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PUBLICATION NO. 980698

3351
VXIbus
FREQUENCY STANDARD

RACAL INSTRUMENTS

RACAL INSTRUMENTS INC.
4 Goodyear Street, P.O. Box C-19541, Irvine, CA 92718
Telephone: 714/859-8999, Fax: 714/859-2505

RACAL INSTRUMENTS, LTD.
480 Bath Road, Slough, Berkshire, SL1 6BE, United Kingdom
Telephone: (0)628 604455, Fax: (0)628 662017

RACAL SYSTEMS ELECTRONIQUE S.A.
18 Avenue Dutartre, 78150 Le Chesnay, France
Telephone: (1)3955 8888, Fax: (1)3955 6735

RACAL ELEKTRONIK SYSTEMS GmbH
Frankenforster Strasse 21, 51427 Bergisch Gladbach, Germany
Telephone: 02204 92220, Fax: 02204 21491

RACAL SYSTEMS ELETTRONICA srl
Strada 2 - Palazzo C 4, 20090 Milanofiori Assago, Milano, Italy
Telephone: (02) 5750.1796, Fax: (02) 5750.1828

RACAL

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FOR YOUR SAFETY

Before undertaking any troubleshooting, maintenance or exploratory procedure, read carefully the **WARNING** and **CAUTION** notices.

This equipment contains voltage hazardous to human life and safety, and is capable of inflicting personal injury.

If this instrument is to be powered from the AC line (mains) through an autotransformer, ensure the common connector is connected to the neutral (earthed pole) of the power supply.

Before operating the unit, ensure the conductor (green wire) is connected to the ground (earth) conductor of the power outlet. Do not use a two-conductor extension cord or a three-prong/two-prong adaptor. This will defeat the protective feature of the third conductor in the power cord.

Maintenance and calibration procedures sometimes call for operation of the unit with power applied and protective covers removed. Read the procedures and heed warnings to avoid "live" circuit points.

Before operating this instrument:

1. Ensure the instrument is configured to operate on the voltage at the power source. See Installation Section.

2. Ensure the proper fuse is in place for the power source to operate.

3. Ensure all other devices connected to or in proximity to this instrument are properly grounded or connected to the protective third-wire earth ground.

If the instrument:

- fails to operate satisfactorily
- shows visible damage
- has been stored under unfavorable conditions
- has sustained stress

Do not operate until performance is checked by qualified personnel.

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1.1 INTRODUCTION

The Racal Instruments Model 3351 Frequency Standards are VXIbus compatible modules offering three precision frequency outputs derived from an internal frequency standard. The 3351E contains an oven-controlled ultra-high stability oscillator, and the 3351R contains a Rubidium Frequency Standard.

The 3351 provides output status information to the Slot 0 System Resource Manager of a VXIbus compatible mainframe. No control of the 3351 by the VXIbus is provided. The 3351 conforms to VXIbus System Specification Revision 1.4.

1.2 FEATURES AND CAPABILITIES

- The 3351R and 3351E provide 1 MHz, 5 MHz and 10 MHz sinusoidal outputs with an amplitude of approximately $1.0V_{RMS}$ across a 50Ω load.
- The standard configuration is 10 MHz on Channel 1, 5 MHz on Channel 2 and 1 MHz on Channel 3. Other combinations can be provided by special order.
- The outputs are short circuit proof and are available at front panel mounted BNC connectors.
- A green LED indicator adjacent to each output BNC glows when an output signal is present, and extinguishes if an output fails.
- A green LOCK MONITOR LED on the 3351R front panel indicates when the Rubidium Standard oscillator is under atomic resonance control.
- An interrupt signal is provided to the VXIbus if an output failure occurs, or the Rubidium Standard is not in its "Lock" condition.

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1.3 OPTIONS

1.3.1 Option 01 (1 PPS Output)

Channel 3 output can be replaced with Option 01, a 1 PPS TTL compatible output. A positive going pulse of approximately 200mS in duration, synchronized with the internal frequency standard, is provided. The indicator LED flashes for each occurrence of the output pulse. In the absence of an output pulse, the LED stops flashing, but no error indication is provided to the VXIbus.

1.4 SPECIFICATIONS

Output Characteristics

Number of Outputs	Three
Sinewave Frequencies	1 MHz, 5 MHz and 10 MHz. The standard configuration is 10 MHz on Channel 1, 5 MHz on Channel 2 and 1 MHz on Channel 3.
Level	0.9V to 1.25V_{RMS} across 50Ω
Impedance	50Ω nominal
Protection	Each output will withstand a continuous short circuit and application of reverse power up to 500 mW
Connectors	Front panel mounted BNC Connectors
1 PPS Output	TTL output (74LS) V_{Hmin} 2.7V, -400 µA V_{Lmax} 0.4V, 4 mA Pulsewidth 200 mS
Frequency Accuracy/Stability	All outputs are derived from an internal frequency standard; an oven-controlled ultra-high stability oscillator (Model 3351E) or a Rubidium Frequency Standard (Model 3351R). (See Specifications under 3351E Frequency Characteristics and 3351R Frequency Characteristics)

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3351E Frequency Characteristics

