DANIELS™
ELECTRONICS LTD.

MT-3 RADIO SYSTEMS

VT-3A130 AMPLIFIER INSTRUCTION MANUAL

118 - 138 MHz

Covers the following:
Amplifier portion of VT-3A130-SYD410

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Part No.:	IM22-VT3A130AMP			PRINTED IN CANADA

Reviewed By:

Quality Assurance:

Claudia Boorman		
Name	Signature	Date

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 VT-3A130 Amplifier provides the final stage of RF amplification and filtering for the VT-3A Transmitters. The output power is 1.0 - 4.0 Watt adjustable (carrier only). The amplifier operates over 118MHz - 138 MHz frequency range without tuning.

Output filtering for the VT-3A130 Amplifier is provided by an Output Lowpass Filter Board. The Output Lowpass Filter Board is mounted in a separate compartment of the amplifier case in order to provided maximum attenuation of harmonic and other spurious signals.

Refer to section 4.1.2 "VT-3A130 Amplifier Schematic Diagram" for the Amplifier schematic diagram and section 4.1.3 for the Output Lowpass Filter component layout and schematic diagram.

1.2 Performance Specification

Type:	VT-3 series VHF Amplifier module
Family:	VT-3A130
Frequency Range:	118.0 MHz to 138.0 MHz
RF Power Output:	1.0 - 4.0 Watts adjustable (carrier only)
RF Power Input	Nominal level from -5 dBm to +5 dBm
System Impedance:	50 Ω
Spurious and Harmonics Emissions:	More than 90 dB below carrier
Modulation:	6K00A3 (Amplitude Modulation)
Transmitted Noise	More than 45 dBc below carrier
Audio Response:	Flat audio; +1/-3 dB: 300 Hz - 3 kHz
Audio Distortion:	Less than 3% -40˚C to +60˚C at 30% modulation Less than 5% -40˚C to +60˚C at 90% modulation
Load VSWR tolerance:	Z load = 20:1:
Operating Voltage:	+13.8 Vdc Nominal (range +10 to +17 Vdc), +9.5 Vdc Regulated.
Active Current:	+13.8 Vdc supply less than 1.5 A at Pout=4
Standby Current:	Typically less than 4 mA

Amplifier Enable:	Active to ground.
Output Power Rise Time (10-90% of steady state value)	Less than 20 ms
Output Power Fall Time (90-10% of Steady state value)	Less than 10ms
Key-On/Key-off Spectral Mask	Transients are at least 80 dBc for frequencies ± 400 kHz from carrier.
Operating Temperature Range:	-30˚C to +60˚C, optional - 40˚C temperature test.
Operating Humidity:	95% Relative Humidity (Non-condensing) at +25°C

2 THEORY OF OPERATION

2.1 General

VT-3A130 Amplifier is a Class A linear amplifier with a low level AM modulator. A built in regulated power supply provides approximately 15.0Vdc output voltage with the input voltage range of 10.0 Vdc to 17 Vdc. This amplifier utilizes a 10 Watt hybrid power amplifier module manufactured by Mitsubishi. The module is mounted directly to the heatsink with its leads soldered to a circuit board where DC supply voltage and RF input and output connections are made.

Power for the VT-3A130 Amplifier is provided from +13.8 Vdc and 9.5Vdc supplies. The supplies can be continuously connected to the amplifier. The VT-3A130 Amplifier will draw only about 4 mA of current from +13.8 Vdc and about 0.1 mA from 9.5Vdc until the AMPLIFIER ENABLE pin is grounded.

The VT-3A130 Amplifier is housed in a machined aluminum case that ensures optimum RF shielding, provides a good ground, and also acts as a heatsink.

2.2 Power Requirements

The current drawn from the +9.5 Vdc supply should not exceed 10 mA. Current consumption of the +13.8 Vdc line is dependent on transmitter frequency, output power, temperature, and supply voltage and can range from 800 mA to 1500 mA. The current drawn from the +13.8 Vdc supply should not exceed 1500 mA under normal circumstances and should never be allowed to exceed 1700 mA.

