

# **Model TVM-100 TV AURAL MODULATION MONITOR**

## **Guide to Operations**

8/00

©11/88



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## **WARRANTY AND ASSISTANCE**

All Belar products are warranted against defects in materials and workmanship. This warranty applies for one year from the date of delivery, FOB factory or, in the case of certain major components listed in the instruction manual, for the specified period. Belar will repair or replace products which prove to be defective during the warranty period provided that they are returned to Belar prepaid. No other warranty is expressed or implied. Belar is not liable for consequential damages.

For any assistance, contact your Belar Sales Representative or Customer Engineering Service at the Belar factory.

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# **1 General Information**

## **1-1 General Description**

The Belar Model TVM-100 Precision TV Aural Monitor is a wide-band TV aural modulation monitor designed to measure the total modulation characteristics of monaural as well as multi-channel television transmitters.

The TVM-100 is also used as a low-distortion, low-noise main channel demodulator for driving audio monitor amplifiers and audio distortion analyzers. Wide-band outputs are provided for Stereo, SAP, PRO, and SCA monitors.

Designed to conform with the latest EIA/BTSC recommendations, the TVM-100 features a highly accurate modulation calibrator for mono and stereo modes, along with a digital frequency deviation display. Built-in noise measurement capability allows direct measurement of FM and AM signal-to-noise ratios as well as noise due to transmitter ICPM.

## **1-2 Physical Description**

The TVM-100 is constructed on a standard 5¼ X 19 inch EIA rack mount panel. Factory adjustments are located within the shielded compartment of the monitor. The AC power input, mains voltage selector, RF and IF inputs and monitor outputs are located on the rear of the TVM-100 chassis on individual BNC connectors and on a card edge connector.

## **1-3 Electrical Description**

The TVM-100 is a solid state, low sensitivity crystal controlled, superheterodyne TV receiver incorporating a highly linear and stable digital pulse counting discriminator to demodulate the TV aural signal. Various metering and test provisions are contained within the monitor to measure transmitter output characteristics. These provisions include a selectable true-peak or FCC defined semi-peak modulation meter and thumbwheel controlled peak modulation indicator, both switchable to positive, negative or independent modulation polarity; a precision peak digital meter to set modulations accurately (to 100 Hz deviation); LED indicating circuits to set the incoming RF level; a precision deviation and zero deviation calibration oscillator to check monitor calibration and permit a signal-to-noise test of the monitor and provisions for measurement of AM and FM noise. A carrier alarm and fixed 100% peak modulation indicator are also provided.

Outputs obtained from the monitor include two composite wideband outputs for stereo and SAP monitoring; a de-emphasized audio output; balanced and unbalanced audio monitor outputs; remote modulation meter output, 100% peak indicator, adjustable peak indicator and carrier alarm indicator.

#### 1-4 Electrical and Mechanical Specifications

Frequency Range . . . . . 54 to 806 MHz (specify frequency)

RF Input . . . . . 1 mv to 0.2 vrms (aural)  
50  $\Omega$ , BNC connector

Detected Measurement Bandwidth . . . . . 30 Hz to 150 kHz

Frequency Response . . . . .  $\pm 0.01$  dB, 30 Hz to 50 kHz

Linear Phase Deviation . . . . . Less than  $\pm 0.05^\circ$

##### Modulation Metering:

Deviation Indication 100% @  $\pm 73$  kHz and 100% @  $\pm 25$  kHz, 0 to 133% range  
Accuracy . . . . .  $\pm 2\%$  @ all modulation levels

Characteristics . . . . . Selectable: peak (sample hold) or semi-peak

##### Peak Modulation Indicators

Adjustable Indicator . . . . . 1% to 199% range in 1% increments

Fixed Indicator . . . . . Set to indicate @ 100%  
Accuracy . . . . .  $\pm 1\%$

Noise Measurement Range . . . . .  $-50$  dB to  $-70$  dB

##### Test Functions

Calibrate . . . . . Provides internal standard modulation  
references @ 25 kHz and 73 kHz  
Deviations: Accuracy:  $\pm 100$  Hz

Calibrator Accuracy . . . . .  $\pm 0.1\%$

Deviation Meter . . . . . Indicates modulation deviation of calibrator or test signal  
Zero . . . . . Provides zero deviation for signal-to-noise measurement tests

RF Level ..... Sets proper operating input level  
Carrier Alarm ..... Indicator adjusted for 90% carrier level

## Outputs

Wideband Composite . Two @ 1.5 vrms for stereo, SAP, PRO and SCA monitors  
Main channel Audio (Program) .....  $\pm 10$  dBm,  
600 ohms, balanced  
Main channel Audio (Test) ..... 5 vrms,  
10k ohms, unbalanced

## Audio Output Specifications

Frequency Response .....  $\pm 0.01$  dB, 30 Hz to 50 kHz  
 $\pm 0.1$  dB, 30 Hz to 120 kHz  
Harmonic Distortion ..... 0.01%, max (SMPTE)  
Signal to Noise Ratio ..... 80 dB, min

Dimensions ..... 5.25"H x 10.25"D x 19"W  
(EIA Rack Mount)

Shipping Weight ..... 16 lbs (7.3 kgs)

## 2 Installation

### 2-1 Initial Inspection

Check the shipping carton for external damage. If the carton exhibits evidence of abuse in handling (holes, broken corners, etc.) ask the carrier's agent to be present when the unit is unpacked. Carefully unpack the unit to avoid damaging the equipment through use of careless procedures. Inspect all equipment for physical damage immediately after unpacking. Bent or broken parts, dents and scratches should be noted. If damage is found, refer to Paragraph 2-2 for the recommended claim procedure. Keep all packing material for proof of damage claim or for possible future use.

The TVM-100 is shipped with an instruction book, three wire line cord, four beige rack-mount screws with integral non-marring washers, and a 10 position, dual readout remote connector.

## **2-2 Claims**

If the unit has been damaged, notify the carrier immediately. File a claim with the carrier or transportation company and advise Belar of such action to arrange the repair or replacement of the unit without waiting for a claim to be settled with the carrier.

## **2-3 Repacking for Shipment**

If the unit is to be returned to Belar, attach a tag to it showing owner, owner's address, and phone number. A description of the service required should be included on the tag. The original shipping carton and packaging materials should be used for reshipment. If they are not available or reusable, the unit should be repackaged in the following manner:

- a. Use a double-walled carton with a minimum test strength of 275 pounds.
- b. Use heavy paper or sheets of cardboard to protect all surfaces.
- c. Use at least 4 inches of tightly packed, industry approved, shock absorbing material such as extra firm polyurethane foam or rubberized hair. **NEWSPAPER IS NOT SUFFICIENT FOR CUSHIONING MATERIAL.**
- d. Use heavy duty shipping tape to secure the outside of the carton.
- e. Use large **FRAGILE** labels on each surface.
- f. Return the unit, freight prepaid, via air freight. Be sure to insure the unit for full value.

## **2-4 Preparation for Use**

The TVM-100 Modulation Monitor is designed to be mounted in a standard 19-inch rack. When mounted in a rack, a slight air space should be provided above and below the unit. When the monitor is mounted above high heat generating equipment such as power amplifiers, consideration should be given to cooling requirements which allow a free movement of cooler air through and around the TVM-100. In no instance should the ambient chassis temperature be allowed to rise above 50 degrees C (122 degrees F). Mount the TVM-100 to the rack using the screws provided.

*Units beginning with serial number 200511:*

These units can be operated from a 100 to 240 Vac, single phase, 50-60 Hz power source with no user adjustments. The fuse should be a 5 mm x 20 mm type GMA-3, 3 AMP-250 V (UL/CSA) or T3.15 A-250 V (IEC) fuse only. A spare fuse is stored in the removable fuse compartment.

*Units with serial number 200074 to 200510:*

These units can be operated from either a 105 to 125 Vac or 210 to 250 Vac single phase, 50 to 400 Hz power source. Make sure the unit is set for the proper voltage as follows: Unplug the line cord. Open the fuse compartment door and pull lever to remove fuse. Using needlenose pliers, pull the voltage select board straight out of the power entry module. While facing the rear of the unit, orient the voltage select board so the desired line voltage is face up and reads correctly ("120" for 115 Vac operation, "240" for 230 Vac operation. The "100" and "220" positions on the bottom of the board are not used.) Reinsert the board into the power entry module, install the proper fuse ( $\frac{1}{2}$ A 250 V for 115 Vac,  $\frac{1}{4}$ A 250 V for 230 Vac), close the fuse door, and plug the line cord back in.

*Units prior to serial number 200074:*

These units can be operated from either a 105 to 125 Vac or 210 to 250 Vac single phase, 50 to 400 Hz power source. Make sure the unit is set for the proper voltage as follows: Unplug the line cord. Slide the line voltage selector switch (S1) to the 115 V or 230 V position. Ensure that the fuse (F1) is the proper current rating for selected voltage ( $\frac{1}{2}$  A 250 V for 115 Vac,  $\frac{1}{4}$  A 250 V for 230 Vac). Plug the line cord back in.

Connect the three wire grounded line cord provided, or if a substitute line cord is used, be sure that the ground lead is connected to "G" on the line cord receptacle.

Connect a 50 ohm coaxial cable (RG-58) between the monitor probe on the transmitter and the RF input connector on top of the attenuator module.

Set the Aural IF Frequency Switch (S2) to **41** and the Aural IF Selector switch (S3) to **INT**.

**CAUTION: DO NOT APPLY MORE THAN 3 VOLTS RF TO THE MONITOR. EXCESSIVE RF INPUT CAN CAUSE DAMAGE NOT COVERED UNDER THE WARRANTY.**

If desired, connect an external aural monitoring amplifier to pins 4 and 5 on the remote connector. This is a balanced 600 ohm output.

A remote total modulation meter may be connected to pin 6 on the remote connector, with a total loop resistance of 3750 ohms. Pins 9, 8 and 7 may be connected to LED's to remotely indicate carrier level alarm, adjustable peak modulation and 100% peak modulation respectively. A current limiting resistor, typically 160 ohms, should be connected in series with the LED's. A +5 Vdc source is available on pin 10. Ground is available on pins A thru L.

## 2-5 Interconnections and Controls

### MODEL TVM-100 REAR PANEL JACKS

#### JACK Function

- RF RF Input: set input attenuator plugs to extinguish both LED's on the rear panel when using transmitter sample. **Note that the plugs must be moved in pairs!**
- J2 1.46 Vrms @ 75 ohms, unbalanced, composite wideband output to SAP monitor
- J3 1.46 Vrms @ 75 ohms, unbalanced, composite wideband output to stereo monitor
- J4 IF input

### MODEL TVM-100 REMOTE CONNECTOR

#### Pin Function

- |          |                                                   |
|----------|---------------------------------------------------|
| 1        | Remote CAL mute                                   |
| 2        | Remote SAP offset                                 |
| 3        | Remote PRO offset                                 |
| 4        | Audio out, 600 ohms, balanced (de-emphasized) (-) |
| 5        | Audio out, 600 ohms, balanced (de-emphasized) (+) |
| 6        | Remote total modulation meter                     |
| 7        | Remote 100% peak LED                              |
| 8        | Remote Adjustable peak LED                        |
| 9        | Remote Carrier alarm LED                          |
| 10       | +5 Vdc                                            |
| A thru L | Ground                                            |

### 3 Operation

#### 3-1 Initial Operation

1. Ensure that the rear panel IF selector switches are set to 41 and INTERNAL positions. Remove the 4 screws from the input attenuator module cover and remove cover. Make certain that the mechanical meter zero is set properly.
2. Depress the SEMI switch.
3. Depress the ZERO switch and allow at least a 15 minute warm up.
4. Depress the CAL switch and check for a 100% reading.
5. Depress SPLIT for split-sound or QUASI-P for quasi-parallel sound detection.
6. Depress MONO for monaural or MTS for multi-channel sound.
7. Depress the RF LEVEL switch to indicate rf level.
8. Apply the RF input to the RF input jack and adjust the input attenuator to a level that both LED lamps go out. **Note that the attenuator plugs must be moved in pairs!** The LEDs are visible through the top two holes of the back cover. These holes are to the left of the input jack of the attenuator module. The left LED indicates low RF level and the right LED indicates high RF level. When both lights are out, the RF level is in the center of the AGC range and the meter will indicate 100%. The TVM-100 will operate with as little as 30% RF level, but a 100% level (as indicated on the front panel meter) is required to calibrate the AM noise measurement. Also, the center of the AGC range is needed for lowest ICPM in the quasi-parallel mode of detection.
9. Depress the OPERate switch and the SEMI switch and the TVM-100 is now ready for operation.

#### 3-2 Normal Operation

For normal operation, leave the TVM-100 in OPERate position. Changes in RF level will not affect the accuracy of modulation measurements.

The PEAK MOD thumbwheel switch is usually set to the maximum allowable peak modulation according to the services being transmitted, and the PEAK MOD LED will flash at this preset level or greater.

The CARRIER ALARM LED will illuminate when the carrier falls below 30% of the meter carrier level reading.

### **3-3 Functions**

1. **OPERATE SWITCH** - When depressed, places the unit into operation. In this mode, the modulation meter as well as the PEAK MOD and 100% modulation indicators are independent of modulation polarity.
2. **PLUS** - When depressed, places the unit into operation. The modulation meter, PEAK MOD and 100% indicators measure positive modulation excursions.
3. **MINUS** - When depressed, places the unit into operation. The modulation meter, PEAK MOD and 100% indicators measure negative modulation excursions.
4. **ZERO** - When depressed, applies a zero deviation calibration oscillator to the monitor. This function permits a signal-to-noise ratio test of the monitor.
5. **CAL** - When depressed, applies a standard 73 kHz deviation to the monitor to check modulation calibration.
6. **RF LEVEL** - When depressed, measures the RF level applied to the monitor. When the RF reads 100%, the AM NOISE function is correctly calibrated.
7. **PEAK** - When depressed, places the meter into a true peak reading mode by introducing a sample-hold circuit into the metering circuit.
8. **SEMI** - When depressed, returns the metering circuit to a semi-peak mode that conforms to the FCC modulation meter requirements.
9. **SAP** - When depressed, measures the SAP injection in kHz on the digital readout when the optional SAP and PRO injection board is installed.
10. **PRO** - When depressed, measures the PRO injection in kHz on the digital readout when the optional SAP and PRO injection board is installed.
11. **FM NOISE** - When depressed, inserts a 40 dB gain , de-emphasized , metering amplifier into the circuit so that with an unmodulated carrier applied to the monitor, a monaural signal-to-noise ratio measurement can be made. Note that a 100% (0 dB) reading is now -40 dB and a -20 dB reading is now -60 dB. Thus the algebraic sum of the meter reading and -40 dB is the noise reading. A 100% meter reading now corresponds to 0.73 kHz deviation for modulating frequencies under approximately 400 Hz.
12. **AM NOISE** - When depressed, applies the 40 dB gain, de-emphasized, metering amplifier to the AM noise detector and amplifier so that an AM noise measurement

can be made. When the RF level is set to 100%, the circuit is calibrated to read AM noise directly, with a 100% (0 dB) meter reading representing -40 dB. Again the algebraic sum of the meter reading and -40 dB is the noise reading. A 100% meter reading now corresponds to 1% amplitude modulation for modulating frequencies under approximately 400 Hz.

13. SPLIT - When depressed, places the unit into the split sound mode of operation, *i.e.*, no visual carrier is needed for aural detection.
14. QUASI-P - When depressed, places the unit into the quasi-parallel mode of operation, *i.e.*, the visual modulation is removed from visual carrier which is used for aural detection.
15. MTS - When depressed, the unit reads 73 kHz deviation as 100% on the modulation meter. Note that the digital peak readout is unaffected by this. The MTS MODE INDICATOR LED is illuminated when this pushbutton is depressed.
16. MONO - When depressed, the normalization of the unit is changed to read 25 kHz deviation as 100% on the modulation meter. Note that the digital peak readout is unaffected by this. The MONO MODE INDICATOR LED is illuminated when this pushbutton is depressed.
17. MODULATION METER - Measures modulation, RF level, FM noise, or AM noise, depending on the function selected.
18. DIGITAL PANEL METER - Displays total modulation deviation directly in kiloHertz. If the SAP and PRO injection board is installed, this meter displays the SAP or PRO injection level in kiloHertz when the SAP or PRO pushbutton is depressed.
19. CAL POT - Calibrates the modulation meter and the digital panel meter. When the CAL pushbutton is depressed the modulation meter should read 100% and the DPM should read 25 in MONO mode and 73 in MTS mode.
20. PEAK MOD THUMBWHEEL - Pre-sets, in 1% increments, the PEAK MODulation indicator to light at or above the indicated modulation setting. This circuit follows the modulation polarity set by the function switch.
21. CARRIER ALARM INDICATOR - Indicates when the carrier level falls to 30% or less of the RF level as shown on the meter.
22. PEAK MOD INDICATOR - Indicates when the modulation level equals or exceeds the level set by the PEAK MOD thumbwheel. This indicator follows the modulation polarity set by the function switch.

- 23. 100% MOD INDICATOR - Indicates when the modulation level equals or exceeds 100%. This indicator follows the modulation polarity set by the function switch.
- 24. AUDIO TEST - Provides a test audio output for monaural only. The output is 5 Vrms, 10k ohms unbalanced, de-emphasized.

### **3-4 Transmitter Measurements**

Normal transmitter proof-of-performance measurements may be made with the TVM-100. Distortion measurements may be made through the audio test jack on the front panel. Five volts rms is available at 100% modulation, 25 kHz deviation monaural, so that most distortion analyzers may be used. The audio test output and the remote audio outputs are de-emphasized according to the standard 75  $\mu$ sec curve, while the modulation meter has a flat frequency response characteristic.

### **3-5 Accessories**

*Option 01* SAP & PRO Injection Board allows SAP & PRO injection levels to be read directly on the digital voltmeter of the TVM-100. In addition, the board removes the SAP and PRO from the total modulation reading when in mono mode. When used with the TVM-200 TV Stereo Modulation Monitor, it removes the SAP & PRO from the composite reading of the TVM-220.

*Option 03* Peak Weighting Module (PWM-1) adds peak weighting capability to the Peak Mod and 100% Peak lights. Five time constants are available, selectable with a rotary switch on the rear of the unit.

## 4 Diagrams, Schematics and Parts Lists

**Replaceable Parts.** This page contains information for ordering replaceable parts for the monitor. The tables that follow list the parts in alphanumeric order by reference designation and provides a description of the part with the Belar part number.

**Ordering Information.** To order a replacement part from Belar, address the order or inquiry to Belar and supply the following information:

- a. Model number and serial number of unit.
- b. Description of part, *including the reference designation and location.*

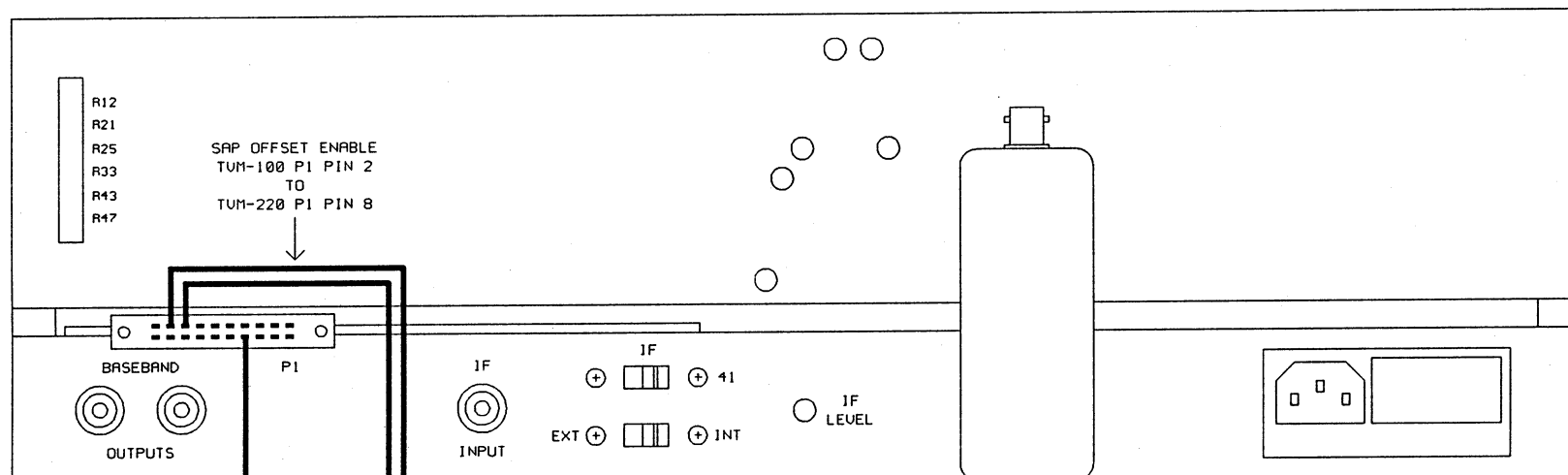
Orders may also be taken over the telephone. Parts orders can be put on your VISA, MasterCard, or American Express card, or we can ship them COD.

### REFERENCE DESIGNATORS

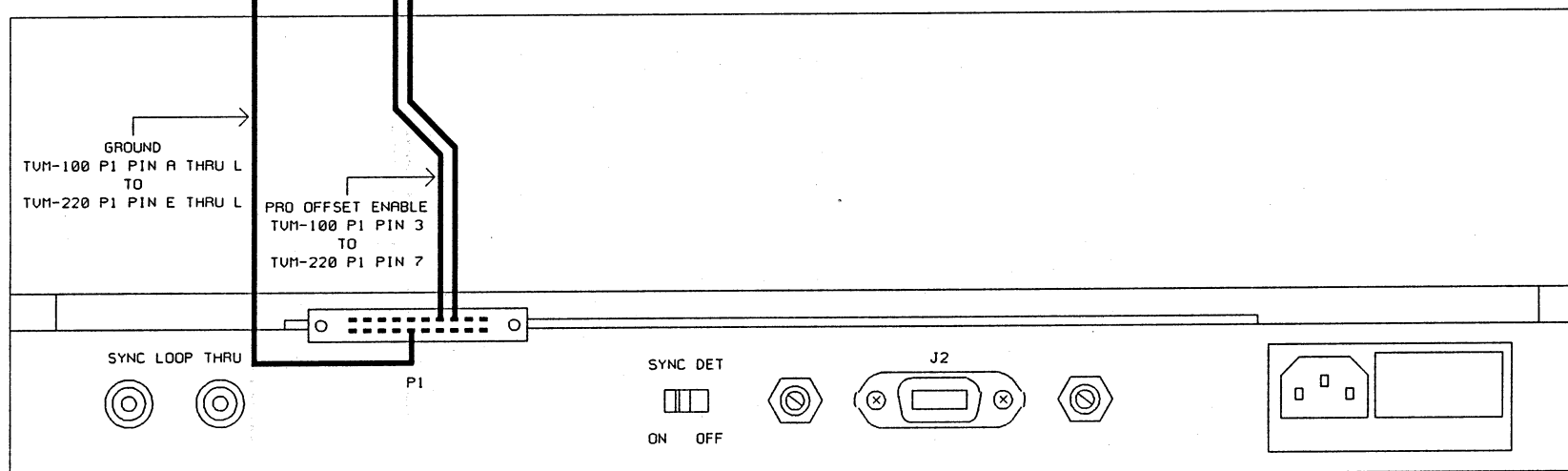
|     |                    |    |                    |    |                      |
|-----|--------------------|----|--------------------|----|----------------------|
| A   | = assembly         | J  | = jack             | S  | = switch             |
| BR  | = diode bridge     | L  | = inductor         | T  | = transformer        |
| C   | = capacitor        | M  | = meter            | TB | = terminal block     |
| CR  | = diode or LED     | P  | = plug             | U  | = integrated circuit |
| DS  | = display or lamp  | Q  | = transistor       | W  | = cable              |
| F   | = fuse             | R  | = resistor         | X  | = socket             |
| FL  | = filter           | RL | = relay            | Y  | = crystal            |
| HDR | = header connector | RN | = resistor network |    |                      |

### ABBREVIATIONS

|      |                        |         |                        |
|------|------------------------|---------|------------------------|
| BCD  | = binary coded decimal | PIV     | = peak inverse voltage |
| CER  | = ceramic              | POLY    | = polystyrene          |
| COMP | = composition          | PORC    | = porcelain            |
| CONN | = connector            | POT     | = potentiometer        |
| DPM  | = digital panel meter  | SEMICON | = semiconductor        |
| ELEC | = electrolytic         | SI      | = silicon              |
| GE   | = germanium            | TANT    | = tantalum             |
| IC   | = integrated circuit   | uF      | = microfarads          |
| k    | = kilo = 1,000         | V       | = volt                 |
| M    | = meg = 1,000,000      | VAR     | = variable             |
| MOD  | = modulation           | VDCW    | = dc working volts     |
| MY   | = mylar                | W       | = watts                |
| PC   | = printed circuit      | WW      | = wirewound            |
| pF   | = picofarads           |         |                        |

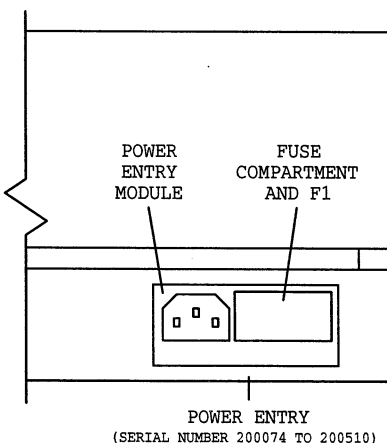
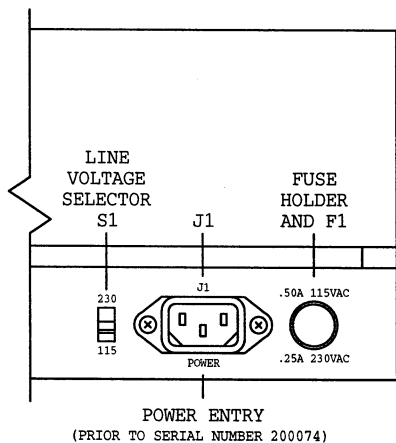
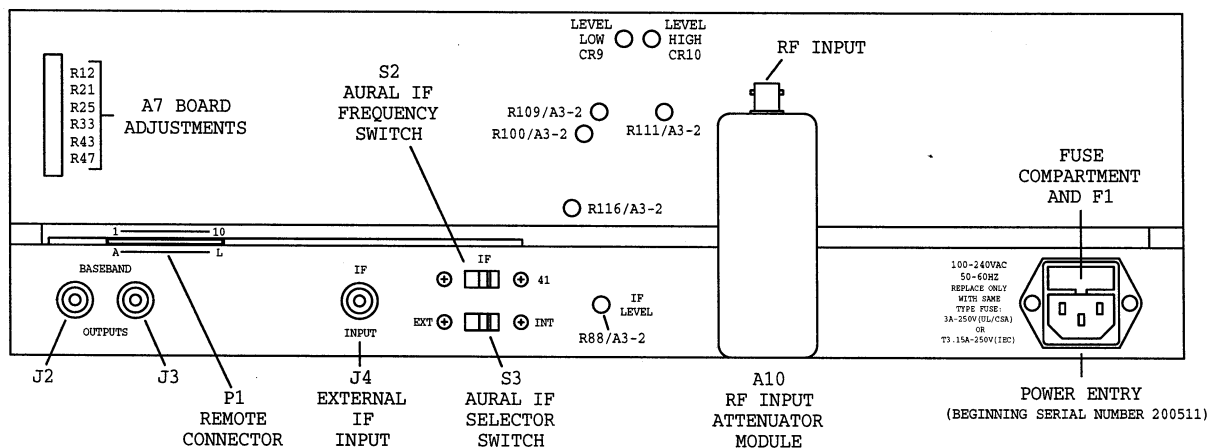
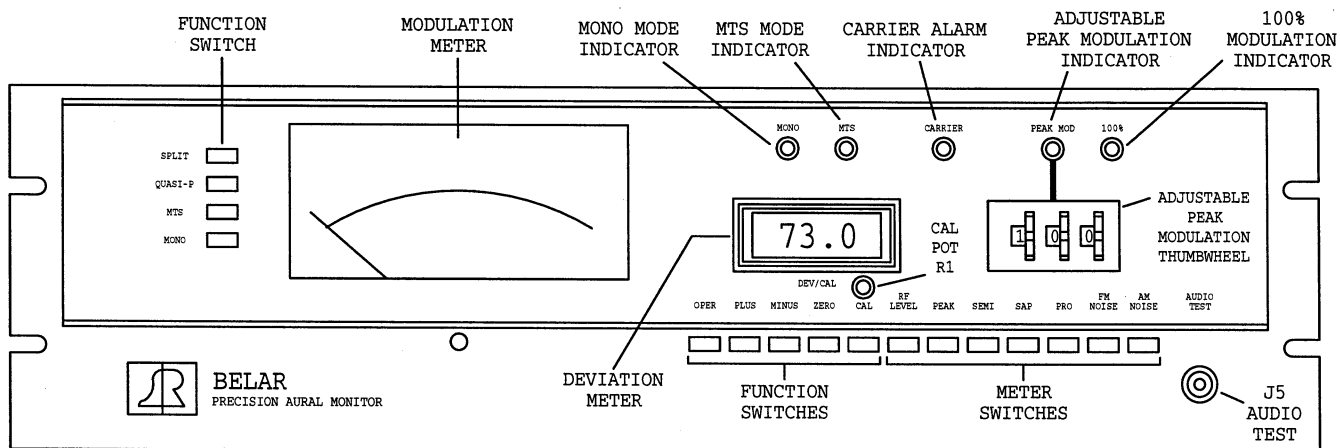


