DANIELS™
ELECTRONICS LTD.

MT-3 FM TRANSMITTER MAINBOARD INSTRUCTION MANUAL

Covers Models:

VT-3H035-SXA300

VT-3H045-SXA300

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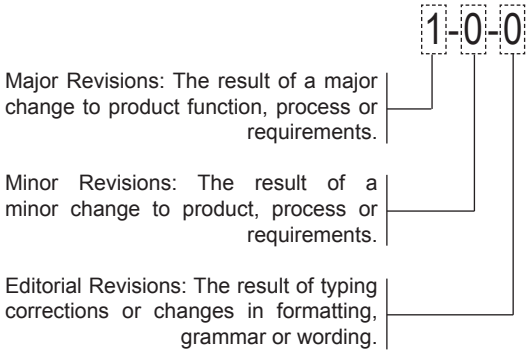
DOCUMENT REVISION DEFINITION

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

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) 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): Undesired Emissions (Conducted Spurious):	<= -90 dBc <= -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) +9.5 VDC regulated
Transmit Current:	<1.2 A for 3.0 W output
Stand By Current:	15 mA (Mode 1) 160 mA (Mode 2) 185 mA (Mode 4)
PTT Time-Out-Timer:	Nominal – 5 minutes Range – 1 sec to 8 hours, disable
Audio Input:	600 Ω balanced or unbalanced input (5 K Ohm) -25 dBm to 0 dBm
Audio Frequency Response:	Pre-emphasis: complies with TIA-603C Flat: +1 dB/-3 dB 100 Hz to 3 kHz
Audio Deviation Limiting:	± 5.0 kHz
Audio Distortion:	<2.0% @ +23°C <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:	• Anodized aluminum construction • Stainless steel hardware • Gold-plated module connectors		
Module Design:	• Compact Eurostandard modular design • Plug-in modules mate with the Daniels standard MT-3 Repeater Subrack • Subracks / modules comply with IEEE 1101, DIN 41494 and IEC 297-3 (mechanical size / modular arrangement)		
External Connections:	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. 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 SO2 gas test with no functional impairment and no change in contact resistance).		
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/ Osc. State	Audio Processor State (8 V Switched)	Audio Processor 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 Ω 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
N/I	**I**	**I**	**N/I**	**I**	**N/I**	**5.0**
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 10th 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

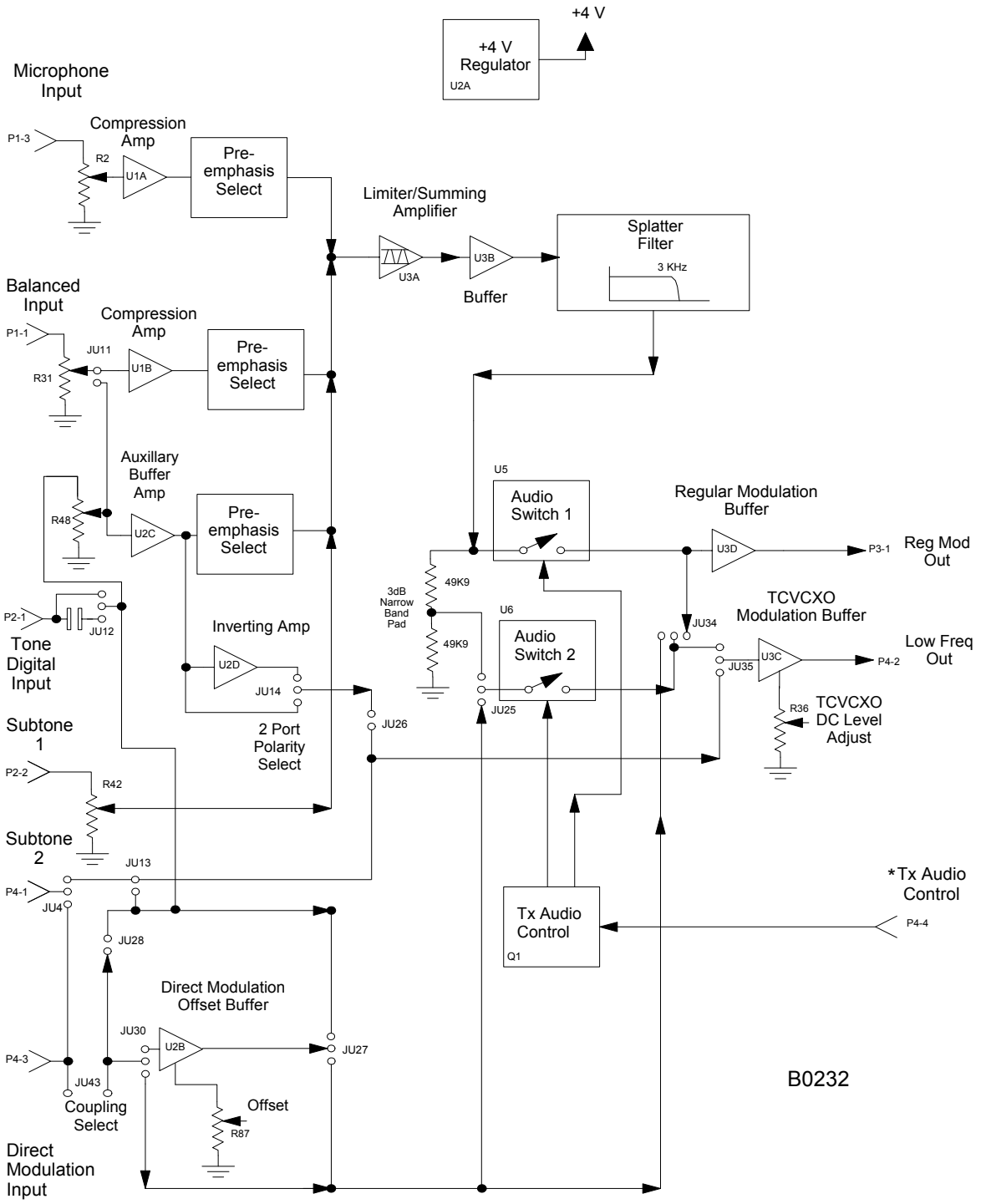
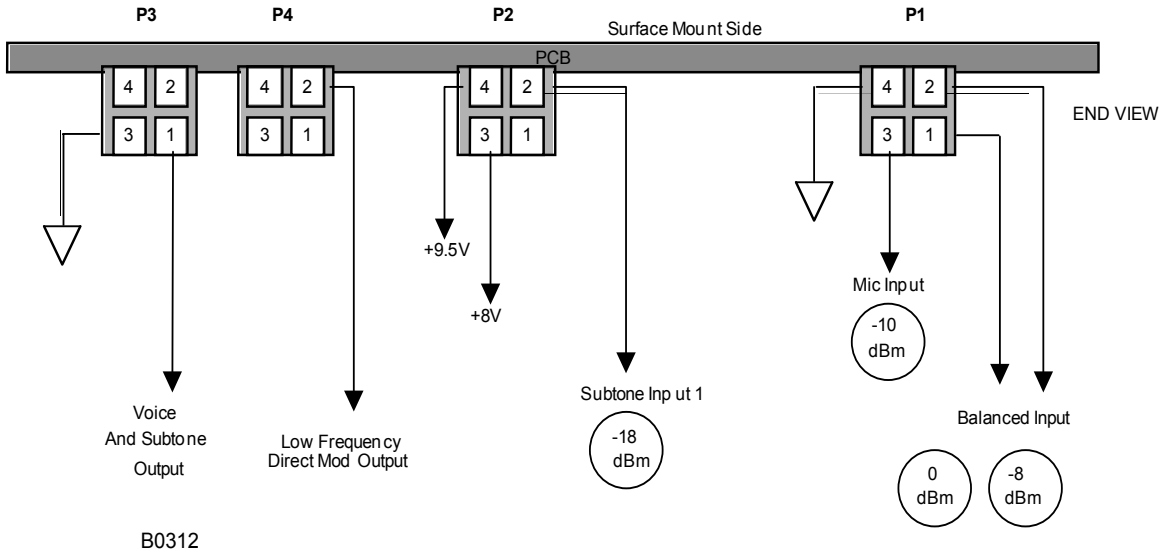


FIGURE 1

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	• 1 kHz signal at -10 dBm gives ±60% rated system deviation • 1 kHz signal compression set at ±84% rated system deviation
Audio Balanced Input	• 1 kHz tone at -8 dBm gives pre-emphasis response ±60% rated system deviation • 1 kHz signal compression set at ±84% rated system deviation
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 µA

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 Ω 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 Ω 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 Ω 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.

