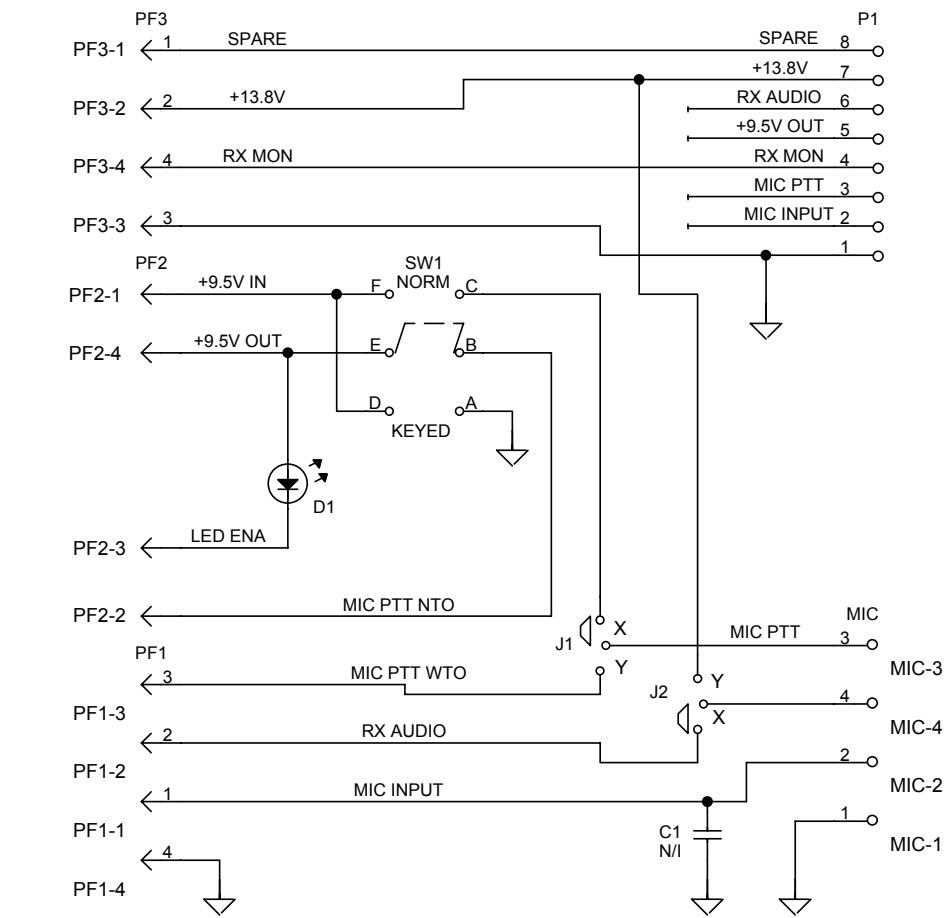
## MT-3 FM TRANSMITTER MAINBOARD SCHEMATIC DIAGRAM



FRONT PANEL BOARD COMPONENT LAYOUT DIAGRAM



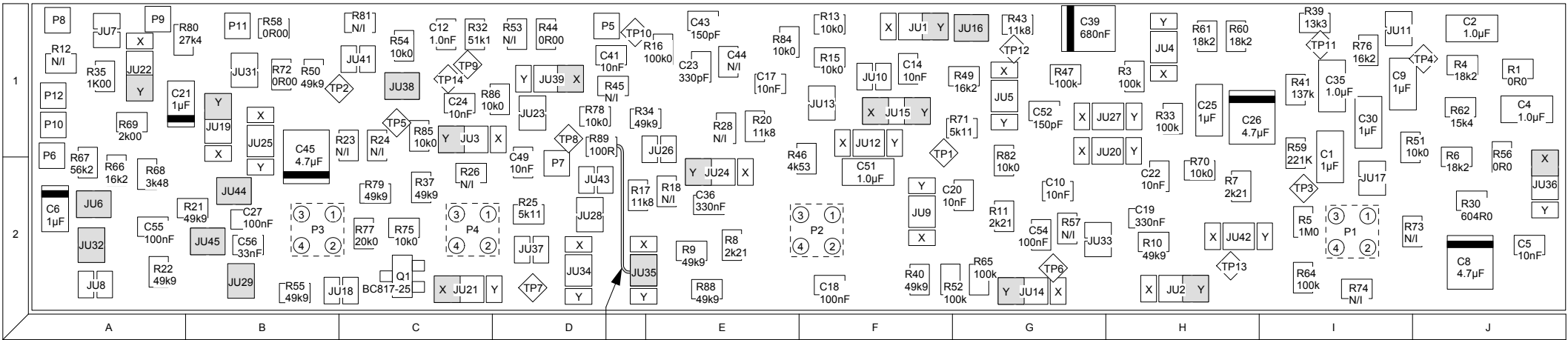
FRONT PANEL BOARD SCHEMATIC DIAGRAM



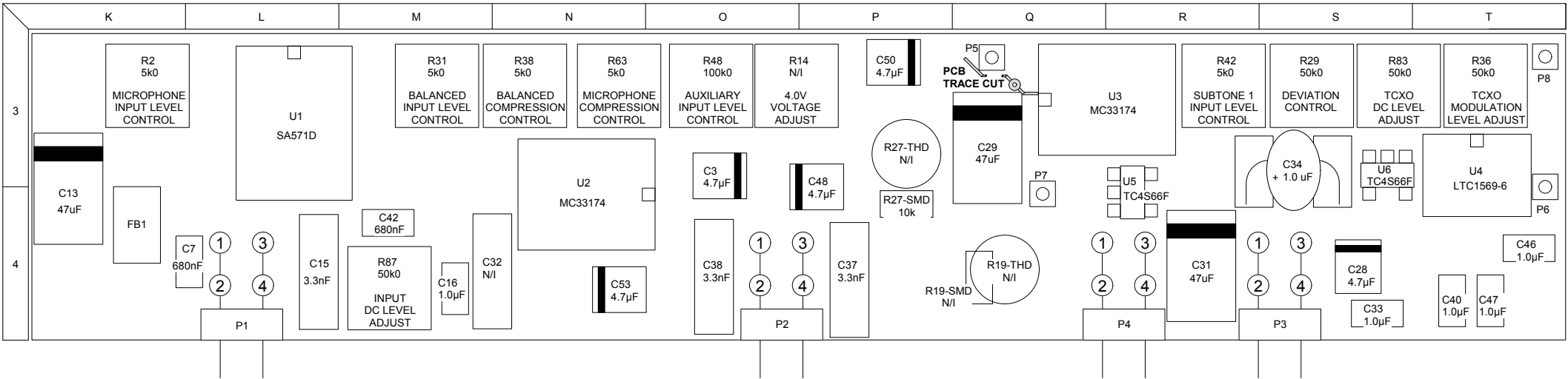
| HIGHEST REFERENCE DESIGNATORS |      |      |
|-------------------------------|------|------|
| C1                            | D1   | J2   |
| MIC                           | PF3  | ---- |
| SW1                           | ---- | ---- |
| UNUSED REFERENCE DESIGNATORS  |      |      |
| ----                          | ---- | ---- |
| ----                          | ---- | ---- |
| ----                          | ---- | ---- |