2.3 RF Circuitry

Refer to Section 4.1.2 "VT-3A130 Amplifier Schematic Diagram". The RF input signal with a level of -5 dBm to +5 dBm is fed to the VT-3A130 Amplifier Board and then is modulated by a balanced AM Modulator which consists of Q1, Q3, Q4, and a wide band RF transformer XFMR1. Q1, Q3 collectors are supplied by 15.0 Vdc in order to increase the modulation linearity. On the contrary, the base circuitry of Q1, Q3 and Q4 are biased by 9.5 Vdc. The typical output power from the Modulator is about 3dBm to 5 dBm. The signal is then amplified further by a Hybrid Power Amplifier Module U1, which is the class A, 10 watt linear amplifier. The U1 is supplied from a 15.0Vdc internal regulated power supply. Maximum carrier power output is 4 - 5 watt for the input voltage range from 10 Vdc to 17 Vdc. Output filtering for the VT-3A130 Amplifier is provided by a Low Pass Filter Board. The Low Pass filter assembly is mounted in a separate compartment of the amplifier case in order to provided maximum attenuation of harmonic and other spurious signals. Refer to Section 4.1.1 "VT-3A130 Amplifier Component Layout"

The part of the output RF energy is coupled by a directional detector circuit TL1 which provides a means of linearization of the audio and leveling of the output power over the frequency range 118 MHz to 138 MHz.

The AC coupled audio signal is applied to the inverting input of U4a in order to provide predistortions to the input modulation audio signal, which is supplied from the audio amplifier U2 to the non-inverting input of U4a.

On the contrary the DC coupled part of the detected audio is passed through the 50Hz low pass filter U6a, U6b, and than compared with a certain DC level which is set by R19. The difference of the signals is amplified by U4b and applied to pin 2 of the Power Amplifier Module in order to keep the output power relatively constant over the frequency range of 118MHz to 138MHz.

2.3.1 VT-3/150 Lowpass Filter

The VT-3/150 Output Lowpass Filter is a 50 ohm, 6 pole, reciprocal filter with a 3 dB cutoff frequency of approximately 150 MHz. The low pass filter assembly attenuates the desired signal's harmonics as well as any other out-of-band emissions so that a 'clean' RF signal is output to the antenna connector.

2.4 Power Supply Circuitry.

The VT-3A130 Amplifier has shutdown circuitry based on Q2 that allows decrease power consumption, less than 0.1 mA from 9.5Vdc, in standby mode. The voltage level on the amplifier enable line of less than +2.0 Vdc turns on the transistor Q2. Q2 supplies the base circuitry of Q1, Q3, Q4, and operational amplifiers U2, U4, and U6.

The U3 LM2588 used as a step-up (boost) regulator. This is a switching regulator that produces an output voltage greater than the input supply voltage. The following is the LM1084ADJ, a low dropout voltage (LDO) positive adjustable regulators with a maximum dropout of 1.5V at 5A of load current. The LM1084 used as a postregulator that reduces the ripple current and also prevents the output voltage level from overshooting the maximum of 16Vdc.

3 VT-3A130 AMPLIFIER ALIGNMENT

3.1 General

Connections to the power supply, audio input and transmit enable line are clearly marked on the amplifier case. The amplifier is enabled when the enable line (AMPLIFIER ENABLE pin) is grounded.

If the amplifier is installed in the transmitter, alignment is simplified by using the SR-3 Subrack, SM-3 System Monitor, and RF extender cable to provide transmitter power and signal interconnection (see the Transmitter Main Board Manual for details). For complete transmitter alignment, the Transmitter Main Board, Synthesizer, Amplifier, and Audio Processor should be tuned in the aforementioned order. Please refer the corresponding manuals for each module.

3.2 Repair Note

The VT-3A130 Amplifier is mainly made up of surface mount devices which should not be removed or replaced using an ordinary soldering iron. Removal and replacement of surface mount components should be performed only with specifically designed surface mount rework and repair stations complete with ElectroStatic Dissipative (ESD) protection.
When removing Surface Mount Solder Jumpers, it is recommended to use solder braid in place of manual vacuum type desoldering tools when removing jumpers. This will help prevent damage to the circuit boards.

3.3 Printed Circuitboard Numbering Convention

To ease troubleshooting and maintenance procedures, Daniels Electronics Limited has adopted a printed circuitboard (PCB) numbering convention in which the last two digits of the circuitboard number represent the circuitboard version. For example:

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

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

3.4 Recommended Test Equipment List

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

Dual Power Supply:	Regulated +9.5 Vdc at 0.1 A. Regulated +13.8 Vdc at 2 A - Topward TPS-4000
Oscilloscope / Multimeter:	Fluke 97 Scopemeter
Current Meter:	Fluke 75 multimeter
Radio communications test set:	Marconi Instruments 2955R
VSWR 3:1 mismatch load:	JFW 50T-035-3.0:1
Alignment Tool:	Johanson 8766

3.5 VT-3A130 Amplifier Alignment

3.5.1 General

The VT-3A130 Amplifier is a module that is factory assembled to operate in the frequency band: 118MHz to 138MHz. The amplifier requires -5 dBm to 5 dBm of input power and is continuously adjustable over its power range of 1.0 to 4.0 Watts.

