DANIELS™
ELECTRONICS LTD.

MT-3 RADIO SYSTEMS

ENHANCED AM/FM SYNTHESIZER INSTRUCTION MANUAL

OS(R/T)-3(A/H) 29 - 470 MHz

Covers models:
OST-3H035, OST-3H045, OSR-3H061
OST-3A128, OSR-3A149
OST-3H141, OST-3H162, OSR-3H141, OSR-3H162
OST-3H440, OSR-3H440

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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.

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1 GENERAL

1.1 Introduction

The OS-3A/H Synthesizer Module produces a low distortion, high stability, FM modulated (FM transmitter) or unmodulated (receiver LO, AM transmitter) RF signal covering the frequency bands of 29 - 50 MHz, 118 - 159.4 MHz, 118 - 174 MHz and 406 - 470 MHz. It achieves ±1 ppm frequency stability from -40°C to +60°C with its own internal reference, or it can be slaved to an external 10/9.6 MHz reference signal of desired stability. The OS-3H Synthesizer Module is provided in eleven models covering three primary frequency bands (see section 1.2). A synthesizer module can be easily removed for programming, calibration, or repair. Each synthesizer module contains two circuit boards providing digital and analog functionality. The analog RF circuitry is fully isolated in a shielded compartment. Three inter-board filtered wire connections provide signal and power interface. Digital signal and power control is provided through five photo-logic optical transceivers, further enhancing electrical noise isolation.

1.2 OS(R/T)-3(A/H) Enhanced Synthesizer Family Models

The OS-3A/H Synthesizer module family forms an integral component of the MT-3 receiver and transmitter product line. In transmitters, the OS-3A/H synthesizer provides a modulated low level RF signal to the Power Amplifier module. In receivers, the OS-3A/H synthesizer provides a low noise local oscillator signal that either directly drives the mixer circuitry or drives a buffer amplifier in order to achieve higher LO mixer drive required for enhanced intermodulation capability. There are eleven distinct models in the OS-3H Enhanced Synthesizer Family. Note that this manual provides service and operating information for all eleven synthesizer family members. It is important to establish the correct synthesizer model number of interest in order to direct attention to specific documented information. The specific model number is printed on the synthesizer module top cover.

The eleven models are described as follows:

Frequency Band: 29 - 50 MHz, Common OS-3H0xx Analog Board

- OST-3H035 - synthesized, installed in transmitter, 29 - 38 MHz RF output.
- OST-3H045 - synthesized, installed in transmitter, 38 - 50 MHz RF output.
- OSR-3H061 - synthesized, installed in receiver, 50.4 - 71.4 MHz RF output.

Frequency Band: 118 - 159.4 MHz, AM Multichannel OS-3H1xx Analog Board

- OST-3A128 - synthesized, installed in AM transmitter, 118 - 138 MHz RF output.
- OSR-3A149 - synthesized, installed in AM receiver, 139.4 - 159.4 MHz RF output.

Frequency Band: 118 - 174 MHz, Common OS-3H1xx Analog Board

- OST-3H141 - synthesized, installed in FM transmitter, 128 – 152.6 MHz RF output.
- OST-3H162 - synthesized, installed in FM transmitter, 150 - 174 MHz RF output.
- OSR-3H141 - synthesized, installed in FM receiver, 128 – 152.6 MHz RF output.
- OSR-3H162 - synthesized, installed in FM receiver, 150 - 174 MHz RF output.

Frequency Band: 406 - 470 MHz, Common OS-3H4xx Analog Board

- OST-3H440 - synthesized, installed in FM transmitter, 406 - 470 MHz RF output.
- OSR-3H440 - synthesized, installed in FM receiver, 427.4 - 451.4 MHz RF output.

The OS-3A/H Enhanced Synthesizer models are very similar; all models use the same digital board and mechanical construction. The significant differences between the models relate to the analog board. There are four different analog boards covering the four frequency bands of 29 - 50 MHz, 118 - 159.4 MHz, 128 - 174 MHz and 406 - 470 MHz respectively. Each model's specific sub band of operation in a given frequency band is determined by select components on the corresponding analog board.

1.3 Performance Specifications

Type:	NBFM Single loop synthesizer module. Utilizing low noise VCO and PLL technology. Compatible with Daniels MT-3 series transmitter and receiver modules.
Frequency Range: Tuning range with no adjustment shown in [ ] brackets.	29 MHz - 38 MHz [± 0.5 MHz] (OST-3H035) 38 MHz - 50 MHz [± 1.0 MHz] (OST-3H045) 50.4 MHz - 71.4 MHz [± 1.0 MHz] (OSR-3H061) 118 MHz -138 MHz [Full band] (OST-3A128) 128 MHz – 152.6 MHz [± 2.0 MHz] (OST-3H141, OSR-3H141) 139.4 MHz - 159.4 MHz [Full band] (OSR-3A149) 150 MHz - 174 MHz [± 2.0 MHz] (OST-3H162, OSR-3H162) 406 MHz - 470 MHz [Full band] (OST-3H440) 427.4 MHz - 451.4 MHz [Full band] (OSR-3H440)
Output Power:	+5 dBm ±2 dBm into 50Ω
Harmonics:	<-30 dBc
Spurious:	<-90 dBc <-70 dBc above 400 MHz
Attack Time:	<50 ms (Power down mode)
Hum and Noise:	-55 dB
Modulation Sensitivity:	3.0 kHz peak deviation / 400 mVrms input
External Reference Input:	External reference input signal via SMB connector J1 Input level 0 dBm ± 3 dB. Input impedance 50Ω Input frequency 10.0 MHz or 9.6 MHz selected through digital board jumper JU1.
Power Requirements:	+9.5 Vdc @ 160 mA for FM and 65 mA for AM Standby mode, TCXO enabled: +9.5 Vdc @ 14 mA for FM and 4 mA for AM

1.4 Printed Circuit Board Numbering Convention

To ease troubleshooting and maintenance procedures, Daniels Electronics Limited 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. For example:

- PCB number 43-912010 indicates circuit board version 1.0;
- PCB number 50002-02 indicates circuit board version 2.0.

All PCB's manufactured by Daniels Electronics are identified by one of the above conventions.

2 THEORY OF OPERATION

2.1 Internal Power and Control (Digital Board)

Refer to "OS(R/T)-3(A/H) Digital Board Schematic Diagram" in section 4 page 19. The synthesizer operates from +9.5 Vdc applied to connector pin P1-2. Total current drain is approximately 160 mA (65 ma for AM). Power Down control (P2-4) controls the +5.0 Vdc microcontroller regulator U2 through power MOSFET switch U1. For receiver applications, the synthesizer is always operating with the enable line P2-4 permanently connected to +9.5 Vdc. In transmitter applications, pin P2-4 is controlled by MT-3 Transmitter Board jumper J18 which selects the synthesizer's standby mode. In low current standby mode (< 16/4 mA) approximately 50 ms of transmitter turn on delay from PTT activation must be tolerated (lock time of synthesizer). For transmitter applications requiring less than 10 ms of turn on delay, the synthesizer can be made to run continuously. This capability comes at the expense of an additional 160 (65 mA for AM) of transmitter standby current.

2.2 Synthesizer Analog Circuitry (Analog Board)

There are four separate analog circuit boards covering the four frequencies bands of 29 - 50 MHz, 118 - 159.4 MHz, 128 - 174 MHz and 406 - 470 MHz respectively. All four analog boards are similar in operation and circuit topology with the VCO, Loop Filter, and Output Lowpass Filter sections being band specific. Refer to "OS(R/T)-3(A/H) Analog Board Schematic Diagram" in section of this manual.

2.2.1 Common Analog Board Circuitry

This section describes the circuitry common to all versions of the FM Synthesizer Analog Board.

The Analog Board utilizes four optical receivers (U1 - U4), and one optical transmitter (U5) to provide an isolated data interface to the digital board. In normal operating modes, +9.5 Vdc Regulator IC U8 provides continuous +5.0 Vdc to the internal TCXO and power control optical receiver U1. This results in a standby current level of ≈ 10 mA for FM and 4 mA for AM. Primary power is controlled through activation of optical receiver U1 under control of the digital board micro controller U4. Regulator U6 provides switched +8.0 Vdc with regulator U7 providing switched +5.0 Vdc to all analog supply points. Power MOSFET IC U9 works as a clamping circuit to quickly discharge VCO filter capacitors C32 and C33 when powered down, resulting in immediate suppression of RF output from the VCO.

The OS-3H enhanced synthesizer is formed around a low power, single chip MC145190 (MC145191) synthesizer IC U10. A 9.6 MHz reference signal is provided from either the internal TCXO (JU1-B Analog Board), or an external source via SMB connector J1 with jumper JU1-A

(Analog Board) and jumper JU2 (AM Analog Board only) installed. The external reference source may be 9.6 MHz or 10.0 MHz through selection of jumper JU2 (Digital Board); install jumper JU2 (Digital Board) for 10.0 MHz reference selection. If an external signal is used for the reference source, it must be of low phase noise, high stability, with a level of 0 dBm ± 3 dB. A sinusoidal signal shape is required for an external reference source. A poor quality reference source will degrade receiver/transmitter performance to unacceptable levels. Transistor Q2 forms a buffer amplifier having 50Ω input impedance at 10.0 MHz. The internal 9.6 MHz TCXO provides better than 1 ppm frequency stability from -30°C to +60°C. Fine frequency adjustment is made through frequency control potentiometer RV1, which is accessible through the synthesizer top cover.

The 9.6 MHz reference source is divided down to establish a channel selection step size of 5.0/6.25, 12.5, or 25.0 kHz depending on the particular synthesizer model type. A third order passive loop filter comprised of C37, C38, C39, C45, C49, R36 and R32, is employed to achieve the required noise performance, modulation, and worst case switching time of 50 ms. A small sample of RF energy is coupled from the VCO output buffer U16 on the FM analog board or from Q6 on the AM analog board to the synthesizer IC U10 prescaler input (pin 11). FM modulation of the VCO from ≈ 100 Hz to 3 kHz, is provided through the baseband input pin P1-1 on Digital Board. A 1 kHz sine wave with a level of approximately 400 mVrms at P1-1 provides FM deviation of 3.0 kHz. SMB connector J2 provides an RF output level of approximately +5 dBm into a 50Ω load.

An optional modulation input is provided through connection P1-18 (Digital Board) and routed to the Analog board via connection P3. This connection must be coupled to a low impedance, dc coupled source and provides a phase modulated bandwidth from 0 (DC) to ≈ 50 Hz (PLL loop filter bandwidth) allowing for specialized applications such as paging or trunking where a separate low frequency digital/analog modulation channel is required. Phase modulation input pin P1-18 is routed to the transmitter audio processor spare pin P4-2 via JA4-2 on the MT-3 transmitter main board. It should be noted that any application of the direct TCXO modulation port transfers the control of the synthesizer steady state frequency setting to the external modulating source. Frequency control potentiometer RV1 is effectively removed from the frequency adjust circuitry.

A lock detect LED (LED1) indicates an unlocked PLL condition. An unlocked PLL condition normally indicates that the VCO is not tuned within the lock in range of the desired channel frequency. When used in a transmitter, the loss of lock will prevent PTT from keying the power amplifier module. This prevents transmission of a spurious, unlocked output signal. Adjustment of tuning capacitor C24 will normally reestablish frequency lock within the synthesizer design frequency range. Optical transmitter U5 is additionally activated in unlocked conditions and enables the micro-controller (digital board) to respond to the unlocked PLL state. Note that the 118 – 159.4 MHz and the 406 - 470 MHz Analog Board does not incorporate a VCO tuning capacitor; the VCO covers the full frequency range without tuning. An unlocked condition in this case would indicate an attempt to synthesize an invalid channel frequency outside the installed VCO frequency range.

2.2.2 29 - 71.4 MHz Analog Board Circuitry

Refer to the "OS(R/T)-3H 29 - 71.4 MHz Analog Board Schematic Diagram" located in section 4 page 3 of this manual.

Field effect transistor Q5 provides a VHF negative resistance amplifier/oscillator that is tuned on frequency by the combination of resonator L5 and a total capacitive reactance presented across L5 through capacitors C62, C63, C64, C23 (Select), variable capacitor C24, and varactor diodes D1 and D2. Fine frequency adjustment is provided by multi-turn trimmer capacitor C24 in conjunction with coarse frequency jumper selections JU2, JU3, and JU4. Select capacitor values are chosen to position the operating frequency in one of three bands; 29 - 38 MHz, 38 - 50 MHz, and 50.4 - 71.4 MHz. Varactor diodes D1 and D2 provide oscillator frequency control. PLL voltage feedback control from the output of the lowpass loop filter controls the VCO frequency through the reverse biasing of varactor diodes D1 and D2. The PLL control voltage can range from ≈ +1.0 Vdc to +7.0 Vdc and is normally set to ≈ +4.5 Vdc for the nominal programmed synthesizer center frequency. Setting the PLL control voltage set point (TP4) is made by adjusting fine frequency variable capacitor C24 combined with binary weighted lumped capacitor coarse frequency jumpers (JU2, JU3, JU4). External baseband frequency modulation is provided through connection P1 and a voltage divider network formed by R21 and R22. A large signal division ratio, established by the resistive dividers R21 and R22, allows low deviation (less than 5 kHz) direct frequency modulation of the VCO output signal.

The PLL lowpass filter is formed from select component values C37, C38, C39, C45, R32, and R36. The loop filter response is optimized for switching time, noise, and modulation requirements specific to each sub-band within the 29 - 71.4 MHz frequency range. The select component values (including the loop filter) can be found in tabular format as part of the VHF OS-3H 29 - 71.4 MHz Analog Board Schematic diagram.

RF output power is taken from the source of Q5 and amplified/buffered by U11. U15 provides further amplification and isolation while delivering ≈ +10 dBm to a six pole lowpass/notch output filter formed from C53, C57, C58, C59, L11, and L13. The six pole output filter provides a 50 MHz (OST-3H035, OST-3H045 TX) or 80 MHz (OSR-3H061 RX) cutoff frequency which reduces harmonic output to acceptable levels. SMB connector J2 provides interconnection to the companion transmitter or receiver with an output level of ≈ +5 dBm.

2.2.3 118 - 159.4 MHz Multichannel AM Analog Board Circuitry

Refer to the "OS(R/T)-3H 118 - 159.4 MHz Analog Board Schematic Diagram" located in section 4 page 7 of this manual.

Field effect transistor Q5 provides a VHF negative resistance amplifier/oscillator that is tuned on frequency by the combination of tapped resonator L5 and a total capacitive reactance presented across L5 through capacitors C40 and/or C23 (Select), varactor diodes D6, D7, and varactor

diodes D1 and D2. Coarse frequency adjustment is provided by varactor diodes D6, D7. Select capacitor values C40 or C23 are chosen to position the operating frequency in one of two bands; 118 - 138 MHz, and 139.4 - 159.4.MHz. Varactor diodes D1 and D2 provide fine oscillator frequency control. PLL voltage feedback control from the output of the lowpass loop filter controls the VCO frequency through the reverse biasing of diodes D1 and D2. The PLL control voltage can range from ≈ +1.0 Vdc to +4.7 Vdc and is normally set to ≈ +3.3 Vdc for the whole range of synthesizer frequencies. Setting the PLL control voltage set point (TP4) is made by adjusting the capacitance of varactor diodes D6, D7, which are controlled by a microcontroller U18 through a digital to analog converter U17. The microcontroller U18 controls the test point TP4, the output of the PLL Low Pass Filter, and adjusts the output voltage of D/A converter so that the TP4 voltage is approximately is 3.3Vdc at any frequencies. The microcontroller than goes sleep in order to keep the power consumption at the low level.

The PLL lowpass filter is formed from select component values C37, C38, C39, C45, R32, and R36. The loop filter response is optimized for switching time, noise, and modulation requirements specific to each sub-band within the 118 - 159.4 MHz frequency range. The select component values (including the loop filter) can be found in tabular format as part of the VHF OS(R/T)-3(A/H) 118 - 159.4 MHz Analog Board Schematic diagram.

RF output power is taken from the source of Q5 and amplified/buffered by Q6. U11 provides further amplification and isolation while delivering ≈ +10 dBm to a five pole lowpass output filter formed from C53, C58, C59, L11, and L12. The five pole lowpass output filter provides a 190 MHz low pass cutoff frequency which reduces harmonic output to acceptable levels. SMB connector J2 provides interconnection to the companion transmitter or receiver with an output level of ≈ +5 dBm.

2.2.4 128 - 174 MHz Analog Board Circuitry

Refer to the "OS(R/T)-3(A/H) 128 - 174 MHz Analog Board Schematic Diagram" located in section 4 page 11 of this manual.

Field effect transistor Q5 provides a VHF negative resistance amplifier/oscillator that is tuned on frequency by the combination of tapped resonator L5 and a total capacitive reactance presented across L5 through capacitors C40 and/or C23 (Select), variable capacitor C24, and varactor diodes D1 and D2. Fine frequency adjustment is provided by multi-turn trimmer capacitor C24. Select capacitor values C40 or C23 are chosen to position the operating frequency in one of two bands; 128 – 152.6 MHz and 150 - 174 MHz. Varactor diodes D1 and D2 provide oscillator frequency control. PLL voltage feedback control from the output of the lowpass loop filter controls the VCO frequency through the reverse biasing of diodes D1 and D2. The PLL control voltage can range from ≈ +1.0 Vdc to +7.0 Vdc and is normally set to ≈ +4.5 Vdc for the nominal programmed synthesizer center frequency. Setting the PLL control voltage set point (TP4) is made by adjusting fine frequency variable capacitor C24. External baseband frequency modulation is provided through connection P1 and a voltage divider network formed by R21 and R22. A large signal

division ratio, established by the resistive dividers R21 and R22, allows low deviation (less than 5 kHz) direct frequency modulation of the VCO output signal.

The PLL lowpass filter is formed from select component values C37, C38, C39, C45, R32, and R36. The loop filter response is optimized for switching time, noise, and modulation requirements specific to each sub-band within the 128 - 174 MHz frequency range. The select component values (including the loop filter) can be found in tabular format as part of the VHF OS(R/T)-3(A/H) 128 - 174 MHz Analog Board Schematic diagram.

RF output power is taken from the source of Q5 and amplified/buffered by U11. U15 provides further amplification and isolation while delivering ≈ +10 dBm to a five pole lowpass output filter formed from C53, C58, C59, L11, and L12. The five pole lowpass output filter provides a 190 MHz low pass cutoff frequency which reduces harmonic output to acceptable levels. SMB connector J2 provides interconnection to the companion transmitter or receiver with an output level of ≈ +5 dBm.

2.2.5 406 - 470 MHz Analog Board Circuitry

Refer to the "OS(R/T)-3H 406 - 470 MHz Analog Board Schematic Diagram" located in section 4 page 15 of this manual.

The UHF OS(R/T)-3H 406 - 470 MHz synthesizer employs integrated surface mount VCO modules (designated U17) for full frequency band coverage. Two VCO modules are used to cover 406 - 470 MHz (TX) and 427.4 - 451.4 MHz (RX) for transmitter and receiver UHF applications respectively. The receiver VCO module is optimized for low phase noise, while the transmitter VCO is configured with modulation input capability. PLL voltage feedback control from the output of the lowpass loop filter controls the VCO frequency through Mod I/P (pin 2). The PLL control voltage can range from ≈ +1.0 Vdc to +7.0 Vdc depending on the selected operating frequency. External baseband frequency modulation is provided through connection P1 and VCO Mod input pin 6.

The PLL lowpass filter is formed from select component values C37, C38, C39, C45, R32, and R36. The loop filter response is optimized for switching time, noise, and modulation requirements specific to each sub-band within the 406 - 470 MHz frequency range. The select component values (including the loop filter and VCO type) can be found in tabular format as part of the UHF OS(R/T)-3H 406 - 470 MHz Analog Board Schematic diagram.