FM AUDIO PROCESSOR BOARD COMPONENT LAYOUT DIAGRAM

BOTTOM SIDE



TOP SIDE



| COMPONENT LOCATION TABLE |     |     |     |     |     |      |     |      |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|--------------------------|-----|-----|-----|-----|-----|------|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| DES                      | LOC | DES | LOC | DES | LOC | DES  | LOC | DES  | LOC | DES | LOC | DES | LOC | DES | LOC | DES | LOC | DES | LOC | DES  | LOC | DES | LOC | DES | LOC | DES | LOC | DES | LOC | DES | LOC | DES | LOC |  |
| C1                       | I1  | C26 | H1  | C51 | F2  | JU1  | F1  | JU26 | E1  | P1  | L4  | R1  | J1  | R26 | C2  | R51 | I1  | R76 | I1  | TP1  | F1  | U1  | L3  |     |     |     |     |     |     |     |     |     |     |  |
| C2                       | J1  | C27 | B2  | C52 | G1  | JU2  | H2  | JU27 | H1  | P2  | O4  | R2  | K3  | R27 | P3  | R52 | F2  | R77 | C2  | TP2  | B1  | U2  | N3  |     |     |     |     |     |     |     |     |     |     |  |
| C3                       | O3  | C28 | S4  | C53 | N4  | JU3  | C1  | JU28 | D2  | P3  | S4  | R3  | H1  | R28 | E1  | R53 | D1  | R78 | D1  | TP3  | I2  | U3  | R3  |     |     |     |     |     |     |     |     |     |     |  |
| C4                       | J1  | C29 | Q3  | C54 | G2  | JU4  | H1  | JU29 | B2  | P4  | R4  | R4  | J1  | R29 | S3  | R54 | C1  | R79 | C2  | TP4  | J1  | U4  | T3  |     |     |     |     |     |     |     |     |     |     |  |
| C5                       | J2  | C30 | I1  | C55 | A2  | JU5  | G1  | JU30 | N/A | P5  | Q3  | R5  | I2  | R30 | J2  | R55 | B2  | R80 | A1  | TP5  | C1  | U5  | R3  |     |     |     |     |     |     |     |     |     |     |  |
| C6                       | A2  | C31 | R4  | C56 | B2  | JU6  | A2  | JU31 | B1  | P6  | T4  | R6  | J2  | R31 | M3  | R56 | J1  | R81 | C1  | TP6  | G2  | U6  | S3  |     |     |     |     |     |     |     |     |     |     |  |
| C7                       | L4  | C32 | M4  |     |     | JU7  | A1  | JU32 | A2  | P7  | Q4  | R7  | H2  | R32 | C1  | R57 | G2  | R82 | G2  | TP7  | D2  |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C8                       | J2  | C33 | S4  |     |     | JU8  | F2  | JU33 | G2  | P8  | T3  | R8  | E2  | R33 | H1  | R58 | B1  | R83 | S3  | TP8  | D1  |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C9                       | I1  | C34 | S3  | FB1 | K4  | JU9  | F2  | JU34 | D2  | P9  | A1  | R9  | E2  | R34 | D1  | R59 | I1  | R84 | E1  | TP9  | C1  |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C10                      | G2  | C35 | I1  |     |     | JU10 | F1  | JU35 | D2  | P10 | A1  | R10 | H2  | R35 | A1  | R60 | H1  | R85 | C1  | TP10 | D1  |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C11                      | N/A | C36 | E2  |     |     | JU11 | I1  | JU36 | J2  | P11 | B1  | R11 | G2  | R36 | T3  | R61 | H1  | R86 | D1  | TP11 | I1  |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C12                      | C1  | C37 | P4  |     |     | JU12 | F1  | JU37 | D2  | P12 | A1  | R12 | A1  | R37 | C2  | R62 | J1  | R87 | M4  | TP12 | G1  |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C13                      | K4  | C38 | O4  |     |     | JU13 | F1  | JU38 | C1  |     |     | R13 | F1  | R38 | N3  | R63 | N3  | R88 | E2  | TP13 | H2  |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C14                      | F1  | C39 | G1  |     |     | JU14 | G2  | JU39 | D1  |     |     | R14 | O3  | R39 | I1  | R64 | I2  | R89 | D1  | TP14 | C1  |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C15                      | L4  | C40 | T4  |     |     | JU15 | F1  | JU40 | N/A | Q1  | C2  | R15 | F1  | R40 | F2  | R65 | G2  |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C16                      | M4  | C41 | D1  |     |     | JU16 | G1  | JU41 | C1  |     |     | R16 | E1  | R41 | I1  | R66 | A2  |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C17                      | E1  | C42 | M4  |     |     | JU17 | I2  | JU42 | H2  |     |     | R17 | D2  | R42 | R3  | R67 | A2  |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C18                      | F2  | C43 | E1  |     |     | JU18 | B2  | JU43 | D2  |     |     | R18 | E2  | R43 | G1  | R68 | A2  |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C19                      | H2  | C44 | E1  |     |     | JU19 | B1  | JU44 | B2  |     |     | R19 | Q4  | R44 | D1  | R69 | A1  |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C20                      | G2  | C45 | B1  |     |     | JU20 | H1  | JU45 | B2  |     |     | R20 | E1  | R45 | D1  | R70 | H2  |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C21                      | A1  | C46 | T4  |     |     | JU21 | C2  |      |     |     |     | R21 | B2  | R46 | F2  | R71 | G1  |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C22                      | H2  | C47 | T4  |     |     | JU22 | A1  |      |     |     |     | R22 | A2  | R47 | G1  | R72 | B1  |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C23                      | E1  | C48 | P3  |     |     | JU23 | D1  |      |     |     |     | R23 | C1  | R48 | O3  | R73 | I2  |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C24                      | C1  | C49 | D2  |     |     | JU24 | E2  |      |     |     |     | R24 | C1  | R49 | G1  | R74 | I2  |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| C25                      | H1  | C50 | P3  |     |     | JU25 | B1  |      |     |     |     | R25 | D2  | R50 | B1  | R75 | C2  |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |  |