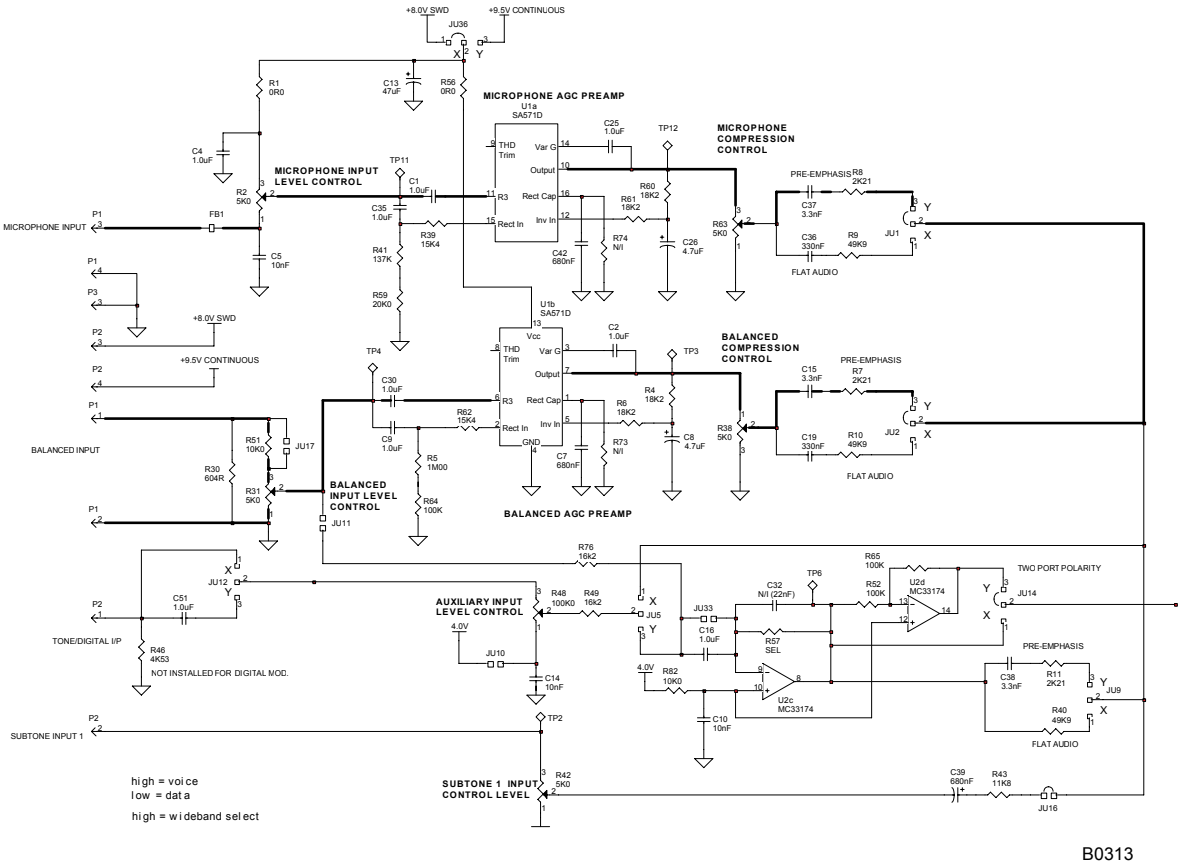
Direct Modulation Input

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.



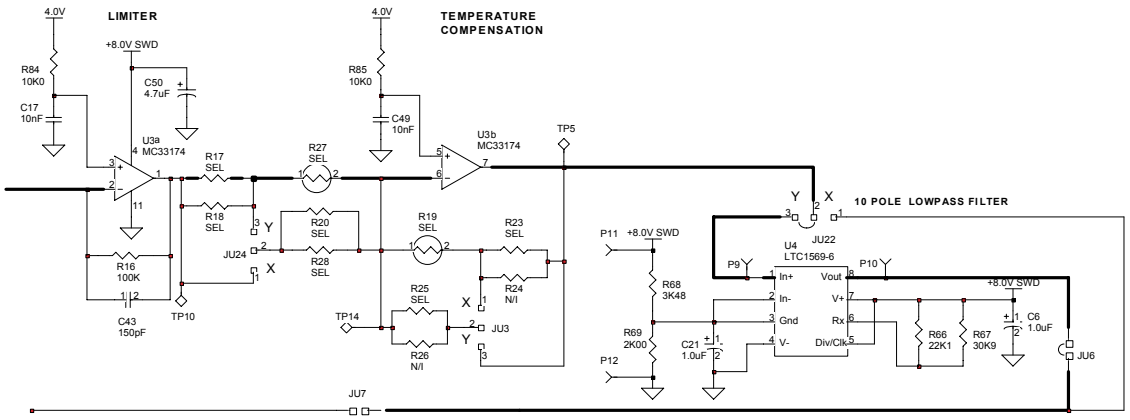
Microphone and Balanced Input Circuitry

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.



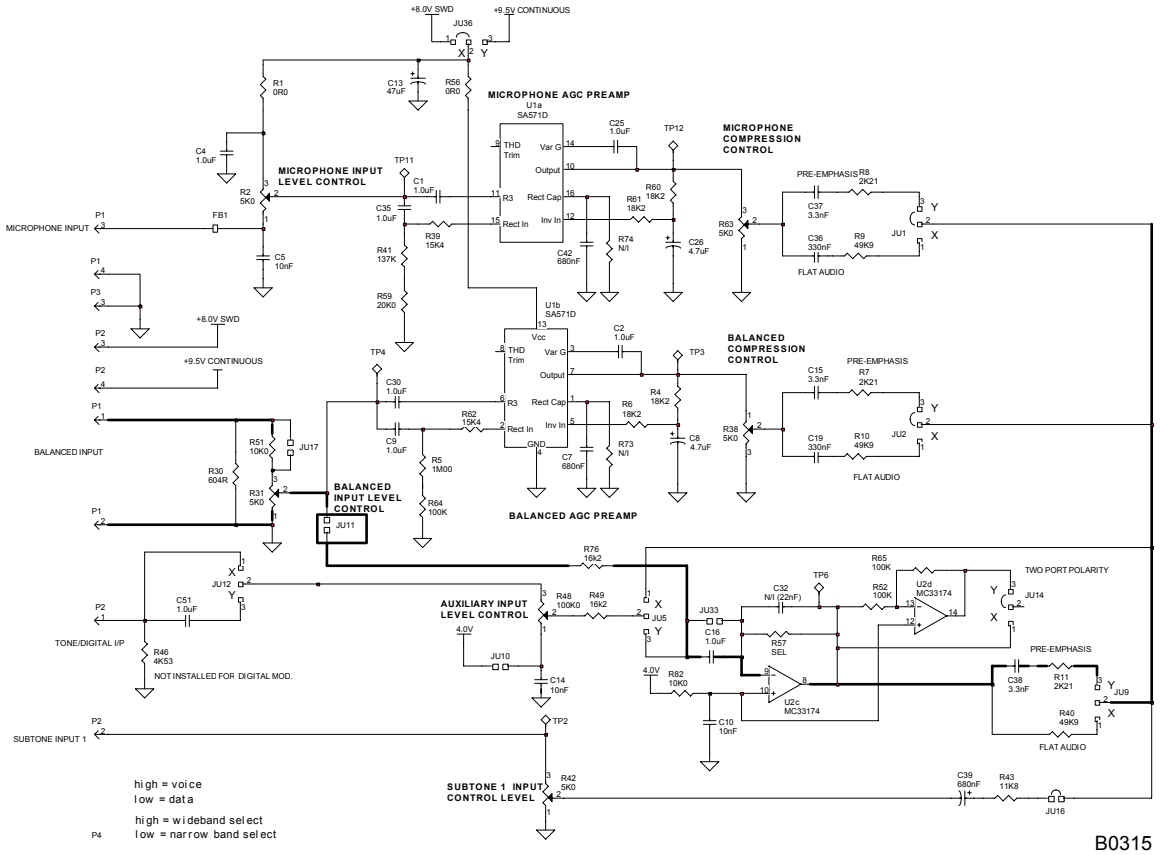
Limiter and Splatter Filter

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.