TUM-100(101) CHASSIS REAR VIEW



TUM-220 CHASSIS REAR VIEW

TUM-100(101)/TUM-220  
SAP & PRO INTERCONNECTIONS  
BELAR ELECTRONICS  
11-25-91



TVM-100 FRONT AND REAR VIEW  
BELAR ELECTRONICS  
7-26-00

# MAIN CHASSIS TVM-100

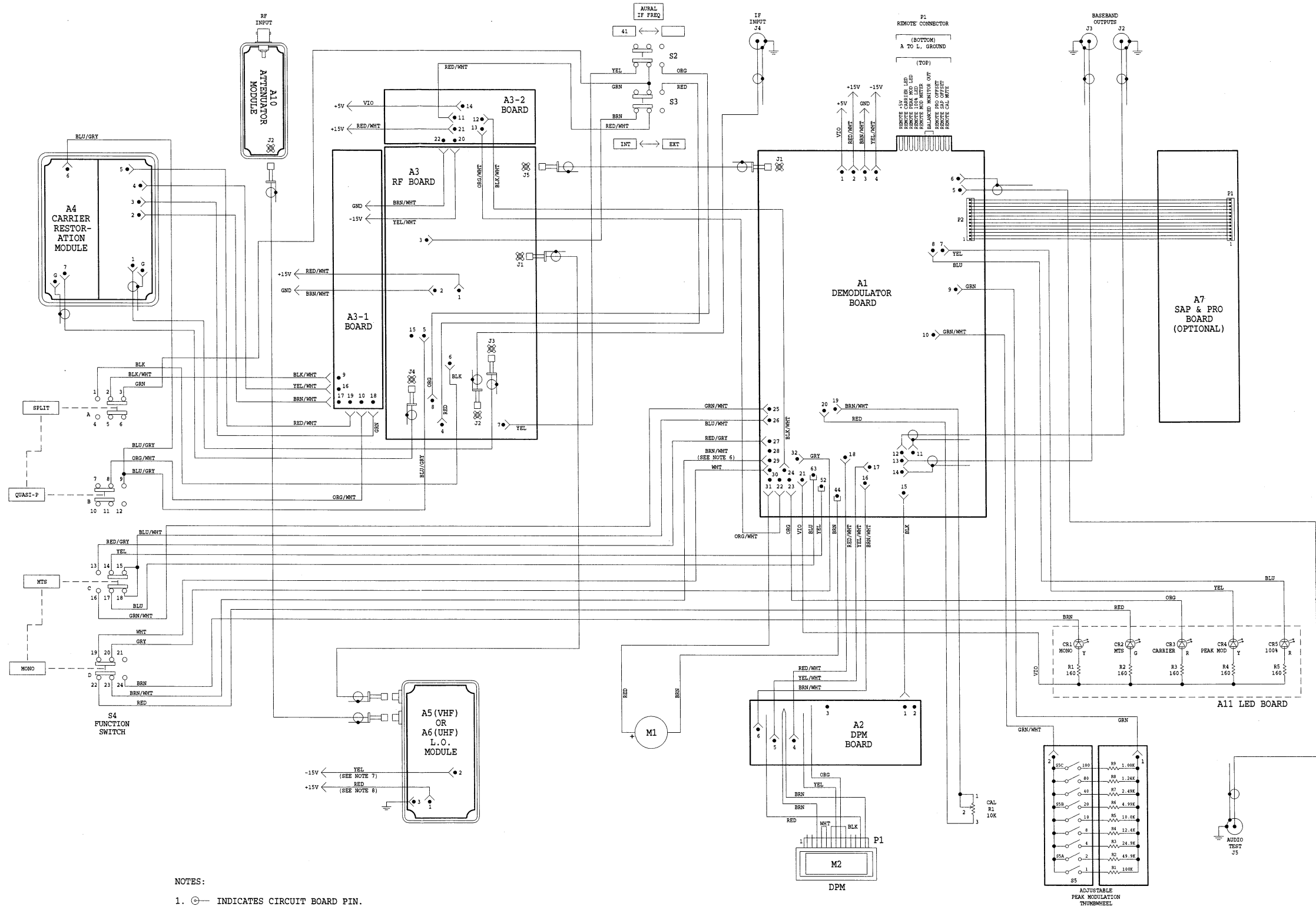
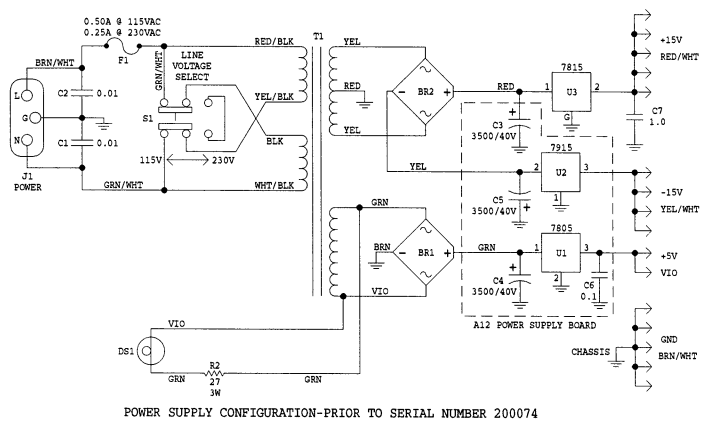
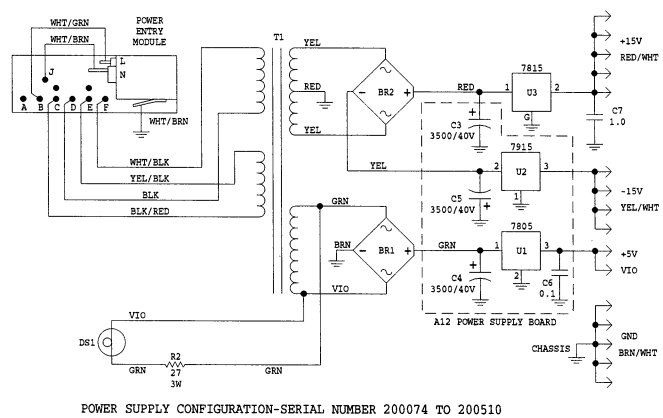
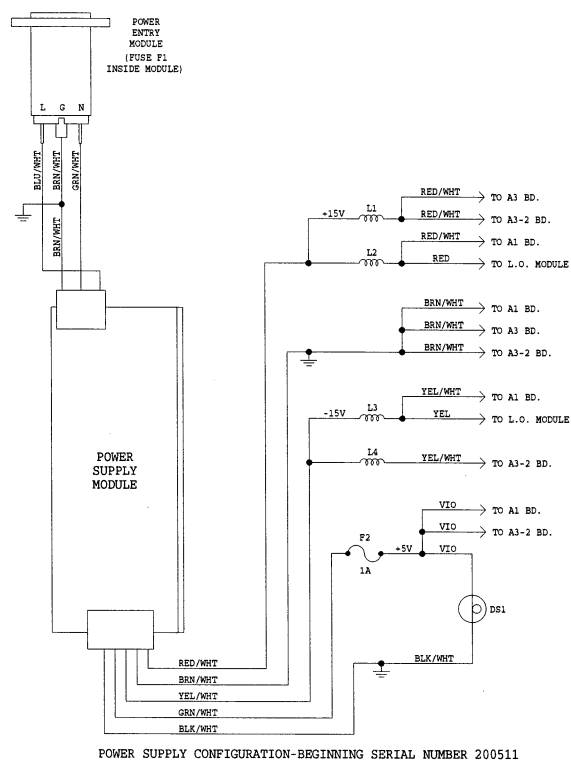
| Reference Designation | Description                                                  | Part Number |
|-----------------------|--------------------------------------------------------------|-------------|
| --                    | POWER SUPPLY MODULE: (NOTE 4)                                | 4005-0020A  |
| BR1, BR2              | DIODE: BRIDGE KBPC602 GI (NOTE 3)                            | 1900-0025   |
| C1, C2                | C: FIXED CERAMIC 0.01uF 1.4kV (NOTE 1)                       | 0151-0010   |
| C7                    | C: FIXED CERAMIC 1.0uF 50V (NOTE 3)                          | 0151-0008   |
| CR1                   | LED: YELLOW MV5353                                           | 1910-0002   |
| CR2                   | LED: GREEN MV5253                                            | 1910-0003   |
| CR3                   | LED: RED MV5053                                              | 1910-0001   |
| CR4                   | LED: YELLOW MV5353                                           | 1910-0002   |
| CR5                   | LED: RED MV5053                                              | 1910-0001   |
| DS1                   | LAMP: 755                                                    | 2140-0005   |
| --                    | SOCKET: LAMP                                                 | 1450-0012   |
| F1                    | FUSE: GMA-3A 250V(UL/CSA) (NOTE 4)                           | 2110-0009   |
| --                    | or T3.15A-250V(IEC)                                          |             |
| --                    | FUSE HOLDER: CHASSIS MOUNT (NOTE 4)                          | 2110-0010   |
| F1                    | FUSE: AGC 1/2A 250V (115 Vac line) (NOTE 3)                  | 2110-0001   |
| --                    | AGC 1/4A 250V (230 Vac line) (NOTE 3)                        | 2110-0002   |
| --                    | FUSEHOLDER: (NOTE 1)                                         | 2110-0003   |
| F2                    | FUSE: AGC-1A 250V (NOTE 4)                                   | 2110-0004   |
| J1                    | POWER ENTRY MODULE: 6EGG1-1 (NOTE 4)                         | 0360-0021   |
| J1                    | POWER ENTRY MODULE: 6J4 (NOTE 2)                             | 0360-0020   |
| J1                    | JACK: POWER (NOTE 1)                                         | 0360-0010   |
| J2 thru J5            | JACK: BNC                                                    | 0360-0005   |
| L1 thru L4            | CHOKE: RF (NOTE 4)                                           | 9140-0011   |
| M1                    | METER: MOD 0-133%                                            | 1120-0012   |
| M2                    | METER: DPM                                                   | 1120-0020   |
| P1                    | PLUG: 13 POSITION (DPM)                                      | 0365-0040   |
| P1, P2                | PLUG: 13 POSITION (OPTIONAL A7 MODULE)                       | 0365-0040   |
| R1                    | R: VAR COMP 10k, 10 TURN                                     | 2100-0018   |
| R2                    | R: WIREWOUND 27 5% 3W (NOTE 3)                               | 0811-0019   |
| S1                    | SWITCH: SLIDE 115/230V SELECTOR (NOTE 1)                     | 3102-0002   |
| S2, S3                | SWITCH: SLIDE                                                | 3102-0001   |
| S4                    | SWITCH: PUSHBUTTON (4 BUTTON)                                | 3101-0031   |
| S5                    | SWITCH ASSY: 3 DIGIT BCD THUMBWHEEL                          | 3103-0002A  |
| T1                    | TRANSFORMER: POWER (NOTE 3)                                  | 9100-0017   |
| U3                    | IC: 7815AK (NOTE 3)                                          | 1826-0039   |
| --                    | LINE CORD (115 Vac line voltage)                             | 8120-0002   |
| --                    | LINE CORD (230 Vac line voltage)                             | 8120-0004   |
| --                    | CONNECTOR: CARD EDGE, 20 PIN (CINCH 50-20SN-9 or equivalent) | 0365-0023   |

NOTE 1: Not used beginning serial number 200074.

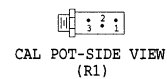
NOTE 2: This part was used from serial number 200074 to 200510.

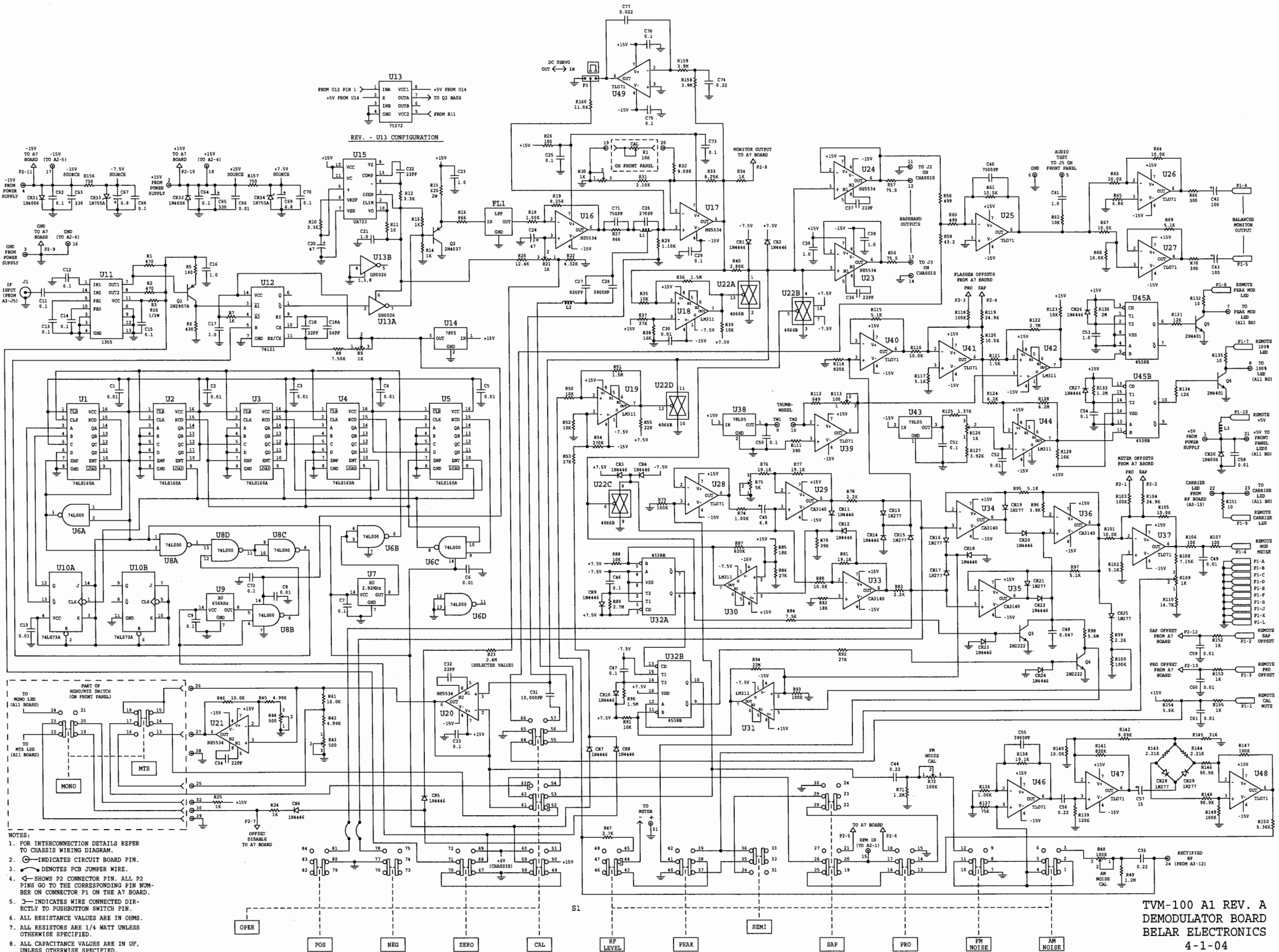
NOTE 3: Not used beginning serial number 200511.

NOTE 4: Used beginning serial number 200511.



- NOTES:
- ⊙ INDICATES CIRCUIT BOARD PIN.
  - INDICATES WIRE CONNECTED DIRECTLY TO PUSHBUTTON SWITCH PIN.
  - ALL RESISTANCE VALUES ARE IN OHMS.
  - ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED.
  - ALL CAPACITANCE VALUES ARE IN UF, UNLESS OTHERWISE SPECIFIED.
  - PRIOR TO SERIAL NUMBER 200221 THIS WIRE WAS GRY/WHT.
  - PRIOR TO SERIAL NUMBER 200511 THIS WIRE WAS YEL/WHT.
  - PRIOR TO SERIAL NUMBER 200511 THIS WIRE WAS RED/WHT.







TVM-100/101 A1 BOARD REV. A  
PART LOCATIONS

| <u>Desiq/Loc</u> | <u>Desiq/Loc</u> | <u>Desiq/Loc</u> | <u>Desiq/Loc</u> | <u>Desiq/Loc</u> | <u>Desiq/Loc</u> | <u>Desiq/Loc</u> | <u>Desiq/Loc</u> | <u>Desiq/Loc</u> | <u>Desiq/Loc</u> | <u>Desiq/Loc</u> | <u>Desiq/Loc</u> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| C1               | H4               | C54              | H6               | CR30             | K4               | R30              | D2               | R84              | E5               | R138             | B6               |
| C2               | H4               | C55              | B6               | CR31             | K4               | R31              | E2               | R85              | E4               | R139             | C7               |
| C3               | H4               | C56              | B7               | CR32             | K3               | R32              | E2               | R86              | E4               | R140             | C7               |
| C4               | I4               | C57              | C7               | CR33             | D4               | R33              | D2               | R87              | E4               | R141             | C6               |
| C5               | J4               | C58              | K4               | CR34             | B3               | R34              | D2               | R88              | E5               | R142             | C6               |
| C6               | J3               | C59              | K7               |                  |                  | R35              | C2               | R89              | E4               | R143             | C6               |
| C7               | K3               | C60              | K7               | FL1              | G1               | R36              | D4               | R90              | F4               | R144             | C6               |
| C8               | I2               | C61              | K7               |                  |                  | R37              | D4               | R91              | F5               | R145             | C7               |
| C9               | J3               | C62              | K4               | J1               | K1               | R38              | D4               | R92              | E5               | R146             | D6               |
| C10              | I3               | C63              | J4               |                  |                  | R39              | D4               | R93              | E5               | R147             | D6               |
| C11              | K1               | C64              | K3               | L1               | F1               | R40              | C2               | R94              | F5               | R148             | D7               |
| C12              | K1               | C65              | K4               | L2               | E2               | R41              | C1               | R95              | D5               | R149             | D7               |
| C13              | K1               | C66              | B3               | L3               | K5               | R42              | C1               | R96              | C6               | R150             | D6               |
| C14              | K2               | C67              | D4               |                  |                  | R43              | D1               | R97              | D5               | R151             | K6               |
| C15              | K2               | C68              | E4               | P1               | **               | R44              | C1               | R98              | D5               | R152             | K7               |
| C16              | J2               | C69              | B3               | P2               | J7               | R45              | C1               | R99              | C5               | R153             | K7               |
| C17              | I1               | C70              | B3               | P3               | E1               | R46              | C2               | R100             | C5               | R154             | J6               |
| C18              | I1               | C71              | E2               |                  |                  | R47              | B3               | R101             | B5               | R155             | K7               |
| C18A             | I1               | C72              | I2               | Q1               | J1               | R48              | A7               | R102             | B5               | R156             | D4               |
| C19              | --               | C73              | D2               | Q2               | H1               | R49              | A7               | R103             | C6               | R157             | B3               |
| C20              | H2               | C74              | D1               | Q3               | E5               | R50              | B3               | R104             | C6               | R158             | D1               |
| C21              | I1               | C75              | D1               | Q4               | E5               | R51              | C3               | R105             | B6               | R159             | D1               |
| C22              | I2               | C76              | D1               | Q5               | H7               | R52              | B4               | R106             | J5               | R160             | D1               |
| C23              | H2               | C77              | D1               | Q6               | I6               | R53              | C3               | R107             | K5               |                  |                  |
| C24              | G2               |                  |                  |                  |                  | R54              | B4               | R108             | B6               | S1               | A1               |
| C25              | E2               | CR1              | C5               | R1               | J1               | R55              | C4               | R109             | B6               |                  |                  |
| C26              | E2               | CR2              | C3               | R2               | J2               | R56              | B5               | R110             | B5               | U1               | I3               |
| C27              | E1               | CR3              | D4               | R3               | K2               | R57              | C5               | R111             | F6               | U2               | H3               |
| C28              | E1               | CR4              | C4               | R4               | --               | R58              | I7               | R112             | F6               | U3               | H4               |
| C29              | D2               | CR5              | C2               | R5               | J2               | R59              | I7               | R113             | G7               | U4               | I4               |
| C30              | D3               | CR6              | A3               | R6               | J1               | R60              | I6               | R114             | E7               | U5               | J4               |
| C31              | C2               | CR7              | C3               | R7               | I2               | R61              | I6               | R115             | E6               | U6               | J3               |
| C32              | C1               | CR8              | C3               | R8               | I1               | R62              | J7               | R116             | E6               | U7               | K2               |
| C33              | C2               | CR9              | E4               | R9               | I1               | R63              | J6               | R117             | F6               | U8               | I2               |
| C34              | B1               | CR10             | F4               | R10              | H2               | R64              | J6               | R118             | F7               | U9               | J2               |
| C35              | A7               | CR11             | E3               | R11              | I2               | R65              | J6               | R119             | F7               | U10              | I3               |
| C36              | B5               | CR12             | G5               | R12              | I2               | R66              | J7               | R120             | F6               | U11              | K1               |
| C37              | C5               | CR13             | F5               | R13              | H1               | R67              | J6               | R121             | G6               | U12              | I2               |
| C38              | B4               | CR14             | G5               | R14              | H1               | R68              | K6               | R122             | G6               | U13              | H1               |
| C39              | B4               | CR15             | F5               | R15              | H1               | R69              | K6               | R123             | H6               | U14              | I2               |
| C40              | I6               | CR16             | D5               | R16              | G1*              | R70              | K6               | R124             | G5               | U15              | H2               |
| C41              | J7               | CR17             | E6               | R17              | --               | R71              | G4               | R125             | G5               | U16              | F2               |
| C42              | K6               | CR18             | D5               | R18              | F2*              | R72              | G4               | R126             | G5               | U17              | D2               |
| C43              | K6               | CR19             | D6               | R19              | F2               | R73              | G4               | R127             | F6               | U18              | D4               |
| C44              | G4               | CR20             | D5               | R20              | G2               | R74              | F3               | R128             | G5               | U19              | C4               |
| C45              | F3               | CR21             | E5               | R21              | G2               | R75              | F4               | R129             | H5               | U20              | C2               |
| C46              | F5               | CR22             | E5               | R22              | G2               | R76              | F3               | R130             | H6               | U21              | C1               |
| C47              | F4               | CR23             | D4               | R23              | F2               | R77              | F4               | R131             | H6               | U22              | C4               |
| C48              | D5               | CR24             | D5               | R24              | A3               | R78              | E4               | R132             | K5               | U23              | B4               |
| C49              | J5               | CR25             | C5               | R25              | C2               | R79              | E3               | R133             | H6               | U24              | C4               |
| C50              | G6               | CR26             | H6               | R26              | F2               | R80              | G4               | R134             | I6               | U25              | I6               |
| C51              | F6               | CR27             | H6               | R27              | E2               | R81              | G5               | R135             | K5               | U26              | J6               |
| C52              | G5               | CR28             | D7               | R28              | --               | R82              | G4               | R136             | B7               | U27              | K6               |
| C53              | H5               | CR29             | D7               | R29              | D2               | R83              | G5               | R137             | B7               |                  |                  |

\* R16,& R18 ARE ON BOTTOM OF PCB

\*\* P1 IS CARD EDGE CONNECTOR FINGERS

-- C19, R4, R17 & R28 ARE NOT USED

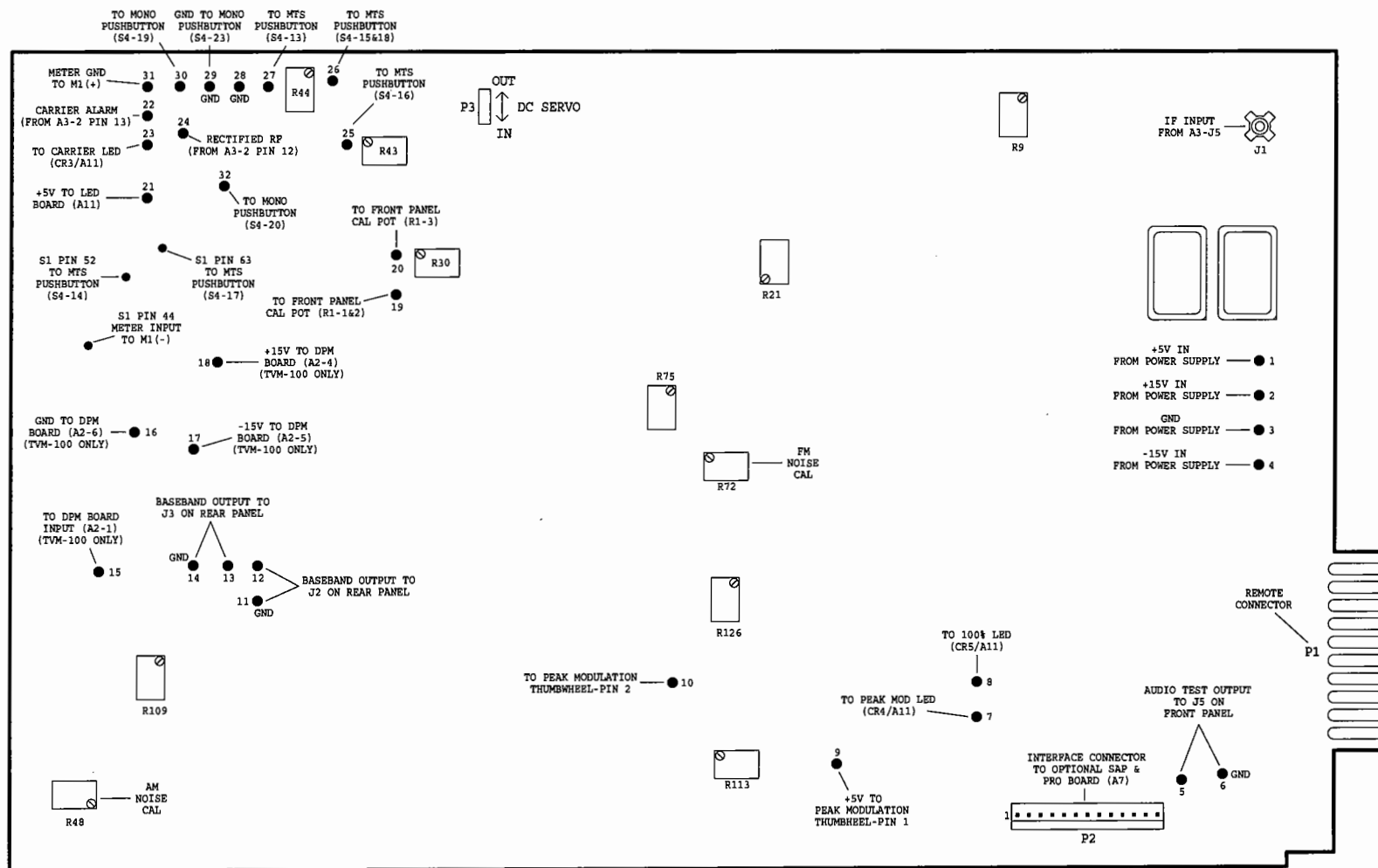
TVM-100/101 A1 BOARD REV. A  
PART LOCATIONS  
cont.