RF output power is taken from the VCO RF output and amplified/buffered by U11. U15 provides further amplification and isolation while delivering ≈ +10 dBm to a five pole lowpass output filter formed from C53, C58, C59, L11, and L12. The five pole lowpass output filter provides a 530 MHz low pass cutoff frequency which reduces harmonic output to acceptable levels. SMB connector J2 provides interconnection to the companion transmitter or receiver with an output level of ≈ +5 dBm.

2.3 Synthesizer Digital Circuitry (Digital Board)

Refer to the "OS(R/T)-3(A/H) Digital Board Schematic Diagram" on page 4-19. Microcontroller U4 provides control of the synthesizer module. It communicates with synthesizer IC U10, monitors the synthesizer lock detect, manages PTT input/output, and determines the operating frequency from either four rotary BCD switches or four externally driven channel select lines. The rotary BCD channel switches are located on the main MT-3 Transmitter or Receiver circuit board. The Microcontroller U4 also communicates with an external factory programmer through I/O lines TX DATA (P1-17), RX DATA (P1-9), and BOOTSTRAP (P2-2). The external programmer places the operating program in non volatile microprocessor memory. It is also used to program 15 user defined channel selections. An internal "watchdog" timer provides robust software protection in all operating modes.

Data communication between the digital and analog circuit boards is provided by four optical transmitters (U5 through U8) and one optical receiver (U9). The optical interface provides a fully isolated inter-board data link designed to eliminate digital noise from disturbing sensitive PLL circuitry.

2.4 Frequency Control

2.4.1 BCD Switch Frequency Control

Selection of the desired synthesizer output frequency is straight forward. If all four of the channel select lines CHAN SEL3 - CHAN SEL0 are pulled low (grounded), the synthesizer will scan four BCD switches connected to SW1 COM - SW4 COM and PC4 - PC7 to establish the operating frequency. The BCD switches are located on the receiver and transmitter main circuit boards.

* Note: The four channel select lines, CHAN SEL3 - Chan SEL0, are connected via the MT-3 transmitter or receiver main board module connector to the M3 motherboard subrack. These lines may be used for external frequency control. They are normally pulled low via jumper sets located on the M3 motherboard subrack.

If the channel select lines are pulled high to +9.5 Vdc in any combination resulting in a binary code greater than 0000 (all low), then the frequency is established as the preprogrammed entry in a table containing 15 separate frequency settings. For example; if all the channel select lines are pulled high then a binary code of 1111 results which selects the frequency entry from the 15th table position. CHAN SEL3 is the most significant bit of the binary channel selection code. The channel table is normally programmed at the factory for those applications requiring specialized remote control of frequency. These programmed channel assignments are stored in non-volatile microprocessor EEPROM and are not susceptible to inadvertent erasure.

In transmitters, the synthesizer operating frequency is the transmitter operating frequency; however, for receivers, an IF Offset correction factor (21.4 MHz typically) must be added to or

subtracted from the synthesizer operating frequency in order to determine the actual receive frequency. Refer to the channel designation table documentation provided with the transmitter or receiver modules for simplified channel number and frequency information.

2.4.2 Frequency Select Handle Frequency Control

For operation in this mode the external channel select must be set to channel #16. Channel selection is achieved by pushing the buttons Frequency Increase Ø and Frequency Decrease Œ on the Frequency Select Handle. The Frequency Select Handle is located on the Front Panel. The user interface consists of an 8 digit display and 3 pushbuttons. On power up or key press, the synthesizer is interrogated for the current channel number and channel frequencies. This information is used to generate the display, and update the synthesizer itself. The module communicates with the synthesizer using a standard 2 wire serial interface (9600 Baud, 8 bits, no parity, 1 stop bit). The command protocols are simple ASCII, both to and from the synthesizer.

The frequency value and the channel are displayed on the Front Panel for several seconds only, in order to conserve power. Another dedicated line allows the handle to temporarily wake up the synthesizer if it has been powered down. (This is currently only used on the transmitters)

For the detailed information about changing frequency see the "Frequency Select Handle Instruction Manual".

2.5 Synthesizer Base and Frequency Increment Table

The OS-3A/H Synthesizer operates in frequency increments of 5.0 / 6.25 kHz, 12.5 kHz, or 25 kHz depending on the particular model and band of operation. The Base Frequency is the lowest frequency of any given synthesizer model.

Model Number	Freq. Range	Base Frequency	Freq. Increment
OST-3H035	29 - 38 MHz	29 MHz	5.0/6.25 kHz
OST-3H045	38 - 50 MHz	29 MHz	5.0/6.25 kHz
OSR-3H061	50.4 - 71.4 MHz	50.4 MHz	5.0/6.25 kHz
OST-3A128	118 - 138 MHz	118 MHz	25/8.333 kHz
OST-3H141	128 – 152.6 MHz	128 MHz	5.0/6.25 kHz
OST-3H162	150 - 174 MHz	150 MHz	5.0/6.25 kHz
OSR-3H141	128 - 153 MHz	128 MHz	5.0/6.25 kHz
OSR-3A149	139.4 - 159.4 MHz	139.4 MHz	25/8.333 kHz
OSR-3H162	150 - 174 MHz	150 MHz	5.0/6.25 kHz
OST-3H440	406 - 470 MHz	406 MHz	12.5 kHz
OSR-3H440	427.4 - 451.4 MHz	427.4 MHz	12.5 kHz

2.6 5.0/6.25 kHz Channelization.

The operating frequency is determined as follows for Synthesizers having 5.0/6.25 kHz channel increment capability;

- for BCD switch settings (in the range of 0000 to 4999, multiply the switch setting by 5.0 kHz and add it to the synthesizer base frequency.

  Example: An OST-3H141 synthesizer has a base frequency of 128 MHz. The selected channel number is 0988. The synthesizer output frequency is:

  ((988 x 5 kHz) + 128 MHz) = 132.940 MHz

- for BCD switch settings in the range of 5000 to 9999, subtract 5000 from the switch setting, multiplying the result by 6.25 kHz and add it to the synthesizer base frequency.

  Example: An OSR-3H162 synthesizer has a base frequency of 150 MHz. The selected channel number is 7205. The synthesizer output frequency is:

  ((7205-5000) x 6.25 kHz) + 150 MHz) = 163.78125 MHz

The key point to remember is that 5.0 kHz channel increments are selected with BCD channel switch settings in the range of #0000 through #4999 and 6.25 kHz channel increments are selected with BCD switch settings in the range of #5000 through #9999.

2.7 8.333 kHz Channelization.

The operating frequency is determined as follows for Synthesizers having 8.333 kHz channel increment capability;

- Multiply the BCD switch setting by 8.333 kHz and add it to the synthesizer base frequency.

  Example: An OST-3A128 synthesizer has a base frequency of 118 MHz. The selected channel number is 0231. The synthesizer output frequency is:

  [(1200 x 8.333 kHz) + 118 MHz] = 128.000 MHz

2.8 12.5 kHz Channelization.

The operating frequency is determined as follows for Synthesizers having 12.5 kHz channel increment capability;

- Multiply the BCD switch setting by 12.5 kHz and add it to the synthesizer base frequency.

  Example: An OST-3H440 synthesizer has a base frequency of 406 MHz. The selected channel number is 1978. The synthesizer output frequency is:

  ((1978 x 12.5 kHz) + 406 MHz) = 430.725 MHz

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3 SYNTHESIZER ALIGNMENT

3.1 General

OS(R/T)-3(A/H) enhanced synthesizer alignment is simplified by using a Type 84 subrack and RF extender card/cable to provide receiver or transmitter power and signal interconnection. Alternatively, +9.5 Vdc may be applied directly to a receiver or transmitter module through positive connection to pins B6 / Z6, and negative connection to pins B30 / Z30 / B32 / Z32. Receiver balanced audio (600 Ω) is available at pins B26 and Z26.

3.2 Repair Note

The OS(R/T)-3(A/H) synthesizer employs a high percentage of surface mount components 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 Electro Static Dissipative (ESD) protection.

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

3.3 Recommended Test Equipment

Alignment of the synthesizer requires the following test equipment or its equivalent.

Power supply - Regulated +9.5 Vdc at 2 A. Phillips PM 2811
Oscilloscope / Multimeter - Fluke 97 Scopemeter
Radio communications test set - Marconi Instruments 2965A

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

3.4 OS(R/T)-3(A/H) Synthesizer Factory Configuration

The OS(R/T)-3(A/H) Synthesizer is factory configured as follows:

- Internal 9.6 MHz reference selected.
- VCO modulation by audio processor enabled (OST TX versions only)

The corresponding internal synthesizer jumper settings are:

Digital Board

- Jumper JU2 not installed 9.6/10 MHz reference frequency, 9.6 MHz selected
- Jumper JU1 installed AM Multichannel mode selected

Analog Board

- Jumper JU1: 'B' position Internal/External reference. Internal selected
- Jumper JU2 not installed Internal/External reference. Internal selected

3.5 OS(R/T)-3(A/H) Synthesizer Alignment

3.5.1 General

Under normal circumstances, synthesizer alignment is accomplished without removing the synthesizer from the MT-3 Receiver IF/Audio Board or the MT-3 Transmitter Main Board. Alignment simply involves setting the internal TCXO reference frequency (if one is installed and the internal reference option enabled). This step is described in "Reference Frequency Alignment" of section 3.5.5.5. A change in synthesizer operating frequency greater than the maximum tuning range for a particular model (Refer to Specifications section 1.3) from an initial factory setting requires a slightly more involved alignment procedure as described in sections 3.5.2 to 3.5.5. To convert a synthesizer with an internal reference source to a synthesizer requiring an external reference signal or vice-versa is done through the appropriate selection of jumper JU1 A or B, and JU2 (Refer to section 3.5.6).

3.5.2 Synthesizer Test Points

Analog Board Component Layout (Top)
Common to all synthesizer family members.

TP1 +8.0 ± 0.3 Vdc. U6 positive regulator output.
TP2 +5.0 ± 0.1 Vdc. U7 positive regulator output.
TP3 +5.0 ± 0.1 Vdc. U8 positive regulator output (always on).
TP4 PLL error voltage. Ranges from +1.0 to +7.0 Vdc depending on frequency. Nominally adjusted (C24) to +4.5 Vdc for tuned center channel. UHF/VHF versions employing integrated VCO modules (OSR-3H440, OST-3H440, OSR-3A149, OST-3A128) require no adjustment.

Digital Board Component Layout (Bottom)

TP1 +5.0 ± 0.1 Vdc. U2 positive regulator output (controlled via pin P2-4).
TP2 Microcontroller E clock. 2 MHz logic level square wave.

3.5.3 Synthesizer Removal and Installation

The synthesizer module is fastened to the main board (MT-3 Receiver IF/Audio Board or MT-3 Transmitter Main board) with a single counter sunk Phillips machine screw accessible from the top cover. Remove this screw to remove the synthesizer module. Using a plastic coated lifting tool, such as a small screwdriver with the tip covered in heat shrink material, gently lift the synthesizer module from the main circuit board by applying pressure in a rotating fashion about four corners of the synthesizer module. It is important to gently remove the synthesizer module "straight out" in order to prevent damage to the connector pins. Installation of the synthesizer is performed in a fashion reverse to the above procedure. It is important to emphasize the importance of connector pin alignment prior to any application of reinsertion force. Four corner locating pins assist in connector pin alignment during installation and removal.

Note: Complete synthesizer alignment can be made without removing the synthesizer. The alignment procedure starting in section 3.5.5 may now be performed.

3.5.4 Circuit Board Removal

Note: Circuit board removal is not required for tuning purposes.
Using a vacuum desoldering station, desolder connections P1, P2, and P3. Remove SMB connectors J1 and J2 by desoldering the center pins and removing four M2.0 machine screws. These connection points are shown in the "OS(R/T)-3(A/H) XXX - XXX MHz Analog Board Component Layout (Top)" diagrams. Remove seven M2.0 machine screws and carefully remove the analog circuit board. Removal of the analog circuit board will expose three interboard wire connections. Carefully remove three ferrite beads and six Teflon washers from the inter-board connection wires. Attempt to maintain the position of the three interboard wires in order to simplify re-assembly. The digital board may now be extracted by removing four M2.0 machine screws. Follow a reverse procedure to re-assemble.

3.5.5 Frequency Adjustment and Channel Selection

Connect a radio communications test set through a short section of low loss 50 Ω coaxial cable to the synthesizer module SMB RF output jack (J2). Select the desired channel number through the BCD frequency selection switches on the MT-3 Transmitter Main board or the MT-3 Receiver IF/audio board (or through .the Frequency Programming Module). Turn the power off and on and wait a few minutes for the oscillator to completely stabilize. It should be noted that the internal synthesizer TCXO, if installed, operates continuously (regardless of the TX PTT state) when installed in a transmitter. This continuous operation results in approximately 10 mA of additional standby current.

The measured RF output signal should be within ± 1.0 ppm of the specified oscillator frequency at an output level of +5 dBm. Note that unlocked synthesizer operation will be indicated by an

unstable or spurious RF output signal. The "Unlocked" red LED will also be illuminated when the PLL is unlocked. Check that the requested channel number is within the frequency range of the particular synthesizer model. An unlocked condition may be rectified by adjusting the VCO tuning elements as described in the following procedures (no adjustment requires for the multichannel AM Synthesizers). Note that there are variations in alignment procedures between the three synthesizer family members as described in the following sections.

3.5.5.1 VHF OS(R/T)-3H 29 - 71.4 MHz VCO Alignment

Refer to the "OS(R/T)-3H 29 - 71.4 MHz Analog Board Component Layout" diagrams and the "OS(R/T)-3H 29 - 71.4 MHz Analog Board Schematic Diagram" located in section 4 on pages 1, 2 and 3.

Using a high impedance (10 MΩ) DC Voltmeter, measure the PLL control voltage at TP4 located on the synthesizer module analog board (top). Access to TP4 is available through the synthesizer top cover. Using a small standard blade screwdriver, carefully adjust the VCO fine frequency "TUNE" trimmer capacitor C24 until a test point (TP4) voltage of approximately +2.3 Vdc is obtained. Measured PLL loop control voltages below approximately +0.5 Vdc and above approximately +4.5 Vdc indicates an "out of lock" synthesizer condition.

If a test point (TP4) voltage of approximately +2.3 Vdc is unattainable through adjustment to C24, then the coarse frequency jumpers, JU2-JU4 require modification in order to pull the VCO tune range within the adjustment range of fine tuning capacitor C24. The top synthesizer cover must be removed in order to gain access to the coarse frequency jumpers. The coarse frequency jumpers (JU2-JU4) may be considered to be a selectable binary weighted capacitor element with JU2 being the most significant "bit" and JU4 being the least significant "bit". The tuning resolution size is ≈12 pF (JU4). If the tuning voltage remains higher than +2.3 Vdc, decrease the tuning jumper setting by 1 "bit" position and re-adjust C24 in an attempt to achieve +2.3 Vdc at TP4. For example, if coarse frequency jumpers JU2-JU4 are all installed and represented by 111 then a decrease by 1 "bit" position (12 pF) is represented by a binary jumper selection of 110; jumper JU4 is not installed and jumpers JU2, JU3 are installed. Continue to decrease the jumper position one "bit" at a time until the synthesizer regains lock with TP4 adjusted (C24) for +2.3 Vdc. If the tuning voltage remains lower than +2.3 Vdc, increase the jumper setting by 1 "bit" position and re-adjust C24 in an attempt to achieve +2.3 Vdc at TP4. Repeat this procedure until +2.3 Vdc at TP4 is achieved.

It is important to check the loop control voltage at TP4 when multiple synthesizer channels have been programmed. All channel selections should result in a TP4 voltage within a +1.0 to +4.0 Vdc range. Adjust the fine tuning capacitor C24 to center multiple channel voltages symmetrically about +2.3 Vdc. Channel selections beyond the tuning range capability of the synthesizer will result in unlocked operation. The tuning range capability of all synthesizer models is listed in the Specifications section (1.3) of this manual.

3.5.5.2 VHF OS(R/T)-3A 118 - 159.4 MHz Alignment

Refer to the "OS(R/T)-3A 118 - 159.4 MHz Analog Board Component Layout" diagrams and the "OS(R/T)-3A 118 - 159.4 MHz Analog Board Schematic Diagram" located in section 4 on pages 5, 6, and 7.

Using a high impedance (10 MΩ) DC Voltmeter, measure the PLL control voltage at TP4 located on the synthesizer module analog board (top). Access to TP4 is available through the synthesizer top cover. The VHF synthesizers operating in the 118 - 159.4 MHz frequency range employ a PIC microcontroller having no frequency adjustment capability. The OST-3A128 and OSR-3A149 models cover 118-138 MHz, and 139.4 - 159.4 MHz respectively and provide full band coverage without tuning adjustment.

All channel selections might result in a TP4 voltage within the +3.1 to +3.5 Vdc range. Channel selections beyond the tuning range capability of the synthesizer will result in unlocked operation over the temperature range - 40C to + 60C. The tuning range capability of all synthesizer models is listed in the Specifications section of this manual.

3.5.5.3 VHF OS(R/T)-3H 128 - 174 MHz VCO Alignment

Refer to the "OS(R/T)-3H 128 - 174 MHz Analog Board Component Layout" diagrams and the "OS(R/T)-3H 128 - 174 MHz Analog Board Schematic Diagram" located in section 4 on pages 9, 10 and 11.

Using a high impedance (10 MΩ) DC Voltmeter, measure the PLL control voltage at TP4 located on the synthesizer module analog board (top). Access to TP4 is available through the synthesizer top cover. Using a small standard blade screwdriver, carefully adjust the VCO fine frequency "TUNE" trimmer capacitor C24 until a test point (TP4) voltage of approximately +2.3 Vdc is obtained. Measured PLL loop control voltages below approximately +0.5 Vdc and above approximately +4.5 Vdc indicates an "out of lock" synthesizer condition.

It is important to check the loop control voltage at TP4 when multiple synthesizer channels have been programmed. All channel selections should result in a TP4 voltage within the +1.0 to +4.0 Vdc range. Adjust the fine tuning capacitor C24 to center multiple channel voltages symmetrically about +2.3 Vdc. Channel selections beyond the tuning range capability of the synthesizer will result in unlocked operation. The tuning range capability of all synthesizer models is listed in the Specifications section of this manual.

3.5.5.4 UHF OS(R/T)-3H 406 - 470 MHz VCO Alignment

Refer to the "OS(R/T)-3H 406 - 470 MHz Analog Board Component Layout" diagrams and the "OS(R/T)-3H 406 - 470 MHz Analog Board Schematic Diagram" located in section 4 on pages 13, 14 and 15.

Using a high impedance (10 MΩ) DC Voltmeter, measure the PLL control voltage at TP4 located on the synthesizer module analog board (top). Access to TP4 is available through the synthesizer top cover. The UHF synthesizers operating in the 406 - 470 MHz frequency range employ integrated VCO modules having no frequency adjustment capability. The OST-3H440 and OSR-3H440 models cover 406-470 MHz, and 427.4 - 470 MHz respectively and provide full band coverage without tuning adjustment. Measured PLL loop control voltages below approximately +0.5 Vdc and above approximately +7.0 Vdc indicates an "out of lock" synthesizer condition.

It is important to check the loop control voltage at TP4 when multiple synthesizer channels have been programmed. All channel selections should result in a TP4 voltage within the +1.0 to +7.0 Vdc range. Channel selections beyond the tuning range capability of the synthesizer will result in unlocked operation. The tuning range capability of all synthesizer models is listed in the Specifications section of this manual.

