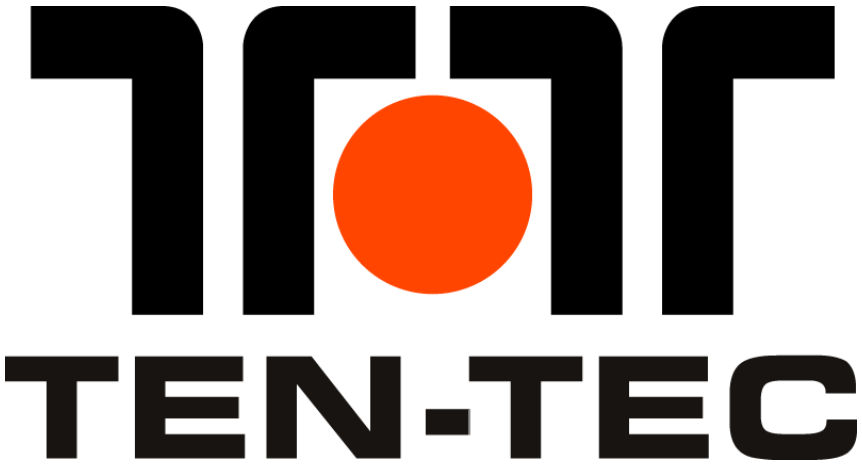


This obsolete manual file is provided as a courtesy to you by Ten-Tec, Inc.

Ten-Tec's service department can repair and service virtually everything we have built going back to our first transceivers in the late 1960's. It is our ability to continue offering service on these rigs that has led to their re-sale value remaining high and has made a major contribution to our legendary service reputation.

Printed and bound copies of all manuals are available for purchase through our service department if you would prefer not to use this copy as your transceiver manual.

We can repair or service your Ten-Tec equipment at our facility in Sevierville, TN. We also offer support via telephone for all products via during usual business hours of 8 a.m. to 5 p.m. USA Eastern time, Monday through Friday. We have a large supply of parts for obsolete products. Repairing a transceiver or amplifier yourself? Contact us for parts pricing information.

Service department direct line: (865) 428-0364
Ten-Tec office line: (865) 453-7172
Service department email: service@tentec.com
Address: 1185 Dolly Parton Parkway, Sevierville, TN 37862 USA

We have found it is most effective for us to help you troubleshoot or repair equipment with a consultation via telephone rather than by email.

Suggested contact methods are:

Troubleshooting or repairing equipment – call (865) 428-0364
Other inquiries – call (865) 428-0364 or email service@tentec.com

THANK YOU AND 73 FROM ALL OF US AT TEN-TEC

TEN - TEC

OPERATOR'S MANUAL

ARGONAUT V
HF TRANSCEIVER
MODEL 516

Photo 1 - 516 Front View

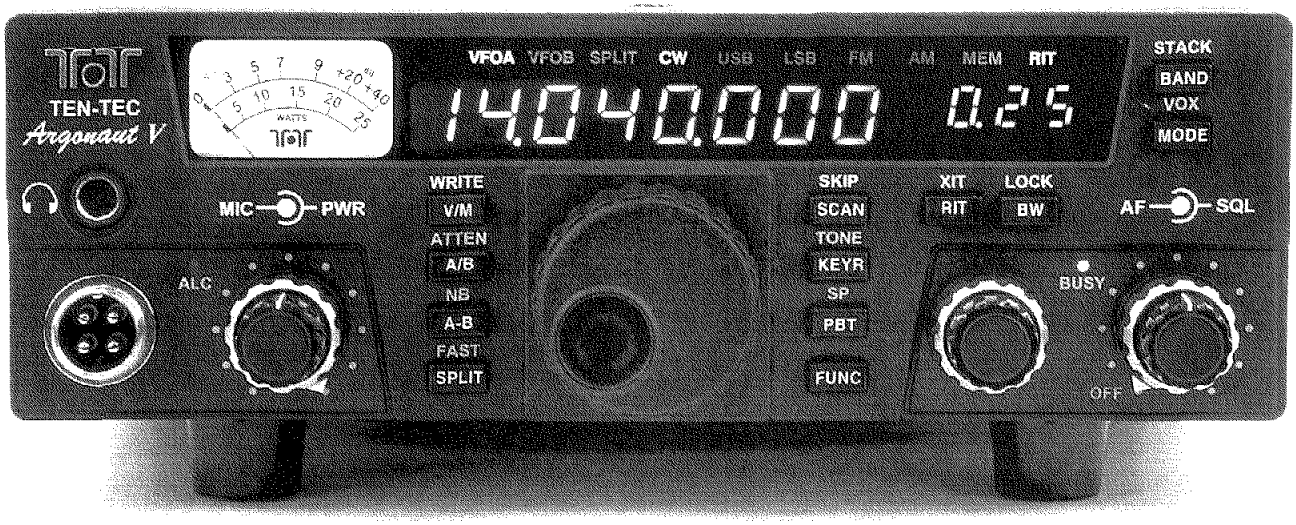
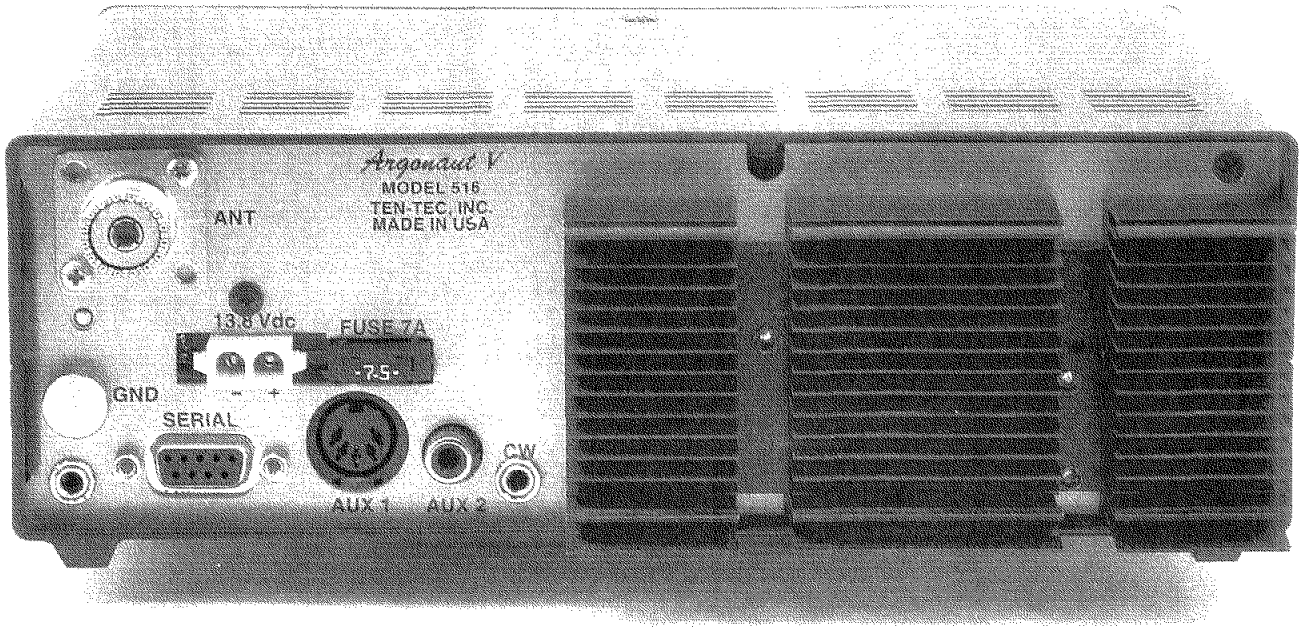


Photo 2 - 516 Rear View



SPECIFICATIONS

GENERAL

FREQUENCY	Receive: 500 kHz – 30 MHz. RANGE Transmit: 1.8-2.0, 3.5-4.0, 7.0-7.3, 10.1-10.15, 14.0-14.35, 18.068-18.168, 21.0-21.45, 24.89-24.99, and 28.0-29.7 MHz. [60M: 5.25 – 5.40 MHz if allocated]
VFOs	Two independent "VFOs" for single or split frequency operation
TUNING STEPS	Selectable: 10 Hz or 1 kHz SSB & CW; 100 Hz & 5 kHz AM; 2.5 or 10 kHz FM
OFFSET TUNING	+/- 10 kHz on receiving and/or transmitting.
FREQUENCY STABILITY	+/- 20 PPM over 0 – 50°C temperature range. +/- 3 PPM with TCXO option.
MODES	CW, LSB, USB, AM, FM.
INTERMEDIATE FREQUENCIES	1st I-F 45 MHz, 2nd I-F 450 kHz, and 3rd I-F 14.5 kHz.
DISPLAY	7-segment green LEDs for main and secondary displays. Green LED backlit annunciators.
OPERATING TEMP. RANGE	0 – 50 degrees Centigrade.
MEMORIES	100 internal to 516. - Virtually any computer will store thousands of memories when controlling the 516.
ANTENNA IMPEDANCE	50 ohms unbalanced, SWR <2:1. SO-239 connector.
SUPPLY VOLTAGE	12 – 14 VDC: 13.8 VDC nominal.
CURRENT REQUIRED	500-mA typical, receiver w/no signal. 6 A @ 20 watts transmitting. 1.5 A @ 5 watts transmitting.
CONSTRUCTION	5 epoxy-glass PC boards, molded front panel, aluminum chassis, textured painted steel top and bottom covers.
DIMENSIONS	HWD = 2.75" x 8.5" x 9.7" (7 x 21.6 x 24.6 cm.) Depth includes heat sink on rear panel. Add ½ " (13 mm) for optional fan
WEIGHT	5 lb. (2.2 kg.)

TRANSMITTER

RF OUTPUT	Adjustable 1 – 20 watts, ALC stabilized.
DUTY CYCLE	100% duty cycle for up to 10 minutes. Continuous duty with optional Model 308 fan cooling of amplifier heat sink.
MICROPHONE	4-pin front panel connector accepts 200 ohm to 50k ohm impedance microphones with 5 mV (-67 dB) output and provides DC polarizing voltage (+9 V) for electret microphones.
LINE INPUT	100 mV p-p into 47k Ohms.
T/R SWITCHING	PTT on SSB, AM, and FM. QSK on CW.
CW OFFSET	DSP generated: programmable 400 to 1000 Hz. Sidetone automatically matches offset.

FM DEVIATION	5 kHz peak.
METERING	Selectable: Forward power 25W/5W, Reverse Power 25W, SWR 1.0:1 to 2.5:1, and PA Current 0 – 9A.
SSB GENERATION	DSP implementation of Weaver method SSB.
SSB CARRIER SUPPRESSION	> 50 dB.
UNWANTED SIDEBAND SUPPRESSION	> 50 dB.
HARMONIC & SPURIOUS OUTPUT	Better than 43 dB below 20W power output, >33 dB below 5W.

RECEIVER

SENSITIVITY	0.2 μV typical, 0.35 for 10 dB SINAD @ 2.4 kHz bandwidth, SSB & CW. AM: 0.9μV max. FM: 0.35 μV typical, 0.6 μV for 12 dB SINAD at 15 kHz bandwidth.
SELECTIVITY	35 filters built-in with 1.5:1 or better shape factors (-6 to –60 dB) for CW, SSB, and AM: 200 - 900 Hz in 50 Hz steps, 900 to 2800 Hz in 100 Hz steps, 4 kHz, and 6 kHz. FM bandwidth is 15 kHz.
THIRD ORDER INTERCEPT	+4 dBm, typical. (20 kHz spacing, ARRL method).
SECOND ORDER INTERCEPT	+66 dBm typical. (ARRL method)
NOISE FLOOR	-126 dBm @ 3 kHz bandwidth.
S-METER	calibrated to 50 μV S9 standard.
ATTENUATOR	20 dB, selectable by operator
PASSBAND TUNING	+/- 2.99 kHz.
I-F REJECTION>	60 dB typical.
IMAGE REJECTION	> 60 dB typical.
RECEIVE RECOVERY TIME	less than 20 ms, including SPLIT mode.
AUDIO	Speaker: 1 watt @ 4 ohms. Line out: > 1 V p-p into 600 ohms.

OVERVIEW OF THIS MANUAL

Chapter 1 of the manual is the introduction to the **Argonaut V** and guide to unpacking.

Chapter 2 contains the steps for getting Model 516 connected to your station right out of the box.

Chapter 3 is a detailed guide to **Argonaut V** controls that will help you take full advantage of the transceiver's capabilities.

Chapter 4 covers 516's theory of operation.

Chapter 5 is a troubleshooting guide, should you have difficulty with transceiver operation.

Chapter 6 contains the glossary of terms used in this manual. We recommend that you refer to it if you come across an unfamiliar descriptive term.

The schematics for Model 516 are in the appendix.

1. ARGONAUT V Model 516

1.1. INTRODUCTION

Ten-Tec's model 516 is a multi-mode HF transceiver with modern and versatile digital signal processing technology (IF-DSP). Its transmitter operates on all HF amateur bands, and the receiver has extended coverage from 500 kHz to 30 MHz.

Model 516 uses our IF DSP technology and RF circuitry, building on our years of engineering HF DSP receivers for government, commercial and amateur radio use.

516's "brain" is an Analog Devices™ AD2181 Digital Signal Processor (DSP). The DSP and control software implements many functions formerly performed by dedicated signal and control components. Digital Signal Processing provides 516 with features that would otherwise be too expensive or impractical for amateur equipment in this price class. The extensive repertoire of filter bandwidths is an example of a feature that would be too costly and space consuming without DSP.

The transceiver features independent **VFO A** and **VFO B** registers, band-stacking registers (one per band), and 100 internal memories, which store frequency, bandwidth, split, and mode. Features include Receiver and Transmitter Incremental Tuning (**RIT** & **XIT**), an adjustable noise-blanker, CW sidetone and offset setting. There are distinct fast and slow tuning rates for the **SSB/CW/AM** modes and for **FM**. The **SQUELCH** works in all modes and Ten-Tec's renowned QSK **CW** is standard. If you have a computer with sound card and suitable software, a simple cable makes you ready for PSK31 and other digital modes of operation. See paragraph 3.5.

Model 516 can use standard or non-standard frequency offsets for 10m **FM** repeater operation with selectable EIA subaudible tone encoding. We supply our model 701 PTT hand microphone as standard equipment.

Operating frequency appears with 10-hertz resolution on a large, bright main LED numeric display. A smaller **MULTI**, or *multipurpose* display, conveys mode-dependent settings for bandwidth, **RIT/XIT** encoder tone frequency, noise blanker setting, offset tuning, keyer and **VOX** menus. There is an electronic lock for the main tuning knob to prevent inadvertent frequency changes.

Argonaut V provides band scanning by either channel memory or tunable frequency limits. The Channel-Scanning mode allows the operator to exclude selected channels from the scan without removing them from memory. Band-Scan with all-mode squelch makes searching for activity as simple and convenient as HF conditions allow.

Argonaut V's frequency accuracy and stability (+/-20 parts/million) are easily adequate for most amateur radio purposes, but for those who need or desire more accuracy we make the transceiver available with a TCXO option on initial order. Accuracy with the TCXO is +/- 3 part per million.

When new bands or firmware upgrades are available, Ten-Tec operators can connect their Internet-capable computers to **www.rfsquared.com** and download the latest code file to the computer. The next step – connecting the radio to the computer with a standard serial cable and running the program per included instructions – updates the Flash Memory in **Argonaut V**.

The rear panel has connections for an audio modem, PC sound-card or similar equipment, a 9-pin RS-232 serial port for firmware upgrades or external control, an auxiliary DC power jack, and jacks for an external speaker (Ten-Tec 307B) and for a keyer.

Because Model 516 is a traditional front panel transceiver, all features and functions are available without need of computer skills and a computer. In keeping with modern trends and its Ten-Tec heritage, however, the 516 design offers a built-in capability for partial computer control. Using this mode, described later in this manual, makes most controls and functions accessible to your computer screen and controllable by third-party computer software.

1.2. UNPACKING

Examine the model 516 for signs of shipping damage. Should any damage be apparent, notify the delivering carrier immediately, stating the full extent of the damage.

Retain all damaged cartons. Liability for shipping damage rests with the carrier. It is recommended you keep the shipping carton and fillers in the event that storage, moving, or shipment becomes necessary.

The following hardware and accessories come standard with your **Argonaut V**. Make sure that you have not overlooked anything.

Qty	Part #	Description
1	#701	Hand Microphone
1	#27031	Mini-ATC Blade Fuse, 7.5A
1	#35057	4-pin Microphone Connector
1	#35163	1/8 in. Stereo Plug
1	#35165	2 Pin Power Connector Shell
1	#38040	.050 hex allen wrench
1	#38244	Microphone clip
2	#41020	Female Terminal Pins
1	#74020	Warranty Card
1	#74278	User's Manual
1	#86095	DC Power Cord

Table 1-1 Included Parts

Replacements for the 7.5-ampere Mini-ATC/ATO blade fuse are readily available in automotive parts stores. This fuse is brown to distinguish it from other values.

If any of the previous items are missing, contact the repair department at Ten-Tec for replacements:

E-mail	**service@tentec.com**
Repair Department	(865) 428-0364
Switchboard	(865) 453-7172
Facsimile	(865) 428-4483

1.3. ACCESSORIES

There are several Ten-Tec station accessory items suitable for use with **Argonaut V**. Contact the Ten-Tec sales department for pricing and availability information.

Part #	Description
#306	4-pin to 2-pin Power Supply Cable Adapter
#307B	External Speaker
#308	Fan Kit
#705	Desk Microphone
#937	+13.8 VDC, 11 Amp Power Supply
#46176	Cable, 5-pin DIN male to 4 color-coded phono plugs
#80573	2-pin DC Connector with pins

Table 1-2 Accessories for Argonaut V

2. INSTALLATION

2.1. POWERING UP ARGONAUT V

The transceiver requires a regulated DC power source for operation. Although **Argonaut V** operates from 12 to 14 VDC, we recommend 13.8 VDC. Maximum power drain is 6 amperes when transmitting at full power.

CAUTION: DO NOT CONNECT THE MODEL 516 DIRECTLY TO AC MAINS. DAMAGE WILL RESULT!

Use the provided power cable (Ten-Tec P/N 86067) to connect the DC power source to the 516. Observe correct polarity. While the model 516 is fuse and diode protected on the DC input, the warranty does not cover damage caused by reversed polarity connection to the radio.

We recommend Ten-Tec's 13.8 VDC, 11 amp power supply, Model 937, to power the unit from standard 120 VAC.

After connecting the power supply to 516, turn on the power supply. Always enable the power supply first, then turn on the 516. Rotate the black **AF** knob (at 516's far right) clockwise to turn the transceiver power on. **NOTE**: If the main display indicates **FLASH** when you turn the radio on without attempting a **RESET**, the processor has detected a problem with the stored firmware. You should first try performing a **MASTER RESET**, see below. If that still results in the **FLASH** indication, the next step is to get a new down load from www.tentec.com. If the **FLASH** indication should persist (very low probability) please contact Ten-Tec service per paragraph 1.2.

2.2. MASTER RESET

On rare occasions you may find the transceiver is operating in an erratic manner or it will not accept serial port commands properly. Spikes or surges on the power supply line or an unforeseen set of circumstances may confuse the microprocessor. This technology has improved dramatically in recent years but it is still possible to have an occasional 'glitch' or lock-up. If turning the power off and on does not resolve the problem, then perform a **MASTER RESET**. First, turn the transceiver power off for a few seconds. Press and hold the **FUNC** key. Turn power on while continuing to hold the **FUNC** key until the initial **display** (**Fb 0.0190** or similar) changes to 14.000.000. Release the **FUNC** key. This operation will reset the radio to default factory settings without erasing the 100 stored channel memories.

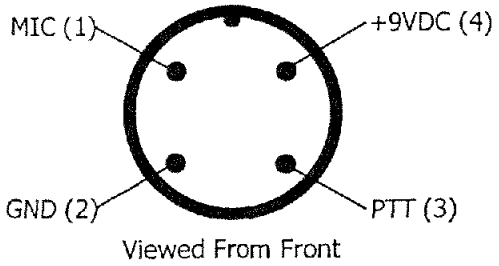
2.3. CHANNEL MEMORY RESET

The channel memory reset operation erases all programmed memories so you may want to write them down first. Turn the transceiver power off for a few seconds. Press and hold the **V/M** key. Turn power on while continuing to hold the **V/M** key until the initial display changes to the last tuned frequency before the reset. The channel memory reset operation does not change the state of the radio apart from erasing all channel memories.

2.4. FRONT PANEL CONNECTORS

There are two front panel connectors on the left side of the transceiver for connection of a microphone and for plugging in headphones. The headphone jack is usable with either stereo or mono

Figure 2-1 Microphone Wiring



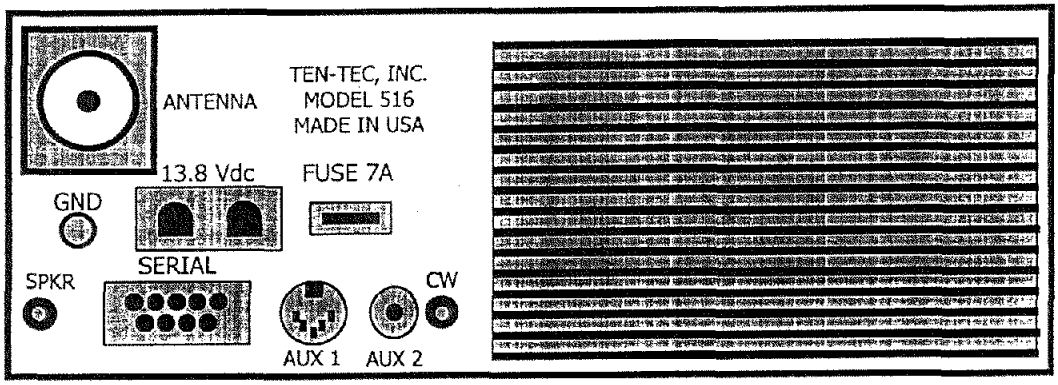
headphones. The front panel microphone jack is for a standard 4-pin **MIC** connector. The model 701 hand microphone we include has a connector pre-wired for the 516.

See Figure 2-1 for connections to the front panel microphone jack.

2.5. REAR PANEL

There are several connectors and one fuse accessible on the **Argonaut V** rear panel.

Figure 2-2 Argonaut V Rear Panel



CAUTION: The corners of the heatsink are *SHARP*

2.5.1. ANTENNA CONNECTOR

The transceiver provides a SO-239 HF antenna connector. The rated load impedance of the 516 is 25 to 100 ohms (i.e. up to a 2:1 SWR) for a typical 50 ohm unbalanced coax fed antenna.

For full rated performance, do not exceed an SWR of 2:1. **Argonaut V** reduces its RF output power for safe operation with greater load mismatches.

2.5.2. GND TERMINAL

This knurled screw provides for a wired connection from the 516 chassis to the station ground. An effective ground connection is important for electrical safety and may improve RF performance.

2.5.3. 13.8 Vdc

The power receptacle accepts Ten-Tec's standard #35165 2-pin DC connector or the #86067 power cord. Please check for proper *polarity*, *voltage*, and *current capacity* of the DC source before connecting it to the radio!

2.5.4. SERIAL PORT

This 9-pin connector functions as an RS-232C serial port. It provides a connection to an IBM-compatible personal computer for two purposes:

- Downloading a flash memory firmware update originating on the Internet and stored as a computer file (See section 2.6); and
- Controlling **Argonaut V** by computer software (see section 3.7).

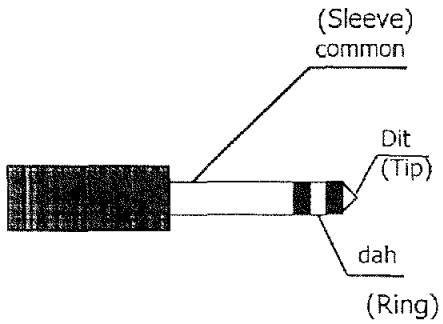
2.5.5. ACCESSORY CONNECTORS

The transceiver rear panel provides two 3.5-mm phone jacks, a DB9S receptacle, a 5-pin DIN jack, and a phono jack, for connections to accessory equipment.

2.5.6. CW (PTT) JACK

Use the **CW** jack to connect a key (or external keyer) for **CW** operation per Figure 2-3. This 3.5 mm phone jack can also serve as a **PTT** connection (a foot-switch, for example) to key the radio in voice or data modes. The KEYR key can set this connection to accept input from keyer paddles for operation with **Argonaut V**'s internal keyer. Use the Tip and Sleeve connections for an external keyer or a manual CW key.

Figure 2-3 Wiring for CW Paddle Plug



CAUTION Resist the temptation to use a ¼-inch-to-3.5 mm adapter in the **CW** jack or the **SPKR** jack. The length and rigidity of the adapter presents a mechanical strain to these jacks, and may damage the radio.

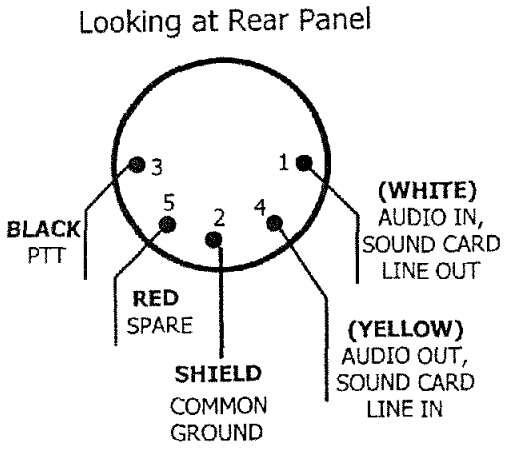
2.5.7. EXT SPKR

Use the 3.5-mm phone jack in the lower left-hand corner of the rear panel to connect an external speaker. One side of this speaker circuit is common with the radio chassis.

2.5.8. AUX 1 JACK

The **AUX 1** jack connects "auxiliary input/output signals". This 5-pin DIN connector accommodates external transmit audio input (sound card line out), receive audio output (sound card line input), and keyline input, from a terminal node controller, computer sound card, or similar source. The nominal line input level for full SSB RF output is 2 volts peak-to-peak into 600 ohms. The nominal line output level is 150-mV p-p in 600 ohms, and is independent of the **AF** control setting on the front panel. **Argonaut V** is digital-ready with simple cables to **AUX 1** – no interface box needed! The color notations in Figure 2-4 refer to Ten-Tec's optional #46176 cable.

Figure 2-4 AUX 1 Jack Wiring



2.5.9. AUX 2 JACK

AUX 2 is a phono jack connected to 516's +13.8 volt DC power line. It can furnish as much as 0.5 amperes to external equipment.

2.6. Performing a Flash Update

Use your web browser to visit **www.rfsquared.com** and navigate to the "**Get the latest for your Argonaut V**" link.

Click on the link and follow the instructions to download the necessary files to a new directory on your computer.

Leave the Internet and bring up the file you downloaded.

Turn **Argonaut V** power OFF.

Use a standard 9-pin serial cable to connect a serial port on the computer to the **SERIAL** jack on the **Argonaut V**. Ensure that the serial port configured in the software and the connected port have the same COM port number.

Turn **Argonaut V** power **ON** while pressing the **MODE** key. Note that the main display says **FLASH**.

Execute the update program on your computer and wait for the computer to prompt that the update is complete.

3. TRANSCEIVER OPERATION

Argonaut V's front panel has 4 rotary controls and 12 keys. Two of the rotaries are dual-concentric potentiometers and two are incremental digital encoders. Eleven dual-purpose control keys and a function key, **FUNC**, provide access to the remaining control functions. Unless otherwise noted, 'press' means '*press and release*' when this manual refers to front panel keys on the 516.

3.1. THE KNOBS

3.1.1. ON/OFF/AF/SQUELCH

The **ON/OFF** switch is at the counter-clockwise extreme of the black inner **AF** (volume) knob on the **AF/SQL** dual control.

The outer silver-colored ring controls the signal level below which the squelch function silences the receiver audio. Initially, the **SQL** ring should be fully counter-clockwise to open the squelch. The **BUSY** indicator (a green LED) lights when the squelch enables the receiver audio. Squelch functions in all modes and is most useful in **FM.**

3.1.2. MULTI-PURPOSE CONTROL

This is an unlabeled knob (rotary encoder) that adjusts many functions selected by 516's keys. The **MULTI** display indicates the present value of selected functions on key presses, and responds to changes made by rotating the **MULTI** knob.

3.1.3. MAIN TUNING KNOB

The large knob in the center of **Argonaut** V's panel controls Main Tuning via either **VFO A** or **VFO B**, per the operator's selection (see 3.2.13, below). There are four tuning rates, with two (**FAS** = 10 kHz steps) & (**SLO** = 2.5 kHz steps) allocated to **FM**, and two (**FAS** = 1 kHz steps) & (**SLO** = 10 Hz steps) allocated to **CW**, **LSB**, **USB**, and **AM**.

3.1.4. MIC/PWR CONTROL

The outer (**PWR**) ring on this dual-control knob sets the transmitter output power by controlling the Automatic Level Control (**ALC**) set point. In **LSB/USB** or **AM** the operator should adjust the black inner knob until the green **ALC** LED just flashes on voice peaks. The **MIC** knob adjusts transmit audio gain in the microphone path. In this way it controls the modulation depth in **AM** and **FM** and the relation between speech peaks and RF power peaks in the SSB modes.

