

2.3 MT-3 Audio Processor

2.3.1 General

The MT-3 Audio Processor is a versatile circuitboard that can provide several types of audio processing for voice or data transmission. Two analog switches on the audio processor, controlled by a common signal, make it possible to transmit voice or data. A continuous +9.5 Vdc supply and a switched +8.0 Vdc supply are required to power the module. The MT-3 Audio Processor is backwards compatible to Daniels Electronics MT-2 series transmitters. Refer to section 5.4.1 "MT-3 Audio Processor Component Layout" and to section 5.4.2 "MT-3 Audio Processor Schematic Diagram" for component location and designation references.

2.3.2 Power Requirements

The audio processor can be configured for continuous audio standby or for switched audio standby by the Transmitter Main Board. If fast audio risetime is desired, the transmitter should be operated in standby mode 2 or 3 as specified in section 2.1.2.7 with JU36 in the 'y' position. Power for the microphone input and the balanced input can be disabled by jumpers JU36 and JU40 respectively if the input is not required. This results in a current savings of approximately 3.5 mA per input. The current requirements for the MT-3 Audio Processor are shown in Table 2-1. The current for the associated TOT is approximately 4 mA when the transmitter is keyed and is included in the keyed values in the table below.

Table 2-1 MT-3 Audio Processor Current Consumption.

Function	Current Draw keyed / unkeyed
Switched Audio Standby	
Both Microphone and Balanced Input enabled	6.0 / 0.3 mA
Only Microphone or Balanced Input enabled	4.5 / 0.3 mA
Only Auxiliary Input enabled	3.0 / 0.3 mA
Continuous Audio Standby	
Both Microphone and Balanced Input enabled	6.0 / 3.5 mA
Only Microphone or Balanced Input enabled	4.5 / 1.5 mA
Only Auxiliary Input enabled	3.0 / 0.5 mA

2.3.3 Audio Processor Turn-on Time

The turn-on time of the audio processor is 25 ms. This measurement is made with the standard factory settings with a 1 kHz tone applied to the balanced input. The turn-on time is the time it takes the audio processor to output a stable audio signal from the time its power (+9.5 Vdc) is switched on. The turn-on time can be virtually eliminated by configuring the audio processor for continuous audio standby (see section 2.1.2.7 Transmitter Standby Modes).

2.3.4 Audio Processor Signals

The MT-3 Audio Processor has six audio inputs, two audio outputs and one audio control input. Five of the audio inputs are used primarily for voice 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.

2.3.4.1 Audio Processor Outputs

Both the audio outputs, Modulation Output (P3-1) and Low Frequency / Direct Modulation Output (P4-2), are gated by audio switches U9 and U10 respectively which are controlled by the Tx Audio Control Input (P4-4). The audio switches operate complimentary to each other so there can ever only be one source modulating the transmitter. In standard configuration, the Modulation Output port is used so switch U9 is always on.

2.3.4.2 Audio Processor Modulation Output

The Modulation Output port is the output port used by all voice input signals. The voice inputs are combined by U1, a gain level programmable comparator which is configured as an automatic level control amplifier. Op-amp U4a together with U5a provide the limiting action for the audio processor. After the audio signals have been combined and limited, they are filtered by a 6 pole lowpass Butterworth filter (U5b, U5c, and U5d). Jumpers JU24, JU25 and JU26 configure the lowpass filter for narrowband or wideband operation: jumpers JU24(x and y) to JU26(x and y) are installed for wideband (25 kHz) channels and are not installed for narrowband (12.5 kHz) channels. The output signal from the filter is then level adjusted by the deviation control pot, R29, before modulating the transmitter.

In special applications, jumper JU6 can be disabled and JU7 enabled, this allows the transmitter to be modulated directly from the auxiliary input. This should not be done without external filtering since jumper JU7 bypasses the limiting and filter circuits.

2.3.4.3 Audio Processor Low Frequency / Direct Mod. Output

The Low Frequency / Direct Modulation Output port has two functions depending on whether the transmitter is synthesized or crystal controlled. 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. In a crystal controlled transmitter, this port can be used by the Direct Modulation Input to directly modulate the crystal control oscillator module. The frequency response of this port is essentially flat from DC to 5 kHz with no limiting or filtering. Amplification, if desired, is provided by Op-amp U3b.