3.5.5.5 Reference Frequency Alignment

Adjust the synthesizer TCXO fine frequency potentiometer RV1 until the correct output frequency is achieved. Access to this potentiometer is made available through an opening in the synthesizer top cover. An RF power level of approximately +5 dBm should be measured at the synthesizer module output connector and the frequency should be within ±1 ppm from the desired operating frequency. Reference frequency adjustments should be made at room temperature (+20°C) after ten minutes.

3.5.6 Jumper Configuration

Solder jumpers are clearly marked on both the synthesizer digital and analog circuit boards. Refer the "OS(R/T)-3(A/H) Digital Board Component Layout (Bottom)" diagram in section 4 page 14, and the applicable "OS(R/T)-3(A/H) Analog Board Component Layout (Top)" diagram for jumper locations. The following list details the required jumper configuration for the two synthesizer operating modes:

1) Internal reference. Install jumper JU1-B, on Analog Board (Standard). The internal temperature compensated crystal oscillator (TCXO) provides the reference signal with a stability less than ±1 ppm from -30°C (Optional -40°C) to + 60°C. (Located on the Analog Board)

2) External reference input. Install jumper JU1-A, JU2 on Analog Board. This mode is used in applications requiring better than ±1 ppm frequency stability. An external 9.6/10.0 MHz reference signal must be provided at synthesizer SMB connector J1. (Located on the Analog Board)

3) Reference Frequency Select. Install jumper JU2 on Digital Board to select a 10.0 MHz reference frequency. When not installed, the reference frequency selected is 9.6 MHz. JU2 must not be installed when using the internal 9.6 MHz TCXO reference. JU2 is used by the microcontroller to establish the correct reference frequency division ratio. (Located on the Digital Board; The Synthesizer module must be removed to change jumper JU2)

4) AM Multichannel Synthesizer Select. Install jumper JU1 on Digital Board to select AM Multichannel Synthesizer with Frequency Select Handle. (Located on the Front Panel)

Remember: Care must be exercised when installing the reconfigured synthesizer module back into the transmitter board or the IF/audio board. Pay careful attention to pin alignment before pressing the synthesizer module into its mating sockets.

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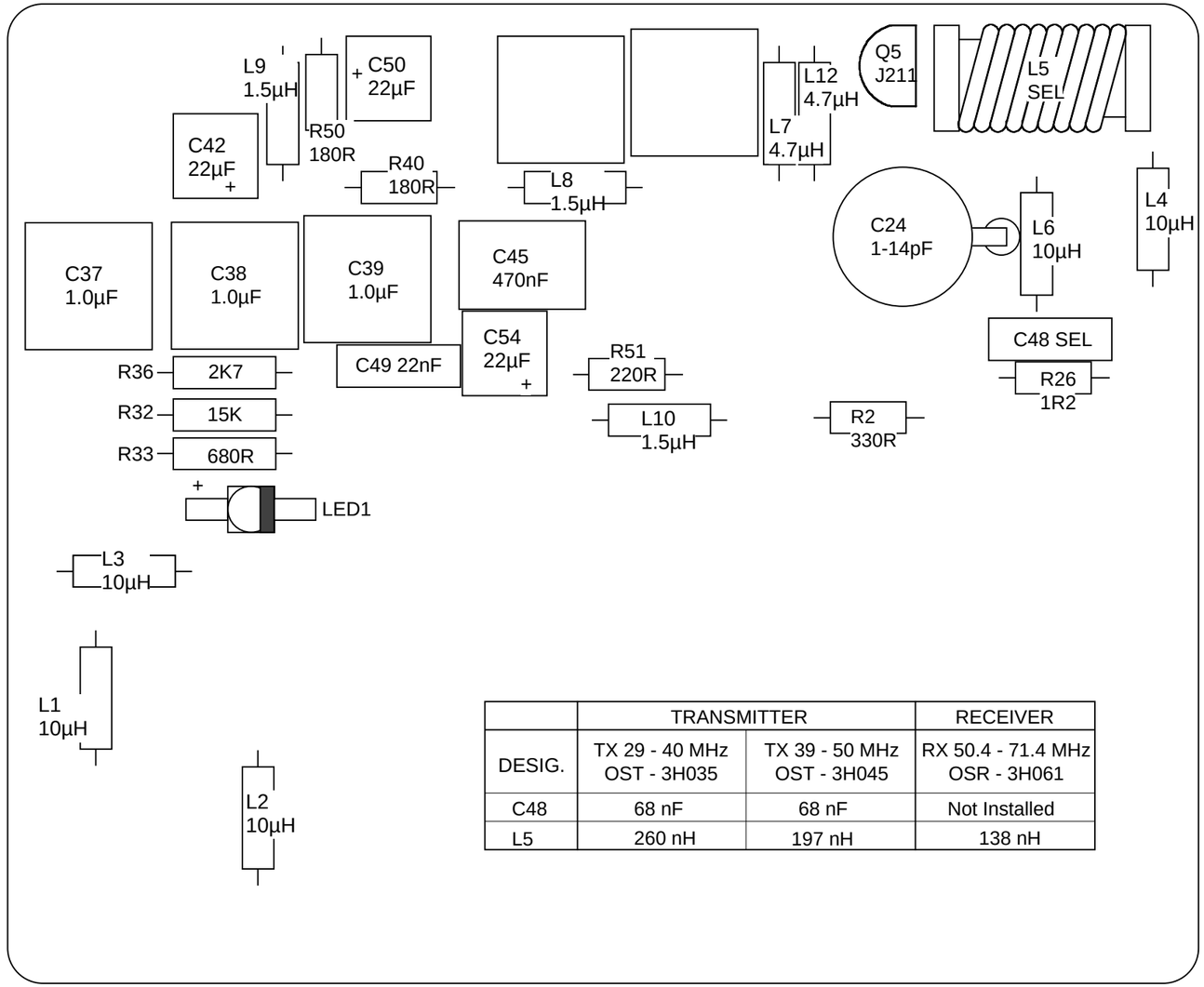
4 ILLUSTRATIONS AND SCHEMATIC DIAGRAMS

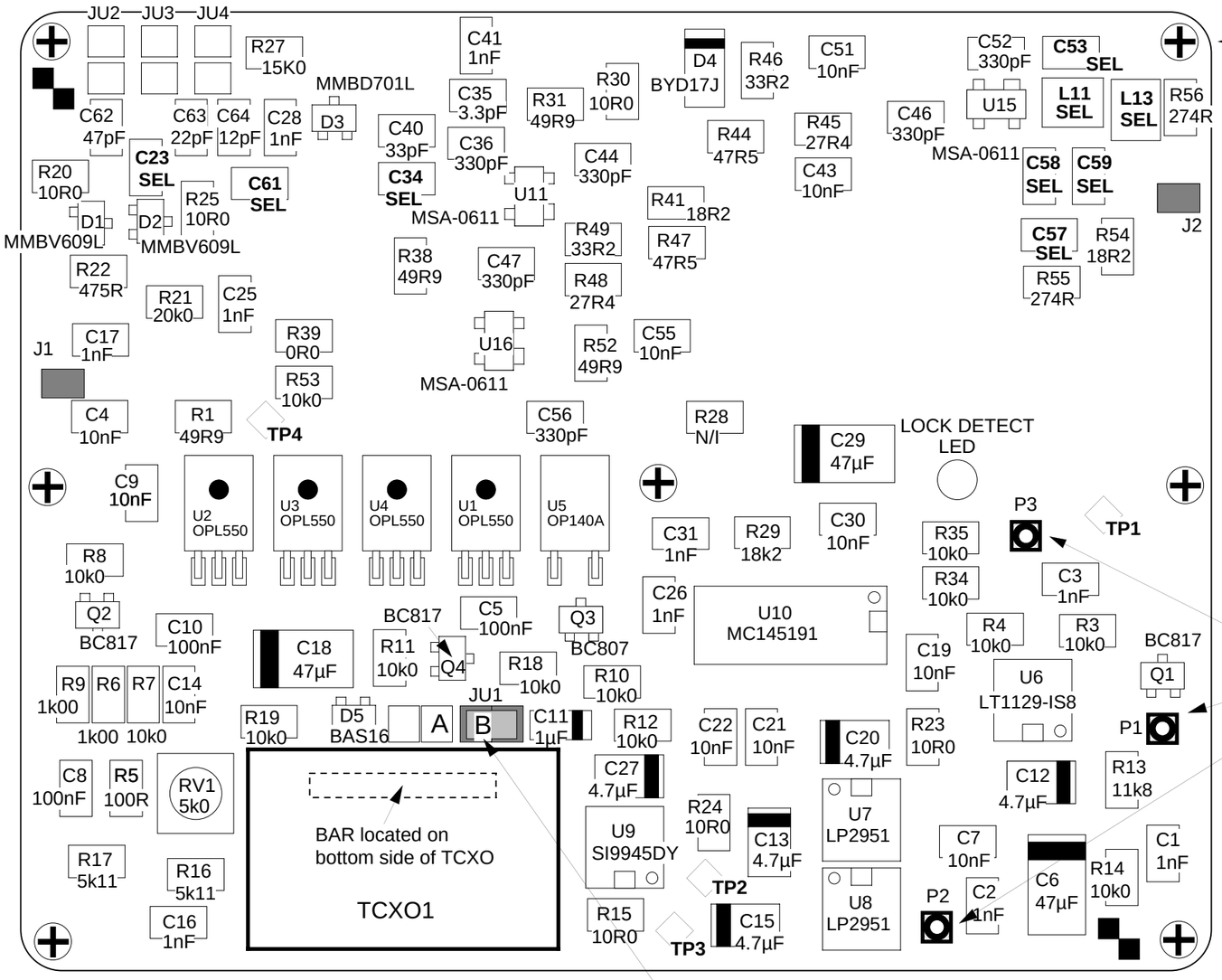
4.1 OS(R/T)-3H 29 - 71.4 MHz Analog Board Diagrams

4.1.1 OS(R/T)-3H 29 - 71.4 MHz Analog Board Component Layout (Bottom)



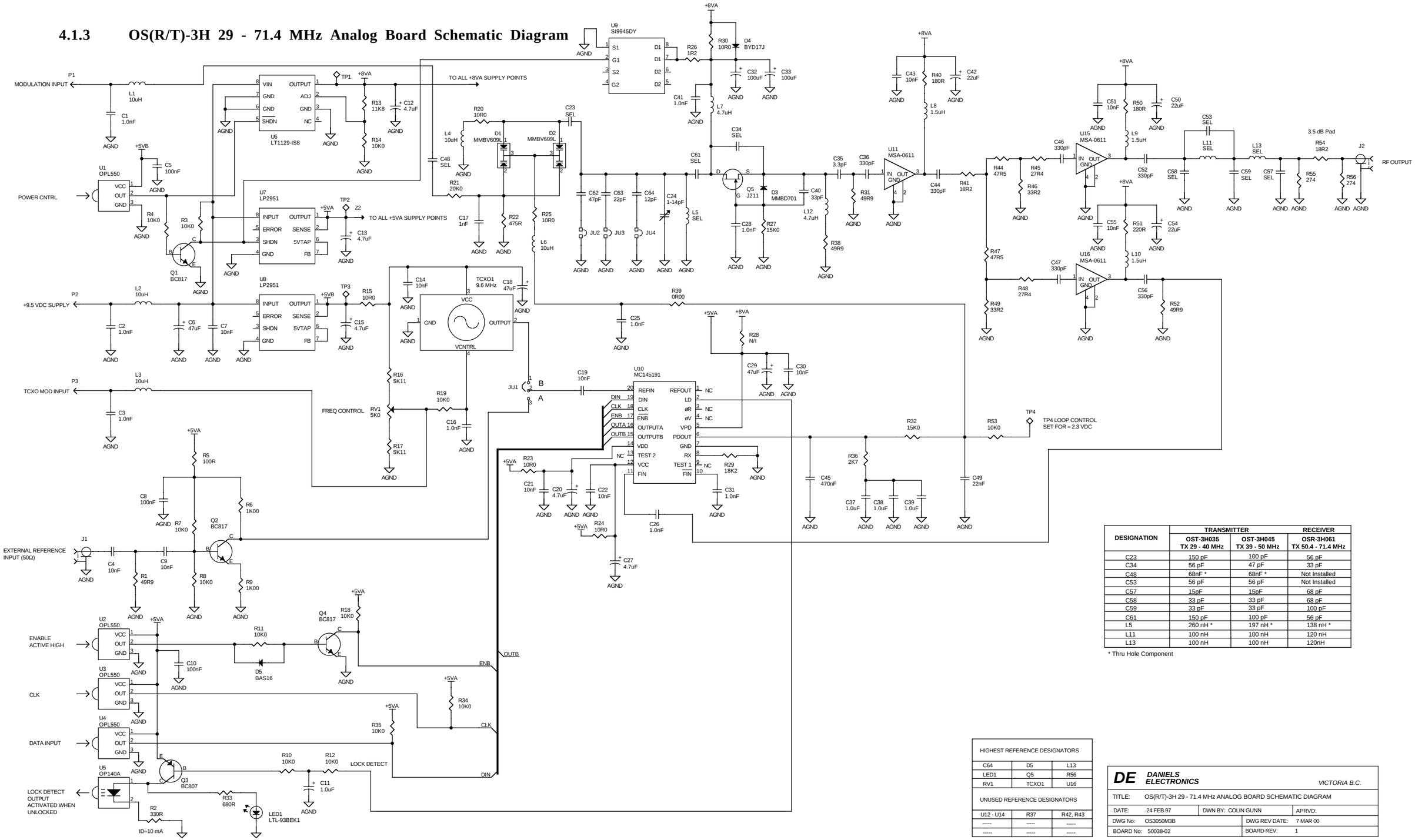
	TRANSMITTER		RECEIVER
DESIG.	TX 29 - 40 MHz OST - 3H035	TX 39 - 50 MHz OST - 3H045	RX 50.4 - 71.4 MHz OSR - 3H061
C48	68 nF	68 nF	Not Installed
L5	260 nH	197 nH	138 nH

4.1.2 OS(R/T)-3H 29 - 71.4 MHz Analog Board Component Layout (Top)



	TRANSMITTER		RECEIVER
DESIG.	TX 29 - 40 MHz OST - 3H035	TX 39 - 50 MHz OST - 3H045	RX 50.4 - 71.4 MHz OSR - 3H061
C23	150 pF	100 pF	56 pF
C34	56 pF	47 pF	33 pF
C53	56 pF	56 pF	Not Installed
C57	15 pF	15 pF	68 pF
C58	33 pF	33 pF	68 pF
C59	33 pF	33 pF	100 pF
C61	150 pF	100 pF	56 pF
L11	100 nH	100 nH	120 nH
L13	100 nH	100nH	120 nH

4.1.3 OS(R/T)-3H 29 - 71.4 MHz Analog Board Schematic Diagram



DESIGNATION	TRANSMITTER		RECEIVER
	OST-3H035 TX 29 - 40 MHz	OST-3H045 TX 39 - 50 MHz	OSR-3H061 TX 50.4 - 71.4 MHz
C23	150 pF	100 pF	56 pF
C34	56 pF	47 pF	33 pF
C48	68nF *	68nF *	Not Installed
C53	56 pF	56 pF	Not Installed
C57	15pF	15pF	68 pF
C58	33 pF	33 pF	68 pF
C59	33 pF	33 pF	100 pF
C61	150 pF	100 pF	56 pF
L5	260 nH *	197 nH *	138 nH *
L11	100 nH	100 nH	120 nH
L13	100 nH	100 nH	120nH

* Thru Hole Component

HIGHEST REFERENCE DESIGNATORS		
C64	D5	L13
LED1	Q5	R56
RV1	TCXO1	U16
UNUSED REFERENCE DESIGNATORS		
U12 - U14	R37	R42, R43
-----	-----	-----
-----	-----	-----

DE DANIELS ELECTRONICS VICTORIA B.C.

TITLE: OS(R/T)-3H 29 - 71.4 MHz ANALOG BOARD SCHEMATIC DIAGRAM

DATE: 24 FEB 97	DWN BY: COLIN GUNN	APRVD:
DWG No: OS3050M3B	DWG REV DATE: 7 MAR 00	
BOARD No: 50038-02	BOARD REV: 1	

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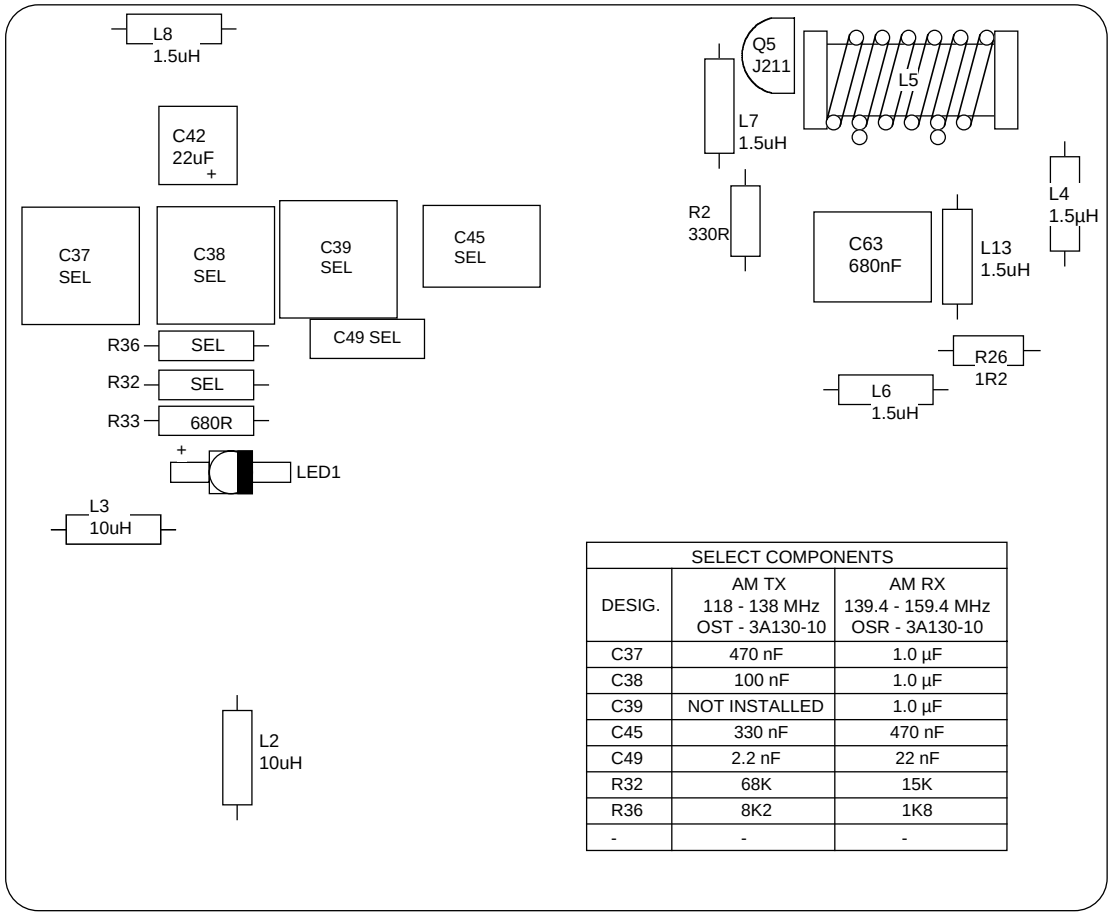
4.2 OS(R/T)-3A 118 - 159.6 MHz Analog Board Diagrams

