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22 April 97  
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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Signature

Support

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## 1. GENERAL

### 1.1 Introduction

The MT 2/MT 3 repeater system is a VHF/UHF radio system which is characterized by high performance and reliability under the most severe environmental conditions. The total system is designed to provide dependable, low maintenance performance, even in the most difficult circumstances.

The MT 2/MT 3 series of modules are packaged in the compact Eurostandard (5"h x 2.8"w x 7.5"d) housing, and are robustly designed for mountain top or transportable applications. All of the modules use high reliability components and each module is accompanied with a complete operational test report on delivery.

The MT 2/MT 3 radio system is specifically designed to deliver high performance under adverse conditions and comply with the design specifications and the Industry Canada (IC) Radio Standards Specification (RSS 119). In addition, voltage stress testing is done over the range of +10 to +17 Volts DC which is followed by a 24 hour burn-in.

When the VT-2 transmitter is used as an exciter for the VHF AMP-2 power amplifier (PA) module, it will provide an adjustable 10 to 30 Watts RF output over the 138 to 174 MHz VHF frequency range. When the VT-3/150 transmitter is used as an exciter the RF output is only adjustable from 20 to 30 Watts.

The VHF AMP-2 family contains three models (AMP-2/145, AMP-2/155, and AMP-2/170) covering three frequency bands 138-150 MHz, 150-162 MHz, and 162-174 MHz respectively. The VHF AMP-2 power PA mates with the VT-2 VHF transmitter exciter module or VT-3/1xx-Sx transmitter exciter module. The combination may be mated with either the MT 2 or MT 3 series radio systems subrack.

### 1.2 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.

### 1.3 Performance Specifications

|                       |  |
|-----------------------|--|
| Frequency:            | 138 to 174 MHz   |
| Models                | AMP-2/145, AMP-2/155, AMP-2/170  |
| Output Power:         | 10-30 Watts (set by MT-2 exciter)<br>20-30 Watts (set by MT-3 exciter)   |
| Output Impedance:     | 50 $\Omega$  |
| Spurious & Harmonics: | Less than 0.25 uW  |
| Operating Voltage:    | +13.8 VDC nominal, range +11 to +16 VDC  |
| Transmit Current:     | 3.5 to 5.5 A @ 30 W 138-174 MHz  |
| Standby Current:      | Minimum 2 mA options 20 mA   |
| Thermal:              | Thermal interlock disables @ 80°C (175°F)  |
| Duty Cycle:           | Continuous (with Fan) -40°C to +60°C Operation<br>Intermittent (without Fan) -40°C to +60°C  |
| Options:              | •Power on indicator.   |
| Exciter               | VT-2 4 W output for 30 W P.A   |
| D.O.C. Approval No:   | VT-2 & AMP-2/150: 142 193 429 C (Land)<br>VT-2 & AMP-2/150: 142 821 531 L (Marine)<br>VT-3 & AMP-2/150: 142 194 316 C (Land)<br>VT-3 & AMP-2/150: 142 822 163 L (Marine) |
| F.C.C. Approval:      | H4JVT-2<br>H4JVT-30  |

### 1.4 Physical Specifications

|                        |  |
|------------------------|--|
| Operating Temperature: | -40°C to +60°C   |
| Operating Humidity:    | Up to 95% R.H. @ 25°C  |
| RF Connectors:         | Type N Standard  |
| Corrosion Prevention:  | Anodized aluminum construction. Stainless steel hardware. Selectively applied Conformal coated glass epoxy printed circuit boards. |
| Physical Dimensions:   | <u>Width:</u> <u>Height:</u> <u>Depth:</u><br>14.2 cm (5.6")    12.8 cm (5.05")    19 cm (7.5")                                    |
| Weight:                | 1.6 kg (3.5 lb)  |
| Features:              | •Heavy Duty Aluminum Heatsink:<br>•Full power and overtemp indicators<br>•Thermal switched (+40°C) Fan.                            |

## **2. THEORY OF OPERATION**

### **2.1 General**

The MT-2 series VHF AMP-2 power amplifier consists of a main RF printed circuit board (PCB) and a RF sensor PCB. The VHF AMP-2 power amplifier is compatible with all MT-2 and MT-3 rack mounting systems and VT-2 VHF and VT-3/1xx-Sx exciters. The VHF AMP-2 has three models (AMP-2/145, AMP-2/155, and AMP-2/170) covering three frequency bands 138-150 MHz, 150-162 MHz, and 162-174 MHz respectively.

### **2.2 RF Sensor Circuitry**

DC power is applied at two points to the power amplifier: +9.5 volts regulated to pins B6, Z6 and +11 to +16 volts to pins B2, Z2. The +9.5 volts DC is applied to all RF sensing circuits ie: RF power O/P indicator transistors Q2 and Q3; and the wideband S.O.E. transistor Q1.

RF sampling via C28 is rectified and filtered by CR1, C29, and C30 (RF PCB). This DC level is applied to Q3 via connector J2. R11 provides DC drive to Q2 therefore setting the RF O/P power threshold for CR4 (TX PWR. LED).

### **2.3 RF Circuitry**

The VHF VT-2 or VT-3/1xx-Sx 4 watt exciter drives the VHF AMP-2 power amplifier. RF is fed through J5 (exciter input) to Q1, a wide band SOE transistor. Q1 is mounted through the extrusion to the heatsink but maintains thermal contact to TH1 (thermal switch) via the extrusion. C2 provides input matching to Q1 and is peaked for minimum reflected power. C17 and C19 match the collector of Q1 to the low pass filter network and should be peaked for maximum RF power. The RF power is sampled by C28, then rectified through CR1, C29, and C30. This D.C level is applied to the R.F sensor board and is used to adjust CR4's intensity level from 10-30 watts. The Low pass filter network L7, L8, L9, L10 and associated capacitors provide a 250 MHz LPF cut off frequency. C4 and C13 are select values dependent on the frequency band.

TH2 thermal switch activates the front panel fan when the temperature in the proximity of Q1 reaches +40°C. The fan is connected to the positive 11 VDC - 16 VDC supply, therefore variations in fan noise and velocity are normal under various supply conditions.

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### 3. INSTALLATION AND SITE OPERATION

The VHF AMP-2 RF power amplifier is approved for operation with the VT-2 or VT-3/1xx-Sx exciter. Complete M3 subracks shipped directly from the factory are normally set to the appropriate options and O/P power calibration as requested by the customer. These units require no recalibration.

For VHF AMP-2 RF power amplifiers shipped separately from the MT-2 racks, install as outlined:

1. Confirm exciter and PA are aligned for the same frequency. (See Alignment Procedure).
2. Remove the blank cover plates or TX-RX pair in the "B" System subrack slots.
3. Install the VHF AMP-2 in slot 39 (visible via the marker hole on the upper left VHF AMP-2 front panel).

NOTE: If the unit is set up with the extender card there will be a voltage drop of +1 to +1.5 VDC when the power amplifier is transmitting. This voltage drop must be compensated for valid power O/P readings. Adjust the power supply for 13.8VDC at the power amplifier.

4. Connect the output of the exciter to the input of the VHF AMP-2 power amplifier with the cable provided.
5. Connect the antenna system and key the transmitter. The LED indicators are defined as follows:
  - A. Power Indicator - indicates +13.8 VDC is applied to the transmitter when the ON-OFF switch is activated. An internal connector on the sensor PCB disables the power indicator LED in the event standby LED current drain must be eliminated.
  - B. TX Indicator - indicates that a preset forward RF power level is present at the transmitter output. The threshold level is internally adjustable for various RF output levels over the 10-30 watt range.
  - C. OT Indicator - (over temperature) a thermostat control switch interrupts the input supply voltage (nominally +13.8 VDC) to the PA when the heat sink temperature exceeds 175 °F (80 °C). The over temp thermostat will reset at 145 °F (63 °C), thus providing hysteresis. The OT indicator is only operational when exciter drive is present.