2.3.4.4 Audio Processor Inputs

As previously mentioned, the MT-3 Audio Processor has six audio inputs, five used primarily for voice signals and one for data signals.

The 6 audio inputs on the audio processor are:

- dynamic microphone input
- 600 ohm balanced input
- 2 subtone inputs
- auxiliary input.
- direct modulation input.

2.3.4.5 Audio Processor Microphone Input

The microphone input has an automatically level controlled (ALC) preamplifier 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 6dB/octave pre-emphasis response or a flat-audio response, jumper JU3 at 'x' and 'y' position respectively.

2.3.4.6 Audio Processor Balanced Input

The 600 ohm balanced input also uses the ALC preamplifier U1, with input level control pot (R31). The balanced input level control can accommodate a -25 dBm to 0 dBm input. Like the microphone input, the balance input is limited and filtered and is output at the standard modulation output port.

2.3.4.7 Audio Processor Auxiliary Input

The auxiliary input is a special input and does not have an ALC preamplifier or an input level control. This input can be configured for a pre-emphasis response (enable JU14) or a flat-audio response (enable JU15). The compression level for this input is set by R48. The auxiliary output is normally summed with the voice signals by op-amp U4a, limited, then filtered and output at the standard modulation output port. 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:

- the balanced input – JU11 'x' position
- the tone/digital input – JU12 enabled
- the direct modulation input – JU13 enabled

When the 600 ohm balanced input is connected to the auxiliary input, the balanced input level control can be used to adjust the level for the auxiliary input. When either the tone/digital input or the direct modulation input are used, the input level is not adjustable.

2.3.4.8 Audio Processor Subtone Inputs

There are two subtone inputs available on the 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 not used. Both subtone inputs have an input level control.

2.3.4.9 Audio Processor 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.

2.4 Low Frequency Modulation

The transmitter has an additional option to address low frequency user modulation requirements. A phase modulated bandwidth from 0 (dc) to 300 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 M-3 motherboard will be used (B20 for TX A, and A20 for TX B). See section 3.8, 'Low Frequency Modulation Configuration' for set up and alignment.

- 4 Adjust the compression control pot (R38) for compression at $\pm 60\%$ maximum deviation.
- 5 Set the audio frequency to 2.4 kHz, then adjust the deviation control (R29) for maximum deviation.
- 6 Reset the modulating frequency to 1 kHz and re-adjust R38 for $\pm 60\%$ maximum deviation.
- 7 Repeat steps 4 and 6 until both conditions are met.
- 8 Vary the audio signal from 1 kHz to 3 kHz and measure the positive deviation and then the negative deviation. Adjust the symmetry control (R14) until the \pm deviation is symmetrical. The variation between \pm deviation levels should not exceed 300 Hz over the 1 kHz to 3 kHz range.
- 9 Repeat steps 4 and 6 and re-adjust if necessary.
- 10 Adjust the balanced input level control (R31) so that the deviation increases until compression is observed. The deviation should be ± 1.5 kHz or ± 3 kHz for narrowband and wideband channels respectively.
- 11 Increase the input level (R31) by +20 dBm, it should not increase the deviation more than maximum. This confirms that the AGC action of preamplifier U1 is working.
- 12 A 2.4 kHz tone at the desired audio input level should produce the maximum deviation. Increasing the input level by +20 dBm should not increase the deviation. This confirms that the limiting action of U4a and U5a is working.
- 13 Set the audio frequency back to 1 kHz at -8 dBm output. Confirm and record audio distortion with the appropriate filter on the communications test set.
- 14 Confirm the audio frequency response by referencing all output deviation measurements to a 1 kHz input tone at $\pm 20\%$ maximum deviation (± 500 Hz for narrowband or ± 1 kHz for wideband).
- 15 Remove the signal to the balanced input (pins B18, Z18).
- 16 Apply a 1 kHz tone at -8 dBm to the microphone audio input. Set the microphone compression control (R2) to produce $\pm 50\%$ maximum deviation. Reduce the signal to -10 dBm and adjust the microphone input level control (R2) for $\pm 50\%$ maximum deviation. Remove the signal.
17. Apply a 100 Hz tone at -18 dBm to the subtone 1 input and adjust the subtone 1 level control (R42) to produce ± 500 Hz deviation. Remove the signal.