|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |

TITLE: FM AUDIO PROCESSOR BOARD - VHF LOW BAND

DATE: 19 JAN 2010

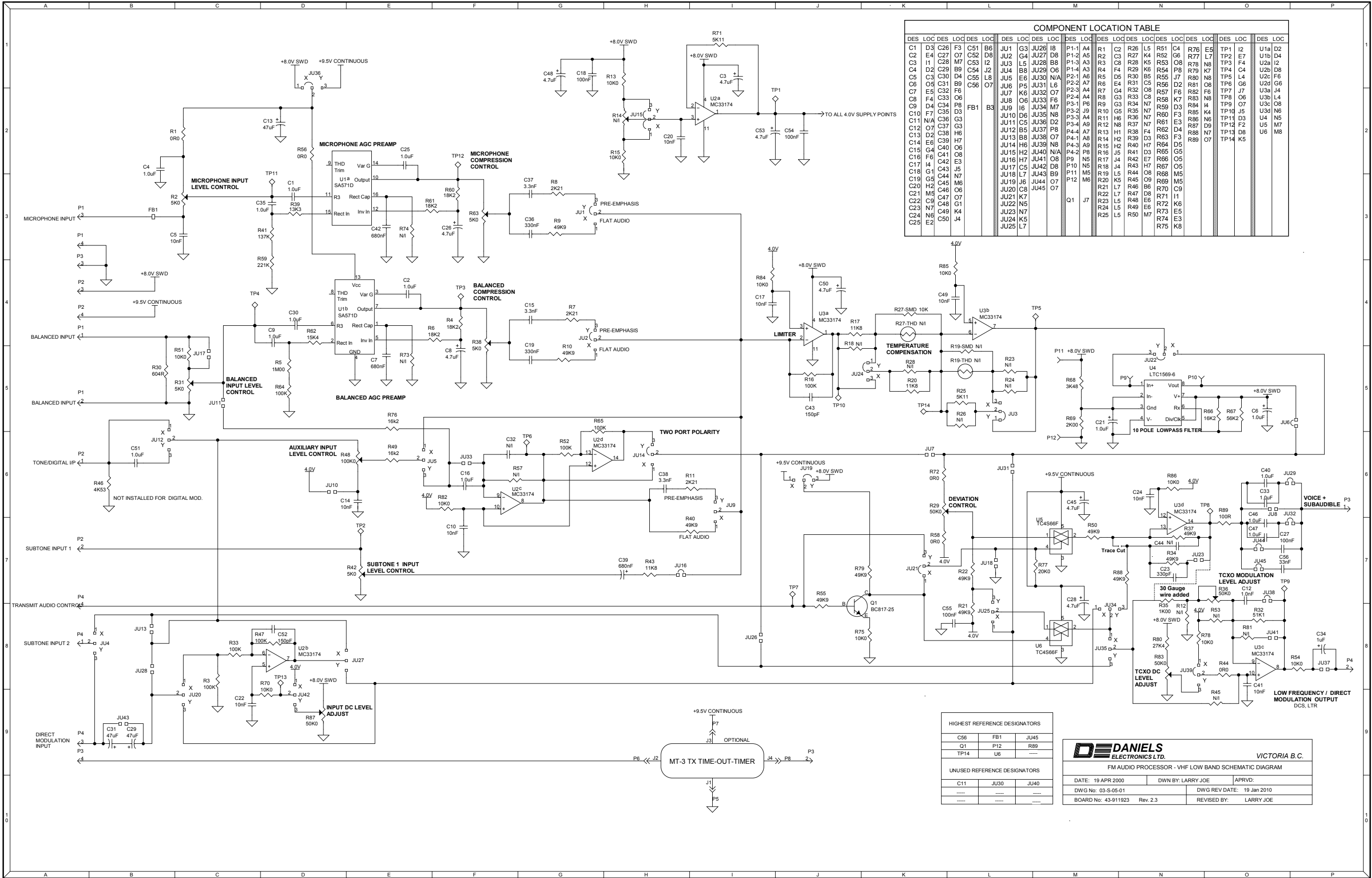
BOARD NO: 43-911923

DWG No: 03-T-01-01

REV DATE:



FM AUDIO PROCESSOR BOARD SCHEMATIC DIAGRAM





## PARTS LIST

### MT-3 FM TRANSMITTER MAINBOARD

Electrical Parts List – VT-3H035-SXA300 & VT-3H045-SXA300

| Designator | Description                    | Part Number   |
|------------|--------------------------------|---------------|
| CONN1      | CONNECTOR, F/48 MALE, R/A PCB  | 3720-6048M0RA |
| C1         | CAP., SM, 10uF TANT., 10%, 35V | 1055-6D106K35 |
| C2         | CAP., SM, 1uF TANT., 20%, 35V  | 1055-5B105M35 |
| C3         | CAP., SM, 10uF TANT., 20%, 16V | 1055-6C106M16 |
| C4         | CAP., SM, 1uF TANT., 20%, 16V  | 1055-5A105M16 |
| C5         | CAP,100nF CER,0805,10%,50V,X7R | 1008-5A104K5R |
| C6         | CAP, 10nF CER,0805,10%,50V,X7R | 1008-4A103K5R |
| C7         | CAP, 10nF CER,0805,10%,50V,X7R | 1008-4A103K5R |
| C8         | CAP,100nF CER,0805,10%,50V,X7R | 1008-5A104K5R |
| C10        | CAP, 1uF CER, 2225, 5%,50V,X7R | 1008-6H105J5R |
| C12        | CAP, 10nF CER,0805,10%,50V,X7R | 1008-4A103K5R |
| C13        | CAP, 10nF CER,0805,10%,50V,X7R | 1008-4A103K5R |
| C14        | CAP, 10nF CER,0805,10%,50V,X7R | 1008-4A103K5R |
| C15        | CAP., SM, 4.7uF TANT., 10%,16V | 1055-5B475K16 |
| C20        | CAP., SM, 4.7uF TANT., 10%,16V | 1055-5B475K16 |
| C21        | CAP,100nF CER,0805,10%,50V,X7R | 1008-5A104K5R |
| C22        | CAP,100nF CER,0805,10%,50V,X7R | 1008-5A104K5R |
| C23        | CAP., 100nF FILM, MMK5,10%,63V | 1016-5A104K63 |
| D1         | DIODE, BYD17J, RECTIFIER,SOD87 | 2101-BYD17J00 |
| D1         | LED, RED, 5mm OD, T-1 3/4      | 2010-503001RD |
| D2         | DIODE, BYD17J, RECTIFIER,SOD87 | 2101-BYD17J00 |
| D3         | DIODE, BYD17J, RECTIFIER,SOD87 | 2101-BYD17J00 |
| D4         | DIODE, BYD17J, RECTIFIER,SOD87 | 2101-BYD17J00 |
| D5         | DIODE, BYD17J, RECTIFIER,SOD87 | 2101-BYD17J00 |
| D6         | DIODE, BYD17J, RECTIFIER,SOD87 | 2101-BYD17J00 |
| D7         | DIODE, BAS16, SWITCHING, SOT23 | 2100-BAS16000 |