The fan is activated automatically when the VHF PA O/P transistor temperature sensor reaches +40°C. The fan's operating temperature range is -20°C to +60°C. The fan sensor will not activate the fan when ambient temperature is below -20°C.



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## **4. VHF AMP-2 ALIGNMENT**

### **4.1 Test Equipment List**

To align the transmitter the following test equipment is recommended:

M-2/M3 rack/system monitor  
Power supply regulated 0-16 volt DC @ 10 A  
Wattmeter, Bird 6104  
Socal, power pad 50 ohm splitter, dummy load  
Spectrum Analyzer IFR 7550  
Alignment Tool Johanson 8777  
Extender Card Daniels EC-48R or EC-48UK  
SWR Meter, 10 W 200 MHz  
Dummy Load 50Ω 50W  
Current Meter (10A)  
DC Voltmeter

### **4.2 Amplifier Alignment**

1. Remove the right side extrusion from the 4 watt exciter. Install the exciter in the system A side of the M-2 or M-3 subrack. Remove all receivers from the M-2 rack (this will facilitate easier power O/P calibration).
2. Install the extender card in the location for the VHF AMP-2 power amplifier (System B). Connect the extender cable to the VHF AMP-2 module and connect the RF exciter output of the exciter to the input of the VHF AMP-2 PA via the VSWR meter.
3. Turn the power adjustment pot, (R49) in the exciter transmitter fully clockwise in order to achieve the maximum power output. Attach a wattmeter, terminated with a 50 ohm resistive load to the output of the VHF AMP-2. Apply +13.8 VDC to the subrack, activate the transmitter (exciter and VHF AMP-2) and measure the DC supply voltage on the Thermostat (TH1) temperature switch lug. Adjust the external power supply voltage until there is +13.8 VDC at the TH1 thermostat lug. This will compensate for the DC voltage drop across the extender card and cables.
4. While the VHF AMP-2 is tuned for maximum RF power output it may be necessary to re-adjust the power supply to maintain +13.8 VDC at the VHF AMP-2 supply input (measure at TH1).

5. Monitor the RF power output of the VHF AMP-2 and adjust C19, C17 and C2 for maximum output power, minimum current, and the lowest VSWR (typically 1.1:1, maximum 1.5:1 between 10 to 30W) respectively.
6. Set the power amplifier power to 10W and adjust C2 for minimum VSWR. Set the power amplifier power to 30W and readjust C2 for minimum VSWR. Recheck the VSWR at 10W.  
Remove the VSWR meter from between the exciter and VHF AMP-2 and set the power amplifier output to 30W and readjust C17, C19 for maximum power and minimum current. Do not adjust C2.

NOTE: C17 has a broad tuning range that mainly affects the current consumption of the VHF AMP-2.

**IMPORTANT:** Remove the VSWR meter before adjusting for the desired power output level. Set the O/P power by adjusting the exciter level. (See rack mounting positions figure 1)

7. Confirm RF output spectral purity by measurement using a power splitter with a spectrum analyzer. Adjust the external DC voltage supply from +11 to +16 VDC and confirm that there are no observable changes in the spectral purity.

NOTE: Extreme mistuning of capacitor adjustments may result in spurious emission, excessive (VHF AMP-2 PA) current consumption and high exciter to VHF AMP-2 VSWR. Maximum continuous collector current for Q1 is 7 Amps @ +16 VDC.

#### Capacitor Selections

| Model     | Frequency   | C1    | C3   | C4            | C13  | C18           |
|-----------|-------------|-------|------|---------------|------|---------------|
| AMP-21145 | 138-150 MHz | 120pF | 60pF | 33pF          | 43pF | 10pF          |
| AMP-21155 | 150-162 MHz | 100pF | 60pF | Not Installed | 43pF | Not Installed |
| AMP-21170 | 162-174 MHz | 33pF  | 43pF | Not Installed | 75pF | Not Installed |

### 4.3 Sensor Circuitry

1. After completion of the Amplifier alignment, set the PA power to 10 watts and adjust R11 until the LED CR4 is barely visible. Set the Power to 30 watts and the LED should be bright. This control is set to indicate that a forward RF power condition is present at the VHF AMP-2 PA output.

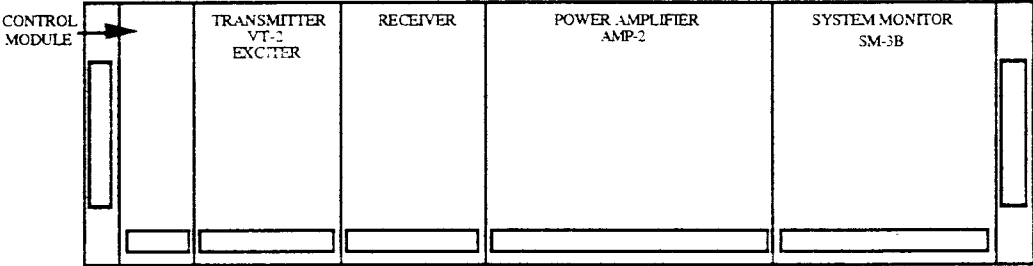
#### OPTION:

Power Indicator (13.8 VDC) consumes 15-20 mA. Disabled by removing JU1.