Setup conditions for the CI-PM-3 Paging Modulator are established via front panel switch settings and internal jumper settings. Internal setup adjustments are easily accessed using a module extender card or extender cable.

I hope that the above information assists you sufficiently in understanding the operation of our VHF transmitters with digital modulation, and helps to expedite our certification application. Please do not hesitate to call me should further explanation and/or clarification be required. Thank you.

Sincerely,

A handwritten signature in cursive script, appearing to read "Ron Backlund".

Ron Backlund
Engineering Manager

6. PARTS LISTS

6.1 CI-PM-3 Electrical Parts List

Ref.	Desig.	Description	Part No.
C1		CAP., SM. 10nF CER,0805,X7R,50V	1008-4A103K5R
C2		CAP., SM, 4.7uF TANT., 10%, 16V	1055-5B475K16
C3		CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C4 - C7		CAP., SM, 1.0uF CER/2225,50,X7R	1008-6H105J5R
C8, C9		CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C10		CAP., 2.2nF FILM, MMK5, 10%, 63V	1016-3A222K63
C11		CAP., 1.5nF FILM, MMK5, 10%, 63V	1016-3A102K63
C12		CAP., 2.2nF FILM, MMK5, 10%, 63V	1016-3A222K63
C13		CAP., 1.5nF FILM, MMK5, 10%, 63V	1016-3A102K63
C14		CAP., 2.2nF FILM, MMK5, 10%, 63V	1016-3A222K63
C15		CAP., 1.5nF FILM, MMK5, 10%, 63V	1016-3A102K63
C16, C17		CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C18		CAP., SM, 2.2uF TANT., 20%, 20V	1055-5B225K20
C19 - C22		CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C23		CAP., SM, 2.2uF TANT., 20%, 20V	1055-5B225K20
C24 - C26		CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C27		CAP., SM, 2.2uF TANT., 20%, 20V	1055-5B225K20
C28 - C31		CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C32		CAP., SM, 2.2uF TANT., 20%, 20V	1055-5B225K20
C33		CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C34		CAP., SM, 2.2uF TANT., 20%, 20V	1055-5B225K20
C35		CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C36		CAP., SM, 10uF TANT., 20%, 16V	1055-6C106M16
C37 - C39		CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C40		CAP., SM, 1.0uF TANT., 20%, 16V	1055-5A105M16
C41		CAP., SM, 10uF TANT., 20%, 16V	1055-6C106M16
C42		CAP., SM, 22uF TANT., 20%, 20V	1055-6D226M20
C43		CAP., SM, 2.2uF TANT., 20%, 20V	1055-5B225K20
C44		CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C45		CAP., SM, 1.0uF TANT., 20%, 16V	1055-5A105M16
C46		CAP., SM, 2.2uF TANT., 20%, 20V	1055-5B225K20
C47		CAP., SM, 47uF TANT., 20%, 16V	1055-6D476M16
C48		CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C49		CAP., SM, 27pF CER., 0805, COG	1008-1A270J1G
C50		CAP., SM, 27pF CER., 0805, COG	1008-1A270J1G
C51		CAP., SM, 220pF CER., 0805, COG	1008-2A221J1G
C52		CAP., SM, 56pF CER., 0805, COG	1008-1A560J1G
C53		CAP., SM, 2.2uF TANT., 20%, 20V	1055-5B225K20
C54		CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C55		CAP., SM, 5-40pF TRIMMERCER.	1088-6B5R040R
C56		CAP., SM, 2.2uF TANT., 20%, 20V	1055-5B225K20
C57		CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C58		CAP., SM, 2.2uF TANT., 20%, 20V	1055-5B225K20
C59		CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C60		CAP., SM, 220pF CER., 0805, COG	1008-2A221J1G
CON1		CONNECTOR, C96 MALE, RA PCB	3720-3096M0RA