## MT-3 FM Transmitter Mainboard Electrical Parts (Continued)

| Designator | Description                    | Part Number   |
|------------|--------------------------------|---------------|
| D8         | DIODE, BAS16, SWITCHING, SOT23 | 2100-BAS16000 |
| FSW1       | SWITCH, BCD-16 STEPS,5 PIN,PCB | 5273-16BCD001 |
| FSW2       | SWITCH, BCD-10 STEPS,5 PIN,PCB | 5273-10BCD001 |
| FSW3       | SWITCH, BCD-10 STEPS,5 PIN,PCB | 5273-10BCD001 |
| FSW4       | SWITCH, BCD-10 STEPS,5 PIN,PCB | 5273-10BCD001 |
| JS1-1      | SOCK. STRIP-L/P,1ROW x12PIN,Au | 5016-SL112G08 |
| JS1-13     | SOCK. STRIP-L/P,1ROW x 9PIN,Au | 5016-SL109G08 |
| JS2-1      | SOCK. STRIP-L/P,1ROW x 6PIN,Au | 5016-SL106G08 |
| JS3-1      | SOCK. STRIP-L/P,1ROW x 2PIN,Au | 5016-SL102G08 |
| LPF1-5     | FILTER, SM, EMI/LPF, 360pF,FER | 1306-T361F2D5 |
| LPF8       | FILTER, SM, EMI/LPF, 360pF,FER | 1306-T361F2D5 |
| LFP10      | FILTER, SM, EMI/LPF, 360pF,FER | 1306-T361F2D5 |
| LPF12      | FILTER, SM, EMI/LPF, 360pF,FER | 1306-T361F2D5 |
| LPF14-35   | FILTER, SM, EMI/LPF, 360pF,FER | 1306-T361F2D5 |
| PCB        | PCB, MT-3 TRANSMITTER, MAIN    | 4321-10920917 |
| PCB        | PCB, MT-3 TX, FRONT PANEL,V1.2 | 4321-40921212 |
| PF1        | HEADER, .1", R/A, 2 ROW X 2PIN | 5010-H202RA9T |
| PF2        | HEADER, .1", R/A, 2 ROW X 2PIN | 5010-H202RA9T |
| PF3        | HEADER, .1", R/A, 2 ROW X 2PIN | 5010-H202RA9T |
| Q1         | TRANSISTOR, BC817-25,NPN,SOT23 | 2120-BC817025 |
| Q3         | TRANSISTOR, BC817-25,NPN,SOT23 | 2120-BC817025 |
| Q4         | TRANSISTOR, BC817-25,NPN,SOT23 | 2120-BC817025 |
| Q5         | MOSFET, D5P06V, P-CHAN., D-PAK | 2144-D5P06V00 |
| Q6         | TRANSISTOR, BC817-25,NPN,SOT23 | 2120-BC817025 |
| Q7         | MOSFET, D5P06V, P-CHAN., D-PAK | 2144-D5P06V00 |
| Q8         | TRANSISTOR, BC807-25,PNP,SOT23 | 2120-BC807025 |
| Q9         | MOSFET, D15N06V, N-CHAN., DPAK | 2144-D15N06V0 |
| Q10        | TRANSISTOR, PZT2222A,NPN,ST223 | 2120-PZT2222A |
| Q11        | TRANSISTOR, BC807-25,PNP,SOT23 | 2120-BC807025 |
| R1         | RES., SM, 10R0 0805, 1%,100ppm | 1150-1A10R0FP |
| R2         | RES., SM, 27K4 0805, 1%,100ppm | 1150-4A2742FP |
| R3         | RES., SM, 1K00 0805, 1%,100ppm | 1150-3A1001FP |
| R4         | RES., SM, 27K4 0805, 1%,100ppm | 1150-4A2742FP |
| R5         | RES., SM, 10R0 0805, 1%,100ppm | 1150-1A10R0FP |
| R6         | RES., SM, 27K4 0805, 1%,100ppm | 1150-4A2742FP |
| R7         | RES., SM, 1K00 0805, 1%,100ppm | 1150-3A1001FP |
| R8         | RES., SM, 27K4 0805, 1%,100ppm | 1150-4A2742FP |
| R9         | RES., SM, 221K 0805, 1%,100ppm | 1150-5A2213FP |
| R10        | RES., SM, 100K 0805, 1%,100ppm | 1150-5A1003FP |
| R11        | RES., SM, 27K4 0805, 1%,100ppm | 1150-4A2742FP |
| R12        | RES., SM, 27K4 0805, 1%,100ppm | 1150-4A2742FP |

## MT-3 FM Transmitter Mainboard Electrical Parts (Continued)

| Designator | Description                    | Part Number   |
|------------|--------------------------------|---------------|
| R13        | RES., SM, 27K4 0805, 1%,100ppm | 1150-4A2742FP |
| R14        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R15        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R16        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R17        | RES., SM, 1K00 0805, 1%,100ppm | 1150-3A1001FP |
| R18        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R19        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R20        | RES., SM, 68K1 0805, 1%,100ppm | 1150-4A6812FP |
| R21        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R22        | RES., SM, 68K1 0805, 1%,100ppm | 1150-4A6812FP |
| R23        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R24        | RES., SM, 68K1 0805, 1%,100ppm | 1150-4A6812FP |
| R25        | RES., SM, 27K4 0805, 1%,100ppm | 1150-4A2742FP |
| R26        | RES., SM, 1K00 0805, 1%,100ppm | 1150-3A1001FP |
| R29        | RES., SM, 82K5 0805, 1%,100ppm | 1150-4A8252FP |
| R30        | RES., SM, 15K0 0805, 1%,100ppm | 1150-4A1502FP |
| R31        | RES., SM, 221K 0805, 1%,100ppm | 1150-5A2213FP |
| R32        | RES., SM, 1K00 0805, 1%,100ppm | 1150-3A1001FP |
| R33        | RES., SM, 68K1 0805, 1%,100ppm | 1150-4A6812FP |
| R34        | RES., SM, 27K4 0805, 1%,100ppm | 1150-4A2742FP |
| R35        | RES., SM, 27K4 0805, 1%,100ppm | 1150-4A2742FP |
| R36        | RES., SM, 221K 0805, 1%,100ppm | 1150-5A2213FP |
| R37        | RES., SM, 1K00 0805, 1%,100ppm | 1150-3A1001FP |
| R38        | RES., SM, 100K 0805, 1%,100ppm | 1150-5A1003FP |
| R39        | RES., SM, 221K 0805, 1%,100ppm | 1150-5A2213FP |
| R40        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R41        | RES., SM, 15K0 0805, 1%,100ppm | 1150-4A1502FP |
| R43        | RES., SM, 221K 0805, 1%,100ppm | 1150-5A2213FP |
| R44        | RES., SM, 221K 0805, 1%,100ppm | 1150-5A2213FP |
| R45        | RES., SM, 221K 0805, 1%,100ppm | 1150-5A2213FP |
| R46        | RES., SM, 221K 0805, 1%,100ppm | 1150-5A2213FP |
| R47        | RES., SM, 1K00 0805, 1%,100ppm | 1150-3A1001FP |
| RELAY1     | RELAY, 9VDC, 2 FORM C,PCB MNT. | 5310-2C09P005 |
| SW1        | SWITCH, TOG/DPDT,O-O-O,PCB/STR | 5215-T2031V02 |
| T1         | TRANSFORMER, AUDIO,600R,1:1    | 1280-600P6005 |
| U1         | IC, MC33172, DUAL OP AMP, SO-8 | 2302-33172N08 |
| U2         | IC, 4081, QUAD 2I/P AND, SO-14 | 2375-40810N14 |
| U3         | IC, MMAD1108,8 DIODE/ARY.,SO16 | 2331-11080N16 |
| U4         | IC, MMAD1108,8 DIODE/ARY.,SO16 | 2331-11080N16 |
| U6         | IC, LP2951,PROG. VOLT REG,SO-8 | 2305-29510N08 |
| U7         | IC, MC33172, DUAL OP AMP, SO-8 | 2302-33172N08 |
| U8         | IC, 4536, PROG. TIMER, SO-16L  | 2375-45360W16 |