Adjustment Range	Coarse and fine screwdriver operated trimmers accessible through side of module
Coarse	$\pm$ 1 x 10^{-6} minimum
Fine	1 x 10^{-7} minimum range
Setability	1 x 10^{-9}
Stability	$\leq$ 5 x 10^{-10}/day at shipment averaged over 10 days
	$\leq$ 1 x 10^{-8}/month after 3 months $\leq$ 2 x 10^{-7} in the first year
Retrace	$\leq$ 2 x 10^{-8} within 30 minutes $\leq$ 1 x 10^{-8} within 5 hours
Short term stability	5 x 10^{-10}_{RMS} 30 min. after turn-on (1 second measurement time) 5 x 10^{-11}_{RMS} within 5 hours
Temperature	$\pm$ 7 x 10^{-9} with respect to the frequency at 25°C
Harmonics	At least 30dB below the output level (50 Ω load)

3351R Frequency Characteristics

Warmup	$\leq$ 4 minutes to reach 1 x 10^{-9} at 25°C ambient
Stability	$\leq$ 4 x 10^{-11}/day after 1 hour stabilization at 25 $\pm$ 3°C
	$\leq$ 5 x 10^{-11}/month after 1 month of continuous operation
Accuracy	1 x 10^{-9}/year
Retrace	2 x 10^{-11} after 1 hour power on at 25°C and up to 48 hours power off
Trim Range	$\pm$ 1 x 10^{-9} minimum Screwdriver operated trimmer accessible through side cover of module.

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Setting Resolution	1×10^{-11}
Harmonics	At least 28dB below the output level (50 Ω load)

General

Size	VXIbus C-size, 2 slots, message-based
Weight	6 pounds, maximum

Temperature Performance

3351E Operating Temperature	0°C to + 50°C
3351R Operating Temperature	-0°C to +55°C
Storage Temperature	-40°C to +70°C

Power Requirements

3351E	+5V:3.0A -24V:0.1A +5VSTDBY:0.75A
3351R	+24V:2.0A +5V:2.3A -24V:0.1A
Cooling Requirements	4.0 Liters at 0.5mm H_20

Options

Option 01	1 PPS Output TTL compatible (Replaces one standard output)

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VXIbus Compatibility

VXIbus	1.4, Message-based module Dual Slot, C-sized
Manufacturer's I.D. Number	4091 (Racal Instruments Inc.) The Model Number is 3351.

1.5 SAFETY

Refer to:	**"FOR YOUR SAFETY"** page preceding the Table of Contents. Follow all **NOTES, CAUTIONS AND WARNINGS** to ensure personal safety and prevent damage to the instrument.

1.6 PRODUCT SUPPORT

Racal Instruments supports the Model 3351 with Product Engineering, Service and Parts Departments. A complete listing of service centers and field representatives is provided on the last two pages of this manual.

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2.1 INTRODUCTION

This section describes the unpacking and inspection, reshipment, installation and environmental requirements of the Model 3351.

2.2 UNPACKING AND INSPECTION

1. Prior to unpacking, check the shipping carton exterior for any signs of damage. Note all irregularities on the shipping bill.

2. Remove the instrument and preserve the packaging.

3. Inspect the instrument for defects or damage. Immediately notify the carrier if damage is apparent.

4. Before use, have qualified personnel perform a safety check.

2.3 RESHIPMENT INSTRUCTIONS

1. Use the original packaging when returning the 3351 to Racal Instruments for calibration or servicing. The original shipping carton and packaging will provide support for safe reshipment.

2. Wrap the module in plastic sheeting and use plastic spray foam to surround and protect the instrument if original packaging is not available.

3. Reship in the original or a new carton.

2.4 LOGICAL ADDRESS SETTING

The Logical Address is settable via an 8-position DIP switch on the Interface daughter card. Carry out the following procedure when changing the Logical Address.

1. Remove the 16 flathead screws that secure the right side cover (as viewed from the front). Remove the cover from the module and expose the Interface daughter card at the rear of the module.

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2. To set the Logical Address, set switch S1 on the Interface daughter card to the binary equivalent of the logical address selected. Logical addresses between 1 and 255 (FF_{HEX}) are permitted. The OFF switch positions on S1 correspond to binary 1. The 3351 is shipped from the factory with the logical address set to 03.

3. Replace and secure the cover using the 16 flathead screws.

2.5 VXIBUS INTERRUPT HANDLER SETTING

One programmable interrupt line is provided on the 3351 module. This line is assigned by using the assign interrupter line word serial protocol command (See page 183 in Rev. 1.4 of the VXIbus Specifications). The interrupt level is set to 1 at the factory.

2.6 STANDBY POWER

When the warmup period required to obtain a specified frequency accuracy cannot be provided, or the best long term stability is required, a standby power source must be applied during periods when VXIbus system power is shut down.

2.6.1 3351E Standby Power

Standby power for the 3351 is provided by a +5V STDBY power supply connected to the VXIbus system connector, P1. The oven-controlled oscillator and frequency multiplier PCB require a peak current (during warmup) of 750 mA, and approximately 350 mA after warmup at an ambient temperature of +35°C. A relay internal to the 3351 automatically switches oscillator power to the +5V STDBY line when normal +5 VDC VXIbus power is shutdown.

2.6.2 3351R Standby Power

Standby power for the Rubidium Frequency Standard is +24V DC nominal (23 VDC-30 VDC). A 2-pin (twin ax) front panel connector is provided to connect an external power source to the rubidium oscillator when normal +24 VDC VXIbus power is shutdown. A peak current of 2.0 A is required during warmup, and approximately 420 mA after warmup at an ambient temperature of +25°C. Isolation diodes in the 3351 automatically switch the Rubidium Frequency Standard to standby power when normal +24 VDC VXIbus power is shut down, and protects the rubidium standard from an accidental reverse application of 24V standby power.