3.2. THE KEYS

3.2.1. FUNCTION KEY

FUNC is the bottom key in the column to the right of the **MULTI** knob. Each of the 11 other **Argonaut** V keys activates two distinct functions. The primary function is on the keycap and the secondary function is on the panel just above the key.

Pressing **FUNC** alternately displays the legend "**Func**" or clears it in the **MULTI** display. Pressing a key other than **FUNC** will cause a change in the frequency display, the **MODE** annunciator, or the **MULTI** display, depending on which key you press. If you press a control key when "**Func**" does not appear in the **MULTI** display, you are activating the *primary* function of a key. To activate the secondary function, be sure to press **FUNC** so that the **MULTI** display shows "**Func**" just before you press the control key. In either case, if the control function has an **ON/OFF** or adjustable setting, the

MULTI display shows its current value. Rotating **MULTI** then changes the value of the control setting. The action is specific to the key pressed.

3.2.2. BAND KEY

Pressing **BAND** steps **Argonaut V**'s frequency to the last-used frequency in the next higher amateur band. Use repeated key presses to cycle through each of the bands in turn.

3.2.3. BAND STACK

Argonaut V has a band-stacking register for each band -- a very handy way for the operator to switch quickly between two frequencies on the same VFO. When you press **FUNC** + **BAND** the radio stores your current frequency in the stack register and tunes to the previous frequency you stacked in that amateur band. Pressing **FUNC** + **BAND** again causes the transceiver to return to the original frequency.

3.2.4. MODE

This transceiver offers five **MODE** settings: **CW**, **LSB**, **USB**, **AM**, and **FM**. Press **MODE** to step through the modes. An LED annunciator above the main frequency display shows which mode is currently active.

3.2.5. KEYER

The **KEYR** button and **MULTI** knob work together to control the internal electronic keyer adjustments, or to select an external key (**oFF**). **KEYR** works only when the **MODE** is **CW**

3.2.5.1. KEY/SPEED

The first press of **KEYR** brings up the keyer Speed menu on the **MULTI** display. Turning **MULTI** to a counterclockwise extreme displays **oFF** to allow an external keying device in the **CW** jack. Adjust **MULTI** from **oFF** to **S__5** through **S_ 40**. These readings indicate keyer speed between 5 and 40 words per minute.

3.2.5.2. SIDETONE FREQUENCY & CW OFFSET

Pressing **KEYR** again after the **S**peed menu brings up the **F**requency menu, which shows sidetone frequency and **CW** transmit offset at the same time. The **MULTI** knob provides a range from 400-Hertz (**F400**) to 1000-Hertz (**F999**) on the **MULTI** display.

3.2.5.3. SIDETONE LEVEL

The next **KEYR** press after the **F**requency menu is the **L**evel menu. The **MULTI** knob adjusts the audio mix level of **CW** sidetone, showing the setting as **L__0** through **L__9**.

3.2.5.4. CW WEIGHTING

Pressing **KEYR** after the **L**evel menu brings the ratio (weighting) menu to the **MULTI** display. The displayed ratio runs from **r_50** through **r150**. R100 is normal weighting

3.2.6. VOX

After the operator presses **FUNC** + **MODE** in **AM**, **FM**, **LSB**, or **USB** modes, the **MULTI** readout displays the "**oN**" or "**oFF**" status of **VOX**, controlled by the **MULTI** knob. Further presses of **MODE** step the **MULTI** display through the list of **VOX** functions: Gain displays as "**Gn**"; Antivox displays as "**A**"; and Hang displays as "**H**". While any of these functions is active, rotating **MULTI** in the appropriate direction increases or decreases the setting from **0** through **9**.

3.2.7. VOX GAIN

This **VOX** function controls the sensitivity of the Voice Operated Transmit switch to audio level. Adjust it high enough to activate at a comfortable speaking level but low enough to avoid activating the transmitter with background noise.

3.2.8. ANTI-VOX

This function adjusts the **VOX** circuit to avoid activating the transmitter with audio from the speaker. Once set, it may require adjustment when there is a change in volume, microphone, speaker, or their relative placement.

3.2.9. VOX HANG/QSK DELAY

Because it is inconvenient to have the transmitter switch off between syllables, the operator adjusts the **VOX H**(ang) setting for the desired hold time. A proper setting will hold the transmitter on during normal speech, but will let it drop back to receive during pauses in speech. In **CW**, **VOX H**(ang) controls break-in delay.

3.2.9.1. VOX WITH THE 705 MICROPHONE

If you use the available Model 705 desk microphone and want to operate with voice-control with **PEGASUS**, **JUPITER**, or **Argonaut V** radios, you must set the switch in its base to **VOX.**

3.2.9.2. USING VOX IN DATA MODES

Some operators may choose to operate data modes such as PSK31 using **VOX** rather than RS232 CTS or DTR lines to control receive/transmit switching. While this method does have the advantage of omitting hookup of one more cable, please be aware that you will have to use a relatively low setting of **VOX G**ain (see 3.2.7) and a relatively high level of **A**nti-**VOX** (see 3.2.8). Failure to adjust these carefully will result in rapid and uncontrolled RX/TX switching when you connect the soundcard or modem! We advise you to check these settings **before** you connect the sound card! The positive RX/TX control afforded by software that uses CTS or DTR for the keyline might be worth hooking up the RS232 cable.

3.2.10. BANDWIDTH

Pressing **BW** causes the MULTI display to show the current setting of DSP filter bandwidth, which controls the effective receiver selectivity. Now the **MULTI** knob controls the filter bandwidth setting. Widen receiver bandwidth by rotating **MULTI** clockwise, or narrow it by counter-clockwise rotation. **Argonaut V** has 35 sharp built-in DSP filters. For **CW**, **LSB**, **USB**, the selectable **BW** settings are **200** to **3000** Hertz in 50-Hertz steps and **1000** to **2800** Hertz in 100-Hertz steps. The **AM** range is **200** through **6000**-Hertz because unlike **CW** and **SSB**, **AM** bandwidth is twice audio bandwidth. For **FM**, the bandwidth is *always* 15 kHz.

Argonaut V stores the **BW** settings for **CW** and **SSB** or **AM** separately so that changing mode can restore the proper bandwidth. Each amateur band has its own bandwidth and **MODE** memories so that returning to a previous band will bring back the last used bandwidths with associated modes.

3.2.11. LOCK

To prevent inadvertent movement of the main tuning knob from changing the 516's operating frequency, we provide an electronic **LOCK** to disable the knob. Press **FUNC** + **LOCK** to alternately

enable or disable the knob. Simply try rotating the main Tuning knob to check whether **LOCK** is on.

3.2.12. RIT and XIT

Pressing RIT alternately enables and disables display of Receiver Incremental Tuning and **MULTI**'s effect on it. RIT allows **MULTI** to move the receiver frequency as much as **9.99** kilohertz above or below the frequency indicated by the main display. The **MULTI** display shows the +/- offset with 10 Hertz resolution. RIT does not affect the transmitted frequency. **Argonaut V** saves the RIT setting through band changes and stores it during power off periods. When RIT is active, pressing the RIT key for more than a second will clear the **RIT** to **0.00**.

Pressing FUNC + XIT alternately enables and disables display of Transmitter Incremental Tuning function and **MULTI**'s effect on it. XIT allows **MULTI** to move the transmitter frequency as much as **9.99** kilohertz above or below the frequency indicated by the main display. The **MULTI** display shows the +/- offset with 10 Hertz resolution. FUNC + XIT does not affect the receiver frequency. An illuminated LED annunciator (**RIT**) above the numeric displays shows the operator that either an RIT or XIT offset is active. When XIT is active, pressing the RIT key for more than a second will clear the **XIT** to **0.00**.

3.2.13. VFO/ MEMORY OPERATION

The transceiver frequency mode alternates between VFO operation and **MEM**ORY operation with each successive press of V/M. In VFO operation, either **VFO A** or **VFO B** (as selected by the A/B key below) controls the transceiver frequency. In **MEM**ORY operation, **MULTI** selects a memory channel from **01** to **100**, so that its stored frequency may control the transceiver frequency.

See paragraph 3.2.17 below which covers the special case of **SPLIT** frequency operation. An illuminated LED annunciator above the numeric displays shows the operator whether the **Argonaut V** is under control of **VFO A**, **VFO B**, or **MEM**.

3.2.14. WRITE KEY

This key sequence has dual functions that depend on which state (**VFO** or **MEM**) the radio is in. In **VFO** mode, it is a "*Store Frequency to Memory*" key. In MEM mode, it is a "*Recall Frequency from Memory*" key.

3.2.14.1. WRITE in VFO MODE

Pressing FUNC + WRITE in VFO mode causes the **MULTI** display to show the last-used memory channel number and its contents. The **MULTI** knob enables scrolling through all memories to allow copying the active VFO frequency into an empty memory location, or you may overwrite the data in any memory location. A second WRITE press (without FUNC) actually executes the copy operation.

3.2.14.2. WRITE in MEMORY MODE

Pressing V/M to make **MEM** light in the annunciator row enables the operator to examine the contents of any memory, as selected with the **MULTI** knob. Pressing FUNC + WRITE while in **MEM** mode writes the current memory contents into the active VFO and returns the radio to **VFO** mode. This allows you to select a

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stored frequency and then tune around the recalled frequency with Main Tuning.

3.2.15. VFO A or B KEY

Successive presses of A/B switch the active VFO and the main display to the frequency contents of VFO A or VFO B. An illuminated LED annunciator above the numeric displays shows which VFO is currently active.

3.2.16. A-B KEY

Pressing A-B (read as A=B) copies the contents of the active VFO to the inactive VFO. This can be a handy shortcut for SPLIT operation. See 3.2.17.

3.2.17. SPLIT FREQUENCY KEY

The SPLIT key enables operation of the receiver on one VFO and the transmitter on the other VFO. Pressing SPLIT causes the currently active VFO to control the receiver and the currently inactive VFO to control the transmitter frequency.

For the usually small frequency splits within a band, it is convenient to start by pressing A-B to make the contents of the inactive VFO match those in the active one. Switch VFOs with A/B and set the transmit frequency, then press A/B again for the receive frequency and press SPLIT. While transmitting, the display changes from the receive frequency to the transmit frequency.

Apart from its use in DX-chasing, this feature enables the user to access repeaters with non-standard frequency offsets. Simply tune one VFO to the input frequency and the other to the output frequency. You will receive on the active VFO and transmit on the other VFO.

The SPLIT function will support crossband transceiving, but *not* crossband QSK.

3.2.18. (FUNC) FAST KEY

The key sequence FUNC + FAST toggles between the **Argonaut V**'s "**FAS**" and "**SLO**" tuning rates, as they appear on the secondary readout. One pair of rates, 10 kHz and 2.5 kHz per step, pertains to tuning in **FM** and a slower pair, 1 kHz and 10 Hz per step, operates in all other modes.

3.2.19. (FUNC) NB KEY

The DSP noise blanker turns on and off with successive presses of FUNC + NB. While the **NB** key is active, the **MULTI** display shows the blanker threshold level. Turn it **oFF** or adjust it between **1** and **9** using the **MULTI** knob.

3.2.20. (FUNC) ATTN KEY

If you experience RF overload, usually evident by hearing noise or distortion that does not respond well to tuning, you should try pressing FUNC then ATTN for relief. This reduces the effect of a strong nearby signal on the signal you are tuning. The **Argonaut V** receiver design provides a switchable 20 dB RF attenuator to combat the effects of front-end overload. FUNC + ATTN toggles the attenuator on and off. Determine whether ATTN is on or off by pressing the key sequence and watching the S-meter.

3.2.21. (FUNC) SKIP KEY

FUNC + SKIP is an adjunct to the MEMory SCAN mode. The key sequence removes a memory channel from the **SCAN** list without actually removing the frequency from channel memory. This feature prevents a persistent signal from

impeding a scan, but allows retrieving the frequency by switching V/M to **M** (the annunciator for **MEM** lights) and bringing the channel to the display with the **MULTI** knob. SKIP has no effect on a frequency scan, where **VFO A** and **VFO B** define the scan limits.

3.2.22. (FUNC) TONE KEY

In **FM** (only), the key sequence FUNC + TONE turns 516's subaudible tone encoder **on** or **oFF**. While the encoder is **on**, the **MULTI** knob selects which EIA standard subaudible (CTCSS) tone is active when **Argonaut V** transmits.

3.2.23. KEYR KEY

KEYR operates in **CW** (only) to turn 516's internal CW automatic keyer on and off. When the **MULTI** display indicates "**oFF**" the rear panel **CW** jack accepts the tip and sleeve contacts of a 3.5-mm phone plug for a manual key or an external keyer. The "dah" side of a conventionally wired paddle (see Figure 2-3) will act as a "sideswiper" hand key when KEYR is **OFF**. When KEYR is "On" the display shows the "dah" weight as related to "3-dits" length and the **MULTI** knob controls that weight over a range of **r_0.5** to **r1.5**.

3.2.24. (FUNC) SP KEY

FUNC + SP is another MODE dependent key function. In the voice modes, **LSB**, **USB**, **AM**, and **FM**, that key sequence enables **MULTI** to turn the speech processor "**oFF**" or set its level from **1** through **9**.

3.2.25. PBT KEY

PBT shifts the receiver passband response in 10-Hertz steps without affecting the tuned frequency display. Use the alternate-action key to turn PBT on and off. When it is on, the **MULTI** knob adjusts the shift over a range from **–2.99** to **+2.99** kHz and displays the value on the **MULTI** display. This is a valuable control, especially in a crowded band because it can "drop QRM off the side of the passband" without changing the pitch of the desired signal. Adjusting PBT can often improve the quality or intelligibility of a signal. Pressing and holding PBT will zero the display. Model 516 has no PBT annunciator.

3.2.26. Examining Some MULTI Settings.

In modes other than **FM**, you may have one or more **MULTI**-controlled functions (BW, RIT, XIT, PBT, NB) set, but the **MULTI** display can show only one at a time. Provided that you are not in the middle of executing one of the secondary key functions to the left of the tuning knob, you can examine (or change) any of the above settings by pressing its key or keys.

3.3. Using Memory Channels

As you tune around the amateur bands or shortwave bands you are likely to find frequencies to which you would like to return. Amateur radio nets use their frequencies on a recurring basis, when those frequencies are not in use by other stations. The **Argonaut V** receiver also covers 0.5 to 30 MHz, a range that may provide many shortwave frequencies to visit periodically. To meet such needs, Ten-Tec makes 100 memory channels available to the operator. 516's memories retain **VFO A** & **VFO B** frequencies, MODE, SPLIT condition, repeater offsets, and CTCSS tones (on **FM**).

3.3.1. Switch to Memory Operation

Pressing the V/M key to light the **MEM** annunciator activates the **MULTI** knob so that rotating it will address memory locations that hold receive and transmit frequency pairs to control the transceiver. Just after switching from **VFO A** or **VFO B** to **MEM**, there is no change in the primary display, but the MULTI display shows the number (from **1 – 100**) of the next available (empty or "oldest") Memory location. At this point, the operator may either

(a) copy the information from both VFOs to a memory location; or (b) copy the memory information to the VFOs.

3.3.2. Storing a Frequency to Memory

When the main display holds a frequency you wish to store in memory, press FUNC + WRITE and the **MULTI** display shows the number of the last used storage location (**1 – 100**). You may either accept this location by again pressing FUNC + WRITE, or change the location by rotating **MULTI** first. An unused location displays a series of dashed lines **--.---.--** on the main display. FUNC + WRITE stores the frequency of the active VFO in the memory (along with current MODE and BW) at the displayed location. When **Argonaut V** is in **FM**, it stores repeater offsets and subaudible tones in use. 516's memory does not require any bank switching or organization by band or mode.

3.3.3. Recalling a Stored Frequency

You may recall a stored frequency from memory into either **VFO A** or **VFO B**. Use A/B to bring up the destination VFO. Then press the V/M key to switch 516 from VFO to MEMory operation. With the **MEM** annunciator lit, the **MULTI** display shows the current location number and the main display shows the stored frequency, if any. Rotate **MULTI** until the desired memory frequency appears in the main display, then press FUNC + WRITE to copy it into the selected destination VFO.

3.3.4. Changing Memory Contents

With the main display showing the frequency you want to store, press FUNC + WRITE, and the **MULTI** readout displays the next available memory location. Rotate **MULTI** until the memory location that you wish to overwrite appears in the **MULTI** display, then press WRITE without FUNC to change the contents of the selected location to the current VFO frequency.

3.3.5. SCAN Key

Argonaut V's design features a SCAN key with **MEM**ory and **V**FO modes of scanning.

3.3.5.1. Scanning in Memory Mode

With the V/M key-pressed so that the annunciator shows **MEM**, press SCAN to start a **MEM**ory Scan. **Argonaut V** starts tuning the transceiver to each memory location in turn until the operator presses SCAN again.

If there is a signal above the **SQUELCH** threshold on a scanned channel, **Argonaut V** will hold that frequency until the signal drops below the threshold set by **SQUELCH**. To abandon scanning, press SCAN again. To reverse the direction of a scanning, rotate the **MULTI** knob.

3.3.5.2. Skipping a Stored Frequency

To remove a memory location from the SCAN sequence without removing it from memory, set 516 to **MEM**ory mode with V/M, rotate **MULTI** to the memory location that you would omit from SCAN, and press FUNC + SKIP. To undo the SKIP operation, use V/M and **MULTI** to bring the skipped location to the display and press FUNC + SKIP.

3.3.5.3. Scanning in VFO Mode

To start a VFO SCAN, tune to a frequency with no signal present in the desired **SCAN** range and adjust the **SQL** control ring to just quiet the receiver noise. Then tune either **VFO A** or **VFO B** to the upper frequency of the desired SCAN range and tune the other VFO to the lower end of the desired frequency range. Press SCAN to begin scanning from the current VFO frequency to that of the inactive VFO. The radio will pause while at any frequency where the signal exceeds the squelch threshold. Press SCAN again to abandon scanning.

3.3.6. Reversing SCAN Direction or Stopping It

Pressing SCAN, A/B, or V/M keys will stop a scan, as will lowering the **SQL** level. While a SCAN is active, you can turn the **MULTI** knob to reverse direction of the scanning.

3.4. TRANSMITTER METERING

When **Argonaut V** transmits, the meter normally indicates power output to a 50-ohm load. The meter scale runs to **25W**. Other transmitter metering ranges are available via front panel keys. For purposes of making measurements or external adjustments, the transmitter should be in **CW** and keyed steadily (press PTT in **CW**), but the transmit metering does function in all modes.

3.4.1. Low Power Range

To read power in the QRP range at 5 watts or lower, press V/M while transmitting. Reduce power first! The **0-25** watt scale becomes **0-5** watts, easily read by mentally doubling the scale indication and dividing by 10, or by noting that each meter tick becomes 1 watt. Un-keying the transmitter returns the scale to **25** watts.

3.4.2. Reflected Power Measurement

The **Argonaut V** meter indicates **0 – 25W** reflected power when the operator presses A-B while transmitting. Reflected power, relative to output power, is a reliable indication of standing wave ratio. You will find that it is easier to make clear estimates of your antenna's SWR if you apply 10 watts or more in **CW** during the reflected power measurement. For any load at a single frequency, the ACTUAL SWR DOES NOT CHANGE with the applied power.

SWR as a function of Forward and Reflected Power

Forward	Reflected Power - Watts												
Watts	13	12	11	10	9	8	7	6	5	4	3	2	1
20	9.3	7.9	6.7	5.8	5.1	4.4	3.9	3.4	3.0	2.6	2.3	1.9	1.6
15	28	18	12.9	9.9	7.9	6.4	5.3	4.4	3.7	3.1	2.6	2.2	1.7
10						18	11.2	8	6	4.4	3.4	2.6	1.9
5										18	8	4.4	2.6

Table 3-1 SWR from Power Meter

See **Table 3-1** to interpret SWR from measurements of forward and reflected power.

Diode non-linearity and the granularity of signal-processing arithmetic limit the accuracy of power measurements at lower outputs. Without knowing the precise value of either reflected power or SWR, you can accurately adjust an antenna or its tuner for minimum reflected power to indicate a good match. Un-keying the transmitter returns the scale to **25** watts.

3.4.3. Power Amplifier Current

Pressing the **A/B** key while transmitting converts the panel meter to read PA current. In this state, the range of **0 – 9** A on the S-meter indicates PA current in amperes. Un-keying the transmitter returns the scale to **25** watts.

3.4.4. Reading SWR from the Meter

Read moderate values of standing wave ratio by pressing **SPLIT** while transmitting. The Power scale on the meter now shows **SWR** from 1.0:1 (at 10) up to 2.5:1 (at 25). For greater mismatches, use the reflected power scale per **Table 3-1**.

3.5. Operation in Data Modes

3.5.1. Cooling for Continuous Duty

Argonaut V is well suited to operation in data modes that use **LSB** or **USB** in connection with an external modem, Terminal Node Controller, or computer sound card. This usually involves continuous-duty operation of the transmitter. Natural convection cooling of the power amplifier heat sink suffices for **CW** and **SSB** modes with their lower duty cycles, and **AM** operation is power limited to five watts of carrier (=20W PEP). **FM** or data transmissions of more than a few minutes duration, however, may tax the ability of the heatsink to dissipate power amplifier heat and require forced air cooling of the heatsink. Ten-Tec strongly recommends the Model 308 Fan Kit option in such cases. Installation is quite simple. The Fan Kit slides onto the PA heatsink and the included cable plugs in to a connector inside **Argonaut V**. This option provides safe continuous duty operation at full power in all modes.

3.5.2. Connecting Sound Cards to Argonaut V

Argonaut V's interface design allows easy connection to standard PC sound cards and similar modem or TNC devices. The rear panel **AUX 1** jack provides the proper line-level audio connections to the

receiver and transmitter circuits and push-to-talk line. We recommend our #46716 cable (see Figure 2-4 AUX 1 Jack Wiring) as an easy means of connecting the radio with the modem. The cable wiring accommodates the **AUX 1** jack wiring on the radio and requires only a pair of male phono to mini-stereo plug cables to adapt it to the line input and output jacks on the sound card. It then remains only to adjust your sound-card levels using the Windows™ controls in the computer. Consult the web sites for your data software for further information.

3.6. Operating in FM

FM presents a special case for several of **Argonaut V**'s keys. **BW**, **RIT**, and **PBT** have no effect. **XIT** shifts the transmit frequency to provide the standard 10-meter **FM** repeater offsets of –0.1, 0.0, and +0.1 MHz. **FUNC** + **TONE** provides standard EIA subaudible tones per 3.2.22.

3.7. Remote Control of Argonaut V

Model 516's RS-232 **SERIAL** connector and the design of its control firmware provide for control of most functions by serial commands. Ten-Tec publishes a Programmer's Manual for **Argonaut V** on **www.rfsquared.com** to facilitate the writing of remote control applications by third-party developers. The **Argonaut V** serial port and command set cannot control the functions of **MIC** gain, **PWR** setting, **AF** volume, and **SQUELCH** controls.

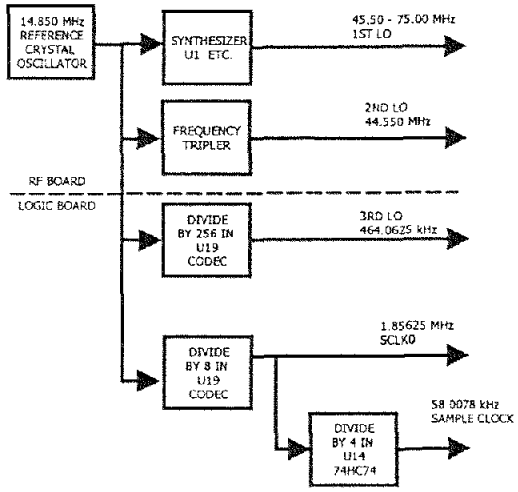
4. Theory of Operation – Argonaut V

Model 516 comprises five printed circuit board subassemblies interconnected as Figure 4-3 and Figure 4-4 show. These are:

- 81929 Logic Subassembly;
- 81930 RF Subassembly;
- 81931 PA Subassembly;
- 81932 Connector Subassembly; and
- 81935 Front Panel Subassembly.

The receiver, transmitter, input/output, and control functions span these boards as described below. A Reference Oscillator at 14.850 megahertz is the basis for all critical frequencies in Model 516. See Figure 4-1.

Figure 4-1 Frequency Relationship



4.1. Receiver Block Diagram.

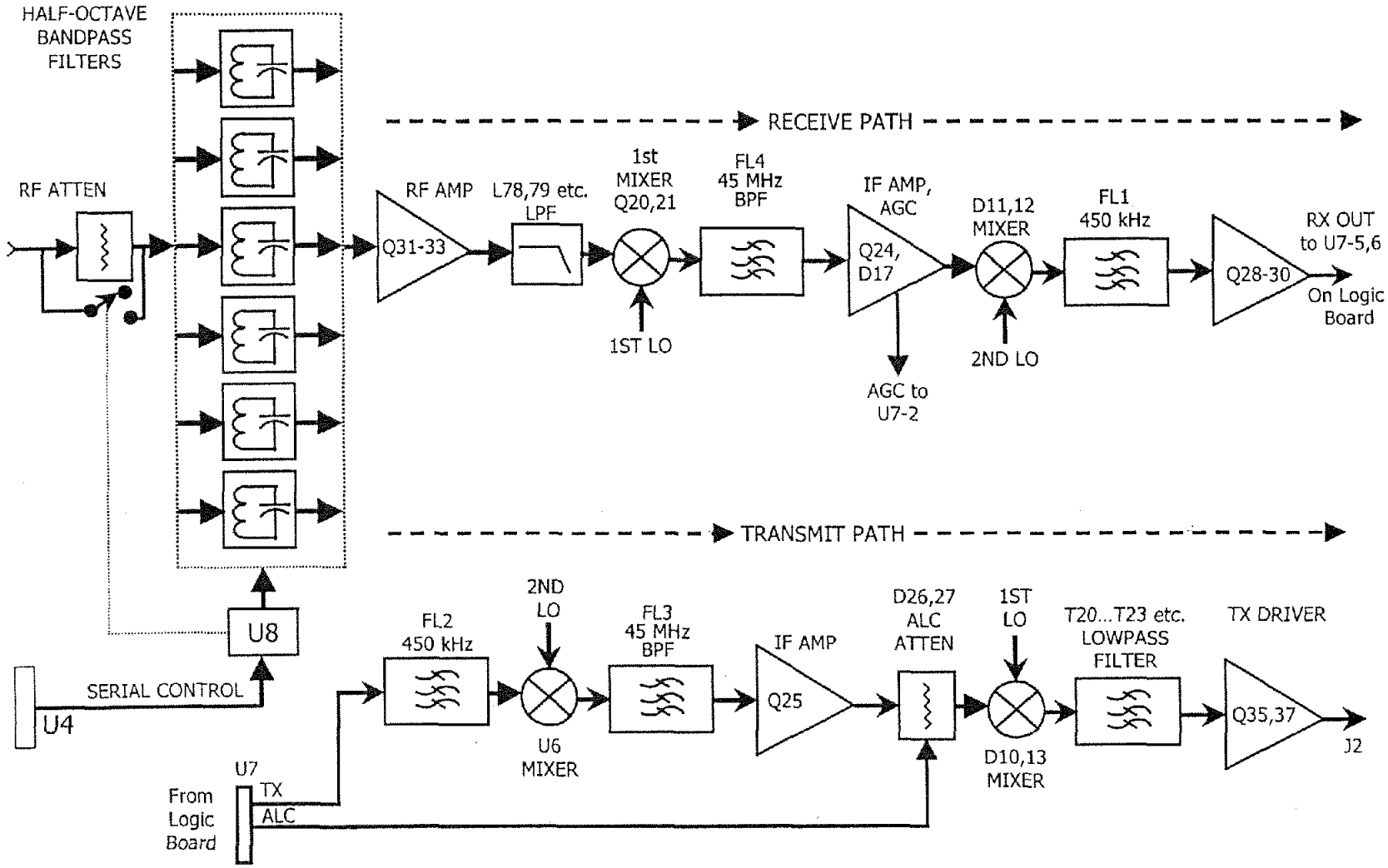
See Figure 4-2 below. Receiver RF signal enters from the **ANT** jack on the PA Board via cable 15 and J1. It passes to the RF attenuator, R155, T17, and R156. In the normally closed position (3-4) of K1, the attenuator is out of the circuit. U8-2 controls the RF attenuator. Dual diodes, D19a & b through D24a & b switch one of six bandpass filters into the RF amplifier input under control of U8. U8 reacts to a serial Data, Clock, and Enable1 stream from the Logic PWB via connector U4.

The signal passes via the R157 & C210 network and T18 to the RF amplifier proper, Q31-33, T19, and associated parts. L78, L79, and their capacitors form a low pass filter for suppression of spurious responses. Networks such as R139 through C165 protect the filter circuits from control signal noise and shape the diode switch response to those signals. Q44 and Q49 shift the logic level T (transmit switch) voltage from the Logic board to near +10V when the radio transmits. This "Buffered T" voltage powers the transmitter IF circuitry on sheet 3 of the RF Board schematic. Q50 dumps that voltage quickly when the processor commands "receive".