Ref.	Desig.	Description	Part No.
R48		RES., SM, 100K0 0805, 1%,100ppm	1150-5A1003FP
R49		RES., SM, 681R0 0805, 1%,100ppm	1150-2A6810FP
R50		RES., SM, 22K1 0805, 1%,100ppm	1150-4A2212FP
R51		RES., SM, 49K9 0805, 1%,100ppm	1150-4A4992FP
R52		RES., SM, 22K1 0805, 1%,100ppm	1150-4A2212FP
R53		RES., SM, 3K92 0805, 1%,100ppm	1150-3A3921FP
R54		RES., SM, 1R00 1206, 1%,400ppm	1150-0B1R00FG
R55		RES., SM, 5K11 0805, 1%,100ppm	1150-3A5111FP
R56		RES., SM, 1R00 1206, 1%,400ppm	1150-0B1R00FG
R57		RES., SM, 274R0 0805, 1%,100ppm	1150-2A2740FP
R58, R59		RES., SM, 49K9 0805, 1%,100ppm	1150-4A4992FP
R60		RES., 1K80 METAL FILM, 5%, 0.5W	1101-3A0182JP
R61		RES., SM, 22R1 1206, 1%,100ppm	1150-1B22R1FP
R62		RES., SM, 47R5 1206, 1%,100ppm	1150-1B47R5FP
R63		RES., SM, 22R1 1206, 1%,100ppm	1150-1B22R1FP
R64		RES., SM, 274K0 0805, 1%,100ppm	1150-5A2743FP
R65		RES., SM, 49K9 0805, 1%,100ppm	1150-4A4992FP
R66		RES., SM, 100K0 0805, 1%,100ppm	1150-5A1003FP
R67		RES., SM, 39K2 0805, 1%,100ppm	1150-4A3922FP
R68		RES., SM, 100K0 0805, 1%,100ppm	1150-5A1003FP
R69		RES., SM, 2K21 0805, 1%,100ppm	1150-3A2211FP
R70		POT., SM, 50K0 4mm SQ, 50K, 11T,SIDE	1174-DM3503J0
R71		RES., SM, 30K9 0805, 1%,100ppm	1150-4A3092FP
R72		RES., SM, 22K1 0805, 1%,100ppm	1150-4A2212FP
R73		RES., SM, 1M00 0805, 1%,100ppm	1150-6A1004FP
R74, R75		RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP
R76		RES., SM, 22K1 0805, 1%,100ppm	1150-4A2212FP
R77		RES., SM, 100K0 0805, 1%,100ppm	1150-5A1003FP
R78		RES., SM, 23K7 1206, 1%,100ppm	1150-4B2372FP
R79		RES., SM, 47K5 0805, 1%,100ppm	1150-4A4752FP
R80		RES., SM, 49K9 0805, 1%,100ppm	1150-4A4992FP
R81		RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP
R82		POT., SM, 50K0 4mm SQ, 50K, 11T,SIDE	1174-DM3503J0
R83		RES., SM, 5K11 0805, 1%,100ppm	1150-3A5111FP
R84		RES., SM, 1K50 0805, 1%,100ppm	1150-3A1501FP
R85		RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP
R86		RES., SM, 49K9 0805, 1%,100ppm	1150-4A4992FP
R87		RES., SM, 5K11 0805, 1%,100ppm	1150-3A5111FP
R88, R89		RES., SM, 274R0 0805, 1%,100ppm	1150-2A2740FP
R90, R91		RES., SM, 100K0 0805, 1%,100ppm	1150-5A1003FP
R92		RES., SM, 1M00 0805, 1%,100ppm	1150-6A1004FP
R93, R94		RES., SM, 1K0 0805, 1%,100ppm	1150-3A1001FP
R95		POT., SM, 50K0 4mm SQ, 50K, 11T,SIDE	1174-DM3503J0
R96, R97		RES., SM, 100K0 0805, 1%,100ppm	1150-5A1003FP
R98		RES., SM, 49K9 0805, 1%,100ppm	1150-4A4992FP
R99		RES., SM, 1K0 0805, 1%,100ppm	1150-3A1001FP
R100		RES., SM, 100K0 0805, 1%,100ppm	1150-5A1003FP
R101		POT., SM, 50K0 4mm SQ, 50K, 11T,SIDE	1174-DM3503J0
SW1 - SW3		SWITCH, TOG, DPDT O-N-O,PC,RA	5215-T2010A01
SW4		SWITCH, TOG, SPTT DPDT,O-O-O,PC,RA	5215-T2110A01
TP1 - TP13		TESTPOINT, SM	