5. ILLUSTRATIONS AND SCHEMATIC DIAGRAMS

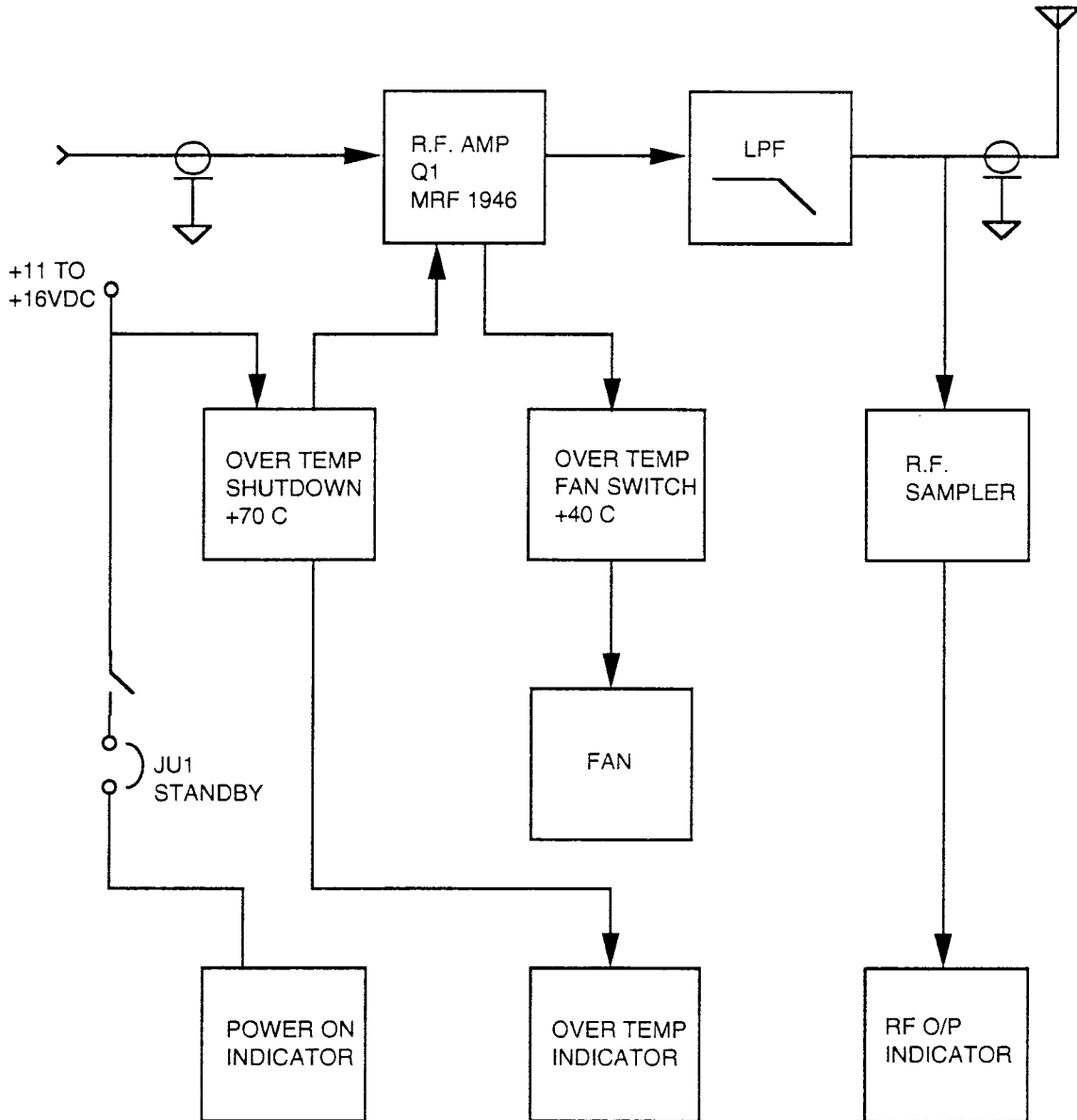
5.1 Rack Mounting Positions

Figure 5-1



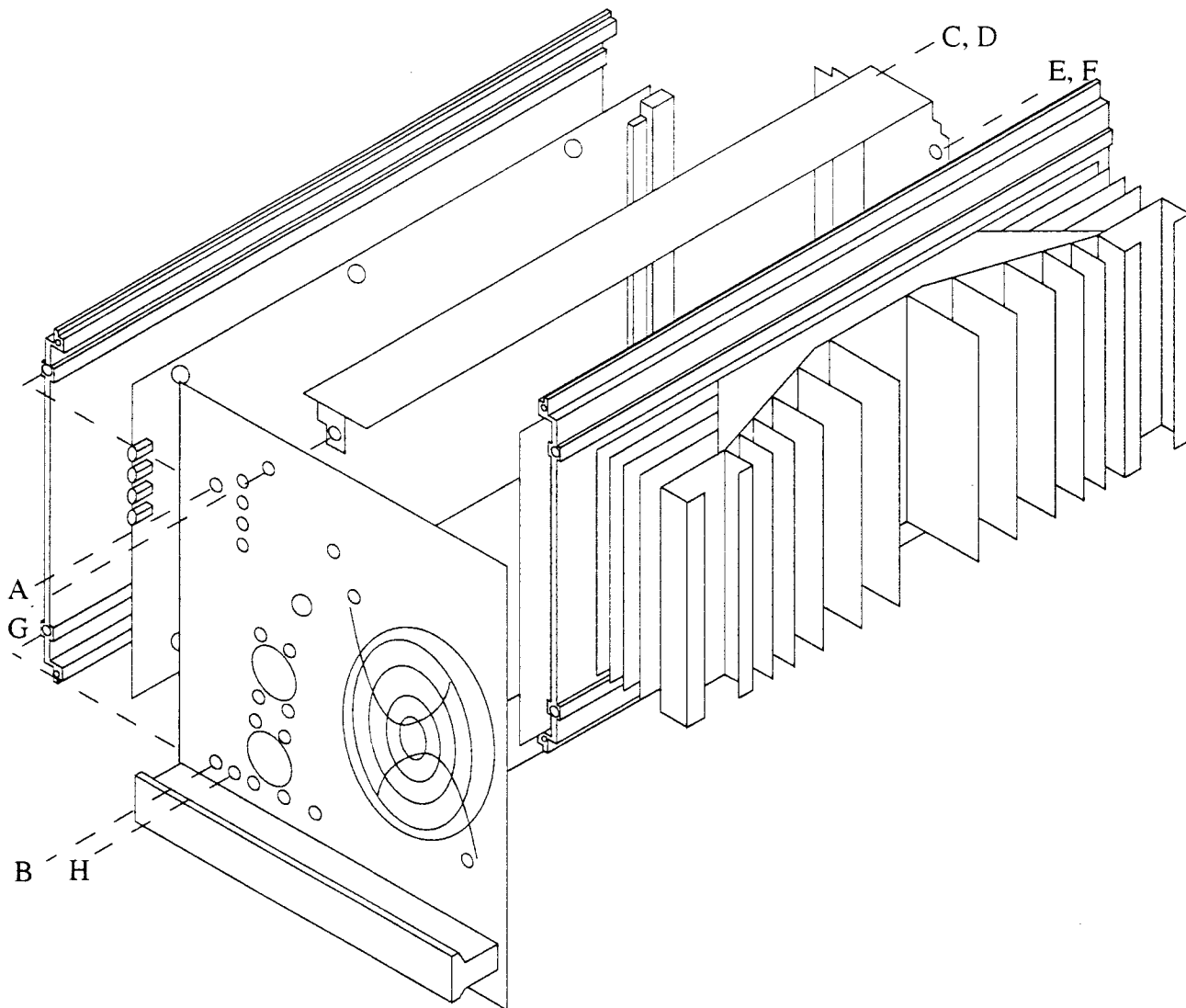
8843M1

5.2 VHF AMP-2 Power Amplifier Block Diagram  
Figure 5-2



8842M2

### 5.3 VHF AMP-2 Exploded View Figure 5-3

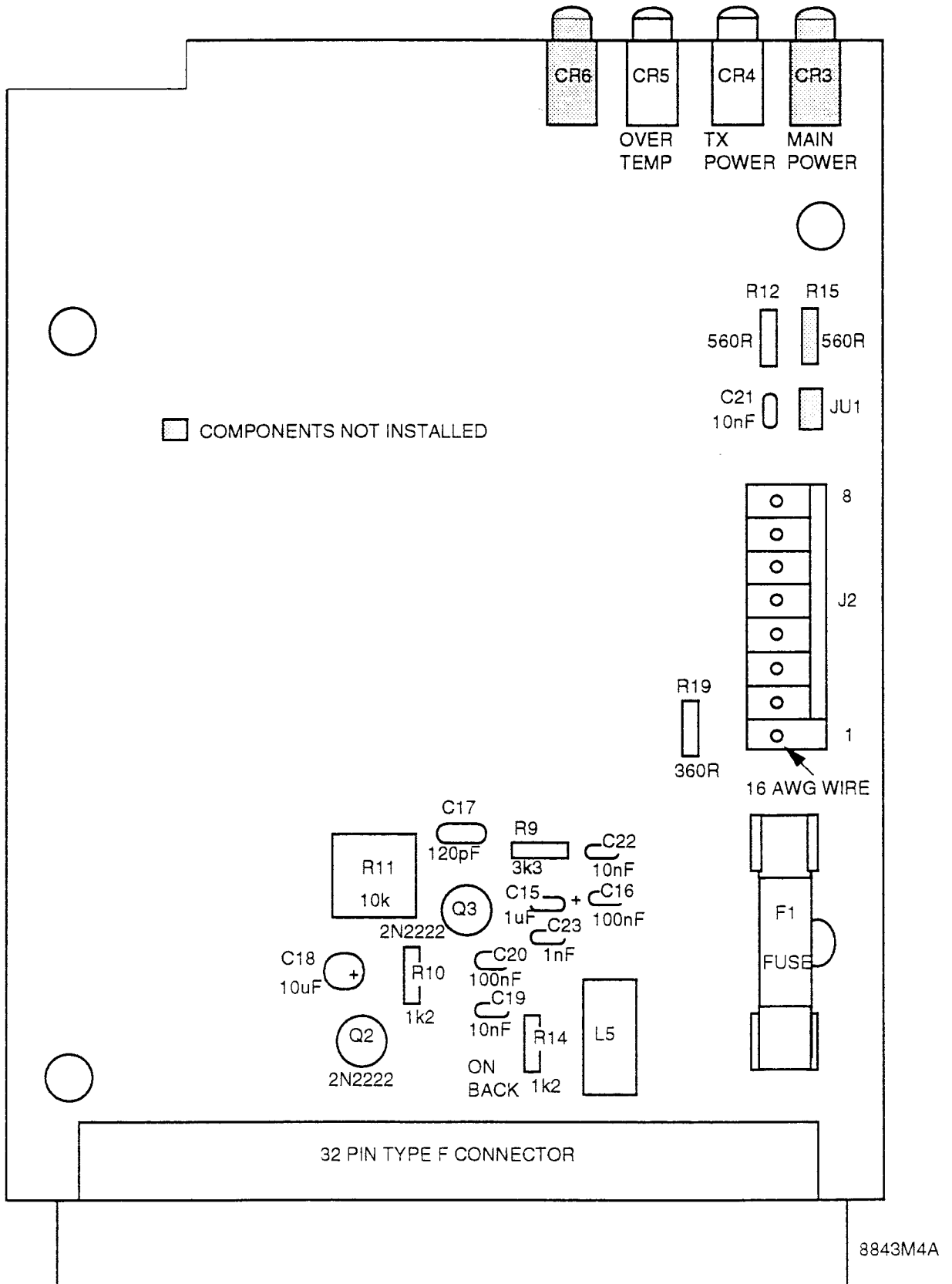


8842M3

#### Amplifier Access:

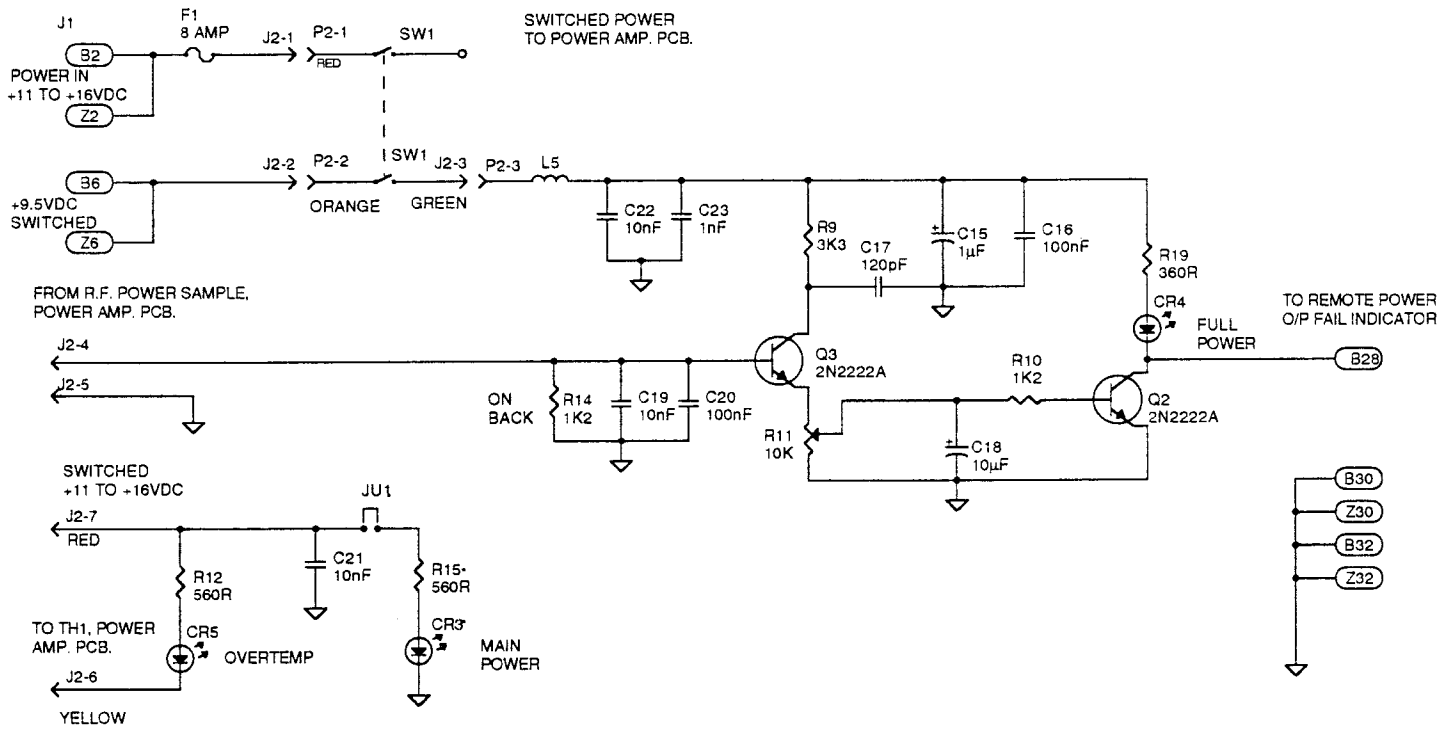