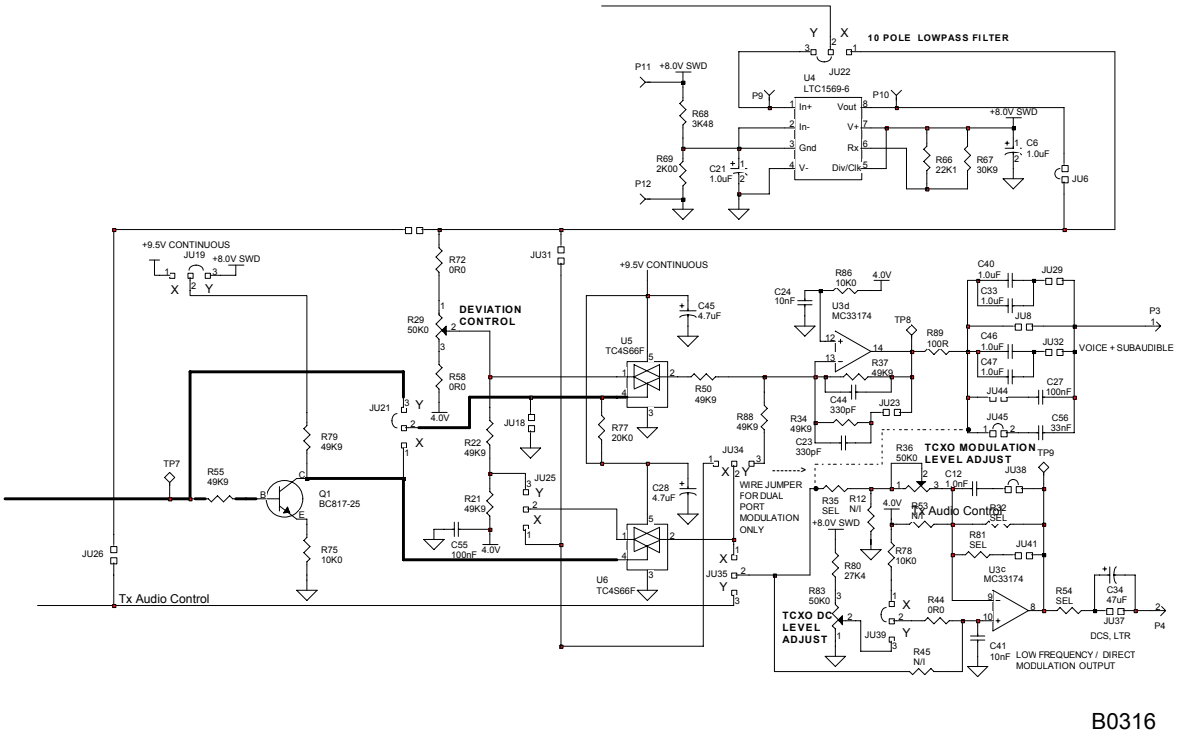
Bypassing Compression

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) 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 Ω 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 ±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 Ω 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 Ω audio transformer enable; Y position disables
J20	X	600 Ω audio transformer enable; Y position disables
J21	Not Installed	+8 VDC audio processor supply bypass
J22	X	600 Ω audio transformer enable; Y position disables
J23	X	600 Ω 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.

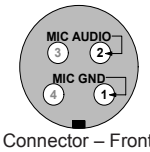
The rest of the tuning instructions are carried out while the transmitter frequency is set for the channel, which is roughly in the middle of the band of pre-programmed channels.

Transmitters with Pre-Emphasis and CTCSS Subtone

Section A: Balanced and Subtone Audio Setup

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

Section B: Microphone Audio Setup

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

Section C: Audio Frequency Response and Deviation

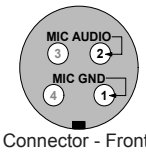
Step	Reference	Action	Desired Results	Notes
23.	AF Gen level	Set and measure.	AF Gen: **+10 dBm**	
24.	Balanced Audio Input	Sweep from **300 Hz** to **2.5 kHz** in **100 Hz** steps.	**± 5.0 kHz**	Deviation should not exceed maximum deviation.
25.	Balanced Audio Input	Apply tone.	AF Gen **1 kHz @ -18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

Transmitters with Flat Audio

Section A: Balanced and Subtone Audio Setup

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

Section B: Microphone Audio Setup

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

Section C: Audio Frequency Response and Deviation

Step	Reference	Action	Desired Results	Notes
15.	AF Gen level	Set and measure.	**+10 dBm**	
16.	Balanced Audio Input	Sweep from **300 Hz** to **2.5 kHz** in **100Hz** steps.	**± 5.0 kHz**	Deviation should not exceed maximum deviation.
17.	Balanced Audio Input	Apply tone.	AF Gen **1kHz @ -18 dBm**	
18.		Perform AF Frequency Response from **300 Hz** to **5 kHz.**		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	Limiting Test	Std Level	Mic Test	Subtone
Measured @	1.8 kHz @ +10 dBm	1 kHz @ -8 dBm	1 kHz @ -10 dBm	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 +/- 1 dB from 500 Hz to 2500 Hz referenced to 1000 Hz (+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 –40ºC), 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 ±4.4 kHz at room temperature and can vary from ±4.4 kHz to ±5.0 kHz from -40ºC to +60ºC.

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	*This skipped designator has been deleted.*	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	*This skipped designator has been deleted.*	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.

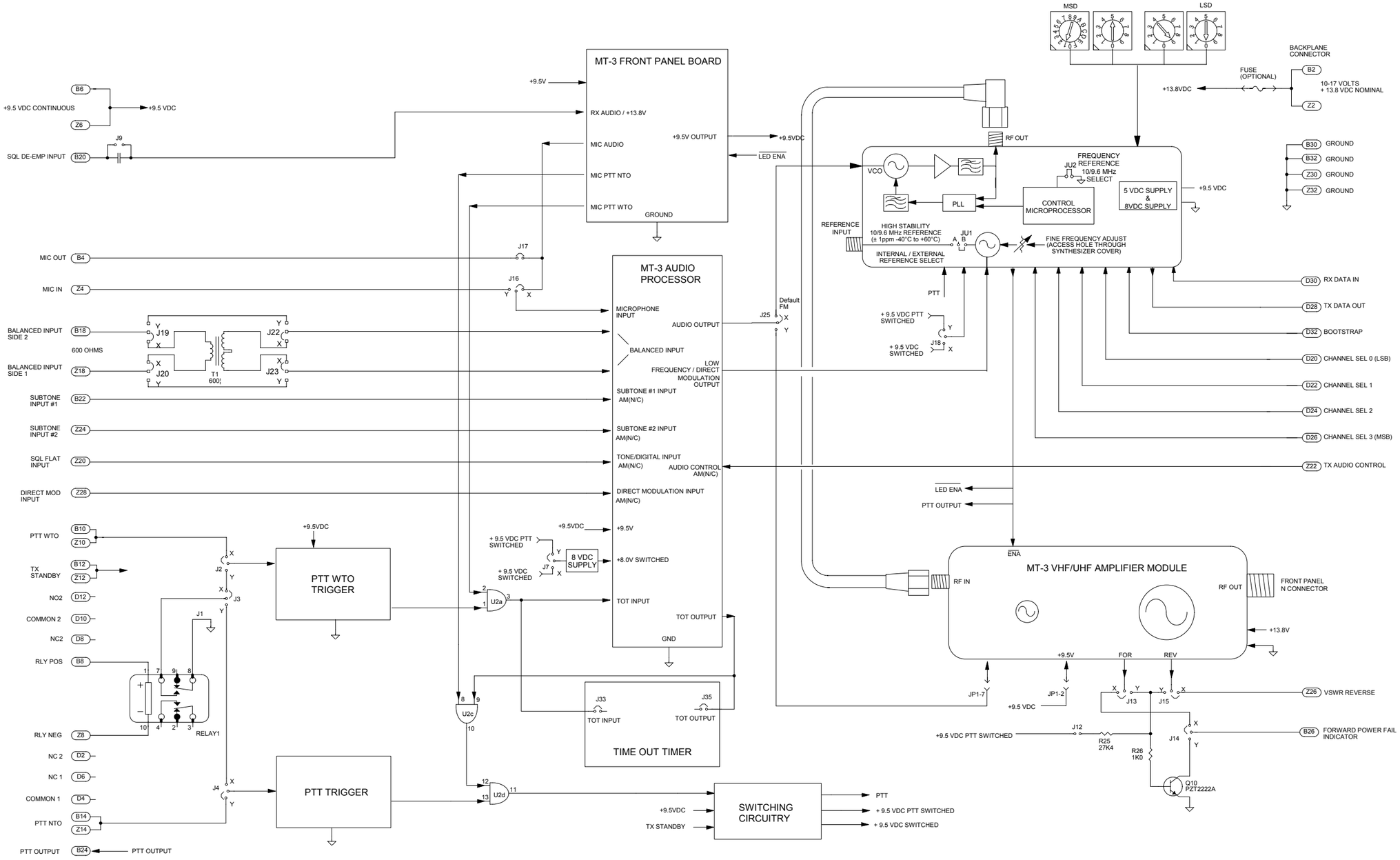
ILLUSTRATIONS AND SCHEMATICS

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:

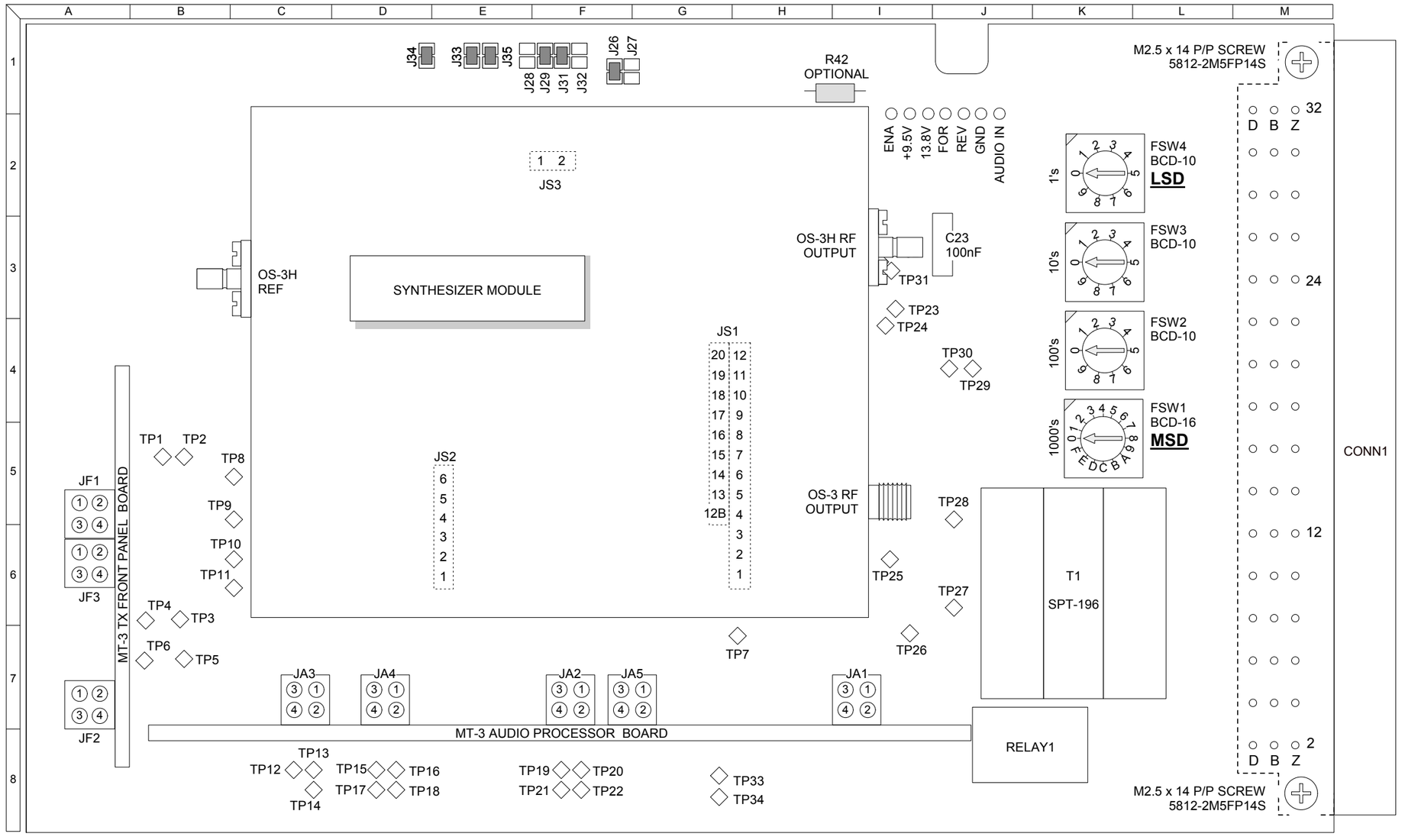
PCB number	43-912010 Indicates circuit board version 1.0
PCB number	50002-02 Indicates circuit board version 2 (no decimal version)

MT-3 FM TRANSMITTER BLOCK DIAGRAM



DANIELS™ ELECTRONICS LTD	A A
TITLE: MT-3 TRANSMITTER BLOCK DIAGRAM	
DATE: 25 JUN 03	DRAWN BY: S. EARTHY
DWG No: B0286-04	REV DATE: 07 MAR 05