## MT-3 FM Transmitter Mainboard Mechanical Parts List

### VT-3H035-SXA300 & VT-3H045-SXA300

| Description                                | Part Number   | Qty. | UOM |
|--------------------------------------------|---------------|------|-----|
| CABLE, CONFORM., 31mm/5mm/4mm              | 7489-C1079100 | 1    | EA  |
| CASE, 14HP RF PLUG-IN, MT-3 TX             | 3702-62502010 | 1    | EA  |
| CONN., N JACK, PANEL MNT,C/SNK             | 5184-10923011 | 1    | EA  |
| CONNECTOR, MIC., 4 PIN, MALE               | 5040-114ST0BK | 1    | EA  |
| FASTENER, QUICK RELEASE, GRAY              | 3702-10000120 | 4    | EA  |
| FERRITE, BEAD,43MIX,3x3.5mm OD             | 1210-43030350 | 3    |     |
| GASKET, BeCu,3FINGER,,71",CLIP             | 5630-12023250 | 2    | EA  |
| HANDLE, FRONT PANEL, 14HP,GREY             | 3702-10000614 | 1    | EA  |
| HOLE PLUG, .250" HOLE,NYL.,BLK             | 5671-250N062B | 1    | EA  |
| LABEL/LEXAN, 14HP, VHF: ORANGE             | 3536-10101405 | 1    | LBL |
| LOCKWASHER, M3, SPLIT,A2 STEEL             | 5814-3M0LK00S | 4    | EA  |
| NAMEPLATE, BLANK, 14HP, ALUM.              | 3702-10001214 | 1    | EA  |
| NUT, M2.5, HEX, 5.0mm FLATS,A2 (for CONN1) | 5813-2M5HX50S | 2    | EA  |
| NUT, M2.5, SQUARE-5mm, ZINC                | 5813-2M5SQ50Z | 2    | EA  |
| PANEL, REAR,POS.4,14HP EXTRSN.             | 3702-63002101 | 1    | EA  |
| PANEL/FRNT,W/IDENT:TX-EXTR.VER             | 3802-61002101 | 1    | EA  |
| SCREW, M2 X 4, PAN/PHILLIPS,A2             | 5812-2M0PP04S | 6    | EA  |
| SCREW, M2.5 x 10 PAN/PHIL, A2 (for CONN1)  | 5812-2M5PP10S | 2    | EA  |
| SCREW, M2.5 x 14 FLAT/PHIL, A2             | 5812-2M5FP14S | 2    | EA  |
| SCREW, M3 X 6, FLAT/PHIL., A2              | 5812-3M0FP06S | 4    | EA  |
| SCREW, M3 X 6, PAN/PHILLIPS,A2             | 5812-3M0PP06S | 4    | EA  |
| SCREW, M3 x 6,OVAL C/S/PHIL,A2             | 5812-3M0VP06S | 2    | EA  |
| SCREW, M3 x 8, PAN/PHIL, BLACK             | 5812-3M0PP08T | 4    | EA  |
| SCREW, M3 x 8,OVAL C/S/PHIL,A2             | 5812-3M0VP08S | 2    | EA  |
| SCREW, M3 x10,OVAL C/S/PHIL,A2             | 5812-3M0VP10S | 2    | EA  |
| SCREW, M5 x 8, FLAT/PHIL., A2              | 5812-5M0FP08S | 4    | EA  |

## FRONT PANEL BOARD

### Electrical and Mechanical Parts List

| Designator | Description                             | Part Number   |
|------------|-----------------------------------------|---------------|
| D1         | LED, RED, 5mm OD, T-1 3/4               | 2010-503001RD |
|            | SPACER, LED-T1 3/4, .300"H,NYL          | 5620-503S300N |
| PCB        | PCB, MT-3 TX, FRONT PANEL,V1.2          | 4321-40921212 |
| PF1        | HEADER, .1", R/A, 2 ROW X 2PIN          | 5010-H202RA9T |
| PF2        | HEADER, .1", R/A, 2 ROW X 2PIN          | 5010-H202RA9T |
| PF3        | HEADER, .1", R/A, 2 ROW X 2PIN          | 5010-H202RA9T |
| SW1        | SWITCH, TOG/DPDT,O-O-O,PCB/STR          | 5215-T2031V02 |
|            | WASHER, TFE,0.036ID,1/8OD,.02T (Qty. 2) | 5805-T3612F20 |