1. Remove screws A-D (M3X8mm CSK).
2. Remove screws E-H (M3X6mm PAN).
3. Lift off left side tuning cover.
4. Lift off wrap around cover.

5.4 VHF AMP-2 RF Sensor Board Component Layout  
Figure 5-4



# 5.5 VHF AMP-2 Sensor Board Schematic Diagram

Figure 5-5



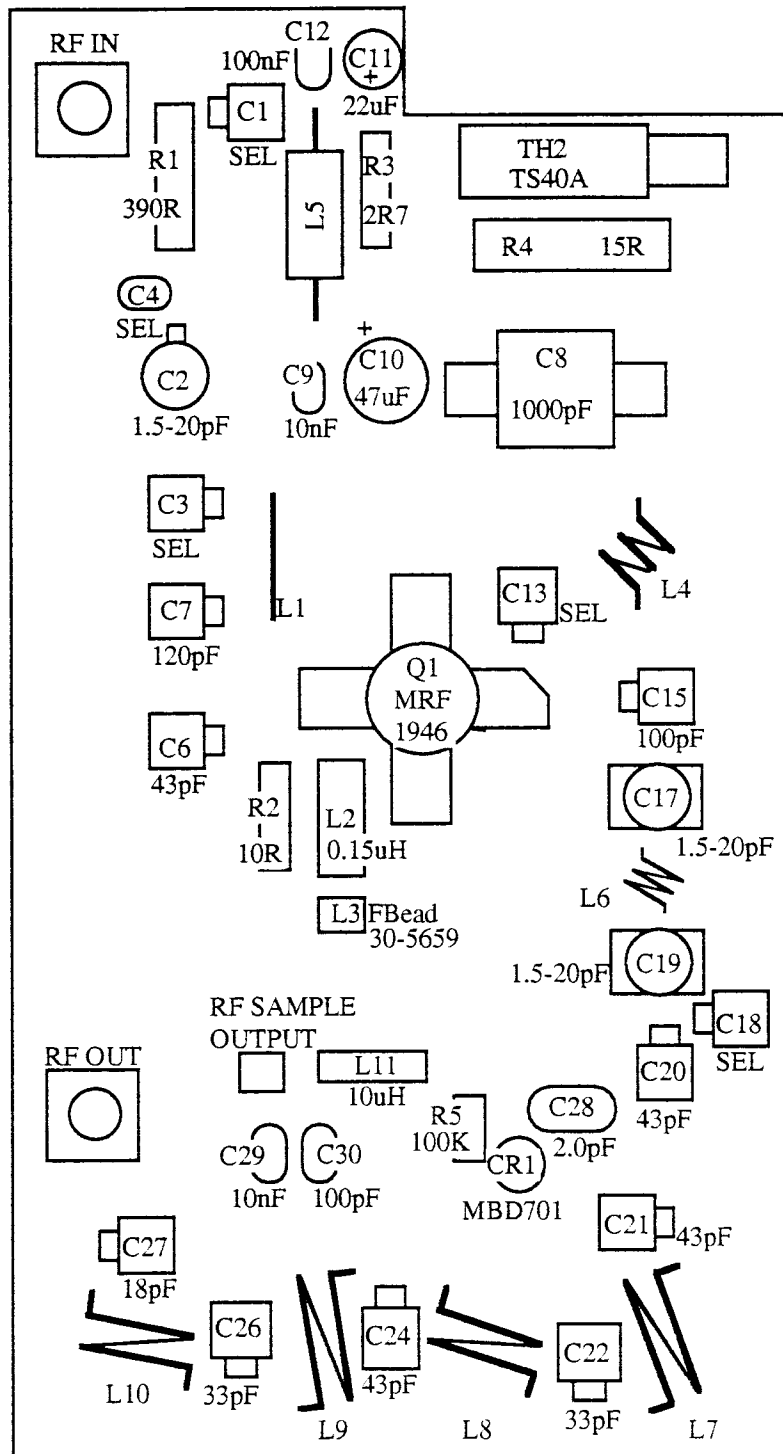
- NOTES  
 1) \* DENOTES COMPONENTS NOT INSTALLED.  
 2) ALL RESISTORS 1/2 WATT UNLESS OTHERWISE STATED.