3.5.2 VT-3A130 Amplifier Adjustment

1. Apply power to the amplifier's +13.8 Vdc and +9.5Vdc pins. The +9.5 Vdc power supply must be well regulated.

2. Connect the amplifier's antenna output connector to the type N input of the radio communications test set through a short section of low loss 50 Ω coaxial cable.

3. Turn the two of the adjustment potentiometers POWER ADJUST pot R19 and AUDIO ADJUST pot R35 fully counterclockwise.

4. Turn DISTORTION ADJUST pot R14 and POWER CONTROL ADJUST pot R24 to its center position

6. Apply a non-modulated 118 MHz RF signal of - 5 dBm / +5 dBm to the RF INPUT connector.

7. Turn on the amplifier by applying a ground to the amplifier ENABLE INPUT pin.

8. Adjust POWER ADJUST pot R19 so that the output power is about 4Watt by turning it clockwise. Do not let the current through the transistor U1 exceed 1.5 A on the +13.8 Vdc line.

9. Apply a 1000 Hz signal with 0.200 Vrms level to the amplifier's MODULATION INPUT and adjust AUDIO ADJUST pot R35 to obtain 90% of AM modulation.
10. Adjust the DISTORTION ADJUST pot R14 to the lowest distortion (less than 5%)

11. Change the RF signal frequency to 128 MHz, 138 MHz and control the Modulation Level and Output Power (with no modulation).
12. Re-adjust the AUDIO ADJUST pot R35 (if it necessarily) so that the modulation level do not exceed 90% at 128 MHz and 138 MHz frequencies.

13. Re-adjust the POWER ADJUST pot R19 (if it necessarily) to achieve a minimum tolerance of the output power (4 Watt +/- 1dB).

3.5.3 Changing Power Output

The power amplifier's carrier output level can be adjusted from 1.0 to 4.0 watts. To change the RF output level, follow the procedures described below.

1. Apply power to the amplifier's +13.8 Vdc and +9.5Vdc pins. The +9.5 Vdc power supply must be well regulated.

2. Connect the amplifier's antenna output connector to the type N input of the radio communications test set through a short section of low loss 50 Ω coaxial cable.

3. The amplifier requires -5 dBm to 5 dBm of RF power

4. Turn on the amplifier by applying a ground to the AMPLIFIER ENABLE pin.

5. Adjust the POWER ADJUST pot R19 to achieve the desired RF carrier power output between 1.0 Watt and 4.0 Watt.

6. Apply a 1000 Hz signal with 0.200Vrms level to the power amplifier's MODULATION INPUT and adjust AUDIO ADJUST pot R35 to obtain 90% of modulation.

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4 ILLUSTRATIONS AND SCHEMATIC DIAGRAMS