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CAUTION

Observe proper voltage polarity and amplitude when applying 24 DC standby voltage. The positive terminal is on the right-hand when viewing the module from the front. The left-hand terminal is ground.

2.7 OUTPUT GROUNDING

The 3351 is shipped from Racal Instruments with the ground side of each output connected to the ground plane via soldered jumpers, W7, W8 and W9 on the printed circuit board. W7 connects Channel 1 to ground, W8 connects Channel 2 to ground, and W9 connects Channel 3 to ground. The outputs can be isolated from the ground plane and each other by removing W7, W8 and W9. Removal of these jumpers allows independent or common grounding of the outputs at the load.

WARNING

Removal of W7, W8 or W9 can create a potential shock hazard. If a difference of potential exists between the VXIbus ground and the ground or low side of the load, this potential will be present on the metal shell of the BNC output connector.

2.8 INSTALLATION

Prior to installation, inspect the module. Pay particular attention to connectors P1 and P2 on the rear of the module to ensure there are no bent, damaged or missing pins on any connectors. Repair damage before proceeding.

To install the Model 3351 in a C-size VXIbus mainframe, use the following procedure:

1. Verify that the 3351 has rear connector P1 oriented to mate with the corresponding connector on the mainframe backplane.

2. Align the 3351 with the guides for the slot selected, and slide the 3351 into the mainframe using a firm even pressure. Push the module home to connect the 3351 to the mainframe.

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NOTE

Poor mechanical alignment of rear connectors P1 and P2 may require the 3351 to be reseated in the VXIbus mainframe. Do NOT use undue force to seat the module.

3. Secure the 3351 to the mainframe with the captive screws from the front panel.

4. To remove the 3351 from the VXIbus mainframe, power down the mainframe and release the captive screws. Use the plastic levers on the top and bottom edges to eject the 3351. Pull the module along the guides provided, and out of the mainframe.

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3.1 INTRODUCTION

This section defines the front panel features and the power-up procedure.

3.2 FRONT PANEL FEATURES

Reference	Item	Description
1	**FAIL LED**	Glows **RED** during power-up self-test, and is extinguished upon successful completion.
2	Output **LED**	Separate output indicator for each channel. Glows **GREEN** when a signal is present at the corresponding Channel output connector.
3	Output BNC Connector	Each BNC connector provides a sinusoidal output at a frequency of 1, 5 or 10MHz, synchronized to an internal Frequency Standard. (Optional 1 PPS available on channel 3.)
4	+24 VDC Standby Voltage Input Connect (3351R only)	Two-pin connector for external 24 VDC standby voltage to Rubidium Frequency Standard. Left-hand pin is ground. Right-hand pin accepts +24 VDC.
5	Rubidium Standard Lock Monitor **LED** (3351 only)	Glows **GREEN** when the oscillator in the Rubidium Frequency Standard is under atomic resonance control. Normally occurs approximately four minutes after power-up. **LED** does not function when normal VXI power is OFF and external 24 VDC standby voltage is powering the Rubidium Standard.

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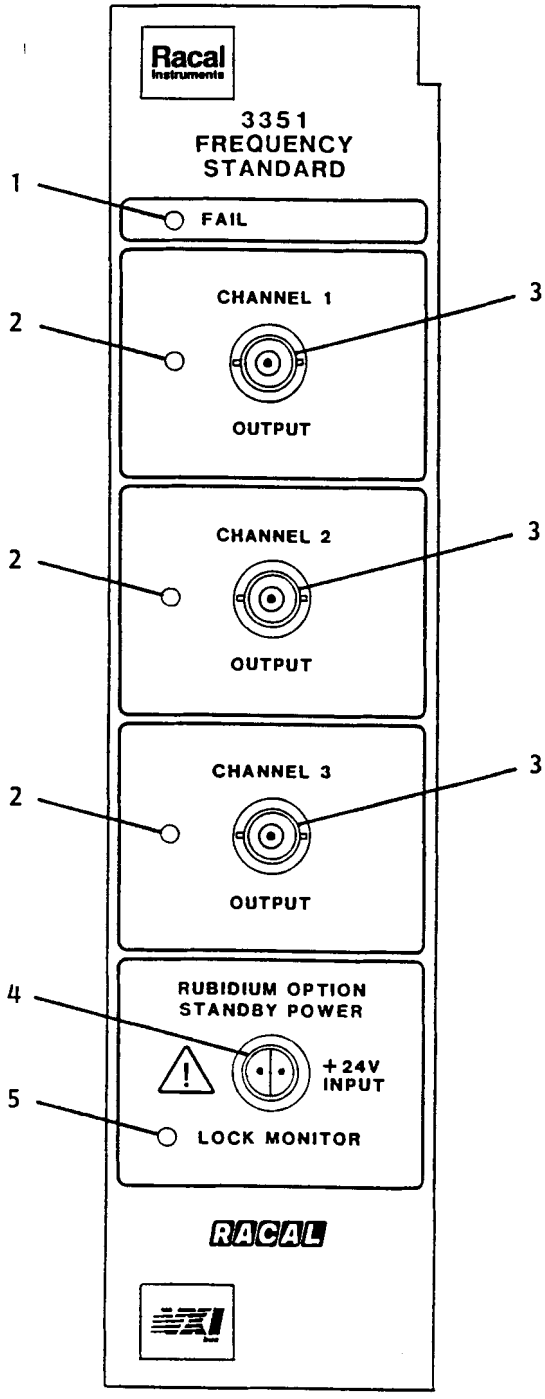


Figure 3-1, Front Panel Features

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3.3 POWER-ON INITIALIZATION, SELF-TEST AND FREQUENCY LOCK

During power-on, the interface waits up to four seconds for the BLOCK/ERROR* signal to go high. If the BLOCK/ERROR* signal does not go high within four seconds, the interface continues with an orderly power-up but generates an interrupt. If the BLOCK/ERROR* signal goes high during power-on, a normal power-up occurs and no interrupt is generated.