4.2.1 OS(R/T)-3A 118 - 159.6 MHz Analog Board Component Layout (Bottom)



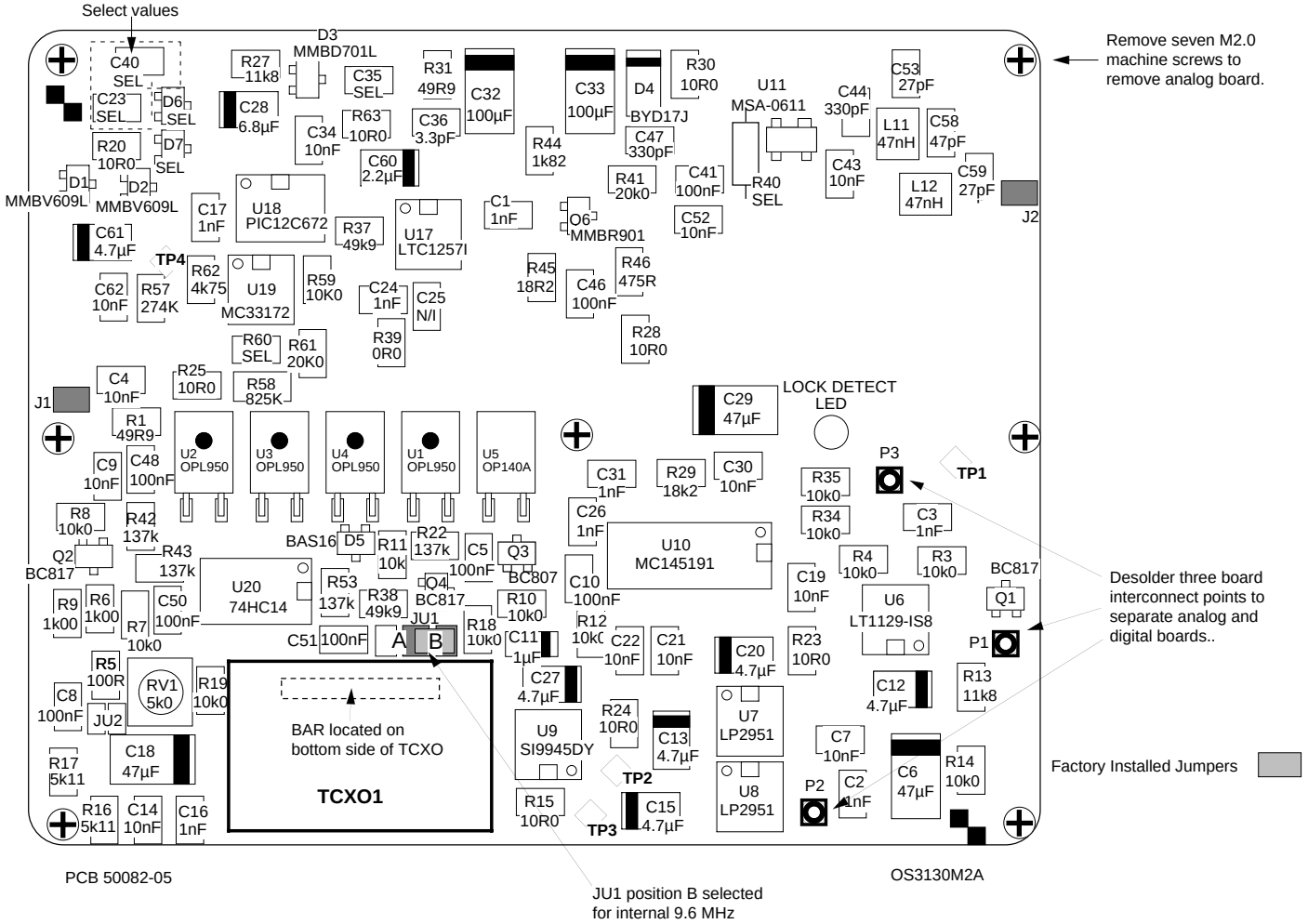
SELECT COMPONENTS		
DESIG.	AM TX 118 - 138 MHz OST - 3A130-10	AM RX 139.4 - 159.4 MHz OSR - 3A130-10
C37	470 nF	1.0 µF
C38	100 nF	1.0 µF
C39	NOT INSTALLED	1.0 µF
C45	330 nF	470 nF
C49	2.2 nF	22 nF
R32	68K	15K
R36	8K2	1K8
-	-	-

PCB 50082-05

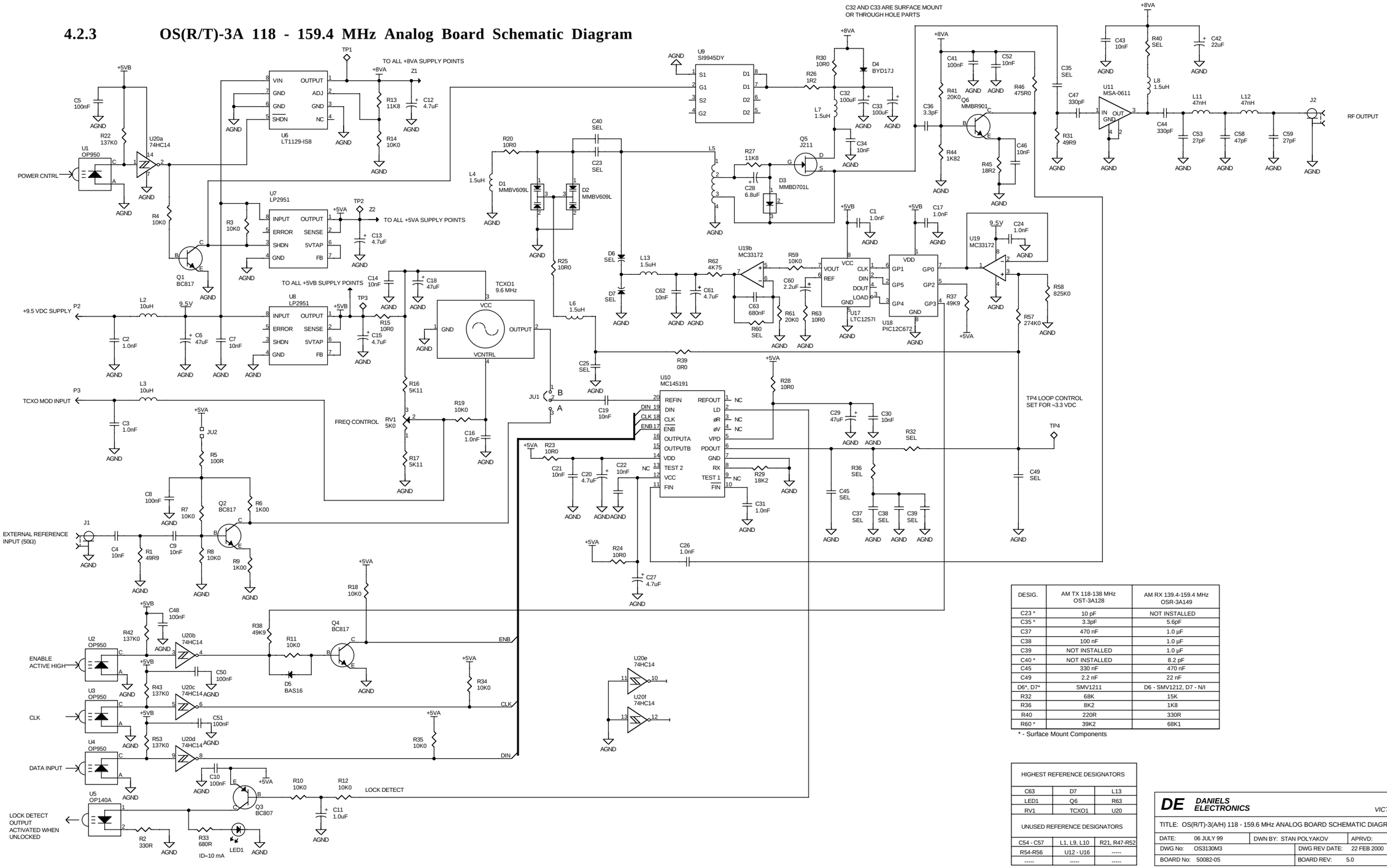
OS3130M1A

4.2.2 OS(R/T)-3A 118 - 159.6 MHz Analog Board Component Layout (Top)

SELECT COMPONENTS		
DESIG.	AM TX 118 -138 MHz OST - 3A128	AM RX 139.4 -159.4 MHz OSR - 3A149
C23	10pF	Not Installed
C35	3.3pF	5.6pF
C40	Not Installed	8.2pF
D6,D7	SMV1211	D6-SMV1212, D7-N/I
R40	220R	330R
R60	39K2	68K1



4.2.3 OS(R/T)-3A 118 - 159.4 MHz Analog Board Schematic Diagram



DESIG.	AM TX 118-138 MHz OST-3A128	AM RX 139.4-159.4 MHz OSR-3A149
C23 *	10 pF	NOT INSTALLED
C35 *	3.3pF	5.6pF
C37	470 nF	1.0 µF
C38	100 nF	1.0 µF
C39	NOT INSTALLED	1.0 µF
C40 *	NOT INSTALLED	8.2 pF
C45	330 nF	470 nF
C49	2.2 nF	22 nF
D6*, D7*	SMV1211	D6 - SMV1212, D7 - N/I
R32	68K	15K
R36	8K2	1K8
R40	220R	330R
R60 *	39K2	68K1

* - Surface Mount Components

HIGHEST REFERENCE DESIGNATORS		
C63	D7	L13
LED1	Q6	R63
RV1	TCXO1	U20
UNUSED REFERENCE DESIGNATORS		
C54 - C57	L1, L9, L10	R21, R47-R52
R54-R56	U12 - U16	-----
-----	-----	-----

DE DANIELS ELECTRONICS — *VICTORIA B.C.*

TITLE: OS(R/T)-3(A/H) 118 - 159.6 MHz ANALOG BOARD SCHEMATIC DIAGRAM

DATE:	06 JULY 99	DWN BY: STAN POLYAKOV	APRVD:
DWG No:	OS3130M3	DWG REV DATE:	22 FEB 2000
BOARD No:	50082-05	BOARD REV:	5.0

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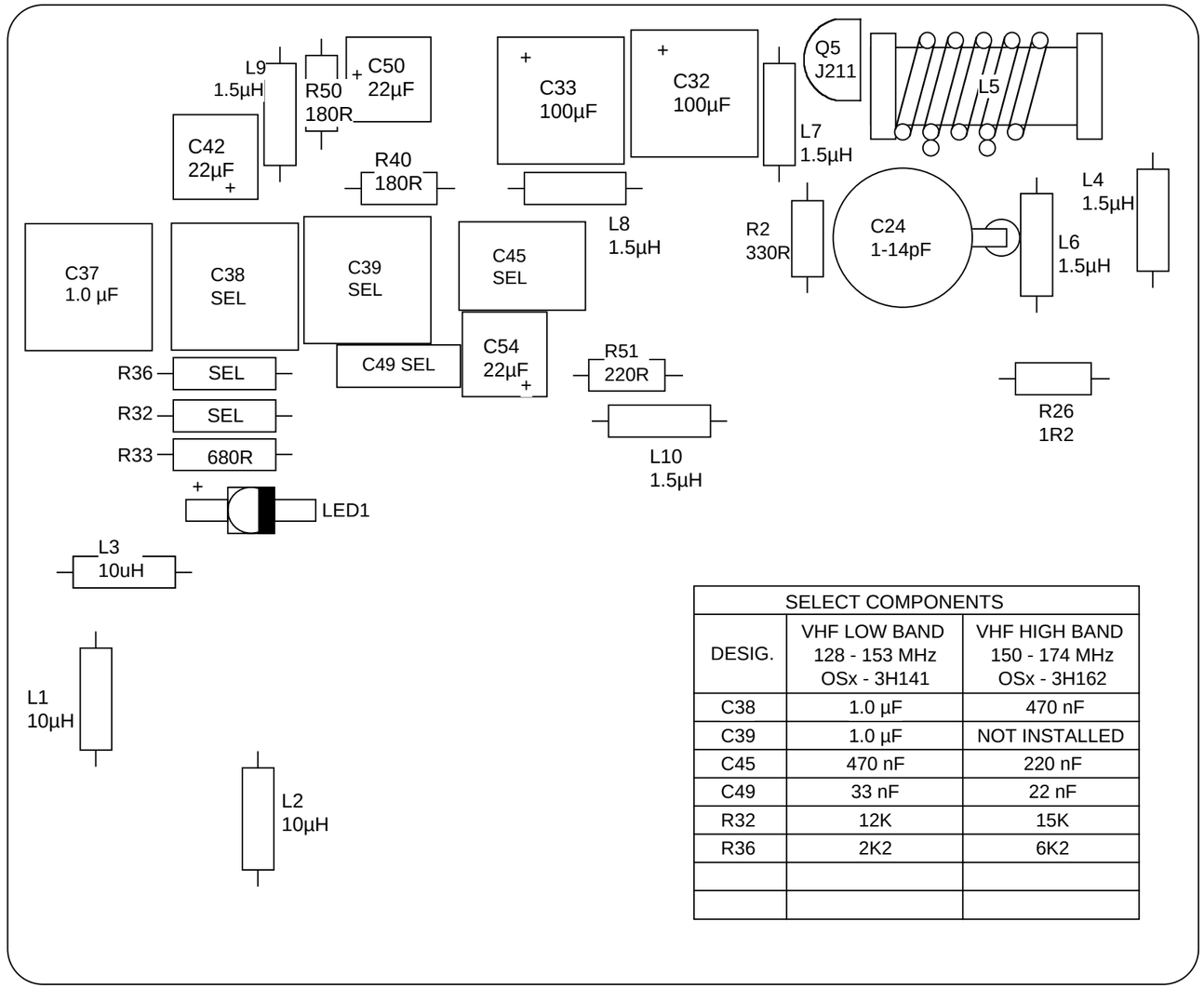
4.3 OS(R/T)-3H 128 - 174 MHz Analog Board Diagrams

4.3.1 OS(R/T)-3H 128 - 174 MHz Analog Board Component Layout (Bottom)

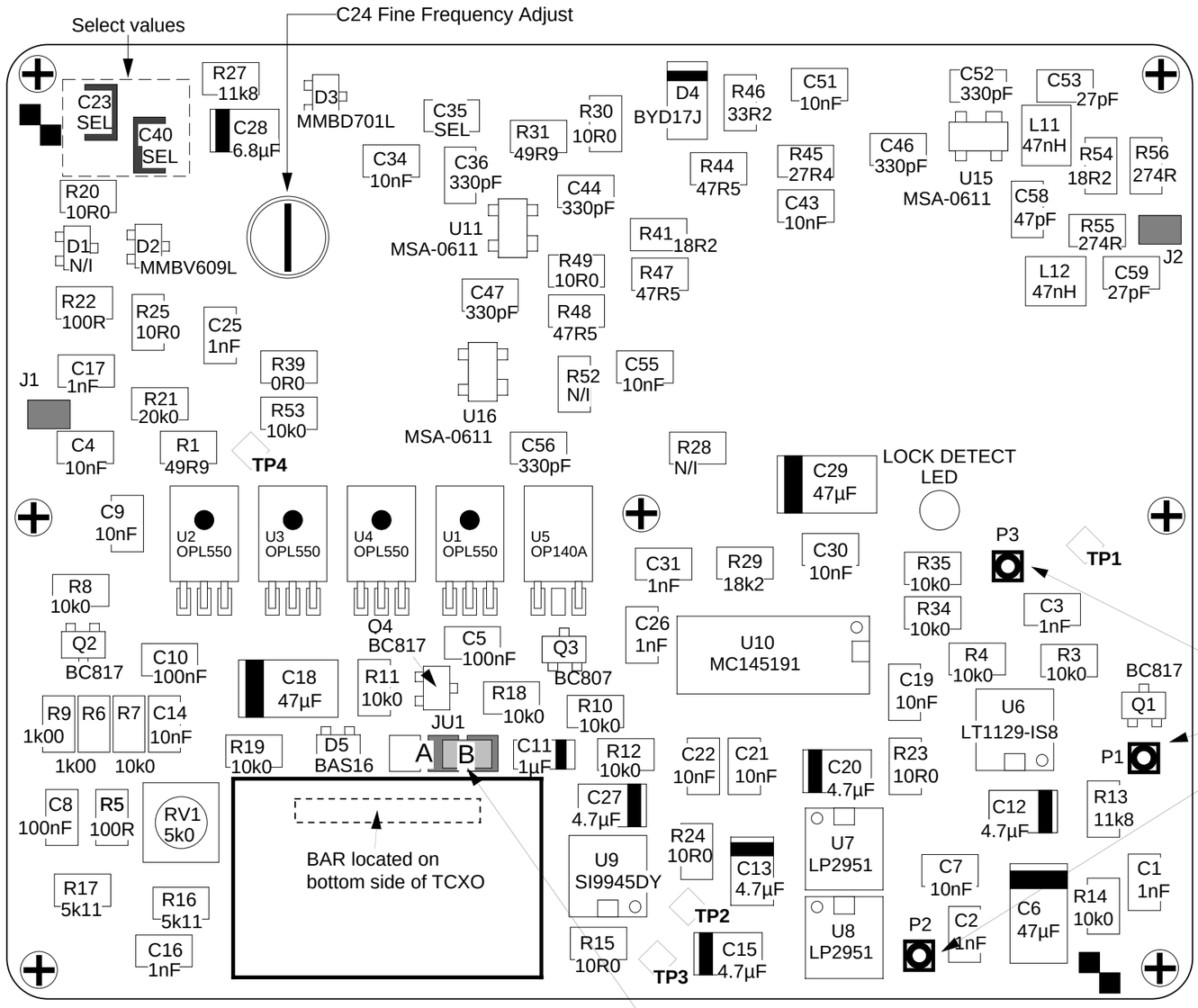


SELECT COMPONENTS		
DESIG.	VHF LOW BAND 128 - 153 MHz OSx - 3H141	VHF HIGH BAND 150 - 174 MHz OSx - 3H162
C38	1.0 µF	470 nF
C39	1.0 µF	NOT INSTALLED
C45	470 nF	220 nF
C49	33 nF	22 nF
R32	12K	15K
R36	2K2	6K2