Desig/Loc

|     |    |
|-----|----|
| U28 | F4 |
| U29 | F3 |
| U30 | E4 |
| U31 | F6 |
| U32 | F5 |
| U33 | G5 |
| U34 | D5 |
| U35 | E6 |
| U36 | C5 |
| U37 | B6 |
| U38 | G7 |
| U39 | G6 |
| U40 | E6 |
| U41 | F6 |
| U42 | G6 |
| U43 | G6 |
| U44 | G5 |
| U45 | H6 |
| U46 | B7 |
| U47 | C7 |
| U48 | D7 |
| U49 | D1 |

pins

|    |    |
|----|----|
| 1  | K3 |
| 2  | K3 |
| 3  | K4 |
| 4  | K4 |
| 5  | K7 |
| 6  | K7 |
| 7  | I6 |
| 8  | I6 |
| 9  | H7 |
| 10 | F6 |
| 11 | C5 |
| 12 | C5 |
| 13 | B5 |
| 14 | B5 |
| 15 | A5 |
| 16 | B4 |
| 17 | B4 |
| 18 | B3 |
| 19 | D3 |
| 20 | D2 |
| 21 | B2 |
| 22 | B1 |
| 23 | B1 |
| 24 | B1 |
| 25 | C1 |
| 26 | C1 |
| 27 | C1 |
| 28 | B1 |
| 29 | B1 |
| 30 | B1 |
| 31 | B1 |
| 32 | B2 |



TVM-100/101 A1  
REV. A  
DEMODULATOR BOARD  
CONNECTIONS & ADJUSTMENTS  
BELAR ELECTRONICS

## A1 BOARD TVM-100/101 REV. A

| Reference<br>Designation | Description                      | Part Number |
|--------------------------|----------------------------------|-------------|
| C1 thru C6               | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C7                       | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C8                       | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C9                       | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C10                      | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C11 thru C15             | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C16,C17                  | C: FIXED CERAMIC 1.0uF 50V       | 0151-0008   |
| C18                      | C: FIXED MICA 22pF 5%            | 0140-2205   |
| C18A                     | C: FIXED CERAMIC 56pF 100V N750  | 0155-0005   |
| C19                      | not used                         |             |
| C20                      | C: FIXED ELEC 47uF 50V           | 0180-0017   |
| C21                      | C: FIXED CERAMIC 1.0uF 50V       | 0151-0008   |
| C22                      | C: FIXED MICA 22pF 5%            | 0140-2205   |
| C23                      | C: FIXED CERAMIC 1.0uF 50V       | 0151-0008   |
| C24                      | C: FIXED ELEC 47uF 50V           | 0180-0017   |
| C25                      | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C26                      | C: FIXED POLY 270pF 2.5% 160V    | 0130-2712   |
| C27                      | C: FIXED POLY 820pF 2.5% 160V    | 0130-8212   |
| C28                      | C: FIXED POLY 3900pF 2.5% 160V   | 0130-3922   |
| C29                      | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C30                      | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C31                      | C: FIXED POLY 10,000pF 2.5% 160V | 0130-1032   |
| C32                      | C: FIXED MICA 22pF 5%            | 0140-2205   |
| C33                      | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C34                      | C: FIXED MICA 22pF 5%            | 0140-2205   |
| C35                      | C: FIXED FILM 0.22uF 10% 80V     | 0120-2241   |
| C36,C37                  | C: FIXED MICA 22pF 5%            | 0140-2205   |
| C38,C39                  | C: FIXED CERAMIC 1.0uF 50V       | 0151-0008   |
| C40                      | C: FIXED POLY 7500pF 2.5% 160V   | 0130-7522   |
| C41                      | C: FIXED CERAMIC 1.0uF 50V       | 0151-0008   |
| C42,C43                  | C: FIXED ELEC 100uF 35V          | 0180-0018   |
| C44                      | C: FIXED FILM 0.22uF 10% 80V     | 0120-2241   |
| C45                      | C: FIXED TANT 6.8uF 25V          | 0185-0002   |
| C46,C47                  | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C48                      | C: FIXED FILM 0.047uF 10% 200V   | 0120-4731   |
| C49                      | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C50,C51                  | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C52                      | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C53                      | C: FIXED CERAMIC 1.0uF 50V       | 0151-0008   |
| C54                      | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C55                      | C: FIXED POLY 3900pF 2.5% 160V   | 0130-3922   |
| C56                      | C: FIXED FILM 0.22uF 10% 80V     | 0120-2241   |
| C57                      | C: FIXED TANT 15uF 15V           | 0185-0003   |
| C58 thru C61             | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C62                      | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C63                      | C: FIXED ELEC 330uF 20V          | 0180-0022   |
| C64                      | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C65                      | C: FIXED ELEC 330uF 20V          | 0180-0022   |
| C66                      | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C67                      | C: FIXED TANT 6.8uF 25V          | 0185-0002   |

## A1 BOARD TVM-100/101 REV. A CONT.

| Reference Designation | Description                    | Part Number |
|-----------------------|--------------------------------|-------------|
| C68                   | C: FIXED CERAMIC 0.1uF 50V     | 0151-0006   |
| C69                   | C: FIXED TANT 6.8uF 25V        | 0185-0002   |
| C70                   | C: FIXED CERAMIC 0.1uF 50V     | 0151-0006   |
| C71                   | C: FIXED MICA 750pF 5%         | 0140-7515   |
| C72,C73               | C: FIXED CERAMIC 0.1uF 50V     | 0151-0006   |
| C74                   | C: FIXED FILM 0.22uF 10% 100V  | 0122-2241   |
| C75,C76               | C: FIXED CERAMIC 0.1uF 50V     | 0151-0006   |
| C77                   | C: FIXED FILM 0.022uF 10% 100V | 0122-2231   |
| CR1 thru CR12         | DIODE: 1N4446                  | 1900-0002   |
| CR13                  | DIODE: 1N277 GERMANIUM         | 1900-0001   |
| CR14                  | DIODE: 1N4446                  | 1900-0002   |
| CR15 thru CR17        | DIODE: 1N277 GERMANIUM         | 1900-0001   |
| CR18                  | DIODE: 1N4446                  | 1900-0002   |
| CR19                  | DIODE: 1N277 GERMANIUM         | 1900-0001   |
| CR20                  | DIODE: 1N4446                  | 1900-0002   |
| CR21                  | DIODE: 1N277 GERMANIUM         | 1900-0001   |
| CR22 thru CR24        | DIODE: 1N4446                  | 1900-0002   |
| CR25                  | DIODE: 1N277 GERMANIUM         | 1900-0001   |
| CR26,CR27             | DIODE: 1N4446                  | 1900-0002   |
| CR28,CR29             | DIODE: 1N277 GERMANIUM         | 1900-0001   |
| CR30 thru CR32        | DIODE: 1N4006                  | 1900-0016   |
| CR33,CR34             | DIODE: 1N755A                  | 1900-0023   |
| FL1                   | FILTER: BELAR LPF              | 9120-0009   |
| J1                    | JACK: SMB, PC MOUNT            | 0360-0040   |
| L1                    | INDUCTOR: BELAR                | 9140-0039   |
| L2                    | INDUCTOR: BELAR                | 9140-0038   |
| L3                    | CHOKE: RF                      | 9140-0011   |
| P2                    | PLUG: 13 PIN, PC MOUNT         | 0365-0041   |
| P3                    | PLUG: 3 PIN, PC MOUNT          | 0365-0030   |
| --                    | JUMPER: 2 PIN (USED WITH P3)   | 0365-0028   |
| Q1                    | TRANSISTOR: 2N2907A            | 1850-0027   |
| Q2                    | TRANSISTOR: 2N4037             | 1850-0011   |
| Q3,Q4                 | TRANSISTOR: 2N2222             | 1850-0020   |
| Q5,Q6                 | TRANSISTOR: 2N4401             | 1850-0028   |
| R1,R2                 | R: METAL FILM 470 2% 1/4W      | 0751-4712   |
| R3                    | R: METAL FILM 820 2% 1/2W      | 0771-8212   |
| R4                    | not used                       |             |
| R5                    | R: METAL FILM 160 2% 1/4W      | 0751-1612   |
| R6                    | R: METAL FILM 430 2% 1/4W      | 0751-4312   |
| R7                    | R: METAL FILM 1k 2% 1/4W       | 0751-1022   |
| R8                    | R: METAL FILM 7.50k 1%         | 0721-7501   |
| R9                    | R: VAR COMP 1k, 10 TURN        | 2100-0021   |
| R10                   | R: METAL FILM 3.3k 2% 1/4W     | 0751-3322   |

A1 BOARD TVM-100/101 REV. A CONT.

| Reference<br>Designation | Description                  | Part Number |
|--------------------------|------------------------------|-------------|
| R11                      | R: METAL FILM 10 2% 1/4W     | 0751-1002   |
| R12                      | R: METAL FILM 3.3k 2% 1/4W   | 0751-3322   |
| R13,R14                  | R: METAL FILM 1k 2% 1/4W     | 0751-1022   |
| R15                      | R: WIRE WOUND 620 5% 2W      | 0811-0012   |
| R16                      | R: METAL FILM 866 1%         | 0721-8660   |
| R17                      | not used                     |             |
| R18                      | R: METAL FILM 1.00k 1%       | 0721-1001   |
| R19                      | R: METAL FILM 8.25k 1%       | 0721-8251   |
| R20                      | R: METAL FILM 12.4k 1%       | 0721-1242   |
| R21                      | R: VAR COMP 1k, 10 TURN      | 2100-0021   |
| R22                      | R: METAL FILM 4.32k 1%       | 0721-4321   |
| R23                      | R: FIXED CARBON 2.4M 5% 1/4W | 0683-2455   |
| R24,R25                  | R: METAL FILM 1k 2% 1/4W     | 0751-1022   |
| R26                      | R: METAL FILM 100 2% 1/4W    | 0751-1012   |
| R27                      | R: METAL FILM 866 1%         | 0721-8660   |
| R28                      | not used                     |             |
| R29                      | R: METAL FILM 1.10k 1%       | 0721-1101   |
| R30                      | R: VAR COMP 1k, 10 TURN      | 2100-0021   |
| R31                      | R: METAL FILM 2.10k 1%       | 0721-2101   |
| R32                      | R: METAL FILM 9.09k 1%       | 0721-9091   |
| R33                      | R: METAL FILM 8.25k 1%       | 0721-8251   |
| R34                      | R: METAL FILM 1k 2% 1/4W     | 0751-1022   |
| R35                      | R: METAL FILM 10k 2% 1/4W    | 0751-1032   |
| R36                      | R: FIXED CARBON 1.5M 5% 1/4W | 0683-1555   |
| R37                      | R: METAL FILM 27k 2% 1/4W    | 0751-2732   |
| R38                      | R: METAL FILM 16k 2% 1/4W    | 0751-1632   |
| R39                      | R: METAL FILM 10k 2% 1/4W    | 0751-1032   |
| R40                      | R: METAL FILM 2.80k 1%       | 0721-2801   |
| R41                      | R: METAL FILM 10.0k 1%       | 0721-1002   |
| R42                      | R: METAL FILM 4.99k 1%       | 0721-4991   |
| R43,R44                  | R: VAR COMP 500, 10 TURN     | 2100-0027   |
| R45                      | R: METAL FILM 4.99k 1%       | 0721-4991   |
| R46                      | R: METAL FILM 10.0k 1%       | 0721-1002   |
| R47                      | R: METAL FILM 2.7k 2% 1/4W   | 0751-2722   |
| R48                      | R: VAR COMP 100k, 10 TURN    | 2100-0030   |
| R49                      | R: FIXED CARBON 1.2M 5% 1/4W | 0683-1255   |
| R50                      | R: METAL FILM 10k 2% 1/4W    | 0751-1032   |
| R51                      | R: FIXED CARBON 1.5M 5% 1/4W | 0683-1555   |
| R52                      | R: METAL FILM 10k 2% 1/4W    | 0751-1032   |
| R53                      | R: METAL FILM 27k 2% 1/4W    | 0751-2732   |
| R54                      | R: METAL FILM 270k 2% 1/4W   | 0751-2742   |
| R55                      | R: METAL FILM 22k 2% 1/4W    | 0751-2232   |
| R56,R57                  | R: METAL FILM 75.0 1%        | 0721-75R0   |
| R58                      | R: METAL FILM 499 1%         | 0721-4990   |
| R59                      | R: METAL FILM 43.2 1%        | 0721-43R2   |
| R60                      | R: METAL FILM 499 1%         | 0721-4990   |
| R61                      | R: METAL FILM 10.0k 1%       | 0721-1002   |
| R62                      | R: METAL FILM 10k 2% 1/4W    | 0751-1032   |
| R63                      | R: METAL FILM 20.0k 1%       | 0721-2002   |
| R64                      | R: METAL FILM 10.0k 1%       | 0721-1002   |

## A1 BOARD TVM-100/101 REV. A CONT.

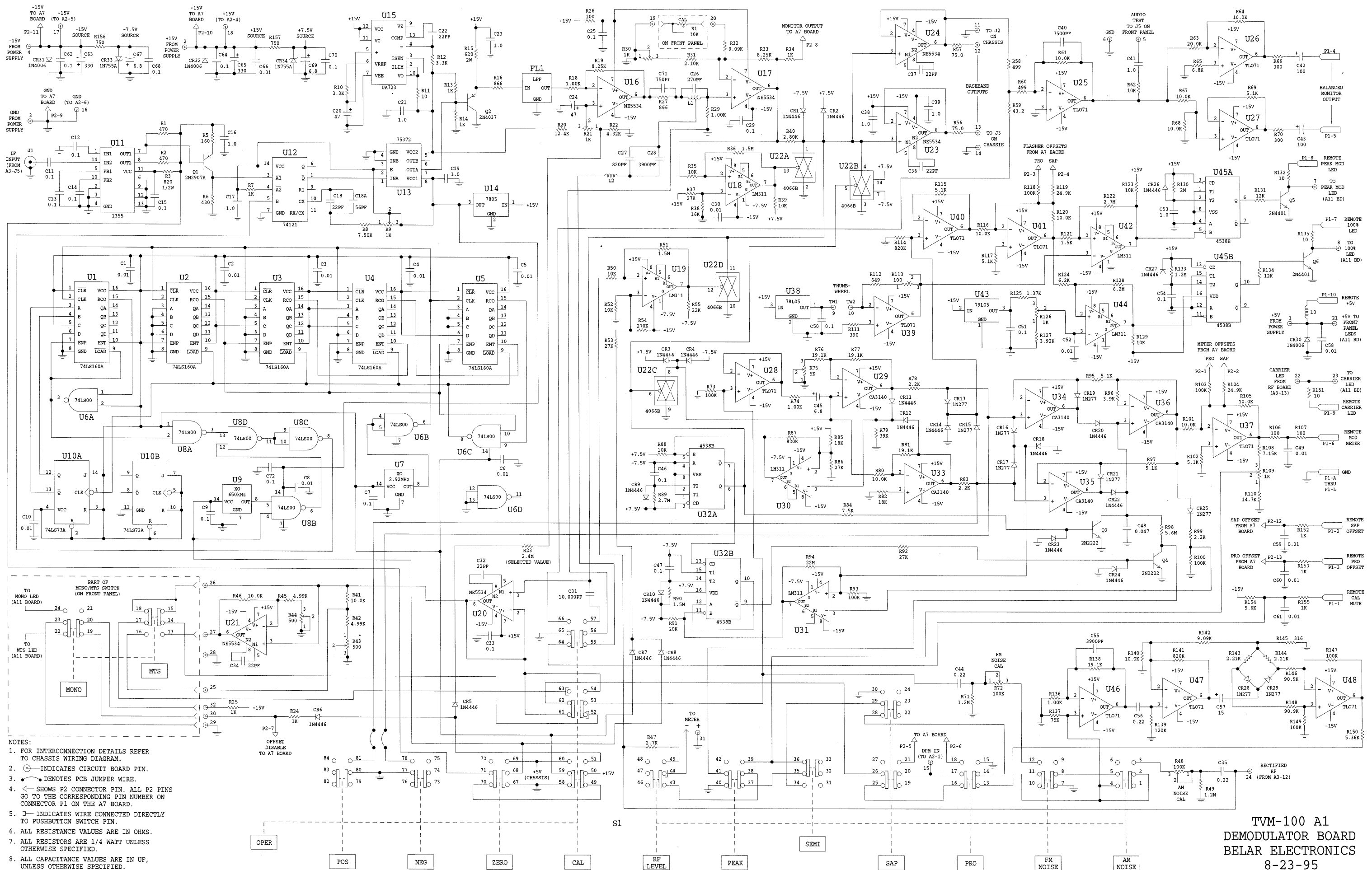
| Reference<br>Designation | Description                  | Part Number |
|--------------------------|------------------------------|-------------|
| R65                      | R: METAL FILM 6.8k 2% 1/4W   | 0751-6822   |
| R66                      | R: METAL FILM 300 2% 1/4W    | 0751-3012   |
| R67,R68                  | R: METAL FILM 10.0k 1%       | 0721-1002   |
| R69                      | R: METAL FILM 5.1k 2% 1/4W   | 0751-5122   |
| R70                      | R: METAL FILM 300 2% 1/4W    | 0751-3012   |
| R71                      | R: FIXED CARBON 1.2M 5% 1/4W | 0683-1255   |
| R72                      | R: VAR COMP 100k, 10 TURN    | 2100-0030   |
| R73                      | R: METAL FILM 100k 2% 1/4W   | 0751-1042   |
| R74                      | R: METAL FILM 1.00k 1%       | 0721-1001   |
| R75                      | R: VAR COMP 5k, 10 TURN      | 2100-0020   |
| R76,R77                  | R: METAL FILM 19.1k 1%       | 0721-1912   |
| R78                      | R: METAL FILM 2.2k 2% 1/4W   | 0751-2222   |
| R79                      | R: METAL FILM 39k 2% 1/4W    | 0751-3932   |
| R80                      | R: METAL FILM 10.0k 1%       | 0721-1002   |
| R81                      | R: METAL FILM 19.1k 1%       | 0721-1912   |
| R82                      | R: METAL FILM 18k 2% 1/4W    | 0751-1832   |
| R83                      | R: METAL FILM 2.2k 2% 1/4W   | 0751-2222   |
| R84                      | R: METAL FILM 7.5k 2% 1/4W   | 0751-7522   |
| R85                      | R: METAL FILM 18k 2% 1/4W    | 0751-1832   |
| R86                      | R: METAL FILM 27k 2% 1/4W    | 0751-2732   |
| R87                      | R: METAL FILM 820k 2% 1/4W   | 0751-8242   |
| R88                      | R: METAL FILM 10k 2% 1/4W    | 0751-1032   |
| R89                      | R: FIXED CARBON 2.7M 5% 1/4W | 0683-2755   |
| R90                      | R: FIXED CARBON 1.5M 5% 1/4W | 0683-1555   |
| R91                      | R: METAL FILM 10k 2% 1/4W    | 0751-1032   |
| R92                      | R: METAL FILM 27k 2% 1/4W    | 0751-2732   |
| R93                      | R: METAL FILM 100k 2% 1/4W   | 0751-1042   |
| R94                      | R: FIXED CARBON 22M 5% 1/4W  | 0683-2265   |
| R95                      | R: METAL FILM 5.1k 2% 1/4W   | 0751-5122   |
| R96                      | R: METAL FILM 3.9k 2% 1/4W   | 0751-3922   |
| R97                      | R: METAL FILM 5.1k 2% 1/4W   | 0751-5122   |
| R98                      | R: FIXED CARBON 5.6M 5% 1/4W | 0683-5655   |
| R99                      | R: METAL FILM 2.2k 2% 1/4W   | 0751-2222   |
| R100                     | R: METAL FILM 100k 2% 1/4W   | 0751-1042   |
| R101                     | R: METAL FILM 10.0k 1%       | 0721-1002   |
| R102                     | R: METAL FILM 5.1k 2% 1/4W   | 0751-5122   |
| R103                     | R: METAL FILM 100k 1%        | 0721-1003   |
| R104                     | R: METAL FILM 24.9k 1%       | 0721-2492   |
| R105                     | R: METAL FILM 10.0k 1%       | 0721-1002   |
| R106,R107                | R: METAL FILM 100 2% 1/4W    | 0751-1012   |
| R108                     | R: METAL FILM 7.15k 1%       | 0721-7151   |
| R109                     | R: VAR COMP 1k, 10 TURN      | 2100-0021   |
| R110                     | R: METAL FILM 14.7k 1%       | 0721-1472   |
| R111                     | R: METAL FILM 390 2% 1/4W    | 0751-3912   |
| R112                     | R: METAL FILM 649 1%         | 0721-6490   |
| R113                     | R: VAR COMP 100, 10 TURN     | 2100-0022   |
| R114                     | R: METAL FILM 820k 2% 1/4W   | 0751-8242   |
| R115                     | R: METAL FILM 5.1k 2% 1/4W   | 0751-5122   |
| R116                     | R: METAL FILM 10.0k 1%       | 0721-1002   |
| R117                     | R: METAL FILM 5.1k 2% 1/4W   | 0751-5122   |

## A1 BOARD TVM-100/101 REV. A CONT.

| Reference<br>Designation | Description                          | Part Number |
|--------------------------|--------------------------------------|-------------|
| R118                     | R: METAL FILM 100k 1%                | 0721-1003   |
| R119                     | R: METAL FILM 24.9k 1%               | 0721-2492   |
| R120                     | R: METAL FILM 10.0k 1%               | 0721-1002   |
| R121                     | R: METAL FILM 1.5k 2% 1/4W           | 0751-1522   |
| R122                     | R: FIXED CARBON 2.7M 5% 1/4W         | 0683-2755   |
| R123                     | R: METAL FILM 10k 2% 1/4W            | 0751-1032   |
| R124                     | R: METAL FILM 6.2k 2% 1/4W           | 0751-6222   |
| R125                     | R: METAL FILM 1.37k 1%               | 0721-1371   |
| R126                     | R: VAR COMP 1k, 10 TURN              | 2100-0021   |
| R127                     | R: METAL FILM 3.92k 1%               | 0721-3921   |
| R128                     | R: FIXED CARBON 6.2M 5% 1/4W         | 0683-6255   |
| R129                     | R: METAL FILM 10k 2% 1/4W            | 0751-1032   |
| R130                     | R: FIXED CARBON 2M 5% 1/4W           | 0683-2055   |
| R131                     | R: METAL FILM 12k 2% 1/4W            | 0751-1232   |
| R132                     | R: METAL FILM 10 2% 1/4W             | 0751-1002   |
| R133                     | R: FIXED CARBON 1.2M 5% 1/4W         | 0683-1255   |
| R134                     | R: METAL FILM 12k 2% 1/4W            | 0751-1232   |
| R135                     | R: METAL FILM 10 2% 1/4W             | 0751-1002   |
| R136                     | R: METAL FILM 1.00k 1%               | 0721-1001   |
| R137                     | R: METAL FILM 75k 2% 1/4W            | 0751-7532   |
| R138                     | R: METAL FILM 19.1k 1%               | 0721-1912   |
| R139                     | R: METAL FILM 120k 2% 1/4W           | 0751-1242   |
| R140                     | R: METAL FILM 10.0k 1%               | 0721-1002   |
| R141                     | R: METAL FILM 820k 2% 1/4W           | 0751-8242   |
| R142                     | R: METAL FILM 9.09k 1%               | 0721-9091   |
| R143,R144                | R: METAL FILM 2.21k 1%               | 0721-2211   |
| R145                     | R: METAL FILM 316 1%                 | 0721-3160   |
| R146                     | R: METAL FILM 90.9k 1%               | 0721-9092   |
| R147                     | R: METAL FILM 100k 1%                | 0721-1003   |
| R148                     | R: METAL FILM 90.9k 1%               | 0721-9092   |
| R149                     | R: METAL FILM 100k 1%                | 0721-1003   |
| R150                     | R: METAL FILM 5.36k 1%               | 0721-5361   |
| R151                     | R: METAL FILM 10 2% 1/4W             | 0751-1002   |
| R152,R153                | R: METAL FILM 1k 2% 1/4W             | 0751-1022   |
| R154                     | R: METAL FILM 5.6k 2% 1/4W           | 0751-5622   |
| R155                     | R: METAL FILM 1k 2% 1/4W             | 0751-1022   |
| R156,R157                | R: METAL FILM 750 2% 1/4W            | 0751-7512   |
| R158,R159                | R: FIXED CARBON 3.9M 5% 1/4W         | 0683-3955   |
| R160                     | R: METAL FILM 11.0k 1%               | 0721-1102   |
|                          |                                      |             |
| S1                       | SWITCH:PUSHBUTTON(12 BUTTON:TVM-100) | 3101-0030   |
|                          | SWITCH:PUSHBUTTON(10 BUTTON:TVM-101) | 3101-0032   |
|                          |                                      |             |
| U1 thru U5               | IC: 74LS160A                         | 1821-0031   |
| U6                       | IC: 74LS00                           | 1821-0029   |
| U7                       | IC: XO, 2.92MHz                      | 0415-0292   |
| U8                       | IC: 74LS00                           | 1821-0029   |
| U9                       | IC: XO, 650kHz                       | 0415-0065   |
| U10                      | IC: 74LS73A                          | 1821-0030   |
| U11                      | IC: 1355                             | 1826-0045   |

A1 BOARD TVM-100/101 REV. A CONT.

| Reference<br>Designation | Description | Part Number |
|--------------------------|-------------|-------------|
| U12                      | IC: 74121   | 1821-0014   |
| U13                      | IC: DS0026  | 1826-0021   |
| U14                      | IC: 7805CT  | 1826-0014   |
| U15                      | IC: UA723   | 1820-0012   |
| U16,U17                  | IC: NE5534  | 1826-0025   |
| U18,U19                  | IC: LM311   | 1826-0009   |
| U20,U21                  | IC: NE5534  | 1826-0025   |
| U22                      | IC: 4066B   | 1822-0018   |
| U23,U24                  | IC: NE5534  | 1826-0025   |
| U25 thru U28             | IC: TLO71   | 1826-0004   |
| U29                      | IC: CA3140E | 1826-0001   |
| U30,U31                  | IC: LM311   | 1826-0009   |
| U32                      | IC: 4538B   | 1822-0023   |
| U33 thru U36             | IC: CA3140E | 1826-0001   |
| U37                      | IC: TLO71   | 1826-0004   |
| U38                      | IC: 78L05CP | 1826-0012   |
| U39 thru U41             | IC: TLO71   | 1826-0004   |
| U42                      | IC: LM311   | 1826-0009   |
| U43                      | IC: 79L05CP | 1826-0017   |
| U44                      | IC: LM311   | 1826-0009   |
| U45                      | IC: 4538B   | 1822-0023   |
| U46 thru U49             | IC: TLO71   | 1826-0004   |





TVM-100/101 A1 BOARD  
PART LOCATIONS

| <u>Desig/Loc</u> | <u>Desig/Loc</u> | <u>Desig/Loc</u> | <u>Desig/Loc</u> | <u>Desig/Loc</u> | <u>Desig/Loc</u> |
|------------------|------------------|------------------|------------------|------------------|------------------|
| C1               | H4               | C44              | G4               | CR15             | F5               |
| C2               | H4               | C45              | F3               | CR16             | D5               |
| C3               | H4               | C46              | F5               | CR17             | E6               |
| C4               | I4               | C47              | F4               | CR18             | D5               |
| C5               | J4               | C48              | D5               | CR19             | D6               |
| C6               | J3               | C49              | J5               | CR20             | D5               |
| C7               | K3               | C50              | G6               | CR21             | E5               |
| C8               | I2               | C51              | F6               | CR22             | E5               |
| C9               | J2               | C52              | G5               | CR23             | D4               |
| C10              | I3               | C53              | H5               | CR24             | D5               |
| C11              | K1               | C54              | H6               | CR25             | C5               |
| C12              | K1               | C55              | B6               | CR26             | H6               |
| C13              | K1               | C56              | B7               | CR27             | H6               |
| C14              | K2               | C57              | C7               | CR28             | D7               |
| C15              | K2               | C58              | K4               | CR29             | D7               |
| C16              | J2               | C59              | K7               | CR30             | K4               |
| C17              | I1               | C60              | K7               | CR31             | K4               |
| C18              | I1               | C61              | K7               | CR32             | K3               |
| C18A             | I1               | C62              | K4               | CR33             | D4               |
| C19              | H1               | C63              | J4               | CR34             | B3               |
| C20              | H2               | C64              | K3               |                  |                  |
| C21              | H1               | C65              | K4               | FL1              | G1               |
| C22              | I2               | C66              | B3               |                  |                  |
| C23              | H2               | C67              | D4               | J1               | K1               |
| C24              | G2               | C68              | E4               |                  |                  |
| C25              | E2               | C69              | B3               | L1               | F1               |
| C26              | E2               | C70              | B3               | L2               | E2               |
| C27              | E1               | C71              | E2               | L3               | K5               |
| C28              | E1               | C72              | I2*              |                  |                  |
| C29              | D1               |                  |                  | P1               | **               |
| C30              | D3               | CR1              | C5               | P2               | J7               |
| C31              | C2               | CR2              | C3               |                  |                  |
| C32              | C1               | CR3              | D4               | Q1               | J1               |
| C33              | C2               | CR4              | C4               | Q2               | H1               |
| C34              | B1               | CR5              | C2               | Q3               | E5               |
| C35              | A7               | CR6              | A3               | Q4               | E5               |
| C36              | B5               | CR7              | C3               | Q5               | H7               |
| C37              | C5               | CR8              | C3               | Q6               | I6               |
| C38              | B4               | CR9              | E4               |                  |                  |
| C39              | B4               | CR10             | F4               | R1               | J1               |
| C40              | I6               | CR11             | E3               | R2               | J2               |
| C41              | J7               | CR12             | G5               | R3               | K2               |
| C42              | K6               | CR13             | F5               | R4               | --               |
| C43              | K6               | CR14             | G5               | R5               | J2               |
|                  |                  |                  |                  | R6               | J1               |
|                  |                  |                  |                  | R7               | I2               |
|                  |                  |                  |                  | R8               | I1               |
|                  |                  |                  |                  | R9               | I1               |
|                  |                  |                  |                  | R10              | H2               |
|                  |                  |                  |                  | R11              | I2               |
|                  |                  |                  |                  | R12              | I2               |
|                  |                  |                  |                  | R13              | H1               |
|                  |                  |                  |                  | R14              | H1               |
|                  |                  |                  |                  | R15              | H1               |
|                  |                  |                  |                  | R16              | G1*              |
|                  |                  |                  |                  | R17              | --               |
|                  |                  |                  |                  | R18              | F2*              |
|                  |                  |                  |                  | R19              | F2               |
|                  |                  |                  |                  | R20              | G2               |
|                  |                  |                  |                  | R21              | G2               |
|                  |                  |                  |                  | R22              | G2               |
|                  |                  |                  |                  | R23              | F2               |
|                  |                  |                  |                  | R24              | A3               |
|                  |                  |                  |                  | R25              | C2               |
|                  |                  |                  |                  | R26              | F2               |
|                  |                  |                  |                  | R27              | E2               |
|                  |                  |                  |                  | R28              | --               |
|                  |                  |                  |                  | R29              | D1               |
|                  |                  |                  |                  | R30              | D2               |
|                  |                  |                  |                  | R31              | D2               |
|                  |                  |                  |                  | R32              | D2               |
|                  |                  |                  |                  | R33              | D2               |
|                  |                  |                  |                  | R34              | D2               |
|                  |                  |                  |                  | R35              | C2               |
|                  |                  |                  |                  | R36              | D4               |
|                  |                  |                  |                  | R37              | D4               |
|                  |                  |                  |                  | R38              | D4               |
|                  |                  |                  |                  | R39              | D4               |
|                  |                  |                  |                  | R40              | C2               |
|                  |                  |                  |                  | R41              | D1               |
|                  |                  |                  |                  | R42              | D1               |
|                  |                  |                  |                  | R43              | D1               |
|                  |                  |                  |                  | R44              | C1               |
|                  |                  |                  |                  | R45              | C1               |
|                  |                  |                  |                  | R46              | C1               |
|                  |                  |                  |                  | R47              | B3               |
|                  |                  |                  |                  | R48              | A7               |
|                  |                  |                  |                  | R49              | A7               |
|                  |                  |                  |                  | R50              | B3               |
|                  |                  |                  |                  | R51              | C3               |
|                  |                  |                  |                  | R52              | B4               |
|                  |                  |                  |                  | R53              | C3               |
|                  |                  |                  |                  | R54              | B4               |
|                  |                  |                  |                  | R55              | C4               |
|                  |                  |                  |                  | R56              | B5               |
|                  |                  |                  |                  | R57              | C5               |
|                  |                  |                  |                  | R58              | I7               |
|                  |                  |                  |                  | R59              | I7               |
|                  |                  |                  |                  | R60              | I6               |
|                  |                  |                  |                  | R61              | I6               |
|                  |                  |                  |                  | R62              | J7               |
|                  |                  |                  |                  | R63              | J6               |
|                  |                  |                  |                  | R64              | J6               |
|                  |                  |                  |                  | R65              | J6               |
|                  |                  |                  |                  | R66              | J7               |
|                  |                  |                  |                  | R67              | J6               |
|                  |                  |                  |                  | R68              | K6               |
|                  |                  |                  |                  | R69              | K6               |
|                  |                  |                  |                  | R70              | K6               |
|                  |                  |                  |                  | R71              | G4               |
|                  |                  |                  |                  | R72              | G4               |
|                  |                  |                  |                  | R73              | G4               |
|                  |                  |                  |                  | R74              | F3               |
|                  |                  |                  |                  | R75              | F4               |
|                  |                  |                  |                  | R76              | F3               |
|                  |                  |                  |                  | R77              | F4               |
|                  |                  |                  |                  | R78              | E4               |
|                  |                  |                  |                  | R79              | E3               |
|                  |                  |                  |                  | R80              | G4               |
|                  |                  |                  |                  | R81              | G5               |
|                  |                  |                  |                  | R82              | G4               |
|                  |                  |                  |                  | R83              | G5               |
|                  |                  |                  |                  | R84              | E5               |
|                  |                  |                  |                  | R85              | E4               |
|                  |                  |                  |                  | R86              | E4               |
|                  |                  |                  |                  | R87              | E4               |
|                  |                  |                  |                  | R88              | E5               |
|                  |                  |                  |                  | R89              | E4               |
|                  |                  |                  |                  | R90              | F4               |
|                  |                  |                  |                  | R91              | F5               |
|                  |                  |                  |                  | R92              | E5               |
|                  |                  |                  |                  | R93              | E5               |
|                  |                  |                  |                  | R94              | F5               |
|                  |                  |                  |                  | R95              | D5               |
|                  |                  |                  |                  | R96              | C6               |
|                  |                  |                  |                  | R97              | D5               |
|                  |                  |                  |                  | R98              | D5               |
|                  |                  |                  |                  | R99              | C5               |
|                  |                  |                  |                  | R100             | C5               |
|                  |                  |                  |                  | R101             | B5               |
|                  |                  |                  |                  | R102             | B5               |
|                  |                  |                  |                  | R103             | C6               |
|                  |                  |                  |                  | R104             | C6               |
|                  |                  |                  |                  | R105             | B6               |
|                  |                  |                  |                  | R106             | J5               |
|                  |                  |                  |                  | R107             | K5               |
|                  |                  |                  |                  | R108             | B6               |
|                  |                  |                  |                  | R109             | B6               |
|                  |                  |                  |                  | R110             | B5               |
|                  |                  |                  |                  | R111             | F6               |
|                  |                  |                  |                  | R112             | F6               |
|                  |                  |                  |                  | R113             | G7               |
|                  |                  |                  |                  | R114             | E7               |
|                  |                  |                  |                  | R115             | E6               |
|                  |                  |                  |                  | R116             | E6               |
|                  |                  |                  |                  | R117             | F6               |
|                  |                  |                  |                  | R118             | F7               |
|                  |                  |                  |                  | R119             | F7               |
|                  |                  |                  |                  | R120             | F6               |
|                  |                  |                  |                  | R121             | G6               |
|                  |                  |                  |                  | R122             | G6               |
|                  |                  |                  |                  | R123             | H6               |
|                  |                  |                  |                  | R124             | G5               |
|                  |                  |                  |                  | R125             | G5               |
|                  |                  |                  |                  | R126             | G5               |
|                  |                  |                  |                  | R127             | F6               |
|                  |                  |                  |                  | R128             | G5               |
|                  |                  |                  |                  | R129             | H5               |
|                  |                  |                  |                  | R130             | H6               |
|                  |                  |                  |                  | R131             | H6               |
|                  |                  |                  |                  | R132             | K5               |
|                  |                  |                  |                  | R133             | H6               |
|                  |                  |                  |                  | R134             | I6               |
|                  |                  |                  |                  | R135             | K5               |
|                  |                  |                  |                  | R136             | B7               |
|                  |                  |                  |                  | R137             | B7               |