MT-3 FM TRANSMITTER MAINBOARD COMPONENT LAYOUT – TOP



FACTORY INSTALLED JUMPERS

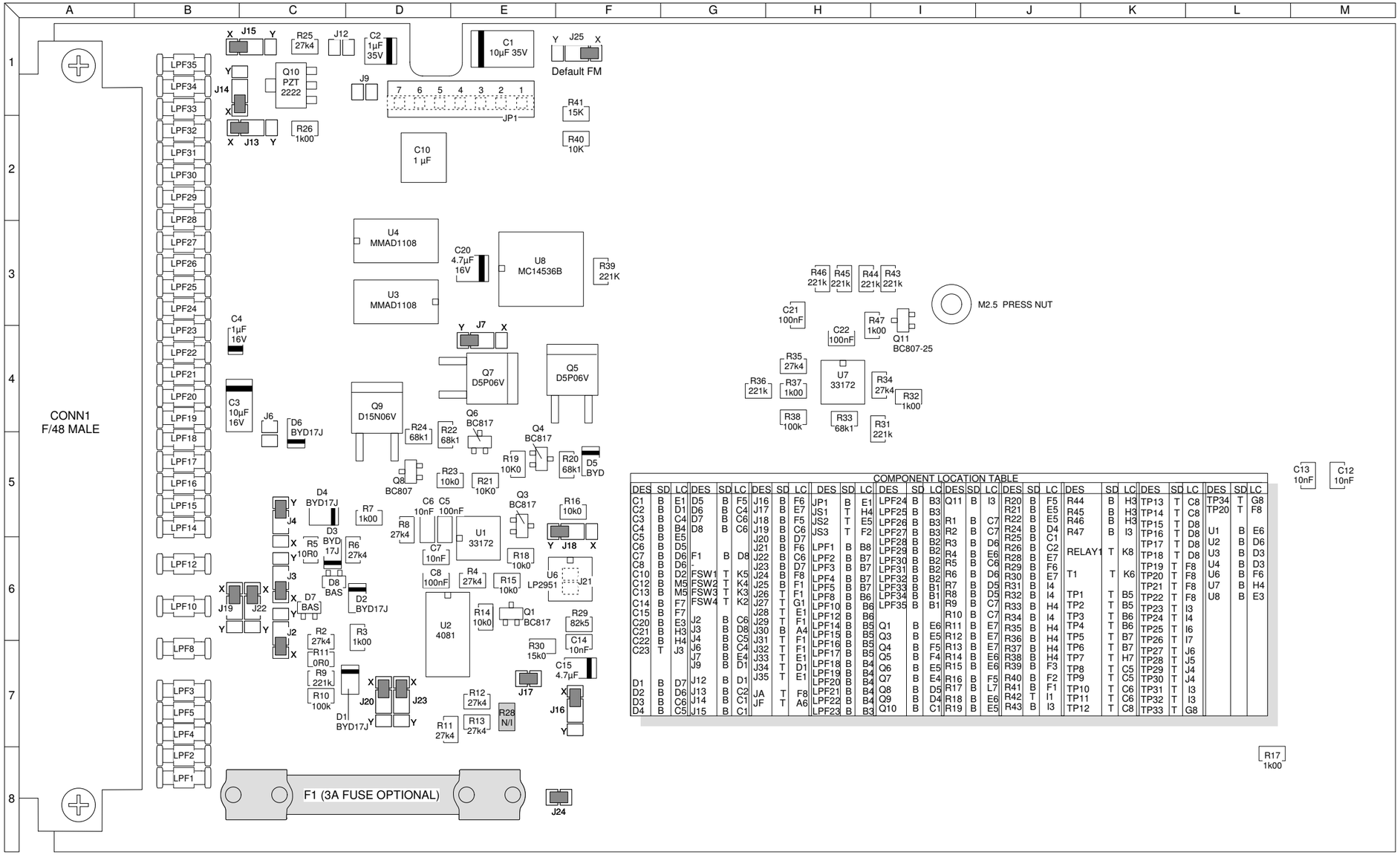
COMPONENTS NOT INSTALLED

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	DES	SD	LC
C1	B	E1	D5	B	F5	J16	B	F6	JP1	B	E1	LPF24	B	B3	Q11	B	I3	R20	B	F5	R44	B	H3	TP13	T	C8	TP34	T	G8
C2	B	D1	D6	B	C4	J17	B	E7	JS1	T	H4	LPF25	B	B3				R21	B	E5	R45	B	H3	TP14	T	C8	TP20	T	F8
C3	B	C4	D7	B	C6	J18	B	F5	JS2	T	E5	LPF26	B	B3	R1	B	C7	R22	B	E5	R46	B	H3	TP15	T	D8			
C4	B	B4	D8	B	C6	J19	B	C6	JS3	T	F2	LPF27	B	B3	R2	B	C7	R24	B	D4	R47	B	I3	TP16	T	D8	U1	B	E6
C5	B	E5				J20	B	D7				LPF28	B	B2	R3	B	D6	R25	B	C1				TP17	T	D8	U2	B	D6
C6	B	D5				J21	B	F6	LPF1	B	B8	LPF29	B	B2	R4	B	E6	R26	B	C2	RELAY1	T	K8	TP18	T	D8	U3	B	D3
C7	B	D6	F1	B	D8	J22	B	C6	LPF2	B	B7	LPF30	B	B2	R5	B	C6	R28	B	E7				TP19	T	F8	U4	B	D3
C8	B	D6	L			J23	B	D7	LPF3	B	B7	LPF31	B	B2	R6	B	D6	R29	B	F6	T1	T	K6	TP20	T	F8	U6	B	F6
C10	B	D2	FSW1	T	K5	J24	B	F8	LPF4	B	B7	LPF32	B	B2	R7	B	D5	R30	B	E7				TP21	T	F8	U7	B	H4
C12	B	M5	FSW2	T	K4	J25	B	F1	LPF5	B	B7	LPF33	B	B1	R8	B	D5	R31	B	I4	TP1	T	B5	TP22	T	F8	U8	B	E3
C13	B	M5	FSW3	T	K3	J26	T	F1	LPF8	B	B6	LPF34	B	B1	R9	B	C7	R32	B	I4	TP2	T	B5	TP23	T	I3			
C14	B	F7	FSW4	T	K2	J27	T	G1	LPF10	B	B6	LPF35	B	B1	R10	B	C7	R33	B	H4	TP3	T	B6	TP24	T	I4			
C15	B	F7				J28	T	E1	LPF12	B	B6				R11	B	E7	R34	B	I4	TP4	T	B6	TP25	T	I6			
C20	B	E3	J2		C6	J29	T	F1	LPF14	B	B5	Q1	B	E6	R12	B	E7	R35	B	H4	TP5	T	B7	TP26	T	I7			
C21	B	H3	J3	B	D8	J30	B	A4	LPF15	B	B5	Q3	B	E5	R13	B	E7	R36	B	H4	TP6	T	B7	TP27	T	J6			
C22	B	H4	J4	B	C5	J31	T	F1	LPF16	B	B5	Q4	B	F5	R14	B	E6	R37	B	H4	TP7	T	H7	TP28	T	J5			
C23	T	J3	J6	B	C4	J32	T	F1	LPF17	B	B5	Q5	B	F4	R15	B	E6	R38	B	H4	TP8	T	C5	TP29	T	J4			
			J7	B	E4	J33	T	E1	LPF18	B	B4	Q6	B	E5				R39	B	F3	TP9	T	C5	TP30	T	J4			
			J9	B	D1	J34	T	D1	LPF19	B	B4				R16	B	F5	R40	B	F2	TP10	T	C6	TP31	T	I3			
						J35	T	E1	LPF20	B	B4	Q7	B	E4	R17	B	L7	R41	B	F1	TP11	T	C6	TP32	T	I3			
D1	B	D7	J12	B	D1				LPF21	B	B4	Q8	B	D5				R42	T	I1	TP12	T	C8	TP33	T	G8			
D2	B	D6	J13	B	C2	JA	T	F8	LPF22	B	B4	Q9	B	D4	R18	B	E6	R43	B	I3									
D3	B	C6	J14	B	C1	JF	T	A6	LPF23	B	B3	Q10	B	C1	R19	B	E5												
D4	B	C5	J15	B	C1																								

DANIELS™ ELECTRONICS LTD.	
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



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	JP1	B	E1	LPF24	B	B3	Q11	B	I3	R20	B	F5	R44	B	H3	TP13	T	C8	TP34	T	G8
C2	B	D1	D6	B	C4	J17	B	E7	JS1	T	H4	LPF25	B	B3				R21	B	E5	R45	B	H3	TP14	T	C8	TP20	T	F8
C3	B	C4	D7	B	C6	J18	B	F5	JS2	T	E5	LPF26	B	B3	R1	B	C7	R22	B	E5	R46	B	H3	TP15	T	D8			
C4	B	B4	D8	B	C6	J19	B	C6	JS3	T	F2	LPF27	B	B3	R2	B	C7	R24	B	D4	R47	B	I3	TP16	T	D8	U1	B	E6
C5	B	E5				J20	B	D7				LPF28	B	B2	R3	B	D6	R25	B	C1				TP17	T	D8	U2	B	D6
C6	B	D5				J21	B	F6	LPF1	B	B8	LPF29	B	B2	R4	B	E6	R26	B	C2	RELAY1	T	K8	TP18	T	D8	U3	B	D3
C7	B	D6	F1	B	D8	J22	B	C6	LPF2	B	B7	LPF30	B	B2	R5	B	C6	R28	B	E7				TP19	T	F8	U4	B	D3
C8	B	D6	-			J23	B	D7	LPF3	B	B7	LPF31	B	B2				R29	B	F6				TP20	T	F8	U6	B	F6
C10	B	D2	FSW1	T	K5	J24	B	F8	LPF4	B	B7	LPF32	B	B2	R6	B	D6	R30	B	E7	T1	T	K6	TP21	T	F8	U7	B	H4
C12	B	M5	FSW2	T	K4	J25	B	F1	LPF5	B	B7	LPF33	B	B1	R7	B	D5	R31	B	I4				TP22	T	F8	U8	B	E3
C13	B	M5	FSW3	T	K3	J26	T	F1	LPF8	B	B6	LPF34	B	B1	R8	B	D5	R32	B	I4	TP1	T	B5	TP23	T	I3			
C14	B	F7	FSW4	T	K2	J27	T	G1	LPF10	B	B6	LPF35	B	B1	R9	B	C7	R33	B	H4	TP2	T	B5	TP24	T	I4			
C15	B	F7				J28	T	E1	LPF12	B	B6				R10	B	C7	R34	B	I4	TP3	T	B6	TP25	T	I6			
C20	B	E3	J2	B	C6	J29	T	F1	LPF14	B	B5	Q1	B	E6	R11	B	E7	R35	B	H4	TP4	T	B7	TP26	T	I7			
C21	B	H3	J3	B	D8	J30	B	A4	LPF15	B	B5	Q3	B	E5	R12	B	E7	R36	B	H4	TP5	T	B7	TP27	T	J6			
C22	B	H4	J4	B	C5	J31	T	F1	LPF16	B	B5	Q4	B	F5	R13	B	E7	R37	B	H4	TP6	T	H7	TP28	T	J5			
C23	T	J3	J6	B	C4	J32	T	F1	LPF17	B	B5	Q5	B	F4	R14	B	E6	R38	B	H4	TP7	T	C5	TP29	T	J4			
			J7	B	E4	J33	T	E1	LPF18	B	B4	Q6	B	E5	R15	B	E6	R39	B	F3	TP8	T	C5	TP30	T	J4			
			J9	B	D1	J34	T	D1	LPF19	B	B4	Q7	B	E4	R16	B	F5	R40	B	F2	TP9	T	C6	TP31	T	I3			
D1	B	D7	J12	B	D1	J35	T	E1	LPF20	B	B4	Q8	B	D5	R17	B	L7	R41	B	F1	TP10	T	C6	TP32	T	I3			
D2	B	D6	J13	B	C2	JA	T	F8	LPF21	B	B4	Q9	B	D4	R18	B	E6	R42	T	I1	TP11	T	C6	TP33	T	G8			
D3	B	C6	J14	B	C1	JF	T	A6	LPF22	B	B4	Q10	B	C1	R19	B	E5	R43	B	I3	TP12	T	C8						
D4	B	C5	J15	B	C1				LPF23	B	B3																		