4.1.1. Schematic Sheet 2

The receive signal passes via a small pad at R218-220 to the Q20 & Q21 FET balanced mixer, which uses the first local oscillator (LO) to convert HF signals to the 45 MHz first intermediate frequency (IF). U10 shunts the mixer input to ground during transmit. R216 is a factory adjustment for mixer balance and should need no further attention for the life of the radio. A 45 MHz crystal filter with 20 kHz bandwidth limits the IF response of the following stages. Q24 is the first IF amplifier and the series-shunt PIN diode attenuator, D17 &18, is the automatic gain control element. During receive current from D16 and L55 forward biases D18 to lower its resistance to signals. At higher signal levels, current from Q18 via L54 pushes through D17 to R133, where the developed voltage reduces the current through D18, thereby reducing signal level to the following stages.

Figure 4-2 Simplified Block Diagram - RF Subassembly



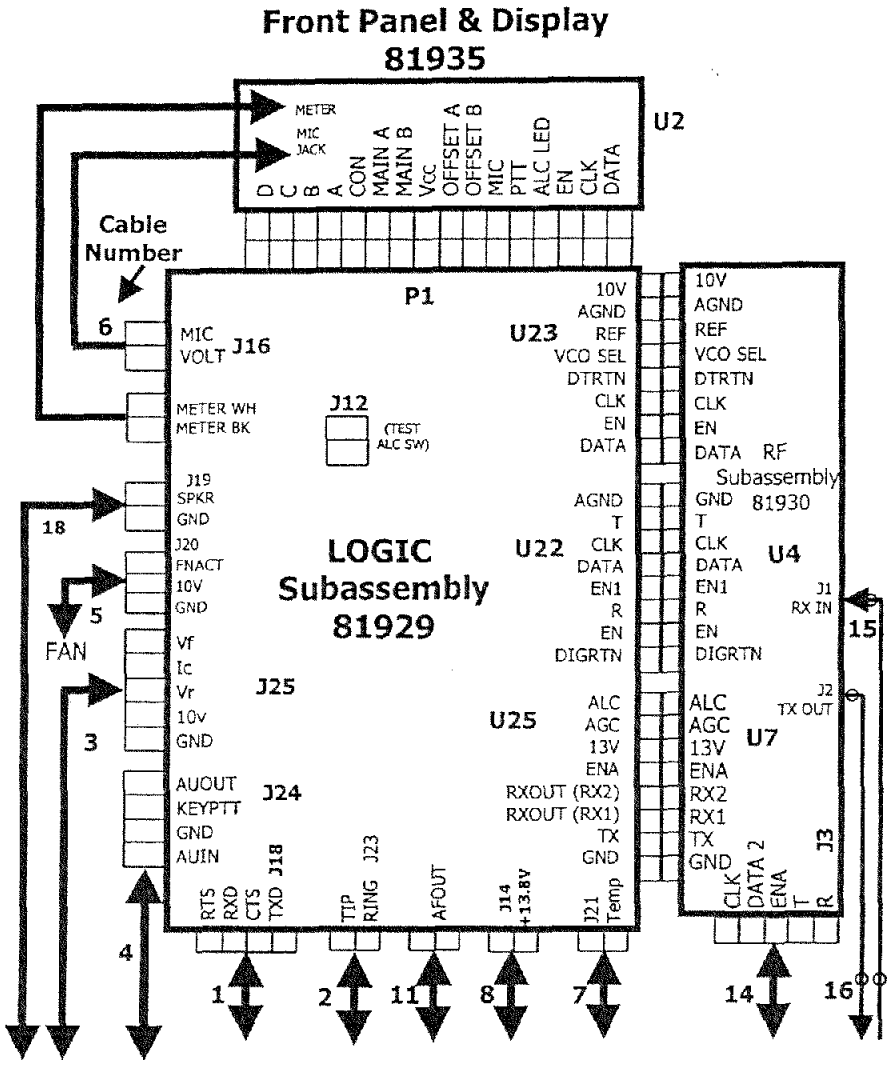


Figure 4-3 Argonaut V Interconnection - Sheet 1

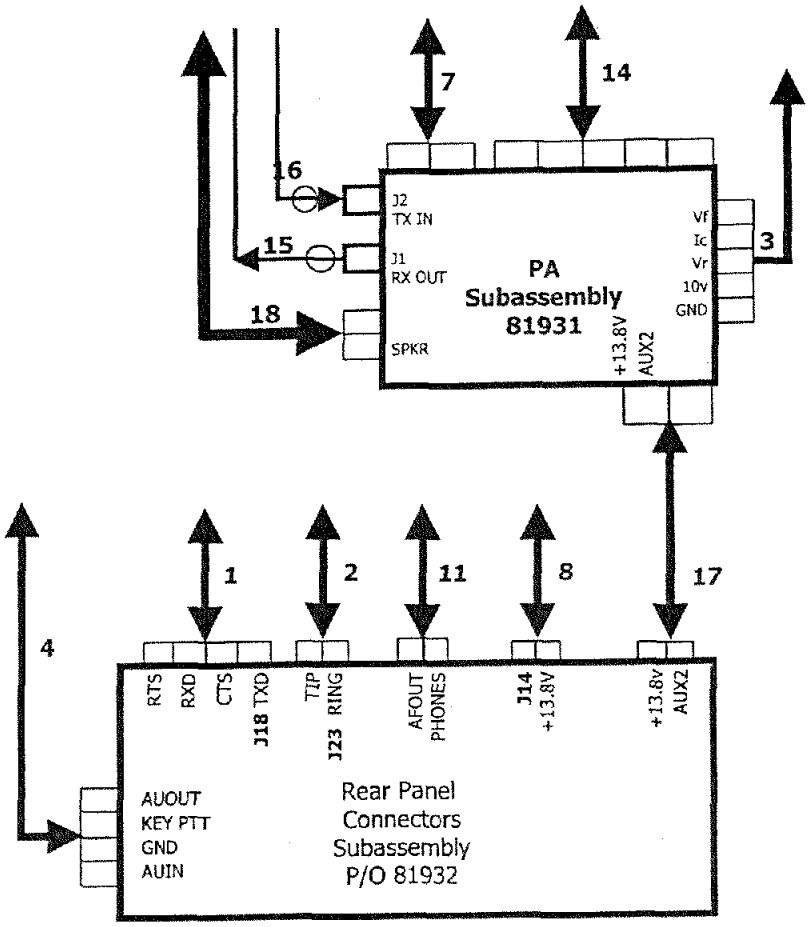


Figure 4-4 Argonaut V Interconnection – Sheet 2

Next in line for the received signal is the second mixer comprising T10, T7, and the diode quad formed by D11 &12. Fed by the 45 MHz first IF and the 44.55 MHz 2nd LO, the output to the Q22 2nd IF amplifier is at 450 kHz. The amplifier output, from a tap on the T5 tuned autotransformer, passes through ceramic bandpass filter, FL1, emitter-follower, Q30, and the Q28 & Q29 IF amplifier. R205 is a factory trim for IF gain.

T8 provides a balanced output to pins 5 & 6 of U7 to carry the 3rd IF signal to the logic board. The secondary winding feeds AGC detector, Q17. R56, R54, and C115 set attack and decay time-constants and Q18 provides DC amplification, delivering the AGC voltage to L54 for D17, and to U7-2 for connection to the Logic Board. Q46 converts T-voltage to a 5-volt level for use on the Logic board, where it mutes the receiver 3rd mixer during transmit.

4.1.2. RX Operations on the Logic Board

Refer to Schematic Diagram, SCH-81929-sheet 2, for the analog section of the Logic Board. The receiver signal

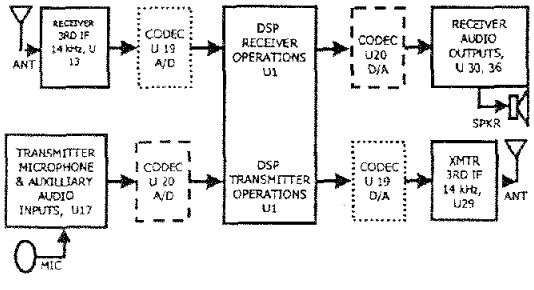
path continues with push-pull 2nd IF signals from U25-5, 6. This signal feeds U13, a triple SPDT analog switch with two poles wired as the 3rd mixer to convert the 450 kHz signal to 14 kHz 3rd IF. C57, C58, R42, and R43 form a balanced highpass filter to correct for (sin x)/x distortion, and they feed the IF signal to the analog-to-digital conversion section of Codec U19. R235 is a set-and-forget balance adjustment for the receiver 3rd mixer.

4.2. Codec Operation

At this point it is useful to explain how **Argonaut V**'s two codecs, U19 and U20, work together to transport analog signals to DSP data and vice versa. Each codec comprises a 16-bit analog-to-digital converter (A/D), a 16-bit digital-to-analog converter (D/A), plus necessary timing logic. Together, the two codecs must handle four signal conversion paths in the transceiver, as Figure 4-5 shows:

- Receiver 3rd IF to digital data;
- DSP data to Receiver Audio;
- Transmitter Audio to DSP data;
- DSP data to Transmitter 3rd IF.

Figure 4-5 DSP Conversion Paths



The codecs accept the 14.850 MHz reference from the RF PWB (81930 sheet 4) and use it for internal conversion clock and shifting functions. They also divide it by 8 to produce the serial data bit-clock output, SCLK, at 1.85626 MHz. SCLK from U19 drives the SCLK pin on the DSP (for serial data bit synchronization), and drives U14 (to generate the balanced 3rd LO for U12 and U13). See Figure 4-6

Figure 4-6 Codec Timing

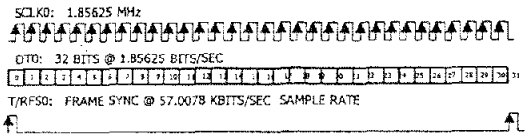
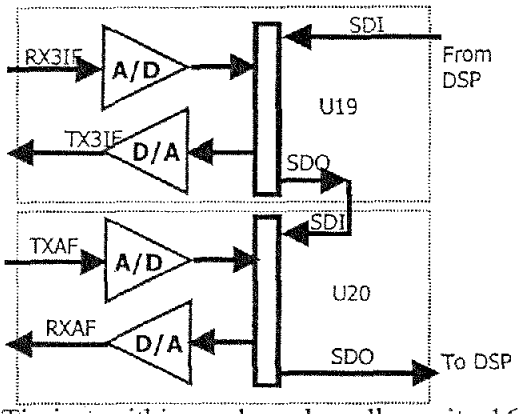


Figure 4-7 Codec data Paths



Timing within each codec allows its 16-bit A/D and D/A to share one 16-bit serial word in each codec. See Figure 4-7.

The word carries DSP data to the D/A and then the A/D loads the word with data for return to the CPU. The Serial Data Output Frame Sync (SDOFS) of each codec connects to the Serial Data Input Frame Sync (SDIFS) of the other. Connecting the serial data output of U19 to the serial data input of U20 concatenates two 16-bit codec words into one 32-bit word destined for the DR0 on the DSP via SDO on U20.

Digitized 3rd IF data leaves U19-17 (SDO) as 16 bits of a 32-bit serial stream bound for the processor via the second codec, U20. In U20, the A/D section produces 16 bits of digital data by digitizing the transmitter audio input and concatenates them with the IF data word from U19. The resulting 32-bit word

leaves U20-16 (SDO) as the DR0 signal to the DSP. The DSP DT0 output clocks 16 bits of digital data for the receiver audio output D/A in U20 followed by 16 bits of digital data for transmitter 3rd IF D/A in U19. The CPU maintains this high-speed serial data loop through both codecs by receiving Frame Sync, Clock and Data from the codecs and sending Frame Sync and Data to them. The data circulates around the loop in the time between ~58 kilohertz data converter sample pulses.

4.2.1. Conversion to Receiver Audio

Returning to the receiver operation, filtering and demodulation of receiver 3rd IF signals takes place in DSP. The resulting data stream drives U20 as described above. The D/A converted receiver audio from one side of U20's balanced output feeds U36, an IC audio power amplifier having a DC-operated volume control, R92b. The amplifier output drives the tip and ring connections of headphone jack J11 through 100-ohm resistors. The normally closed contact feeds the internal speaker circuit at J19 via an RF filter at L2. The other side of the U20 output feeds amplifier, U30b, which supplies the auxiliary audio line output to the rear panel **AUX 1** accessory connector via J24.

4.3. Transmitter Operation

The microphone audio from the front panel jack travels by internal cable to the Analog section of the Logic Board. R271 is an internal potentiometer that permits (infrequent) adjustment for different microphone models. It feeds U17a, which amplifies it by approximately 20 dB and applies it to the **MIC** gain control, R98b, on the front panel. The gain control output and the audio line input from **AUX 1** accessory connector via J24 feed U17b, a summing amplifier, whose output drives the V_{in}+ input to the A/D in U20. The codec reference voltage biases U17 and the V_{in}- input of U20. U20 digital audio feeds the DSP as described above. Modulation of the audio to transmitter 3rd IF and signal filtering take place in DSP. The resulting IF data stream drives U19 as described above. The balanced IF signal from U19 drives switching mixer, U12, which also uses the 3rd LO from U14 to up-convert the 14 kHz signal to 2nd IF at 450 kHz. U29a converts the push-pull mixer output to a single ended signal that goes to the RF PWB via U25-7.

4.3.1. RF Board Tx Section

The transmitter 2nd IF signal enters the RF PWB via U7-7 on sheet 3, and drives ceramic bandpass filter FL2. Buffered-T control voltage from Q49 activates the following transmit signal chain only in transmit. Along with the 44.55 MHz 2nd LO from the PLL section (sheet 3) of the RF Board, the FL2 output feeds U6, the transmitter 2nd mixer IC. The result is transmitter 1st IF at 45 MHz. The T6 tuned transformer feeds FL3, a monolithic crystal bandpass filter. C122, C123, and L37 provide an impedance transformation to the gate of IF amplifier, Q25.

At the amplifier output, PIN diodes D26 and D27 form the automatic level control (ALC) attenuator. Zener diode, D30 supplies forward bias through D26 and R166, thereby providing a conductive path from Q25 through the low-pass filter at L80 and L82. Application of ALC voltage from the Logic Board via U7-1 forces current through D27, which bucks the DC from D26 and shunts some signal current through C216. Both these actions decrease the signal level through the L80, L82 filter to the transmitter 1st mixer, T13,

D10 & 13, and T4. R87 and C113 are balance adjustments for nulling local oscillator feed-through. The 1st mixer accepts 45 MHz IF and 46.8 to 75 MHz 1st LO to produce low level RF in the HF amateur bands.

At the input of amplifier, Q34, T15 converts the balanced mixer signal to single ended. T23 matches Q34 to the low pass filter between C233 & C236. From the filter output, T20 feeds the base of Pre-driver, Q35. During transmit Buffered-T control voltage from Q49 (sheet 1) turns on switch Q39 that, in turn, activates bias regulator Q40. Collector current from Q40 biases Q35 via R180. Q35's collector current flows through R179, reducing Q40 base current. The result is bias current regulation of Q35. C220 and R170 provide RF feedback from T21 to Q35 base. Q35 collector drives Q37 via T21 and C210.

The Buffered-T voltage also activates the Q36 bias regulator for the RF driver Q37, which operates in a manner similar to the earlier bias regulator. Q37 drives transmitter RF to the Power Amplifier board via T22, C224, and J2. The R173, R174, and C222 network provides RF feedback from T22 via coupling capacitor C223 to Q37 base.

4.4. RF Board Local Oscillator Section

Argonaut V requires two fixed frequency local oscillators and one synthesized variable frequency source to accomplish three stages of frequency conversion from RF to audio and vice versa. Quartz crystal Y1 and U1, on sheet 4 of the RF Board schematic, provide an accurate and stable 14.850-megahertz source as the frequency reference for all three LOs. When Ten-Tec supplies the RF Board with the optional Temperature-Compensated-Crystal-Oscillator (TCXO) for exceptional stability, we replace Y1, R12, C1, & C2 with U9.

4.4.1. Reference and 3rd LO

A buffered 14.850 MHz signal from the REF pin of U1 drives a tuned amplifier at Q27 and a low pass filter between L47 and C142 to supply the reference signal to connector U2-3. This connector mates with U23-3 on the Logic board, where digital dividers in U19 and U14 divide the reference frequency by 32 to produce the 3rd LO at 464.0625 kHz for use in U12 & U13 mixers, described in paragraph 4.2.1 above.

4.4.2. 2nd Local Oscillator

The REF pin on U1 also drives tripler Q9 and the low pass filter between C261 and C262 to produce the 2nd LO at 44.550 MHz. This signal feeds both of **Argonaut V**'s second mixers (on sheet 3) at T7 and U6, previously discussed.

4.4.3. First LO Synthesizer

The synthesized 45.5 to 75 MHz 1st LO originates in the voltage-controlled-oscillator (VCO) at Q5. L4, L5, and the four varactor diodes, D38 through D40 comprise the tuned circuit for frequencies above 54.9 MHz, which corresponds to HF below 9.9 MHz. Below that point, a VCO Select line from the Logic board switches in C252 to allow steering the VCO down to 45.5 MHz so that 516 can tune down to 500 kHz. Q41, Q42, and C244 act as a capacitance–multiplier to suppress noise on the VCO power supply.

To attain and preserve isolation of the VCO from its loads, the oscillator operates as a cascode circuit with grounded-base buffers Q4 and Q7. Q4 supplies the VCO sample to the f_{in} pin of phase locked loop (PLL) IC, U1, via the L7 filter. U1 internally divides the

reference frequency down to 2.5 kHz, the PLL tuning step size. Pins 6, 7, & 8 of connector, U7, convey a Clock, a Serial Data stream, and an Enable strobe to U1. The Data stream carries a binary number that sets U1's programmable divider so that it will divide the VCO frequency down to 2.5 kHz when the VCO is within 2.5 kHz of the desired operating frequency. The DSP tunes a complex mixer in software to tune in between 2.5 kHz steps.

The PLL IC drives the charge–pump circuit at Q1, Q3, Q6, and associated parts via the emitters of Q3 and Q6. When the VCO frequency is higher than the required 2.5 kHz step, U1's ϕV pin sends negative-going pulses to Q6. This causes Q6 to remove some charge from the loop filter capacitors, C20 & C18, lowering the voltage on the varactor diodes and steering the VCO lower in frequency until its divided down sample at the U1 f_{in} pin matches the 2.5 kHz internal reference in frequency and phase.

Conversely, when the divided-down VCO sample frequency is lower than 2.5 kHz, the U1 ϕR pin pulls current pulses from Q3's emitter. The charge pump adds charge to the loop filter capacitors, raising the voltage on the VCO-steering line and therefore raising the VCO frequency. This action continues until the divided VCO sample matches the 2.5 kHz internal reference in frequency and phase.

Within the PLL IC, its frequency and phase detector circuitry regulates the occurrence and width of the ϕV and ϕR pulses from wide when the VCO is well off the desired frequency to very narrow (or missing) when it is phase-locked to the reference. Because all three frequency conversion oscillators in the transceiver derive from the reference frequency, the operating frequency is as accurate and stable as the reference source. The Y1 crystal suffices for all ordinary amateur radio uses, but Ten-Tec offers a higher accuracy TCXO for more demanding applications.

4.5. Transmitter Power Amplifier

Refer to Sheet 1 of SCH-81931 for an overall schematic of the 516 Power Amplifier and I/O board schematic. The push-pull driver and amplifier details appear on Sheet 2. The T-voltage, acting through the parallel resistors R62- R90, forward biases D4 to supply base bias to Q4 and Q5 which receive RF drive from the RF Board via cable 16, J2, and T1. R42, R43, C6, & C21 provide local RF feedback and T3 drives the bases of Q2 & Q3 in the final amplifier.

As in the case of the driver, the T voltage activates base bias for the final amplifier. On Sheet 4, D2 and D3, thermally coupled to the PA heatsink, form a temperature-compensated shunt regulator, buffered by Q1. R63 is the PA bias adjustment. L4 and L5 deliver the bias current to the PA bases and R49 through R51 and associated DC-blocking capacitors provide local RF feedback to that stage.

4.5.1. Band Filters

Amplified RF output feeds an array of diode input switches to the band-switched output filters. The amplified RF also drives voltage tripler D5 through D7 to develop a negative blocking voltage (about –150V at full output) for all unselected filters.

There are seven low-pass output filters to serve the ten amateur bands (counting a possible 60-meter allocation) and seven identical switching circuits serve them, so it is enough to describe one of these in

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some detail. Band selection originates with processor's response to the operator's key press. The processor sends a new frequency to the phase-locked local oscillator synthesizer on the RF Board, and sends a band selection word via the Clock, Serial Data, and Enable pins of S6 on the PA Board, Sheet 4. Serial-to-parallel driver IC, U2, latches the word onto the output pins of U2 (labeled A through G). When the tuned frequency is outside an amateur band, all seven U2 output bits will be high.

4.5.2. Band Filter Example

Looking at the 30-meter filter as an example, negative voltage at R32 reverse-biases D20 and D21, effectively removing that filter from the circuit. D19 and Q19 form a level shifter to cut off conduction in Q10, which would otherwise forward bias D20 and D19 by applying current from the T voltage source through them. L35, L37 and the 10 paralleled chip resistors provide a return path for switching diode currents on the "band input" line, while L33, L34, and the 20 paralleled resistors, R99 through R117 perform that function for the "band output line.

When the operator has selected a frequency within amateur band limits, the U2 output bit for that band will be at a logic low level. Again we use the 30-meter circuit as an example, but consider that band selected. The C bit from U2 is low and the other six outputs are high. The low level at D19 anode causes Q19 and Q11 to conduct, pushing current from the T voltage through L16, L17, and L18 to switch on D20 and D21. The 30-meter filter is now connected between the PA RF transformer and the output circuit. T-voltage switches on Q16 (Sheet 5) to overcome the negative voltage at D13 and turn it on. Connecting the filter through directional coupler, T4, to the antenna jack.

4.5.3. Receiver Clamp

Model 516 connects the **ANT**enna jack to the receiver circuitry via the bipolar diode clamp on Sheet 5 of the PA schematic. R8 and R9 bias catch-diodes D11 and D12 so that peak signal excursion at their junction point cannot exceed either +5 or –5 volts with respect to chassis ground.

4.5.4. Amplifier Sensors

At the directional coupler, D35 develops a voltage representing forward power and D34 develops the reflected power signal. PA collector current flow causes a small voltage drop in R64 (Sheet 3) and the op-amp and buffer, U1 and Q6, translate the drop to a ground referenced Ic voltage for the RF power control circuitry on the Analog section of the Logic board schematic. The processor cuts back ALC voltage when collector current approaches 6.5 amperes. Connector, S11, (Sheet 5) supplies Vf, Vr, and Ic, to the Logic board and receives regulated 10 volts from it.

Temperature sensor D9, thermally coupled to the PA heat sink, has a terminal voltage of 10 mV per degree Kelvin. At room temperature, the voltage fed back to the A/D converter on the Logic Board is 2.93 VDC. When the heat sink temperature reaches 60° C, the sensor voltage has risen to 3.33 V, and the processor starts cutting back the PA forward power by sending a suitable DC level to the transmitter ALC circuit.

4.5.5. AUX 2 switch

Q8 is the power switch for the 13.8 VDC line to the **AUX2** jack on the Argonaut V rear panel. Base current for Q8 comes from Q7, which draws current only when the transceiver's +10 VDC regulator gets

power from the power switch at the counterclockwise extreme of the **AF** control. Consequently, **AUX 2** supplies current for accessories only when the operator turns the transceiver **ON**.

4.5.6. Connector Subassembly 81932

This small but essential board appears on Sheet 5 of the PA schematic simply because it starts out as a snap-off part of the bare PA printed wiring board. Its function is to collect cables from their sources on the major boards and connect them to the **SPKR**, **SERIAL**, **AUX 1**, **AUX 2**, and **CW** jacks on the Argonaut V rear panel.

4.6. SCHEMATIC DIAGRAMS

The following schematic diagrams document the electronic design of Model 516 circuit boards:

- 81929 Logic Subassembly;
- 81930 RF Subassembly;
- 81931 PA Subassembly;
- 81932 Connector Subassembly; and
- 81935 Front Panel Subassembly.

The schematic diagrams are in the rear of this manual.

5. TROUBLESHOOTING

While we cannot cover every possible problem, here are hints for dealing with some potential difficulties.

5.1. Check the Obvious!

- Is DC power okay?
- Check power supply, cable and connector(s).
- Is 7.5 ampere fuse loose or missing?
- Are there antenna problems?
- Is the proper antenna connected?
- Is any external antenna switch or tuner connected and properly set?

Control Settings?

Have you double-checked **Argonaut V**'s many control settings for your intended mode of operation?

5.2. Reset the Processor.

See paragraph 2.2. We have learned that **RESET** can cure a multitude of "glitches" in a few seconds.

5.3. No Audio from Receiver

Frequency controls act normally;

S-meter seems to be reacting to signals.

- Receiver squelched? Check setting of **SQL** knob.
- Check setting of **AF** gain control.
- Try a set of headphones in case the speaker has failed.
- Check inside the cabinet for cable connectors that may have loosened in shipment or rough handling.

5.4. Symptom: distorted SSB

Be certain the ALC is set properly in accordance with paragraph 3.1.4. The ALC LED should flash briefly on voice peaks.

A frequent cause of a distorted SSB signal is inadequate RF grounding resulting in feedback. Common RF grounding problems are:

- No ground connection: or
- Too long a lead to a good ground.

Another potential cause of distorted SSB arises when the station is in the near field of the antenna. This is a problem many apartment dwellers face.

5.5. Diagnosing RF feedback problems

Every amateur station should have access to a well-shielded 50-ohm dummy load. Start troubleshooting by disconnecting all RF accessory equipment from the transceiver output. Likewise disconnect all accessories from other radio connectors, leaving only the microphone. Be certain your microphone cable is well shielded. Connect the dummy load to the **ANT** receptacle with a short coaxial cable.

A nearby HF receiver (or a local ham friend's station) will likely have little trouble hearing your very low power RF signal when you transmit 20 watts into the dummy load. If the distortion problem does *not* disappear under these conditions, your rig may well have a problem and you should call Ten-Tec's service department. If the problem goes away, as is likely, you can begin the process of re-connecting accessories one-at-a-time to isolate the problem.

5.6. RF Grounding

Many problems relate to the lack of an RF station ground, as contrasted with a safety ground connection. We recommend bonding all equipment chassis together with short heavy metal braid or strap.

Make these connections from chassis ground lug to chassis ground lug and connect the last piece in the chain feeding the antenna to a good earth ground. This lead needs to be as short as possible. Lengths near ¼ wavelength on any band used can be particularly troublesome when the far end is connected to earth.

Ten-Tec recommends following the good advice in the ARRL Handbook for dealing with RF grounds and safety grounds.

5.7. NO RECEIVER, BUT Argonaut V TRANSMITS

Check the PBT setting or turn it off. It may be set outside the passband.

Disconnect any external equipment that might be pulling the PTT line to ground.

Is the internal KEYER enabled with a **mono** plug in the **KEY** jack? That would cause a constant stream of dits when you apply power.

Check settings of the **SQL**, **AF**, and **RF** controls.

5.8. No operation in VOX

Check for normal voice operation without VOX to rule out a microphone or cable failure.

Check the PTT/VOX switch on the bottom of the Model 705 microphone if you are using one.

Check **Argonaut V**'s **MULTI** display to see if the items for VOX are active and set properly. If any of the three settings is at zero, VOX will not operate.

5.9. When All Else Fails...

If the measures above do not fix the problem, please consult with our service department.

6. Glossary and Index.

The definitions given here are specific to the use of these terms in the Argonaut V manual, and may not be precise in some other context. Many of these definitions use *italicized* terms defined elsewhere in the list. We recommend the ARRL Handbook for Radio Amateurs as a more general authority.