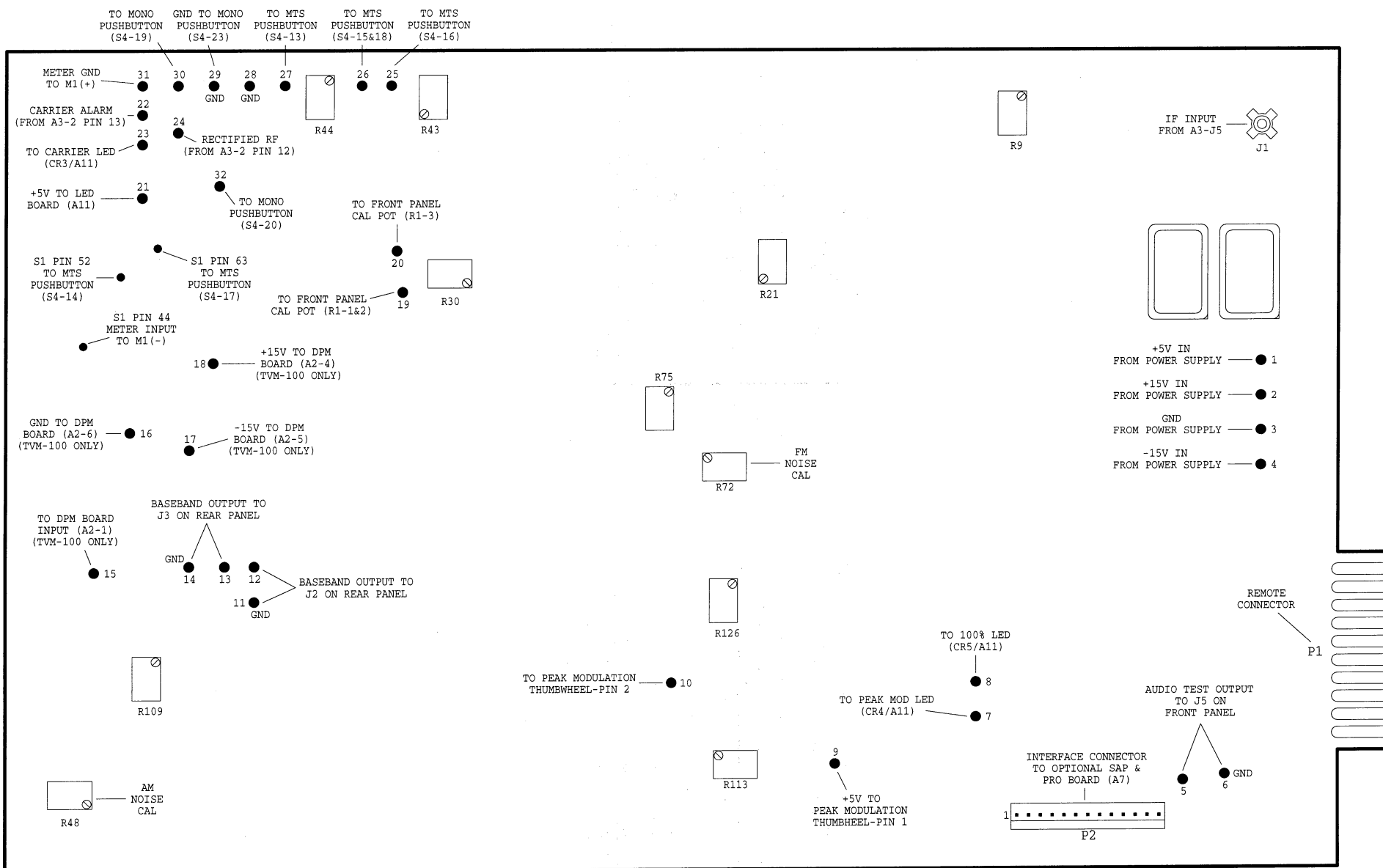
\* C72, R16, & R18 ARE ON BOTTOM OF PCB

\*\* P1 IS CARD EDGE CONNECTOR FINGERS

-- R4, R17 & R28 NOT USED

TVM-100/101 A1 BOARD  
PART LOCATIONS  
cont.

| <u>Desig/Loc</u> | <u>Desig/Loc</u> | <u>Desig/Loc</u> |
|------------------|------------------|------------------|
| R138             | B6               | U26 J6           |
| R139             | C7               | U27 K6           |
| R140             | C7               | U28 F4           |
| R141             | C6               | U29 F3           |
| R142             | C6               | U30 E4           |
| R143             | C6               | U31 F6           |
| R144             | C6               | U32 F5           |
| R145             | C7               | U33 G5           |
| R146             | D6               | U34 D5           |
| R147             | D6               | U35 E6           |
| R148             | D7               | U36 C5           |
| R149             | D7               | U37 B6           |
| R150             | D6               | U38 G7           |
| R151             | K6               | U39 G6           |
| R152             | K7               | U40 E6           |
| R153             | K7               | U41 F6           |
| R154             | J6               | U42 G6           |
| R155             | K7               | U43 G6           |
| R156             | D4               | U44 G5           |
| R157             | B3               | U45 H6           |
|                  |                  | U46 B7           |
| S1               | A1               | U47 C7           |
|                  |                  | U48 D7           |
| U1               | I3               |                  |
| U2               | H3               | <u>pins</u>      |
| U3               | H4               | 1 K3             |
| U4               | I4               | 2 K3             |
| U5               | J4               | 3 K4             |
| U6               | J3               | 4 K4             |
| U7               | K2               | 5 K7             |
| U8               | I2               | 6 K7             |
| U9               | J2               | 7 I6             |
| U10              | I3               | 8 I6             |
| U11              | K1               | 9 H7             |
| U12              | I1               | 10 F6            |
| U13              | H1               | 11 C5            |
| U14              | I2               | 12 C5            |
| U15              | H2               | 13 B5            |
| U16              | F2               | 14 B5            |
| U17              | D2               | 15 A5            |
| U18              | D4               | 16 B4            |
| U19              | C4               | 17 B4            |
| U20              | C2               | 18 B3            |
| U21              | C1               | 19 D3            |
| U22              | C4               | 20 D2            |
| U23              | B4               | 21 B2            |
| U24              | C4               | 22 B1            |
| U25              | I6               | 23 B1            |



TVM-100/101 A1  
DEMODULATOR BOARD  
CONNECTIONS & ADJUSTMENTS  
BELAR ELECTRONICS

## A1 BOARD TVM-100/101

| Reference<br>Designation | Description                      | Part Number |
|--------------------------|----------------------------------|-------------|
| C1 thru C6               | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C7                       | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C8                       | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C9                       | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C10                      | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C11 thru C15             | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C16, C17                 | C: FIXED CERAMIC 1.0uF 50V       | 0151-0008   |
| C18                      | C: FIXED MICA 22pF 5%            | 0140-2205   |
| C18A                     | C: FIXED CERAMIC 56pF 100V N750  | 0155-0005   |
| C19                      | C: FIXED CERAMIC 1.0uF 50V       | 0151-0008   |
| C20                      | C: FIXED ELEC 47uF 50V           | 0180-0017   |
| C21                      | C: FIXED CERAMIC 1.0uF 50V       | 0151-0008   |
| C22                      | C: FIXED MICA 22pF 5%            | 0140-2205   |
| C23                      | C: FIXED CERAMIC 1.0uF 50V       | 0151-0008   |
| C24                      | C: FIXED ELEC 47uF 50V           | 0180-0017   |
| C25                      | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C26                      | C: FIXED POLY 270pF 2.5% 160V    | 0130-2712   |
| C27                      | C: FIXED POLY 820pF 2.5% 160V    | 0130-8212   |
| C28                      | C: FIXED POLY 3900pF 2.5% 160V   | 0130-3922   |
| C29                      | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C30                      | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C31                      | C: FIXED POLY 10,000pF 2.5% 160V | 0130-1032   |
| C32                      | C: FIXED MICA 22pF 5%            | 0140-2205   |
| C33                      | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C34                      | C: FIXED MICA 22pF 5%            | 0140-2205   |
| C35                      | C: FIXED FILM 0.22uF 10% 80V     | 0120-2241   |
| C36, C37                 | C: FIXED MICA 22pF 5%            | 0140-2205   |
| C38, C39                 | C: FIXED CERAMIC 1.0uF 50V       | 0151-0008   |
| C40                      | C: FIXED POLY 7500pF 2.5% 160V   | 0130-7522   |
| C41                      | C: FIXED CERAMIC 1.0uF 50V       | 0151-0008   |
| C42, C43                 | C: FIXED ELEC 100uF 35V          | 0180-0018   |
| C44                      | C: FIXED FILM 0.22uF 10% 80V     | 0120-2241   |
| C45                      | C: FIXED TANT 6.8uF 25V          | 0185-0002   |
| C46, C47                 | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C48                      | C: FIXED FILM 0.047uF 10% 200V   | 0120-4731   |
| C49                      | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C50, C51                 | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C52                      | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C53                      | C: FIXED CERAMIC 1.0uF 50V       | 0151-0008   |
| C54                      | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C55                      | C: FIXED POLY 3900pF 2.5% 160V   | 0130-3922   |
| C56                      | C: FIXED FILM 0.22uF 10% 80V     | 0120-2241   |
| C57                      | C: FIXED TANT 15uF 15V           | 0185-0003   |
| C58 thru C61             | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C62                      | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C63                      | C: FIXED ELEC 330uF 20V          | 0180-0022   |
| C64                      | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C65                      | C: FIXED ELEC 330uF 20V          | 0180-0022   |
| C66                      | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C67                      | C: FIXED TANT 6.8uF 25V          | 0185-0002   |

## A1 BOARD TVM-100/101 CONT.

| Reference Designation | Description                | Part Number |
|-----------------------|----------------------------|-------------|
| C68                   | C: FIXED CERAMIC 0.1uF 50V | 0151-0006   |
| C69                   | C: FIXED TANT 6.8uF 25V    | 0185-0002   |
| C70                   | C: FIXED CERAMIC 0.1uF 50V | 0151-0006   |
| C71                   | C: FIXED MICA 750pF 5%     | 0140-7515   |
| C72                   | C: FIXED CERAMIC 0.1uF 50V | 0151-0006   |
| CR1 thru CR12         | DIODE: 1N4446              | 1900-0002   |
| CR13                  | DIODE: 1N277 GERMANIUM     | 1900-0001   |
| CR14                  | DIODE: 1N4446              | 1900-0002   |
| CR15 thru CR17        | DIODE: 1N277 GERMANIUM     | 1900-0001   |
| CR18                  | DIODE: 1N4446              | 1900-0002   |
| CR19                  | DIODE: 1N277 GERMANIUM     | 1900-0001   |
| CR20                  | DIODE: 1N4446              | 1900-0002   |
| CR21                  | DIODE: 1N277 GERMANIUM     | 1900-0001   |
| CR22 thru CR24        | DIODE: 1N4446              | 1900-0002   |
| CR25                  | DIODE: 1N277 GERMANIUM     | 1900-0001   |
| CR26,CR27             | DIODE: 1N4446              | 1900-0002   |
| CR28,CR29             | DIODE: 1N277 GERMANIUM     | 1900-0001   |
| CR30 thru CR32        | DIODE: 1N4006              | 1900-0016   |
| CR33,CR34             | DIODE: 1N755A              | 1900-0023   |
| FL1                   | FILTER: BELAR LPF          | 9120-0009   |
| J1                    | JACK: SMB, PC MOUNT        | 0360-0040   |
| L1                    | INDUCTOR: BELAR            | 9140-0039   |
| L2                    | INDUCTOR: BELAR            | 9140-0038   |
| L3                    | CHOKE: RF                  | 9140-0011   |
| P2                    | PLUG: 13 PIN, PC MOUNT     | 0365-0041   |
| Q1                    | TRANSISTOR: 2N2907A        | 1850-0027   |
| Q2                    | TRANSISTOR: 2N4037         | 1850-0011   |
| Q3,Q4                 | TRANSISTOR: 2N2222         | 1850-0020   |
| Q5,Q6                 | TRANSISTOR: 2N4401         | 1850-0028   |
| R1,R2                 | R: METAL FILM 470 2% 1/4W  | 0751-4712   |
| R3                    | R: METAL FILM 820 2% 1/2W  | 0771-8212   |
| R5                    | R: METAL FILM 160 2% 1/4W  | 0751-1612   |
| R6                    | R: METAL FILM 430 2% 1/4W  | 0751-4312   |
| R7                    | R: METAL FILM 1k 2% 1/4W   | 0751-1022   |
| R8                    | R: METAL FILM 7.50k 1%     | 0721-7501   |
| R9                    | R: VAR COMP 1k, 10 TURN    | 2100-0021   |
| R10                   | R: METAL FILM 3.3k 2% 1/4W | 0751-3322   |
| R11                   | R: METAL FILM 10 2% 1/4W   | 0751-1002   |
| R12                   | R: METAL FILM 3.3k 2% 1/4W | 0751-3322   |
| R13,R14               | R: METAL FILM 1k 2% 1/4W   | 0751-1022   |
| R15                   | R: WIRE WOUND 620 5% 2W    | 0811-0012   |
| R16                   | R: METAL FILM 866 1%       | 0721-8660   |
| R18                   | R: METAL FILM 1.00k 1%     | 0721-1001   |

## A1 BOARD TVM-100/101 CONT.

| Reference<br>Designation | Description                                              | Part Number |
|--------------------------|----------------------------------------------------------|-------------|
| R19                      | R: METAL FILM 8.25k 1%                                   | 0721-8251   |
| R20                      | R: METAL FILM 12.4k 1%                                   | 0721-1242   |
| R21                      | R: VAR COMP 1k, 10 TURN                                  | 2100-0021   |
| R22                      | R: METAL FILM 4.32k 1%                                   | 0721-4321   |
| R23                      | R: FIXED CARBON 2.4M 5% 1/4W<br>(R23 SELECTED FOR VALUE) | 0683-2455   |
| R24, R25                 | R: METAL FILM 1k 2% 1/4W                                 | 0751-1022   |
| R26                      | R: METAL FILM 100 2% 1/4W                                | 0751-1012   |
| R27                      | R: METAL FILM 866 1%                                     | 0721-8660   |
| R29                      | R: METAL FILM 1.00k 1%                                   | 0721-1001   |
| R30                      | R: VAR COMP 1k, 10 TURN                                  | 2100-0021   |
| R31                      | R: METAL FILM 2.10k 1%                                   | 0721-2101   |
| R32                      | R: METAL FILM 9.09k 1%                                   | 0721-9091   |
| R33                      | R: METAL FILM 8.25k 1%                                   | 0721-8251   |
| R34                      | R: METAL FILM 1k 2% 1/4W                                 | 0751-1022   |
| R35                      | R: METAL FILM 10k 2% 1/4W                                | 0751-1032   |
| R36                      | R: FIXED CARBON 1.5M 5% 1/4W                             | 0683-1555   |
| R37                      | R: METAL FILM 27k 2% 1/4W                                | 0751-2732   |
| R38                      | R: METAL FILM 16k 2% 1/4W                                | 0751-1632   |
| R39                      | R: METAL FILM 10k 2% 1/4W                                | 0751-1032   |
| R40                      | R: METAL FILM 2.80k 1%                                   | 0721-2801   |
| R41                      | R: METAL FILM 10.0k 1%                                   | 0721-1002   |
| R42                      | R: METAL FILM 4.99k 1%                                   | 0721-4991   |
| R43, R44                 | R: VAR COMP 500, 10 TURN                                 | 2100-0027   |
| R45                      | R: METAL FILM 4.99k 1%                                   | 0721-4991   |
| R46                      | R: METAL FILM 10.0k 1%                                   | 0721-1002   |
| R47                      | R: METAL FILM 2.7k 2% 1/4W                               | 0751-2722   |
| R48                      | R: VAR COMP 100k, 10 TURN                                | 2100-0030   |
| R49                      | R: FIXED CARBON 1.2M 5% 1/4W                             | 0683-1255   |
| R50                      | R: METAL FILM 10k 2% 1/4W                                | 0751-1032   |
| R51                      | R: FIXED CARBON 1.5M 5% 1/4W                             | 0683-1555   |
| R52                      | R: METAL FILM 10k 2% 1/4W                                | 0751-1032   |
| R53                      | R: METAL FILM 27k 2% 1/4W                                | 0751-2732   |
| R54                      | R: METAL FILM 270k 2% 1/4W                               | 0751-2742   |
| R55                      | R: METAL FILM 22k 2% 1/4W                                | 0751-2232   |
| R56, R57                 | R: METAL FILM 75.0 1%                                    | 0721-75R0   |
| R58                      | R: METAL FILM 499 1%                                     | 0721-4990   |
| R59                      | R: METAL FILM 43.2 1%                                    | 0721-43R2   |
| R60                      | R: METAL FILM 499 1%                                     | 0721-4990   |
| R61                      | R: METAL FILM 10.0k 1%                                   | 0721-1002   |
| R62                      | R: METAL FILM 10k 2% 1/4W                                | 0751-1032   |
| R63                      | R: METAL FILM 20.0k 1%                                   | 0721-2002   |
| R64                      | R: METAL FILM 10.0k 1%                                   | 0721-1002   |
| R65                      | R: METAL FILM 6.8k 2% 1/4W                               | 0751-6822   |
| R66                      | R: METAL FILM 300 2% 1/4W                                | 0751-3012   |
| R67, R68                 | R: METAL FILM 10.0k 1%                                   | 0721-1002   |
| R69                      | R: METAL FILM 5.1k 2% 1/4W                               | 0751-5122   |
| R70                      | R: METAL FILM 300 2% 1/4W                                | 0751-3012   |
| R71                      | R: FIXED CARBON 1.2M 5% 1/4W                             | 0683-1255   |
| R72                      | R: VAR COMP 100k, 10 TURN                                | 2100-0030   |

## A1 BOARD TVM-100/101 CONT.

| Reference<br>Designation | Description                  | Part Number |
|--------------------------|------------------------------|-------------|
| R73                      | R: METAL FILM 100k 2% 1/4W   | 0751-1042   |
| R74                      | R: METAL FILM 1.00k 1%       | 0721-1001   |
| R75                      | R: VAR COMP 5k, 10 TURN      | 2100-0020   |
| R76,R77                  | R: METAL FILM 19.1k 1%       | 0721-1912   |
| R78                      | R: METAL FILM 2.2k 2% 1/4W   | 0751-2222   |
| R79                      | R: METAL FILM 39k 2% 1/4W    | 0751-3932   |
| R80                      | R: METAL FILM 10.0k 1%       | 0721-1002   |
| R81                      | R: METAL FILM 19.1k 1%       | 0721-1912   |
| R82                      | R: METAL FILM 18k 2% 1/4W    | 0751-1832   |
| R83                      | R: METAL FILM 2.2k 2% 1/4W   | 0751-2222   |
| R84                      | R: METAL FILM 7.5k 2% 1/4W   | 0751-7522   |
| R85                      | R: METAL FILM 18k 2% 1/4W    | 0751-1832   |
| R86                      | R: METAL FILM 27k 2% 1/4W    | 0751-2732   |
| R87                      | R: METAL FILM 820k 2% 1/4W   | 0751-8242   |
| R88                      | R: METAL FILM 10k 2% 1/4W    | 0751-1032   |
| R89                      | R: FIXED CARBON 2.7M 5% 1/4W | 0683-2755   |
| R90                      | R: FIXED CARBON 1.5M 5% 1/4W | 0683-1555   |
| R91                      | R: METAL FILM 10k 2% 1/4W    | 0751-1032   |
| R92                      | R: METAL FILM 27k 2% 1/4W    | 0751-2732   |
| R93                      | R: METAL FILM 100k 2% 1/4W   | 0751-1042   |
| R94                      | R: FIXED CARBON 22M 5% 1/4W  | 0683-2265   |
| R95                      | R: METAL FILM 5.1k 2% 1/4W   | 0751-5122   |
| R96                      | R: METAL FILM 3.9k 2% 1/4W   | 0751-3922   |
| R97                      | R: METAL FILM 5.1k 2% 1/4W   | 0751-5122   |
| R98                      | R: FIXED CARBON 5.6M 5% 1/4W | 0683-5655   |
| R99                      | R: METAL FILM 2.2k 2% 1/4W   | 0751-2222   |
| R100                     | R: METAL FILM 100k 2% 1/4W   | 0751-1042   |
| R101                     | R: METAL FILM 10.0k 1%       | 0721-1002   |
| R102                     | R: METAL FILM 5.1k 2% 1/4W   | 0751-5122   |
| R103                     | R: METAL FILM 100k 1%        | 0721-1003   |
| R104                     | R: METAL FILM 24.9k 1%       | 0721-2492   |
| R105                     | R: METAL FILM 10.0k 1%       | 0721-1002   |
| R106,R107                | R: METAL FILM 100 2% 1/4W    | 0751-1012   |
| R108                     | R: METAL FILM 7.15k 1%       | 0721-7151   |
| R109                     | R: VAR COMP 1k, 10 TURN      | 2100-0021   |
| R110                     | R: METAL FILM 14.7k 1%       | 0721-1472   |
| R111                     | R: METAL FILM 390 2% 1/4W    | 0751-3912   |
| R112                     | R: METAL FILM 649 1%         | 0721-6490   |
| R113                     | R: VAR COMP 100, 10 TURN     | 2100-0022   |
| R114                     | R: METAL FILM 820k 2% 1/4W   | 0751-8242   |
| R115                     | R: METAL FILM 5.1k 2% 1/4W   | 0751-5122   |
| R116                     | R: METAL FILM 10.0k 1%       | 0721-1002   |
| R117                     | R: METAL FILM 5.1k 2% 1/4W   | 0751-5122   |
| R118                     | R: METAL FILM 100k 1%        | 0721-1003   |
| R119                     | R: METAL FILM 24.9k 1%       | 0721-2492   |
| R120                     | R: METAL FILM 10.0k 1%       | 0721-1002   |
| R121                     | R: METAL FILM 1.5k 2% 1/4W   | 0751-1522   |
| R122                     | R: FIXED CARBON 2.7M 5% 1/4W | 0683-2755   |
| R123                     | R: METAL FILM 10k 2% 1/4W    | 0751-1032   |
| R124                     | R: METAL FILM 6.2k 2% 1/4W   | 0751-6222   |

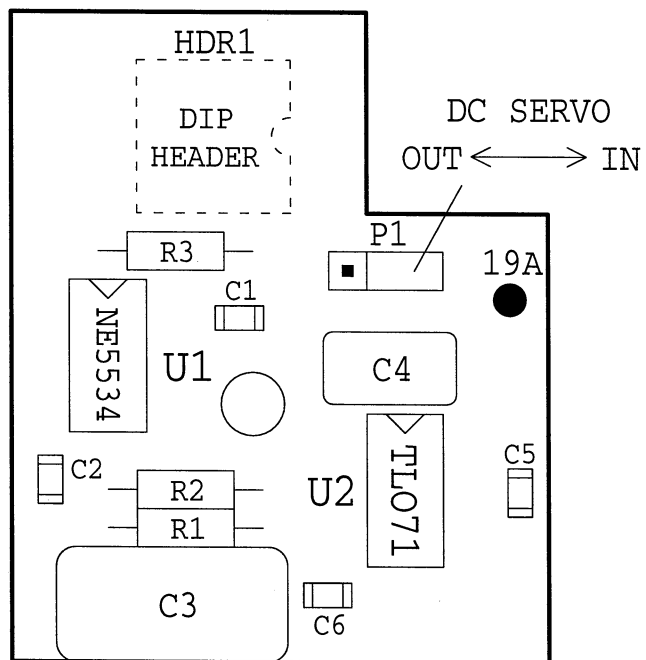
## A1 BOARD TVM-100/101 CONT.

| Reference<br>Designation | Description                             | Part Number |
|--------------------------|-----------------------------------------|-------------|
| R125                     | R: METAL FILM 1.37k 1%                  | 0721-1371   |
| R126                     | R: VAR COMP 1k, 10 TURN                 | 2100-0021   |
| R127                     | R: METAL FILM 3.92k 1%                  | 0721-3921   |
| R128                     | R: FIXED CARBON 6.2M 5% 1/4W            | 0683-6255   |
| R129                     | R: METAL FILM 10k 2% 1/4W               | 0751-1032   |
| R130                     | R: FIXED CARBON 2M 5% 1/4W              | 0683-2055   |
| R131                     | R: METAL FILM 12k 2% 1/4W               | 0751-1232   |
| R132                     | R: METAL FILM 10 2% 1/4W                | 0751-1002   |
| R133                     | R: FIXED CARBON 1.2M 5% 1/4W            | 0683-1255   |
| R134                     | R: METAL FILM 12k 2% 1/4W               | 0751-1232   |
| R135                     | R: METAL FILM 10 2% 1/4W                | 0751-1002   |
| R136                     | R: METAL FILM 1.00k 1%                  | 0721-1001   |
| R137                     | R: METAL FILM 75k 2% 1/4W               | 0751-7532   |
| R138                     | R: METAL FILM 19.1k 1%                  | 0721-1912   |
| R139                     | R: METAL FILM 120k 2% 1/4W              | 0751-1242   |
| R140                     | R: METAL FILM 10.0k 1%                  | 0721-1002   |
| R141                     | R: METAL FILM 820k 2% 1/4W              | 0751-8242   |
| R142                     | R: METAL FILM 9.09k 1%                  | 0721-9091   |
| R143, R144               | R: METAL FILM 2.21k 1%                  | 0721-2211   |
| R145                     | R: METAL FILM 316 1%                    | 0721-3160   |
| R146                     | R: METAL FILM 90.9k 1%                  | 0721-9092   |
| R147                     | R: METAL FILM 100k 1%                   | 0721-1003   |
| R148                     | R: METAL FILM 90.9k 1%                  | 0721-9092   |
| R149                     | R: METAL FILM 100k 1%                   | 0721-1003   |
| R150                     | R: METAL FILM 5.36k 1%                  | 0721-5361   |
| R151                     | R: METAL FILM 10 2% 1/4W                | 0751-1002   |
| R152, R153               | R: METAL FILM 1k 2% 1/4W                | 0751-1022   |
| R154                     | R: METAL FILM 5.6k 2% 1/4W              | 0751-5622   |
| R155                     | R: METAL FILM 1k 2% 1/4W                | 0751-1022   |
| R156, R157               | R: METAL FILM 750 2% 1/4W               | 0751-7512   |
| S1                       | SWITCH: PUSHBUTTON (12 BUTTON: TVM-100) | 3101-0030   |
|                          | SWITCH: PUSHBUTTON (10 BUTTON: TVM-101) | 3101-0032   |
| U1 thru U5               | IC: 74LS160A                            | 1821-0031   |
| U6                       | IC: 74LS00                              | 1821-0029   |
| U7                       | IC: XO, 2.92MHz                         | 0415-0292   |
| U8                       | IC: 74LS00                              | 1821-0029   |
| U9                       | IC: XO, 650kHz                          | 0415-0065   |
| U10                      | IC: 74LS73A                             | 1821-0030   |
| U11                      | IC: 1355                                | 1826-0045   |
| U12                      | IC: 74121                               | 1821-0014   |
| U13                      | IC: 75372                               | 1823-0004   |
| U14                      | IC: 7805CT                              | 1826-0014   |
| U15                      | IC: UA723                               | 1820-0012   |
| U16, U17                 | IC: NE5534                              | 1826-0025   |
| U18, U19                 | IC: LM311                               | 1826-0009   |
| U20, U21                 | IC: NE5534                              | 1826-0025   |
| U22                      | IC: 4066B                               | 1822-0018   |
| U23, U24                 | IC: NE5534                              | 1826-0025   |