PCB 50025-02

OS3150M1B

4.3.2 OS(R/T)-3H 128 - 174 MHz Analog Board Component Layout (Top)

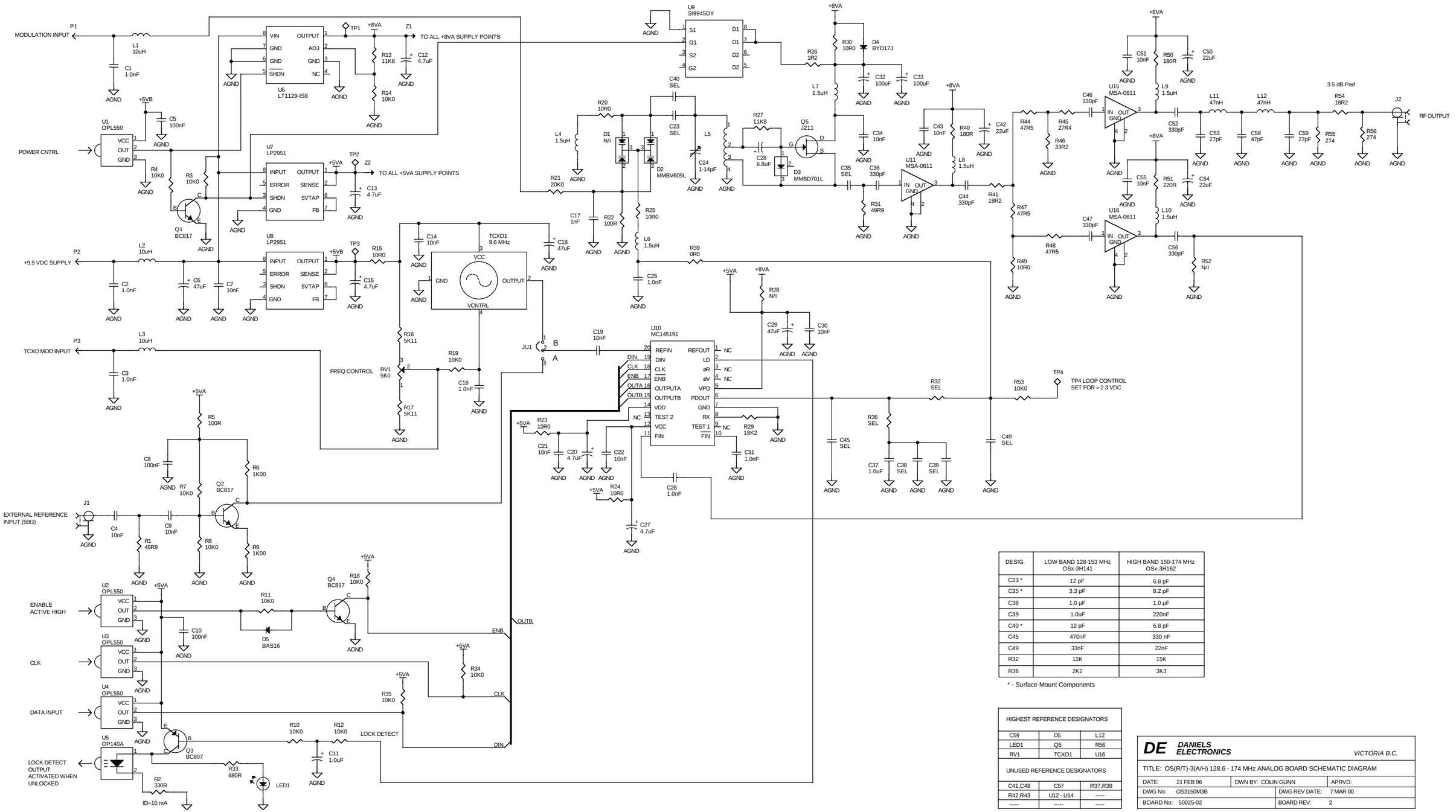


SELECT COMPONENTS		
	VHF LOW BAND 128 - 153 MHz OSx - 3H141	VHF HIGH BAND 150 - 174 MHz OSx - 3H162
C23	12 pF	6.8 pF
C35	3.3 pF	8.2 pF
C40	12 pF	6.8 pF

PCB 50025-02

OS3150M2B

4.3.3 OS(R/T)-3H 128 - 174 MHz Analog Board Schematic Diagram



DESIG.	LOW BAND 128-153 MHz OSx-3H141	HIGH BAND 150-174 MHz OSx-3H162
C23 *	12 pF	6.8 pF
C35 *	3.3 pF	8.2 pF
C38	1.0 µF	1.0 µF
C39	1.0uF	220nF
C40 *	12 pF	6.8 pF
C45	470nF	330 nF
C49	33nF	22nF
R32	12K	15K
R36	2K2	3K3

* - Surface Mount Components

HIGHEST REFERENCE DESIGNATORS		
C59	D5	L12
LED1	Q5	R56
RV1	TCXO1	U16

UNUSED REFERENCE DESIGNATORS		
C41,C48	C57	R37,R38
R42,R43	U12 - U14	-----
-----	-----	-----

DE DANIELS ELECTRONICS *VICTORIA B.C.*

TITLE: OS(R/T)-3(A/H) 128.6 - 174 MHz ANALOG BOARD SCHEMATIC DIAGRAM

DATE: 21 FEB 96	DWN BY: COLIN GUNN	APRVD:
DWG No: OS3150M3B	DWG REV DATE: 7 MAR 00	
BOARD No: 50025-02	BOARD REV: 2	

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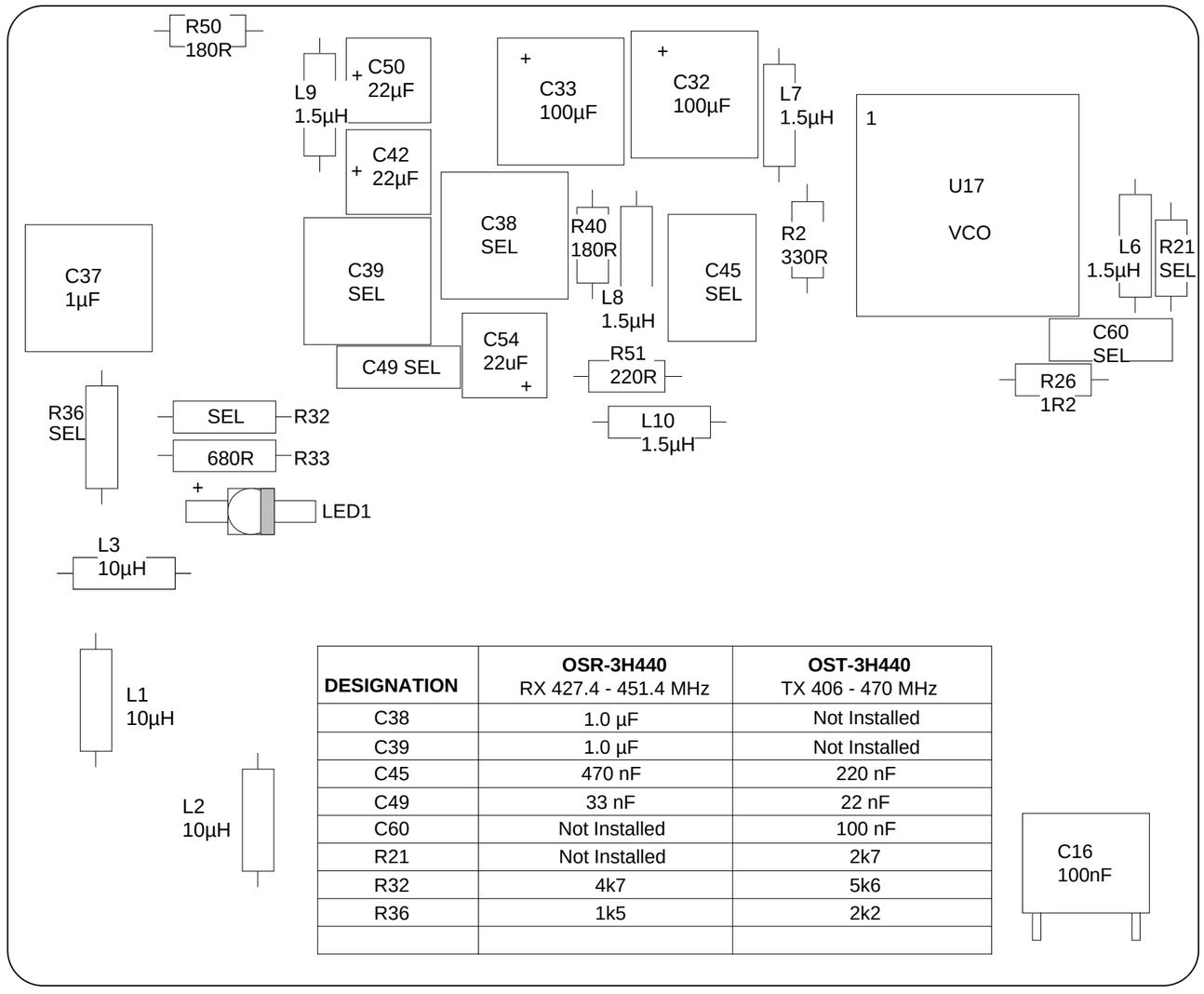
4.4 OS(R/T)-3H 406 - 470 MHz Analog Board Diagrams

4.4.1 OS(R/T)-3H 406 - 470 MHz Analog Board Component Layout (Bottom)



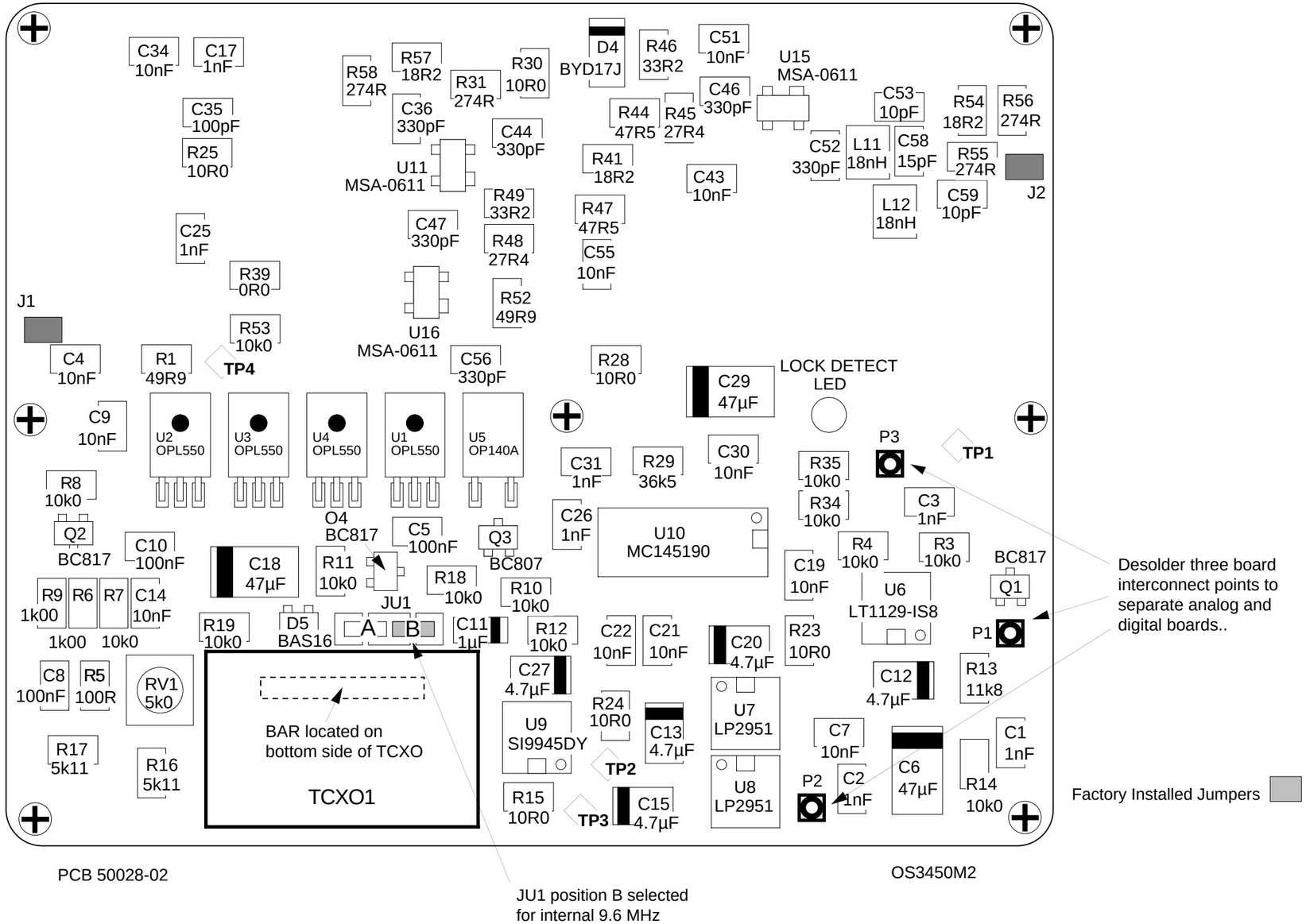
VCO INSTALLED (U17)	
RX 427.4 - 451.4 MHz	TX 406 - 470 MHz
LVCO-2309 TEV	VCO-190-435 MT

DESIGNATION	**OSR-3H440** RX 427.4 - 451.4 MHz	**OST-3H440** TX 406 - 470 MHz
C38	1.0 µF	Not Installed
C39	1.0 µF	Not Installed
C45	470 nF	220 nF
C49	33 nF	22 nF
C60	Not Installed	100 nF
R21	Not Installed	2k7
R32	4k7	5k6
R36	1k5	2k2

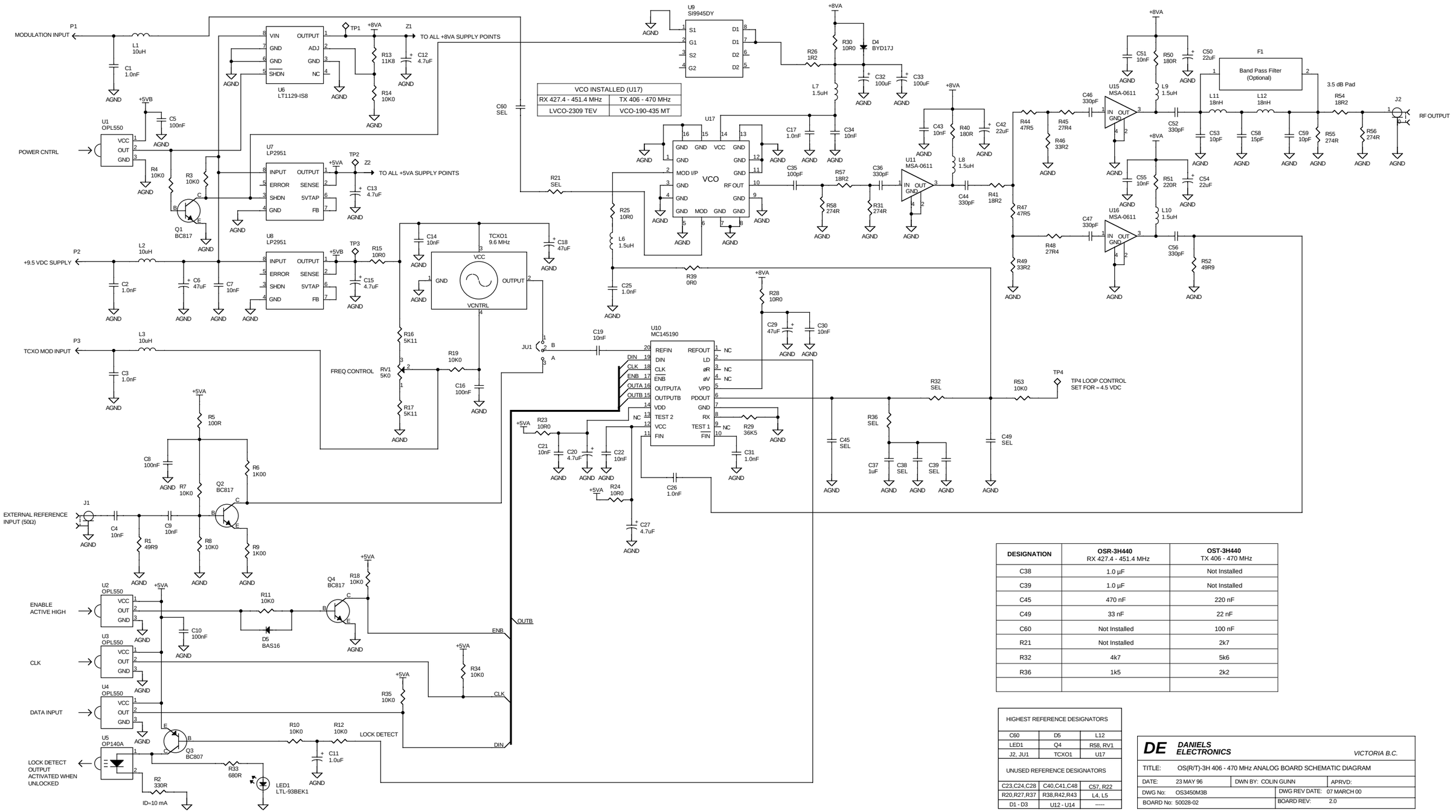
PCB 50028-02

OS3450M1B

4.4.2 OS(R/T)-3H 406 - 470 MHz Analog Board Component Layout (Top)



4.4.3 OS(R/T)-3H 406 - 470 MHz Analog Board Schematic Diagram



DESIGNATION	OSR-3H440 RX 427.4 - 451.4 MHz	OST-3H440 TX 406 - 470 MHz
C38	1.0 µF	Not Installed
C39	1.0 µF	Not Installed
C45	470 nF	220 nF
C49	33 nF	22 nF
C60	Not Installed	100 nF
R21	Not Installed	2k7
R32	4k7	5k6
R36	1k5	2k2

HIGHEST REFERENCE DESIGNATORS		
C60	D5	L12
LED1	Q4	R58, RV1
J2, JU1	TCXO1	U17

UNUSED REFERENCE DESIGNATORS		
C23,C24,C28	C40,C41,C48	C57, R22
R20,R27,R37	R38,R42,R43	L4, L5
D1 - D3	U12 - U14	-----

DE DANIELS ELECTRONICS — VICTORIA B.C.