4.1 VT-3A130 Amplifier

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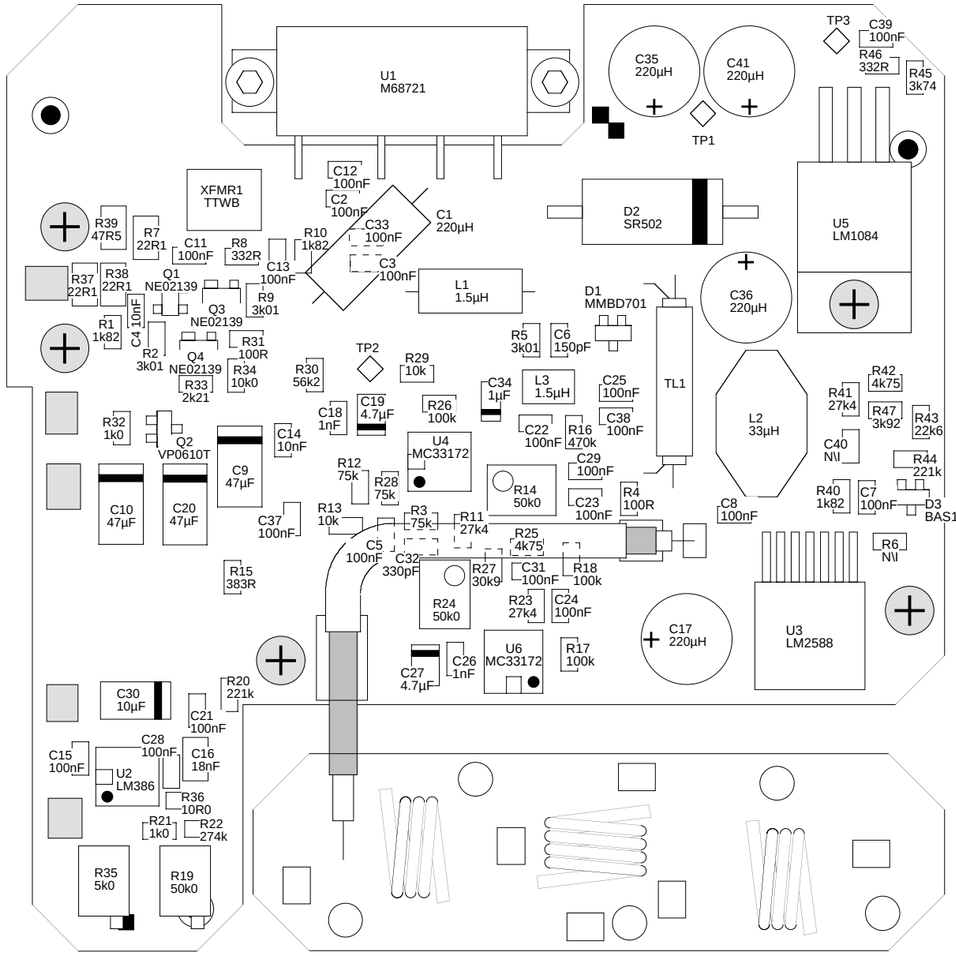
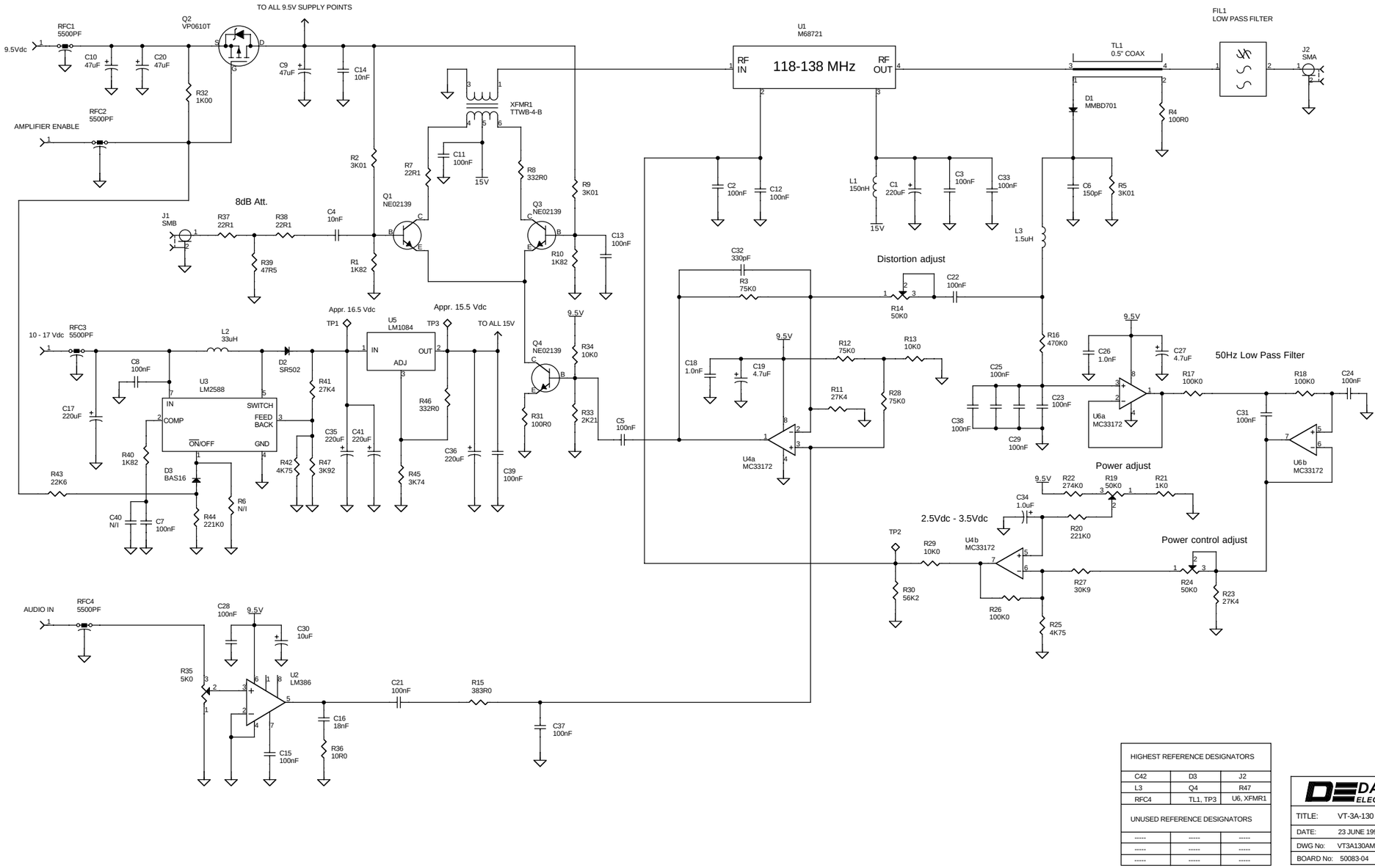
4.1.1 VT-3A130 Amplifier Component Layout