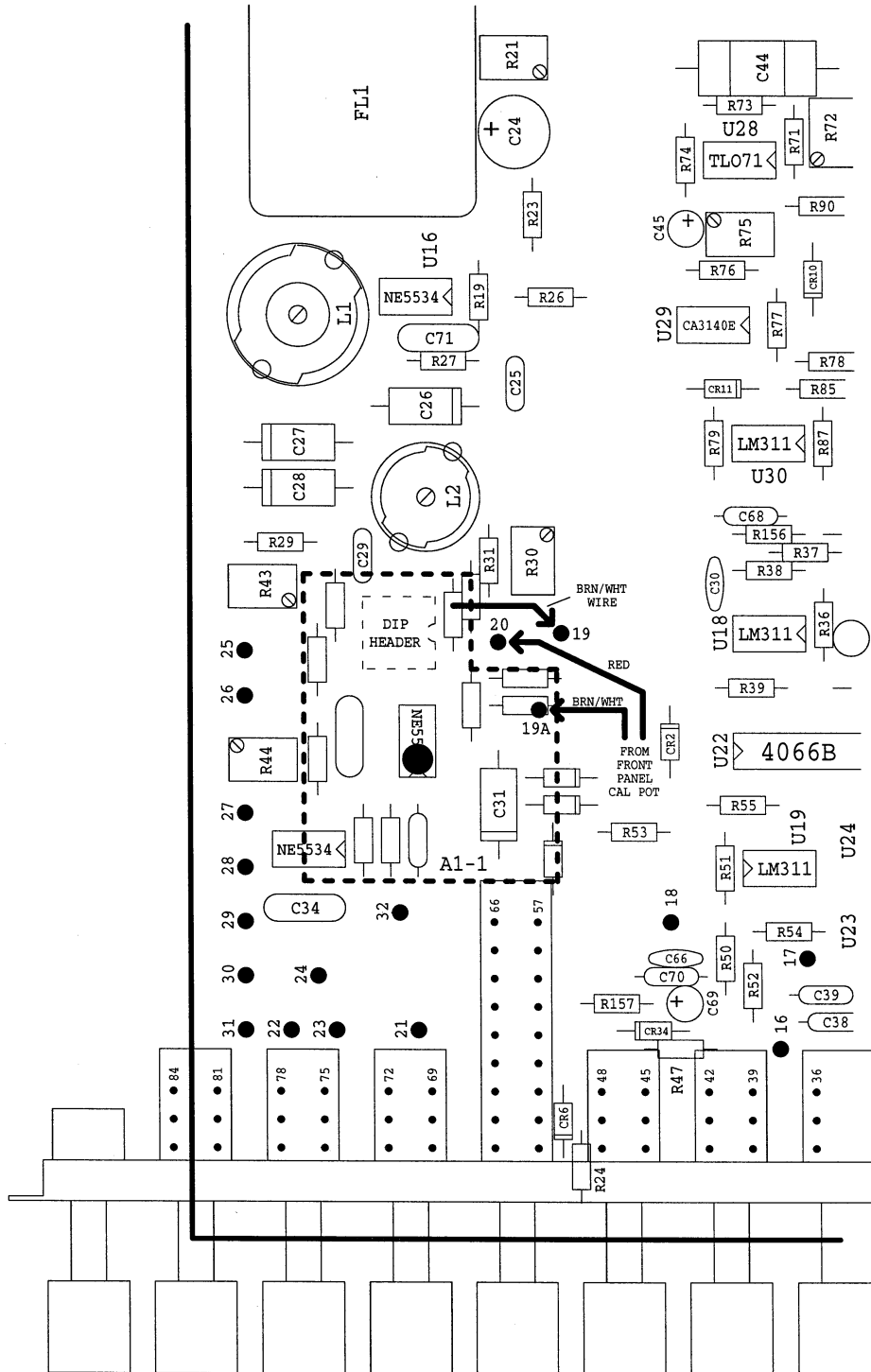
A1 BOARD TVM-100/101 CONT.

| Reference<br>Designation | Description | Part Number |
|--------------------------|-------------|-------------|
| U25 thru U28             | IC: TLO71   | 1826-0004   |
| U29                      | IC: CA3140E | 1826-0001   |
| U30,U31                  | IC: LM311   | 1826-0009   |
| U32                      | IC: 4538B   | 1822-0023   |
| U33 thru U36             | IC: CA3140E | 1826-0001   |
| U37                      | IC: TLO71   | 1826-0004   |
| U38                      | IC: 78L05CP | 1826-0012   |
| U39 thru U41             | IC: TLO71   | 1826-0004   |
| U42                      | IC: LM311   | 1826-0009   |
| U43                      | IC: 79L05CP | 1826-0017   |
| U44                      | IC: LM311   | 1826-0009   |
| U45                      | IC: 4538B   | 1822-0023   |
| U46 thru U48             | IC: TLO71   | 1826-0004   |





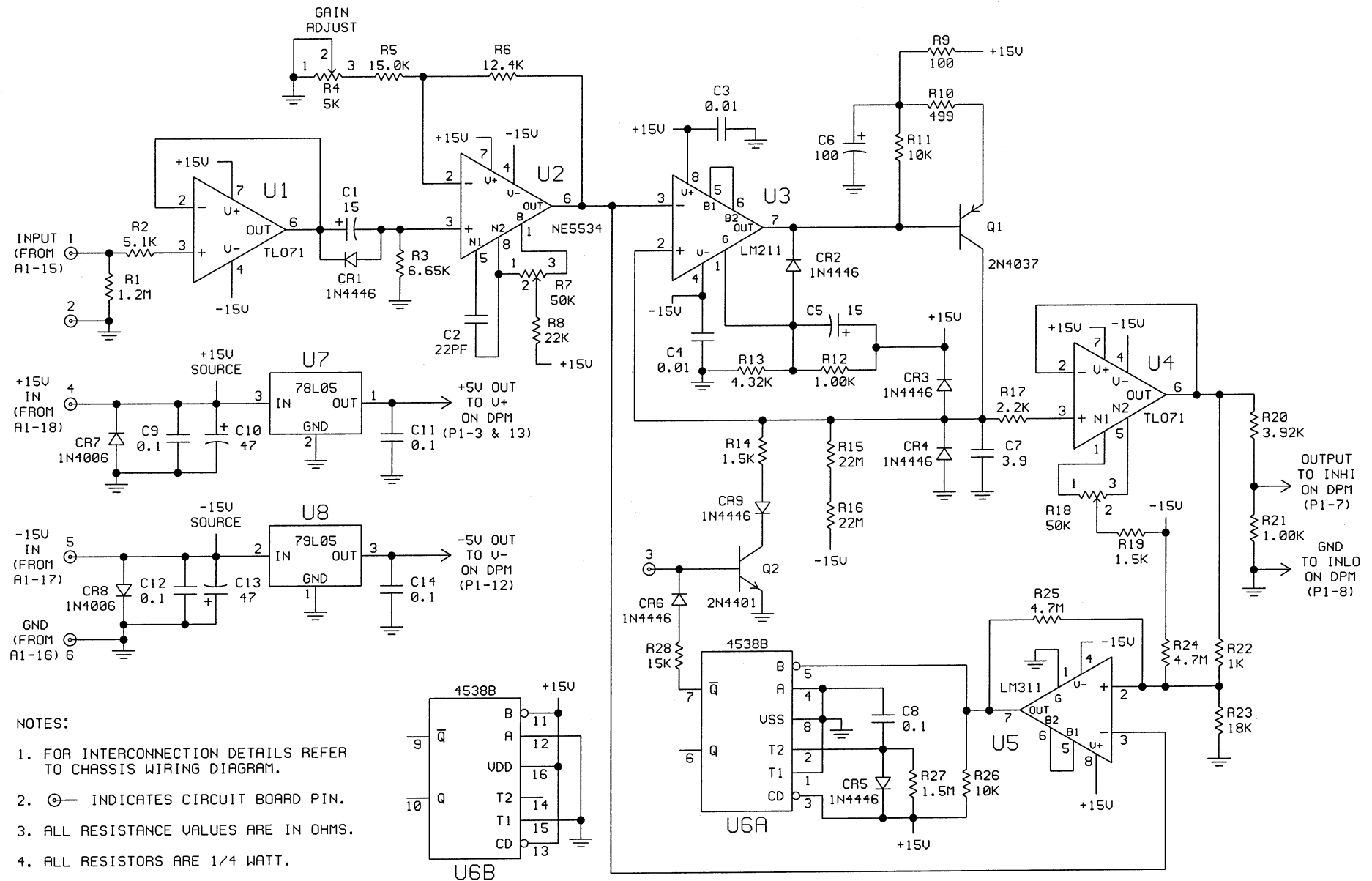
TVM-100/101  
A1-1 SERVO BOARD  
COMPONENT LAYOUT  
BELAR ELECTRONICS



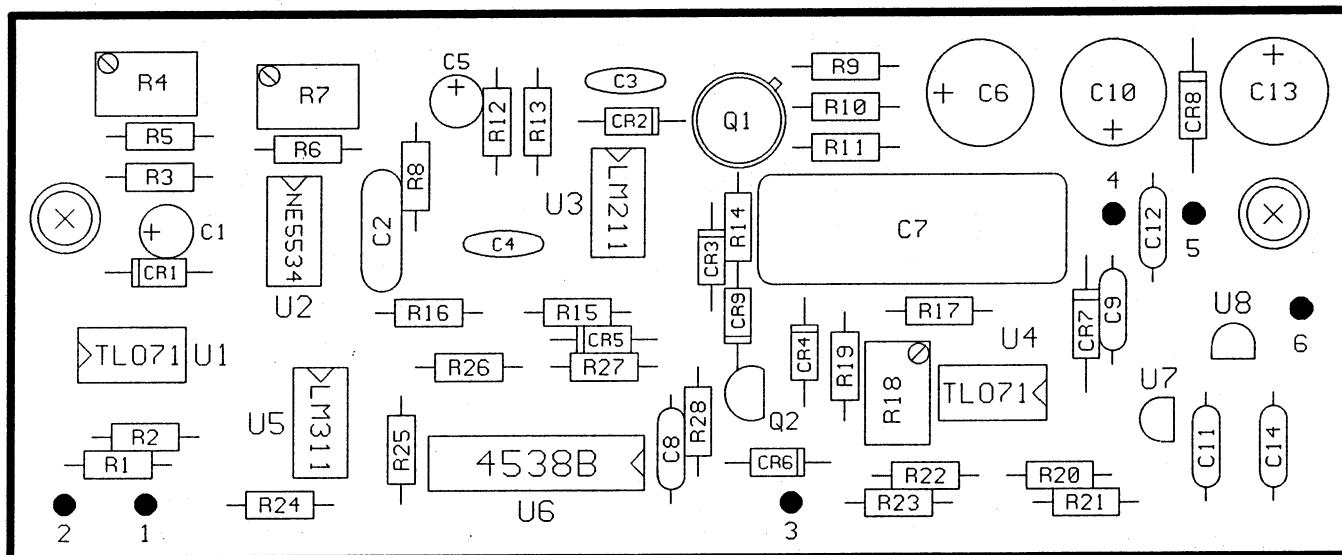
TVM-100/101  
A1-1 DAUGHTER BOARD LOCATION

A1-1 BOARD TVM-100/101

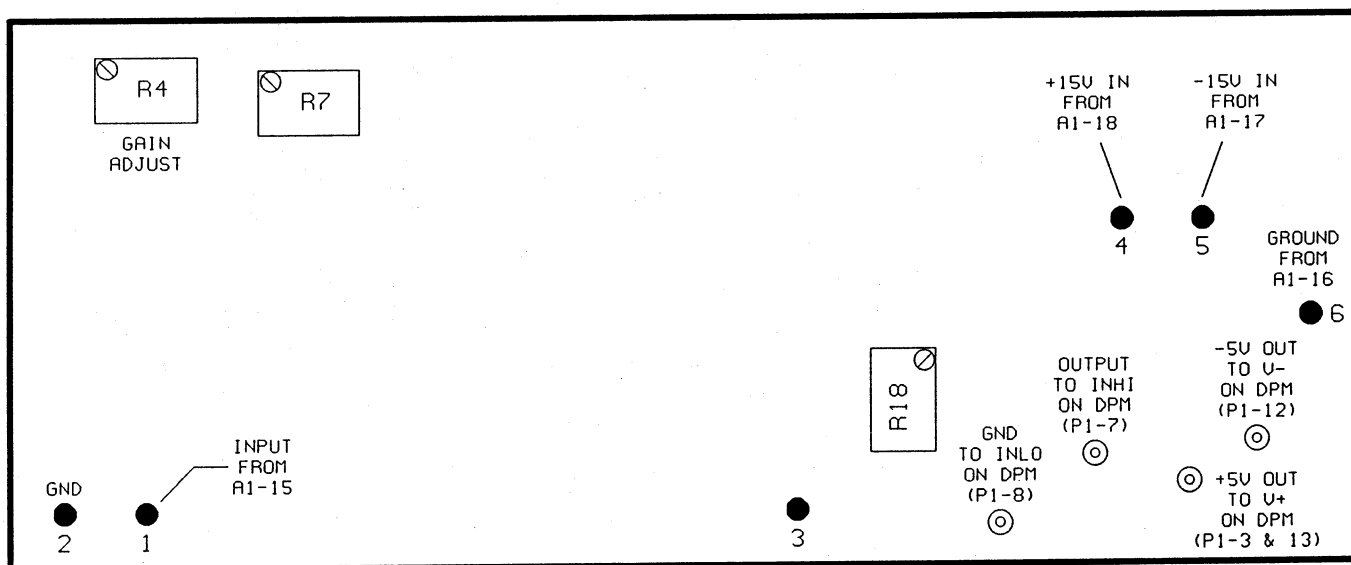
| Reference<br>Designation | Description                     | Part Number     |
|--------------------------|---------------------------------|-----------------|
| C1,C2                    | C: FIXED CERAMIC CHIP 0.1uF 50V | C1206 0151-0014 |
| C3                       | C: FIXED FILM 0.22uF 10% 100V   | 0122-2241       |
| C4                       | C: FIXED FILM 0.022uF 10% 100V  | 0122-2231       |
| C5,C6                    | C: FIXED CERAMIC CHIP 0.1uF 50V | C1206 0151-0014 |
| HDR1                     | DIP HEADER: 8 PIN               | 0363-0008       |
| P1                       | PLUG: 3 PIN, PC MOUNT           | 0365-0030       |
| --                       | JUMPER: 2 PIN (USED WITH P1)    | 0365-0028       |
| R1,R2                    | R: FIXED CARBON 3.9M 5% 1/4W    | 0683-3955       |
| R3                       | R: METAL FILM 11.0k 1%          | 0721-1102       |
| U1                       | IC: NE5534                      | 1826-0025       |
| U2                       | IC: TLO71                       | 1826-0004       |



TUM-100 A2  
DPM BOARD  
BELAR ELECTRONICS  
1-7-97



TUM-100 A2 BOARD  
 COMPONENT LAYOUT  
 BELAR ELECTRONICS

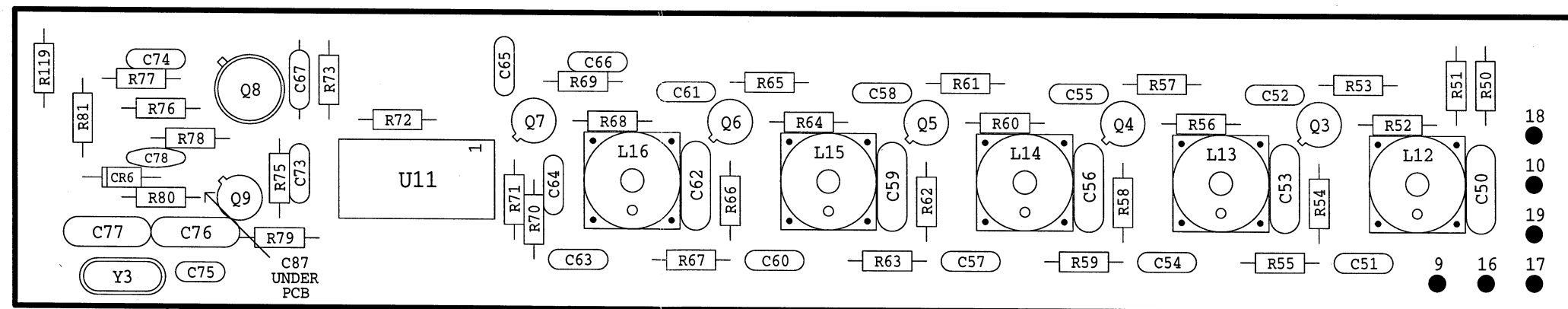
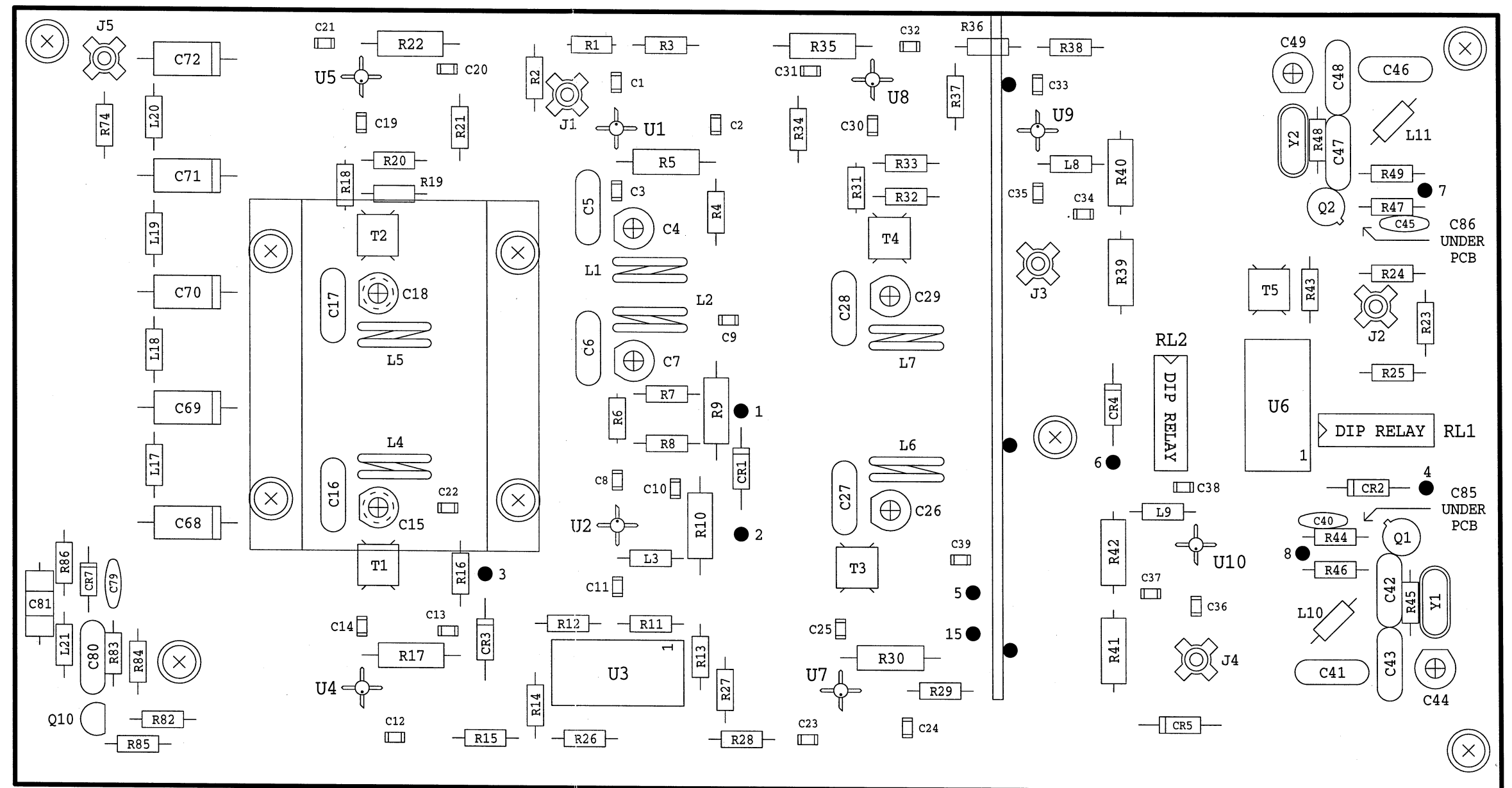
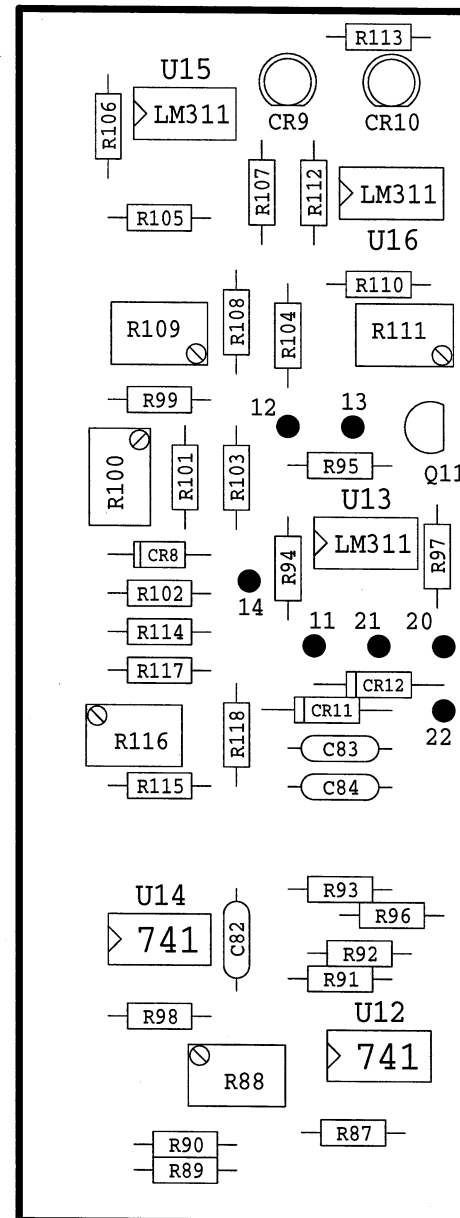


TUM-100 A2 BOARD  
CONNECTIONS & ADJUSTMENTS  
BELAR ELECTRONICS

## A2 BOARD TVM-100

| Reference Designation | Description                  | Part Number |
|-----------------------|------------------------------|-------------|
| C1                    | C: FIXED TANT 15uF 15V       | 0185-0003   |
| C2                    | C: FIXED MICA 22pF 5%        | 0140-2205   |
| C3, C4                | C: FIXED CERAMIC 0.01uF 100V | 0151-0003   |
| C5                    | C: FIXED TANT 15uF 15V       | 0185-0003   |
| C6                    | C: FIXED ELEC 100uF 35V      | 0180-0018   |
| C7                    | C: FIXED FILM 3.9uF 100V     | 0135-0003   |
| C8, C9                | C: FIXED CERAMIC 0.1uF 50V   | 0151-0006   |
| C10                   | C: FIXED ELEC 47uF 50V       | 0180-0017   |
| C11, C12              | C: FIXED CERAMIC 0.1uF 50V   | 0151-0006   |
| C13                   | C: FIXED ELEC 47uF 50V       | 0180-0017   |
| C14                   | C: FIXED CERAMIC 0.1uF 50V   | 0151-0006   |
| CR1 thru CR6          | DIODE: 1N4446                | 1900-0002   |
| CR7, CR8              | DIODE: 1N4006                | 1900-0016   |
| CR9                   | DIODE: 1N4446                | 1900-0002   |
| Q1                    | TRANSISTOR: 2N4037           | 1850-0011   |
| Q2                    | TRANSISTOR: 2N4401           | 1850-0028   |
| R1                    | R: FIXED CARBON 1.2M 5% 1/4W | 0683-1255   |
| R2                    | R: METAL FILM 5.1k 2% 1/4W   | 0751-5122   |
| R3                    | R: METAL FILM 6.65k 1%       | 0721-6651   |
| R4                    | R: VAR COMP 5k, 10 TURN      | 2100-0020   |
| R5                    | R: METAL FILM 15.0k 1%       | 0721-1502   |
| R6                    | R: METAL FILM 12.4k 1%       | 0721-1242   |
| R7                    | R: VAR COMP 50k, 10 TURN     | 2100-0025   |
| R8                    | R: METAL FILM 22k 2% 1/4W    | 0751-2232   |
| R9                    | R: METAL FILM 100 2% 1/4W    | 0751-1012   |
| R10                   | R: METAL FILM 499 1%         | 0721-4990   |
| R11                   | R: METAL FILM 10k 2% 1/4W    | 0751-1032   |
| R12                   | R: METAL FILM 1.00k 1%       | 0721-1001   |
| R13                   | R: METAL FILM 4.32k 1%       | 0721-4321   |
| R14                   | R: METAL FILM 1.5k 2% 1/4W   | 0751-1522   |
| R15, R16              | R: FIXED CARBON 22M 5% 1/4W  | 0683-2265   |
| R17                   | R: METAL FILM 2.2k 2% 1/4W   | 0751-2222   |
| R18                   | R: VAR COMP 50k, 10 TURN     | 2100-0025   |
| R19                   | R: METAL FILM 1.5k 2% 1/4W   | 0751-1522   |
| R20                   | R: METAL FILM 3.92k 1%       | 0721-3921   |
| R21                   | R: METAL FILM 1.00k 1%       | 0721-1001   |
| R22                   | R: METAL FILM 1k 2% 1/4W     | 0751-1022   |
| R23                   | R: METAL FILM 18k 2% 1/4W    | 0751-1832   |
| R24, R25              | R: FIXED CARBON 4.7M 5% 1/4W | 0683-4755   |
| R26                   | R: METAL FILM 10k 2% 1/4W    | 0751-1032   |
| R27                   | R: FIXED CARBON 1.5M 5% 1/4W | 0683-1555   |
| R28                   | R: METAL FILM 15k 2% 1/4W    | 0751-1532   |
| U1                    | IC: TLO71                    | 1826-0004   |
| U2                    | IC: NE5534                   | 1826-0025   |
| U3                    | IC: LM211                    | 1826-0043   |
| U4                    | IC: TLO71                    | 1826-0004   |
| U5                    | IC: LM311                    | 1826-0009   |
| U6                    | IC: 4538                     | 1822-0023   |
| U7                    | IC: 78L05CP                  | 1826-0012   |
| U8                    | IC: 79L05CP                  | 1826-0017   |





## A3 MODULE TVM-100/101

## A3 BOARD

| Reference Designation | Description                                            | Part Number |
|-----------------------|--------------------------------------------------------|-------------|
| C1 thru C3            | C: FIXED CERAMIC CHIP 0.1uF 50V                        | 0151-0014   |
| C4                    | C: VARIABLE CERAMIC 6-50pF                             | 0121-0011   |
| C5, C6                | C: FIXED MICA 250pF 5%                                 | 0140-2515   |
| C7                    | C: VARIABLE CERAMIC 6-50pF                             | 0121-0011   |
| C8 thru C14           | C: FIXED CERAMIC CHIP 0.1uF 50V                        | 0151-0014   |
| C15                   | C: VARIABLE CERAMIC 6-50pF                             | 0121-0011   |
| C16, C17              | C: FIXED MICA 270pF 5%                                 | 0140-2715   |
| C18                   | C: VARIABLE CERAMIC 6-50pF                             | 0121-0011   |
| C19 thru C25          | C: FIXED CERAMIC CHIP 0.1uF 50V                        | 0151-0014   |
| C26                   | C: VARIABLE CERAMIC 6-50pF                             | 0121-0011   |
| C27, C28              | C: FIXED MICA 270pF 5%                                 | 0140-2715   |
| C29                   | C: VARIABLE CERAMIC 6-50pF                             | 0121-0011   |
| C30 thru C39          | C: FIXED CERAMIC CHIP 0.1uF 50V                        | 0151-0014   |
| C40                   | C: FIXED CERAMIC 0.01uF 100V                           | 0151-0003   |
| C41                   | C: FIXED MICA 24pF 5%                                  | 0140-2405   |
| C42                   | C: FIXED MICA 75pF 5%                                  | 0140-7505   |
| C43                   | C: FIXED MICA 51pF 5%                                  | 0140-5105   |
| C44                   | C: VARIABLE CERAMIC 6-50pF                             | 0121-0011   |
| C45                   | C: FIXED CERAMIC 0.01uF 100V                           | 0151-0003   |
| C46                   | C: FIXED MICA 24pF 5%                                  | 0140-2405   |
| C47                   | C: FIXED MICA 75pF 5%                                  | 0140-7505   |
| C48                   | C: FIXED MICA 51pF 5%                                  | 0140-5105   |
| C49                   | C: VARIABLE CERAMIC 6-50pF                             | 0121-0011   |
| C68                   | C: FIXED POLY 270pF 2.5% 160V                          | 0130-2712   |
| C69                   | C: FIXED POLY 1200pF 2.5% 160V                         | 0130-1222   |
| C70                   | C: FIXED POLY 1600pF 2.5% 160V                         | 0130-1622   |
| C71                   | C: FIXED POLY 1200pF 2.5% 160V                         | 0130-1222   |
| C72                   | C: FIXED POLY 270pF 2.5% 160V                          | 0130-2712   |
| C79                   | C: FIXED CERAMIC 0.01uF 100V                           | 0151-0003   |
| C80                   | C: FIXED MICA 750pF 5%                                 | 0140-7515   |
| C81                   | C: FIXED FILM 0.0022uF 10% 200V                        | 0120-2221   |
| C85, C86              | C: FIXED MICA 10pF 5%<br>(C85 & C86 ARE ON PCB BOTTOM) | 0140-1005   |
| CR1 thru CR5          | DIODE: 1N4006                                          | 1900-0016   |
| CR7                   | DIODE: 1N277, GERMANIUM                                | 1900-0001   |
| J1 thru J5            | JACK: SMB, PC MOUNT                                    | 0360-0040   |
| L1                    | INDUCTOR:                                              | Belar       |
| L2                    | INDUCTOR:                                              | Belar       |
| L3                    | CHOKE: 18uH                                            | 9141-0030   |
| L4                    | INDUCTOR:                                              | Belar       |
| L5                    | INDUCTOR:                                              | Belar       |
| L6                    | INDUCTOR:                                              | Belar       |
| L7                    | INDUCTOR:                                              | Belar       |
| L8, L9                | CHOKE: 18uH                                            | 9141-0030   |
| L10, L11              | CHOKE: 0.47uH                                          | 9141-0006   |
| L17                   | CHOKE: 8.2uH                                           | 9141-0015   |