TITLE: OS(R/T)-3H 406 - 470 MHz ANALOG BOARD SCHEMATIC DIAGRAM

DATE: 23 MAY 96 | DWN BY: COLIN GUNN | APRVD:

DWG No: OS3450M3B | DWG REV DATE: 07 MARCH 00

BOARD No: 50028-02 | BOARD REV: 2.0

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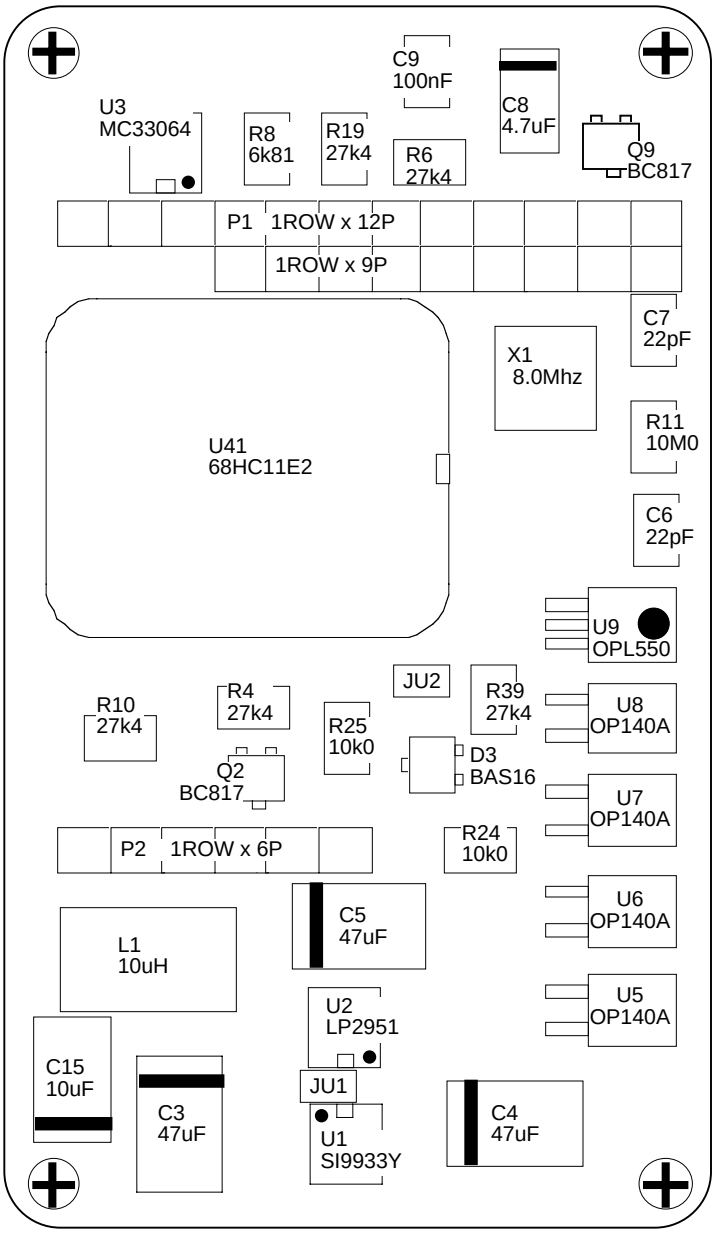
4.5 OS(R/T)-3(A/H) Digital Board Diagrams

4.5.1 OS(R/T)-3(A/H) Digital Board Component Layout (Bottom)

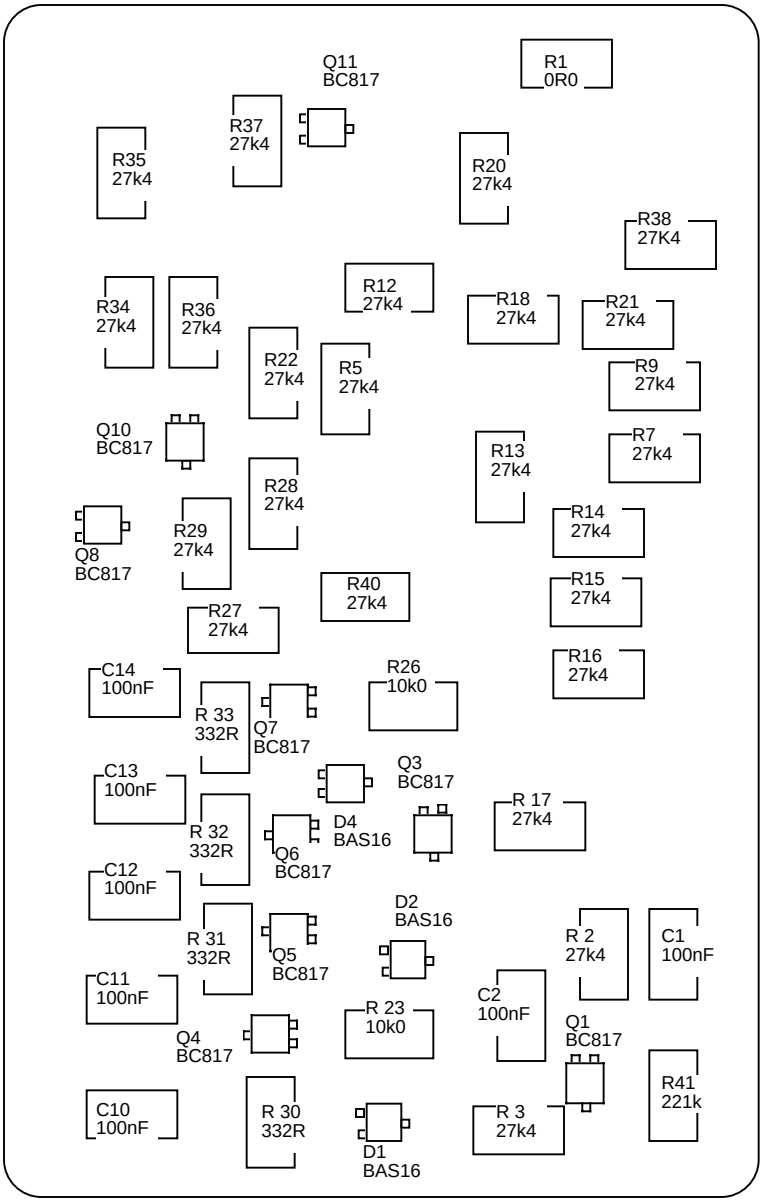


PCB 50021-03 OS3150M4A

	OSx-3H 29-470 MHz	OSx-3A 118-159.6 MHz
JU1	NOT INSTALLED	INSTALLED

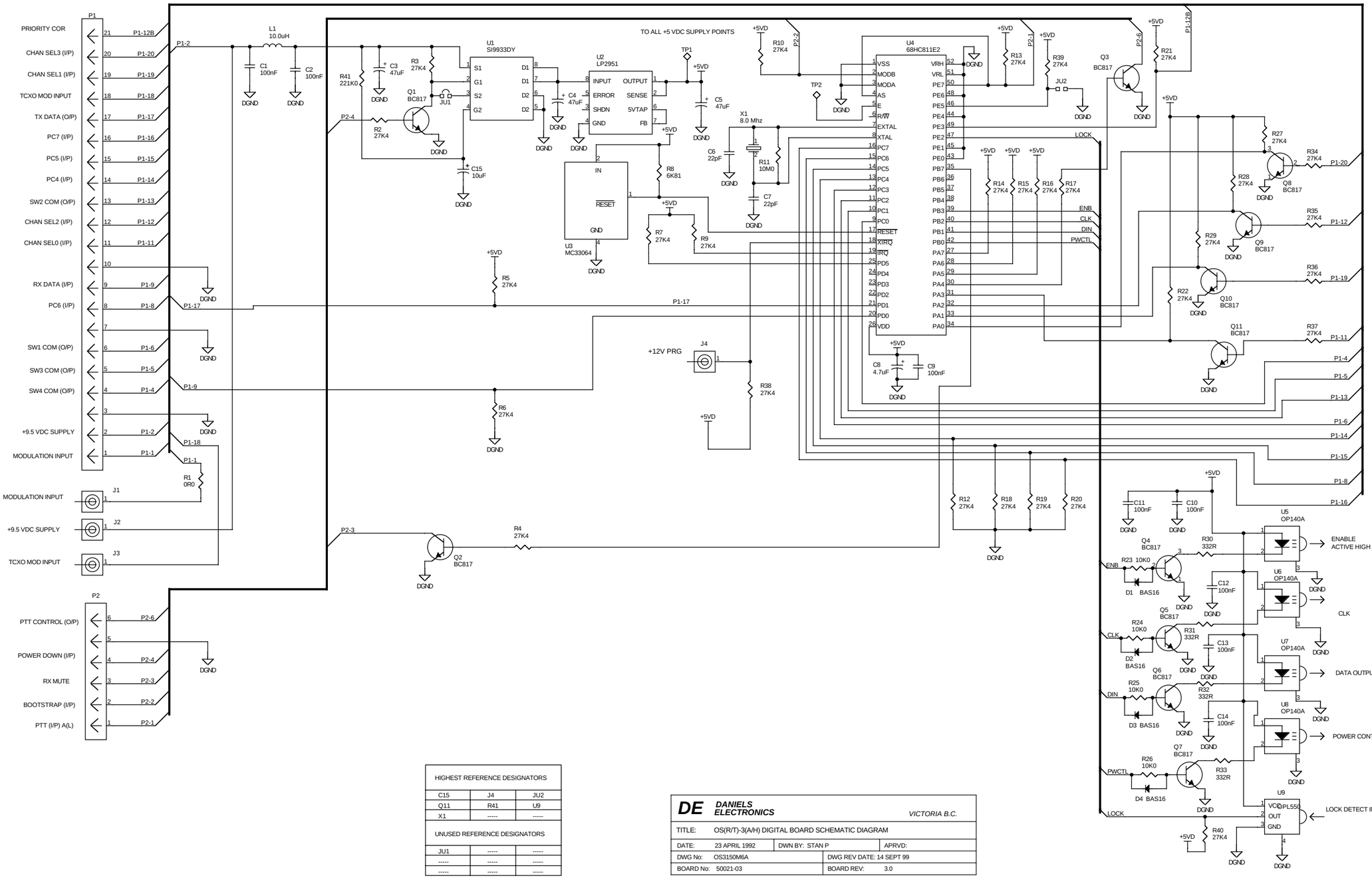
	9.6 MHz REFERENCE	10 MHz REFERENCE
JU2	NOT INSTALLED	INSTALLED

4.5.2 OS(R/T)-3(A/H) Digital Board Component Layout (Top)



PCB 50021-03 OS3150M5A

4.5.3 OS(R/T)-3(A/H) Digital Board Schematic Diagram



HIGHEST REFERENCE DESIGNATORS		
C15	J4	JU2
Q11	R41	U9
X1	-----	-----
UNUSED REFERENCE DESIGNATORS		
JU1	-----	-----
-----	-----	-----
-----	-----	-----

DE DANIELS ELECTRONICS			VICTORIA B.C.
TITLE:	OS(R/T)-3(A/H) DIGITAL BOARD SCHEMATIC DIAGRAM		
DATE:	23 APRIL 1992	DWN BY: STAN P	APRVD:
DWG No:	OS3150M6A	DWG REV DATE:	14 SEPT 99
BOARD No:	50021-03	BOARD REV:	3.0

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5 PARTS LISTS

5.1 OS(R/T)-3H 29 - 71.4 MHz Analog Board Electrical Parts List

Ref. Desig	Description	Part No.	
C1 - C3	CAP., SM 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C4	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C5	CAP., SM 100nF CER., 0805, X7R, 50V	1008-5A104K5R	
C6	CAP., SM 47uF TANT., 20%, 16V	1055-6D476M16	
C7	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C8	CAP., SM 100nF CER., 0805, X7R, 50V	1008-5A104K5R	
C9	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C10	CAP., SM 100nF CER., 0805, X7R, 50V	1008-5A104K5R	
C11	CAP., SM 1.0uF TANT., 10%, 16V	1055-5A105M16	
C12, C13	CAP., SM 4.7uF TANT., 10%, 16V	1055-5B475K16	
C14	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C15	CAP., SM 4.7uF TANT., 10%, 16V	1055-5B475K16	
C16	CAP., SM 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C17	CAP., SM 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C18	CAP., SM 47uF TANT., 20%, 16V	1055-6D476M16	
C19	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C21	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C20	CAP., SM 4.7uF TANT., 10%, 16V	1055-5B475K16	
C22	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C23	CAP., SM, 150pF CER., 0805,C0G	1008-2A151J1G	OST-3H035
C23	CAP., SM, 100pF CER., 0805,C0G	1008-2A101J1G	OST-3H045
C23	CAP., SM, 56pF CER., 0805, C0G	1008-1A560J1G	OSR-3H061
C24	CAP., 1-14pF TRIM., STAND. >6	1082-A1R0014J	
C25	CAP., SM 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C26	CAP., SM 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C27	CAP., SM 4.7uF TANT., 10%, 16V	1055-5B475K16	
C28	CAP., SM 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C29	CAP., SM 47uF TANT., 20%, 16V	1055-6D476M16	
C30	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C31	CAP., SM 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C32, C33	CAP., SM, 100uF TANT., 20%,16V	1055-7D107M16	
C34	CAP., SM, 56pF CER., 0805, C0G	1008-1A560J1G	OST-3H035
C34	CAP., SM, 47pF CER., 0805, C0G	1008-1A470J1G	OST-3H045
C34	CAP., SM, 33pF CER., 0805, C0G	1008-1A330J1G	OSR-3H061
C35	CAP., SM 10pF CER., 0805, COG	1008-1A100J1G	
C36	CAP., SM 330pF CER., 0805, COG	1008-2A331J1G	
C37, C38	CAP., 1.0uF FILM, MMK5, 10%, 63V	1016-6D105K50	
C39	CAP., 1.0uF FILM, MMK5,10%,50V	1016-6D105K50	
C40	CAP., SM 33pF CER., 0805, COG	1008-1A330J1G	
C41	CAP., SM 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C42	CAP., 22uF DIP. TANT., 20%, 20V	1054-6G226M20	
C43	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C44	CAP., SM 330pF CER., 0805, COG	1008-2A331J1G	
C45	CAP., 470nF FILM, MMK5,10%,63V	1016-5D474K63	
C46	CAP., SM 330pF CER., 0805, COG	1008-2A331J1G	
C47	CAP., SM 330pF CER., 0805, COG	1008-2A331J1G	
C48	CAP., 68nF FILM, MMK5, 10%,63V	1016-4A683K63	OST-3H035

Ref. Desig	Description	Part No.	
C48	CAP., 68nF FILM, MMK5, 10%,63V	1016-4A683K63	OST-3H045
C48	CAP., Not Installed	Not Installed	OSR-3H061
C49	CAP., 22nF FILM, MMK5, 10%,63V	1016-4A223K63	
C50	CAP., 22uF DIP. TANT., 20%, 20V	1054-6G226M20	
C51	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C52	CAP., SM 330pF CER., 0805, COG	1008-2A331J1G	
C53	CAP., SM, 56pF CER., 0805, C0G	1008-1A560J1G	OST-3H035
C53	CAP., SM, 56pF CER., 0805, C0G	1008-1A560J1G	OST-3H045
C53	CAP., SM, Not Installed	Not Installed	OSR-3H061
C54	CAP., 22uF DIP. TANT., 20%, 20V	1054-6G226M20	
C55	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C56	CAP., SM 330pF CER., 0805, COG	1008-2A331J1G	
C57	CAP., SM, 15pF CER., 0805, COG	1008-1A150J1G	OST-3H035
C57	CAP., SM, 15pF CER., 0805, COG	1008-1A150J1G	OST-3H045
C57	CAP., SM, 68pF CER., 0805, C0G	1008-1A680J1G	OSR-3H061
C58	CAP., SM, 33pF CER., 0805, C0G	1008-1A330J1G	OST-3H035
C58	CAP., SM, 33pF CER., 0805, C0G	1008-1A330J1G	OST-3H045
C58	CAP., SM, 68pF CER., 0805, C0G	1008-1A680J1G	OSR-3H061
C59	CAP., SM, 33pF CER., 0805, C0G	1008-1A330J1G	OST-3H035
C59	CAP., SM, 33pF CER., 0805, C0G	1008-1A330J1G	OST-3H045
C59	CAP., SM, 100pF CER., 0805,C0G	1008-2A101J1G	OSR-3H061
C61	CAP., SM, 150pF CER., 0805,C0G	1008-2A151J1G	OST-3H035
C61	CAP., SM, 100pF CER., 0805,C0G	1008-2A101J1G	OST-3H045
C61	CAP., SM, 56pF CER., 0805, C0G	1008-1A560J1G	OSR-3H061
C62	CAP., SM, 47pF CER., 0805, C0G	1008-1A470J1G	
C63	CAP., SM, 22pF CER., 0805, C0G	1008-1A220J1G	
C64	CAP., SM, 12pF CER., 0805, C0G	1008-1A120J1G	
D1, D2	DIODE, MMBV609L VARICAP, SOT-23	2106-MMBV609L	
D3	DIODE, MMBD701 HOT_CARR. SOT23	2105-MMBD7010	
D4	DIODE, BYD17J RECTIFIER, SOD87	2101-BYD17J00	
D5	DIODE, BAS16 SWITCHING, SOT23	2100-BAS16000	
L1 - L4	CHOKE, RF/MOULD.10uH 10%,.25	1251-4A00100K	
L5	INDUCTOR,13.5T/260nH,MOLD.,ORG	1253-A1352603	OST-3H035
L5	INDUCTOR,11.5T/197nH,MOLD.,BRN	1253-A1151971	OST-3H045
L5	INDUCTOR, 9.5T/138nH,MOLD.,WHT	1253-A0951389	OSR-3H061
L6	CHOKE, RF/MOULD.10uH 10%,.25	1251-4A00100K	
L7	CHOKE, RF/MOULD.4.7uH 10%,.25	1251-TBA	
L8 - L10	CHOKE, RF/MOULD.1.5uH 10%,.25	1251-3A001R5K	
L11	INDUCTOR,SM,100nH CER,10%,1008	1256-2BR1000K	OST-3H035
L11	INDUCTOR,SM,100nH CER,10%,1008	1256-2BR1000K	OST-3H045
L11	INDUCTOR,SM,120nH CER,10%,1008	1256-2BR12OOK	OSR-3H061
L12	CHOKE, RF/MOULD.,4.7uH,10%,.25	1251-3A004R7K	
L13	INDUCTOR,SM,100nH CER,10%,1008	1256-2BR1000K	OST-3H035
L13	INDUCTOR,SM,100nH CER,10%,1008	1256-2BR1000K	OST-3H045
L13	INDUCTOR,SM,120nH CER,10%,1008	1256-2BR12OOK	OSR-3H061
PCB	PCB, ANALOG,OS-3H VHF 30-50MHz	4309-26500382	
LED1	LED, SUB-MIN., 2mm SQ,AXIAL,ORG	2012-S229013C	

Ref. Desig	Description	Part No.
Q1, Q2	TRANSISTORBC817 NPN, SOT23	2120-BC817025
Q3	TRANSISTORBC807 PNP, SOT23	2120-BC807025
Q4	TRANSISTORBC817 NPN, SOT23	2120-BC817025
Q5	JFET, J211 RF N-CHAN. TO-92	2041-J2110000
RV1	POT., SM 5K0 1T, TOP ADJ	1174-AS2502J1
R1	RES., SM 49R9 0805, 1%,100ppm	1150-1A49R9FP
R2	RES.330R METAL FILM, 5%, 0.5W	1101-2A0331JP
R3, R4	RES., SM 10K0 0805, 1%,100ppm	1150-4A1002FP
R5	RES., SM 100R 0805, 1%,100ppm	1150-2A1000FP
R6	RES., SM 1K00 0805, 1%,100ppm	1150-3A1001FP
R7, R8	RES., SM 10K0 0805, 1%,100ppm	1150-4A1002FP
R9	RES., SM 1K00 0805, 1%,100ppm	1150-3A1001FP
R10 - R12	RES., SM 10K0 0805, 1%,100ppm	1150-4A1002FP
R13	RES., SM 11K8 0805, 1%,100ppm	1150-4A1182FP
R14	RES., SM 10K0 0805, 1%,100ppm	1150-4A1002FP
R15	RES., SM 10R0 0805, 1%,100ppm	1150-1A10R0FP
R16, R17	RES., SM, 5K11 0805, 1%,100ppm	1150-3A5111FP
R18, R19	RES., SM 10K0 0805, 1%,100ppm	1150-4A1002FP
R20	RES., SM 10R0 0805, 1%,100ppm	1150-1A10R0FP
R21	RES., SM 20K0 0805, 1%,100ppm	1150-4A2002FP
R22	RES., SM, 475R 0805, 1%,100ppm	1150-2A4750FP
R23 - R25	RES., SM 10R0 0805, 1%,100ppm	1150-1A10R0FP
R26	RES.1R2 METAL FILM, 5%, 0.5W	1101-0A01R2JI
R27	RES., SM 15K0 0805, 1%,100ppm	1150-4A1502FP
R28	RES., NOT INSTALLED	NOT INSTALLED
R29	RES., SM 18K2 0805, 1%,100ppm	1150-4A1822FP
R30	RES., SM 10R0 0805, 1%,100ppm	1150-1A10R0FP
R31	RES., SM 49R9 0805, 1%,100ppm	1150-1A49R9FP
R32	RES., 15K METAL FILM, 5%, 0.5W	1101-4A0153JP
R33	RES.680R METAL FILM, 5%, 0.5W	1101-2A0681JP
R34, R35	RES.10K0 METAL FILM, 5%, 0.5W	1101-4A0103JP
R36	RES., 2K7 METAL FILM, 5%, 0.5W	1101-3A0272JP
R38	RES., SM 56R2 0805, 1%,100ppm	1150-4A5622FP
R39	RES., SM 0R00 0805, ZERO OHM JUMPER	1150-0A0R0000
R40	RES.180R METAL FILM, 5%, 0.5W	1101-2A0181JP
R41	RES., SM 18R2 0805, 1%,100ppm	1150-1A18R2FP
R44	RES., SM 47R5 0805, 1%,100ppm	1150-1A47R5FP
R45	RES., SM 27R4 0805, 1%,100ppm	1150-1A27R4FP
R46	RES., SM 33R2 0805, 1%,100ppm	1150-1A33R2FP
R47	RES., SM 47R5 0805, 1%,100ppm	1150-1A47R5FP
R48	RES., SM 27R4 0805, 1%,100ppm	1150-1A27R4FP
R49	RES., SM 33R2 0805, 1%,100ppm	1150-1A33R2FP
R50	RES.180R METAL FILM, 5%, 0.5W	1101-2A0181JP
R51	RES.220R METAL FILM, 5%, 0.5W	1101-2A0221JP
R52	RES., SM 49R9 0805, 1%,100ppm	1150-1A49R9FP
R53	RES., SM 10K0 0805, 1%,100ppm	1150-4A1002FP
R54	RES., SM 18R2 0805, 1%,100ppm	1150-1A18R2FP
R55 R56	RES., SM 274 0805, 1%,100ppm	1150-2A2740FP
TCXO1	VTCXO MODULE9.6 MHz 4 PIN, +- 1ppm	2641-09600BM5