| HIGHEST REFERENCE DESIGNATORS |         |    |
|-------------------------------|---------|----|
| C23                           | CR5     | L5 |
| Q3                            | R19     | J2 |
| F1                            |         |    |
| UNUSED REFERENCE DESIGNATORS  |         |    |
| C1-C14                        | CR1-CR2 | Q1 |
| R1-R8                         | L1-L4   |    |

|                               |                           |               |
|-------------------------------|---------------------------|---------------|
| <b>DE DANIELS ELECTRONICS</b> |                           | VICTORIA B.C. |
| TITLE: RF SENSOR BOARD VT-30  |                           |               |
| DATE: 26 OCT 1991             | DWN BY: S. SHANNON        | APRVD:        |
| DWG No: 8842M5                | DWG REV DATE: 14 DEC 1992 |               |
| BOARD No: 43-884311           | BOARD REV: 1.1            |               |



**5.6 VHF AMP-2 Power Amplifier Board Component Layout**  
 Figure 5-6

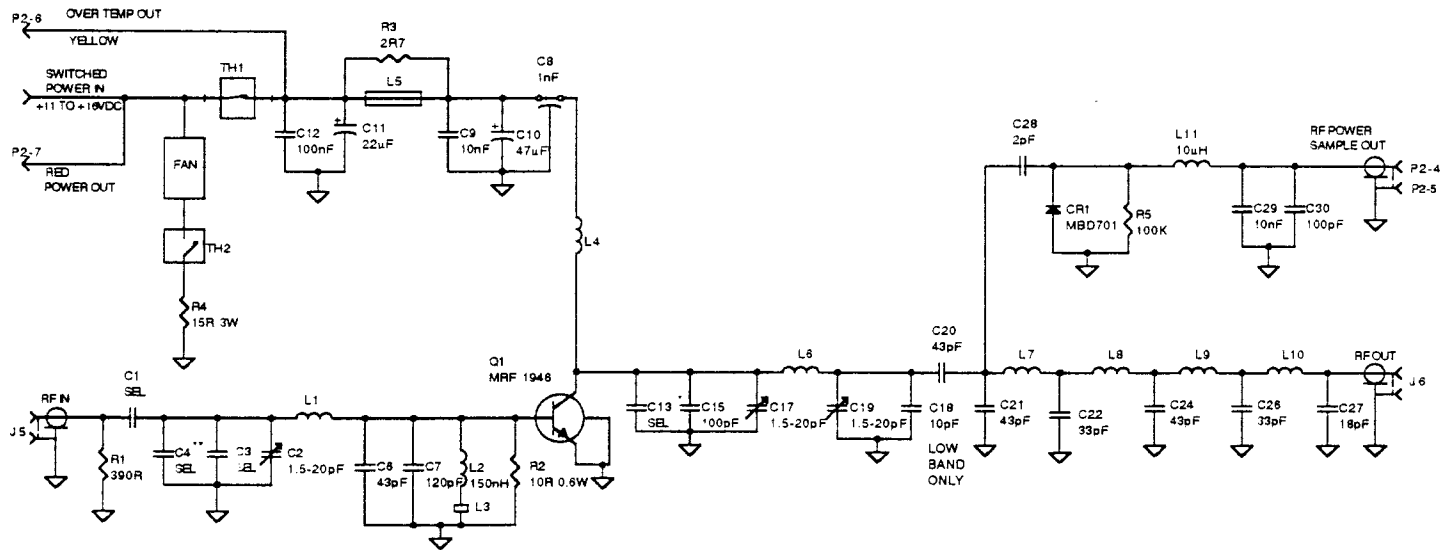


8842M6B

| FREQUENCY BAND SELECTION |       |      |               |      |               |
|--------------------------|-------|------|---------------|------|---------------|
|                          | C1    | C3   | C4            | C13  | C18           |
| 138-150MHz               | 120pF | 60pF | 33pF          | 43pF | 10pF          |
| 150-162MHz               | 100pF | 60pF | Not Installed | 43pF | Not Installed |
| 162-174MHz               | 33pF  | 43pF | Not Installed | 75pF | Not Installed |

# 5.7 VHF AMP-2 Power Amplifier Schematic Diagram

Figure 5-7



| FREQUENCY BAND SELECTION |       |      |               |      |               |
|--------------------------|-------|------|---------------|------|---------------|
|                          | C1    | C3   | C4            | C13  | C18           |
| 138-150MHz               | 120pF | 80pF | 33pF          | 43pF | 10pF          |
| 150-182MHz               | 100pF | 80pF | Not installed | 43pF | Not installed |
| 182-174MHz               | 33pF  | 43pF | Not installed | 75pF | Not installed |

- NOTES
- 1) ALL RESISTORS 1/2 WATT UNLESS OTHERWISE STATED.
  - 2) TH1, THERMOSTAT IS IN THERMAL CONTACT WITH CASE.
  - 3) \*DENOTES COMPONENT USED TO MATCH IMPEDENCE WITH Q1. VALUE IS 75pF OR 43pF IF C17 TUNED TO BOTTOM.
  - 4) \*\*DENOTES COMPONENT USED TO MATCH IMPEDENCE WITH EXITER OUTPUT. VALUE VARIES 8-33pF FOR LOW BAND, NOT INSTALLED FOR HIGH BAND.

| HIGHEST REFERENCE DESIGNATORS |     |     |
|-------------------------------|-----|-----|
| C30                           | CR1 | L11 |
| Q1                            | R5  | TH2 |
| J6                            | P2  |     |
| UNUSED REFERENCE DESIGNATORS  |     |     |
| C5                            | C14 | C16 |
| C23                           | C25 | P1  |
| J1-J4                         |     |     |

|                                  |                                |               |
|----------------------------------|--------------------------------|---------------|
| <b>DE DANIELS ELECTRONICS</b>    |                                | VICTORIA B.C. |
| TITLE: VHF POWER AMPLIFIER VT-30 |                                |               |
| DATE: 26 OCT 1991                | DWN BY: S. SHANNON             | APRVD:        |
| DWG No: 3842M7B                  | DWG REV DATE: 04 NOVEMBER 1994 |               |
| BOARD No: 43-984221              | BOARD REV: 2.1                 |               |

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## 6. PARTS LIST - VHF AMP-2