## FM AUDIO PROCESSOR

### Electrical Parts List – A21-VUAP3

| Designator | Description                    | Part Number   |
|------------|--------------------------------|---------------|
| C1         | CAP,1uF C,1206,+80-20%,25V,X7R | 1008-6B105Z3R |
| C2         | CAP,1uF C,1206,+80-20%,25V,X7R | 1008-6B105Z3R |
| C3         | CAP., SM, 4.7uF TANT., 10%,16V | 1055-5B475K16 |
| C4         | CAP,1uF C,1206,+80-20%,25V,X7R | 1008-6B105Z3R |
| C5         | CAP, 10nF CER,0805,10%,50V,X7R | 1008-4A103K5R |
| C6         | CAP., SM, 1uF TANT., 20%, 16V  | 1055-5A105M16 |
| C7         | CAP,680nF CER,1206,20%,25V,X7R | 1008-5B684M3R |
| C8         | CAP., SM, 4.7uF TANT., 10%,16V | 1055-5B475K16 |
| C9         | CAP,1uF C,1206,+80-20%,25V,X7R | 1008-6B105Z3R |
| C10        | CAP, 10nF CER,0805,10%,50V,X7R | 1008-4A103K5R |
| C12        | CAP, 1nF CER, 0805,10%,50V,X7R | 1008-3A102K5R |
| C13        | CAP., SM, 47uF TANT., 20%, 16V | 1055-6D476M16 |
| C14        | CAP, 10nF CER,0805,10%,50V,X7R | 1008-4A103K5R |
| C15        | CAP., 3.3nF FILM, MMK5,10%,63V | 1016-3A332K63 |
| C16        | CAP,1uF C,1206,+80-20%,25V,X7R | 1008-6B105Z3R |
| C17        | CAP, 10nF CER,0805,10%,50V,X7R | 1008-4A103K5R |
| C18        | CAP,100nF CER,0805,10%,50V,X7R | 1008-5A104K5R |
| C19        | CAP,330nF CER,0805,20%,25V,X7R | 1008-5A334M3R |
| C20        | CAP, 10nF CER,0805,10%,50V,X7R | 1008-4A103K5R |
| C21        | CAP., SM, 1uF TANT., 20%, 16V  | 1055-5A105M16 |
| C22        | CAP, 10nF CER,0805,10%,50V,X7R | 1008-4A103K5R |
| C23        | CAP,330pF CER,0805,5%,100V,C0G | 1008-2A331J1G |
| C24        | CAP, 10nF CER,0805,10%,50V,X7R | 1008-4A103K5R |
| C25        | CAP,1uF C,1206,+80-20%,25V,X7R | 1008-6B105Z3R |

## FM Audio Processor Electrical Parts (Continued)

| Designator | Description                    | Part Number   |
|------------|--------------------------------|---------------|
| C26        | CAP., SM, 4.7uF TANT., 10%,16V | 1055-5B475K16 |
| C27        | CAP,100nF CER,0805,10%,50V,X7R | 1008-5A104K5R |
| C28        | CAP., SM, 4.7uF TANT., 10%,16V | 1055-5B475K16 |
| C29        | CAP., SM, 47uF TANT., 20%, 16V | 1055-6D476M16 |
| C30        | CAP,1uF C,1206,+80-20%,25V,X7R | 1008-6B105Z3R |
| C31        | CAP., SM, 47uF TANT., 20%, 16V | 1055-6D476M16 |
| C33        | CAP,1uF C,1206,+80-20%,25V,X7R | 1008-6B105Z3R |
| C34        | CAP., 1uF DIP. TANT., 20%, 35V | 1054-5A105M35 |
| C35        | CAP,1uF C,1206,+80-20%,25V,X7R | 1008-6B105Z3R |
| C36        | CAP,330nF CER,0805,20%,25V,X7R | 1008-5A334M3R |
| C37        | CAP., 3.3nF FILM, MMK5,10%,63V | 1016-3A332K63 |
| C38        | CAP., 3.3nF FILM, MMK5,10%,63V | 1016-3A332K63 |
| C39        | CAP., SM, 680nF TANT., 10%,35V | 1055-4B684K35 |
| C40        | CAP,1uF C,1206,+80-20%,25V,X7R | 1008-6B105Z3R |
| C41        | CAP, 10nF CER,0805,10%,50V,X7R | 1008-4A103K5R |
| C42        | CAP,680nF CER,1206,20%,25V,X7R | 1008-5B684M3R |
| C43        | CAP,150pF CER,0805,5%,100V,C0G | 1008-2A151J1G |
| C45        | CAP., SM, 4.7uF TANT., 10%,16V | 1055-5B475K16 |
| C46        | CAP,1uF C,1206,+80-20%,25V,X7R | 1008-6B105Z3R |
| C47        | CAP,1uF C,1206,+80-20%,25V,X7R | 1008-6B105Z3R |
| C48        | CAP., SM, 4.7uF TANT., 10%,16V | 1055-5B475K16 |
| C49        | CAP, 10nF CER,0805,10%,50V,X7R | 1008-4A103K5R |
| C50        | CAP., SM, 4.7uF TANT., 10%,16V | 1055-5B475K16 |
| C51        | CAP,1uF C,1206,+80-20%,25V,X7R | 1008-6B105Z3R |
| C52        | CAP,150pF CER,0805,5%,100V,C0G | 1008-2A151J1G |
| C53        | CAP., SM, 4.7uF TANT., 10%,16V | 1055-5B475K16 |
| C54        | CAP,100nF CER,0805,10%,50V,X7R | 1008-5A104K5R |
| C55        | CAP,100nF CER,0805,10%,50V,X7R | 1008-5A104K5R |
| C56        | CAP, 33nF CER,0805,10%,50V,X7R | 1008-4A333K5R |
| FB1        | FERRITE BEAD, SM,43MIX,.18x.12 | 1213-43181200 |
| P1         | HEADER, .1", R/A, 2 ROW X 2PIN | 5010-H202RA9T |
| P2         | HEADER, .1", R/A, 2 ROW X 2PIN | 5010-H202RA9T |
| P3         | HEADER, .1", R/A, 2 ROW X 2PIN | 5010-H202RA9T |
| P4         | HEADER, .1", R/A, 2 ROW X 2PIN | 5010-H202RA9T |
| PCB        | PCB, AUDIO PROCESSOR, MT-3 TX  | 4321-30911923 |
| Q1         | TRANSISTOR, BC817-25,NPN,SOT23 | 2120-BC817025 |
| R1         | RES., SM, ZERO OHM JUMPER,0805 | 1150-0A0R0000 |
| R2         | POT.,SM/4mmSQ,5K0,MUL/TRN,SIDE | 1174-DM2502J0 |
| R3         | RES., SM, 100K 0805, 1%,100ppm | 1150-5A1003FP |
| R4         | RES., SM, 18K2 0805, 1%,100ppm | 1150-4A1822FP |
| R5         | RES., SM, 1M00 0805, 1%,100ppm | 1150-6A1004FP |
| R6         | RES., SM, 18K2 0805, 1%,100ppm | 1150-4A1822FP |
| R7         | RES., SM, 2K21 0805, 1%,100ppm | 1150-3A2211FP |