6.1. A

3rd IF That portion of **Argonaut V** which operates at a center frequency of 14 kHz to make *DSP* easier and more effective.
p 21

60-Meters The proposed new amateur frequency band allocation (pending FCC approval) at 5.25 - 5.40 MHz.
p 25

A/B The 516 button which switches between the ***VFO-A*** and ***VFO-B*** frequency controls.
p 11

A/D Analog signal to Digital signal conversion device.
p 22

AC MAINS The usual 110 - 120 volt power circuits in American homes. Keep them out of the Model 516 Transceiver!
p 4

AF knob Ten-Tec's name for the volume control on a communications radio.
p 4

AGC Automatic Gain Control, a circuit that holds the receiver audio output level fairly constant despite large changes in RF signal level.
p - 21

ALC Automatic Level Control, a circuit that holds the transmitter RF level fairly constant despite changes in circuit gain from band to band.
p v

Alternate-Action Key A control button which has two distinct effects (such as VFO A & VFO B) and activates each of them with every-other push.
p 17

AM Amplitude Modulation, comprising both sidebands and a carrier,
p 1

Analog The type of circuit which operates on signals whose strength can take on any value in a continuous range. See also "digital".
p 21

Annunciator An **Argonaut V** indicator formed by words selectively illuminated by *LEDs* to indicate a particular state of operation.
p v

ANTI VOX A circuit function designed to prevent audio from the loudspeaker from activating the *VOX* function.
p 9

Argonaut V Ten-Tec's name for the Model 516 transceiver.
p vii

Attack The time that *Automatic Gain Control* requires to activate when the received signal strength changes.
p - 21

Attenuator A circuit device which reduces the signal strength by a designed amount. Used in Model 516 to prevent receiver overload by extremely strong signals.
p vi

ATTN The control key that switches **Argonaut V**'s *attenuator* in and out of the circuit.
p 12

Automatic Gain Control See AGC.
p 20

Automatic Keyer A device internal to Model 516 which responds to input from an operator's manual switch (paddle) to form the "dits" and "dahs" of Morse Code in a uniformly-generated manner.
p 13

Autotransformer An electric transformer which has only one winding with one or more taps for matching *impedance* between two points in a circuit.
p 21

Auxiliary DC **Argonaut V**'s **AUX 2** rear panel "convenience-outlet" for supplying DC power, controlled by the radio's switch, to station accessories.
p 7

6.2. B

Balanced Mixer A frequency-conversion device which suppresses unwanted RF or *LO* signals from its IF output by way of signal cancellation.
p 20

Balanced Output Characteristic of a circuit which has two terminals exhibiting equal and opposite voltages with respect to a reference (usually ground).
p 20

Band Scanning **Argonaut V**'s function that permits searching for signals by having the radio tune automatically between defined limits. p 1

Bandpass Filters Circuits, usually composed of inductors and capacitors, that pass a continuous range of frequencies while rejecting frequencies outside a defined range.
p 20

Band-Stacking Registers Model 516's convenient means of rapidly moving the radio between two frequencies in an amateur band without changing the VFOs.
p 1, 9

Bandwidth The width of a continuous range of frequencies occupied by a signal or limited by a radio circuit.
p vi

Buffered-T Voltage An amplified- to-10-volts version of **Argonaut V**'s T-control (5V transmitter control) voltage used to activate the transmitting circuits based on the state of the *PTT* line.
p 20

BW See Bandwidth. Model 516's control key that selects *bandwidth*.
p 10

6.3. C

Cascode A form of bias sharing and signal coupling between a grounded-emitter and a grounded-base amplifier stage, used to provide load isolation in critical circuits.
p · 24

Channel Memory A memory location that stores frequency, mode, *BW*, and *SPLIT* information for later use.
p 1

Charge A quantity of electrons that form an electric current when they move.
p 25

Charge–Pump In a frequency *synthesizer*, a form of loop-filter that supplies a signal indicating the sense of frequency *offset* and proportional to the amount of offset from the *reference frequency*.
p 25

Codec Coder/Decoder, a device or integrated circuit that performs *A/D* and *D/A* signal conversion.
p 22

concatenates Attaches, or appends, so as to make a single larger digital word out of two smaller words.
p · 22

correct polarity Connect positive-to-positive (usually red) and negative to negative (usually black)
p 4

CTCSS Continuous Tone-Coded *Squelch* System adds a *subaudible* tone between 66 and 254 Hertzto the FM voice signal to reduce unintentional interference to repeater inputs.
p 13

CW Continuous Wave, a former distinction between electronically generated constant-amplitude radio signals and the damped oscillations of earlier spark-driven systems. Now refers to Morse code telegraphy signals.
p 1

6.4. D

D/A Digital-to-Analog converter, a device that accepts analog signals and encodes them as digital output signals.
p 22

Data Modes Any of several signaling methods that use digital content to *modulate* analog audio signals driving a single sideband transmitter. Examples include *PSK31*, Pactor, MFSK16, and Hellschreiber.
p 6

DB9S An industry-standard 9-pin female jack commonly employed as an *RS-232 serial port* connector on terminals, *modems*, and Ten-Tec radios. p 6

Decay Refers to the action of an *AGC* circuit when an input signal diminishes in amplitude from a level which caused *AGC* to reduce gain.
p 21

Delivering Carrier Refers to the commercial freight agency that delivers your radio. The delivering carrier bears responsibility for damage in transit.
p 1

DELAY Abreviation for "*VOX* DELAY" which characterizes the time period in which a *VOX* circuit holds the radio in transmit after apparent cessation of speech.
p10

Demodulation The process of separating the *modulating* content of a signal from its RF carrier and delivering the information to a device which transforms it to human or machine readable information.
p 23

Destination VFO. The frequency controlling register in a modern radio that accepts frequency information previously stored in *channel memory*.
p 14

Digital Modes Another name for *"Data Modes"*.
p 1

Digital Signal Processing Technology The engineering technique of manpulating signals as digital number samples in a computer. In modern *transceivers* this requires two-way signal conversions between analog and digital forms.
p 1

DIN Jack A round multi-pin connector design standardized by Deutsche Industrie Norm in Europe. Ten-Tec radios use this connector type to interface external accessory equipment, e.g. *modems*, to the receiver and transmitter audio and keying circuits. p 6

Diode Clamp A circuit which limits maximum or minimum voltage excursions of a signal using AC coupling, diodes, and one or more reference voltages. Model 516's antenna to receiver connection is an example which limits the amount of transmit signal that can impact the receiver input circuits.
p 26

Diodes Electronic devices which act as one-way check-valves to electonic current. Diodes conduct in the "forward biased direction (anode more positive than cathode by the "barrier voltage") and they block signals which "reverse-bias" the diode.
p 4

Directional Coupler A form of in-line transformer that favors signal coupling for signals flowing in one direction over those of the opposite direction. Argonaut V (and most other radios) use a directional coupler to determine *SWR* of the transmitter's output load.
p 26

DSP Digital Signal Processing used in all recent Ten-Tec radios to economically implement features with superior performance to that readily attainable in analog technology.
p v

Dual-Concentric Potentiometers Two rotary controls, such as **AF** and **SQL** that have an inner and outer knob sharing a common axis of rotation.
p 8

6.5. E

EIA Electronic Industries Association, an American organization that promulgates standards, for example *RS-232*, for the electronic industry.
p 1

Execute The actual functioning of an action previously commanded by operator interaction with a computer, or similar storage and logic device.
p 7

External Speaker An optional accessory for a radio receiver that substitutes a larger, better-sounding unit for the built-in loudspeaker. Ten-Tec's Model **307B** is a good example.
p 2

6.6. F

FAS Abbreviation for "**FAST** Tuning-Rate" as presented on 516's ***MULTI*** display. See also ***SLO***.
p 8

Firmware Computer programming instructions or data stored in non-volatile memory so that it is available without an external loading operation.
p 2

First Local Oscillator The *synthesized* signal which **Argonaut V**'s first mixers use to convert signal frequency between HF and 1st IF.
p 20

Flash Memory The semiconductor technology that Ten-Tec uses to allow firmware upgrades to its radios equipment via a ***SERIAL PORT*** connection to a personal computer. Tis memory holds its contents indefinitely without electrical power, but can easily be rewritten electrically.
p 1

FM Frequency Modulation changes the carrier instantaneous frequency to convey information by a radio carrier. Popular on VHF and UHF, Ten-Tec includes it in Model 516 to accommodate its use on the upper end of the 10-meter ham band.
p 1

FM repeater An unattended FM station in an advantageous location that receives signals on one frequency from lesser advantaged stations and automatically retransmits them on another frequency so that they are available over a wide area not otherwise accessible to lesser stations.
p 1

Frame Sync A word or pulse that digital communications equipment uses to find and align the beginning of a formatted signal so as to correctly handle the data .
p 22

Frequency Conversion The process of translating a signal to a different frequency, where it will be more useful in transmission or reception than it was at the starting frequency. The combination of an *LO* and a *mixer* accomplish this in most radio equipment.
p 24

Frequency Offset The difference in frequency between two signals, such as that which separates a repeater input signal from its output signal, or a receiver tuned frequency from the desired signal.
p 1

FUNC The **Argonaut V** key which activates the secondary function assigned to its control keys.
p 4

FUNC+**LOCK** The key sequence to activate or release 516's Tuning Lock feature.
p 10

FUNC+**SKIP** The key sequence to activate or release 516's ability to temporarily omit a stored *channel-memory* frequency from its memory *scan* sequence.
p 15

6.7. G

Glitch An originally German word adopted by computer users to describe an unexpected or unwanted action in hardware or software.
p 4

6.8. H

Hertz The unit of frequency (named in honor of a radio pioneer) that replaces "cycles-per-second" in modern usage.
p 1

HF High Frequency is the name assigned by international convention to the frequencies between 3 and 30 megahertz.
p 1

6.9. I

I/O Abreviates "Input/Output" connections between **Argonaut V** and accessory equipment.
p · 25

IC Abbreviates "Integrated Circuit".
p · 23

IF Abbreviates "Intermediate Frequency", a frequency internal to radio equipment, chosen because it supports the design of a wide frequency-coverage transceiver.
p 1

Impedance In a electronic circuit, the ratio between voltage and current. Ten-Tec designers match circuit source and load impedances for efficient performance.
p v, 5

Incremental Digital Encoders Electromechanical devices used in modern electronic equipment to translate changes in control shaft rotation to digital numbers for interpretation as commands by the internal processor. They maintain an analog "feel" for such operator controls as tuning and gain.
p 8

Incremental Tuning A convenient radio feature that produces a temporary offset between the nominal tuned-frequency and a receiver or transmitter's actual operating frequency. See ***RIT*** and ***XIT***.
p 11

Intermediate Frequency See "*IF*". **Argonaut V**'s design provides *IFs* of 9 MHz, 450 kHz, and 14 kHz for effective performance of its transmitter and receiver functions.
p 20

6.10. K

Kelvin The unit of temperature in the Absolute-Zero-based scale named after Lord Kelvin.
p · 26

Keyer 516's internal hardware and software device that accepts contact closures from the user's paddle to form well-timed dits and dahs for Morse code CW operation.
p 1

Key A push-button momentary switch that activates one of **Argonaut V**'s control functions by signalling the processor with a pulse.
p 4

kHz abreviates "*kilohertz*". See below.
p 1

Kilohertz A unit of frequency denoting 1000 *Hertz*.
p 23

6.11. L

LED Abbreviates "Light-Emitting *Diode*", a semiconductor device that converts electric current to light emission. 516 uses LED's where older equipment used lamps.
p 28

LO Abbreviates "*local oscillator*". See below.
p 20

LOCK The secondary function, on 516's panel that electronically locks the main tuning control.
p 10

Local Oscillator A signal generated in a radio and used in a *mixer* to translate a signal frequency to an *IF*, or an *IF* to an operating frequency.
p 20

Local RF Feedback An electronic design technique that uses a controlled path to convey a signal sample from an amplifier output to its input in order to make circuit performance relatively independent of individual transistor or IC characteristics.
p · 25

Logic Subassembly The component-bearing circuit board (#81929) that implements **Argonaut V**'s control and *DSP* functions. p 20

LSB Abbreviates the "Lower Sideband" form of *Single-Sideband modulation* as used here, or "Least-Significant-Bit", depending on the context.
p v, 8

6.12. M

M or **MEM** Abbreviates **Argonaut V**'s "Memory" mode of operation, as distinguished from its "***VFO***" operation.
p 11

MASTER RESET The operation which restores 516's factory-default settings after a *glitch*.
p 4

MEMORY Memory mode tunes **Argonaut V** using stored frequencies, rather than the operator-tuned ***VFO***.
p 11

MHz Abbreviates "Megahertz", the unit of frequency which represents millions of *Hertz*.
p v, 1

Mismatch The condition that describes connection of a load with an *impedance* providing other than an optimum match to the circuit source impedance.
p 5

Mode One of the ways that 516 operates, such as **VFO** or **MEM**, or one of the *modulation* forms available with 516's **MODE** key.
p v, 1

MODE The **Argonaut V** key that selects the form of *modulation* used in transmission and reception.
p 7

Modem Abbreviates "modulator/demodulator", a function of equipment external to the transceiver proper, which accepts and provides digitally-modulated audio signals to translate information between 516 and digital user equipment such as a computer or data terminal.
p 2

Modulation The electronic process of imparting information to a radio frequency carrier by varying its amplitude, frequency, or phase in a systematic manner related to information content.
p 8

Modulation Depth A measure of the strength of *modulation* applied to an RF carrier.
p 8

Mono Abbreviates "Monaural" which describes an audio system or connector which carries a single source signal, as occurs in some headphone connections See also *Stereo*..
p 4

MULTI Abbreviates "Multi-function" to describe **Argonaut V**'s one unlabeled *rotary control* and the smaller of its two displays, both of which take on different functions depending on a preceding key press.
p 1

MULTI Display The smaller of 516's two displays uses 7-segment numerals and approximations of alphabetic characters to convey changes in control status to the operator.
p 1

Multi-Mode The description of amateur radio equipment, such as **Argonaut V**, that provides at least **CW**, **SSB**, and **FM** *modes* of operation.
p 1

mV p-p Abreviates "millivolts peak-to-peak", a convenient measure of low-level signal amplitude.
p v, 6

6.13. N

Nets A short form of "Networks", which are organized communications groups of radio amateurs. Nets usually have a regular operating schedule and frequency. Amateurs organize nets for many different purposes.
p 13

Noise-Blanker A radio receiver function designed to minimize impulse noise by detecting noise pulses and briefly blanking the receiver for a net increase in quality of reception. **Argonaut V**'s noise blanker is a *DSP* implementation.
p 1, 12

Numeric Display An array of electro-optical elements which translates internal digital information into a row of visible numbers.
p 1, 11

6.14. O

Offset See "*Frequency Offset*", above.
p v, 1, 9

Overwrite The process of changing memory contents by writing in new data.
p 11

6.15. P

PA Subassembly The Argonaut V printed circuit board (#81931) containing the components and connections that form the Power Amplifier function.
p 20

Passband Response The contiguous range of frequencies which one or more of 516's filters passes to subsequent functions in the receiver or transmitter circuits.
p 13

Phase The time relationship between a signal and a reference signal.
p 24

Phase Detector An electronic circuit that accepts a pair of signals and outputs a new signal corresponding to the difference

in *phase* (or sometimes frequency as well) between them. This circuit develops the error signal that steers a *PLL* into lock with its reference. **p 25**

PIN diode A three-layer diode optimized with respect to transit time for low and controllable RF resistance by virtue of its p-type, intrinsic, and n-type doping layers. 516 uses PIN diodes as switches and variable *attenuator* elements. p 20

PLL Abbreviates "phase-locked-loop", a circuit that establishes and maintains a stable and controllable ratio between a *VCO* frequency source and a fixed *reference* source. **Argonaut V**'s 1st *local oscillator synthesizer* is a PLL. p 23

Primary Display The larger of 516's two *numeric displays*. As 516's main display, it shows the operating frequency of the radio.
p 14

Programmed Memories Refers to **Argonaut V** internal computer memory locations that contain either computer instructions or data, especially *channel memory* data. p 4

PSK31 The abbreviated name of amateur radio's popular and robust form of digital communication, "Phase-Shift-Keying - 31 baud". 516 is "PSK31-ready".
p 1, 10

PTT Abbreviates "Push-To-Talk", a control line that Argonaut V uses to initiate voice and data transmissions or to form Morse code characters for CW transmission. p 1, 6, 15

Push-Pull The characteristic of a circuit that refers to symmetrical pairs of elements, each half of which handle signal excursions exclusively above or below ground reference level. p 22

6.16. Q

Q24 In this manual, the Reference Designator representing "Transistor 24" as a distinct component in a schematic diagram or circuit description.
p 20

QRM Traditional "Q-code" jargon used by CW operators to signify "man-made interference".
p 13

QSK CW That form of CW operation, characteristic of Ten-Tec equipment and preferred by experienced operators, that allows the sending operator to hear signals from his receiver between Morse code elements or letters.
p 1, 10, 12

6.17. R

Reference Frequency In a *synthesized* transceiver, a stable fixed-frequency signal which is the basis for generation of frequency-determining *local oscillators* in the radio's tuning scheme.
p 24, 25

Registers Locations in memory or digital storage, especially **Argonaut V**'s **VFO** registers, that hold control numbers, which store operating frequencies derived from the operator's movements of the tuning knob.
p 1

Regulated Characteristic of a circuit that holds some electronic output property constant despite variations in signal input or component value changes. Ten-Tec equipment uses regulated power supplies for critical circuits.
p 4, 26

Resolution The smallest change that can be recognized by an electronic device, especially 516's frequency display.
p 1, 11

Reversed Polarity The usually destructive connection of the positive and negative terminals of a power supply to the opposite-polarity terminals of a load device containing semiconductors.
p 4

RF Subassembly **Argonaut V**'s (#81930) circuit board, which contains the majority of low-level analog signal handling components for the transmitter and receiver functions.
p 20

RIT Abbreviates "Receiver *Incremental Tuning*", a convenience feature that allows the operator to examine signals offset from the tuned frequency shown in the main display without disturbing that setting so that he may use it later. See also ***XIT***.
p 1, 15

Rotary Control One of 516's four control knobs, **MIC/PWR**, **TUNING**, ***MULTI***, and ***AF/SQL***, that function in the manner of traditional radio control knobs.
p 8

RS-232 The popular EIA standard governing connector type, physical format, and electrical format of serial communication including that between **Argonaut V**'s ***SERIAL PORT*** and a computer or similar data handling device.
p 2, 6, 19

6.18. S

Sample Pulses Regularly-occurring signals that initiate *A/D* conversions for 516's *DSP* functions.
p 23

SCAN A control key that initiates one of **Argonaut V**'s two automatic receiver-tuning and signal-search functions that tune frequency in steps between limits set by the operator controls.
p 1, 12-14

Scrolling The act of searching a list of possibilities, either by moving a pointer past a fixed list, or by moving a list past a fixed pointer. The ***MULTI*** control is 516's pointer, and the various lists appear in the ***MULTI*** *display*.
p 11

Second Mixer The receiver (or transmitter) circuit that effects the conversion between 1st and 2nd IFs in **Argonaut V**'s RF Subassembly.
p 21, 24

Secondary Readout Another name for 516's smaller *numeric display* associated with the ***MULTI*** control.
p 12

Selectivity An important characteristic of the receiver that largely determines the degree of response to signals other than the desired one.
p vi, 10

Serial Data refers to digital data organized in a sequential stream of bits and words on a single circuit. **Argonaut V** handles much of its control data and *DSP* interface signals via serial data.
p 20, 22

Serial Port The *DB9S* rear panel connector that Ten-Tec provides for connection to a computer in order to implement some remote control or to update firmware.
p 2, 4, 6, 19

Serial Port Commands A systematic scheme of digital words that assert control of some 516 functions via the *SERIAL PORT*.
p 4

Sidetone An audio feedback signal provided to the transmitting operator to keep him apprised of his Morse code transmissions as he forms the characters. **p v, 1, 9**

Sin (X)/X Distortion A form of low-pass distortion in frequency response caused by the non-ideal length of sampling pulses in a *DSP* conversion.
p 22

SKIP The **Argonaut V** ability to temporarily exclude a stored frequency from a ***SCAN*** operation without deleting it from memory.
p 12, 13, 15

Sleeve Name of the common ground connection on *Mono* or *Stereo* phone plugs and jacks. **p 13**

SLO Abbreviation for "**SLOW** Tuning-Rate" as presented on 516's ***MULTI*** *display*. See also ***FAS***.
p 8, 12

SO-239 The traditional military designator for the "UHF" female coaxial jack used on most HF amateur equipment.
p v, 5

Sound Card A function internal to most personal computers, it comprises hardware for two-way conversion between audio and digital signals.
p 1, 6, 10, 16

SPDT Abbreviates "single-pole-double throw", signifying a switch that selects either of two nodes to connect to one circuit.
p 22

Speech Peaks The highest excursions of a human voice signal. See also *RF Peaks*".
p 8

Speech Processor 516's *DSP* implementation to improve the average to peak ratio in the transmission of voice signals for greater "punch" or intelligibility.
p 13

SPLIT An **Argonaut V** control key and its corresponding *annunciator* that allow the operator to select or de-select "split-frequency operation", in which mode the active *VFO* controls receiver frequency and the other *VFO* controls transmit frequency.
p vi, 11-13

Spurious Responses An undesireable receiver property, minimized by good design but practically unavoidable in practice, that produces extraneous reciever signals via impairments in performance.
p 20

SQL Abbreviated label for "***SQUELCH***".
p 8, 15

SQUELCH A receiver function which silences the receiver output until an input signal rises above the control setting. See ***SQUELCH*** *Threshold*.
p 1, 8, 14

Squelch Threshold The control setting for signal strength below which the ***SQUELCH*** function mutes the receiver output.
p 14, 15

SSB Abreviates "Single-Sideband", an efficient and very popular form of **AM,** which suppresses the carrier power and one of the two redundant sidebands. See **USB** and **LSB**.
p 1, 6, 8

Steering Line The node of a *VCO* which accepts a relatively low frequency frequency control voltage to steer its output frequency.
p 25

Stereo Abbreviates "Stereophonic", describing an audio system or a connector that carries two circuits, as in some headphone connections. See also *Mono*.
p 2, 4, 19

Subaudible Tone Encoding Another term for *CTCSS*, used primarily in *FM* communications systems to facilitate frequency-sharing.
p 1

SWR Abbreviates "Standing-wave-Ratio", a manifestation of *impedance* mismatch between an RF transmission line and its load *impedance*.
p 5,15

Synthesizer A frequency generation circuit (for example, the 516 *PLL*) that electronically manipulates an internal source to generate and maintain one or more output frequencies with stability and resolution determined by its *reference frequency* source.
p 24, 26

6.19. T

TCXO Abbreviates "Temperature-Controlled Crystal Oscillator", a particularly stable and accurate form of *reference frequency* signal offered as an option on the **Argonaut V** RF Subassembly.
p v, 1, 24

Terminal Node Controller A special purpose form of computer and modem equipment sometimes connected to the **AUX***illiary I/O connector for use in packet radio* communications.,
p 6, 16

Tip And Ring Connections The two ungrounded connections on a stereo phone plug or jack. The "*Sleeve*" connection carries common ground for both.
p 23

Transceiver A radio set that combines transmitting and receiving functions with common frequency control and some shared circuitry. Transceivers have almost entirely replaced sets of separate transmitters and receivers that radio amateurs formerly used.
p 1, 2, 24

Tuning Rates The relationship between rotation of the tuning control and the resulting movement in operating frequency.
p 1, 8, 12

TX Abbreviates "Transmitter" or "Transmit".
p 10, 23

6.20. U

U17b On a schematic diagram or circuit description, the reference designator for "Integrated Circuit # 17b", or in some

Ten-Tec schematics, for "Connector #17b"
p 23

Upgrades An outstanding feature of recent Ten-Tec radios! Argonaut V's *Flash Memory* and ***SERIAL PORT*** hardware facilitates customers using our free Internet downloads to simply install feature upgrades as we develop them.
p 1, 2

USB Abbreviates the "Upper Sideband" form of *Single-Sideband* amplitude modulation.
p 8-10, 13

6.21. V

V/M The 516 control key that switches the frequency control between *VFO* and *Memory*.
p 4, 11, 13-15

Varactor Diode A diode designed for a range of capacitance variation with reverse bias voltage.
p 24, 25

VCO Abbreviates "Voltage-Controlled- Oscillator", the output frequency-generating component of 516's *LO synthesizer PLL*.
p 24, 25

VFO Abbreviates "Variable-Frequency-Oscillator", one of the **Argonaut V**'s two means of frequency control. This mode of operation accepts operator changes to the tuning knob, translating them into frequency changes to the value stored in either the *VFO A* or the *VFO B* register. The processor sends frequency control information to the *synthesizer* based on the contents of the selected register.
p 1, 8, 9, 11-15

VFO A One of two available frequency *registers*.
p 1, 8, 11-15

VFO B One of two available frequency *registers*.
p 1, 8, 11-15

Voltage Tripler A power supply circuit that stacks rectifiers in a manner that produce three time sthe DC output voltage as would be obtained from a single stage rectifier. 516 uses a voltage tripler to develop high-voltage reverse bias for bandswitching diodes.
p 25

VOX DELAY The time interval during which the voice-operated transmit circuit remains in transmit state when speech apparently ceases. Also controls *QSK Delay* in **Argonaut V**.
p 10

6.22. W

Weight The characteristic that describes the ratio between dit and dah lengths in Morse code. **Argonaut V**'s internal *keyer* function includes a weight adjustment.
p 9, 13

Words Per Minute The measure of Morse code signalling rate, determined by the number of times the keyer can send the standard word, "PARIS", in a one minute interval.
p 9

WRITE This 516 control key copies *channel memory* data between channel memory and the *VFO* register, in a direction dictated by the V or M state of the radio, as indicated by the *annunciator*.
p 11, 14

6.23. X

XIT Abbreviates "Transmitter *Incremental Tuning*", a convenience feature that allows the operator to transmit his signal at an *offset* from the tuned frequency shown in the main display without disturbing that setting so that he may use it later. See also **RIT**.
p 1,11, 13

6.24. Z

Zener Diode a diode designed to exhibit a constant voltage in reverse bias over a range of bias current. 516 uses a number of Zener diodes to stabilize voltages in sensitive or critical circuits.
p · 23

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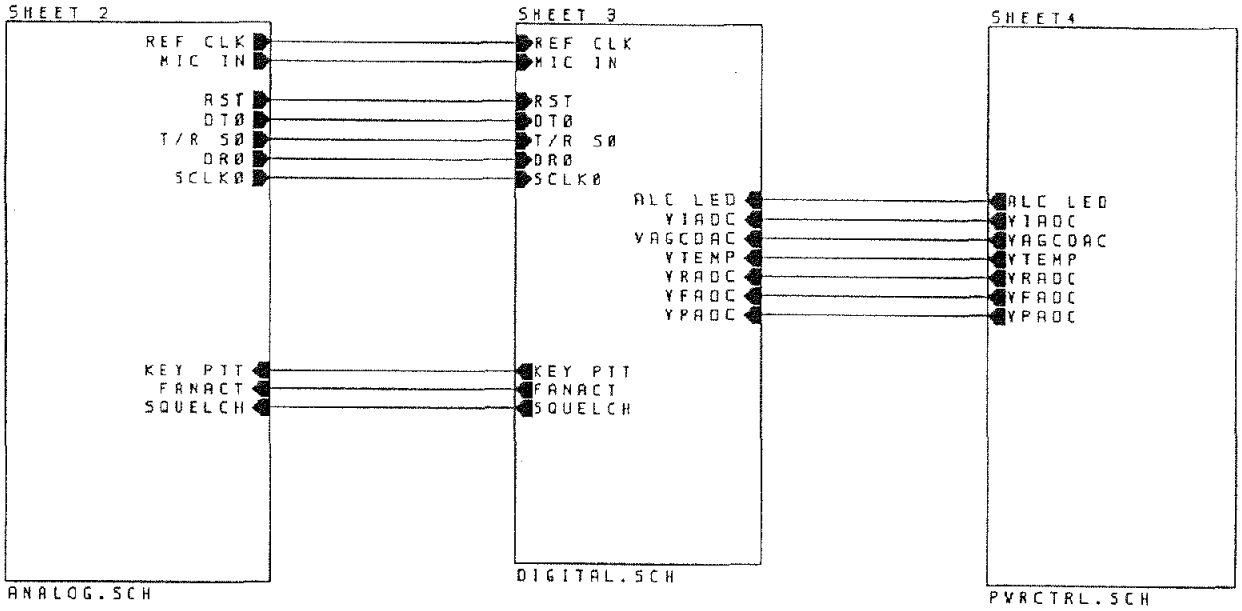

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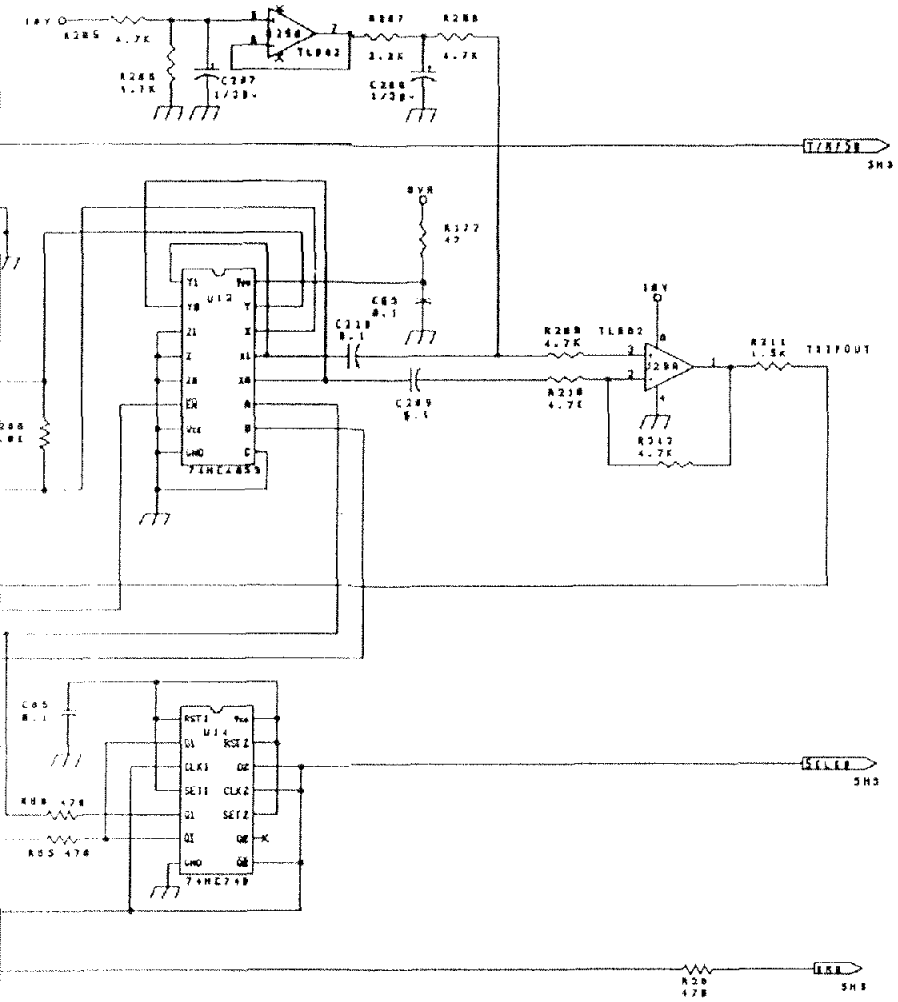