### 6.1 VHF AMP-2 Power Amplifier Parts List - PCB No. (43-884221)

| Ref<br>Desig | Description                                   | Part No.      |
|--------------|---|---------------|
| C1           | CAP., 33pF METAL CLAD, 5% 250V (162-174 MHz)  | 1046-1A330JCB |
| C1           | CAP., 100pF METAL CLAD, 5% 250V (150-162 MHz) | 1046-2A101JCB |
| C1           | CAP., 120pF METAL CLAD, 5% 250V (138-150 MHz) | 1046-2A121JCB |
| C2           | CAP., TRIM. 1.5-20pF VERT. >12T               | 1082-C1R5020F |
| C3           | CAP., 43pF METAL CLAD, 5% 25V (162-174 MHz)   | 1046-1A430JCB |
| C3           | CAP., 60pF METAL CLAD, 5% 250V (138-162 MHz)  | 1046-1A600JCB |
| C4           | CAP., 10pF CER., +-2%,100V,NPO (138-150 MHz)  | 1003-1B100C0G |
| C4           | CAP., NOT INSTALLED (150-174 MHz)             |               |
| C6           | CAP., 43pF METAL CLAD, 5% 250V                | 1046-1A430JCB |
| C7           | CAP., 120pF METAL CLAD, 5% 250V               | 1046-2A121JCB |
| C8           | CAP., 1nF METAL CLAD, 5% 350V                 | 1046-3C102JCC |
| C9           | CAP., 10nF CER., 80/-20%, 63V, .2"SP          | 1004-4B103Z5V |
| C10          | CAP., 47µF DIP. TANT. 20%, 35V                | 1054-6M476M35 |
| C11          | CAP., 22µF DIP. TANT. 20%, 20V                | 1054-6G226M20 |
| C12          | CAP., 100nF MONO., 20%, 50V, Z5U              | 1007-5B104M5U |
| C13          | CAP., 43pF METAL CLAD, 5%, 250V (138-162 MHz) | 1046-1A430JCB |
| C13          | CAP., 75pF METAL CLAD, 5%, 250V (162-174 MHz) | 1046-1A750JCB |
| C15          | CAP., 100pF METAL CLAD, 5% 250V               | 1046-2A101JCB |
| C17          | CAP., TRIM. 1.5-20pF VERT. >12T               | 1082-C1R5020F |
| C18          | CAP., 10pF METAL CLAD, 5%, 25V (138-150 MHz)  | 1046-1A100JCB |
| C18          | CAP., NOT INSTALLED                           |               |
| C19          | CAP., TRIM. 1.5-20pF VERT. >12T               | 1082-C1R5020F |
| C20          | CAP., 43pF METAL CLAD, 5% 250V                | 1046-1A430JCB |
| C21          | CAP., 43pF METAL CLAD, 5% 250V                | 1046-1A430JCB |
| C22          | CAP., 33pF METAL CLAD, 5% 250V                | 1046-1A330JCB |
| C24          | CAP., 43pF METAL CLAD, 5% 250V                | 1046-1A430JCB |
| C26          | CAP., 33pF METAL CLAD, 5% 250V                | 1046-1A330JCB |
| C27          | CAP., 18pF METAL CLAD, 5% 250V                | 1046-1A180JCB |
| C28          | CAP., 2.0pF MICA, +/- .5pF, 500V              | 1044-0A020DCD |
| C29          | CAP., 10nF CER., 80/-20%, 63V, .2"SP          | 1004-4B103Z5V |
| C30          | CAP., 100pF CER 2% 100V NPO, .2"SP            | 1003-2B101C0G |
| CR1          | DIODE, MBD701 HOT CARRIER                     | 2005-MBD70100 |
| L1           | WIRE, BUSS, 18AWG 0.18"ID                     | CONSUMABLE    |
| L2           | CHOKE, RF/MOULD., 150nH, 10%, 0.37            | 1251-2B00R15K |
| L3           | FERRITE,.BEAD, 43 MIX, 3X3.5mm OD             | 1210-43030350 |
| L4           | WIRE, MAGNET, 16AWG, HEAVY.BROWN              | 7142-10001601 |
| L5           | WIRE, BUSS, 16AWG, TIN COPPER                 | CONSUMABLE    |
| L6           | COIL, 2.5 TURNS, 20AWG, 0.11"ID               | 1220-2T502005 |
| L7           | COIL, 1.62 TURNS, 16AWG, 0.325"ID             | 1220-1T621615 |
| L8           | COIL, 1.62 TURNS, 16AWG, 0.325"ID             | 1220-1T621615 |
| L9           | COIL, 1.62 TURNS, 16AWG, 0.325"ID             | 1220-1T621615 |
| L10          | COIL, 1.62 TURNS, 16AWG, 0.325"ID             | 1220-1T621615 |
| L11          | CHOKE, RF/MOULD.,10uH,10%..25"                | 1251-4A00100K |

## Parts List VHF AMP-2 Power Amplifier (continued)

| Ref   |                                   |               |
|-------|-----------------------------------|---------------|
| Desig | Description                       | Part No.      |
| Q1    | TRANS, MRF 1946, VHF, 30W         | 2025-MRF19460 |
| R1    | RES., 390R METAL FILM, 5%, 2W     | 1105-2A0391JI |
| R2    | RES., 10R METAL FILM, 5% 0.5W     | 1101-1A0100JP |
| R3    | RES., 2R7 METAL FILM, 5% 0.5W     | 1101-0A02R7JI |
| R4    | RES., 15R METAL FILM, 5% 3W       | 1105-1B0150JI |
| R5    | RES., 100K METAL FILM, 5% 0.5W    | 1101-5A0104JP |
| TH1   | SWITCH, TEMP/175°F, SPST, NC, 10A | 5281-175SB15A |
| TH2   | SWITCH, TEMP., 40°C, SPST, NO, 3W | 5281-C40SA310 |

## 6.2 VHF AMP-2 Power Amplifier Mechanical Parts List - PCB No. (43-884221)

| Description                           | Part No.        | Qty. |
|---------------------------------------|-----------------|------|
| BUSHING, 1/4", NYLON, 0.312" HOLE     | 5673-250N312A   | 1    |
| TIE STRAP, .1"WX3", LOCK., NYL.       | 5660-1003L01N   | 6    |
| CABLE, COAX, RG316 TFE, WHITE, 15.5cm | 7405-RG316000   | 1    |
| CABLE, SMA PLUG-N PANEL JK, 14cm      | 7910-SP6NJ014   | 1    |
| CABLE, SMA PLUG-N PANEL JK, 19cm      | 7910-SP6NJ019   | 1    |
| CABLE, N PLG-PLG, RG223/U, 37cm       | CBL223-NPONP037 | 1    |
| CONN, SMA STR. JK, PC MNT, .281       | 5112-J28100BG   | 2    |
| COVER, WRAP AROUND, POWER AMP         | 3702-62302020   | 1    |
| GUARD, FOR 60mm SQ. FAN, STEEL        | 6519-60602R0S   | 1    |
| FAN, 12VDC, 60X60X25mm, 9CFM          | 6510-60251209   | 1    |
| FASTENER, QUICK RELEASE, C/PKG        | 3702-10000120   | 4    |
| PANEL, FR, SLK, V/UHF PWR AMP.        | 3802-61002010   | 1    |
| HANDLE, 28HP, GREY                    | 3702-10000628   | 1    |
| HEATSINK, VT-30/UT-30, BLACK          | 5572-20884910   | 1    |
| HOUSING, .156,CRIMP TERM,7 CCT        | 5022-156HS07L   | 1    |
| LABEL, FOIL, RF MODULE                | 3501-27101000   | 1    |
| LOCKWASHER, M3 SPLIT, A2              | 5814-3M0LK00S   | 4    |
| LUG, NO.10, .85"L., INT. TOOTH        | 5682-S1085000   | 1    |
| LABEL/LEXAN, 28HP, VHF: RED           | 3536-10212805   | 1    |
| NAMEPLATE, BLANK, 28HP, GREY          | 3702-10001228   | 1    |
| NUT, M2.5, SQUARE(5.0mm), ZINC        | 5813-2M5SQ50Z   | 2    |
| NUT, M3, HEX, 5.4mm FLATS, A2         | 5813-3M0HX54S   | 8    |
| NUT, M4, HEX, 6.9mm FLATS, A2         | 5813-4M0HX69S   | 2    |
| PCB, VHF 30W AMPLIFIER (VT-30)        | 4321-80884221   | 1    |
| HOLE PLUG, 0.187" HOLE, NYLON, BLACK  | 5671-187N062B   | 2    |