Ref. Desig	Description	Part No.
U1 - U4	DIODE, OPL550 I/R SENSOR,TTL O/P,PLST	2014-1L18230T
U5	LED, OP140A I/R,GaAs,.81 x .23,PLAST.	2013-1G18230A
U6	I.C., LT1129-IS8, PROG. VOLT REG, SO8	2305-11290N08
U7 U8	I.C., LP2951 PROG. VOLT REG, SO-8	2305-29510N08
U9	MOSFET, SI9945DY, N CHAN.,SO-8	2142-SI9945DY
U10	I.C., MC145191, PLL FREQ/SYNTH, SO-20	2355-45191N20
U11	I.C., MSA-0611, MM1C AMP, SOT-143	2354-MSA06110
U15 U16	I.C., MSA-0611, MM1C AMP, SOT-143	2354-MSA06110

5.2 OS(R/T)-3A 118 – 159.4 MHz Analog Board Electrical Parts List

Ref. Desig	Description	Part No.	
C1- C3	CAP., SM ,1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C4	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C5	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R	
C6	CAP., SM, 47uF TANT., 20%, 16V	1055-6D476M16	
C7	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C8	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R	
C9	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C10	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R	
C11	CAP., SM, 1.0uF TANT., 10%, 16V	1055-5A105M16	
C12, C13	CAP., SM, 4.7uF TANT., 10%, 16V	1055-5B475K16	
C14	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C15	CAP., SM, 4.7uF TANT., 10%, 16V	1055-5B475K16	
C16, C17	CAP., SM ,1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C18	CAP., SM, 47uF TANT., 20%, 16V	1055-6D476M16	
C19	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C20	CAP., SM, 4.7uF TANT., 10%, 16V	1055-5B475K16	
C21, C22	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C23	CAP., SM, 10pF CER., 0805, C0G	1008-1A100J1G	(OST-3A128)
C23	CAP., NOT INSTALLED	NOT INSTALLED	(OSR-3A149)
C24	CAP., SM ,1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C25	CAP., NOT INSTALLED	NOT INSTALLED	
C26	CAP., SM ,1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C27	CAP., SM, 4.7uF TANT., 10%, 16V	1055-5B475K16	
C28	CAP., SM, 6.8uF TANT., 20%, 10V	1055-5B685M10	
C29	CAP., SM, 47uF TANT., 20%, 16V	1055-6D476M16	
C30	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C31	CAP., SM ,1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C32, C33	CAP., SM, 100uF TANT., 20%,16V	1055-7D107M16	
C34	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C35	CAP., SM, 5.6pF CER., 0805, C0G	1008-0A569D1G	
C36	CAP., SM, 3.3pF CER., 0805,C0G	1008-0A339J1G	
C37	CAP., 470nF FILM, MMK5,10%,63V	1016-5D474K63	(OST-3A128)
C37	CAP., 1.0uF FILM, MMK5,10%,50V	1016-6D105K50	(OSR-3A149)
C38	CAP., 100nF FILM, MMK5,10%,63V	1016-5A104K63	(OST-3A128)
C38	CAP., 1.0uF FILM, MMK5,10%,50V	1016-6D105K50	(OSR-3A149)
C39	CAP., NOT INSTALLED	NOT INSTALLED	(OST-3A128)
C39	CAP., 1.0uF FILM, MMK5,10%,50V	1016-6D105K50	(OSR-3A149)
C40	CAP., SM, 8.2pF CER., 0805,C0G	1008-0A829J1G	(OSR-3A149)
C40	CAP., NOT INSTALLED	NOT INSTALLED	(OST-3A128)
C41	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R	
C42	CAP., 22uF DIP. TANT., 20%, 20V	1054-6G226M20	
C43	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C44	CAP., SM, 330pF CER., 0805, COG	1008-2A331J1G	
C45	CAP., 470nF FILM, MMK5,10%,63V	1016-5D474K63	(OSR-3A149)
C45	CAP., 330nF FILM, MMK5,10%,50V	1016-5B334K50	(OST-3A128)
C46	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C47	CAP., SM, 330pF CER., 0805, COG	1008-2A331J1G	
C48	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R	
C49	CAP., 22nF FILM, MMK5, 10%,63V	1016-4A223K63	(OSR-3A149)
C49	CAP., 2.2nF FILM, MMK5,10%,63V	1016-3A222K63	(OST-3A128)

Ref. Desig	Description	Part No.
C50, C51	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C52	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R
C53	CAP., SM, 27pF CER., 0805, COG	1008-1A270J1G
C58	CAP., SM, 47pF CER., 0805, COG	1008-1A470J1G
C59	CAP., SM, 27pF CER., 0805, COG	1008-1A270J1G
C60	CAP., SM, 2.2uF TANT., 20%, 20V	1055-5B225K20
C61	CAP., SM, 4.7uF TANT., 10%, 16V	1055-5B475K16
C62	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R
C63	CAP., 680nF FILM, MMK5,10%,50V	1016-5D684K50
D1, D2	DIODE, MMBV609L VARICAP, SOT-23	2106-MMBV609L
D3	DIODE, MMBD701L HOT CARR., SOT23	2105-MMBD7010
D4	DIODE, BYD17J RECTIFIER, SOD87	2101-BYD17J00
D5	DIODE, BAS16 SWITCHING, SOT23	2100-BAS16000
D6, D7	DIODE, SMV1211, VARACTOR,SOT2	2106-SMV12111 (OSR-3A149)
D6	DIODE,SMV1212-4,VARACTOR,SOT23	2106-SMV12124 (OST-3A128)
D7	DIODE, SMV1211, VARACTOR,SOT2	2106-SMV12111 (OSR-3A149)
D7	DIODE, NOT INSTALLED	NOT INSTALLED (OST-3A128)
L2, L3	CHOKE, RF/MOULD., 10uH 10%,.25	1251-4A00100K
L4	CHOKE, RF/MOULD., 3.9uH 10%,.25	1251-3A003R9K
L5	BOBBIN 5.5 TURNS, 1.59 mm pitch	5791-A1010300
	WIRE, COPPER, 20AWG, SILVER PLD, 10.2cm	7140-30002000 (1pc 10cm, 2pcs 10mm)
L6 – L8	CHOKE, RF/MOULD., 1.5uH 10%,.25	1251-3A001R5K
L11, L12	INDUCTOR, SM, 47nH CER,10%,1008	1256-1B47N00K
L13	CHOKE, RF/MOULD., 1.5uH 10%,.25	1251-3A001R5K
LED1	LED, SUB-MIN.,2mm SQ,AXIAL,ORG	2012-S229013C
PCB	PCB, ANALOG,OS-3H AM/WB SYNTH.	4309-26500825
Q1, Q2	TRANSISTOR, BC817 NPN, SOT23	2120-BC817025
Q3	TRANSISTOR, BC807 PNP, SOT23	2120-BC807025
Q4	TRANSISTOR, BC817 NPN, SOT23	2120-BC817025
Q5	JFET, J211 RF, N-CHAN., TO-92A	2041-J2110000
Q6	TRANSISTOR, MMBR901 HIGH FREQ.	2124-MMBR9010
R1	RES., SM, 49R9 0805, 1%,100ppm	1150-1A49R9FP
R2	RES., 330R METAL FILM, 5%, 0.5W	1101-2A0331JP
R3, R4	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP
R5	RES., SM, 100R 0805, 1%,100ppm	1150-2A1000FP
R6	RES., SM, 1K00 0805, 1%,100ppm	1150-3A1001FP
R7, R8	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP
R9	RES., SM, 1K00 0805, 1%,100ppm	1150-3A1001FP
R10 – R12	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP
R13	RES., SM, 11K8 0805, 1%,100ppm	1150-4A1182FP
R14	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP
R15	RES., SM, 10R0 0805, 1%,100ppm	1150-1A10R0FP
R16, R17	RES., SM, 5K11 0805, 1%,100ppm	1150-3A5111FP
R18, R19	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP
R20	RES., SM, 10R0 0805, 1%,100ppm	1150-1A10R0FP
R22	RES., SM, 137K0 0805, 1%,100ppm	1150-5A1373FP

Ref. Desig	Description	Part No.	
R23 - R25	RES., SM, 10R0 0805, 1%,100ppm	1150-1A10R0FP	
R26	RES., 1R2 METAL FILM, 5%, 0.5W	1101-0A01R2JI	
R27	RES., SM, 11K8 0805, 1%,100ppm	1150-4A1182FP	
R28	RES., SM, 10R0 0805, 1%,100ppm	1150-1A10R0FP	
R29	RES., SM, 18K2 0805, 1%,100ppm	1150-4A1822FP	
R30	RES., SM, 10R0 0805, 1%,100ppm	1150-1A10R0FP	
R31	RES., SM, 100R 0805, 1%,100ppm	1150-2A1000FP	
R32	RES., 15K METAL FILM, 5%, 0.5W	1101-4A0153JP	(OSR-3A149)
R32	RES., 68K METAL FILM, 5%, 0.5W	1101-4A0683JP	(OST-3A128)
R33	RES., 680R METAL FILM, 5%, 0.5W	1101-2A0681JP	
R34, R35	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP	
R36	RES., 1K8 METAL FILM, 5%, 0.5W	1101-3A0182JP	(OSR-3A149)
R36	RES., 8K2 METAL FILM, 5%, 0.5W	1101-3A0822JP	(OST-3A128)
R37, R38	RES., SM, 49K9 0805, 1%,100ppm	1150-4A4992FP	
R39	RES., SM, 0R00 0805, ZERO OHM JUMPER	1150-0A0R0000	
R40	RES., 330R METAL FILM, 5%,0.5W	1101-2A0391JP	
R41	RES., SM, 20K0 0805, 1%,100ppm	1150-4A2002FP	
R42, R43	RES., SM, 137K0 0805, 1%,100ppm	1150-5A1373FP	
R44	RES., SM, 1K82 0805, 1%,100ppm	1150-3A1821FP	
R45	RES., SM, 18R2 0805, 1%,100ppm	1150-1A18R2FP	
R46	RES., SM, 475R0 0805, 1%,100ppm	1150-2A4750FP	
R53	RES., SM, 137K0 0805, 1%,100ppm	1150-5A1373FP	
R57	RES., SM, 274K 0805, 1%, 100ppm	1150-5A2743FP	
R58	RES., SM, 825K0 1206, 1%,100ppm	1150-5B8253FP	
R59	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP	
R60	RES., SM, 68K1 0805, 1%,100ppm	1150-4A6812FP	(OSR-3A149)
R60	RES., SM, 39K2 0805, 1%,100ppm	1150-4A3922FP	(OST-3A128)
R61	RES., SM, 20K0 0805, 1%,100ppm	1150-4A2002FP	
R62	RES., SM, 4K75 0805, 1%,100ppm	1150-3A4751FP	
R63	RES., SM, 10R0 0805, 1%,100ppm	1150-1A10R0FP	
RV1	POT., SM, 5K0 1T, TOP ADJ	1174-AS2502J1	
TCXO1	VTCXO MODULE9.6 MHz 4 PIN, +- 1ppm	2641-09600BM5	
U1 - U4	DIODE, OP950 I/R SENSOR,TTL O/P,PLST	TBA	
U5	LED, OP140A I/R,GaAs,.81 x .23,PLAST.	2013-1G18230A	
U6	IC, LT1129-IS8, PROG. VOLT REG,SO-8	2305-11290N08	
U7, U8	IC, LP2951 PROG. VOLT REG, SO-8	2305-29510N08	
U9	MOSFET, SI9945DY, N CHAN.,SO-8	2142-SI9945DY	
U10	IC, MC145190,PLL FREQ/SYNTH,SO-20	2355-45190N20	
U11	IC, MSA-0611, MM1C AMP,SOT-143	2354-MSA06110	
U17	IC, LTC1257I 12BIT SER.DA,S0-8	2387-12570N08	
U18	IC, PIC12C672 MICROCONTROLLER, SO-8	TBA	
U19	IC, MC33172 DUAL OP AMP, SO-8	2302-33172N08	
U20	IC, 74HC14 HEX SCHMITT, SO-14	2376-00140N14	

5.3 OS(R/T)-3H 128 - 174 MHz Analog Board Electrical Parts List

Ref. Desig	Description	Part No.	
C1-C3	CAP., SM, 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C4	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C5	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R	
C6	CAP., SM, 47µF TANT., 20%, 16V	1055-6D476M16	
C7	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C8	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R	
C9	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C10	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R	
C11	CAP., SM, 1.0µF TANT., 10%, 16V	1055-5A105M16	
C12,C13	CAP., SM, 4.7µF TANT., 10%, 16V	1055-5B475K16	
C14	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C15	CAP., SM, 4.7µF TANT., 10%, 16V	1055-5B475K16	
C16	CAP., SM, 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C17	CAP., SM 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C18	CAP., SM, 47µF TANT., 20%, 16V	1055-6D476M16	
C19	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C20	CAP., SM, 4.7µF TANT., 10%, 16V	1055-5B475K16	
C21,C22	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C23	CAP., SM, 12pF CER., 0805, COG	1008-1A120J1G	(OS-3H141)
C23	CAP., SM, 6.8pF CER., 0805,C0G	1008-0A689J1G	(OS-3H162)
C24	CAP., TRIM., 1-14pF STAN. >6T	1082-A1R0014J	
C25	CAP., SM, 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	(OS-3H141)
C25	CAP., SM, 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	(OS-3H162)
C26	CAP., SM, 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C27	CAP., SM, 4.7µF TANT., 10%, 16V	1055-5B475K16	
C28	CAP., SM, 6.8µF TANT., 20%, 10V	1055-5B685M10	
C29	CAP., SM, 47µF TANT., 20%, 16V	1055-6D476M16	
C30	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C31	CAP., SM, 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C32, C33	CAP., SM, 100uF TANT., 20%,16V	1055-7D107M16	
C34	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C35	CAP., SM, 3.3pF CER., 0805,C0G	1008-0A339J1G	(OS-3H141)
C35	CAP., SM, 8.2pF CER., 0805,C0G	1008-0A829J1G	(OS-3H162)
C36	CAP., SM, 330pF CER., 0805, COG	1008-2A331J1G	
C37	CAP., 1.0µF FILM, MMK5, 10%, 50V	1016-6D105K50	(OS-3H141)
C37	CAP., 1.0µF FILM, MMK5, 10%, 50V	1016-6D105K50	(OS-3H162)
C38	CAP., 1.0µF FILM, MMK5, 10%, 50V	1016-6D105K50	(OS-3H141)
C38	CAP., 470nF FILM, MMK5,10%,63V	1016-5D474K63	(OS-3H162)
C39	CAP., 1.0µF FILM, MMK5, 10%, 63V	1016-6D105K50	(OS-3H141)
C39	CAP., NOT INSTALLED	NOT INSTALLED	(OS-3H162)
C40	CAP., SM, 12pF CER., 0805, C0G	1008-1A120J1G	(OS-3H141)
C40	CAP., SM, 6.8pF CER., 0805,C0G	1008-0A689J1G	(OS-3H162)
C42	CAP., 22µF DIP. TANT., 20%, 20V	1054-6G226M20	
C43	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C44	CAP., SM, 330pF CER., 0805, COG	1008-2A331J1G	
C45	CAP., 470nF FILM, MMK5,10%,63V	1016-5D474K63	(OS-3H141)
C45	CAP., 220nF FILM, MMK5,10%,50V	1016-5A224K50	(OS-3H162)
C46,C47	CAP., SM, 330pF CER., 0805, COG	1008-2A331J1G	
C49	CAP., 33nF FILM, MMK5, 10%, 63V	1016-4A333K63	(OS-3H141)
C49	CAP., 22nF FILM, MMK5, 10%, 63V	1016-4A223K63	(OS-3H162)

Ref. Desig	Description	Part No.	
C50	CAP., 22µF DIP. TANT., 20%, 20V	1054-6G226M20	
C51	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C52	CAP., SM, 330pF CER., 0805, COG	1008-2A331J1G	
C53	CAP., SM, 27pF CER., 0805, COG	1008-1A270J1G	
C54	CAP., 22µF DIP. TANT., 20%, 20V	1054-6G226M20	
C55	CAP., SM, 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C56	CAP., SM, 330pF CER., 0805, COG	1008-2A331J1G	
C58	CAP., SM, 47pF CER., 0805, COG	1008-1A470J1G	
C59	CAP., SM, 27pF CER., 0805, COG	1008-1A270J1G	
D1	DIODE, NOT INSTALLED	NOT INSTALLED	
D2	DIODE, MMBV609L VARICAP, SOT-23	2106-MMBV609L	
D3	DIODE, MMBD701L HOT CARR., SOT23	2105-MMBD7010	
D4	DIODE, BYD17J RECTIFIER,SOD87	2101-BYD17J00	
D5	DIODE, BAS16 SWITCHING, SOT23	2100-BAS16000	
L1-L3	CHOKE, RF/MOULD., 10uH 10%,.25	1251-4A00100K	
L4	CHOKE, RF/MOULD., 1.5uH 10%,.25	1251-3A001R5K	
L5	BOBBIN, 5.5 TURNS, 1.59 mm pitch	5791-A1010300	
	WIRE, COPPER, 20AWG, Ag PLATED, 11cm	7140-30002000	(1pc 9cm, 2pcs 1cm)
L6-L10	CHOKE, RF/MOULD., 1.5uH 10%,.25	1251-3A001R5K	
L11,L12	INDUCTOR, SM, 47nH CER,10%,1008	1256-1B47N00K	
L12	INDUCTOR, SM, 47nH CER,10%,1008	1256-1B47N00K	
LED1	LED, SUB-MIN.,2mm SQ,AXIAL,ORG	2012-S229013C	
PCB	PCB, ANALOG, OS-3H H/P SYNTH.	4309-26500252	
Q1,Q2	TRANSISTOR, BC817-25,NPN,SOT23	2120-BC817025	
Q3	TRANSISTOR, BC807 PNP, SOT23	2120-BC807025	
Q4	TRANSISTOR, BC817 NPN, SOT23	2120-BC817025	
Q5	JFET, J211 RF, N-CHAN., TO-92A	2041-J2110000	
R1	RES., SM, 49R9 0805, 1%,100ppm	1150-1A49R9FP	
R2	RES., 330R METAL FILM, 5%, 0.5W	1101-2A0331JP	
R3,R4	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP	
R5	RES., SM, 100R 0805, 1%,100ppm	1150-2A1000FP	
R6	RES., SM, 1K00 0805, 1%,100ppm	1150-3A1001FP	
R7,R8	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP	
R9	RES., SM, 1K00 0805, 1%,100ppm	1150-3A1001FP	
R10-R12	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP	
R13	RES., SM, 11K8 0805, 1%,100ppm	1150-4A1182FP	
R14	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP	
R15	RES., SM, 10R0 0805, 1%,100ppm	1150-1A10R0FP	
R16, R17	RES., SM, 5K11 0805, 1%,100ppm	1150-3A5111FP	
R18, R19	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP	
R20	RES., SM, 10R0 0805, 1%,100ppm	1150-1A10R0FP	
R21	RES., SM, 20K0 0805, 1%,100ppm	1150-4A2002FP	
R22	RES., SM, 100R 0805, 1%,100ppm	1150-2A1000FP	
R23-R25	RES., SM, 10R0 0805, 1%,100ppm	1150-1A10R0FP	
R26	RES., 1R2 METAL FILM, 5%, 0.5W	1101-0A01R2JI	
R27	RES., SM, 11K8 0805, 1%,100ppm	1150-4A1182FP	