An interrupt is generated when the BLOCK/ERROR* signal changes from high to low. This occurs when lock is lost or when no output signal is detected. The interrupt STATUS/ID word generated is "01xx" (in hex), where xx is the logical address of the instrument.

An interrupt also is generated when the BLOCK/ERROR* signal changes from low to high. This occurs when lock is regained or when the output signal is again detected. The interrupt STATUS/ID word generated is "02xx" (in hex), where xx is the logical address of the 3351.

NOTE

These interrupts are user defined EVENTs 1 and 2. See Appendix E.4 in Revision 1.3 of the VXIbus specification. These EVENTs can be enabled and disabled using the word serial command "Control Event". See Control Event in Appendix E.1 in Revision 1.4 of the VXIbus Specification for further information.

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3.4 SOFTWARE COMMANDS

The 3351 is a VXIbus message-based module which uses Word Serial Protocol to communicate status and error information to the Resource Manager.

3.4.1 CAL("*string*");

Syntax: *CAL("string":);*

Definition: This command saves any printable *ASCII string* into non-volatile memory. Although it is intended for storing calibration information, it can store any string. For example, it can store the date calibration was last done, and who performed the calibration. The command line is limited to 99 characters. This effectively limits the *string* to 91 characters.

Example 1:

CAL("02/27/91"); stores the date 02/27/91 into non-volatile memory.

NOTE

This string can be enclosed in either single or double quotes. This allows the other mark to be used in the string.

Example 2:

CAL("Station one's standard");

Example 3:

CAL('Station "ONE" standard');

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3.4.2 CAL?();

Syntax: *CAL?();*

Definition: This command recalls the string stored in non-volatile memory. An EOI is returned with the last character of the string.

NOTE

If CAL('"'); is sent (i.e., no space between'"'), a null string is stored. When a null string is recalled, the 3351 software will actually return a space with the EOI.

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3.4.3 STATE?();

Syntax: *STATE?();*

Definition: This command returns the current state of the BLOCK/ERROR* signal. A "1" is returned if the 3351 is in lock and no error is detected. A "0" is returned if the 3351 is not in lock or an error is detected. An EOI is returned with the result.

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3.5 POWER-UP

1. Power-up the mainframe. Ensure the **FAIL LED** on the front panel lights and then extinguishes after a few seconds to show the module has passed its power-up self-test.

2. Verify the green **LED** output indicators are **ON** to indicate the presence of an output signal. If Option 01 is installed (1 PPS Output), the Channel 3 output **LED** will light momentarily each time an output pulse is present.

3. If the module is a 3351R, ensure the green Lock Monitor **LED** lights after approximately four minutes of operation. If the module is a 3351E, the Lock Monitor **LED** will remain off. The 3351 is now ready for use.

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4.1 INTRODUCTION

This section contains the theory of operation for the Model 3351 based on block diagrams shown in Figures 4-1 and 4-2, and the schematics found in Section 6 of this manual.

When an integrated circuit package contains more than one circuit, suffix letters are used to distinguish them (e.g. UIA). If it is necessary to identify a specific pin of an IC, the reference designator with a suffix letter is followed by a hyphen and then the pin number (e.g. UIA-7).

4.2 FUNCTIONAL BLOCKS

The 3351 contains two major functional blocks.

- Frequency Generation/Distribution
- Error Detection

4.2.1 Frequency Generation/Distribution

The frequency generation/distribution block (Figure 4-1) contains either a Rubidium Frequency Standard (3351R) or Ovenized Oscillator (3351E), signal conditioning, frequency dividers, filters, three output amplifiers, error detection circuits, power supply filters and -15VDC regulator. The frequency standard outputs are 10 MHz sinusoids which are passed through a signal conditioning section for conversion to TTL logic levels required by the 2 and 10 frequency dividers. The resulting 10, 5 and 1 MHz TTL level signals are applied to low-pass filters to remove all frequency components except the fundamental, and provide low distortion sinusoidal inputs for the output amplifiers. Any one of the three frequencies available at J6-J14 can be connected to an output amplifier via a soldered coaxial cable. The three output amplifiers are identical, each consisting of a cascade connected wideband amplifier with a transformer coupled output. The overall gain of each amplifier is approximately 7 when loaded with 50Ω. The outputs at J18-J20 are routed to front panel BNC connectors with coaxial cables.

4.2.2 Error Detection

The error detection block (Figure 4-2) monitors the output signal amplitude at the primary of each output transformer, and provides a TTL logic output to the controller board if an output amplitude drops below a specified level. (See Figure 4-2). The 3351R error detection circuit also includes an RLOCK signal from the

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rubidium standard to indicate when the oscillator is operating under atomic resonance control. An output error signal is generated whenever the rubidium standard is not in a "LOCK" condition.