## FM Audio Processor Electrical Parts (Continued)

| Designator | Description                    | Part Number   |
|------------|--------------------------------|---------------|
| R8         | RES., SM, 2K21 0805, 1%,100ppm | 1150-3A2211FP |
| R9         | RES., SM, 49K9 0805, 1%,100ppm | 1150-4A4992FP |
| R10        | RES., SM, 49K9 0805, 1%,100ppm | 1150-4A4992FP |
| R11        | RES., SM, 2K21 0805, 1%,100ppm | 1150-3A2211FP |
| R13        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R15        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R16        | RES., SM, 100K 0805, 1%,100ppm | 1150-5A1003FP |
| R17        | RES., SM, 11K8 0805, 1%,100ppm | 1150-4A1182FP |
| R21        | RES., SM, 49K9 0805, 1%,100ppm | 1150-4A4992FP |
| R22        | RES., SM, 49K9 0805, 1%,100ppm | 1150-4A4992FP |
| R25        | RES., SM, 5K11 0805, 1%,100ppm | 1150-3A5111FP |
| R27        | THERMISTOR/SMT, 10K, NTC, 1206 | 1185-4B103AAK |
| R29        | POT.,SM/4mmSQ,50K,MUL/TRN,SIDE | 1174-DM3503J0 |
| R30        | RES., SM, 604R 0805, 1%,100ppm | 1150-2A6040FP |
| R31        | POT.,SM/4mmSQ,5K0,MUL/TRN,SIDE | 1174-DM2502J0 |
| R32        | RES., SM, 51K1 0805, 1%,100ppm | 1150-4A5112FP |
| R33        | RES., SM, 100K 0805, 1%,100ppm | 1150-5A1003FP |
| R34        | RES., SM, 49K9 0805, 1%,100ppm | 1150-4A4992FP |
| R35        | RES., SM, 1K00 0805, 1%,100ppm | 1150-3A1001FP |
| R36        | POT.,SM/4mmSQ,50K,MUL/TRN,SIDE | 1174-DM3503J0 |
| R37        | RES., SM, 49K9 0805, 1%,100ppm | 1150-4A4992FP |
| R38        | POT.,SM/4mmSQ,5K0,MUL/TRN,SIDE | 1174-DM2502J0 |
| R39        | RES., SM, 15K4 0805, 1%,100ppm | 1150-4A1542FP |
| R40        | RES., SM, 49K9 0805, 1%,100ppm | 1150-4A4992FP |
| R41        | RES., SM, 137K 0805, 1%,100ppm | 1150-5A1373FP |
| R42        | POT.,SM/4mmSQ,5K0,MUL/TRN,SIDE | 1174-DM2502J0 |
| R43        | RES., SM, 11K8 0805, 1%,100ppm | 1150-4A1182FP |
| R44        | RES., SM, ZERO OHM JUMPER,0805 | 1150-0A0R0000 |
| R46        | RES., SM, 4K53 0805, 1%,100ppm | 1150-3A4531FP |
| R47        | RES., SM, 100K 0805, 1%,100ppm | 1150-5A1003FP |
| R48        | POT.,SM/4mmSQ,100K,MUL/TN,SIDE | 1174-DM4104J0 |
| R49        | RES., SM, 16K2 0805, 1%,100ppm | 1150-4A1622FP |
| R50        | RES., SM, 49K9 0805, 1%,100ppm | 1150-4A4992FP |
| R51        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R52        | RES., SM, 100K 0805, 1%,100ppm | 1150-5A1003FP |
| R54        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R55        | RES., SM, 49K9 0805, 1%,100ppm | 1150-4A4992FP |
| R56        | RES., SM, ZERO OHM JUMPER,0805 | 1150-0A0R0000 |
| R58        | RES., SM, ZERO OHM JUMPER,0805 | 1150-0A0R0000 |
| R59        | RES., SM, 20K0 0805, 1%,100ppm | 1150-4A2002FP |
| R60        | RES., SM, 18K2 0805, 1%,100ppm | 1150-4A1822FP |
| R61        | RES., SM, 18K2 0805, 1%,100ppm | 1150-4A1822FP |
| R62        | RES., SM, 15K4 0805, 1%,100ppm | 1150-4A1542FP |

## FM Audio Processor Electrical Parts (Continued)

| Designator | Description                    | Part Number   |
|------------|--------------------------------|---------------|
| R63        | POT.,SM/4mmSQ,5K0,MUL/TRN,SIDE | 1174-DM2502J0 |
| R64        | RES., SM, 100K 0805, 1%,100ppm | 1150-5A1003FP |
| R65        | RES., SM, 100K 0805, 1%,100ppm | 1150-5A1003FP |
| R66        | RES., SM, 16K2 0805, 1%,100ppm | 1150-4A1622FP |
| R67        | RES., SM, 56K2 0805, 1%,100ppm | 1150-4A5622FP |
| R68        | RES., SM, 3K48 0805, 1%,100ppm | 1150-3A3481FP |
| R69        | RES., SM, 2K00 0805, 1%,100ppm | 1150-3A2001FP |
| R70        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R71        | RES., SM, 5K11 0805, 1%,100ppm | 1150-3A5111FP |
| R72        | RES., SM, ZERO OHM JUMPER,0805 | 1150-0A0R0000 |
| R75        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R76        | RES., SM, 16K2 0805, 1%,100ppm | 1150-4A1622FP |
| R77        | RES., SM, 20K0 0805, 1%,100ppm | 1150-4A2002FP |
| R78        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R79        | RES., SM, 49K9 0805, 1%,100ppm | 1150-4A4992FP |
| R80        | RES., SM, 27K4 0805, 1%,100ppm | 1150-4A2742FP |
| R82        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R83        | POT.,SM/4mmSQ,50K,MUL/TRN,SIDE | 1174-DM3503J0 |
| R84        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R85        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R86        | RES., SM, 10K0 0805, 1%,100ppm | 1150-4A1002FP |
| R87        | POT.,SM/4mmSQ,50K,MUL/TRN,SIDE | 1174-DM3503J0 |
| R88        | RES., SM, 49K9 0805, 1%,100ppm | 1150-4A4992FP |
| R89        | RES., SM, 100R 0805, 1%,100ppm | 1150-2A1000FP |
| U1         | IC, SA571D, COMPANDOR, SO-16L  | 2327-SA571D00 |
| U2         | IC, MC33174, QUAD OP AMP,SO-14 | 2304-33174N14 |
| U3         | IC, MC33174, QUAD OP AMP,SO-14 | 2304-33174N14 |
| U4         | IC, LTC1569I,LPF,10TH ORD,SO-8 | 2326-15696N08 |
| U5         | IC, 4S66F,BILATERAL SWITCH,SMV | 2375-4S66FSMV |
| U6         | IC, 4S66F,BILATERAL SWITCH,SMV | 2375-4S66FSMV |