FACTORY INSTALLED JUMPERS

COMPONENTS NOT INSTALLED

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

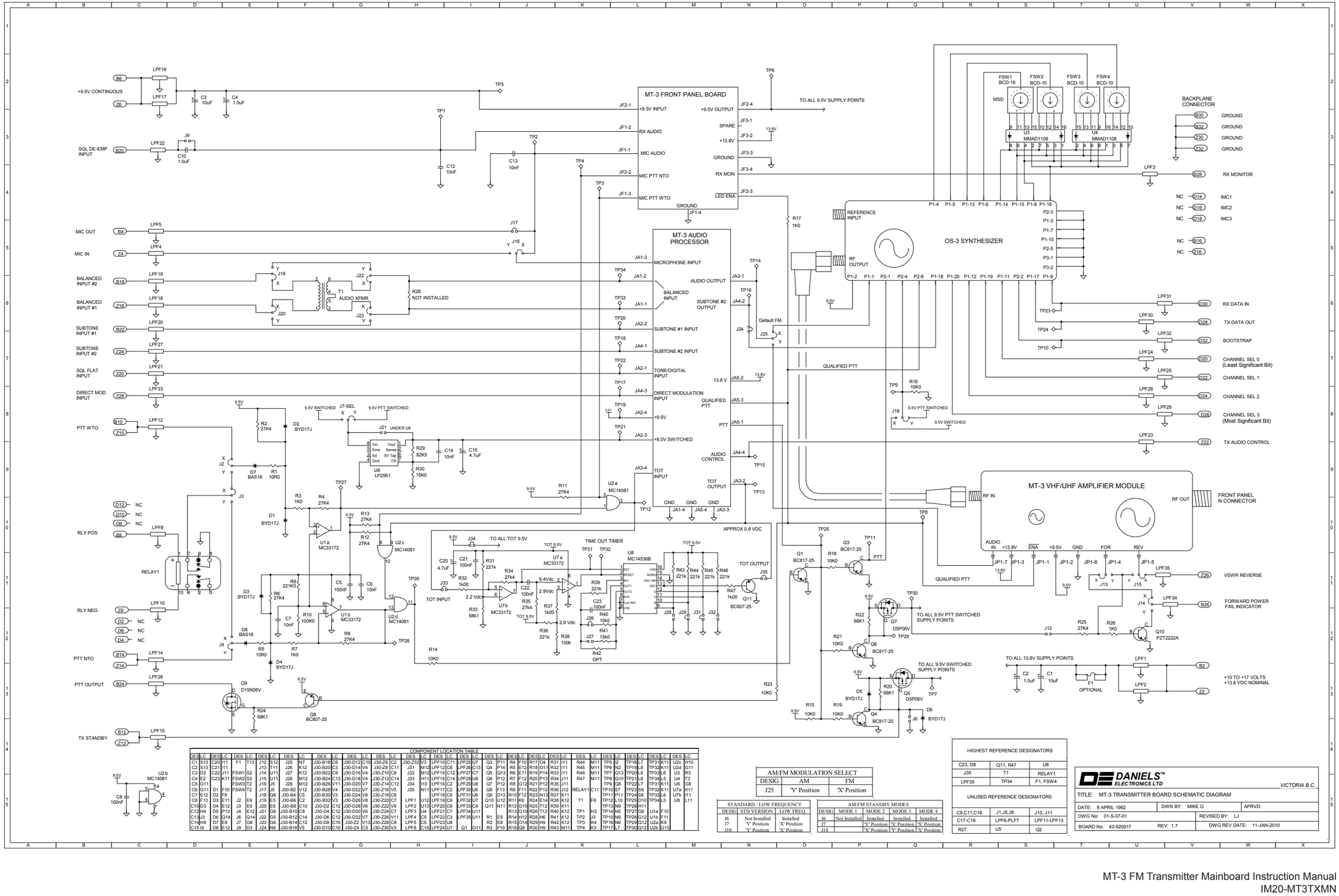
STANDARD / LOW FREQUENCY		
DESIG	STD VERSION	LOW FREQ.
J6	Not Installed	Installed
J7	'Y' Position	'X' Position
J18	'Y' Position	'X' Position

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

DANIELS™ ELECTRONICS LTD

TITLE: MT-3 TRANSMITTER MAIN BOARD (BOTTOM)	
DATE: 9 OCTOBER 2001	BOARD NO: 43-920917
DWG No: 01-B-07-05	REV DATE: 12 MAR 2007

MT-3 FM TRANSMITTER MAINBOARD SCHEMATIC DIAGRAM



COMPONENT LOCATION TABLE

DES	LC	DES	LC	DES	LC	DES	LC	DES	LC	DES	LC	DES	LC	DES	LC	DES	LC	DES	LC	DES	LC	DES	LC	DES	LC	DES	LC	DES	LC	DES	LC
C1	S13	C20	I11	F1	T13	J12	S12	J25	N7	J30-B18	C6	J30-D12	C10	J30-Z6	C2	J30-Z32	V3	LPF10	C11	LPF25	U7	Q3	P11	R4	F10	R17	O4	R31	I11	R44	M11	TP5	I2	TP18	L7	TP31	K11	U2c	H10
C2	S13	C21	I11			J13	T11	J26	K12	J30-B20	C3	J30-D14	V4	J30-Z8	C11	J31	M12	LPF11	C8	LPF26	C13	Q4	P14	R5	E12	R18	O1	R32	I11	R45	M11	TP6	N2	TP19	L8	TP32	K11	U2d	G11
C3	D2	C22	J11	FSW1	S2	J14	U11	J27	K12	J30-B22	C8	J30-D16	V4	J30-Z10	C8	J32	M12	LPF14	C12	LPF27	C7	Q5	Q13	R6	E11	R19	P14	R33	I11	R46	M11	TP7	Q13	TP20	L6	TP33	L6	U3	R3
C4	E2	C23	K11	FSW2	S2	J15	U11	J28	M12	J30-B24	C13	J30-D18	V4	J30-Z12	C14	J33	H11	LPF15	C14	LPF28	U8	Q6	P12	R7	F12	R20	P13	R34	J11	R47	M11	TP8	Q10	TP21	L8	TP34	L5	U4	T3
C5	G11			FSW0	T2	J16	J5	J29	M12	J30-B26	V11	J30-D20	V7	J30-Z14	C12	J34	I10	LPF16	C2	LPF29	U8	Q7	P12	R8	G12	R21	P12	R35	J11			TP9	Q8	TP22	L7	TP35	K11	U6	G8
C6	G11	D1	F10	FSW4	T2	J17	J5	J30-B2	V12	J30-B28	V4	J30-D22	V7	J30-Z16	V5	J35	N11	LPF17	C2	LPF30	U6	Q8	F13	R9	F11	R22	P12	R36	J12	RELAY1	C11	TP10	S7	TP23	S6	TP32	K11	U7a	K11
C7	E12	D2	F8			J18	Q8	J30-B4	C5	J30-B30	V3	J30-D24	V8	J30-Z18	C6			LPF18	C6	LPF31	U6	Q9	D13	R10	F12	R23	N13	R37	K11			TP11	P11	TP24	S6	TP33	L6	U7b	I11
C8	F13	D3	E11	J2	E9	J19	E5	J30-B6	C2	J30-B32	V3	J30-D26	V8	J30-Z20	C7	LPF1	U12	LPF19	C6	LPF32	U7	Q10	U12	R11	K9	R24	E14	R38	K12	T1	F6	TP12	L10	TP25	C10	TP34	L5	U8	L11
C10	D3	D4	E12	J3	E9	J20	E6	J30-B8	C10	J30-D2	C12	J30-D28	V6	J30-Z22	V8	LPF2	U13	LPF20	C6	LPF33	C8	Q11	N11	R12	G10	R25	T12	R39	K11			TP13	N9	TP26	H11				
C12	H4	D5	P13	J4	E12	J21	G8	J30-B10	C8	J30-D4	C12	J30-D30	V6	J30-Z24	C7	LPF3	U4	LPF21	C7	LPF34	U11			R13	G10	R26	T12	R40	K12	TP1	H3	TP14	N5	TP27	G9	U1a	F10		
C13	J3	D6	Q14	J6	Q14	J22	G5	J30-B12	C14	J30-D6	C12	J30-D32	V7	J30-Z26	V11	LPF4	C5	LPF22	C3	LPF35	U11	R1	E9	R14	H12	R28	H6	R41	K12	TP2	J3	TP15	N9	TP28	Q12	U1b	F11		
C14	H9	D7	E9	J7	G8	J23	G6	J30-B14	C12	J30-D8	C10	J30-Z2	V13	J30-Z28	C8	LPF5	C5	LPF23	U8			R2	E8	R15	O14	R29	H9	R42	K12	TP3	K4	TP16	N6	TP29	Q12	U2a	K9		
C15	I9	D8	E12	J9	D3	J24	N6	J30-B16	V5	J30-D10	C10	J30-Z4	C5	J30-Z30	V3	LPF8	C10	LPF24	U7	Q1	O11	R3	F10	R16	Q8	R30	H9	R43	M11	TP4	K3	TP17	L7	TP30	Q12	U2b	G13		