PCB 50083-04 PCB 50086-01 VT-3A130 Lowpass Filter Assembly VT3A130AMPM1B

4.1.2 VT-3A130 Amplifier Schematic Diagram



HIGHEST REFERENCE DESIGNATORS		
C42	D3	J2
L3	Q4	R47
RFC4	TL1, TP3	U6, XFMR1
UNUSED REFERENCE DESIGNATORS		
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DANIELS ELECTRONICS LTD.		VICTORIA B.C.
TITLE: VT-3A-130 AMPLIFIER SCHEMATIC DIAGRAM		
DATE: 23 JUNE 1999	DWN BY: STAN POLYAKOV	APRVD:
DWG No: VT3A130AMPM2B	DWG REV DATE: 9 MARCH 2000	
BOARD No: 50083-04	BOARD REV: 04	

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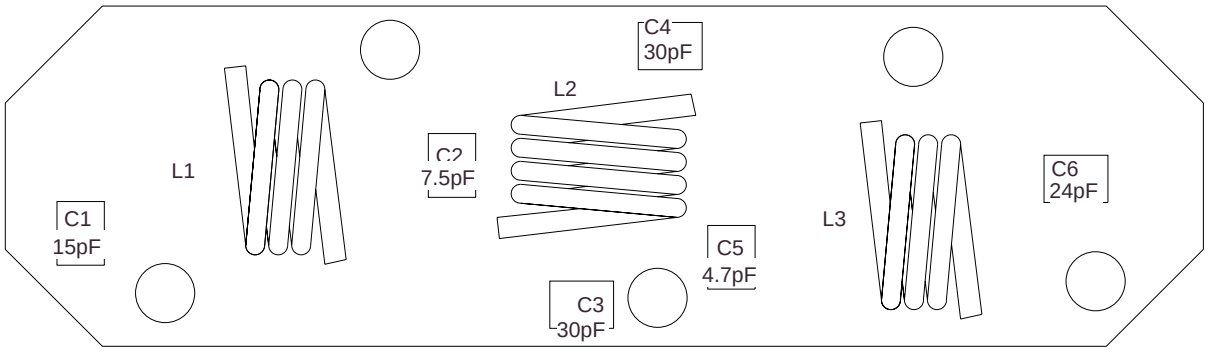
4.2 VT-3A130 Lowpass Filter