## REVISION HISTORY

| Revision | Date   | Action # | Description                                                                                                                                                                                                                                                                                                                                                             |
|----------|--------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3        | Mar 02 | 701      | TOT specification changed from 5min $\pm$ 30sec to 5min $\pm$ 50sec.                                                                                                                                                                                                                                                                                                    |
| 3        | Apr 02 | 697      | Improve hum & noise performance, UT-3/8xxx only Version 2.3 Audio Processor changes <ul style="list-style-type: none"> <li>C56 now 22nF for 800 MHz LTR™ only (remains as 33nF for other bands.)</li> <li>JU29, JU32, and JU44 Not Installed for 800 MHz LTR™</li> </ul>                                                                                                |
| 3        | Feb 02 | 678      | To prevent frequency error when PTT first activated. Reduction of charge time for C34 on the Version 2.3 Audio Processor. C34 now 1.0 $\mu$ F, DIP Tantalum (was 47 $\mu$ F SM Tantalum) <ul style="list-style-type: none"> <li>C34 remains as 47<math>\mu</math>F for LTR™ &amp; DCS applications.</li> </ul>                                                          |
| 4        | Mar 03 |          | <ul style="list-style-type: none"> <li>Reissue including Version 2.3 Audio Processor information.</li> <li>Version 1.6 Audio Processor information is removed.</li> <li>Issue 4 covers Version 1.8, 2.2 &amp; 2.3 Audio Processors.</li> <li>Issue 4 contains no AM information - the document title is changed to reflect coverage of only FM transmitters.</li> </ul> |
|          |        | 699      | For VT-3H035 & VT-3H045 transmitters, to reduce spurious emissions for CE approval, the PCB trace pattern is modified and C44 is Not Installed.                                                                                                                                                                                                                         |
|          |        | 701      | Time Out Timer tolerance is changed to $\pm$ 17%. Tolerance for 5 minutes setting is $\pm$ 50sec.                                                                                                                                                                                                                                                                       |
| 4-1-0    | Sep 03 |          | <ul style="list-style-type: none"> <li>New Manual Format</li> <li>Removed all reference to Version 1.8 Audio Processor</li> </ul>                                                                                                                                                                                                                                       |
| 4-1-1    | Oct 03 |          | Typographical updates to manual.                                                                                                                                                                                                                                                                                                                                        |
| 4-2-0    | Jan 05 | 660      | <ul style="list-style-type: none"> <li>Update Audio Processor Component Layout Dwg: 43-911923-01-T-01-01 to 43-911923-01-T-02-01<br/>43-911923-01-S-0101 to 43-911923-01-S-02-01</li> <li>Add Select table for Audio Processor Components: "Audio Processor Component Layout Selection Table"</li> </ul>                                                                |
|          |        | 791      | Update Main Board Component & Schematic Dwg to update J25 SEL: X installed for FM Products & Y installed for AM Products                                                                                                                                                                                                                                                |
|          |        | ---      | <ul style="list-style-type: none"> <li>Update Tx Front Panel Component Dwg: 43-921212-01-T-01-01 to 43-921212-01-T-02-01</li> <li>Update specification tables and part list</li> </ul>                                                                                                                                                                                  |

Revision History continued next page

| Revision        | Date     | Action # | Description                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------|----------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4-2-0<br>(cont) |          | 829      | Update Parts List                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                 |          | 836      | Update C56 to 47nF for 950MHz transmitters.                                                                                                                                                                                                                                                                                                                                                                                                     |
| 4-3-0           | Jun 05   | 836A1    | CO 836 expanded to include the UT-3/930-SXB300 Audio Processor model selected components.                                                                                                                                                                                                                                                                                                                                                       |
|                 |          | 836A2    | CO 836 expanded to include the UT-3/930-SXB300 with this main board.                                                                                                                                                                                                                                                                                                                                                                            |
|                 |          | 846      | <ul style="list-style-type: none"> <li>Update Audio Processor Component Layout and the Audio Processor Component Layout Selection Table.</li> <li>Alignment procedures updated.</li> </ul>                                                                                                                                                                                                                                                      |
|                 |          | ---      | <ul style="list-style-type: none"> <li>Revision History older than 7yrs removed from publication.</li> <li>Top level mechanical parts moved to the top level Transmitter IMs;               <ul style="list-style-type: none"> <li>for all VHF Synthesized Tx mech parts consult IM20-VT3150</li> <li>for all UHF Synthesized Tx mech parts consult IM23-UT3400</li> <li>for all Crystal Tx mech parts consult IM21-xT3C</li> </ul> </li> </ul> |
| 4-4-0           | Dec 05   | 6056     | OC-3 Product discontinued. Remove references.                                                                                                                                                                                                                                                                                                                                                                                                   |
|                 |          | 6113     | VT-3/140 Audio Processor select value table updated.                                                                                                                                                                                                                                                                                                                                                                                            |
|                 |          | 6115     | VT-3/160 Audio Processor select value table updated.                                                                                                                                                                                                                                                                                                                                                                                            |
| 4-5-0           | Feb 06   | 6129     | UT-3/420-SXCX00 Audio Processor select value table updated.                                                                                                                                                                                                                                                                                                                                                                                     |
|                 |          | 6130     | UT-3/460-SXCX00 Audio Processor select value table updated.                                                                                                                                                                                                                                                                                                                                                                                     |
|                 |          | ---      | Audio Processor Parts list expanded to display all models and their band selected components.                                                                                                                                                                                                                                                                                                                                                   |
| 5-0-0           | Feb 2010 |          | <b>Revision history older than seven years has been removed.</b>                                                                                                                                                                                                                                                                                                                                                                                |
|                 |          | 6127     | Improve the Low Band transmitter's standard subtone response.                                                                                                                                                                                                                                                                                                                                                                                   |
|                 |          | 6154     | VHF and UHF Audio Processor Max Dev tuning change.                                                                                                                                                                                                                                                                                                                                                                                              |
|                 |          | 6344     | Remove all references specific to the MT-3 800/900 MHz product.                                                                                                                                                                                                                                                                                                                                                                                 |
|                 |          | 6347     | Discontinue the MT-3 UHF 400 and VHF 150 modules. <ul style="list-style-type: none"> <li>updated 43-920917 CLD – Top and schematic</li> </ul>                                                                                                                                                                                                                                                                                                   |
|                 |          | 6437     | VT-3H045 Temp compensation adjustment. <ul style="list-style-type: none"> <li>Updated the MT-3 VHF Low Band Performance Specifications</li> </ul>                                                                                                                                                                                                                                                                                               |
|                 |          | 6452     | VT-3H035 Temp compensation adjustment.                                                                                                                                                                                                                                                                                                                                                                                                          |
|                 |          | 3682     | <ul style="list-style-type: none"> <li>Update operating voltage to nominal (10–17 V)</li> <li>Change document title to include MT-3</li> </ul>                                                                                                                                                                                                                                                                                                  |
|                 |          | ---      | <ul style="list-style-type: none"> <li>Update company logos and trademark information</li> <li>Apply Daniels Style Guide</li> <li>Update BOMs, schematics and CLDs</li> </ul>                                                                                                                                                                                                                                                                   |