## A3 BOARD TVM-100/101 CONT.

| Reference Designation | Description                          | Part Number |
|-----------------------|--------------------------------------|-------------|
| L18,L19               | CHOKE: 15uH                          | 9141-0025   |
| L20                   | CHOKE: 8.2uH                         | 9141-0015   |
| L21                   | CHOKE: 1000uH                        | 9141-0100   |
| Q1,Q2                 | TRANSISTOR: 2N5179                   | 1850-0023   |
| Q10                   | TRANSISTOR: 2N4401                   | 1850-0028   |
| R1                    | R: METAL FILM 17.8 1%                | 0721-17R8   |
| R2,R3                 | R: METAL FILM 294 1%                 | 0721-2940   |
| R4                    | R: METAL FILM 33 2% 1/4W             | 0751-3302   |
| R5                    | R: METAL FILM 680 2% 1/2W            | 0771-6812   |
| R6                    | R: METAL FILM 17.8 1% (VHF)          | 0721-17R8   |
|                       | R: METAL FILM 37.4 1% (UHF)          | 0721-37R4   |
| R7,R8                 | R: METAL FILM 294 1% (VHF)           | 0721-2940   |
|                       | R: METAL FILM 150 1% (UHF)           | 0721-1500   |
| R9,R10                | R: METAL FILM 150 2% 1/2W            | 0771-1512   |
| R11*                  | R: METAL FILM 17.8 1%                | 0721-17R8   |
| R12*,R13*             | R: METAL FILM 294 1%                 | 0721-2940   |
|                       | *(R11,R12 AND R13 USED FOR UHF ONLY) |             |
| R14,R15               | R: METAL FILM 16.5 1%                | 0721-16R5   |
| R16                   | R: METAL FILM 33 2% 1/4W             | 0751-3302   |
| R17                   | R: METAL FILM 680 2% 1/2W            | 0771-6812   |
| R18                   | R: METAL FILM 17.8 1%                | 0721-17R8   |
| R19,R20               | R: METAL FILM 294 1%                 | 0721-2940   |
| R21                   | R: METAL FILM 33 2% 1/4W             | 0751-3302   |
| R22                   | R: METAL FILM 680 2% 1/2W            | 0771-6812   |
| R23                   | R: METAL FILM 37.4 1%                | 0721-37R4   |
| R24,R25               | R: METAL FILM 150 1%                 | 0721-1500   |
| R26                   | R: METAL FILM 28.7 1%                | 0721-28R7   |
| R27                   | R: METAL FILM 100 2% 1/4W            | 0751-1012   |
| R28                   | R: METAL FILM 12 2% 1/4W             | 0751-1202   |
| R29                   | R: METAL FILM 33 2% 1/4W             | 0751-3302   |
| R30                   | R: METAL FILM 680 2% 1/2W            | 0771-6812   |
| R31                   | R: METAL FILM 37.4 1%                | 0721-37R4   |
| R32,R33               | R: METAL FILM 150 1%                 | 0721-1500   |
| R34                   | R: METAL FILM 33 2% 1/4W             | 0751-3302   |
| R35                   | R: METAL FILM 680 2% 1/2W            | 0771-6812   |
| R36                   | R: METAL FILM 17.8 1%                | 0721-17R8   |
| R37,R38               | R: METAL FILM 294 1%                 | 0721-2940   |
| R39 thru R42          | R: METAL FILM 150 2% 1/2W            | 0771-1512   |
| R43                   | R: METAL FILM 200 2% 1/4W            | 0751-2012   |
| R44                   | R: METAL FILM 510 2% 1/4W            | 0751-5112   |
| R45,R46               | R: METAL FILM 5.1k 2% 1/4W           | 0751-5122   |
| R47                   | R: METAL FILM 510 2% 1/4W            | 0751-5112   |
| R48,R49               | R: METAL FILM 5.1k 2% 1/4W           | 0751-5122   |
| R74                   | R: METAL FILM 100 1%                 | 0721-1000   |
| R82                   | R: METAL FILM 5.6k 2% 1/4W           | 0751-5622   |
| R83                   | R: METAL FILM 680 2% 1/4W            | 0751-6812   |
| R84                   | R: METAL FILM 39k 2% 1/4W            | 0751-3932   |
| R85                   | R: METAL FILM 220 2% 1/4W            | 0751-2212   |
| R86                   | R: METAL FILM 5.6k 2% 1/4W           | 0751-5622   |

# A3 BOARD TVM-100/101 CONT.

| Reference Designation | Description                                        | Part Number            |
|-----------------------|----------------------------------------------------|------------------------|
| RL1,RL2*              | RELAY: JWD-172-3<br>*(RL2 NOT USED IN TVM-101)     | 1600-0005              |
| T1 thru T5            | TRANSFORMER: RF                                    | Belar                  |
| U1                    | IC: MAR-6                                          | 1845-0026              |
| U2                    | IC: MAR-3 (VHF)<br>MAR-8 (UHF)                     | 1845-0023<br>1845-0028 |
| U3                    | IC: PAS-1                                          | 1845-0010              |
| U4,U5                 | IC: MAR-6                                          | 1845-0026              |
| U6                    | IC: SRA-1                                          | 1845-0001              |
| U7,U8                 | IC: MAR-6                                          | 1845-0026              |
| U9,U10                | IC: MAR-3                                          | 1845-0023              |
| Y1                    | XTAL: (FREQUENCY DEPENDS ON OPTIONAL IF FREQUENCY) |                        |
| Y2                    | XTAL: 45.75MHz                                     | 0413-4575              |

# A3-1 BOARD TVM-100/101

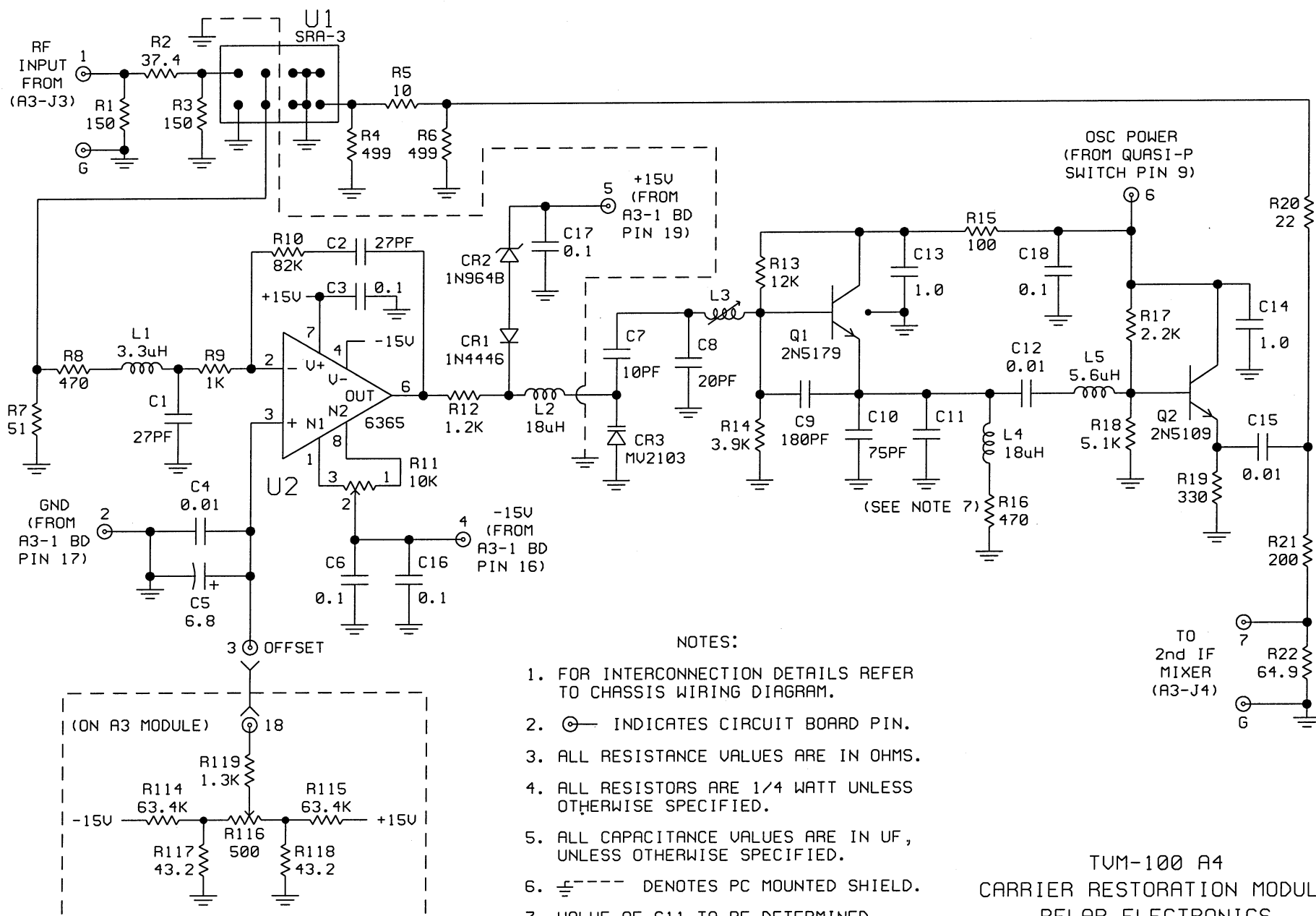
| Reference Designation | Description                                                          | Part Number |
|-----------------------|----------------------------------------------------------------------|-------------|
| C50*                  | C: FIXED MICA 470pF 2%<br>*C50 is in parallel with a 75pF mica cap.  | 0140-4712   |
| C51,C52               | C: FIXED CERAMIC 0.1uF 50V                                           | 0151-0006   |
| C53                   | C: FIXED MICA 560pF 2%                                               | 0140-5612   |
| C54,C55               | C: FIXED CERAMIC 0.1uF 50V                                           | 0151-0006   |
| C56**                 | C: FIXED MICA 500pF 2%<br>**C56 is in parallel with a 39pF mica cap. | 0140-5012   |
| C57,C58               | C: FIXED CERAMIC 0.1uF 50V                                           | 0151-0006   |
| C59**                 | C: FIXED MICA 470pF 2%<br>**C59 is in parallel with a 39pF mica cap. | 0140-4712   |
| C60,C61               | C: FIXED CERAMIC 0.1uF 50V                                           | 0151-0006   |
| C62**                 | C: FIXED MICA 470pF 2%<br>**C62 is in parallel with a 39pF mica cap. | 0140-4712   |
| C63 thru C67          | C: FIXED CERAMIC 0.1uF 50V                                           | 0151-0006   |
| C73                   | C: FIXED CERAMIC 1.0uF 50V                                           | 0151-0008   |
| C74                   | C: FIXED CERAMIC 0.1uF 50V                                           | 0151-0006   |
| C75                   | C: FIXED MICA 36pF 5%                                                | 0142-3605   |
| C76                   | C: FIXED MICA 360pF 5%                                               | 0140-3615   |
| C77                   | C: FIXED MICA 500pF 5%                                               | 0140-5015   |
| C78                   | C: FIXED CERAMIC 0.01uF 100V                                         | 0151-0003   |
| C87                   | C: FIXED MICA 10pF 5%<br>(C87 IS ON PCB BOTTOM)                      | 0142-1005   |
| CR6                   | DIODE: 1N4446                                                        | 1900-0002   |
| L12 thru L16          | INDUCTOR:                                                            | Belar       |

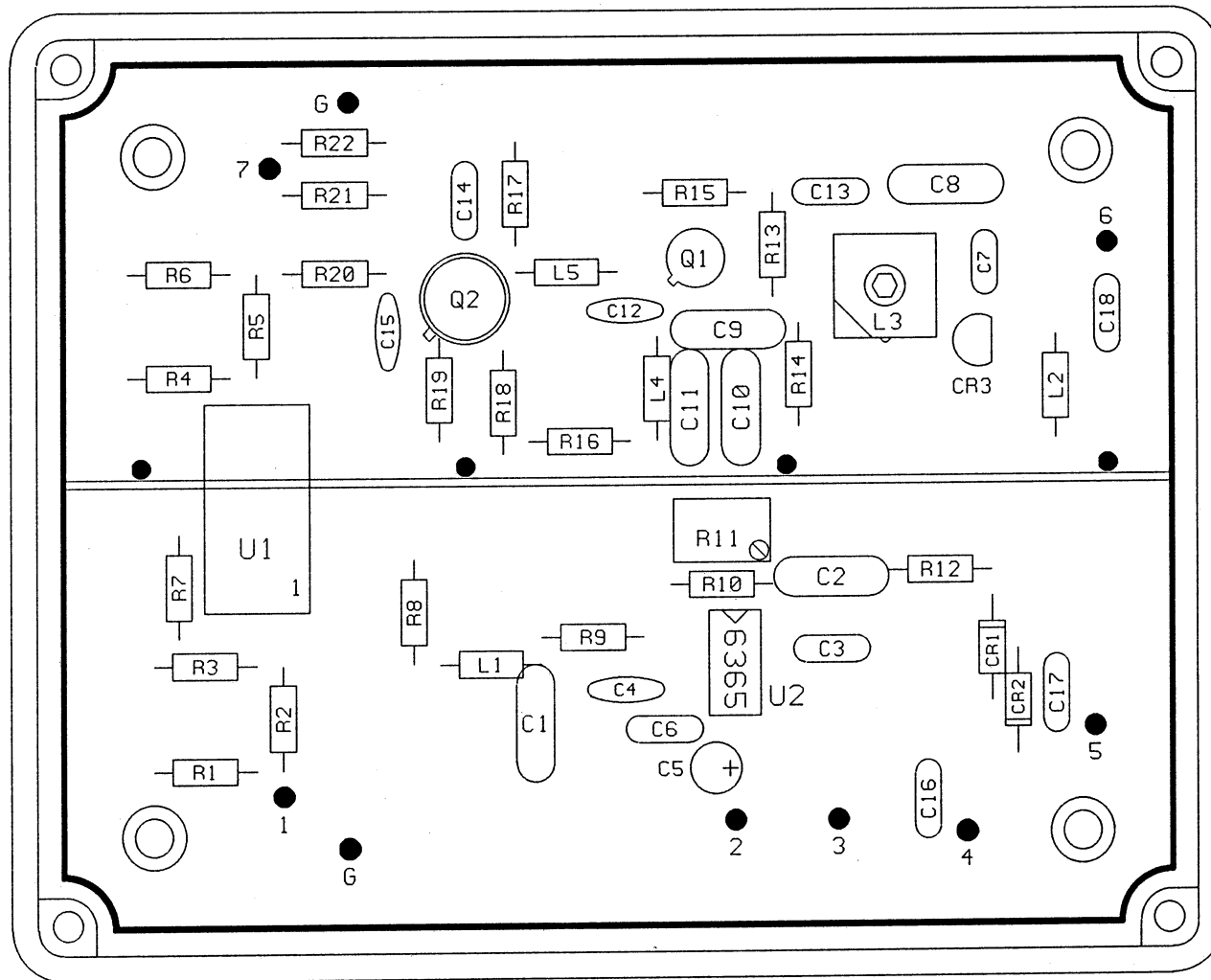
## A3-1 BOARD TVM-100/101 CONT.

| Reference<br>Designation | Description                                     | Part Number |
|--------------------------|-------------------------------------------------|-------------|
| Q3 thru Q7               | TRANSISTOR: 2N5179                              | 1850-0023   |
| Q8                       | TRANSISTOR: 2N3866                              | 1850-0014   |
| Q9                       | TRANSISTOR: 2N5179                              | 1850-0023   |
| R50                      | R: METAL FILM 49.9 1%                           | 0721-49R9   |
| R51                      | R: METAL FILM 576 1%                            | 0721-5760   |
| R52                      | R: METAL FILM 330 2% 1/4W                       | 0751-3312   |
| R53                      | R: METAL FILM 1.10k 1%                          | 0721-1101   |
| R54                      | R: METAL FILM 300 2% 1/4W                       | 0751-3012   |
| R55                      | R: METAL FILM 2k 2% 1/4W                        | 0751-2022   |
| R56                      | R: METAL FILM 330 2% 1/4W                       | 0751-3312   |
| R57                      | R: METAL FILM 1.10k 1%                          | 0721-1101   |
| R58                      | R: METAL FILM 300 2% 1/4W                       | 0751-3012   |
| R59                      | R: METAL FILM 2k 2% 1/4W                        | 0751-2022   |
| R60                      | R: METAL FILM 330 2% 1/4W                       | 0751-3312   |
| R61                      | R: METAL FILM 750 1%                            | 0721-7500   |
| R62                      | R: METAL FILM 200 2% 1/4W                       | 0751-2012   |
| R63                      | R: METAL FILM 2k 2% 1/4W                        | 0751-2022   |
| R64                      | R: METAL FILM 330 2% 1/4W                       | 0751-3312   |
| R65                      | R: METAL FILM 787 1%                            | 0721-7870   |
| R66                      | R: METAL FILM 200 2% 1/4W                       | 0751-2012   |
| R67                      | R: METAL FILM 2k 2% 1/4W                        | 0751-2022   |
| R68                      | R: METAL FILM 330 2% 1/4W                       | 0751-3312   |
| R69                      | R: METAL FILM 510 2% 1/4W                       | 0751-5112   |
| R70                      | R: METAL FILM 1k 2% 1/4W                        | 0751-1022   |
| R71                      | R: METAL FILM 43.2 1%                           | 0721-43R2   |
| R72, R73                 | R: METAL FILM 69.8 1%                           | 0721-69R8   |
| R75                      | R: METAL FILM 49.9 1%                           | 0721-49R9   |
| R76                      | R: METAL FILM 62 2% 1/4W                        | 0751-6202   |
| R77                      | R: METAL FILM 220 2% 1/4W                       | 0751-2212   |
| R78                      | R: METAL FILM 5.1k 2% 1/4W                      | 0751-5122   |
| R79                      | R: METAL FILM 2.4k 2% 1/4W                      | 0751-2422   |
| R80                      | R: METAL FILM 510 2% 1/4W                       | 0751-5112   |
| R81*                     | R: METAL FILM 360 2% 1/4W                       | 0751-3612   |
|                          | *(VALUE FACTORY SELECTED. NOMINAL VALUE SHOWN.) |             |
| R119                     | R: METAL FILM 1.3k 2% 1/4W                      | 0751-1322   |
| U11                      | IC: SRA-3                                       | 1845-0003   |
| Y3                       | XTAL: 5.15MHz                                   | 0413-0515   |

## A3-2 BOARD TVM-100/101

| Reference Designation | Description                               | Part Number |
|-----------------------|-------------------------------------------|-------------|
| C82                   | C: FIXED CERAMIC 1.0uF 50V                | 0151-0008   |
| C83,C84               | C: FIXED CERAMIC 0.1uF 50V                | 0151-0006   |
| CR8                   | DIODE: 1N4446                             | 1900-0002   |
| CR9,CR10              | LED: RED MV5053                           | 1910-0001   |
| CR11,CR12             | DIODE: 1N4006                             | 1900-0016   |
| Q11                   | TRANSISTOR: 2N4401                        | 1850-0028   |
| R87                   | R: METAL FILM 1k 2% 1/4W                  | 0751-1022   |
| R88                   | R: VAR COMP 10k 10 TURN                   | 2100-0024   |
| R89                   | R: METAL FILM 6.19k 1%                    | 0721-6191   |
| R90*                  | R: METAL FILM 1.69k 1%                    | 0721-1691   |
|                       | *(R90 ONLY USED FOR LARGE CARRIER RATIOS) |             |
| R91                   | R: METAL FILM 20k 2% 1/4W                 | 0751-2032   |
| R92                   | R: METAL FILM 270 2% 1/4W                 | 0751-2712   |
| R93                   | R: METAL FILM 18k 2% 1/4W                 | 0751-1832   |
| R94                   | R: METAL FILM 270k 2% 1/4W                | 0751-2742   |
| R95                   | R: METAL FILM 12k 2% 1/4W                 | 0751-1232   |
| R96                   | R: METAL FILM 1k 2% 1/4W                  | 0751-1022   |
| R97                   | R: METAL FILM 30k 2% 1/4W                 | 0751-3032   |
| R98                   | R: METAL FILM 22k 2% 1/4W                 | 0751-2232   |
| R99                   | R: METAL FILM 1k 2% 1/4W                  | 0751-1022   |
| R100                  | R: VAR COMP 5k 10 TURN                    | 2100-0020   |
| R101                  | R: METAL FILM 39k 2% 1/4W                 | 0751-3932   |
| R102                  | R: METAL FILM 1k 2% 1/4W                  | 0751-1022   |
| R103                  | R: METAL FILM 510 2% 1/4W                 | 0751-5112   |
| R104                  | R: METAL FILM 10k 2% 1/4W                 | 0751-1032   |
| R105                  | R: METAL FILM 47k 2% 1/4W                 | 0751-4732   |
| R106                  | R: FIXED CARBON 6.2M 5% 1/4W              | 0683-6255   |
| R107                  | R: METAL FILM 330 2% 1/4W                 | 0751-3312   |
| R108                  | R: METAL FILM 75 2% 1/4W                  | 0751-7502   |
| R109                  | R: VAR COMP 500 10 TURN                   | 2100-0027   |
| R110                  | R: METAL FILM 1.3k 2% 1/4W                | 0751-1322   |
| R111                  | R: VAR COMP 1k 10 TURN                    | 2100-0021   |
| R112                  | R: FIXED CARBON 1.2M 5% 1/4W              | 0683-1255   |
| R113                  | R: METAL FILM 330 2% 1/4W                 | 0751-3312   |
| R114,R115             | R: METAL FILM 63.4k 1%                    | 0721-6342   |
| R116                  | R: VAR COMP 500 10 TURN                   | 2100-0027   |
| R117,R118             | R: METAL FILM 43.2 1%                     | 0721-43R2   |
| U12                   | IC: MC1741                                | 1826-0006   |
| U13                   | IC: LM311                                 | 1826-0009   |
| U14                   | IC: MC1741                                | 1826-0006   |
| U15,U16               | IC: LM311                                 | 1826-0009   |

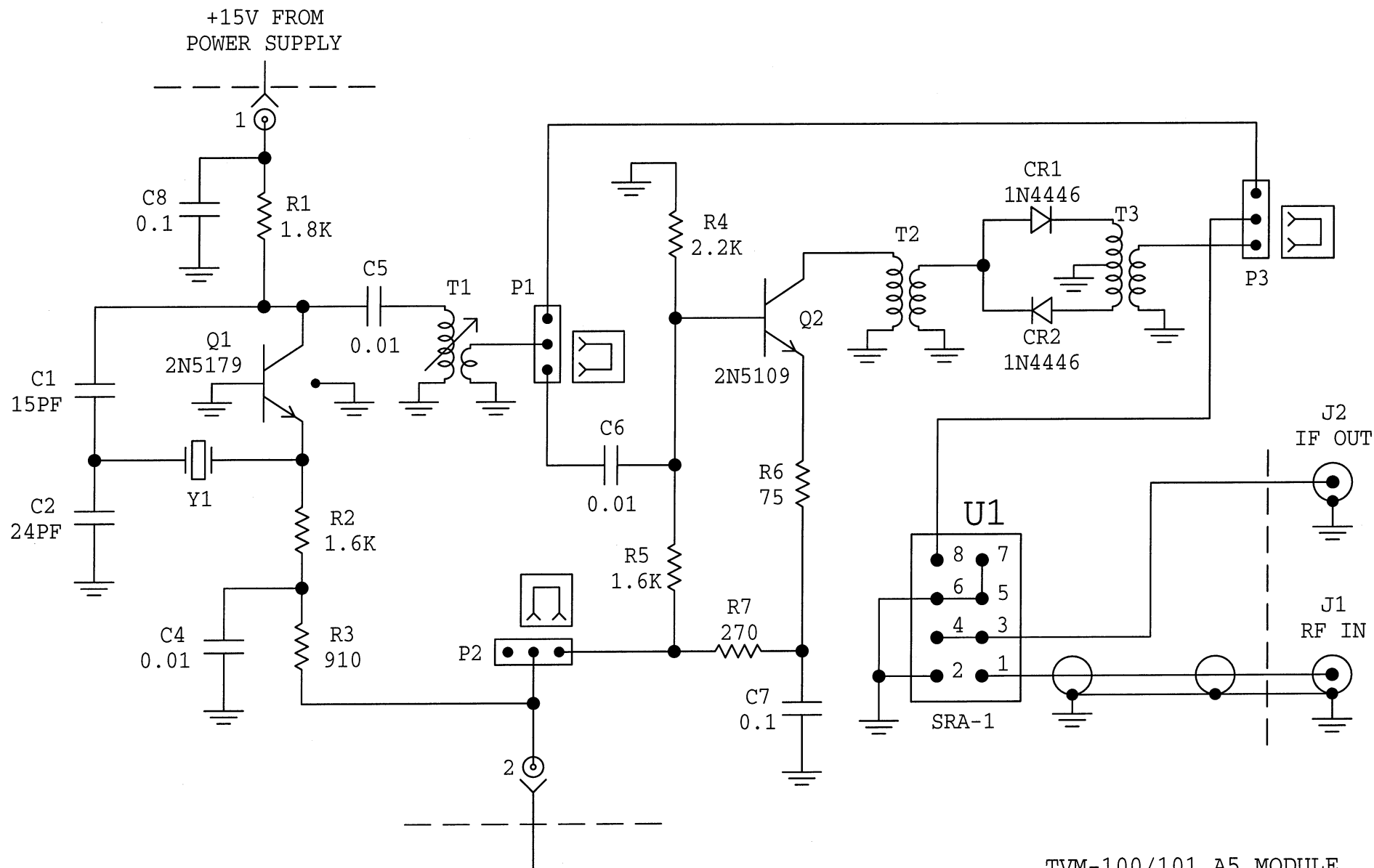




TUM-100 A4 MODULE  
COMPONENT LAYOUT  
BELAR ELECTRONICS

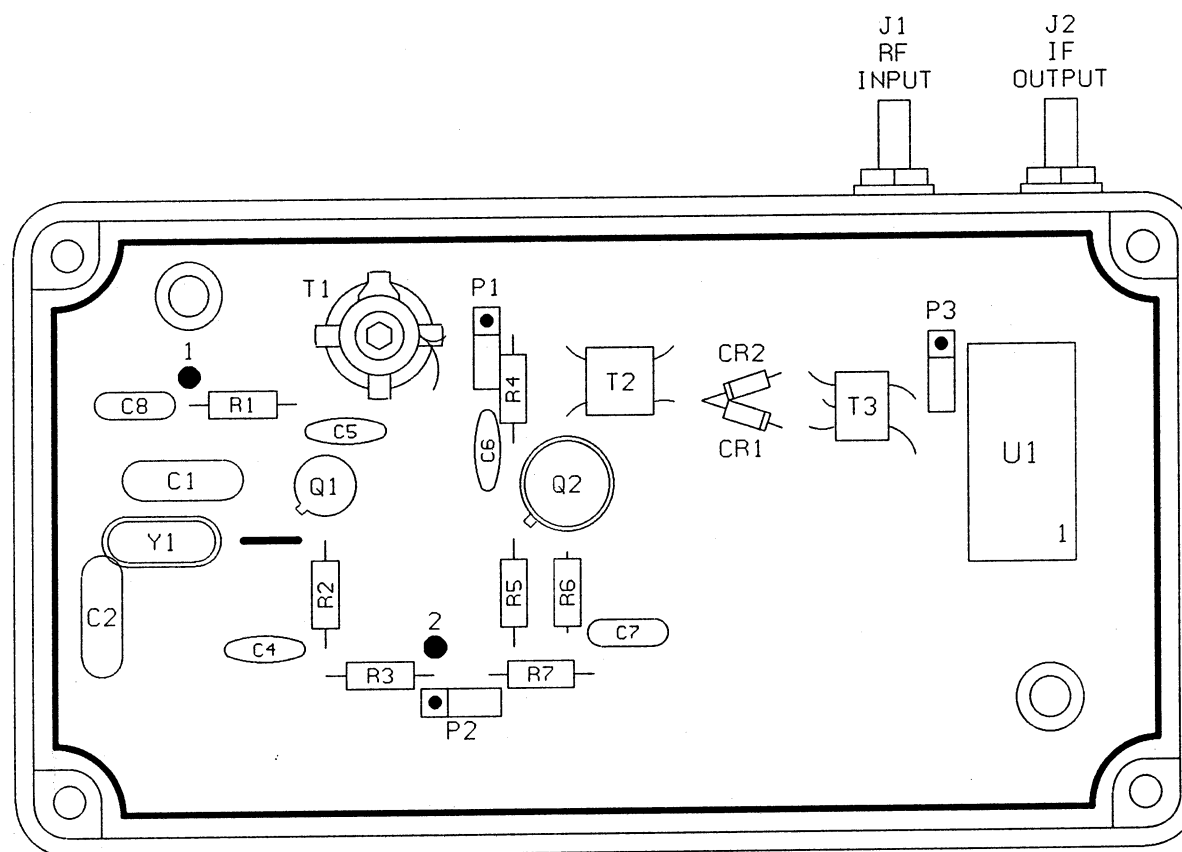
## A4 BOARD TVM-100

| Reference Designation | Description                      | Part Number |
|-----------------------|----------------------------------|-------------|
| C1, C2                | C: FIXED MICA 27pF 5%            | 0140-2705   |
| C3                    | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C4                    | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C5                    | C: FIXED TANT 6.8uF 25V          | 0185-0002   |
| C6                    | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C7                    | C: FIXED MICA 10pF 5%            | 0140-1005   |
| C8                    | C: FIXED MICA 20pF 5%            | 0140-2005   |
| C9                    | C: FIXED MICA 180pF 5%           | 0140-1815   |
| C10                   | C: FIXED MICA 75pF 5%            | 0140-7505   |
| C11                   | TO BE DETERMINED BY MANUFACTURER |             |
| C12                   | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C13, C14              | C: FIXED CERAMIC 1.0uF 50V       | 0151-0008   |
| C15                   | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C16 thru C18          | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| CR1                   | DIODE: 1N4446                    | 1900-0002   |
| CR2                   | DIODE: IN964B                    | 1900-0029   |
| CR3                   | DIODE: MV2103                    | 1900-0028   |
| L1                    | CHOKE: 3.3uH                     | 9141-0010   |
| L2                    | CHOKE: 18uH                      | 9141-0030   |
| L3                    | L: ADJUSTABLE                    | 9142-0001   |
| L4                    | CHOKE: 18uH                      | 9141-0030   |
| L5                    | CHOKE: 5.6uH                     | 9141-0012   |
| Q1                    | TRANSISTOR: 2N5179               | 1850-0023   |
| Q2                    | TRANSISTOR: 2N5109               | 1850-0031   |
| R1                    | R: METAL FILM 150 1%             | 0721-1500   |
| R2                    | R: METAL FILM 37.4 1%            | 0721-37R4   |
| R3                    | R: METAL FILM 150 1%             | 0721-1500   |
| R4                    | R: METAL FILM 499 1%             | 0721-4990   |
| R5                    | R: METAL FILM 10 2% 1/4W         | 0751-1002   |
| R6                    | R: METAL FILM 499 1%             | 0721-4990   |
| R7                    | R: METAL FILM 51 2% 1/4W         | 0751-5102   |
| R8                    | R: METAL FILM 470 2% 1/4W        | 0751-4712   |
| R9                    | R: METAL FILM 1k 2% 1/4W         | 0751-1022   |
| R10                   | R: METAL FILM 82k 2% 1/4W        | 0751-8232   |
| R11                   | R: VAR COMP 10k, 10 TURN         | 2100-0024   |
| R12                   | R: METAL FILM 1.2k 2% 1/4W       | 0751-1222   |
| R13                   | R: METAL FILM 12k 2% 1/4W        | 0751-1232   |
| R14                   | R: METAL FILM 3.9k 2% 1/4W       | 0751-3922   |
| R15                   | R: METAL FILM 100 2% 1/4W        | 0751-1012   |
| R16                   | R: METAL FILM 470 2% 1/4W        | 0751-4712   |
| R17                   | R: METAL FILM 2.2k 2% 1/4W       | 0751-2222   |
| R18                   | R: METAL FILM 5.1k 2% 1/4W       | 0751-5122   |
| R19                   | R: METAL FILM 330 2% 1/4W        | 0751-3312   |
| R20                   | R: METAL FILM 22 2% 1/4W         | 0751-2202   |
| R21                   | R: METAL FILM 200 2% 1/4W        | 0751-2012   |
| R22                   | R: METAL FILM 64.9 1%            | 0721-64R9   |
| U1                    | IC: SRA-3                        | 1845-0003   |
| U2                    | IC: 6365                         | 1826-0044   |