Ref. Desig	Description	Part No.	
R28	RES., NOT INSTALLED	NOT INSTALLED	
R29	RES., SM, 18K2 0805, 1%,100ppm	1150-4A1822FP	
R30	RES., SM, 10R0 0805, 1%,100ppm	1150-1A10R0FP	
R31	RES., SM, 49R9 0805, 1%,100ppm	1150-1A49R9FP	
R32	RES., 12K METAL FILM, 5%, 0.5W	1101-4A0123JP	(OS-3H141)
R32	RES., 15K METAL FILM, 5%, 0.5W	1101-4A0153JP	(OS-3H162)
R33	RES., 680R METAL FILM, 5%, 0.5W	1101-2A0681JP	
R34,R35	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP	
R36	RES., 2K2 METAL FILM, 5%, 0.5W	1101-3A0222JP	(OS-3H141)
R36	RES., 6K2 METAL FILM, 5%, 0.5W	1101-3A0622JP	(OS-3H162)
R39	RES., SM, 0 0805, ZERO OHM JUMPER	1150-0A0R0000	
R40	RES., 180R METAL FILM, 5%, 0.5W	1101-2A0181JP	
R41	RES., SM, 18R2 0805, 1%,100ppm	1150-1A18R2FP	
R44	RES., SM, 47R5 0805, 1%,100ppm	1150-1A47R5FP	
R45	RES., SM, 27R4 0805, 1%,100ppm	1150-1A27R4FP	
R46	RES., SM, 33R2 0805, 1%,100ppm	1150-1A33R2FP	
R47	RES., SM, 47R5 0805, 1%,100ppm	1150-1A47R5FP	
R48	RES., SM, 47R5 0805, 1%,100ppm	1150-1A47R5FP	
R49	RES., SM, 10R0 0805, 1%,100ppm	1150-1A10R0FP	
R50	RES., 180R METAL FILM, 5%, 0.5W	1101-2A0181JP	
R51	RES., 220R METAL FILM, 5%, 0.5W	1101-2A0221JP	
R52	RES., SM, NOT INSTALLED.	NOT INSTALLED	
R53	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP	
R54	RES., SM, 18R2 0805, 1%,100ppm	1150-1A18R2FP	
R55	RES., SM, 274 0805, 1%,100ppm	1150-2A2740FP	
R56	RES., SM, 274 0805, 1%,100ppm	1150-2A2740FP	
RV1	POT., SM, 5K0 1T, TOP ADJ	1174-AS2502J1	
TCXO1	VTCXO MODULE, 9.6 MHz 4 PIN, +- 1ppm	2641-09600BM5	
U1-U4	DIODE, I/R SENSOR,TTL O/P,PLST	2014-1L18230T	
U5	LED, I/R,GaAs,.81 x .23,PLAST.	2013-1G18230A	
U6	I.C., LT1129-IS8 ,PROG. VOLT REG,SO8	2305-11290N08	
U7,U8	I.C., LP2951 PROG. VOLT REG, SO-8	2305-29510N08	
U9	MOSFET, SI9945DY, N CHAN.,SO-8	2142-SI9945DY	
U10	IC, 45191,PLL FREQ/SYNTH,SO-20	2355-45191N20	
U11	IC, MSA-0611, MM1C AMP,SOT-143	2354-MSA06110	
U15,U16	IC, MSA-0611, MM1C AMP,SOT-143	2354-MSA06110	

5.4 OS(R/T)-3H 406 - 470 MHz Analog Board Electrical Parts List

Ref. Desig	Description	Part No.	
C1 - C3	CAP., SM 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C4	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C5	CAP., SM 100nF CER., 0805, X7R, 50V	1008-5A104K5R	
C6	CAP., SM 47uF TANT., 20%, 16V	1055-6D476M16	
C7	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C8	CAP., SM 100nF CER., 0805, X7R, 50V	1008-5A104K5R	
C9	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C10	CAP., SM 100nF CER., 0805, X7R, 50V	1008-5A104K5R	
C11	CAP., SM 1.0uF TANT., 10%, 16V	1055-5A105M16	
C12, C13	CAP., SM 4.7uF TANT., 10%, 16V	1055-5B475K16	
C14	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C15	CAP., SM 4.7uF TANT., 10%, 16V	1055-5B475K16	
C16	CAP., 100nF FILM, MMK5, 10%, 63V	1016-5A104K63	
C17	CAP., SM 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C18	CAP., SM 47uF TANT., 20%, 16V	1055-6D476M16	
C19	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C20	CAP., SM 4.7uF TANT., 10%, 16V	1055-5B475K16	
C21, C22	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C25, C26	CAP., SM 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C27	CAP., SM 4.7uF TANT., 10%, 16V	1055-5B475K16	
C29	CAP., SM 47uF TANT., 20%, 16V	1055-6D476M16	
C30	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C31	CAP., SM 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R	
C32, C33	CAP., SM, 100uF TANT., 20%,16V	1055-7D107M16	
C34	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C35	CAP., SM 100pF CER., 0805, COG	1008-2A101J1G	
C36	CAP., SM 330pF CER., 0805, COG	1008-2A331J1G	
C37	CAP., 1.0uF FILM, MMK5,10%,50V	1016-6D105K50	
C38	CAP., NOT INSTALLED	NOT INSTALLED	OST-3H440
C38	CAP., 1.0uF FILM, MMK5,10%,50V	1016-6D105K50	OSR-3H440
C39	CAP., NOT INSTALLED	NOT INSTALLED	OST-3H440
C39	CAP., 1.0uF FILM, MMK5,10%,50V	1016-6D105K50	OSR-3H440
C42	CAP., 22uF DIP. TANT., 20%, 20V	1054-6G226M20	
C43	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C44	CAP., SM 330pF CER., 0805, COG	1008-2A331J1G	
C45	CAP., 220nF FILM, MMK5,10%,50V	1016-5A224K50	OST-3H440
C45	CAP., 470nF FILM, MMK5,10%,50V	1016-5C474K50	OSR-3H440
C46	CAP., SM 330pF CER., 0805, COG	1008-2A331J1G	
C47	CAP., SM 330pF CER., 0805, COG	1008-2A331J1G	
C49	CAP., 22nF FILM, MMK5, 10%,63V	1016-4A223K63	OST-3H440
C49	CAP., 33nF FILM, MMK5, 10%,63V	1016-4A333K63	OSR-3H440
C50	CAP., 22uF DIP. TANT., 20%, 20V	1054-6G226M20	
C51	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C52	CAP., SM 330pF CER., 0805, COG	1008-2A331J1G	
C53	CAP., SM, 10pF CER., 0805, C0G	1008-1A100J1G	
C54	CAP., 22uF DIP. TANT., 20%, 20V	1054-6G226M20	
C55	CAP., SM 10nF CER, 0805, X7R, 50V	1008-4A103K5R	
C56	CAP., SM 330pF CER., 0805, COG	1008-2A331J1G	
C58	CAP., SM, 15pF CER., 0805, C0G	1008-1A150J1G	
C59	CAP., SM, 10pF CER., 0805, C0G	1008-1A100J1G	

Ref. Desig	Description	Part No.	
C60	CAP., 100nF FILM, MMK5, 10%, 63V	1016-5A104K63	OST-3H440
C60	CAP., NOT INSTALLED	NOT INSTALLED	OSR-3H440
D4	DIODE, BYD17J RECTIFIER,SOD87	2101-BYD17J00	
D5	DIODE, BAS16 SWITCHING, SOT23	2100-BAS16000	
L1 - L3	CHOKE, RF/MOULD.10uH 10%,.25	1251-4A00100K	
L6 - L10	CHOKE, RF/MOULD.1.5uH 10%,.25	1251-3A001R5K	
L11 L12	INDUCTOR, SM18nH CER,10%,1008	1256-1B18N00K	
LED1	LED, SUB-MIN.,2mm SQ,AXIAL,ORG	2012-S229013C	
PCB	PCB, ANALOG, OS-3H UHF SYNTH.	4309-27500282	
Q1, Q2	TRANSISTOR, BC817 NPN, SOT23	2120-BC817025	
Q3	TRANSISTOR, BC807 PNP, SOT23	2120-BC807025	
Q4	TRANSISTOR, BC817 NPN, SOT23	2120-BC817025	
R1	RES., SM 49R9 0805, 1%,100ppm	1150-1A49R9FP	
R2	RES.330R METAL FILM, 5%, 0.5W	1101-2A0331JP	
R3 R4	RES., SM 10K0 0805, 1%,100ppm	1150-4A1002FP	
R5	RES., SM 100R 0805, 1%,100ppm	1150-2A1000FP	
R6	RES., SM 1K00 0805, 1%,100ppm	1150-3A1001FP	
R7 R8	RES., SM 10K0 0805, 1%,100ppm	1150-4A1002FP	
R9	RES., SM 1K00 0805, 1%,100ppm	1150-3A1001FP	
R10 - R12	RES., SM 10K0 0805, 1%,100ppm	1150-4A1002FP	
R13	RES., SM 11K8 0805, 1%,100ppm	1150-4A1182FP	
R14	RES., SM 10K0 0805, 1%,100ppm	1150-4A1002FP	
R15	RES., SM 10R0 0805, 1%,100ppm	1150-1A10R0FP	
R16, R17	RES., SM, 5K11 0805, 1%,100ppm	1150-3A5111FP	
R18, R19	RES., SM 10K0 0805, 1%,100ppm	1150-4A1002FP	
R21	RES., 2K7 METAL FILM, 5%, 0.5W	1101-3A0272JP	OST-3H440
R21	RES., NOT INSTALLED	NOT INSTALLED	OSR-3H440
R23	RES., SM 10R0 0805, 1%,100ppm	1150-1A10R0FP	
R24, R25	RES., SM 10R0 0805, 1%,100ppm	1150-1A10R0FP	
R26	RES.1R2 METAL FILM, 5%, 0.5W	1101-0A01R2JI	
R28	RES., SM 10R0 0805, 1%,100ppm	1150-1A10R0FP	
R29	RES., SM 36K5 0805, 1%,100ppm	1150-4A3652FP	
R30	RES., SM 10R0 0805, 1%,100ppm	1150-1A10R0FP	
R31	RES., SM 274R 0805, 1%,100ppm	1150-2A2740FP	
R32	RES., 4K7 METAL FILM, 5%, 0.5W	1101-3A0472JP	OSR-3H440
R32	RES., 5K6 METAL FILM, 5%, 0.5W	1101-3A0562JP	OST-3H440
R33	RES.680R METAL FILM, 5%, 0.5W	1101-2A0681JP	
R34, R35	RES., SM 10K0 0805, 1%,100ppm	1150-4A1002FP	
R36	RES., 2K2 METAL FILM, 5%, 0.5W	1101-3A0222JP	OST-3H440
R36	RES., 1K5 METAL FILM, 5%, 0.5W	1101-3A0152JP	OSR-3H440
R39	RES., SM 0R0 0805, ZERO OHM JUMPER	1150-0A0R0000	
R40	RES.180R METAL FILM, 5%, 0.5W	1101-2A0181JP	
R41	RES., SM 18R2 0805, 1%,100ppm	1150-1A18R2FP	
R44	RES., SM 47R5 0805, 1%,100ppm	1150-1A47R5FP	
R45	RES., SM 27R4 0805, 1%,100ppm	1150-1A27R4FP	
R46	RES., SM 33R2 0805, 1%,100ppm	1150-1A33R2FP	

Ref. Desig	Description	Part No.	
R47	RES., SM 47R5 0805, 1%,100ppm	1150-1A47R5FP	
R48	RES., SM 27R4 0805, 1%,100ppm	1150-1A27R4FP	
R49	RES., SM 33R2 0805, 1%,100ppm	1150-1A33R2FP	
R50	RES.180R METAL FILM, 5%, 0.5W	1101-2A0181JP	
R51	RES.220R METAL FILM, 5%, 0.5W	1101-2A0221JP	
R52	RES., SM 49R9 0805, 1%,100ppm	1150-1A49R9FP	
R53	RES., SM 10K0 0805, 1%,100ppm	1150-4A1002FP	
R54	RES., SM 18R2 0805, 1%,100ppm	1150-1A18R2FP	
R55, R56	RES., SM 274R 0805, 1%,100ppm	1150-2A2740FP	
R57	RES., SM 18R2 0805, 1%,100ppm	1150-1A18R2FP	
R58	RES., SM 274R 0805, 1%,100ppm	1150-2A2740FP	
RV1	POT., SM5K0 1T, TOP ADJ	1174-AS2502J1	
TCXO1	VTCXO MODULE 9.6 MHz 4 PIN, +- 1ppm	2641-09600BM5	
U1 - U4	DIODE, OPL550 I/R SENSOR,TTL O/P,PLST	2014-1L18230T	
U5	LED, OP140A I/R,GaAs,.81 x .23,PLAST.	2013-1G18230A	
U6	I.C., LT1129-IS8,PROG. VOLT REG, SO8	2305-11290N08	
U7, U8	I.C.LP2951 PROG. VOLT REG, SO-8	2305-29510N08	
U9	MOSFET, SI9945DY, N CHAN.,SO-8	2142-SI9945DY	
U10	I.C., MC14519, PLL FREQ/SYNTH, SO-20	2355-45190N20	
U11	I.C., MSA-0611, MM1C AMP, SOT-143	2354-MSA06110	
U15, U16	I.C., MSA-0611, MM1C AMP, SOT-143	2354-MSA06110	
U17	VCO MODULE,427.4-451.4MHz,T-PK	2621-L002309T	OSR-3H440
U17	VCO MODULE, 406-470 MHz,T-PKG.	2621-190435MT	OST-3H440

5.5 OS(R/T)-3(A/H) Digital Board Electrical Parts List

Ref. Desig	Description	Part No.
C1,C2	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C3-C5	CAP., SM, 47µF TANT., 20%, 16V	1055-6D476M16
C6,C7	CAP., SM, 22pF CER., 0805, COG	1008-1A220J1G
C8	CAP., SM, 4.7µF TANT., 10%, 16V	1055-5B475K16
C9-C14	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C15	CAP., SM, 10µF TANT., 20%, 16V	1055-6C106M16
P1	INTERCONNECT/STD,1ROW x 12P,Au	5015-IS112G21
	INTERCONNECT/STD,1ROW x9PIN,Au	5015-IS109G21
P2	INTERCONNECT/STD,1ROW x6PIN,Au	5015-IS106G21
D1 - D4	DIODE, BAS16 SWITCHING, SOT23	2100-BAS16000
L1	INDUCTOR, SM, 10.0uH, 10%,1812	1255-4G10000K
PCB	PCB, DIGITAL, OS-3H H/P SYNTH.	4309-26500213
Q1 - Q11	TRANSISTOR, BC817-25,NPN,SOT23	2120-BC817025
R1	RES., SM, 0 0805, ZERO OHM JUMPER	1150-0A0R0000
R2-R7	RES., SM, 47K5 0805, 1%,100ppm	1150-4A4752FP
R8	RES., SM, 6K81 0805, 1%,100ppm	1150-3A6811FP
R9,R10	RES., SM, 47K5 0805, 1%,100ppm	1150-4A4752FP
R11	RES., SM, 10M0 1206, 5%,400ppm	1151-7B0106JG
R12-R22	RES., SM, 47K5 0805, 1%,100ppm	1150-4A4752FP
R23-R26	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP
R27-R29	RES., SM, 47K5 0805, 1%,100ppm	1150-4A4752FP
R30-R33	RES., SM, 332R 0805, 1%,100ppm	1150-2A3320FP
R34-R40	RES., SM, 47K5 0805, 1%,100ppm	1150-4A4752FP
R41	RES., SM, 221K 0805, 1%, 100ppm	1150-5A2213FP
U1	MOSFET, SI9933DY, P CHAN.,SO-8	2142-SI9933DY
U2	IC, LP2951,PROG. VOLT REG,SO-8	2305-29510N08
U3	IC, MC33064,UNDR/VOLT SEN.SO-8	2308-33064N08
U4	IC, 68HC811E2, MIC/CTR, PLCC52	2380-68811P52
U5-U8	LED, I/R,GaAs,.81 x .23,PLAST.	2013-1G18230A
U9	DIODE, I/R SENSOR,TTL O/P,PLST	2014-1L18230T
X1	RESONATOR, SM, 8.0MHz, CERAMIC	1575-8001816A

5.6 OS(R/T)-3(A/H) Synthesizer Mechanical Parts List

Description	Part No.	Qty.	
CASE, OS-3H SYNTH. MODULE,ALUM	3702-66100920	1	
CONN., SMB, JACK,2 HOLE FLANGE	5120-J2SC01BG	2	
FERRITE, BEAD,73 MIX, 3X3.5mm OD (CON3-CON5)	1210-73030350	3	OS-3H050
FERRITE, BEAD,43 MIX, 3X3.5mm OD (CON3-CON5)	1210-43030350	3	OS-3A130
FERRITE, BEAD,43 MIX, 3X3.5mm OD (CON3-CON5)	1210-43030350	3	OS-3H150
FERRITE, BEAD,61 MIX, 3X3.5mm OD (CON3-CON5)	1210-61030350	3	OS-3H440
HEADER, .1”, 1 ROWX3PIN, AU	5010-H103ST7L	2	
LABEL, FOIL,FRQ/SN,OS-3H SYNTH	3501-13091006	1	
LID, CASE,OS-3H SYNTH/MODL.,AL	3702-66100921	1	
PIN, 2 x 10mm, GROOVED W/PILOT	5876-D1470210	4	
SCREW, M2.0 x 4, FLAT/PHIL, A2	5812-2M0FP04S	8	
SCREW, M2 X 4, PAN/PHILLIPS,A2	5812-2M0PP04S	15	
SCREW, M2.5 x 24.5 FLAT/PHIL, A2	5812-2M5FP24S	1	
WASHER, TFE,0.036ID,1/8OD,.02T	5805-T3612F20	6	

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6 REVISION HISTORY

ISSUE	DATE	REVISION
1	May 97	• Issue 1
2	Mar 98	• Changes to the AM Analog board (OST-3A128) to improve performance ECO #547. C37 was 220nF is now 100nF and C40 was 8.2pF is now not installed C45 was 33nF is now 22nF and C49 was 2.2nF is now 1.5nF R32 was 33kΩ is now 56kΩand R36 was 3k3Ω is now 5k6Ω
3	Mar 00	• Changes to the AM Analog board to improve performance at -40˚C. ECO #565. L4 was 1.5µH is now 3.9 µH • Changes to the FM Analog boards to improve manufacturing. ECO #572 C32 & C33 were 100µF through hole tantalums are now 100µF surface mount tantalums • Changes to the OS-3A/H Digital board for compatibility with the new AM wideband Synthesizers. ECO #579. Added C15 (10µF) and R41 (221kΩ). JU1 was added and is installed for AM modules only. PCB, DIGITAL, OS-3H/P SYNTH was version 2 now version 3. • Added the new component layouts, schematic diagram and parts lists for the new AM wideband synthesizer. Wideband referring to only having to be tune once and working over the whole AM band (118-138 MHz).