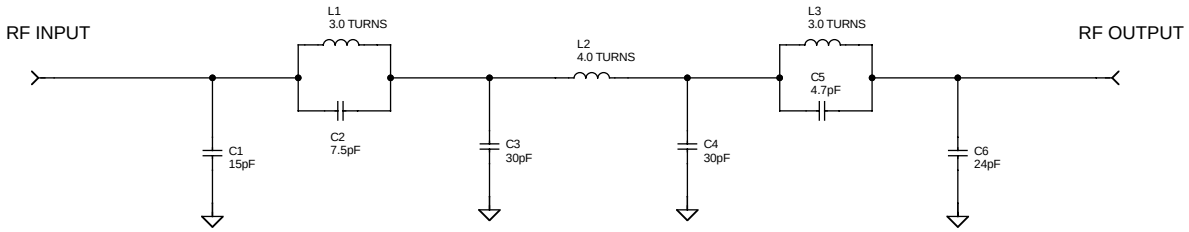
4.2.1 VT-3A130 Lowpass Filter Component Layout



PCB 50086-01

VT3A130AMPM3A

4.2.2 VT-3A130 Lowpass Filter Schematic Diagram



HIGHEST REFERENCE DESIGNATORS		
C6	L3	-----
-----	-----	-----
-----	-----	-----
UNUSED REFERENCE DESIGNATORS		
-----	-----	-----
-----	-----	-----
-----	-----	-----

DANIELS ELECTRONICS LTD.		VICTORIA B.C.
TITLE: VT-3A130 LOW PASS FILTER		
DATE: 02 JUNE 1999	DWN BY: STAN POLYAKOV	APRVD:
DWG No: VT3A130AMPM4A	DWG REV DATE:	
BOARD No: 50086-01	BOARD REV: 01	

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5 PARTS LISTS

5.1 VT-3A130 Amplifier Electrical Parts List

Ref Design	Description	Part No.
C1	CAP., 220uF ELECTRO.,AXIAL,25V	1064-1GE221TL
C2, C3	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C4	CAP., SM, 10nF CER,0805,X7R,50V	1008-4A103K5R
C5	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C6	CAP., SM, 150pF CER., 0805,C0G	1008-2A151J1G
C7, C8	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C9, C10	CAP., SM, 47uF TANT., 20%, 16V	1055-6D476M16
C11 – C13	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C14	CAP., SM, 10nF CER,0805,X7R,50V	1008-4A103K5R
C15	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C16	CAP., SM, 18nF CER., 1206, X7R	1008-4B183K5R
C17	CAP., 220uF ELECTRO,RADIAL,25V	1065-1FD221ML
C18	CAP., SM, 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R
C19	CAP., SM, 4.7uF TANT., 10%, 16V	1055-5B475K16
C20	CAP., SM, 47uF TANT., 20%, 16V	1055-6D476M16
C21 – C25	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C26	CAP., SM, 1.0nF CER., 0805, X7R, 50V	1008-3A102K5R
C27	CAP., SM, 4.7uF TANT., 10%, 16V	1055-5B475K16
C28, C29	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C30	CAP., SM, 10uF TANT., 20%, 16V	1055-6C106M16
C31	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C32	CAP., SM, 330pF CER., 0805,C0G	1008-2A331J1G
C33	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C34	CAP., SM, 1.0uF TANT., 20%,16V	1055-5A105M16
C35	CAP., 220uF ELECTRO,RADIAL,25V	1065-1FD221ML
C36	CAP., 220uF ELECTRO,RADIAL,25V	1065-1FD221ML
C37 – C39	CAP., SM, 100nF CER., 0805, X7R, 50V	1008-5A104K5R
C40	NOT INSTALLED	NOT INSTALLED
C41	CAP., 220uF ELECTRO,RADIAL,25V	1065-1FD221ML
D1	DIODE, MMBD701 HOT CARR.,SOT23	2105-MMBD7010
D2	DIODE, SR502,5A SCHOT,D0201-AD	2004-SR502000
D3	DIODE, BAS16 SWITCHING, SOT23	2100-BAS16000
J1	CONN., SMB, JACK,2 HOLE FLANGE	5120-J2SC01BG
J2	CONN., N JACK, PANEL MNT,C/SNK	5184-10923011
L1	CHOKE, RF/MOULD.,150nH,20%,.37	1251-2B00R15K
L2	INDUCTOR, SM, 33uH, POWER, 2A	1247-4D330000
L3	INDUCTOR, SM, 1.5uH 10%, 1812	1255-3G1R500K
PCB	PCB, AMPLIFIER, AM VT-3A130-10	4322-15500834
Q1	TRANSISTOR, NE02139 HIGH FREQ.	2124-NE021390
Q2	MOSFET, VP0610T,P CHAN.,SOT-23	2142-VP0610T0
Q3, Q4	TRANSISTOR, NE02139 HIGH FREQ.	2124-NE021390