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

HIGHEST REFERENCE DESIGNATORS		
C23, D8	Q11, R47	U8
J35	T1	RELAY1
LPF35	TP34	F1, FSW4

UNUSED REFERENCE DESIGNATORS		
C9,C11,C16	J1,J5,J8	J10, J11
C17-C19	LPF6-PLF7	LPF11-LPF13
R27	U5	Q2

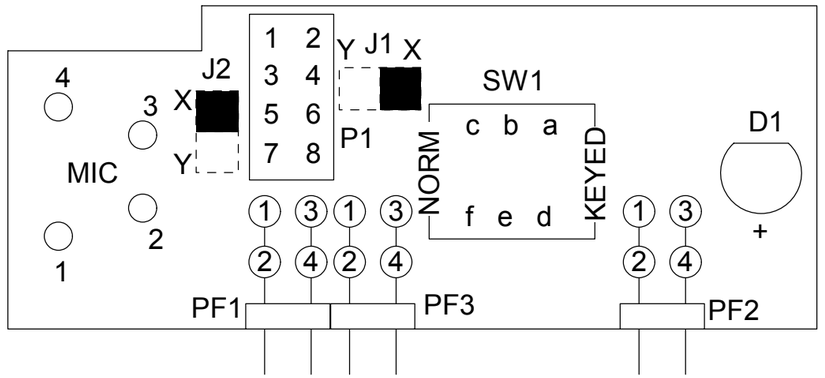
DANIELS™ ELECTRONICS LTD — VICTORIA B.C.

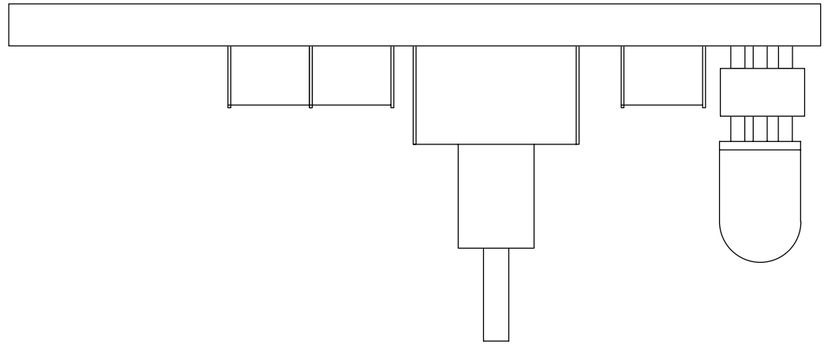
TITLE: MT-3 TRANSMITTER BOARD SCHEMATIC DIAGRAM		
DATE: 8 APRIL 1992	DWN BY: MIKE G	APRVD:
DWG No: 01-S-07-01		REVISED BY: LJ
BOARD No: 43-920917 REV: 1.7		DWG REV DATE: 11-JAN-2010

FRONT PANEL BOARD COMPONENT LAYOUT DIAGRAM

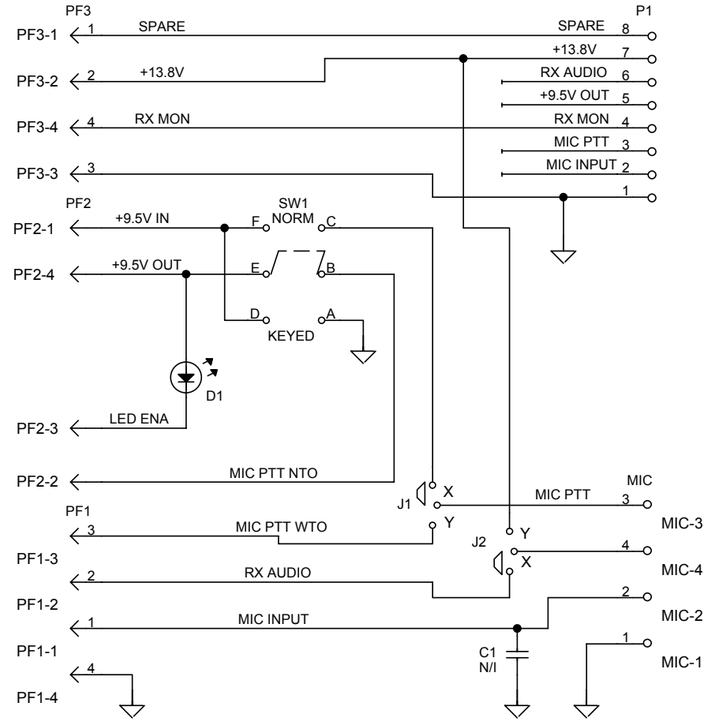
Factory Installed Solder Jumper.

Solder Jumper On Solder Side Of PCB.