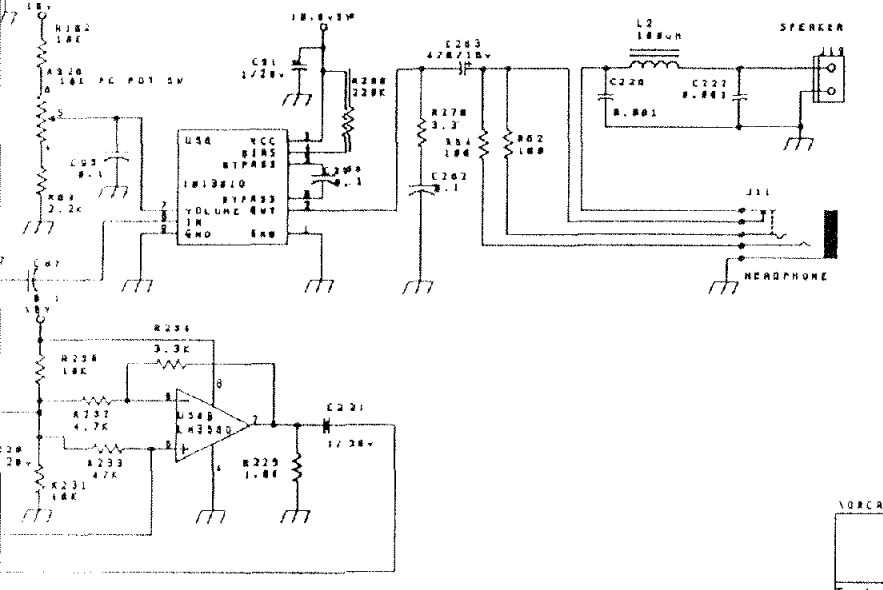

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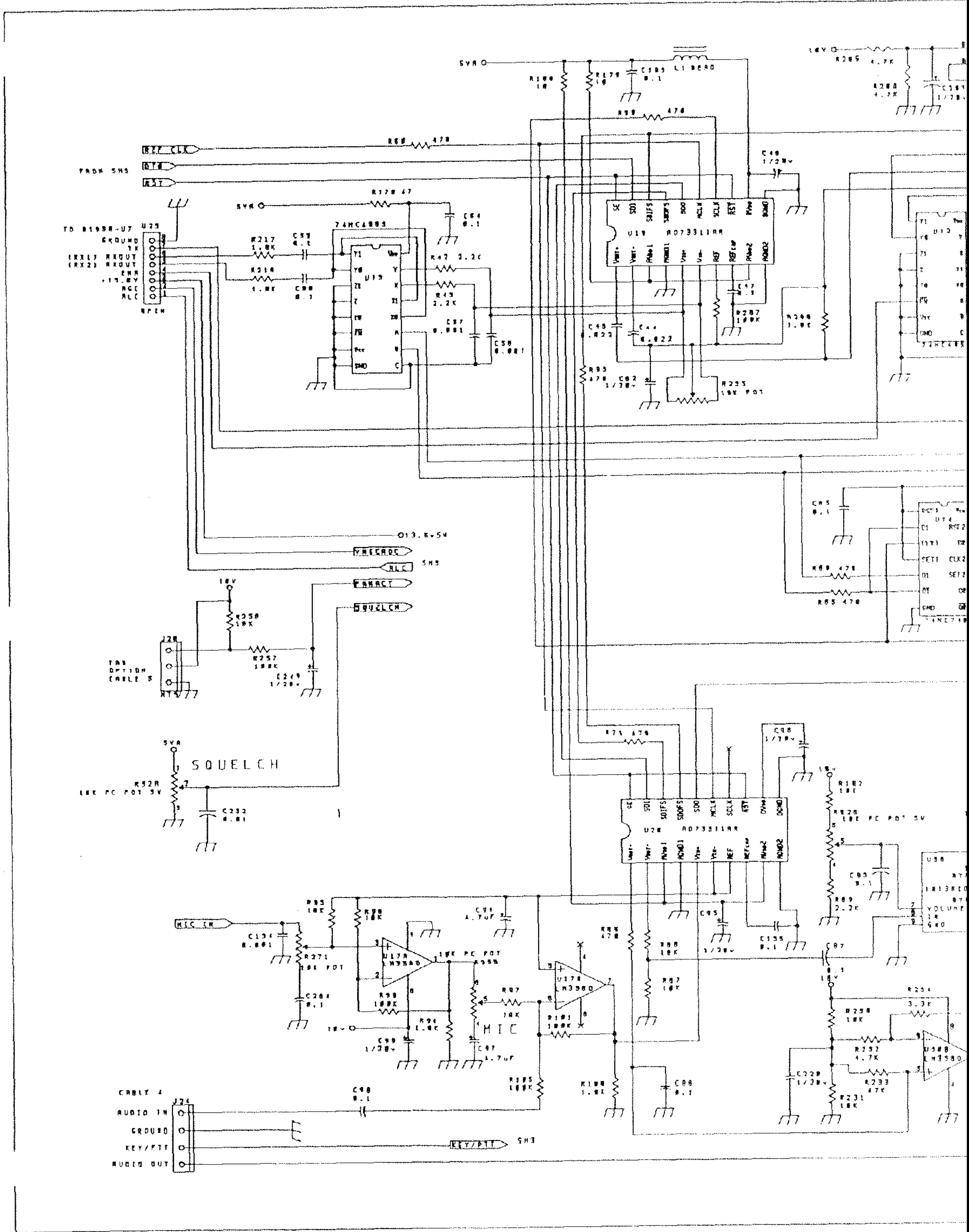
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MIC
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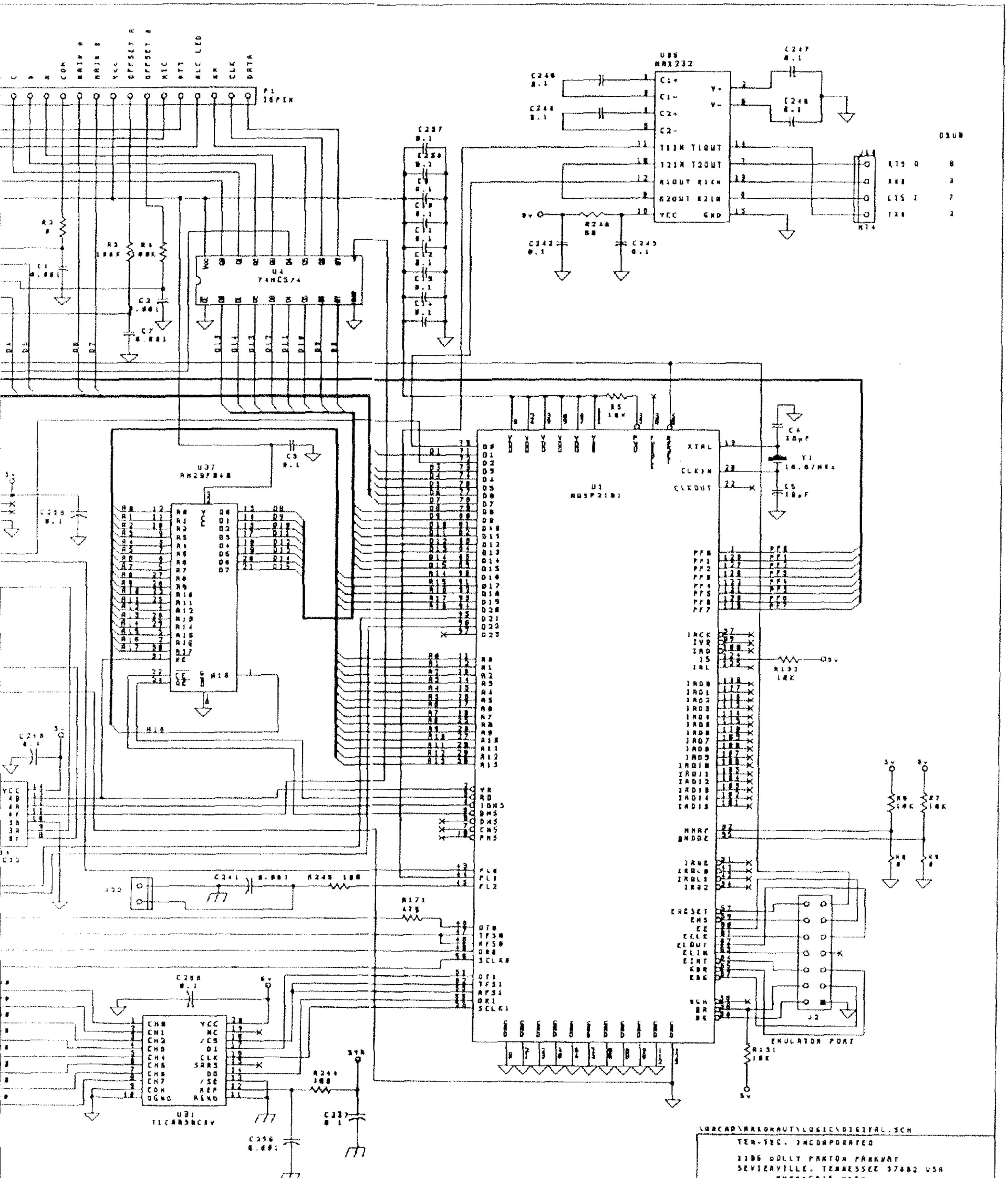

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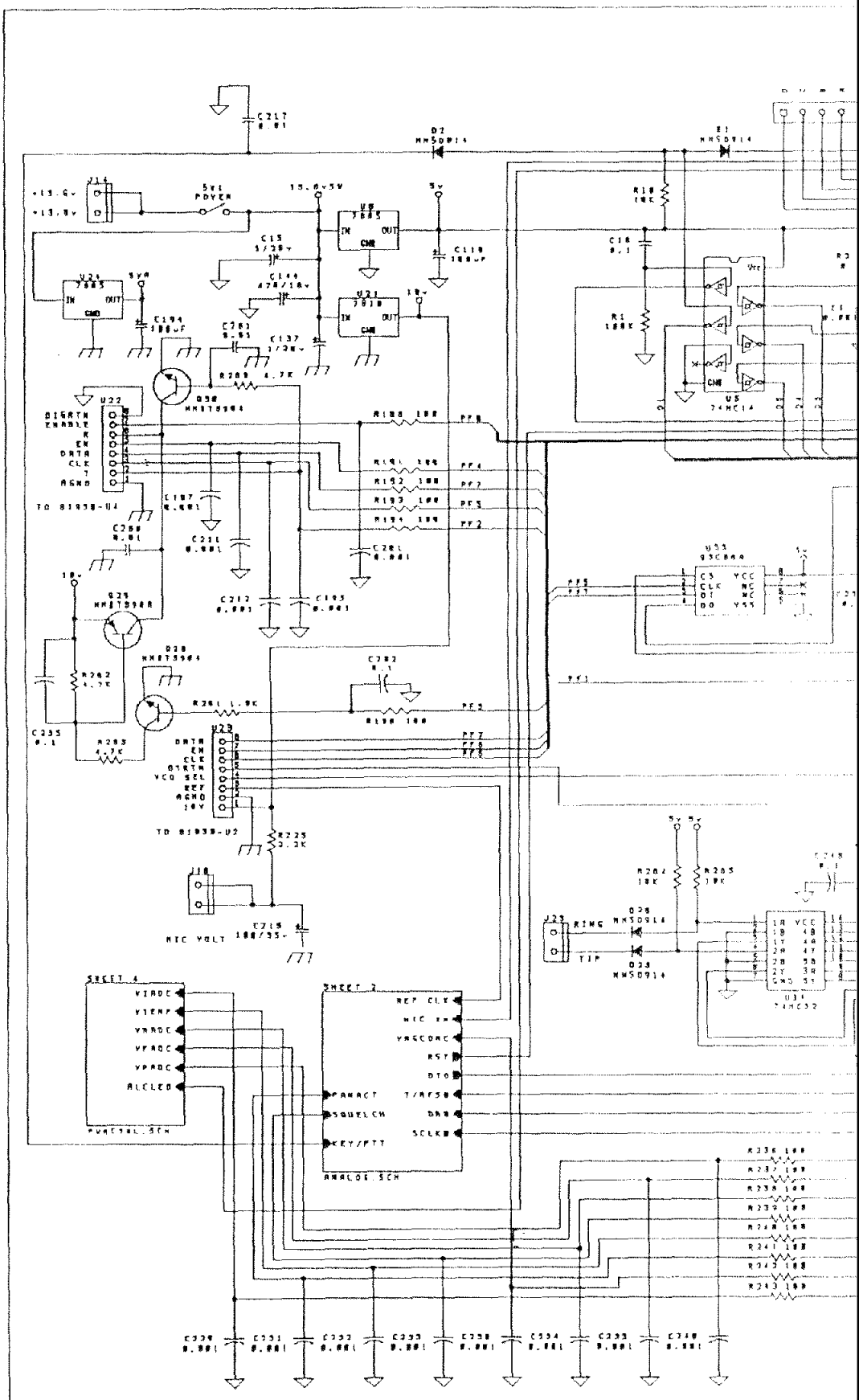
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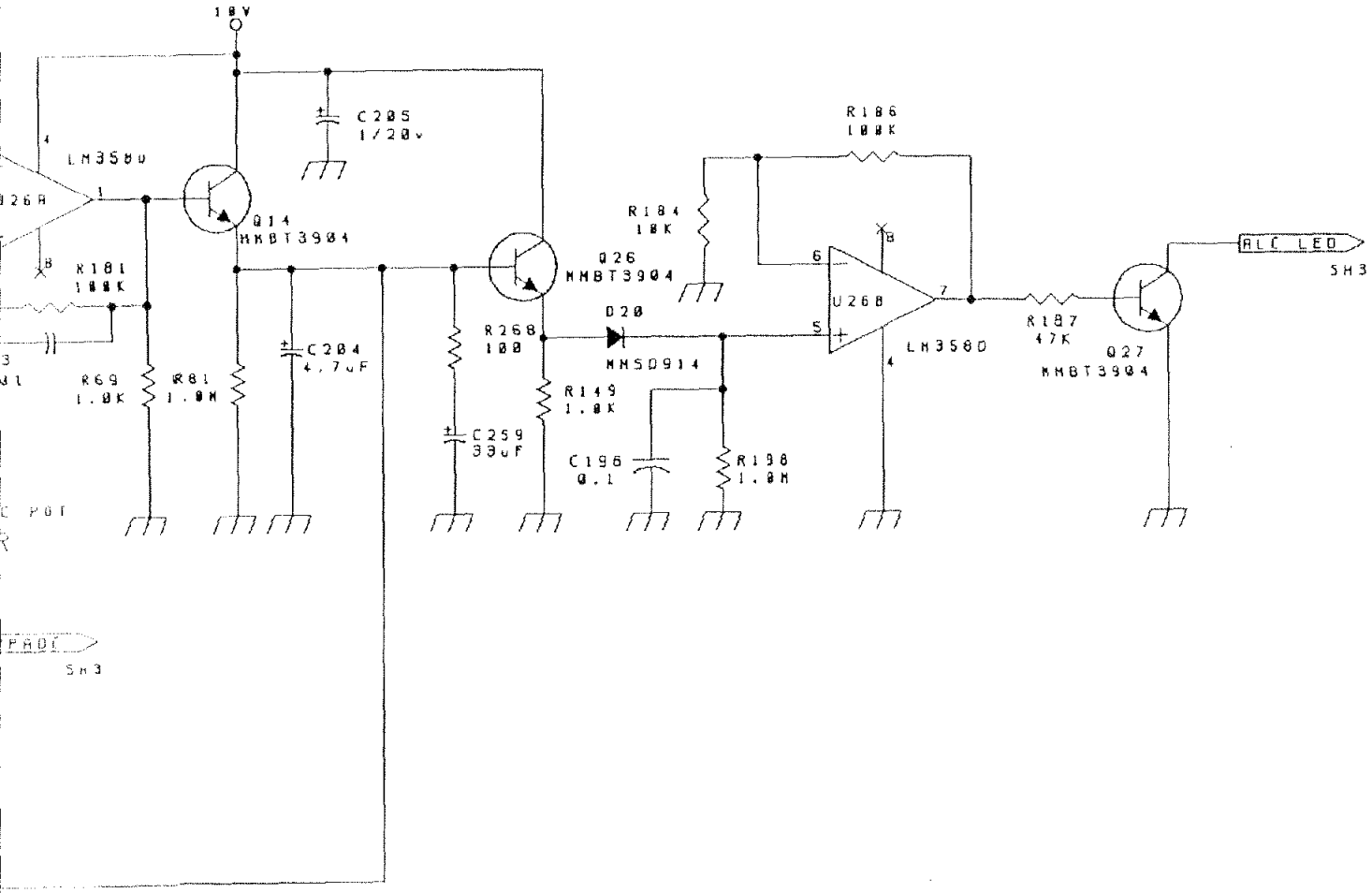

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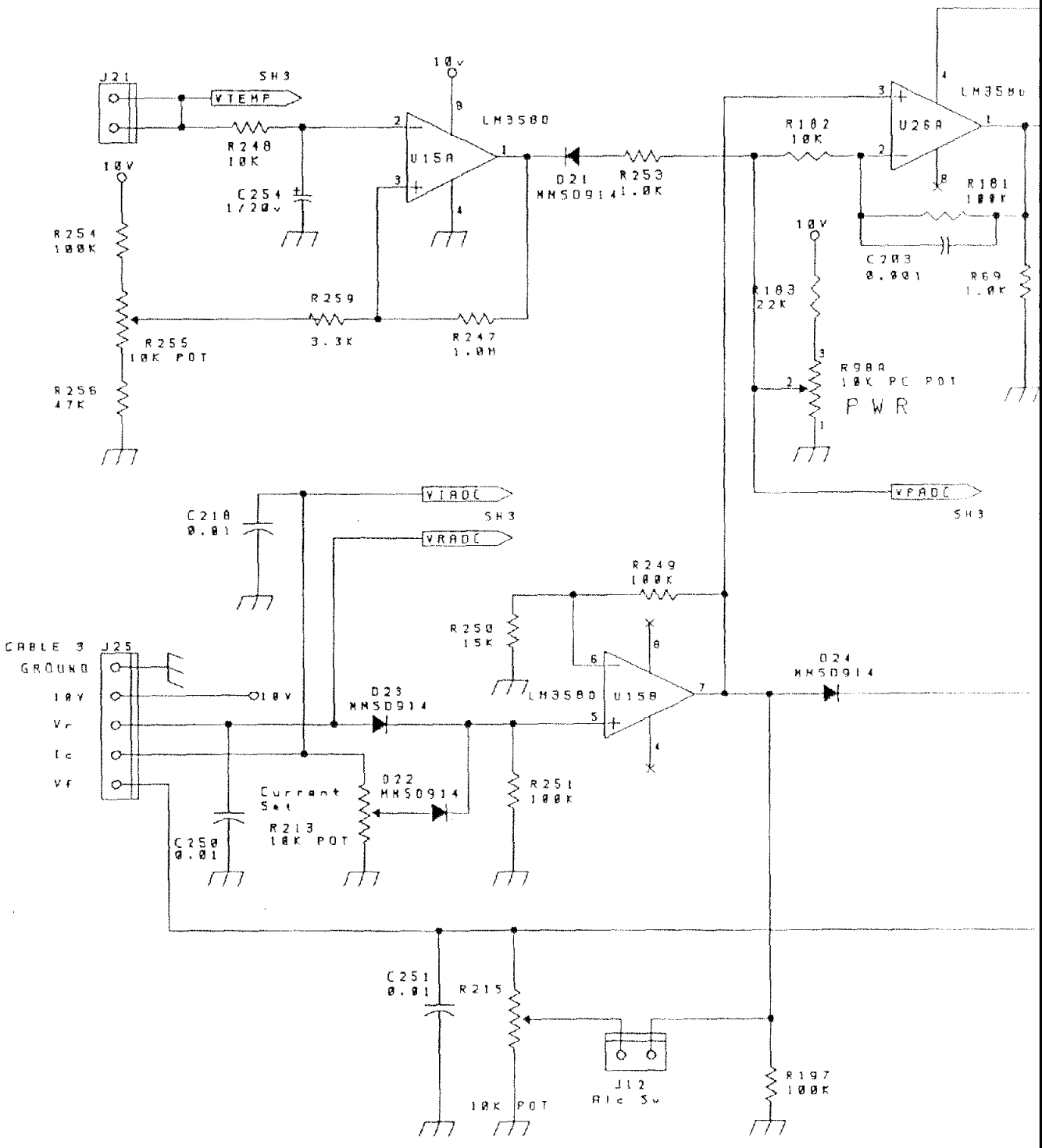
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R102
10K
U26A
LM3580
R181
100K
C203
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1.0K
R254
100K
R255
10K POT
R259
3.3K
R247
1.0M
R256
47K
R103
22K
R98A
10K PC POT
PWR
VIADC
VRADC
SH3
C218
0.01
R249
100K
R250
15K
LM3580
U15B
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CABLE 3
J25
GROUND
10V
Vr
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Current
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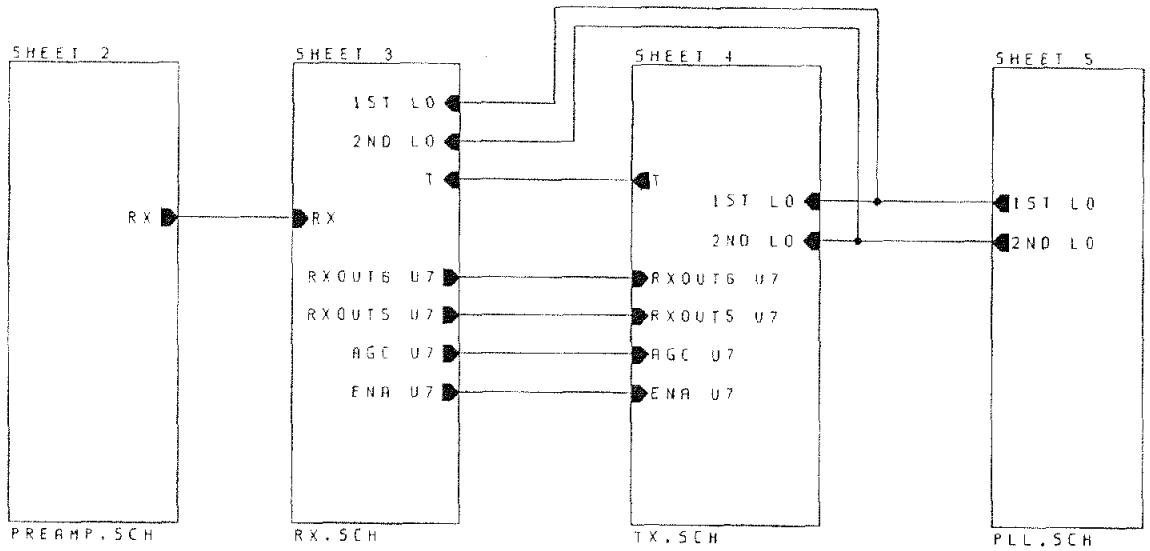

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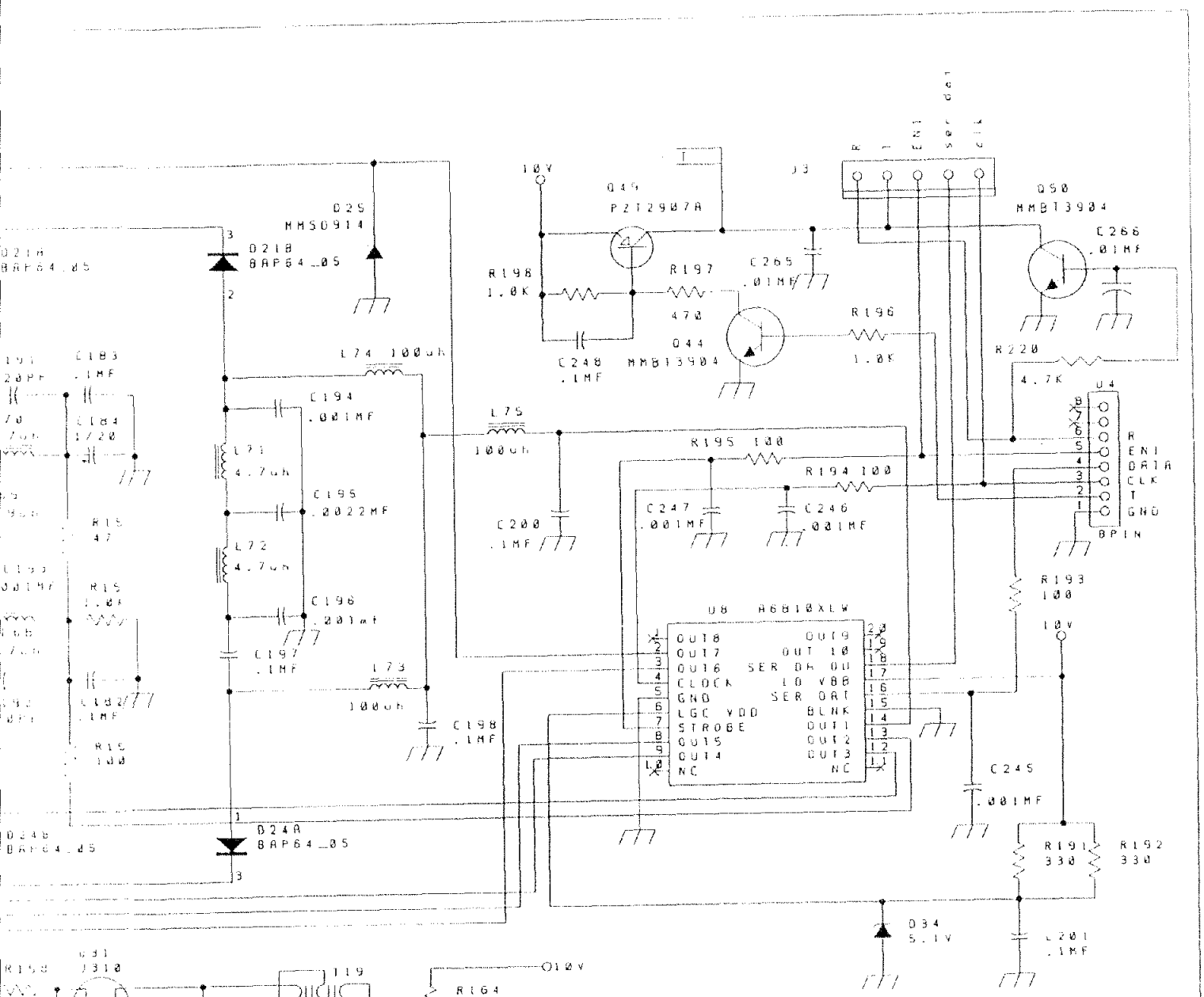