Ref Design	Description	Part No.
RFC1	FILTER, EMI, Pi/5500PF,8-32UNC	1302-P552D10D
RFC2	FILTER, EMI, Pi/5500PF,8-32UNC	1302-P552D10D
RFC3	FILTER, EMI, Pi/5500PF,8-32UNC	1302-P552D10D
RFC4	FILTER, EMI, Pi/5500PF,8-32UNC	1302-P552D10D
R1	RES., SM, 1K82 0805, 1%,100ppm	1150-3A1821FP
R2	RES., SM, 3K01 0805, 1%,100ppm	1150-3A3011FP
R3	RES., SM, 75K0 0805, 1%,100ppm	1150-4A7502FP
R4	RES., SM, 100R0 0805, 1%,100ppm	1150-2A1000FP
R5	RES., SM, 3K01 0805, 1%,100ppm	1150-3A3011FP
R7	RES., SM, 22R1 1206, 1%,100ppm	1150-1B22R1FP
R8	RES., SM, 332R0 0805, 1%,100ppm	1150-2A3320FP
R9	RES., SM, 3K01 0805, 1%,100ppm	1150-3A3011FP
R10	RES., SM, 1K82 0805, 1%,100ppm	1150-3A1821FP
R11	RES., SM, 27K4 0805, 1%,100ppm	1150-4A2742FP
R12	RES., SM, 75K0 0805, 1%,100ppm	1150-4A7502FP
R13	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP
R14	POT., SM, 50K0 12T, TOP ADJUST	1172-M30503W5
R15	RES., SM, 383R0 0805, 1%,100ppm	1150-2A3830FP
R16	RES., SM, 470K0 0805, 1%,100ppm	1150-5A4703FP
R17, R18	RES., SM, 100K0 0805, 1%,100ppm	1150-5A1003FP
R19	POT., SM, 50K0 12T, SIDE ADJ.	1172-M30503X5
R20	RES., SM, 221K0 0805, 1%,100ppm	1150-5A2213FP
R21	RES., SM, 1K0 0805, 1%,100ppm	1150-3A1001FP
R22	RES., SM, 274K0 0805, 1%,100ppm	1150-5A2743FP
R23	RES., SM, 27K4 0805, 1%,100ppm	1150-4A2742FP
R24	POT., SM, 50K0 12T, TOP ADJUST	1172-M30503W5
R25	RES., SM, 4K75 0805, 1%,100ppm	1150-3A4751FP
R26	RES., SM, 100K0 0805, 1%,100ppm	1150-5A1003FP
R27	RES., SM, 30K9 0805, 1%,100ppm	1150-4A3092FP
R28	RES., SM, 75K0 0805, 1%,100ppm	1150-4A7502FP
R29	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP
R30	RES., SM, 56K2 0805, 1%,100ppm	1150-4A5622FP
R31	RES., SM, 100R0 0805, 1%,100ppm	1150-2A1000FP
R32	RES., SM, 1K0 0805, 1%,100ppm	1150-3A1001FP
R33	RES., SM, 2K21 0805, 1%,100ppm	1150-3A2211FP
R34	RES., SM, 10K0 0805, 1%,100ppm	1150-4A1002FP
R35	POT., SM, 5K0 12T, SIDE ADJ.	1172-M20502X5
R36	RES., SM, 10R0 0805, 1%,100ppm	1150-1A10R0FP
R37, R38	RES., SM, 22R1 1206, 1%,100ppm	1150-1B22R1FP
R39	RES., SM, 47R5 1206, 1%,100ppm	1150-1B47R5FP
R40	RES., SM, 1K82 0805, 1%,100ppm	1150-3A1821FP
R41	RES., SM, 27K4 0805, 1%,100ppm	1150-4A2742FP
R42	RES., SM, 4K75 0805, 1%,100ppm	1150-3A4751FP
R43	RES., SM, 22K6 0805, 1%,100ppm	1150-4A2262FP
R44	RES., SM, 221K0 0805, 1%,100ppm	1150-5A2213FP
R45	RES., SM, 3K74 0805, 1%,100ppm	1150-3A3741FP
R46	RES., SM, 332R0 0805, 1%,100ppm	1150-2A3320FP
R47	RES., SM, 3K92 0805, 1%,100ppm	1150-3A3921FP
TL1	COUPLER, DIRECT., 5 TURN,1.00"	1227-C5T10484