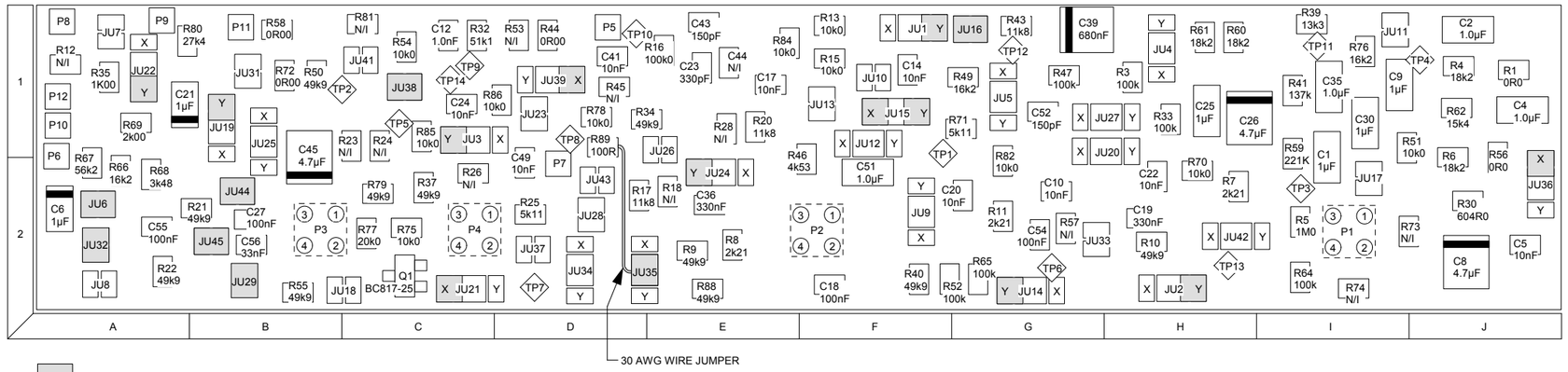
FRONT PANEL BOARD SCHEMATIC DIAGRAM



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

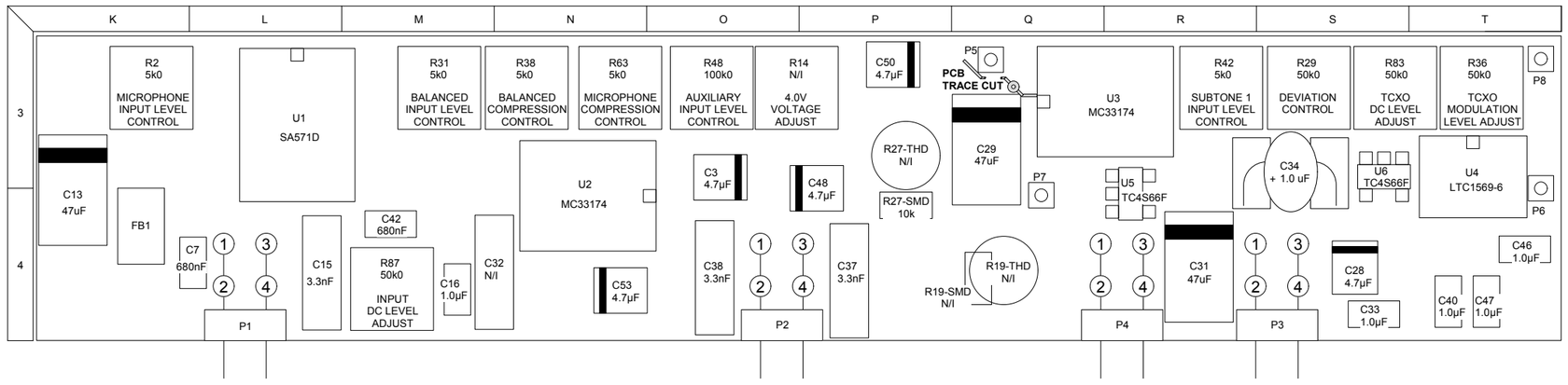
FM AUDIO PROCESSOR BOARD COMPONENT LAYOUT DIAGRAM

BOTTOM SIDE



- JUMPERS INSTALLED

TOP SIDE

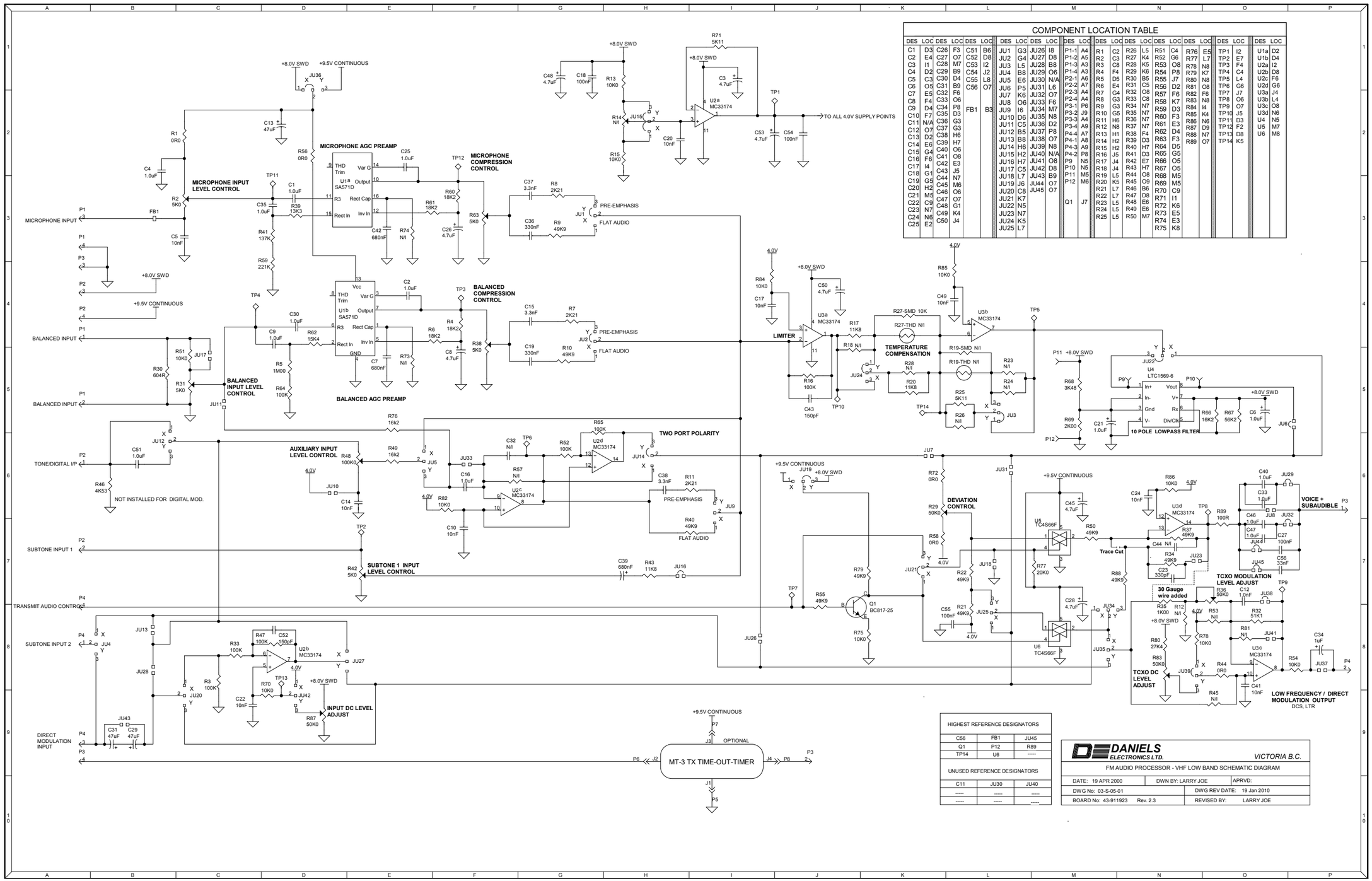


COMPONENT LOCATION TABLE

DES	LOC	DES	LOC	DES	LOC	DES	LOC	DES	LOC	DES	LOC	DES	LOC	DES	LOC	DES	LOC	DES	LOC	DES	LOC	DES	LOC
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	O3	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	A2	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						

DANIELS™ ELECTRONICS LTD	
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 ± 30sec to 5min ± 50sec.
3	Apr 02	697	Improve hum & noise performance, UT-3/8xxx only Version 2.3 Audio Processor changes • C56 now 22nF for 800 MHz LTR™ only (remains as 33nF for other bands.) • JU29, JU32, and JU44 Not Installed for 800 MHz LTR™
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 1.0µF, DIP Tantalum (was 47µF SM Tantalum) • C34 remains as 47µF for LTR™ & DCS applications.
4	Mar 03		• Reissue including Version 2.3 Audio Processor information. • Version 1.6 Audio Processor information is removed. • Issue 4 covers Version 1.8, 2.2 & 2.3 Audio Processors. • Issue 4 contains no AM information - the document title is changed to reflect coverage of only FM transmitters.
		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 ±17%. Tolerance for 5 minutes setting is ± 50sec.
4-1-0	Sep 03		• New Manual Format • Removed all reference to Version 1.8 Audio Processor
4-1-1	Oct 03		Typographical updates to manual.
4-2-0	Jan 05	660	• Update Audio Processor Component Layout Dwg: 43-911923-01-T-01-01 to 43-911923-01-T-02-01 43-911923-01-S-0101 to 43-911923-01-S-02-01 • Add Select table for Audio Processor Components: “Audio Processor Component Layout Selection Table”
		791	Update Main Board Component & Schematic Dwg to update J25 SEL: X installed for FM Products & Y installed for AM Products
		---	• Update Tx Front Panel Component Dwg: 43-921212-01-T-01-01 to 43-921212-01-T-02-01 • Update specification tables and part list

Revision History continued next page

Revision	Date	Action #	Description
4-2-0 (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	• Update Audio Processor Component Layout and the Audio Processor Component Layout Selection Table. • Alignment procedures updated.
		---	• Revision History older than 7yrs removed from publication. • Top level mechanical parts moved to the top level Transmitter IMs; – for all VHF Synthesized Tx mech parts consult IM20-VT3150 – for all UHF Synthesized Tx mech parts consult IM23-UT3400 – for all Crystal Tx mech parts consult IM21-xT3C
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		**Revision history older than seven years has been removed.**
		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. • updated 43-920917 CLD – Top and schematic
		6437	VT-3H045 Temp compensation adjustment. • Updated the MT-3 VHF Low Band Performance Specifications
		6452	VT-3H035 Temp compensation adjustment.
		3682	• Update operating voltage to nominal (10–17 V) • Change document title to include MT-3
		---	• Update company logos and trademark information • Apply Daniels Style Guide • Update BOMs, schematics and CLDs