The 1 PPS output option replaces the output on CHANNEL 3, and is discussed in Section 4.8.

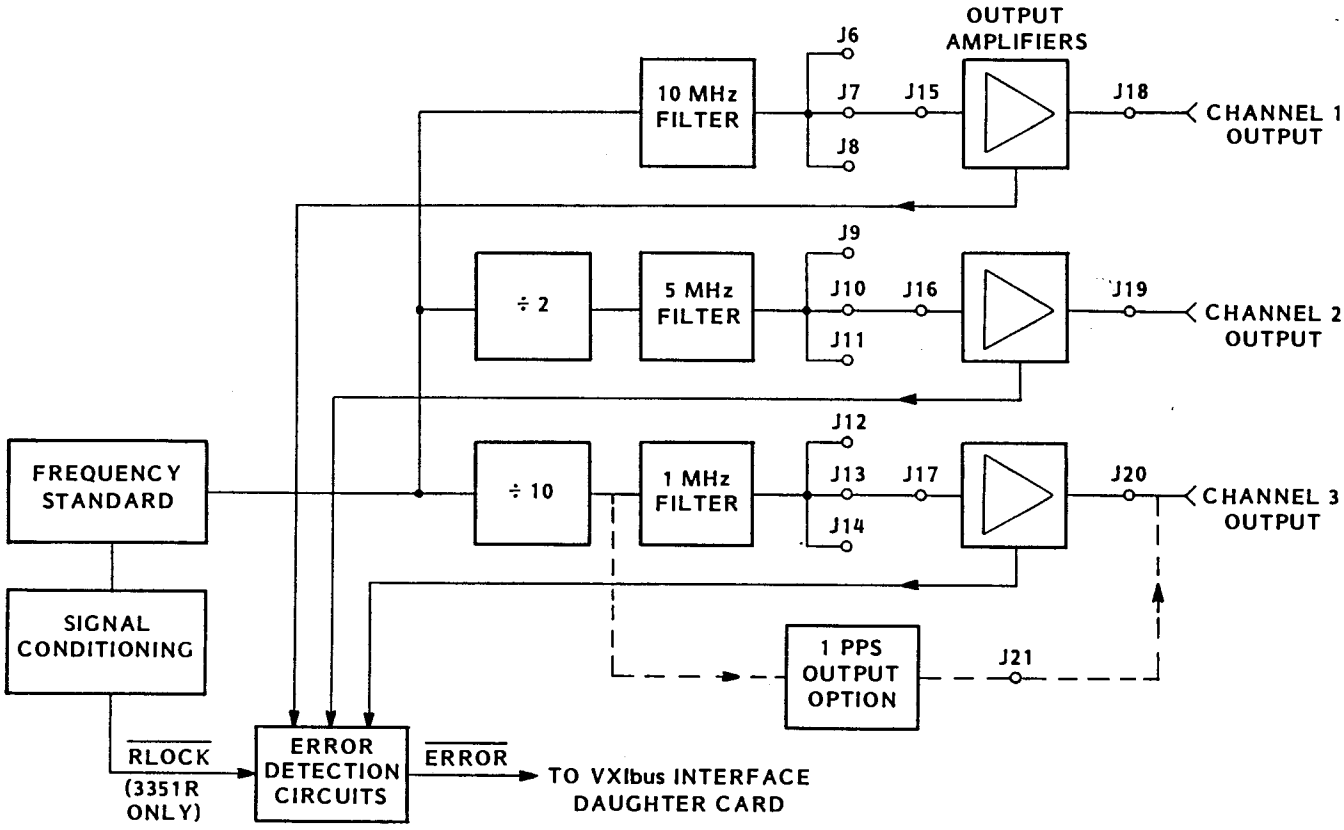


Figure 4-1, Frequency Generation/Distribution Block Diagram

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4.3 POWER SUPPLIES

DC power is supplied to the 3351 by the VXIbus backplane. +5V and -24V are used by both versions of the 3351; +24VDC is required by the rubidium standard in the 3351R, and +5V STDBY by the oven-controlled oscillator in the 3351E (Table 4.1).

Table 4.1, Power Supplies

POWER SUPPLIES	
+24VDC	Filtered by L8,L9,C22-C25
-24VDC	Filtered by L11,C3,C4,C12; regulated by U2 to provide -15VDC
+5VDC	Filtered by L10,L12,C1,C2,C13,C14 before being used by the circuits

4.3.1 3351E Frequency Standard

The frequency standard used in the 3351E is an oven-controlled ultra-high stability oscillator with a 5 MHz sinusoidal output. A frequency doubler circuit (see Schematic 431822) converts the oscillator output to 10 MHz. The 5 MHz oscillator/oven assembly and attached frequency multiplier circuit are powered by +5VDC from power relay K1. Filtered +5VDC is applied across the coil and to the normally open contact of K1; +5V STDBY is applied to the normally closed contact of K1. When +5V is present on the VXIbus backplane, K1 is energized and the filtered voltage is applied to the oscillator/multiplier assembly through J5/P5-1. When +5V is not present on the VXIbus backplane, K1 de-energizes and connects the +5V STDBY line from the VXIbus backplane to J5/P5-1. The 10 MHz output of the frequency multiplier circuit is applied to the input of a buffer stage (Q2) through J5/P5-4.