Ref Design	Description	Part No.
U1	AMP, RF,M68721,10W,118-137 MHz	2256-M6872100
U2	IC, LM386 LV AUDIO AMP.,SO-8	2323-386M1N08
U3	IC, LM2588,REG./ADJ,FLBK,T0263	2305-25880263
U4	IC, MC33172 DUAL OP AMP, SO-8	2302-33172N08
U5	IC, LM1084IT,REG./ADJ,5A,T0220	2205-10842203
U6	IC, MC33172 DUAL OP AMP, SO-8	2302-33172N08
XFMR1	TRANSFMR,RF/WB,.075-90MHz,1:16	1288-50B160D0

5.2 VT-3A130 Lowpass Filter Electrical Parts List

Ref Desig	Description	Part No.
C1	CAP., SM, 15pF PORCEL.,+-5%500V	1036-1B2150J5
C2	CAP., SM, 7.5pF PORCEL.,+-.25pF	1036-0B2759C5
C3, C4	CAP., SM, 30pF PORCEL., 5%,500V	1036-1B2300J5
C5	CAP., SM, 4.7pF PORCEL.,+-.25pF	1036-0B2479C5
C6	CAP., SM, 24pF PORCEL., 5%,500V	1036-1B2240J5
PCB	PCB, LPF,TX AMP,AM VT-3A130-10	4322-16500861
L1	COIL, 3 TURNS,18AWG,6.35 mm ID	1220-3T001622
L2	COIL, 4 TURNS,18ANG,6.35 mm ID	1220-4T001622
L3	COIL, 3 TURNS,18AWG,6.35 mm ID	1220-3T001622

5.3 VT-3A130 Amplifier Mechanical Parts List

Ref Description	Part No.	Qty.	
CABLE, COAX, RG316, TFE, WHITE, 6.1cm	7405-RG316000	1	LPF I/P to PA O/P
CASE, MT-3 VHF/UHF AMPLIFIER	3702-66102130	1	
CAP SCREW,8-32x1/4,HX BUT-9/64	5806-832BH04S	1	
CAP SCREW, M3x8 HEX SOCK-M2.5	5816-3M0SH08S	2	for U1
INSULATOR, THERM. COND.,TO-220	5622-1T220701	1	for U5
LID, CASE, MT-3 AMPLIFIER,ALUM	3702-66102151	1	
SCREW, M2 X 6, PAN/PHILLIPS,A2	5812-2M0PP06S	2	
SCREW, M2.5 X 6, PAN/PHIL., A2	5812-2M5PP06S	5	LPF to case
SCREW, M3 X 6, FLAT/PHIL., A2	5812-3M0FP06S	4	connector to case
SCREW, M3 x 8, PAN/PHIL, A2	5812-3M0PP08S	5	PCB to case,
SET SCREW, M3x3, HEX SOCKET,A2	5817-3M0AC03S	1	
SHOULDER WASHER, M3,.24"OD,NYL	5674-120N2440	1	for U5
TURRET TERMINAL, 4-40,.188L,Tn	5053-144M188T	1	
WIRE, PVC/STRAND., 22AWG,BLACK, 11.5cm	7110-22S07300	1	ground
WIRE, PVC/STRAND., 22AWG, RED, 10cm	7110-22S07300	1	13.8V power
WIRE, PVC/STRAND., 22AWG, ORG., 10cm	7110-22S07303	1	9.5V power
WIRE, PVC/STRAND.,22AWG,YELLOW, 10.5cm	7110-22S07304	1	modulation I/P
WIRE, PVC/STRAND., 22AWG, BLUE, 10.5cm	7110-22S07306	1	enable

6 REVISION HISTORY

ISSUE	DATE	DESCRIPTION AND (REASON)
1	May 97	• First Issue.
2	Mar 98	• To improve the performance at -40˚C. ECO #546. C35 was 2.2µF now not installed. R19 was 274R now not installed. R20 was 274R now not installed. R21 was 18R2 now 0R00. PCB was 50048-01 now 50048-02.
3	Mar 98	• Updated the PCB to make it easier to assemble. ECO #551. PCB was 50048-02 now 50048-03.
4	Mar 00	• Corrected the instruction manual part number on the title page. Part number was IM20-VT3A130AMP now IM22-VT3A130AMP • The Amplifier is now capable of working over the whole AM Frequency band (118 – 138 MHz) without being re-tuned.

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