6.2 CI-PM-3 Mechanical Parts List

Description	Part Number	Qty.
CABLE, FLAT, 15 CONDUCTOR, GREY	7272-F15S0015	1
CABLE, SMA PL-SMB PL, RG316, 12cm	\$7910-SP0WP012	2
CAP, FOR SMA JACK, W/SEAL, Au	5119-C1100601	2
CONN., D-SUB/15 SOCKET, IDC	5036-A15S05MT	1
CONN., SMA JACK-JACK, BULKHEAD	5118-J875BJ05	2
COVER, 7HP PLUG-IN, SOLD. SIDE	3702-33160002	1
COVER, 7HP PLUG-IN, COMP. SIDE	3702-33160003	1
FASTENER, QUICK RELEASE, GRAY	3702-10000120	2
HANDLE, EXTRACTOR, 3.7HP, GREY	3702-33160008	1
HEATSINK, TO-220, 1.2"X1"-.5"H	5513-3302513B	1
HOLDER, PCB/EXTRACTOR, DIE CAST	3702-33160011	2
INSULATOR, THERM. COND., TO-220	5622-1T220701	1
LABEL/LEXAN, 3.7HP,CI-PM-3:BLK	3536-10550310	1
LOCKWASHER, M3, SPLIT, A2 STEEL	5814-3M0LK00S	1
NAMEPLATE, BLANK, 3.7HP, ALUM.	3702-10001203	1
NUT, M3, HEX, 5.4mm FLATS, A2	5813-3M0HX54S	1
PANEL/FRONT, W/IDENT: CI-PM-3	3802-61005510	1
SCREW, M2.5x8, OVAL C/S/PHIL, A2	5812-2M5VP08S	2
SCREW, M2.5 x 12 PAN/PHIL, A2	5812-2M5PP12S	2
SCREW, M3 x 12, PAN/PHIL.. A2	5812-3M0PP12S	1
SCREWLOCK KIT, FOR D-SUB. CONN	5030-SLK00503	1
SHOULDER WASHER, M3..24"OD,NYL	5674-120N2440	1
SOCKET, IDC, 2 x 8, GOLD CONT.	5011-C208S00G	1
STANDOFF, 7HP COVER, COMP/EJECT	3702-33160032	2
STANDOFF, 7HP COVER, SOLD/EJECT	3702-33160033	2

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Ref. Desig.	Description	Part No.
U1, U2	IC, LP2951 PROG. VOLT REG,SO-8	2305-29510N08
U3	IC, ICL232 ICL232, DUAL RS-232,SO-16L	2379-232IBW16
U4	IC, AD9901 PF DISCRMTR	2362-9901LC20
U5	IC, LT1083CP VOLT. REG.,TO-3P	2205-1083T03P
U6	OEXO MODULE, 10.0MHz, +9.6 VDC	2646-10000D08
U7	IC, MC14066 QUAD ANLG. SW, SO-14	2375-40660N14
U8	IC, 74HC14 HEX SCHMITT, SO-14	2376-00140N14
U9 - U11	IC, ADG333A QD SPDT SW.,SO-20L	2373-G333AW20
U12	IC, 74HC14 HEX SCHMITT, SO-14	2376-00140N14
U13 - U16	IC, AD824 QUAD FET OP AMP,SO14	2304-82400N14
U17	IC, MC33174 QUAD OP AMP,SO-14	2304-33174N14
U18	IC, MC14174 HEX D FLIPFLOP,S-16	2375-41740N16
U19, U20	IC, MSA-1105 MMIC AMP, PKG-05	2354-MSA11050
U21	IC, AD8042 DUAL 160MHz AMP,S08	2366-80420N08
U22	IC, MC14536 PROG. TIMER, SO-16L	2375-45360W16
U23	IC, MC14490 CONTACT BOUNCE,SO-16L	2375-44900W16
U24	IC, AD8042 DUAL 160MHz AMP,S08	2366-80420N08
U25	IC, 74HC14 HEX SCHMITT, SO-14	2376-00140N14
X1	RESONATOR, SM, 2.0MHz, CERAMIC	1575-200S128B