4.3.2 3351R Frequency Standard

The 3351R contains a Rubidium Frequency Standard with a 10 MHz sinusoidal output. The internal heater and voltage regulator for the rubidium oscillator are powered by +24VDC. +24VDC from the VXIbus backplane is filtered by L8, L9 and C22 - C25. The filtered +24VDC is applied to the rubidium standard through isolation diode CR2. +24VDC standby power is applied to the rubidium standard via a 2-pin front panel connector through isolation diode CR1. CR2 prevents the application of standby voltage to the backplane power supply. CR1 prevents the

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application of backplane voltage to the +24V standby power supply and protects the rubidium standard from accidental reversal of the +24V standby voltage. The 10 MHz output of the rubidium standard is applied to the input of a buffer stage (Q2) through J22.

4.3.3 3351R Rubidium Standard Lock Monitor

The LOCK MONITOR LED (DS4), visible through a hole in the front panel, is controlled by the LOCK MONITOR output of the rubidium standard. The LOCK MONITOR output goes low approximately four minutes after +24DC power is applied to the rubidium standard, and is applied to the non-inverting input of comparator UIA through CR13. CR13 protects the input of UIA from damage when the rubidium standard is operating on standby power, and +5VDC to the comparator is off. The inverting inputs of UIA and UIB are biased to approximately +2.5V by R1 and R2. The output of UIA, RLOCK, goes to a TTL logic low level when the LOCK MONITOR output is low. RLOCK is applied to the inverting input of UIB and one input of U3A. A logic low input to UIB drives the output of UIB high, turning Q1 on and illuminating DS4. U1, DS4 and associated circuitry are still operational when the rubidium standard is not installed (i.e., Model 3351E). In this case, R9 pulls the input of U1A high, turning DS4 off and setting RLOCK high. Jumper W6 is installed in the 3351E to provide a logic high output at U3A-3, independent of the state of RLOCK.

4.4 SIGNAL CONDITIONING

4.4.1 Sinusoidal Signal

The output waveform of either frequency standard is a 10 MHz sine wave. This sinusoidal signal is capacitively coupled through C27 to an emitter-follower stage consisting of Q2, R50, R51, R55, and R56. The emitter-follower stage buffers the frequency standard output from the following stage that converts the sine wave signal to TTL logic levels.

The sinusoidal signal at the emitter of Q2 is coupled through C31 and R57 to a waveform shaping stage consisting of Q3, CR3, R58 and R59. Negative-going half cycles of the sine wave input are clipped by CR3 and turn Q3 off. Q3 is turned on during the positive excursion of the sine wave input. The waveform (at the collector of Q3) switches between approximately 0 and +5V and is applied to the input of a TTL buffer U4A. The output of U4A is coupled to other sections of U4 that further buffer the 10 MHz TTL signal prior to divide-by-2, divide-by-10 and 10 MHz filter circuits.

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4.5 FREQUENCY DIVIDERS

5 MHz and 1 MHz TTL square waves are generated by dividing the 10 MHz signal by 2 and 10, respectively.

The buffered 10 MHz TTL signal is applied to the clock input of U5-B from the output of U4C. U5-B is configured to divide the 10 MHz signal to a 5 MHz square wave. The 5 MHz square wave at U5B-9 is applied to the buffered low-pass filter where it is converted to a low distortion 5 MHz sine wave.

The buffered 10 MHz TTL signal is also applied to a divide-by-10 circuit, U6, from the output of U4B. U6 is configured to provide a 1 MHz square wave at U6-12. This signal is applied to a low pass filter and converted to a low distortion 1 MHz sine wave.

4.6 1 MHz, 5 MHz, AND 10 MHz FILTERS

Low distortion sine wave signals of 1 MHz, 5 MHz and 10 MHz are derived from the TTL level signals by passing the square waves through elliptic low-pass filters. The filter outputs are then coupled to emitter-follower stages to provide low impedance distribution points for each frequency. Each filter is 3 dB down just above the fundamental frequency (1 MHz, 5 MHz or 10 MHz), and is more than 80 dB down at the 3rd harmonic.

4.7 OUTPUT DRIVER AMPLIFIERS

One of the filter outputs is routed to J15 and coupled to the base of Q14 through C93. The bases of Q14 and Q13 are biased by R151, R153 and R155 from the -15V supply. The base of Q13 is at approximately -10VDC and the base of Q14 at approximately -12.5V. The amplitude of the sine wave input to Q14 is 600-650 mV_{p-p}. This signal is amplified by Q14 and applied through R154 to the emitter of cascade transistor Q13. The signal is further amplified by Q13 and applied across the primary of output transformer T1 and R152. The signal at the secondary is coupled to the CHANNEL 1 output connector through C95 at an amplitude of approximately 1.0V RMS.

CHANNEL 2 and CHANNEL 3 output amplifiers are identical to CHANNEL 1.

4.8 OUTPUT ERROR DETECTION

The signal at the primary of T1 is coupled through C138 to a voltage doubling detector consisting of R158, CR4, CR5, C97 and R194. A positive DC voltage appears across C97 and R194 when an output signal is present at the primary of T1. The detected voltage is compared with a reference voltage VR of

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approximately 1.6V derived from the +5V supply and voltage divider R16 and R17. The comparison is made by comparator U7C. When there is adequate signal at the primary of T1, the comparator output is held low, and current is supplied to front panel LED indicator, DS1, through limiting resistor R5.