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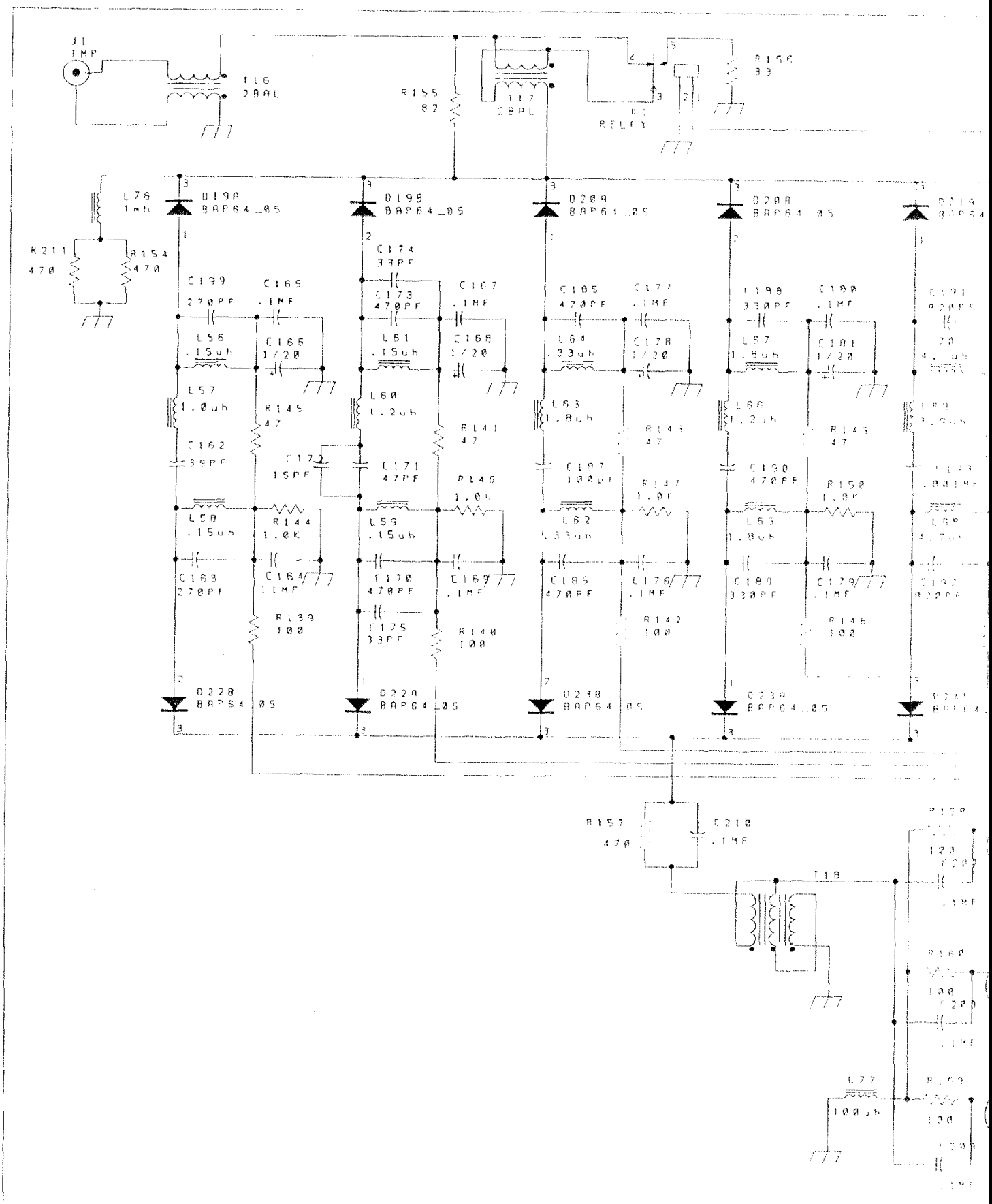
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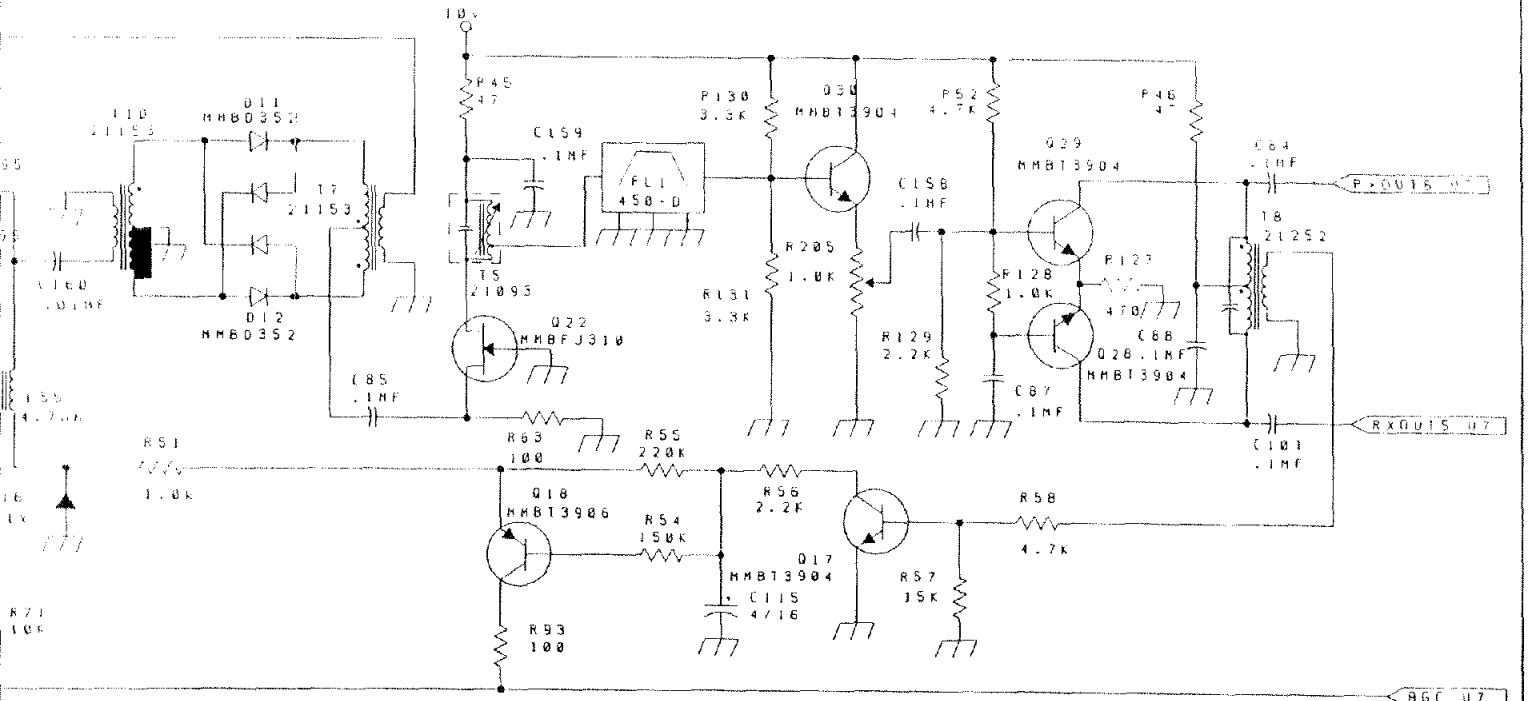
BAP64_05
D20B
BAP64_05
D21A
R211
470
R154
470
C199
270PF
C165
.1MF
C174
33PF
C173
470PF
C167
.1MF
C185
470PF
C177
.1MF
C198
330PF
C180
.1MF
L56
.15uh
C165
1/20
L61
.15uh
C168
1/20
L64
.33uh
C178
1/20
L57
1.8uh
C181
1/20
L57
1.0uh
R145
47
L60
1.2uh
R141
47
L63
1.8uh
R143
47
L66
1.2uh
R149
47
C162
39PF
C172
15PF
C171
47PF
C187
100pf
C190
470PF
R146
1.0L
R147
1.0K
R150
1.0K
L58
.15uh
R144
1.0K
L59
.15uh
L62
.33uh
L65
1.8uh
C163
270PF
C164
.1MF
C170
470PF
C169
.1MF
C186
470PF
C176
.1MF
C189
330PF
C179
.1MF
R139
100
C175
33PF
R140
100
R142
100
R148
100
D22A
BAP64_05
D22B
BAP64_05
D23A
BAP64_05
D23B
BAP64_05
R157
470
C210
.1MF
T18
L77
100uh



3rd IF Center Freq = Sample Rate/4 = 14.502 kHz

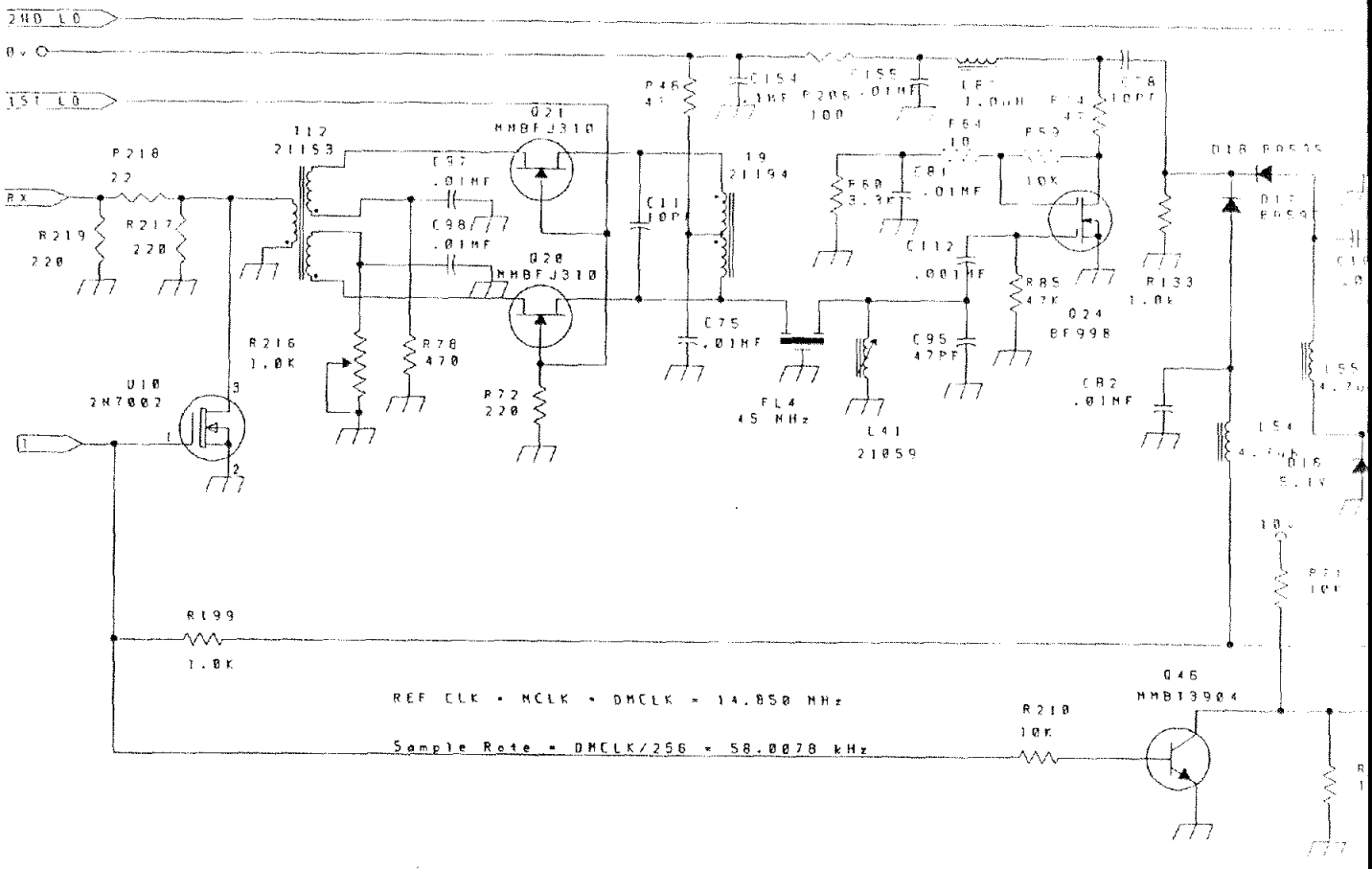
3rd LO = SCLK/4 = MCLK/32 = .4640625 MHz

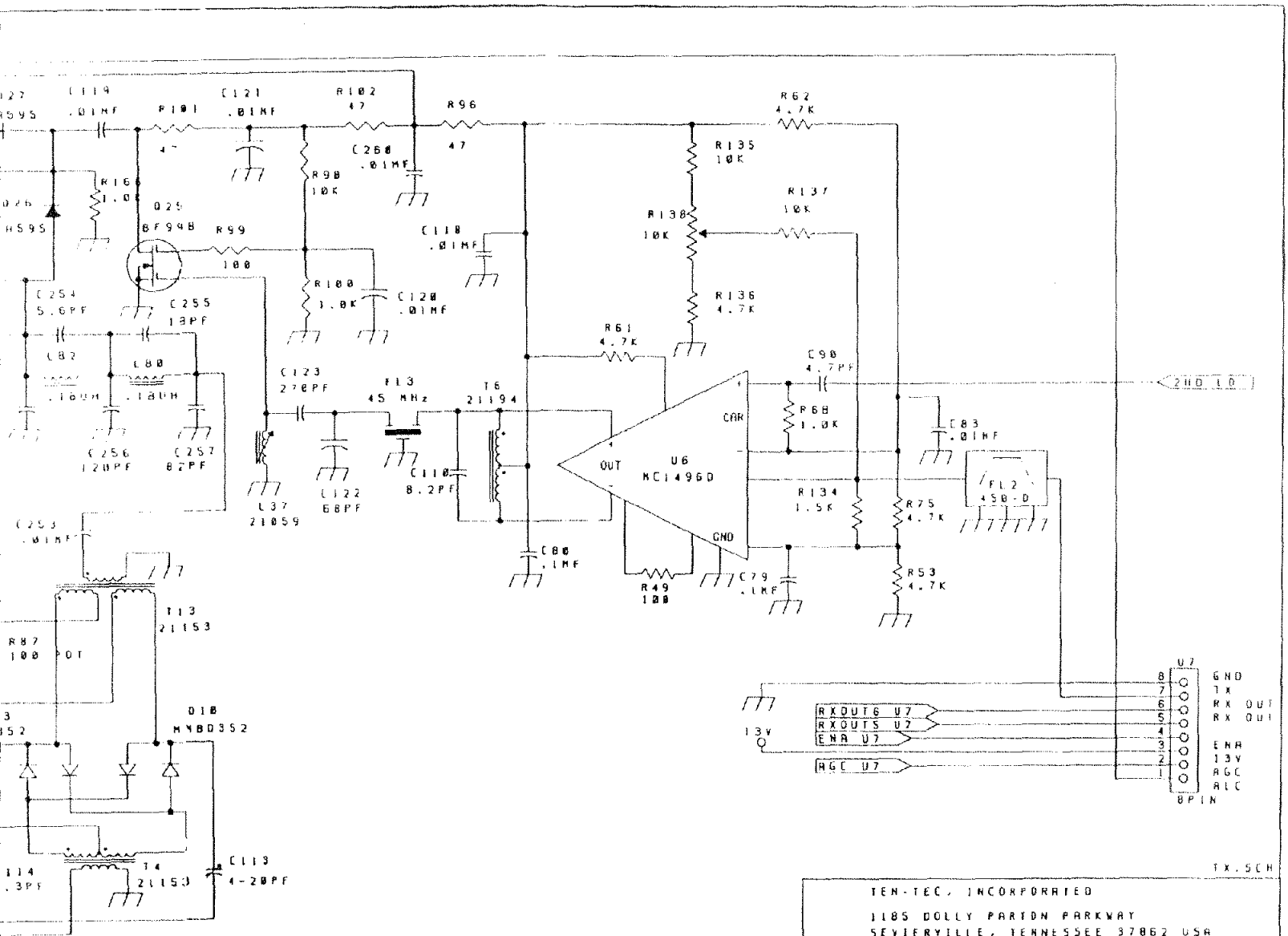
TEN-TEC INCORPORATED

AMERICA'S FINEST
1185 DOLLY PARTON PARKWAY
SEVIERVILLE, TENNESSEE 37862 USA

Title:
MODEL 516 RF PWB RX SECTION

Size	Document Number	REV
C	SCH-81930	K2
Date: October 3, 2002	Sheet 3 of 5	


2ND LO
0v
1ST LO
RX
T
P218
22
R219
220
R217
220
T12
21153
Q21
MMBFJ310
C97
.01MF
C98
.01MF
Q20
MMBFJ310
R216
1.0K
R78
470
R72
220
U10
2N7002
C11
10PF
T9
21194
C75
.01MF
FL4
45 MHz
L41
21059
R60
3.3K
C81
.01MF
C112
.001MF
C95
47PF
R85
47K
Q24
BF998
CR2
.01MF
R133
1.0K
R199
1.0K
REF CLK = MCLK = DMCLK = 14.850 MHz
Sample Rate = DMCLK/256 = 58.0078 kHz
Q46
MMBT3904
R210
10K



TX.SCH

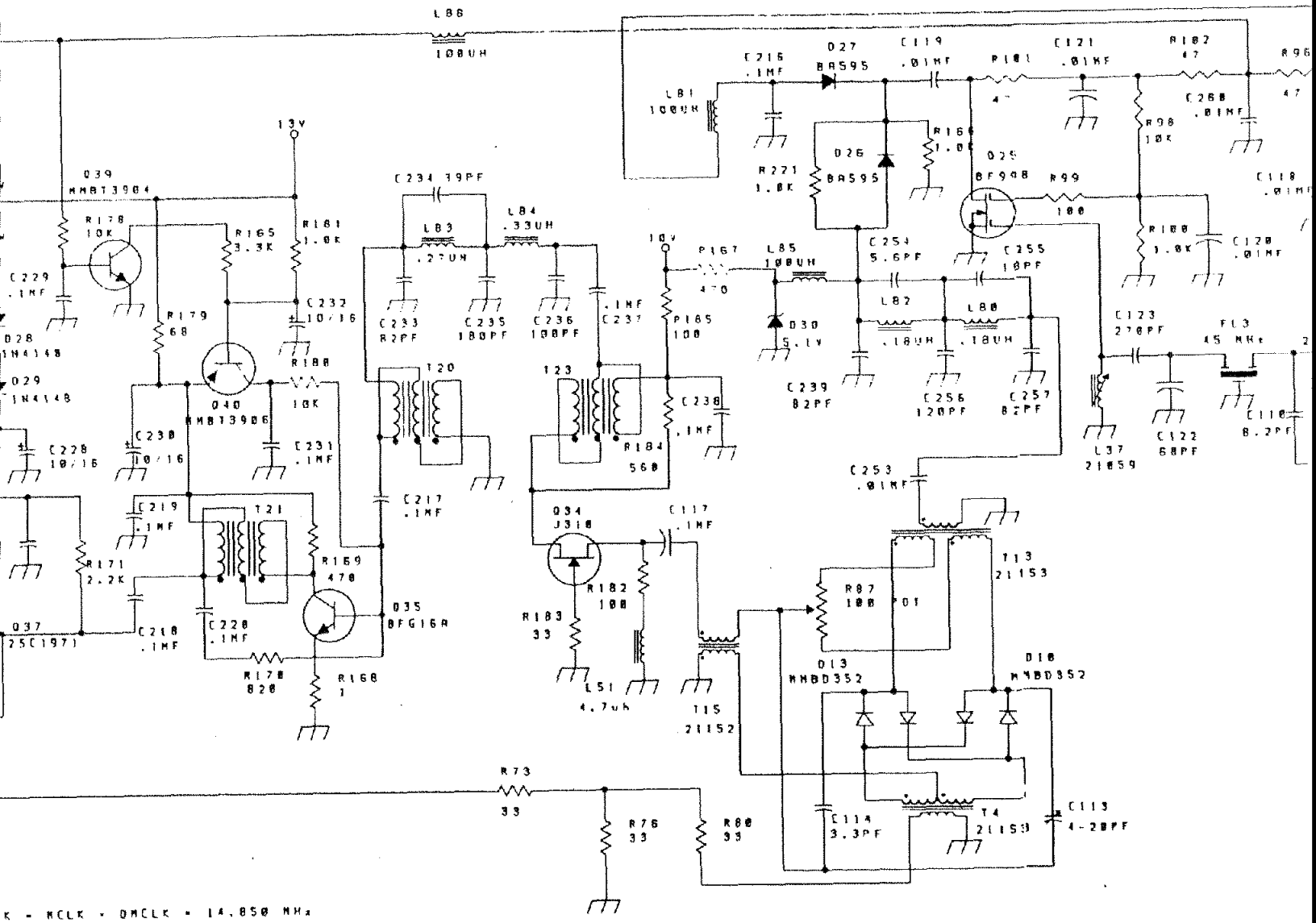
TEN-TEC, INCORPORATED

1185 DOLLY PARTON PARKWAY
SEVIERVILLE, TENNESSEE 37862 USA
AMERICA'S BEST

Title: MODEL 516 RF PWB TX SECTION

Size	Document Number	RE
C	SCH-81930	X2
Date: October 3, 2002	Sheet 4 of 5	

= 14.502 kHz 3rd LO = SCLK/4 = MCLK/32 = .4640625 MHz

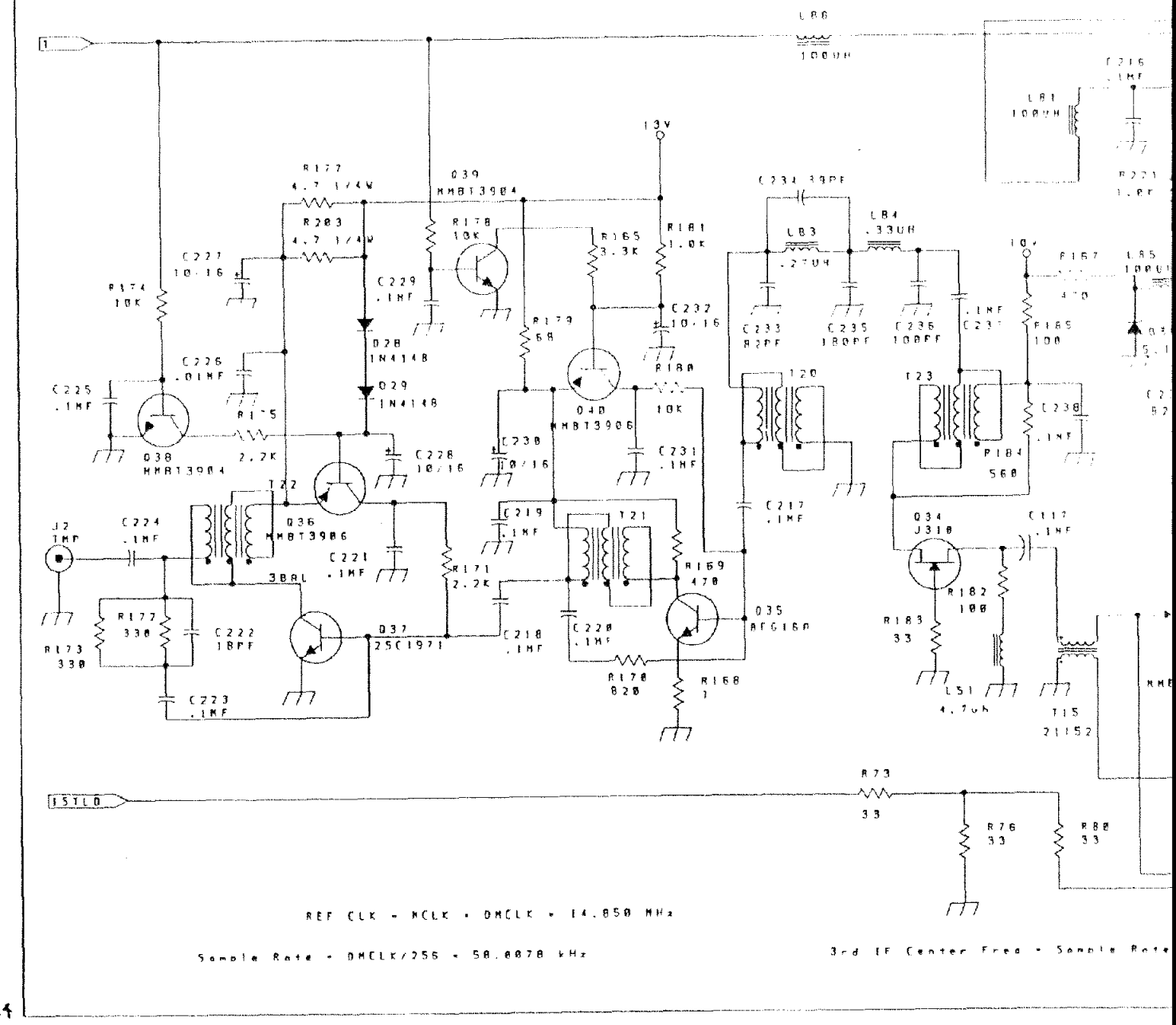


K = MCLK = DMCLK = 14.850 MHz

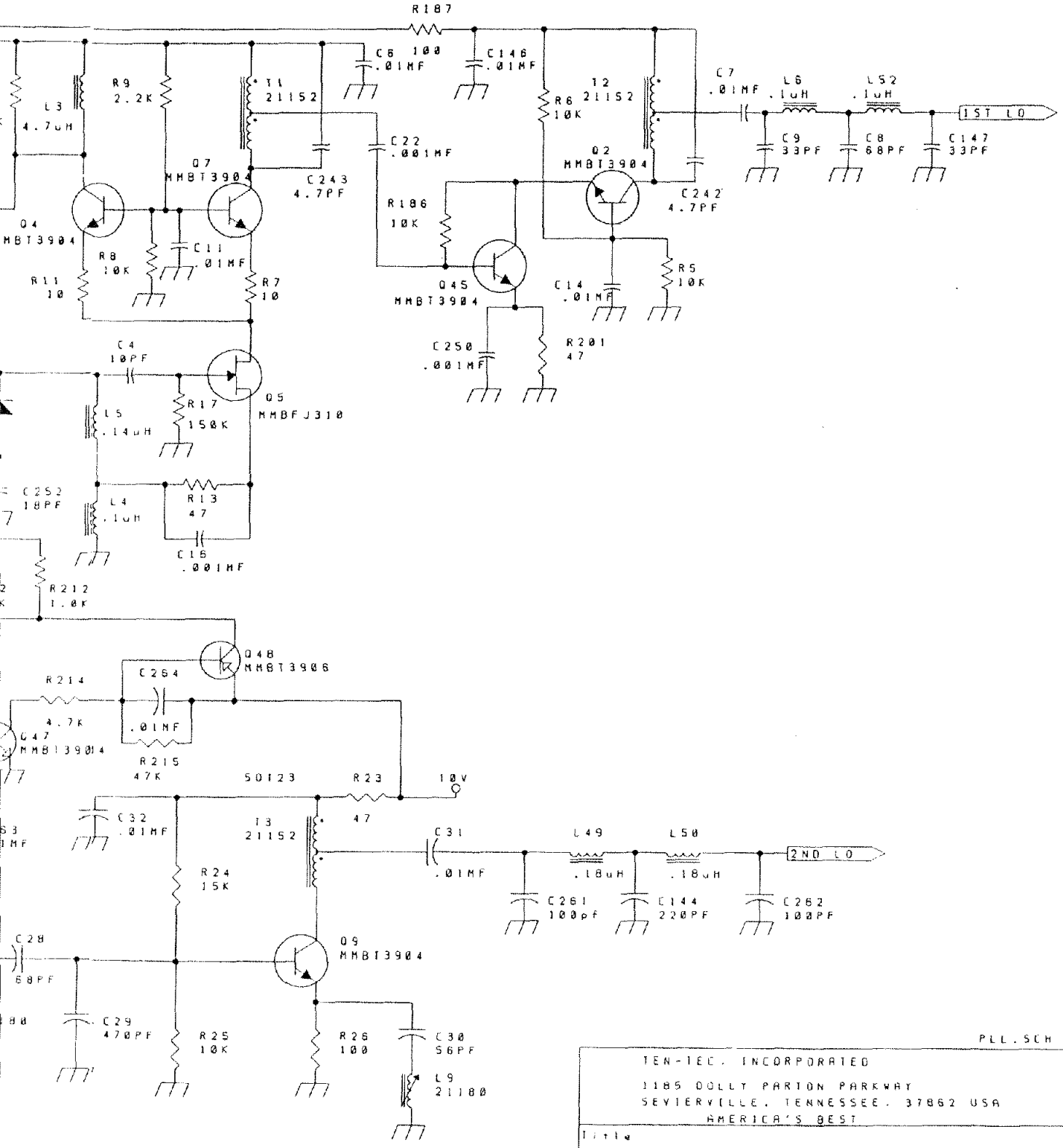
CLK/256 = 58.0078 kHz

3rd IF Center Freq = Sample Rate/4 = 14.502 kHz

3rd LO = SCLK/8 = MCLK/3


L86
100UH
13V
R177
4.7 1/4W
R203
4.7 1/4W
Q39
MMBT3904
R178
10K
R165
3.3K
R181
1.0K
C234 39PF
LB3
.27UH
LB4
.33UH
10V
C227
10-16
C229
.1MF
R174
10K
D28
1N4148
R179
68
C232
10/16
C233
82PF
C235
180PF
C236
100PF
C237
.1MF
R167
470
L85
100UH
R185
100
C226
.01MF
C225
.1MF
D29
1N4148
R175
2.2K
Q38
MMBT3904
R180
10K
Q40
MMBT3906
T20
T23
C230
10/16
C231
.1MF
C228
10/16
P184
560
C238
.1MF
T22
C219
.1MF
T21
C217
.1MF
J2
IMP
C224
.1MF
Q36
MMBT3906
C221
.1MF
3BAL
R171
2.2K
R169
470
Q35
BFG168
Q34
J310
C117
.1MF
R182
100
R183
33
R177
330
C222
18PF
R173
330
Q37
2SC1971
C218
.1MF
C220
.1MF
R170
820
R168
1
L51
4.7UH
T15
21152
C223
.1MF
1STLO
R73
33
R76
33
R80
33
REF CLK = MCLK = DMCLK = 14.850 MHz
Sample Rate = DMCLK/255 = 58.0078 kHz
3rd IF Center Freq = Sample Rate