## Parts List VHF AMP-2 Power Amplifier Mechanical (continued)

| Description                              | Part No.      | Qty. |
|--|---------------|------|
| CAP SCREW, M3x8 HEX SOCK-M2.5            | 5816-3M0SH08S | 2    |
| SCREW, M5 x 12, PAN/PHIL                 | 5812-5M0PP12S | 4    |
| SCREW, M2.5 x 12, C/SNK, FLAT PHIL, Ni   | 5812-2M5FP12N | 2    |
| SCREW, M3 x 4, PAN PHIL, A2              | 5812-3M0PP04S | 5    |
| SCREW, M3 x 6 PAN PHILLIPS, A2           | 5812-3M0PP06S | 10   |
| SCREW, M3 x 8, OVAL C/S/PHIL, A2         | 5812-3M0VP08S | 8    |
| SCREW, M3X8, PAN PHIL, A2                | 5812-3M0PP08S | 16   |
| SCREW, M4 x 35, PAN/PHIL, A2             | 5812-4M0PP35S | 2    |
| SEAL, SLOTTED, .234-64 UNS-2             | 1083-S234T640 | 3    |
| SIDE PANEL, VT-30, HEATSINK              | 3802-62002020 | 1    |
| PANEL, SIDE, 160mm, ALUMINUM             | 3702-23160000 | 1    |
| TAB, GND, VT-30 TRIM CAP., BR            | 3702-67002025 | 4    |
| NUT, SWITCH-1/4-40UNS, BRASS.NI          | 5219-2540BN00 | 1    |
| SWITCH, TOG./DPDT, ON-NONE-ON            | 5205-T2U21P02 | 1    |
| TAB, GND, M3, 2-WAY/90~, BRASS/Ni        | 3702-67802010 | 4    |
| RECEPT., TAB/.250", 16-14, INSUL         | 5065-250R16A4 | 1    |
| TERMINAL, TRIFURC./FEM., CRIMP, 18-20    | 5022-156CTFT0 | 1    |
| TERMINAL, TRIFURC./FEM., CRIMP, 22-26    | 5022-156CTFT3 | 5    |
| WASHER, FLAT, M5, 10mm OD                | 5814-5M0FLA0S | 4    |
| LOCKWASHER, M5, SPLIT, A2 STEEL          | 5814-5M0LK00S | 4    |
| LOCKWASHER, M4, SPLIT, A2                | 5814-4M0LK00S | 18   |
| WIRE, PVC/STRAND., 16AWG, RED, 10.5cm    | 7110-16S26302 | 1    |
| WIRE, PVC/STRAND., 16AWG, RED, 6.4cm     | 7110-16S26302 | 3    |
| WIRE, PVC/STRAND., 22AWG, GREEN, 14.5cm  | 7110-18S16305 | 1    |
| WIRE, PVC/STRAND., 22AWG, ORANGE, 14.5cm | 7110-22S07303 | 1    |
| WIRE, PVC/STRAND., 22AWG, RED, 18cm      | 7110-22S07302 | 1    |
| WIRE, PVC/STRAND., 22AWG, YELLOW, 18cm   | 7110-22S07304 | 1    |

### 6.3 RF Sensor PCB Parts List - PCB No. (43-884311)

| Ref<br>Desig | Description                                     | Part No.      |
|--------------|---|---------------|
| C15          | CAP., 1 $\mu$ F DIP.TANT. 20%, 35V              | 1054-5A105M35 |
| C16          | CAP., 100nF MONO., 20% 50V, Z5U                 | 1007-5B104M5U |
| C17          | CAP., 120pF CER 2% 100V NPO .2"                 | 1003-2B121C0G |
| C18          | CAP., 10 $\mu$ F DIP. TANT. 20% 25V             | 1054-6E106M25 |
| C19          | CAP., 10nF CER., 80/20%, 63V, .1"SP             | 1004-4A103Z5V |
| C20          | CAP., 100nF MONO., 20% 50V, Z5U                 | 1007-5B104M5U |
| C21          | CAP., 10nF CER., 80/20%, 63V, .1"SP             | 1004-4A103Z5V |
| C22          | CAP., 10nF CER., 80/20%, 63V, .1"SP             | 1004-4A103Z5V |
| C23          | CAP., 1nF CER., 10%, 100V, Y5P                  | 1004-3A102Y5P |
| CR3          | DIODE, LED, PC MOUNT, NYLON, R/A, RED, OPTIONAL | 2017-391N05RD |
| CR4          | DIODE, LED, PC MOUNT, NYLON, R/A, RED, OPTIONAL | 2017-391N05RD |
| CR5          | DIODE, LED, PC MOUNT, NYLON, R/A, RED, OPTIONAL | 2017-391N05RD |
| F1           | FUSE, 8 AMP FAST-BLO 1-1/4 IN.                  | 5604-5GAGC080 |
| L5           | CHOKER/RF, FERRITE, 2.5 TURNS                   | 1211-43061025 |
| Q2           | TRANS, 2N2222A NPN, T0 18                       | 2020-2N2222A0 |
| Q3           | TRANS, 2N2222A NPN, T0 18                       | 2020-2N2222A0 |
| R9           | RES., 3K3 METAL FILM, 5% 0.5W                   | 1101-3A0332JP |
| R10          | RES., 1K2 METAL FILM, 5% 0.5W                   | 1101-3A0122JP |
| R11          | POT., 10K SINGLE TURN, HORIZ. MTG.              | 1171-S30103P1 |
| R12          | RES., 560R METAL FILM, 5% 0.5W                  | 1101-2A0561JP |
| R14          | RES., 1K2 METAL FILM, 5% 0.5W                   | 1101-3A0122JP |
| R15          | RES., 560R METAL FILM, 5% 0.5W, OPTIONAL        | 1101-2A0561JP |
| R19          | RES., 360R METAL FILM, 5% 0.5W                  | 1101-2A0361JP |



## 6.4 RF Sensor Mechanical Parts List - PCB No. (43-884311)

| Description                        | Part No.      | Qty. |
|------------------------------------|---------------|------|
| NUT, M2.5, HEX, 5.0mm FLATS, A2    | 5813-2M0HX50S | 2    |
| SCREW, M2.5 x 10, CHEESE/SLOT, Ni  | 5812-2M5CS10N | 2    |
| CONN, F/32, MALE, R/A PCB          | 3720-6032M0RA | 1    |
| HEADER, .156", 7 PIN/Au, LOCKING   | 5022-156HD07L | 1    |
| FUSE CLIP, 0.250" DIAM., W/EAR     | 5609-C250P01B | 2    |
| STANDOFF, 7/32 OD, 1/4L, M3, SWAGE | 5917-7B4BM30T | 4    |
| PCB, VHF 30W AMP. RF SENSOR        | 4321-80884311 | 1    |
| COVER, WRAP AROUND, POWER AMP      | 3702-62302020 | 1    |
| TAB, .250", 16-14AWG, INSULATED    | 5065-250T16A4 | 1    |

## 7. REVISION HISTORY

| ISSUE | DATE | DESCRIPTION AND (REASON) |
|-------|------|--------------------------|
|-------|------|--------------------------|

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- |   |        |  |
|---|--------|--|
| 1 | Dec 88 | <ul style="list-style-type: none"><li>• Section 6 (before blue books).</li></ul>   |
| 2 | Dec 92 | <ul style="list-style-type: none"><li>• Updated the manual text and parts list to match the current version. The VSWR option is removed from the manual. Updated to blue book.</li></ul> |
| 3 | Mar 93 | <ul style="list-style-type: none"><li>• Changed No. 4 lug to No. 2-3 lug</li></ul>   |
| 4 | Aug 93 | <ul style="list-style-type: none"><li>• Inserted "Reviewed By", page 2 section 1.</li><li>• Updated Front page and revision history page.</li></ul>                                      |