CHANNEL 2 and CHANNEL 3 output detectors are identical to CHANNEL 1.

4.8.1 Outputs

The outputs of U7C, U7B and U7A are routed to one input of U7D via the wired-OR gate consisting of CR10-12. If the signal level at the primary of T1, T2 or T3 drops below a specified amplitude, the voltage at the input of U7D is pulled below the reference voltage on U7D-11, and the output of U7D is held low providing an output error signal OPERROR to one input of NAND Gate U3B. The other input to U3B is RLOCK from U3A-3.

4.8.2 RLOCK

The RLOCK signal from the rubidium standard (3351R) or a fixed logic 1 from the 3351E is combined with the OPERROR signal at U3B. If either signal goes low, the output of U3B goes high turning Q19 on and providing an error signal, ERROR, to the controller board. This error signal generates an interrupt signal at the VXIbus backplane.

4.9 1 PPS OUTPUT (OPTION 01)

The 1 PPS output replaces the normal output on Channel 3, and consists of three cascaded dual decade counters, U8, U9 and U10. The clock pulse input of one half of U8 is a 1 MHz square wave from the output of divide-by-ten counter U6, and is connected via jumper W5. The 1 MHz input is divided by 10^6 through U8, U9 and U10 and the final output appears at $U10^{-9}$ as a 200 mS TTL level pulse that repeats at a 1 Hz rate. The 1 PPS output is routed to the CHANNEL 3 output connector and to U3D-13. The output of U3D is connected to CHANNEL 3 output LED (DS3) through jumper W2. Jumper W4 is also installed to disable one input of the diode OR-gate controlling comparator U7-D. Thus, a failure of the 1 PPS output will not cause an output error signal OPERROR at U7D-13. Jumpers W1 and W3 are removed from the circuit to disconnect the CHANNEL 3 output detector (U7A) from DS3 and CR10.

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5.1 INTRODUCTION

This section contains information and procedures to verify performance of the 3351, and to adjust the internal frequency standard.

5.2 TEST EQUIPMENT REQUIRED

Test equipment required is listed in Table 5.1. Suggested models are recommended, but other instruments having the required specifications may be substituted.

Table 5.1, Test Equipment Required

Equipment Type/Suggested Model	Required Parameters
RF Millivoltmeter/Racal Instruments 9303	To measure 1.00V_{RMS} nominal at 1 MHz, 5 MHz and 10 MHz. Input Impedance 50Ω.
Spectrum Analyzer/Hewlett-Packard 8568	Resolution sinewave outputs bandwidth 1 kHz to 100 kHz. To measure relative power levels in the range from +15 dBm to -60 dBm over a frequency range from DC to 100 MHz for sinewave outputs.
Frequency Standard/Racal Instruments 9480/FRK	Rubidium Oscillator 10 MHz output, 1V_{RMS} nominal, ± 5 parts in 10^{11} accuracy to calibrate Rubidium Oscillator.
Frequency Standard/Racal Instruments 9480/FRS	Rubidium Vapor Frequency Standard, 10 MHz output, 1V_{RMS} nominal, ± 1 part in 10^{10} accuracy to calibrate ovenized standard.
Frequency Counter/Racal Instruments 2251	To measure 1 MHz, 5 MHz and 10 MHz at a level of 1V_{RMS} with 1 part in 10^{10} resolution.
Digitizing Oscilloscope/Hewlett-Packard 54502	To measure amplitude and pulsewidth of 5V 1 PPS signal.
BNC Adapters and Connectors (as required)	---------
50Ω Load	BNC, with feedthrough for monitor
50Ω Coaxial Cables	BNC-to-BNC, various lengths

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5.3 PERFORMANCE VERIFICATION TESTS

5.3.1 Output Level and Frequency

1. Connect the RF Millivoltmeter and Frequency Counter to monitor the CHANNEL 1 output and provide a 50Ω load.

2. Verify the output level on the millivoltmeter is between 0.9V and 1.25V, and the frequency is 1 MHz, 5 MHz or 10 MHz within 1 part in 10^9, as determined by the internal wiring of the 3351.

3. Repeat the above procedures for CHANNEL 2 and CHANNEL 3 outputs.

5.3.2 Harmonic Distortion

1. Connect the Spectrum Analyzer to one of the outputs.

2. Set the Spectrum Analyzer to the conditions given in Table 5.2 relating to the output frequency of the channel being tested.

3. Ensure all harmonic signals are at least 30 dB below the 3351E output level (28 dB below the 3351R output level). The frequency span can be increased to observe higher harmonics.

4. Repeat the above procedures for other outputs.

Table 5.2, Spectrum Analyzer Settings (Harmonic Test)

Spectrum Analyzer Setting	3351 Output Frequency		
	1 MHz	5 MHz	10 MHz
Video BW	3 kHz	3 kHz	3 kHz
Resolution BW	10 kHz	30 kHz	100 kHz
Frequency Span	10 MHz	50 MHz	100 MHz
Center Frequency	1 MHz	5 MHz	10 MHz
Reference Level	13 dBm	13 dBm	13 dBm
Input Attenuator	30 dB	30 dB	30 dB

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5.4 SPURIOUS OUTPUTS

1. Connect the Spectrum Analyzer to one of the outputs.

2. Set the Spectrum Analyzer to the conditions given in Table 5.3 relating to the output frequency of the channel being tested.