NOTE: J1 & J2 ARE  
MOUNTED ON CASE

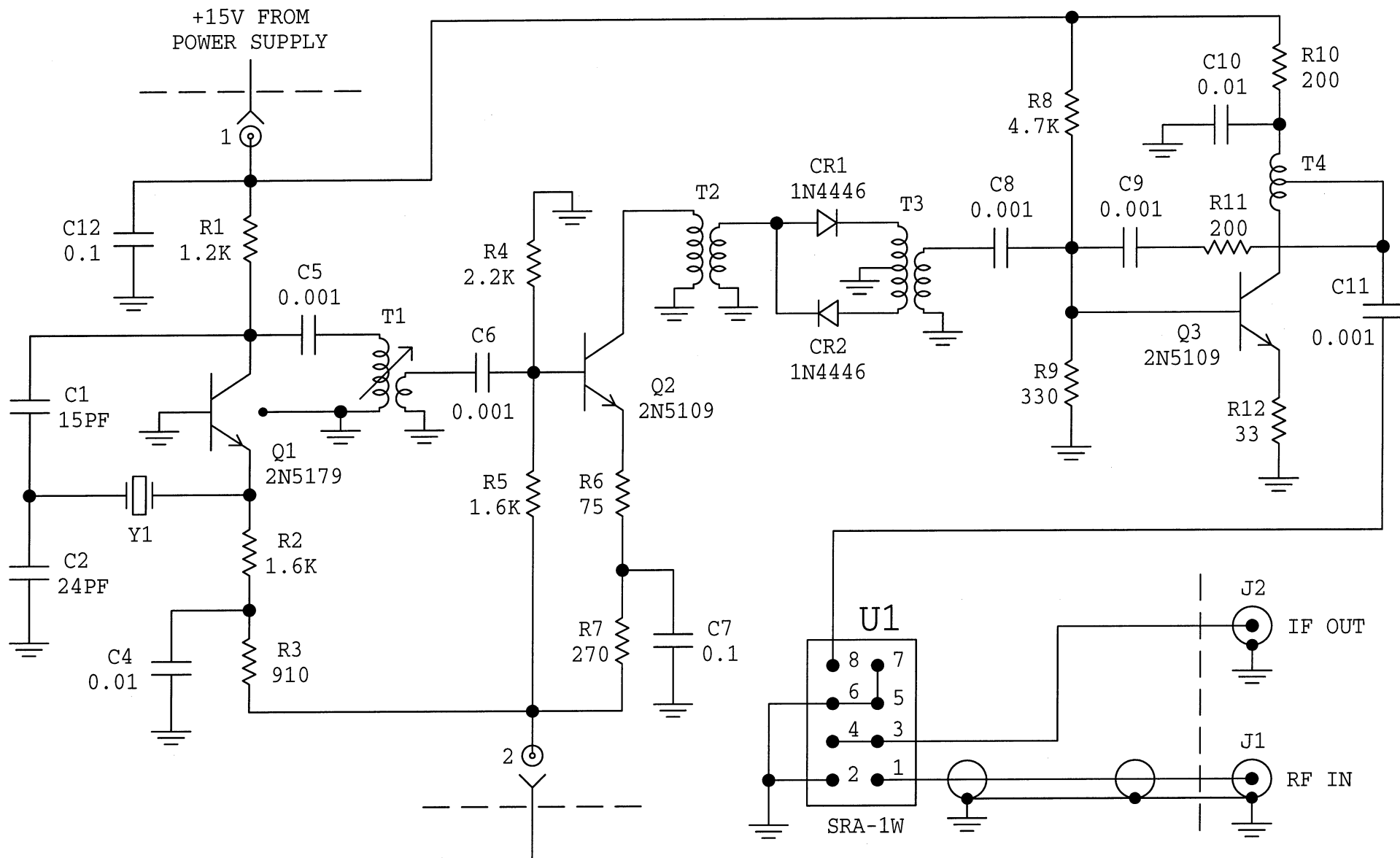
TVM-100/101 A5 MODULE  
VHF LOCAL OSCILLATOR  
BELAR ELECTRONICS  
10-2-91



TUM-100/101 A5 MODULE  
 COMPONENT LAYOUT  
 BELAR ELECTRONICS

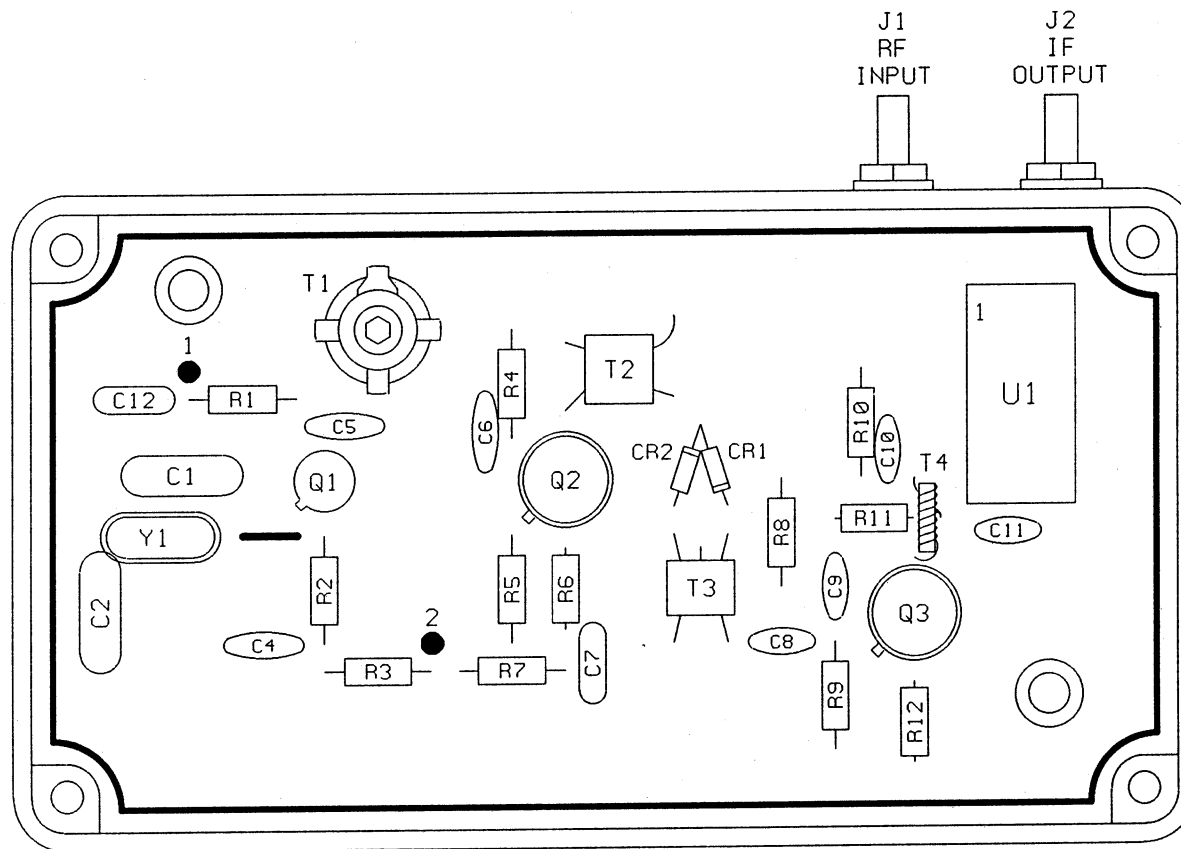
## A5 BOARD TVM-100/101

| Reference<br>Designation | Description                                                                          | Part Number |
|--------------------------|--------------------------------------------------------------------------------------|-------------|
| C1                       | C: FIXED MICA 15pF 5%                                                                | 0140-1505   |
| C2                       | C: FIXED MICA 24pF 5%                                                                | 0140-2405   |
| C4 thru C6               | C: FIXED CERAMIC 0.01uF 100V                                                         | 0151-0003   |
| C7,C8                    | C: FIXED CERAMIC 0.1uF 50V                                                           | 0151-0006   |
| CR1,CR2                  | DIODE: 1N4446                                                                        | 1900-0002   |
| J1,J2                    | J: SMB, CHASSIS MOUNT<br>(J1 & J2 ARE MOUNTED ON CASE)                               | 0360-0041   |
| P1 thru P3               | PIN: 3 POSITION                                                                      | 0365-0030   |
| --                       | JUMPER: 2 POSITION<br>(USED WITH P1 THRU P3)                                         | 0365-0028   |
| Q1                       | TRANSISTOR: 2N5179                                                                   | 1850-0023   |
| Q2                       | TRANSISTOR: 2N5109                                                                   | 1850-0031   |
| R1                       | R: METAL FILM 1.8k 2% 1/4W                                                           | 0751-1822   |
| R2                       | R: METAL FILM 1.6k 2% 1/4W                                                           | 0751-1622   |
| R3                       | R: METAL FILM 910 2% 1/4W                                                            | 0751-9112   |
| R4                       | R: METAL FILM 2.2k 2% 1/4W                                                           | 0751-2222   |
| R5                       | R: METAL FILM 1.6k 2% 1/4W                                                           | 0751-1622   |
| R6                       | R: METAL FILM 75 2% 1/4W                                                             | 0751-7502   |
| R7                       | R: METAL FILM 270 2% 1/4W                                                            | 0751-2712   |
| T1                       | TRANSFORMER: VARIABLE                                                                | Belar       |
| T2                       | TRANSFORMER: RF, VHF                                                                 | Belar       |
| T3                       | TRANSFORMER: RF TAPPED, VHF                                                          | Belar       |
| U1                       | IC: SRA-1                                                                            | 1845-0001   |
| Y1                       | XTAL: VHF LOW, 41.25MHz ABOVE AURAL<br>VHF HIGH, 41.25MHz ABOVE AURAL (DIVIDED BY 2) |             |



NOTE: J1 & J2 ARE  
MOUNTED ON CASE

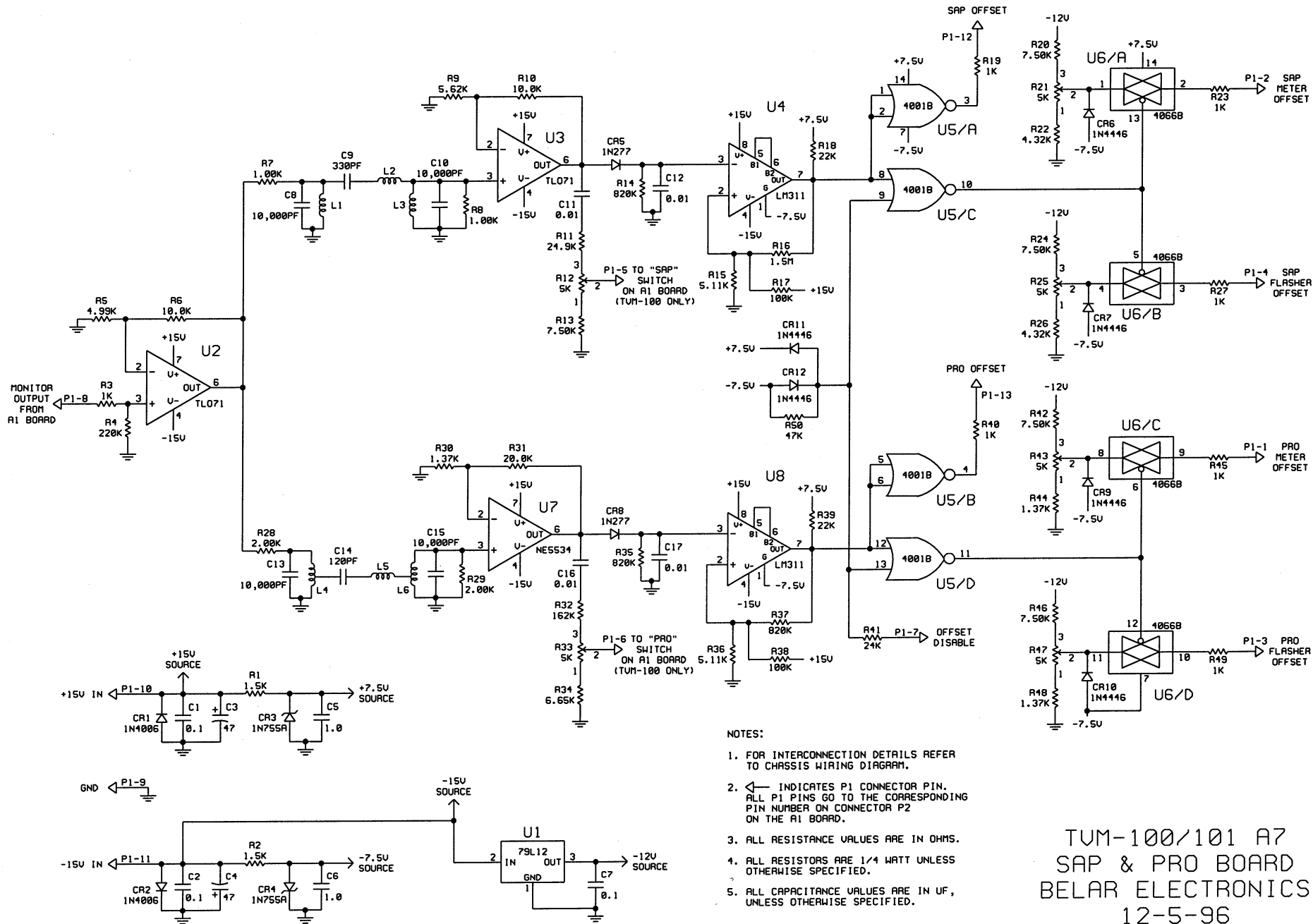
TVM-100/101 A6 MODULE  
UHF LOCAL OSCILLATOR  
BELAR ELECTRONICS  
10-3-91

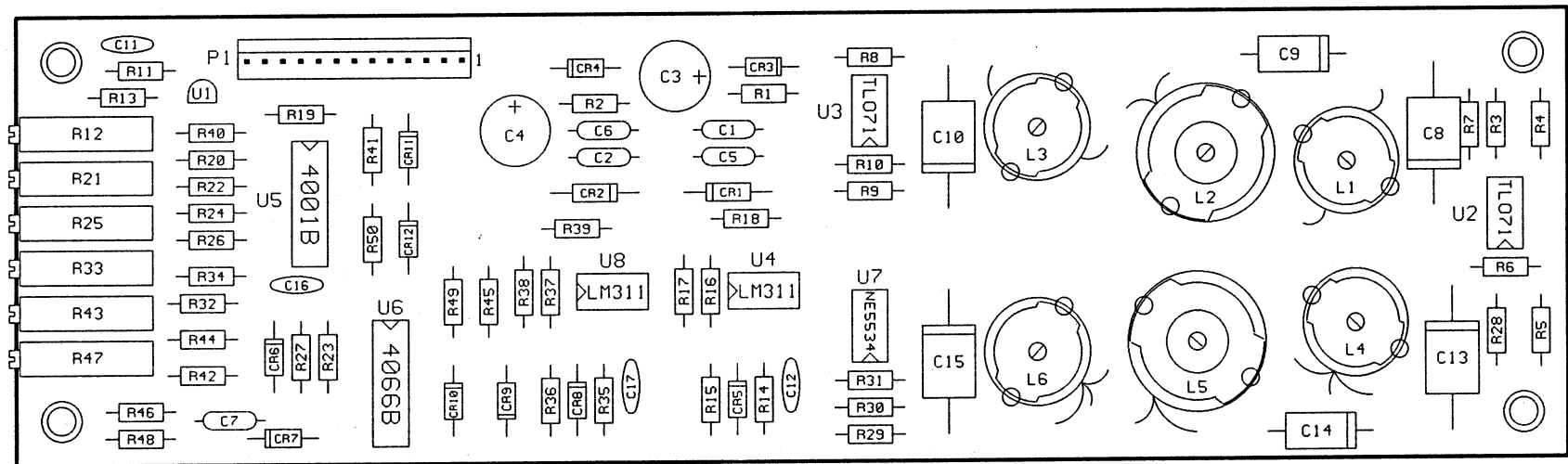


TUM-100/101 A6 MODULE  
 COMPONENT LAYOUT  
 BELAR ELECTRONICS

## A6 BOARD TVM-100/101

| Reference<br>Designation | Description                                            | Part Number |
|--------------------------|--------------------------------------------------------|-------------|
| C1                       | C: FIXED MICA 15pF 5%                                  | 0140-1505   |
| C2                       | C: FIXED MICA 24pF 5%                                  | 0140-2405   |
| C4                       | C: FIXED CERAMIC 0.01uF 100V                           | 0151-0003   |
| C5, C6                   | C: FIXED CERAMIC 0.001uF 1kV                           | 0151-0002   |
| C7                       | C: FIXED CERAMIC 0.1uF 50V                             | 0151-0006   |
| C8, C9                   | C: FIXED CERAMIC 0.001uF 1kV                           | 0151-0002   |
| C10                      | C: FIXED CERAMIC 0.01uF 100V                           | 0151-0003   |
| C11                      | C: FIXED CERAMIC 0.001uF 1kV                           | 0151-0002   |
| C12                      | C: FIXED CERAMIC 0.1uF 50V                             | 0151-0006   |
| CR1, CR2                 | DIODE: 1N4446                                          | 1900-0002   |
| J1, J2                   | J: SMB, CHASSIS MOUNT<br>(J1 & J2 ARE MOUNTED ON CASE) | 0360-0041   |
| Q1                       | TRANSISTOR: 2N5179                                     | 1850-0023   |
| Q2, Q3                   | TRANSISTOR: 2N5109                                     | 1850-0031   |
| R1                       | R: METAL FILM 1.2k 2% 1/4W                             | 0751-1222   |
| R2                       | R: METAL FILM 1.6k 2% 1/4W                             | 0751-1622   |
| R3                       | R: METAL FILM 910 2% 1/4W                              | 0751-9112   |
| R4                       | R: METAL FILM 2.2k 2% 1/4W                             | 0751-2222   |
| R5                       | R: METAL FILM 1.6k 2% 1/4W                             | 0751-1622   |
| R6                       | R: METAL FILM 75 2% 1/4W                               | 0751-7502   |
| R7                       | R: METAL FILM 270 2% 1/4W                              | 0751-2712   |
| R8                       | R: METAL FILM 4.7k 2% 1/4W                             | 0751-4722   |
| R9                       | R: METAL FILM 330 2% 1/4W                              | 0751-3312   |
| R10, R11                 | R: METAL FILM 200 2% 1/4W                              | 0751-2012   |
| R12                      | R: METAL FILM 33 2% 1/4W                               | 0751-3302   |
| T1                       | TRANSFORMER: VARIABLE                                  | Belar       |
| T2                       | TRANSFORMER: RF, UHF                                   | Belar       |
| T3                       | TRANSFORMER: RF TAPPED, UHF                            | Belar       |
| T4                       | TRANSFORMER: RF AUTO, UHF                              | Belar       |
| U1                       | IC: SRA-1W                                             | 1845-0002   |
| Y1                       | XTAL: 41.25MHz ABOVE AURAL (DIVIDED BY 6)              |             |





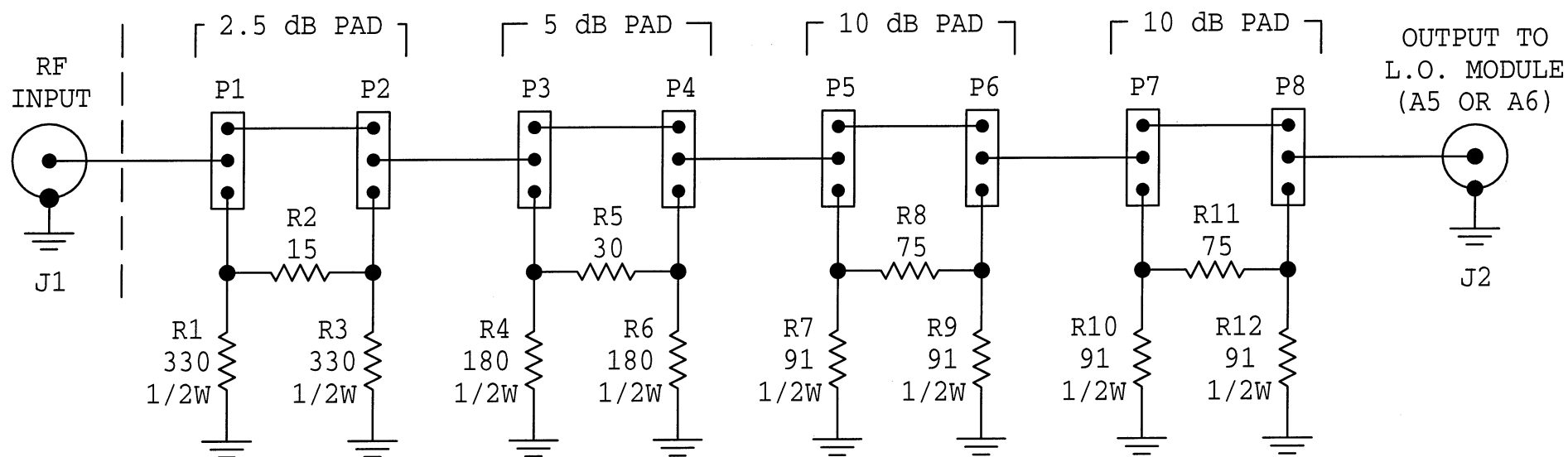
TUM-100/101 A7 BOARD  
 COMPONENT LAYOUT  
 BELAR ELECTRONICS

## A7 BOARD TVM-100/101

| Reference Designation | Description                      | Part Number |
|-----------------------|----------------------------------|-------------|
| C1,C2                 | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C3,C4                 | C: FIXED ELEC 47uF 50V           | 0180-0017   |
| C5,C6                 | C: FIXED CERAMIC 1.0uF 50V       | 0151-0008   |
| C7                    | C: FIXED CERAMIC 0.1uF 50V       | 0151-0006   |
| C8                    | C: FIXED POLY 10,000pF 2.5% 160V | 0130-1032   |
| C9                    | C: FIXED POLY 330pF 2.5% 160V    | 0130-3312   |
| C10                   | C: FIXED POLY 10,000pF 2.5% 160V | 0130-1032   |
| C11,C12               | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| C13                   | C: FIXED POLY 10,000pF 2.5% 160V | 0130-1032   |
| C14                   | C: FIXED POLY 120pF 2.5% 160V    | 0130-1212   |
| C15                   | C: FIXED POLY 10,000pF 2.5% 160V | 0130-1032   |
| C16,C17               | C: FIXED CERAMIC 0.01uF 100V     | 0151-0003   |
| CR1,CR2               | DIODE: 1N4006                    | 1900-0016   |
| CR3,CR4               | DIODE: IN755A                    | 1900-0023   |
| CR5                   | DIODE: 1N277 GERMANIUM           | 1900-0001   |
| CR6,CR7               | DIODE: IN4446                    | 1900-0002   |
| CR8                   | DIODE: 1N277 GERMANIUM           | 1900-0001   |
| CR9 thru CR12         | DIODE: 1N4446                    | 1900-0002   |
| L1                    | INDUCTOR:                        | Belar       |
| L2                    | INDUCTOR:                        | Belar       |
| L3                    | INDUCTOR:                        | Belar       |
| L4                    | INDUCTOR:                        | Belar       |
| L5                    | INDUCTOR:                        | Belar       |
| L6                    | INDUCTOR:                        | Belar       |
| P1                    | PLUG: 13 PIN, PC MOUNT           | 0365-0041   |
| R1,R2                 | R: METAL FILM 1.5k 2% 1/4W       | 0751-1522   |
| R3                    | R: METAL FILM 1k 2% 1/4W         | 0751-1022   |
| R4                    | R: METAL FILM 220k 2% 1/4W       | 0751-2242   |
| R5                    | R: METAL FILM 4.99k 1%           | 0721-4991   |
| R6                    | R: METAL FILM 10.0k 1%           | 0721-1002   |
| R7,R8                 | R: METAL FILM 1.00k 1%           | 0721-1001   |
| R9                    | R: METAL FILM 5.62k 1%           | 0721-5621   |
| R10                   | R: METAL FILM 10.0k 1%           | 0721-1002   |
| R11                   | R: METAL FILM 24.9k 1%           | 0721-2492   |
| R12                   | R: VAR COMP 5k, 10 TURN          | 2100-0026   |
| R13                   | R: METAL FILM 7.50k 1%           | 0721-7501   |
| R14                   | R: METAL FILM 820k 2% 1/4W       | 0751-8242   |
| R15                   | R: METAL FILM 5.11k 1%           | 0721-5111   |
| R16                   | R: FIXED CARBON 1.5M 5% 1/4W     | 0683-1555   |
| R17                   | R: METAL FILM 100k 1%            | 0721-1003   |
| R18                   | R: METAL FILM 22k 2% 1/4W        | 0751-2232   |
| R19                   | R: METAL FILM 1k 2% 1/4W         | 0751-1022   |
| R20                   | R: METAL FILM 7.50k 1%           | 0721-7501   |
| R21                   | R: VAR COMP 5k, 10 TURN          | 2100-0026   |
| R22                   | R: METAL FILM 4.32k 1%           | 0721-4321   |

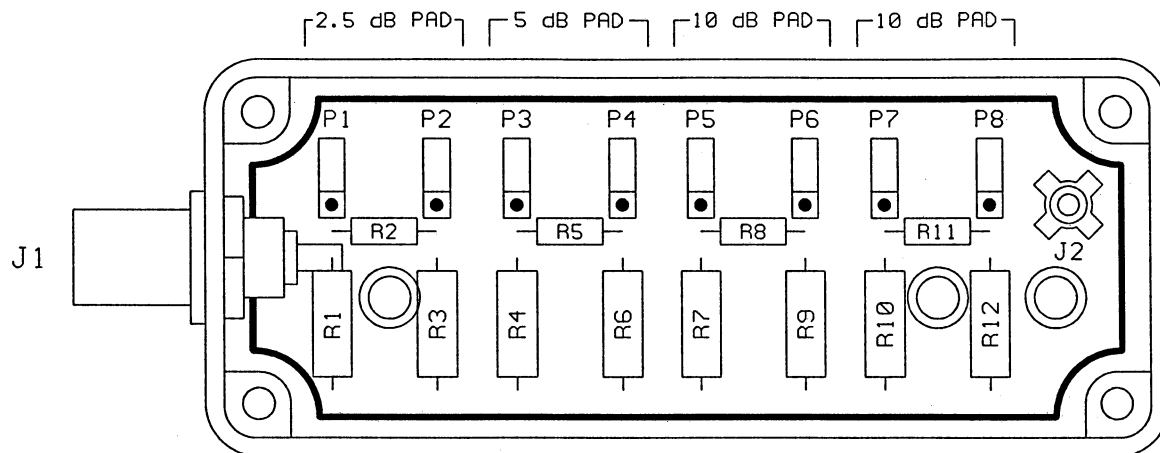
## A7 BOARD TVM-100/101 CONT.

| Reference<br>Designation | Description                | Part Number |
|--------------------------|----------------------------|-------------|
| R23                      | R: METAL FILM 1k 2% 1/4W   | 0751-1022   |
| R24                      | R: METAL FILM 7.50k 1%     | 0721-7501   |
| R25                      | R: VAR COMP 5k, 10 TURN    | 2100-0026   |
| R26                      | R: METAL FILM 4.32k 1%     | 0721-4321   |
| R27                      | R: METAL FILM 1k 2% 1/4W   | 0751-1022   |
| R28, R29                 | R: METAL FILM 2.00k 1%     | 0721-2001   |
| R30                      | R: METAL FILM 1.37k 1%     | 0721-1371   |
| R31                      | R: METAL FILM 20.0k 1%     | 0721-2002   |
| R32                      | R: METAL FILM 162k 1%      | 0721-1623   |
| R33                      | R: VAR COMP 5k, 10 TURN    | 2100-0026   |
| R34                      | R: METAL FILM 6.65k 1%     | 0721-6651   |
| R35                      | R: METAL FILM 820k 2% 1/4W | 0751-8242   |
| R36                      | R: METAL FILM 5.11k 1%     | 0721-5111   |
| R37                      | R: METAL FILM 820k 2% 1/4W | 0751-8242   |
| R38                      | R: METAL FILM 100k 1%      | 0721-1003   |
| R39                      | R: METAL FILM 22k 2% 1/4W  | 0751-2232   |
| R40                      | R: METAL FILM 1k 2% 1/4W   | 0751-1022   |
| R41                      | R: METAL FILM 24k 2% 1/4W  | 0751-2432   |
| R42                      | R: METAL FILM 7.50k 1%     | 0721-7501   |
| R43                      | R: VAR COMP 5k, 10 TURN    | 2100-0026   |
| R44                      | R: METAL FILM 1.37k 1%     | 0721-1371   |
| R45                      | R: METAL FILM 1k 2% 1/4W   | 0751-1022   |
| R46                      | R: METAL FILM 7.50k 1%     | 0721-7501   |
| R47                      | R: VAR COMP 5k, 10 TURN    | 2100-0026   |
| R48                      | R: METAL FILM 1.37k 1%     | 0721-1371   |
| R49                      | R: METAL FILM 1k 2% 1/4W   | 0751-1022   |
| R50                      | R: METAL FILM 47k 2% 1/4W  | 0751-4732   |
| U1                       | IC: 79L12CP                | 1826-0019   |
| U2, U3                   | IC: TLO71                  | 1826-0004   |
| U4                       | IC: LM311                  | 1826-0009   |
| U5                       | IC: 4001B                  | 1822-0015   |
| U6                       | IC: 4066B                  | 1822-0018   |
| U7                       | IC: NE5534                 | 1826-0025   |
| U8                       | IC: LM311                  | 1826-0009   |



NOTE: J1 IS MOUNTED ON CASE.