### Amplifier PCB

- L11 was indicated in manual as coil, 1.62 turns, 16AWG, 0.325"ID, 1220-1T621615, is now CHOKE, RF/Mould.,10uH,10%,.25", 1251-4A00100K (Incorrect part was listed).
- R1 and R4 Part number was 1105-\_\_\_J1 is now 1105-\_\_\_JI (Incorrect part number).
- R2 and R5 was 1101-\_\_\_JH is now 1101-\_\_\_JP (Incorrect part number).
- R3 was 1101-\_\_\_JE is now 1101-\_\_\_JI (Incorrect part number).
- Label, foil,DOC S/N,VT-2/VT-30 was 39-891610 is now 3501-24211050 (Incorrect part number).
- Label, foil, FCC ID, H4JVT-30 was 39-892210 is now 3501-40211050 (Incorrect part number).
- was screw, 4-40 x 3/8", pan phil, SS 5802-440PP06S (2) is now screw, 4-40x3/8, cap sock-3/32 SS 5802-440SA06S (2) (Easier to apply a specific torque to a allen key style head).
- Screw, M3X8, pan phil, A2 5812-3M0PP08N (16) (was not shown).
- Was cover, wrap around, MT-2 TX/AMP 3702-62302005 is now cover, wrap around, power amp 3702-62302020 (Wrap around changed to avoid having to modify the TX wrap around)

### Sensor PCB

- R9, R12, R14, R15, R19 was 1101-\_\_\_JH is now 1101-\_\_\_JP (Incorrect part number).

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| ISSUE | DATE | DESCRIPTION AND (REASON) |
|-------|------|--------------------------|
|-------|------|--------------------------|

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- 5      Aug 94      VT-30 RF Amp board:
- Screws were 10-32x1/2 Pan Phil now M5x12 Pan Phil.
  - Screws were 4-40x3/8 Cap Sock now M3x8 Hex Sock-M2.5.
  - Washers were Flat,#10,0.435"OD now Flat,M5,10mm OD.
  - Lockwashers were #10 INT. Tooth now M5,Split,A2,Steel.
  - Standoff 7/32 OD,1/4L,M3,Swage was Nickel now Tinned.
  - Front Panel switch,TOG/DPDT, on-none-on was 5205-T2U21P01 is now 5205-T2U21P02.
  - PCB was 43-884220 now 43-884221:
    - Removed ground under Q1 (MRF1946).
    - Removed ground beside L5 pad.

Updated entire Instruction Manual to Daniels standards.

- 6      Jan 95      Sensor Board
- Nut, M2.5, Hex, Flats, A2 was 5.4 mm now 5.0 mm.

Mechanical

- M3x8 screw, Pan/Phil was Ni now A2.
- Added CABLE, COAX, RG316 TFE, WHITE, 15.5cm to parts list.
- Added LABEL, FOIL, FREQUENCY, MHz to parts list.

VHF AMP-2 Power Amp PCB

- C1 was CAP., 100pF METAL CLAD, 5% 250V  
now 33pF METAL CLAD , 5% 250V for High band;  
now 120pF METAL CLAD , 5% 250V for Low band.
- C3 was CAP., 60pF METAL CLAD, 5% 250V for all bands  
now 43pF METAL CLAD, 5% 25V for High band;  
now 60pF METAL CLAD, 5% 250V for Low and Mid bands.
- C4 is now 33pF CER, +-2%, 100V, NPO for Low band;  
Not installed for Mid and High band.
- C18 CAP., 10pF METAL CLAD, 5%, 25V or Low band;  
Not installed for Mid and High band.

All references of VT-30 now VHF AMP-2.

- 7      Apr 97      • following changes incorporated into Issue 7

| ISSUE | DATE   | DESCRIPTION AND (REASON)  |
|-------|--------|---|
|       | Mar 95 | • M3X8 OVAL C/S PHIL was Ni now A2.   |
|       | Apr 95 | ECO #362<br>• Addition of the "Number Convention" section to the GENERAL section of all instruction manuals.  |
|       | May 95 | ECO #377<br>• New official copyright statement.<br><br>• VHF AMP-2 is not adjustable over 10-30 Watts when the UT-3 is used as an exciter.  |
|       | Oct 95 | ECO #422<br>• C13 is now two values (43pF or 75pF) depending on band.   |
|       | Nov 95 | ECO #418<br>• was HOUSING, CRIMP TERM., 8 POS 5022-156H508L<br>is now HOUSING, .156,CRIMP TERM,7 CCT 5022-156HS07L<br>• was HEADER, 8 PIN, W/LOCKING CLAMP 5022-156HD08L<br>is now HEADER, .156",7 PIN/Au,LOCKING 5022-156HD07L<br>• Red wire for 13.8V power was 16 AWG 14.5cm long<br>is now two pieces of 16 AWG 10.5cm and 6.4cm<br>• Added TAB, .250", 16-14AWG,INSULATED 5065-250T16A4<br>• Added RECEPT., TAB/.250",16-14,INSUL 5065-250R16A4<br>• was TERMINAL, CRIMP, .156" HOUSING 5022-156CTFEM<br>is now TERMINAL, TRIFURC./FEM., CRIMP 5022-156CTFT0 |
|       | Jan 97 | ECO #496<br>• replaced replaced NAMEPLATE, IDENT-RED;AMP-2/150<br>with LABEL/LEXAN, 28HP, VHF: RED 3536-10212805<br>and NAMEPLATE, BLANK, 28HP, GREY 3702-10001228  |
| 7A    | JUN 97 | • ECO #291,292.<br>• Label, Set, Foil, RF Module 3501-27101000 replaces:<br>Label, Foil, DOC/SN, VT-s/VT-30<br>Label, Foil, FCC/ID, H4JVT-30<br>Label, Foil, Freq, MHz<br>See page 6-3.   |

| ISSUE | DATE    | DESCRIPTION AND (REASON)   |
|-------|---------|--|
|       | July 98 | <ul style="list-style-type: none"> <li>• MCO #5009 – To use a terminal better suited for 22 and 24AWG wire; Removed 6 Terminal, TRIF./FE, CRIMP, 18-30 – 5022 – 156CTFT0</li> <li>Added 6 Terminal, TRIF./FE, CRIMP, 22-26 – 5022 – 156CTFT3</li> </ul>  |
|       | Feb 99  | <ul style="list-style-type: none"> <li>• ECO #559 &amp; 559A – To improve manufacturability.</li> <li>• L1 was COIL, .75T, 18AWG, 0.18"ID \$1220-0T751815<br/>Is now WIRE, BUSS, 18AWG, TINNED COPPER CONSUMABLE</li> <li>• L4 was COIL, 2.5T, 16AWG, 0.18"ID \$1220-2T501620<br/>Is now WIRE, MAGNET 16AWG, HEAVY, BROWN, 12cm 7142-10001601.</li> <li>• L5 was WIRE, MAGNETM 16AWG, HEAVY, BROWN, 3.5cm 7142-10001601.<br/>Is now WIRE, BUSS, 16AWG, TINNED COPPER, 3.5cm CONSUMABLE.</li> </ul> |
|       | Jun 99  | <ul style="list-style-type: none"> <li>• ECO #575. 64 Mix Ferrite Bead is obsolete. Replaced with 43Mix Ferrite Bead.</li> </ul>   |
|       | Jan 00  | <ul style="list-style-type: none"> <li>• Added “Model” to the table in section 4.2 (AMPLIFIER ALIGNMENT).</li> </ul>   |
|       | Feb 00  | <ul style="list-style-type: none"> <li>• Corrected the part number for the switch, TOG./DPDT, ON-NONE-ON in the Mechanical parts list.</li> </ul>  |
|       | Apr 01  | <ul style="list-style-type: none"> <li>• MCO #5053. The SMA and SMB cables are bow a turnkey production. Part numbers were \$7910... are now 7910...</li> </ul>  |