A4



PLL.SCH

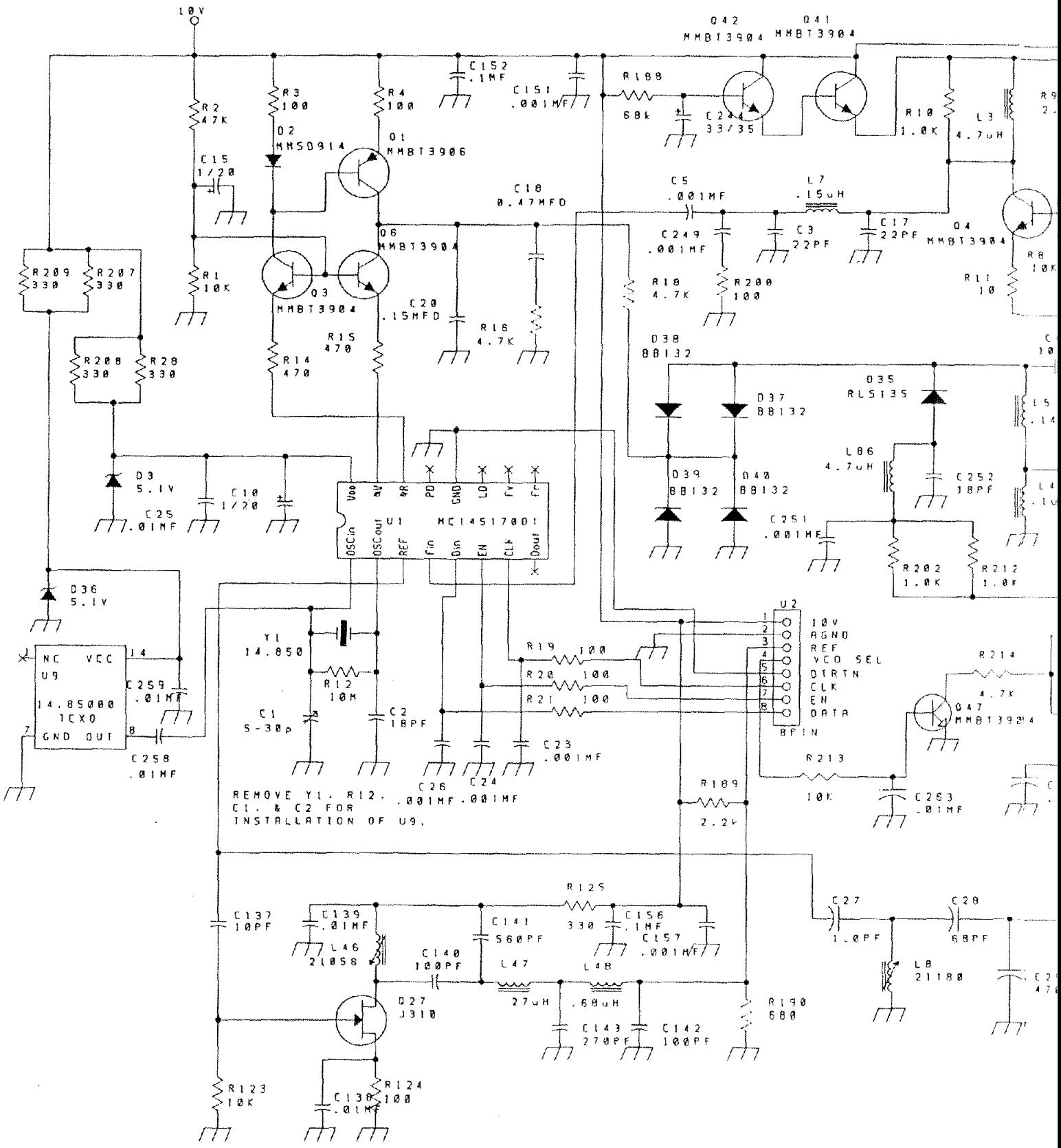
TEN-TEC, INCORPORATED

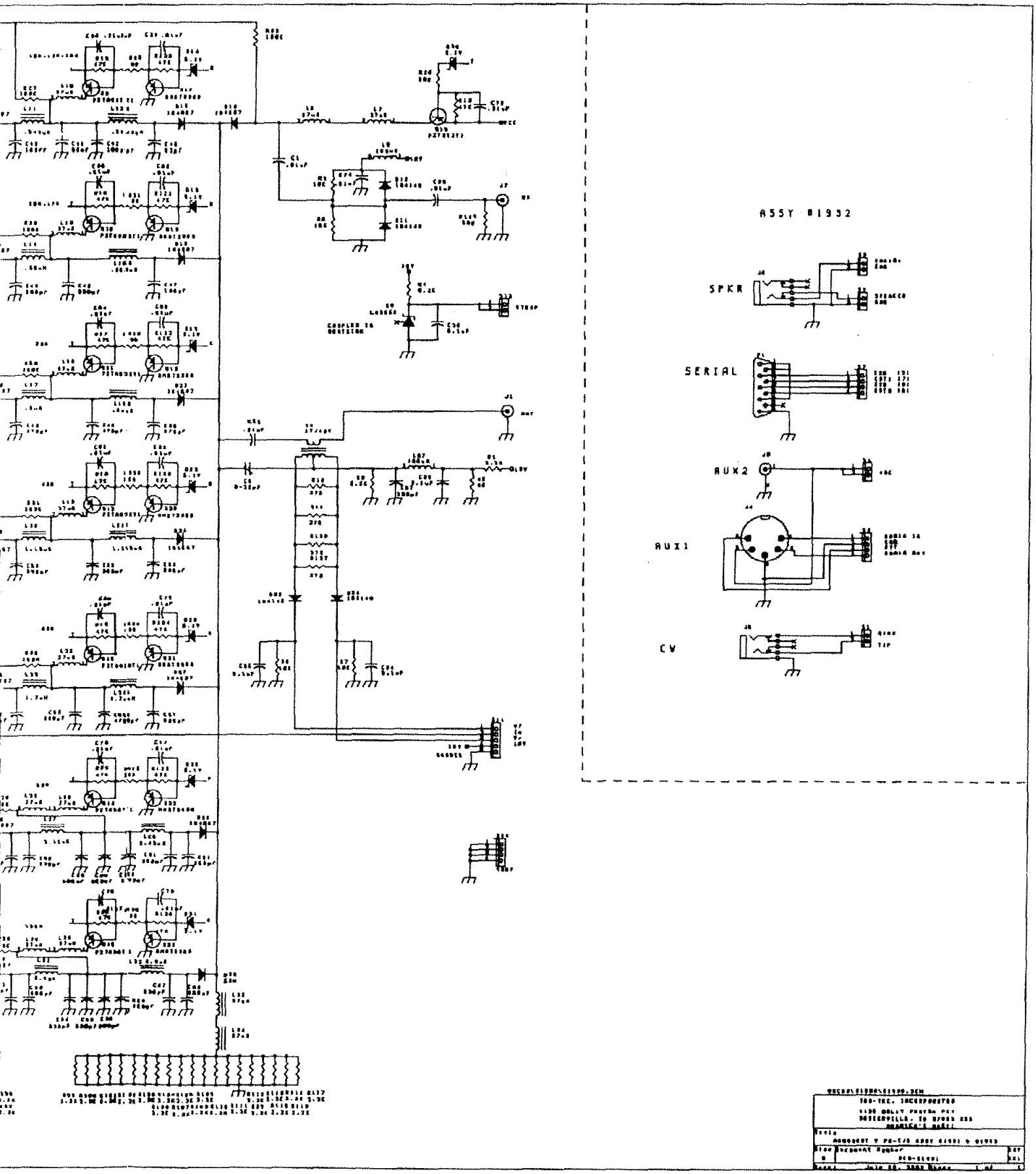
1185 DOLLY PARTON PARKWAY
SEVIERVILLE, TENNESSEE, 37862 USA
AMERICA'S BEST

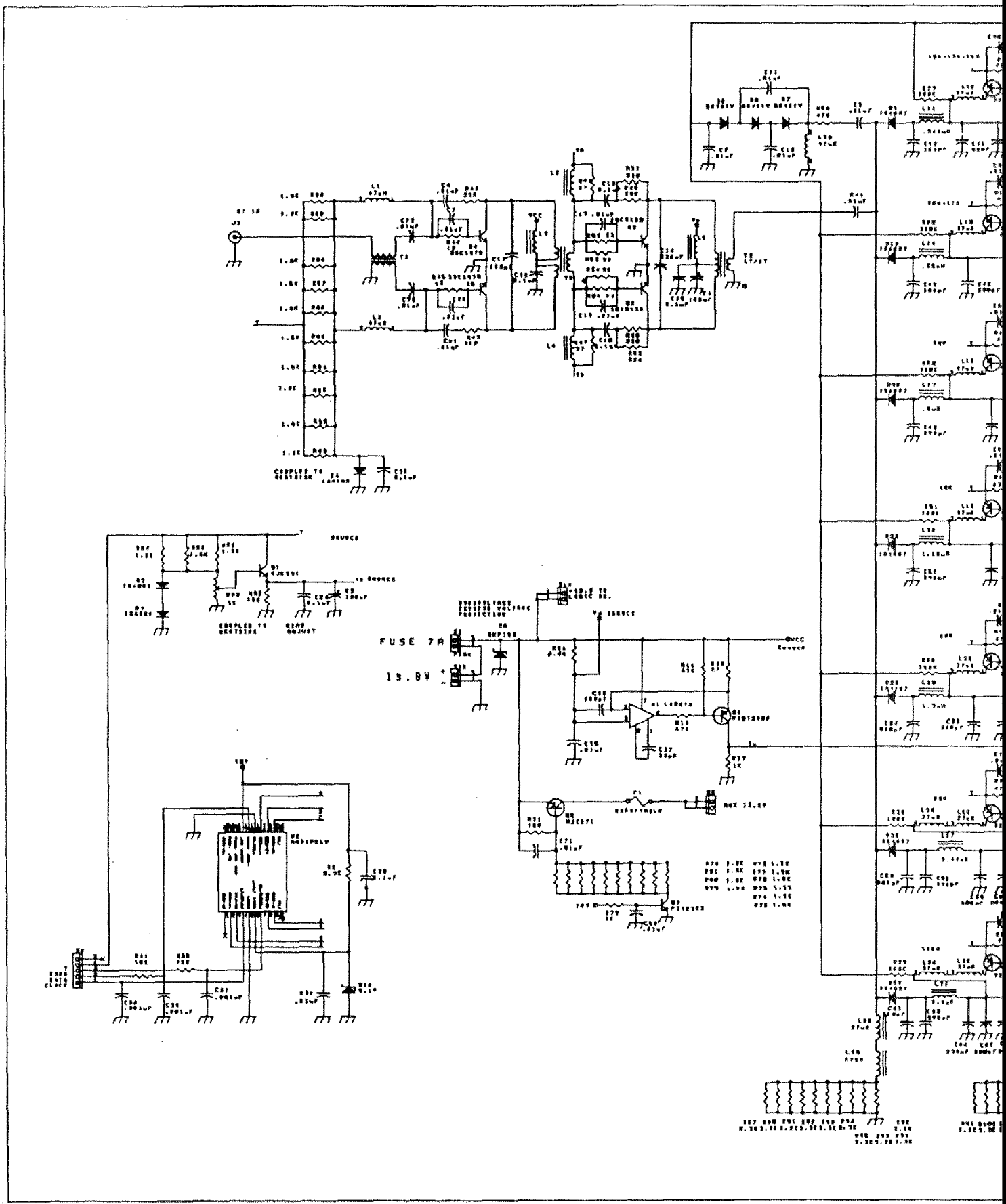
Title

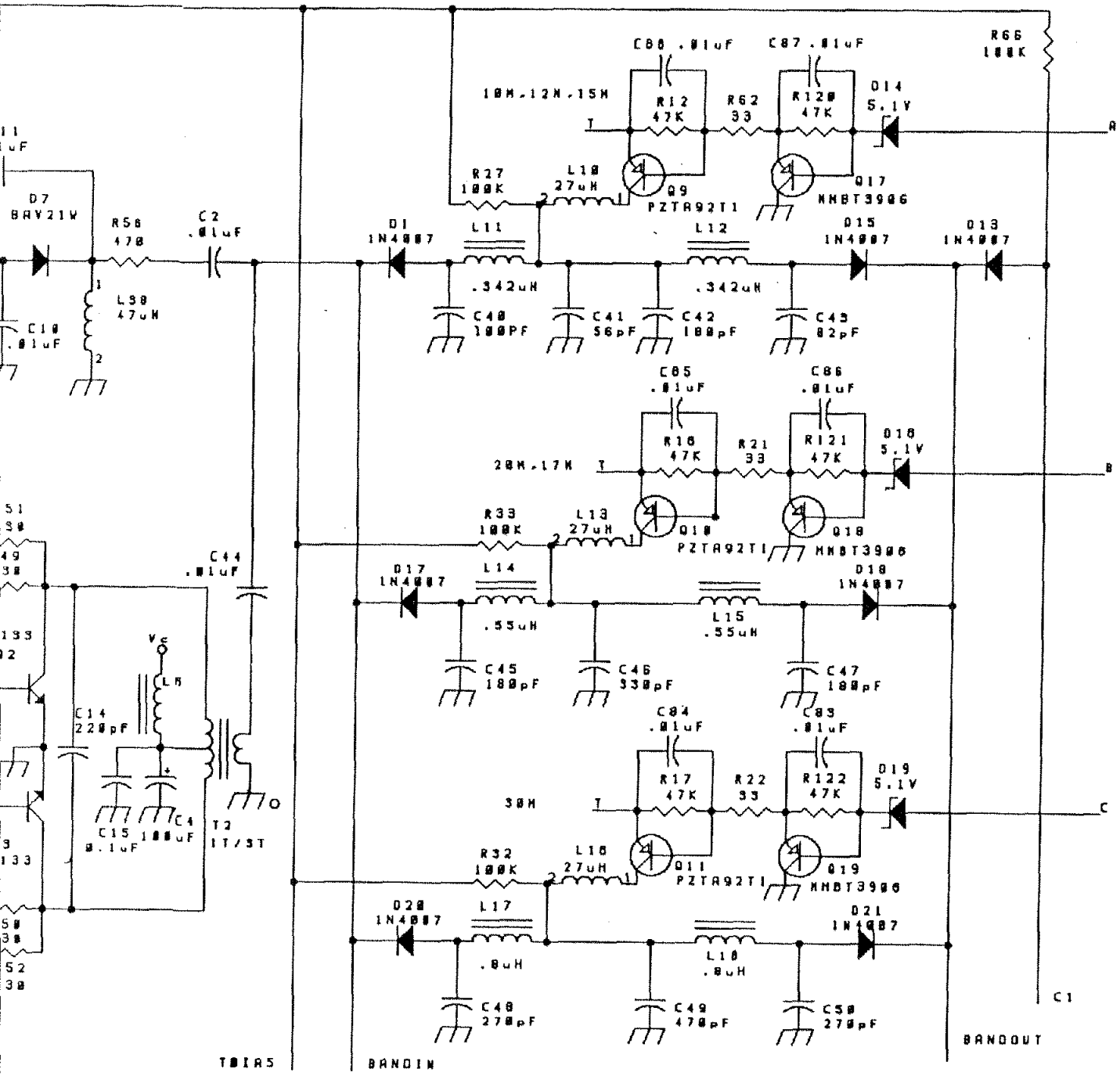
MODEL 516 RF PWB PLL SECTION

Size	Document Number	REV
B	SCH-81930	K2
Date: October 3, 2002	Sheet 5 of 5	


10V
R2 47K
R3 100
R4 100
D2 MMSD914
Q1 MMBT3906
C15 1/20
C152 .1MF
C151 .001MF
Q42 MMBT3904
Q41 MMBT3904
R188
68K
C244 33/35
R10 1.0K
L3 4.7uH
C18 0.47MFD
C5 .001MF
L7 .15uH
C249 .001MF
C3 22PF
C17 22PF
Q4 MMBT3904
R8 10K
R11 10
Q6 MMBT3904
Q3 MMBT3904
R1 10K
R209 330
R207 330
R208 330
R20 330
R14 470
R15 470
C20 .15MFD
R16 4.7K
R18 4.7K
R200 100
D38 BB132
D37 BB132
D35 RLS135
D39 BB132
D40 BB132
L86 4.7uH
C252 18PF
C251 .001MF
R202 1.0K
R212 1.0K
D3 5.1V
C25 .01MF
C10 1/20
U1 MC145170D1
Vpp fV fR PD GND LD Fr Fr
OSCin OSCout REF Fin Din EN CLK Dout
D36 5.1V
U9 NC VCC 14
14.85000 TCXO
GND OUT 7 8
C259 .01MF
C258 .01MF
Y1 14.850
R12 10M
C1 5-30p
C2 18PF
C26 .001MF
C24 .001MF
C23 .001MF
R19 100
R20 100
R21 100
U2
10V
AGND
REF
VCO SEL
DIRTN
CLK
EN
DATA
8PIN
R214 4.7K
Q47 MMBT3904
R213 10K
C263 .01MF
R189 2.2K
REMOVE Y1, R12, C1, & C2 FOR INSTALLATION OF U9.
R125
C137 10PF
C139 .01MF
L46 210S8
C141 560PF
330
C156 .1MF
C157 .001MF
C140 100PF
L47
L48
27uH
.68uH
C143 270PF
C142 100PF
R190 680
Q27 J310
R123 10K
R124 100
C130 .01MF
C27 1.0PF
C28 68PF
L8 21180


A55Y 81932
SPKR
SERIAL
AUX2
AUX1
CV


FUSE 7A
13.8V



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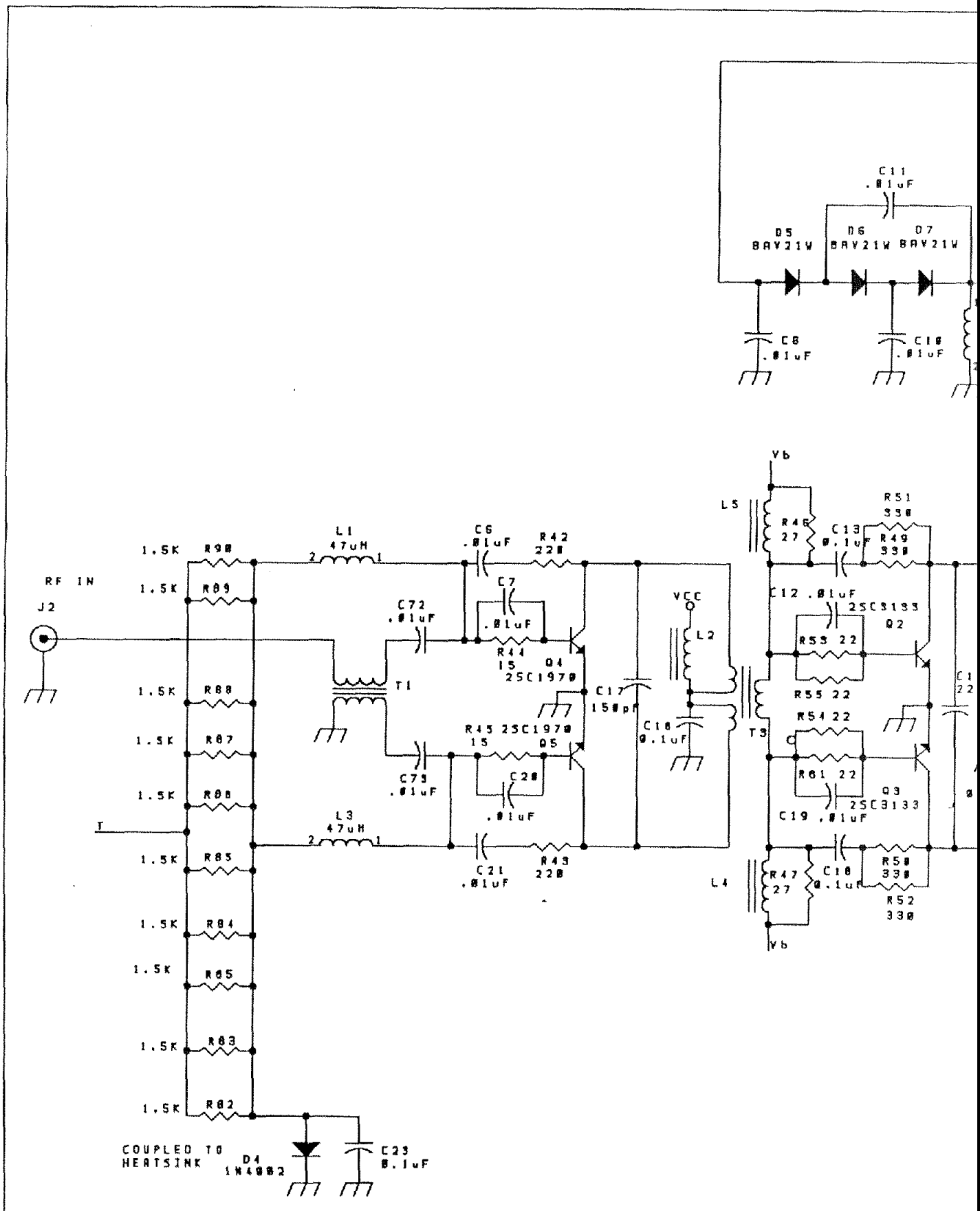
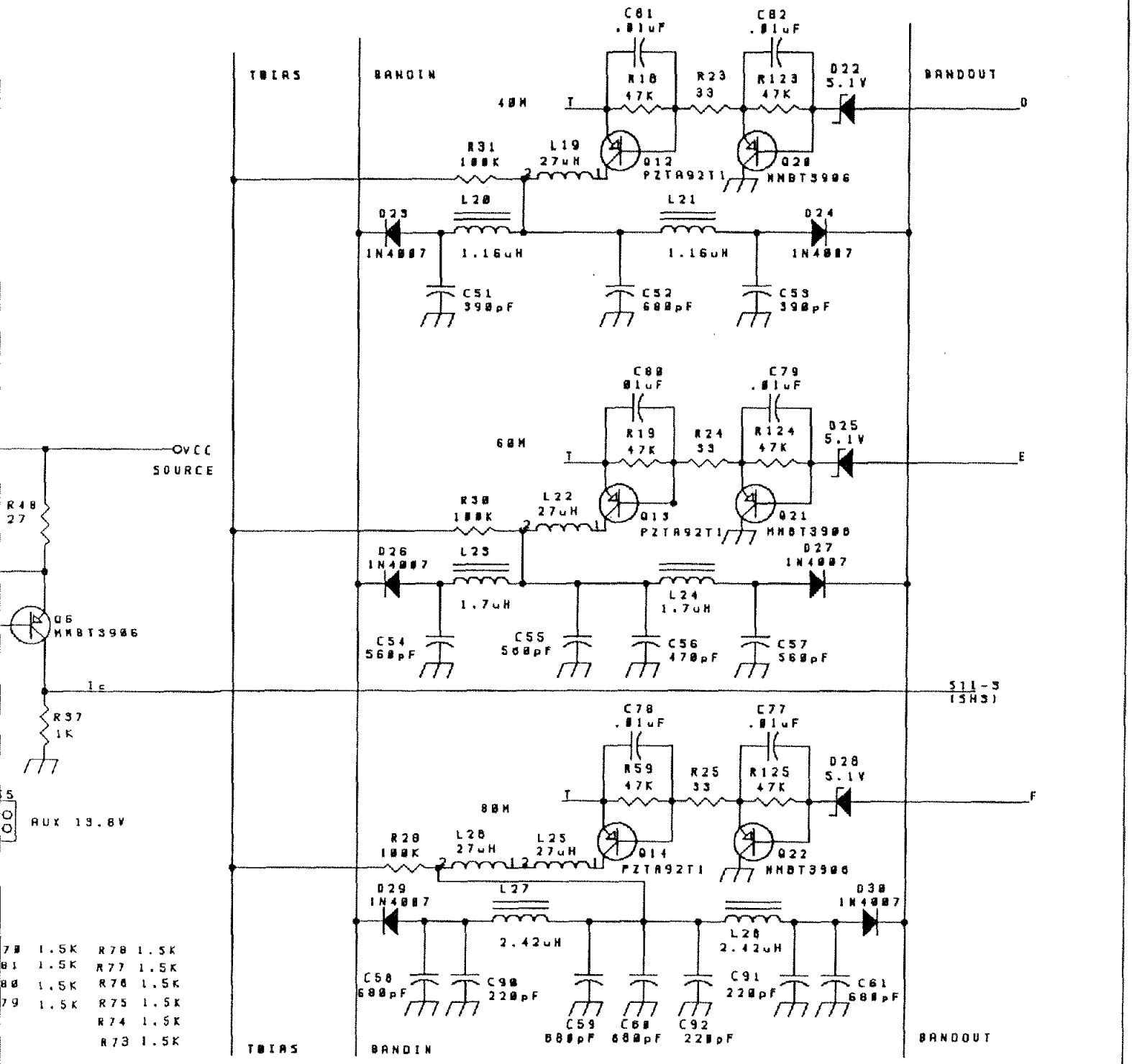
TEN-TEC, INC 1185 DOLLY PARTON PKY SEVIERVILLE, TN 37862 USA AMERICA'S BEST!		
Title ARGONAUT V PWR AMP SEC'N A		
Size B	Document Number SCH-81931A	REV AK2
Date: July 29, 2002	Sheet 2 of 5	


C11
.01uF
D5
BAV21W
D6
BAV21W
D7
BAV21W
C8
.01uF
C10
.01uF
Vb
L5
R46
27
C13
0.1uF
R51
330
R49
330
C12 .01uF
2SC3133
Q2
R53 22
R55 22
R54 22
R61 22
Q3
2SC3133
C19 .01uF
R47
27
C18
0.1uF
R50
330
R52
330
L4
T3
Vb
RF IN
J2
1.5K
R90
1.5K
R89
1.5K
R88
1.5K
R87
1.5K
R86
1.5K
R85
1.5K
R84
1.5K
R85
1.5K
R83
1.5K
R82
L1
47uH
C6
.01uF
R42
220
C7
.01uF
R44
15
Q4
2SC1970
C72
.01uF
T1
C73
.01uF
R45 2SC1970
15
Q5
C28
.01uF
L3
47uH
C21
.01uF
R43
220
C17
150pF
C16
0.1uF
VCC
L2
COUPLED TO
HEATSINK
D4
1N4002
C23
0.1uF



TEN-TEC, INC
1185 DOLLY PARTON PKY
SEVIERVILLE, TN 37862 USA
AMERICA'S BEST!

Title: ARGONAUT V PWR AMP SEC'N B

Size: b | Document Number: SCH-819318 | REV: AK2

Date: July 29, 2002 | Sheet 3 of 5

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OMNI-VII. It's that simple.