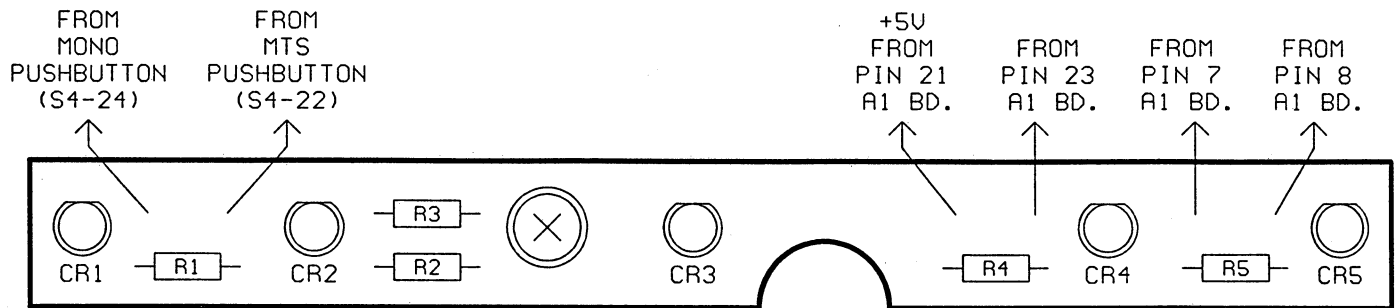
TVM-100/101 A10  
ATTENUATOR MODULE  
BELAR ELECTRONICS  
1-11-94



TVM-100/101 A10 MODULE  
COMPONENT LAYOUT

#### A10 MODULE TVM-100/101

| Reference Designation | Description                                                     | Part Number            |
|-----------------------|-----------------------------------------------------------------|------------------------|
| J1                    | JACK: BNC                                                       | 0360-0005              |
| J2                    | JACK: SMB, PC MOUNT                                             | 0360-0040              |
| P1 thru P8            | PIN: 3 POSITION<br>JUMPER: 2 POSITION<br>(USED WITH P1 THRU P8) | 0365-0030<br>0365-0028 |
| R1                    | R: METAL FILM 330 2% 1/2W                                       | 0771-3312              |
| R2                    | R: METAL FILM 15 2% 1/4W                                        | 0751-1502              |
| R3                    | R: METAL FILM 330 2% 1/2W                                       | 0771-3312              |
| R4                    | R: METAL FILM 180 2% 1/2W                                       | 0771-1812              |
| R5                    | R: METAL FILM 30 2% 1/4W                                        | 0751-3002              |
| R6                    | R: METAL FILM 180 2% 1/2W                                       | 0771-1812              |
| R7                    | R: METAL FILM 91 2% 1/2W                                        | 0771-9102              |
| R8                    | R: METAL FILM 75 2% 1/4W                                        | 0751-7502              |
| R9,R10                | R: METAL FILM 91 2% 1/2W                                        | 0771-9102              |
| R11                   | R: METAL FILM 75 2% 1/4W                                        | 0751-7502              |
| R12                   | R: METAL FILM 91 2% 1/2W                                        | 0771-9102              |

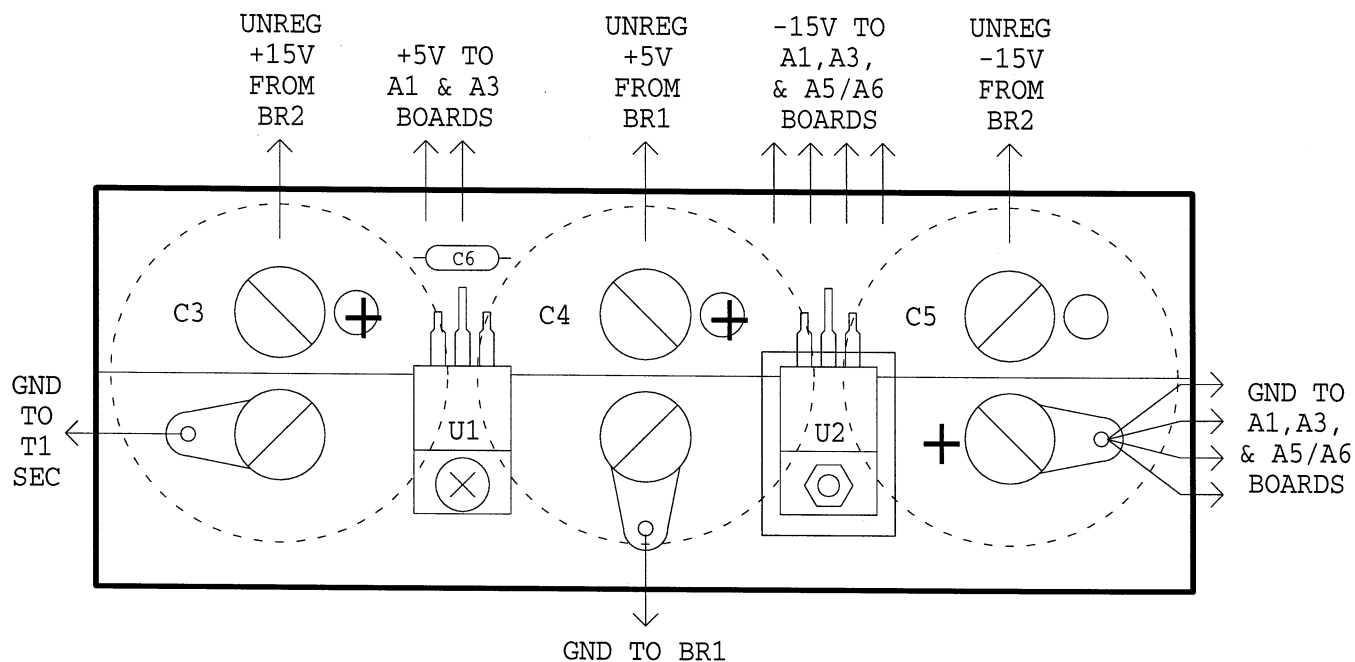


TVM-100/101 A11 BOARD  
COMPONENT LAYOUT

#### A11 BOARD TVM-100/101

| Reference Designation | Description               | Part Number |
|-----------------------|---------------------------|-------------|
| CR1                   | LED: YELLOW MV5353        | 1910-0002   |
| CR2                   | LED: GREEN MV5253         | 1910-0003   |
| CR3                   | LED: RED MV5053           | 1910-0001   |
| CR4                   | LED: YELLOW MV5353        | 1910-0002   |
| CR5                   | LED: RED MV5053           | 1910-0001   |
| R1 thru R5            | R: METAL FILM 160 2% 1/4W | 0751-1615   |

(SEE CHASSIS WIRING DIAGRAM FOR A11 BOARD SCHEMATIC)



TVM-100/101  
A12 POWER SUPPLY BOARD  
COMPONENT LAYOUT  
(ONLY USED PRIOR TO TVM-100 SERIAL NUMBER 200511 &  
TVM-101 SERIAL NUMBER 230271)

A12 BOARD TVM-100/101

Reference

| Designation | Description                | Part Number |
|-------------|----------------------------|-------------|
| C3 thru C5  | C: FIXED ELEC 3500uF 40V   | 0180-0026   |
| C6          | C: FIXED CERAMIC 0.1uF 50V | 0151-0006   |
| U1          | IC: 7805C                  | 1826-0014   |
| U2          | IC: 7915C                  | 1826-0033   |

(SEE CHASSIS WIRING DIAGRAM FOR A12 BOARD SCHEMATIC)

# BELAR PWM-1 PEAK WEIGHTING MODULE

## Operation Guide

The Belar PWM-1 Peak Weighting Module adds peak weighting to the Peak Mod and 100% Peak lights of your Belar TVM-100 or TVM-101 Precision TV Aural Modulation Monitor. It will generally result in your peak lights lighting less frequently for a given modulation level. It does not affect the operation or reading of the modulation meter.

**BYPASS** The PWM-1 is completely bypassed. The monitor will function exactly as it would without the option installed.

**3 CYCLES** The monitor peak lights will ignore any peak shorter than 3 cycles (of a 10kHz tone burst).

**5 CYCLES** The monitor peak lights will ignore any peak shorter than 5 cycles (of a 10kHz tone burst).

**9 CYCLES** The monitor peak lights will ignore any peak shorter than 9 cycles (of a 10kHz tone burst).

**15 CYCLES** The monitor peak lights will ignore any peak shorter than 15 cycles (of a 10kHz tone burst).

**20 CYCLES** The monitor peak lights will ignore any peak shorter than 20 cycles (of a 10kHz tone burst).

By changing the peak weighting constants and noting the effect on your peak lights, you can better understand the composition of your total modulation. For example, if your program material is highly processed with little dynamic range (and you have no subcarriers), peak weighting will cause almost no change in your monitor readings. If your program has little processing, you will see more effect from the peak weighting.

# **Instructions for installing the BELAR PWM-1 PEAK WEIGHTING MODULE in your Belar TVM-100/TVM-101 Precision TV Aural Modulation Monitor**

Before proceeding, please:

- Read through these entire instructions before beginning the actual installation.
- Ensure that your PWM-1 kit is complete. Contents include:
  - PWM-1 circuit board (with rotary switch and ribbon cable attached)
  - Knob for rotary switch
  - Allen wrench for tightening set screws on knob
  - Mounting template
  - PWM-1 foil label for back of unit
  - Coaxial jumper cable
  - Instruction book

**Overview:** The PWM-1 is installed in the back of the cover of your TVM-100/TVM-101. The installation procedure involves removing the cover, making a hole for the switch (note: TVM-100 S/N 200065 / TVM-101 S/N 230044 and later already have this hole), applying the foil label, installing the switch (with attached circuit board), making the electrical connections, and reinstalling the cover.

|                 |                            |                                             |
|-----------------|----------------------------|---------------------------------------------|
| Tools required: | small Phillips screwdriver | small round file or similar                 |
|                 | center punch or awl        | Exacto knife or similar                     |
|                 | 1/4" drill                 | IC removal tool (or small flat screwdriver) |

**Note:** References to the TVM-100 apply equally to the TVM-101.

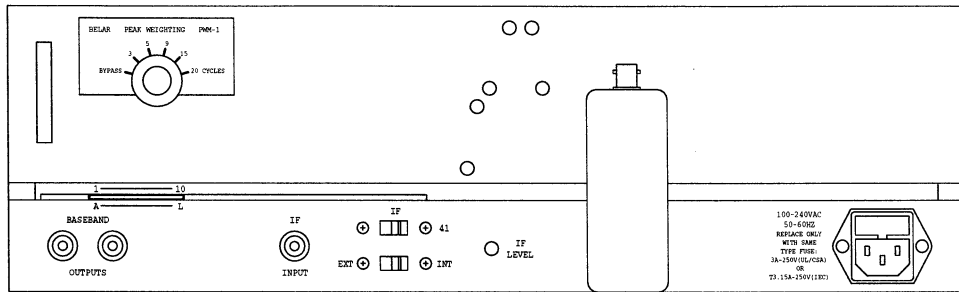
- 1 Unplug all cords from the TVM-100, and remove it from the equipment rack.
- 2 Remove the TVM-100 top cover.
- 3 Using a scissors, cut the template supplied where indicated. (The two templates are identical -- one is a spare.)
- 4 Tape the template to the outside rear of the TVM-100 cover, using the left and top edges as a guide.
- 5 Center punch and drill a 1/4" hole as shown by the template.
- 6 Using the template, carefully mark label position on rear cover. This will help you properly position the foil label when you apply it later.
- 7 Remove the template and deburr the hole.
- 8 Carefully peel the label backing away from bottom of label, and fold it over so about 3/8" of the label is exposed. Locate the label on the cover using the marks you made in step 6, and carefully press the bottom of label against the panel.

- 9 Slowly peel label backing from the bottom up, while pressing label against panel. This will avoid air bubbles under label.
- 10 Roll label flat with a rubber roller, or rub the label backing over the surface of the label to flatten.
- 11 Using an Exacto knife, cut a hole in the label around the edge of the switch mounting hole.
- 12 Remove the nut and lockwasher from the PWM-1 rotary switch.
- 13 Install the PWM-1 module on the inside rear of the TVM-100 top cover, with the gold pins toward the top. Mount the lockwasher and nut and tighten securely, making sure that the module remains horizontal.
- 14 Install the knob. The knob pointer should be opposite the flat on the switch shaft. Tighten the set screws on the knob with the Allen wrench supplied. If the pointer does not line up with the position marks on the label, remove the knob, loosen the nut and rotate the module slightly. Tighten the nut and reinstall the knob.
- 15 Lay the TVM-100 top cover just behind the unit with the PWM-1 knob facing down. Rest the cover on the input attenuator.
- 16 Unplug the coaxial cable from pins 13 and 14 on the TVM-100 A1 board. (See diagram at the rear of the manual.) These pins are marked "BB1" and "G". Plug the center conductor of the coax you just removed onto pin 3 of the module, and the shield onto ground pin 4 (see PWM-1 Component Layout drawing).
- 17 Plug one end of the center conductor of the coaxial cable (supplied) onto pin 1 of the module and the shield onto ground pin 2. Plug the center conductor of the other end onto pin 13 on the TVM-100 A1 board and the shield onto ground pin 14. (Ground pin 14 is the one closest to the thumbwheel.)
- 18 Remove U40 (TLO71) from the TVM-100 A1 board. (See diagram at the rear of the manual.) Note the position of pin 1.
- 19 Insert the 8 pin DIP plug from the module into U40's socket on the TVM-100 A1 board. The notch on the DIP plug denotes pin 1. This pin should be inserted toward the unit front panel. If the DIP plug is inserted properly, the flat cable should exit the DIP plug toward the rear of the unit.
- 20 Carefully rotate the top cover into position and temporarily secure it with two mounting screws.

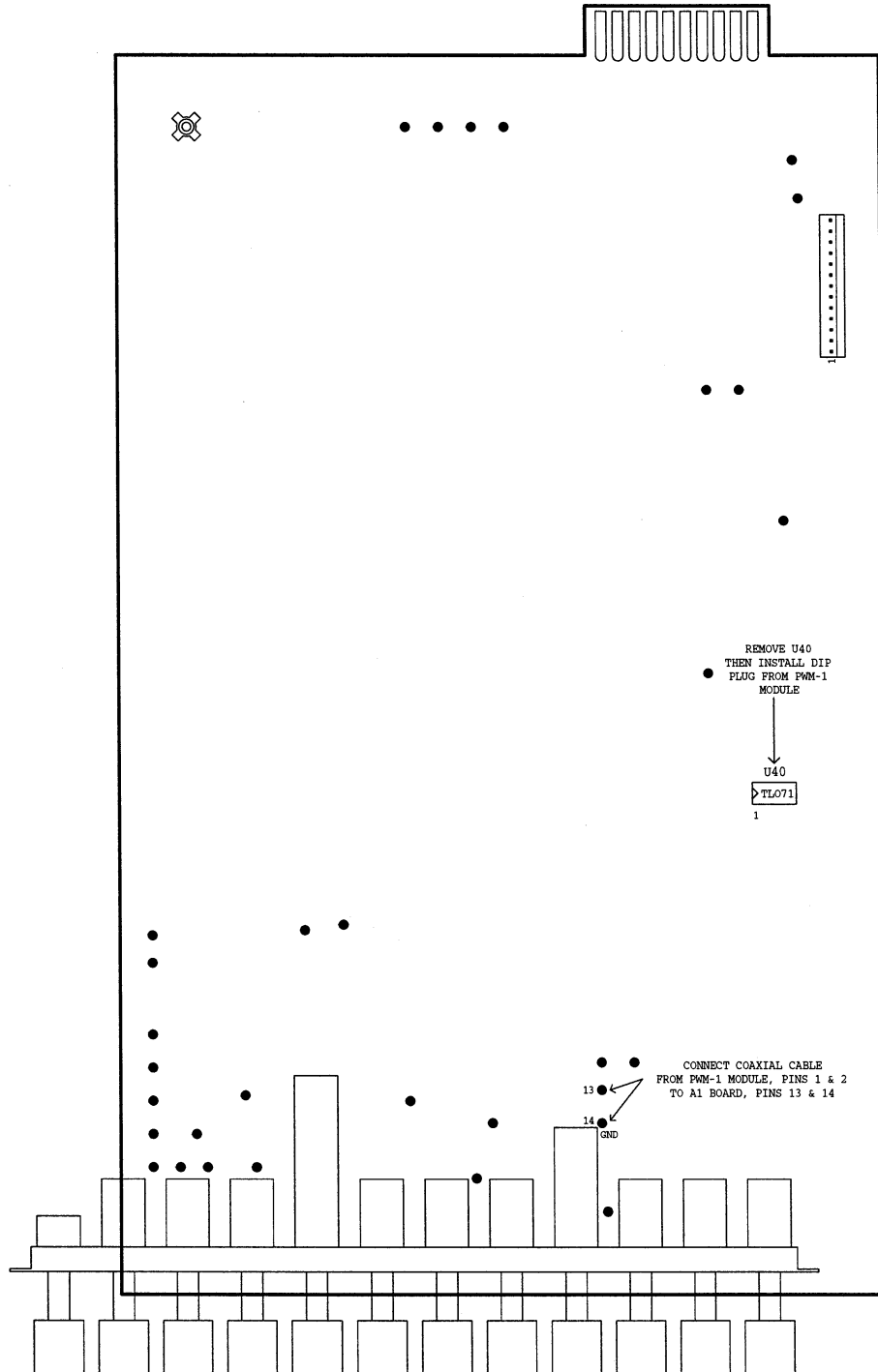
NOTE: The gain of the PWM-1 is factory set and installation of the module should not require any field adjustments. The following steps are included for the user who wishes to verify the PWM-1 module gain after installation.

- 21 Depress the TVM-100 "CAL" and "PEAK" pushbuttons. Set the PWM-1 switch to the "BYPASS" position. Plug the TVM-100 line cord in and allow unit to warm up for about 15 minutes.
- 22 Increase the thumbwheel setting on the TVM-100 front panel until the "PEAK MOD" LED goes out. Decrease the thumbwheel setting until the LED just comes on. Make a note of the thumbwheel position.
- 23 Move the PWM-1 switch to the "3 CYCLES" position. Again, rotate the thumbwheel setting on the TVM-100 until the "PEAK MOD" LED just comes on. This point should be the same as in the "BYPASS" position. If not, remove the cover and carefully rotate it to gain access to the PWM-1 module gain adjustment pot.

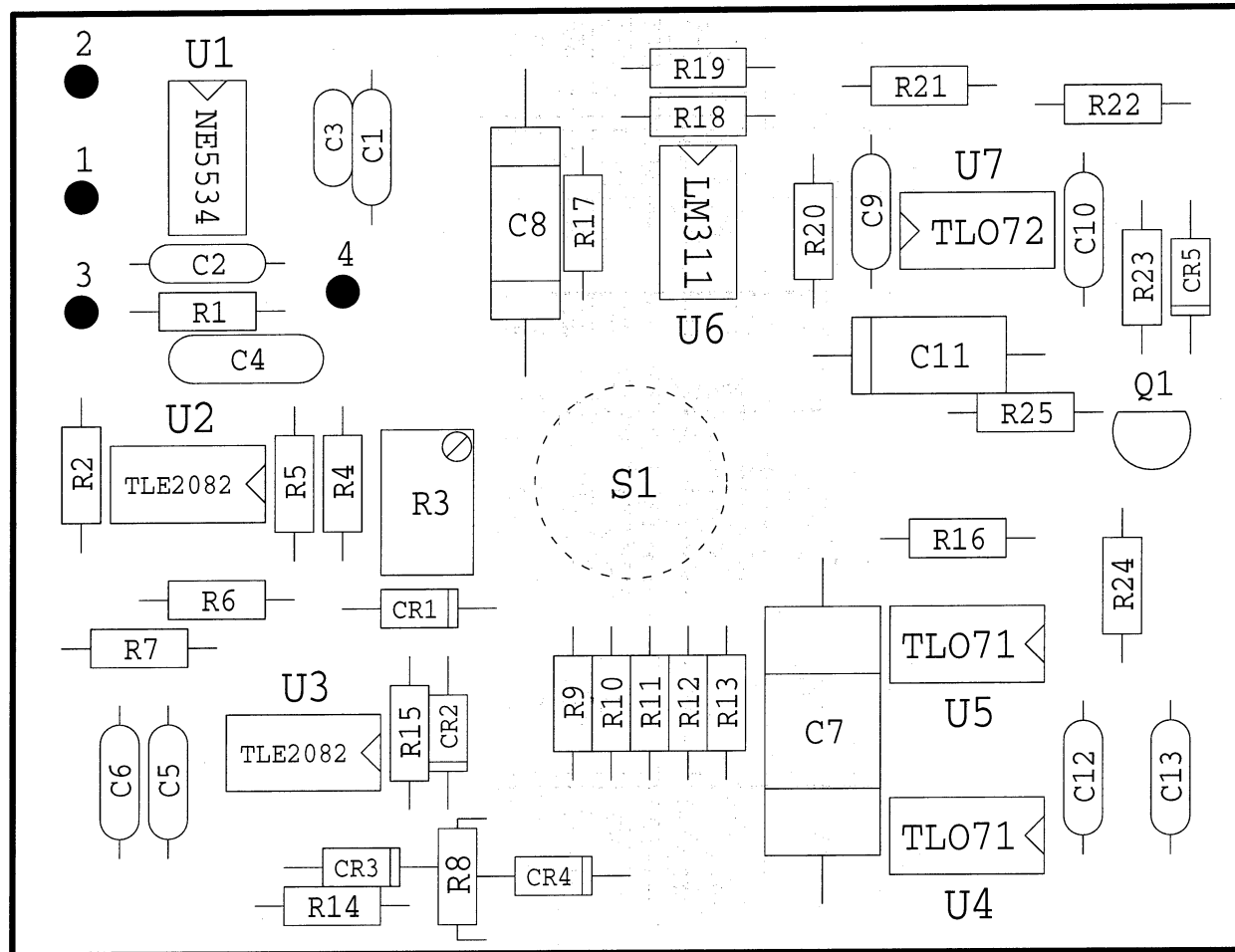
- 24 With the PWM-1 still in the "3 CYCLES" position, set the TVM-100 thumbwheel to the same position you noted in step 22. Adjust R3 on the module until the LED is off, then reverse the adjustment rotation until the LED just comes on and stays on. When the adjustment has been properly made, the "PEAK MOD" LED should come on at the same thumbwheel position in both the "BYPASS" and "3 CYCLES" positions of the PWM-1. When the adjustment is complete, unplug the TVM-100 line cord and install the cover using all the mounting screws.
- 25 Reinstall the TVM-100, and reconnect all cords. This completes the module installation.



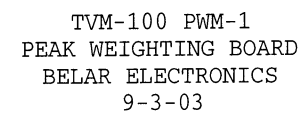
TVM-100 CHASSIS REAR VIEW  
WITH PWM-1 INSTALLED



PWM-1 MODULE TO TVM-100/101 A1 BOARD  
CONNECTION POINTS  
BELAR ELECTRONICS

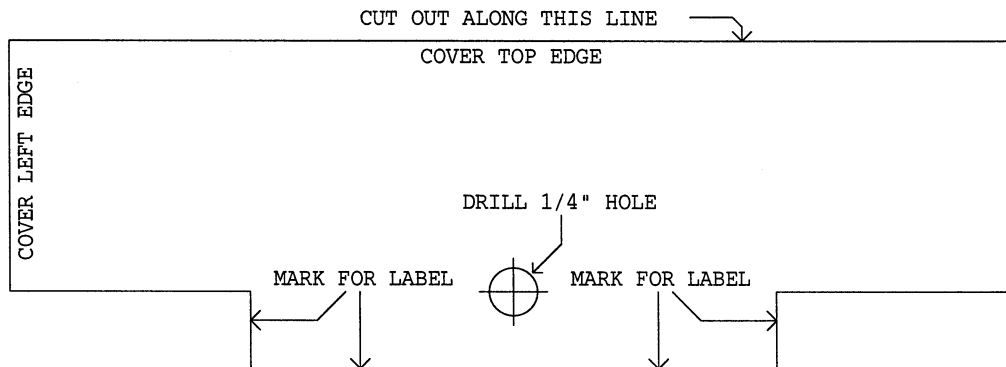
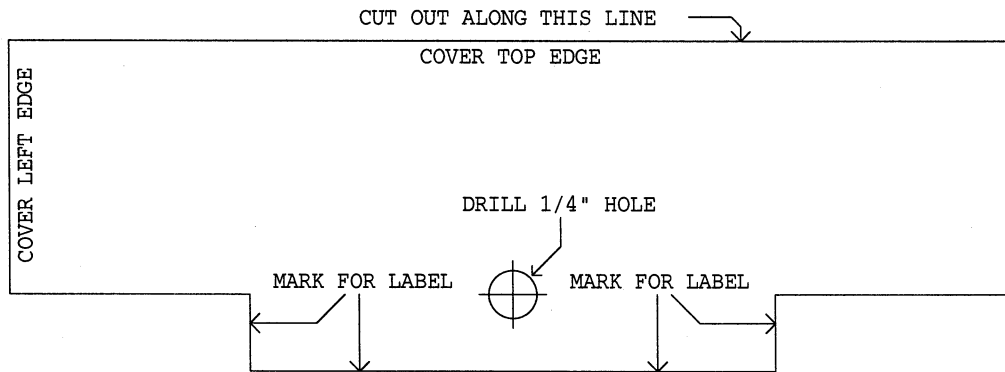


TVM-100 PWM-1 BOARD  
COMPONENT LAYOUT  
BELAR ELECTRONICS



PWM-1 BOARD TVM-100

| Reference<br>Designation | Description                     | Part Number |
|--------------------------|---------------------------------|-------------|
| C1,C2                    | C: FIXED CERAMIC 1.0uF 50V      | 0151-0008   |
| C3                       | C: FIXED MICA 22pF 5%           | 0142-2205   |
| C4                       | C: FIXED CERAMIC 3.3uF 50V      | 0151-0011   |
| C5,C6                    | C: FIXED CERAMIC 0.1uF 50V      | 0151-0006   |
| C7                       | C: FIXED FILM 0.22 uF 10% 80V   | 0120-2241   |
| C8                       | C: FIXED FILM 0.01 uF 10% 200V  | 0120-1031   |
| C9,C10                   | C: FIXED CERAMIC 0.1uF 50V      | 0151-0006   |
| C11                      | C: FIXED POLY 1000pF 2.5% 160V  | 0130-1022   |
| C12,C13                  | C: FIXED CERAMIC 1.0uF 50V      | 0151-0008   |
| CR1 thru CR5             | DIODE: 1N4446                   | 1900-0002   |
| Q1                       | TRANSISTOR: 2N4401              | 1850-0028   |
| R1                       | R: METAL FILM 75.0 1%           | 0721-75R0   |
| R2                       | R: METAL FILM 220k 2%           | 0751-2242   |
| R3                       | R: VAR COMP 10k, 10 TURN        | 2100-0024   |
| R4                       | R: METAL FILM 12.1k 1%          | 0721-1212   |
| R5 thru R7               | R: METAL FILM 10.0k 1%          | 0721-1002   |
| R8                       | R: FIXED CARBON 4.7M 5% 1/4W    | 0683-4755   |
| R9                       | R: METAL FILM 2.00k 1%          | 0721-2001   |
| R10                      | R: METAL FILM 3.32k 1%          | 0721-3321   |
| R11                      | R: METAL FILM 5.62k 1%          | 0721-5621   |
| R12                      | R: METAL FILM 9.76k 1%          | 0721-9761   |
| R13                      | R: METAL FILM 13.0k 1%          | 0721-1302   |
| R14,R15                  | R: METAL FILM 5.1k 2%           | 0751-5122   |
| R16                      | R: METAL FILM 4.7k 2%           | 0751-4722   |
| R17                      | R: METAL FILM 22k 2%            | 0751-2232   |
| R18,R19                  | R: METAL FILM 220k 2%           | 0751-2242   |
| R20                      | R: METAL FILM 10k 2%            | 0751-1032   |
| R21,R22                  | R: METAL FILM 470k 2%           | 0751-4742   |
| R23 thru R25             | R: METAL FILM 10k 2%            | 0751-1032   |
| S1                       | SWITCH: ROTARY - 2 POLE, 6 POS. | 3100-0003   |
| --                       | KNOB: 0F3B                      | 0370-0005   |
| U1                       | IC: NE5534                      | 1826-0025   |
| U2,U3                    | IC: TLE2082                     | 1826-0069   |
| U4,U5                    | IC: TLO71                       | 1826-0004   |
| U6                       | IC: LM311                       | 1826-0009   |
| U7                       | IC: TLO72                       | 1826-0038   |



TVM-100 PWM-1 MOUNTING TEMPLATE  
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