Ref. Desig.	Description	Part No.
D1, D2	DIODE, BYD17J RECTIFIER,SOD87	2101-BYD17J00
D3	IC, LM4040-4.1 4.1V REF,.5%,SOT23	2306-40404100
D4 - D8	DIODE, BAS16 SWITCHING, SOT23	2100-BAS16000
D9, D10	IC, LM4040-2.5 2.5V REF,.5%,SOT23	2306-40402500
D11, D12	DIODE, BAS16 SWITCHING, SOT23	2100-BAS16000
J1	CONN. DB15F D-SUB15 SOCKET, IDC	5036-A15S05MT
J2 - J3	CONN., SMB JACK,PC MNT,STRHT.	5122-J20S00BG
JU1, JU2	HEADER, .1", 3X1 HEADER 1 ROW X 3 PIN, Au	5010-H103ST7L
JU5, JU6	HEADER, .1", 3X1 HEADER 1 ROW X 3 PIN, Au	5010-H103ST7L
JU23	HEADER, .1", 3X1 HEADER 1 ROW X 3 PIN, Au	5010-H103ST7L
JU31 - JU33	HEADER, .1", 3X1 HEADER 1 ROW X 3 PIN, Au	5010-H103ST7L
JU35, JU36	HEADER, .1", 2X6 HEADER 2 ROW X 6 PIN, Au	5010-H206ST7L
JU48	HEADER, .1", 3X1 HEADER 1 ROW X 3 PIN, Au	5010-H103ST7L
L1, L2	CHOKE, RFMOULD.,22uH 10%,.25"	1251-4A00220K
LED1	LED, YELGRN,BILEVEL,RA PC MT	2017-091N22YG
LED2	LED, RED,RA PC MNT,.200"H,NYL	2017-091N06RD
LPF1 - LPF9	FILTER, SM, EM1LPF, 360pF,FER	1306-T361F2D5
MOD1	MODULE, CTCSS ENCODERDECODER	AC-CTCSS-TS-64
PCB	PCB, PAGING MODULATOR, CI-PM-3	4355-10500291
Q1 - Q3	TRANSISTOR, BC817-25 NPN,SOT23	2120-BC817025
R1	RES., SM, 1M00 0805, 1%,100ppm	1150-6A1004FP
R2	RES., SM, 178K0 0805, 1%,100ppm	1150-5A1783FP
R3 - R6	POT., SM, 50K0 4mm SQ, 50K, 11T,SIDE	1174-DM3503J0
R7, R8	RES., SM, 49K9 0805, 1%,100ppm	1150-4A4992FP
R9 - R18	RES., SM, 22K1 0805, 1%,100ppm	1150-4A2212FP
R19	RES., SM, 49R9 0805, 1%,100ppm	1150-1A49R9FP
R20	RES., SM, 22R1 1206, 1%,100ppm	1150-1B22R1FP
R21	RES., SM, 47R5 1206, 1%,100ppm	1150-1B47R5FP
R22	RES., SM, 22R1 1206, 1%,100ppm	1150-1B22R1FP
R23, R24	POT., SM, 50K0 4mm SQ, 50K, 11T,SIDE	1174-DM3503J0
R25	RES., SM, 39R2 0805, 1%,100ppm	1150-1A39R2FP
R26, R27	RES., SM, 178R0 1206, 1%,100ppm	1150-2B1780FP
R28 - R30	RES., SM, 27K4 0805, 1%,100ppm	1150-4A2742FP
R31, R32	RES., SM, 100K0 0805, 1%,100ppm	1150-5A1003FP
R33 - R37	RES., SM, ZERO OHM JUMPER,0805	1150-0A0R0000
R38	RES., SM, 1K0 0805, 1%,100ppm	1150-3A1001FP
R39	RES., SM, 3K01 0805, 1%,100ppm	1150-3A3011FP
R40	RES., SM, 1M00 0805, 1%,100ppm	1150-6A1004FP
R41	RES., SM, 392K0 1206, 1%,100ppm	1150-5B3923FP
R42	RES., SM, 3M30 0805, 5%,200ppm	1150-6A3304JL
R43	RES., SM, 1K0 0805, 1%,100ppm	1150-3A1001FP
R44	RES., SM, 3K01 0805, 1%,100ppm	1150-3A3011FP
R45	RES., SM, 150R0 0805, 1%,100ppm	1150-2A1500FP
R46	RES., SM, 49K9 0805, 1%,100ppm	1150-4A4992FP
R47	RES., SM, 150K0 1206, 5%,200ppm	1151-5B0154JL