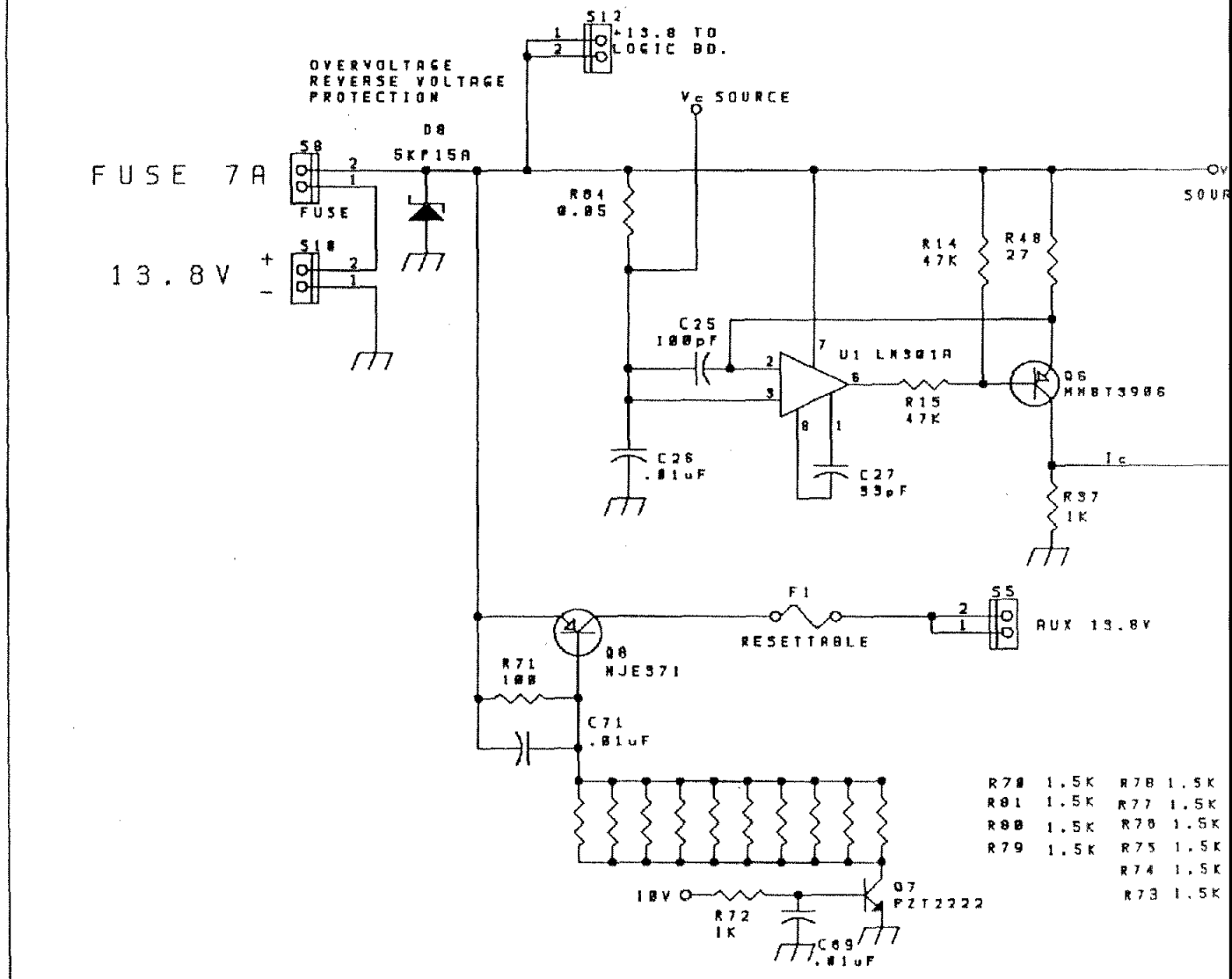
So sit back in your chair and relax. The Omni-VII not only has top of the line receiver performance and everything else you need in a high-end tranceiver -- it's also very easy to use. Spend your time on the air instead of reading the operator's manual. For complete information on the Omni-VII and our Amateur Radio product line, visit our website or call (800) 833-7373 for our current catalog.

Proudly made in Sevierville, Tennessee USA

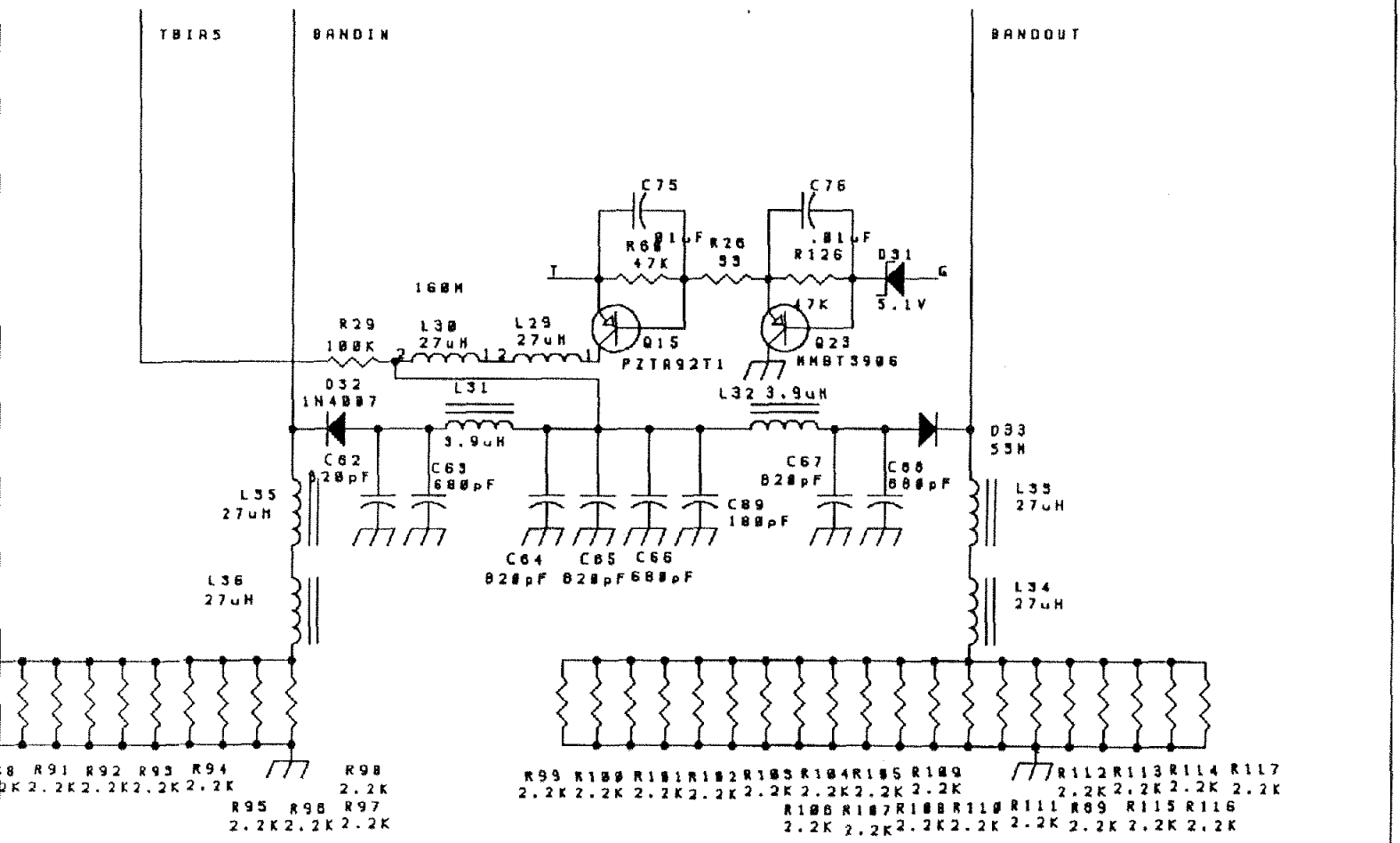
TEN-TEC

www.tentec.com

1185 Dolly Parton Pkwy., Sevierville, TN 37862. Sales: 800-833-7373 M-F 8:00-5:30 (Eastern Time) sales@tentec.com. Office: (865) 453-7172. FAX: (865) 428-4483.
Service: (865) 428-0364 M-F 8:00-5:00 (Eastern Time), service@tentec.com. We accept Visa, MC, American Express and Discover.


S12
+13.8 TO LOGIC BD.
OVERVOLTAGE REVERSE VOLTAGE PROTECTION
Vc SOURCE
D8
5KP15A
S8
FUSE 7A
FUSE
S18
13.8V
+
-
R84
0.05
R14
47K
R48
27
C25
100pF
U1 LM301A
Q6
MMBT3906
R15
47K
C26
.01uF
C27
33pF
Ic
R37
1K
F1
RESETTABLE
S5
AUX 13.8V
Q8
MJE371
R71
100
C71
.01uF
R70 1.5K
R81 1.5K
R80 1.5K
R79 1.5K
R78 1.5K
R77 1.5K
R76 1.5K
R75 1.5K
R74 1.5K
R73 1.5K
18V
R72
1K
Q7
PZT2222
C69
.01uF

A12



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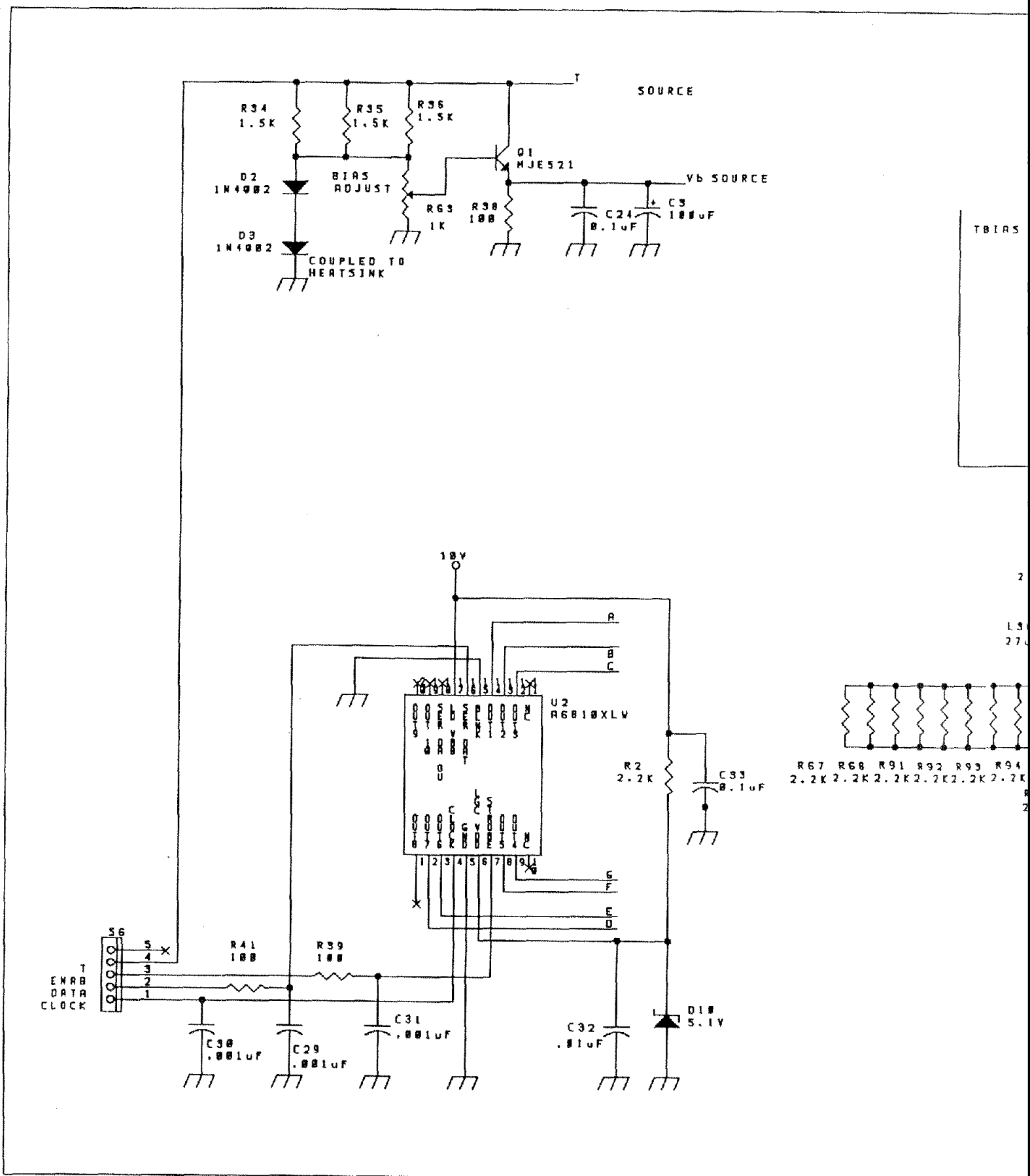
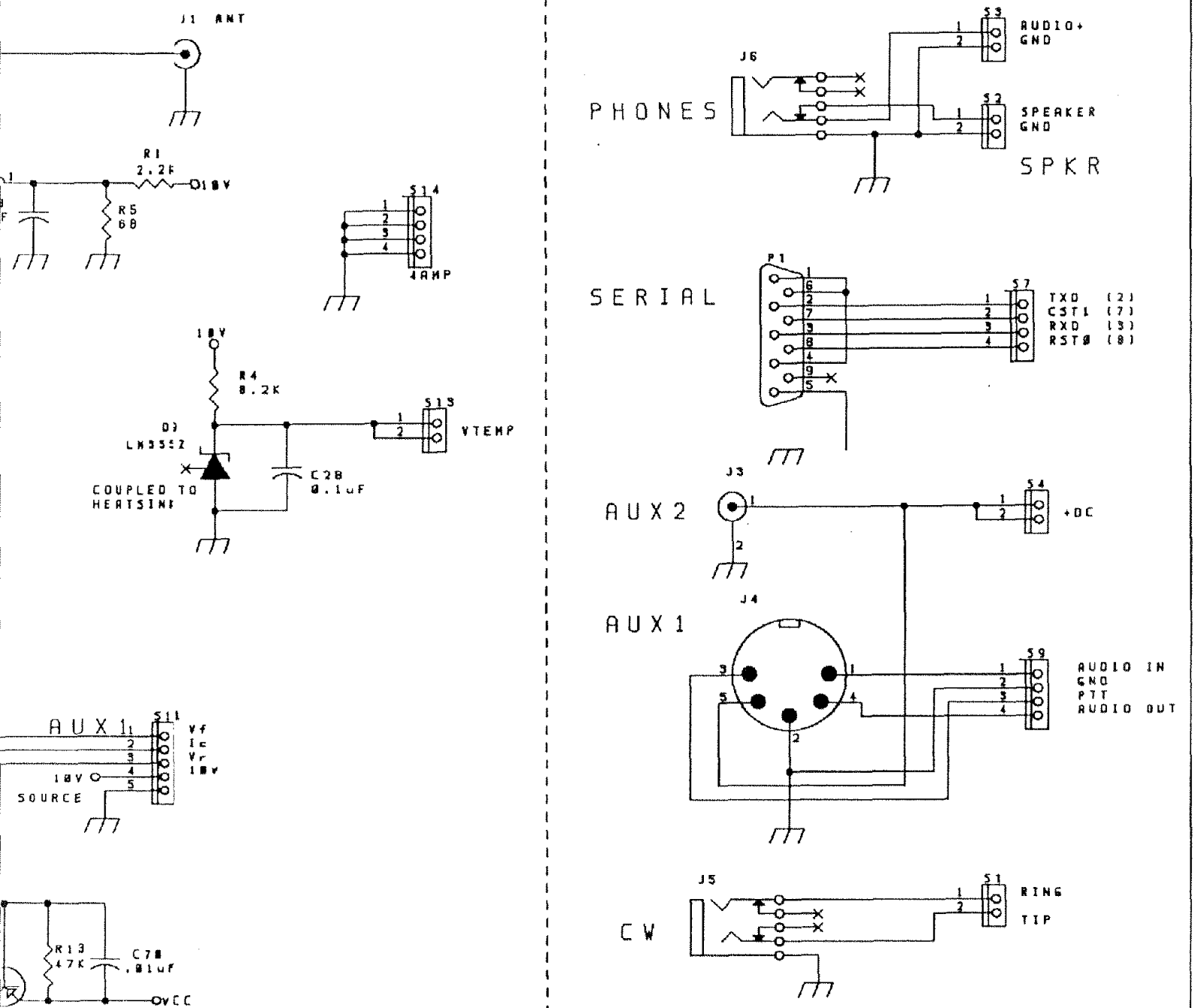
TEN-TEC, INC 1185 DOLLY PARTON PKY SEVIERVILLE, TN 37862 USA AMERICA'S BEST!		
Title ARGONAUT V PWR AMP SEC'N C		
Size B	Document Number SCH-81931C	REV AK2
Date: July 29, 2002	Sheet 4 of 5	


T
SOURCE
R34
1.5K
R35
1.5K
R36
1.5K
Q1
MJE521
D2
1N4002
BIAS
ADJUST
Vb SOURCE
R63
1K
R38
100
C24
0.1uF
C3
100uF
D3
1N4002
COUPLED TO
HEATSINK
TBIAS
10V
A
B
C
U2
A6810XLV
R2
2.2K
C33
0.1uF
R67 R68 R91 R92 R93 R94
2.2K 2.2K 2.2K 2.2K 2.2K 2.2K
G
F
E
D
S6
T
ENAB
DATA
CLOCK
R41
100
R39
100
C30
.001uF
C29
.001uF
C31
.001uF
C32
.01uF
D10
5.1V

A13



THESE PARTS ARE ON ASSY 81932

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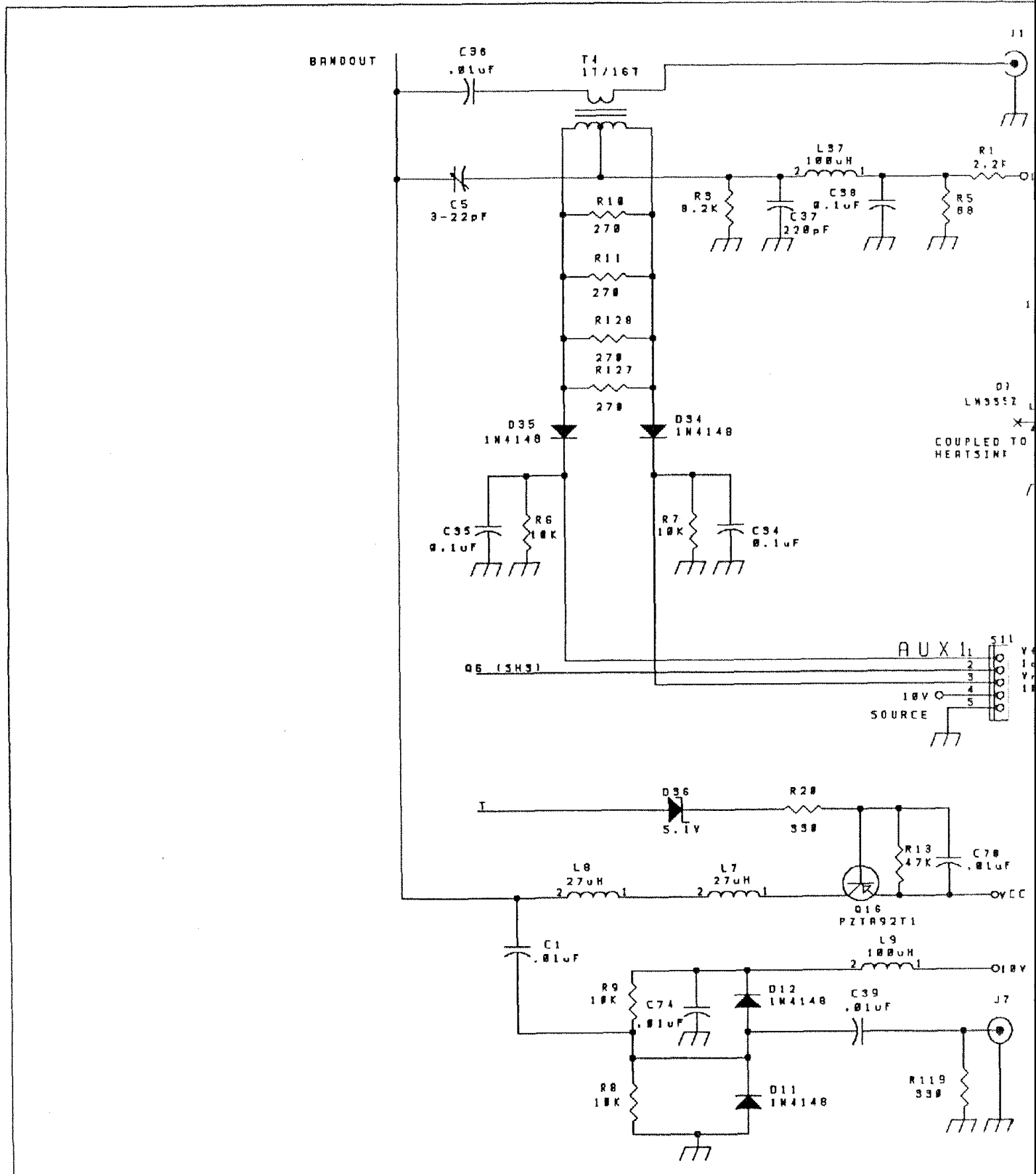
TEN-TEC, INC 1185 DOLLY PARTON PKY SEVIERVILLE, TN 37862 USA AMERICA'S BEST!		
Title: ARGONAUT V PWR AMP SEC'N D & I/O		
Size: B	Document Number: SCH-819310	REV: AK2
Date: July 29, 2002	Sheet 5 of 5	


BANDOUT
C36
.01uF
T4
1T/1CT
J1
L37
100uH
R1
2.2K
C5
3-22pF
R10
270
R3
8.2K
C37
220pF
C38
0.1uF
R5
68
R11
270
R120
270
R127
270
D35
1N4148
D34
1N4148
D3
LN3552
COUPLED TO
HEATSINK
C35
0.1uF
R6
10K
R7
10K
C34
0.1uF
AUX1
Q6 (SH3)
10V
SOURCE
D36
5.1V
R28
330
R13
47K
C78
.01uF
L8
27uH
L7
27uH
Q16
PZTA92T1
VCC
C1
.01uF
L9
100uH
10V
R9
10K
C74
.01uF
D12
1N4148
C39
.01uF
J7
R8
10K
D11
1N4148
R119
330

A14

Ten-Tec, Inc.
1185 Dolly Parton Parkway
Sevierville, TN 37862
Repair Service: (865) 428-0364

LIMITED WARRANTY AND SERVICE POLICY, U.S.A. AND CANADA

Ten-Tec, Inc., warrants this product to be free from defects in material and workmanship for a period of one (1) year from the date of purchase, under these conditions:

1. THIS WARRANTY APPLIES ONLY TO THE ORIGINAL OWNER. It is important that the warranty registration card be sent to us promptly.

2. READ THE MANUAL THOROUGHLY. This warranty does not cover damage resulting from improper operation. Developing a thorough understanding of this equipment is your responsibility.

3. IF TROUBLE DEVELOPS we recommend you contact our customer service group direct at the address or phone number shown above. It has been our experience that factory direct service is expeditious and usually results in less down-time on the equipment. Some overseas dealers do offer warranty service and, of course, have our complete support.

4. EQUIPMENT RETURNED TO THE FACTORY must be properly packaged, preferably in the original shipping carton(s). You pay the freight to us and we prepay surface freight back to you. Canadian customers must have proper customs documentation sent with incoming repair equipment. Duties or fees charged due to improper documenting are the responsibility of the owner of the equipment.

5. EXCLUSIONS. This warranty does not cover damage resulting from misuse, lightning, excess voltages, polarity errors or damage resulting from modifications not recommended or approved by Ten-Tec. In the event of transportation damage, a claim must be filed with the carrier. Under no circumstances is Ten-Tec liable for consequential damages to persons or property caused by the use of this equipment.

6. TEN-TEC RESERVES the right to make design changes without any obligation to modify equipment previously manufactured, or to notify owners of changes to existing equipment.

7. THIS WARRANTY is given in lieu of any other warranty, expressed or implied.

SERVICE OUTSIDE OF THE U.S.A. OR CANADA

Many of our international dealers provide warranty service on the equipment they sell. Many of them also provide out of warranty service on all equipment whether they sold it or not. If your dealer does not provide service or is not conveniently located, follow the procedure outlined above. Equipment returned to us will be given the same attention as domestic customers but roundtrip freight expense, customs and broker fees will be paid by you.

Part no. 74244

Ten-Tec ARGONAUT V Quick Reference

On-Off is on the **AF** control. **Squelch** is on its outside ring.

BAND key steps upward through the amateur bands. **BAND** stores last used **MODE** & **BW.**

Change Modes by pressing the **MODE** key to step through the Modes.

Change Tuning Rate with *Func*> **FAST**: **Display** briefly indicates ***FAS*** **or** ***SLO***.

MULTI control adjusts most button functions & displays settings on the small readout.

Func appears in the **MULTI** Display when you are ready for the *second function* of a key press.

Band **STACK** stores the present **FREQUENCY, MODE, & BW**, and tunes to the last **FREQUENCY, MODE, & BW** stored on the current band.

Go to **VOX** menus with ***FUNC*** >**MODE** and **MULTI** knob:

Turn **VOX** *oFF / oN* with **MULTI;**

Press **MODE** again > **Gain = 0 ... 9** Set *Gain* with **MULTI;**

Press **MODE** again> **Antivox = 0 ... 9** Set *Antivox* with **MULTI;**

Press **MODE** again> **Hang = 1 ... 9** Set VOX *Hang* with **MULTI;** =**QSK Delay** in **CW**

Press **MODE** again> Leave VOX menu.

Go to **Keyer** menus with **KEYR** and **MULTI knob:**

Turn Internal **Keyer oFF** or set *Speed 1 ... Speed 50* with **MULTI;**

Press **KEYR** again to set **Spot** and **CW Offset** from *F400* to *F999;*

Press **KEYR** again to set **CW sidetone** from *Level 1* to *Level 9;*

Press **KEYR** again to set **CW Weighting** from *ratio 50* to *ratio150*. ***r100*** is normal.

Press **KEYR** again to leave Keyer menus.

Set **DSP Bandwidth** by pressing **BW** & adjust **MULTI** from *200* to *3000 (6000 in AM)* Hertz.

LOCK and **UNLOCK** TUNING with *Func* **BW** – no indicator.

Set **RIT** with its key and **MULTI** knob from *2.99* to *–2.99* kHz. Indicator = **RIT**. Hold **RIT** to clear it.

Set **XIT** with *Func* > **RIT** and **MULTI** Knob from *2.99* to *–2.99* kHz.

Indicator = **RIT**.

Switch VFOs with **A/B**. **Switch** between **Memory** and **VFO** with **V/M**

Store VFO to **Memory** by pressing *Func* > **WRITE** and select **Memory #** with **MULTI**. Then press **V/M** to store frequency and return to VFO.

Save SPLIT in **Memory** by pressing **SPLIT** before storing VFO in Memory.

Recall Memory to VFO by pressing *Func* > **WRITE** and select **Memory #** with **MULTI**. Then press **V/M** to store frequency and return to VFO.

Make both VFOs same **A-B**.

Operate Split Frequency by pressing **SPLIT**. Receives on displayed VFO; transmits on inactive VFO.

Set Noise Blanker with *Func* > **NB**. **MULTI** adjusts oFF through 9.

Set RF Attenuator On or Off with *Func* > **ATTN**.

No indicator except for S-meter.

Shift Passband Tuning with **PBT**. MULTI display shows range from *–2.99* to *2.99*. PBT stays ON until you reset it.

Adjust Speech Processor with *Func* >**SP** and **MULTI** from *oFF* through *9*.

Examine Memory Contents: Press **V/M** to light **MEM** in Annunciator. Use **MULTI** to bring up Memory data, then *Func* >**WRITE** to put data in active VFO, or V/M to return to previous VFO setting.

Transmit Metering: While in transmit: Make antenna measurements/adjustments in **CW** with **KEYR** **oFF.** Press and hold key or paddle "dit-side".

Press **V/M** for 0 – 5 Watt **QRP** scale on meter;

Press **A/B** for 0 – 7-Ampere **Collector Current** on S-meter scale;

Press **A-B** for 0 – 25-Watt **Reflected Power** scale on meter;

Press **SPLIT** to read 10 to 25W on power scale as 1.0 to 2.5 **SWR**.

Argonaut V will store your current settings whenever they remain stable for five seconds before powering down.

Part No. 74380
21 October, 2002

Ten-Tec ARGONAUT V Manual Errata

1. On p.10, Section 3.2.6.3: VOX H(ang) is also used to set CW hang time. A setting of 0 in CW mode indicates full break-in (QSK).

2. On p.10, Section 3.2.7: Available filter bandwidths are 200-3000 Hz in CW, USB and LSB, 400-6000 Hz in AM.

Note: The same number of filter bandwidths is available in AM as in CW, USB or LSB. But in AM, IF bandwidth is by definition equal to twice the audio bandwidth. The display always indicates IF bandwidth; hence, each available AM bandwidth is exactly double what would be shown for CW, USB or LSB.

3. On p.15, Section 3.4.2: The **A-B** key is used for reflected power measurement.

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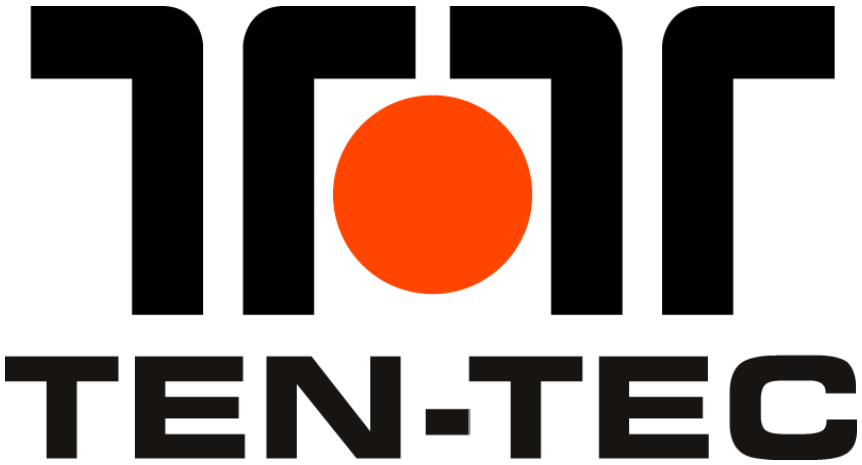
Attention: Argonaut V Manual Addendum: Part Number 74385

The following item supplements information in your instruction manual.

The Argonaut V requires an open microphone to operate VOX. The hand microphone included in the packing kit will work only on PTT with the Argonaut V. The microphone can be modified for VOX operation, please see details on www.rfsquared.com. You may also use the Ten-Tec 705 desk microphone to operate VOX with the Argonaut V.



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Other inquiries – call (865) 428-0364 or email service@tentec.com

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