3. Ensure all spurious signals displayed are at least -65 dB below the output level.

Table 5.3, Spectrum Analyzer Settings (Spurious Test)

Spectrum Analyzer Setting	3351 Output Frequency		
	1 MHz	5 MHz	10 MHz
Video BW	1 kHz	3 kHz	3 kHz
Resolution BW	1 kHz	30 kHz	30 kHz
Frequency Span	1 MHz	5 MHz	10 MHz
Center Frequency	1 MHz	5 MHz	10 MHz
Reference Level	13 dBm	13 dBm	13 dBm
Input Attenuator	30 dB	30 dB	30 dB

5.5 Calibration

5.5.1 Internal Frequency Standard Adjustment

1. Prior to calibration, the 3351 must be in continuous operation for 24 hours at an ambient temperature of 25 $\pm$ 2°C.

2. Prior to calibration of the 3351E, remove the large slotted head screws covering the access holes to the COARSE and FINE frequency adjustment trimmers on the oscillator. It will only be necessary to remove the screw covering the FINE adjustment, in most cases. These screws are accesible through a hole in the side of the module.

3. Connect the master frequency standard (9480/FRK for 3351R calibration and 9480/FRS for 3351E) to the EXT STD INPUT of the 2251 Frequency Counter.

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4. Connect the 3351 10 MHz output to INPUT A of the 2251.

5. Program the 2251 Frequency Counter as follows:

    1. Frequency, Channel A
    2. AC coupled 50Ω input impedance
    3. Auto-Trigger
    4. External Reference Input
    5. 10 S Gate Time
    6. Enable math function for deviation read-out

Command string: IP A0 AAU ALI B1 SGT 10 SMX 10E6 SMZ 10E6 ME

5.5.2 1 PPS Output

1. Set up the Digitizing Oscilloscope to couple DC, 1MΩ input impedance.

2. Connect the 1 PPS output to the digitizing oscilloscope input, and verify that the low voltage is < 0.8 V and the high voltage is > 3.8 V. Verify that the width is 3.6 mS ± 1 mS.

3. Connect the 2251 Channel A input to the output under test and the master frequency to the 2251 EXT STD INPUT.

4. Set up the counter as follows:

    a. Frequency Channel A
    b. DC coupled, 1MΩ input impedance
    c. Attenuation x 1
    d. Trigger level manual at 2 V, positive slope
    e. External reference input
    f. 1 mS gate time

Command String: 1P A0 AAD ADC AHI AMN APS AFD SLA 2.0 FA B1 SGT 1e-3 T0

5. Verify that the frequency is 1 Hz within 1 part in 10^4.

6. Repeat Steps 1 through 5 for any other 1 PPS outputs.

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5.5.3 3351R Calibration

1. Adjust the FINE FREQUENCY ADJUST trimmer (accessible through a hole in the side cover) until the 2251 reads .100 x 10^{-9}. This is equivalent to a resolution of $\pm$ 1 part in 10^{10} of the difference between the master frequency standard and the 3351R output.

5.5.4 3351E Calibration

1. Adjust the COARSE and FINE FREQUENCY ADJUST trimmers (accessible through a hole in the side of the 3351E) until the 2251 reads 5 x 10^{-9}. This is equivalent to a resolution of $\pm$ 5 parts in 10^{9} of the difference between the master frequency standard and the 3351E ouput.

2. Replace the screws covering the COARSE and FINE adjustment trimmers on the oscillator.

NOTE

If 10 MHz output is not installed, modify the command string for the appropriate frequency. For example, if a 5 MHz signal is used, the math function commands would read: SM 5E6 SMZ 5E6.

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3351E

404947-001	Final Assy., 3351E	6-4
401991	PCB Assy., Freq. Distribution	6-10
431991	Schematic, Freq. Distribution	6-11
404979-001	Cable Assy., Freq. Distribution	6-24
404979-002	Cable Assy., Freq. Distribution	6-24
404979-003	Cable Assy., Freq. Distribution	6-24
404980-001	Cable Assy., Freq. Out	6-25
404980-002	Cable Assy., Freq. Out	6-25
404980-003	Cable Assy., Freq. Out	6-25
404386	Oscillator Assy	6-26
401822	PCB Assy., Doubler	6-27
431822	Schematic, Doubler	6-28

3351E/01

404947-002	Final Assy., 3351E Opt. 01	6-5
401991	PCB Assy., Freq. Distribution	6-10
431991	Schematic, Freq. Distribution	6-11
404979-001	Cable Assy., Freq. Distribution	6-24
404979-002	Cable Assy., Freq. Distribution	6-24
404979-003	Cable Assy., Freq. Distribution	6-24
404980-001	Cable Assy., Freq. Out	6-25
404980-002	Cable Assy., Freq. Out	6-25
404980-003	Cable Assy., Freq. Out	6-25
404386	Oscillator Assy	6-26
401822	PCB Assy., Doubler	6-27
431822	Schematic, Doubler	6-28

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3351E/10M

404947-003	Final Assy., 3351E	6-6
401991	PCB Assy., Freq. Distribution	6-10
431991	Schematic, Freq. Distribution	6-11
404979-001	Cable Assy., Freq. Distribution	6-24
404979-004	Cable Assy., Freq. Distribution	6-24
404980-001	Cable Assy., Freq. Out	6-25
404980-002	Cable Assy., Freq. Out	6-25
404980-003	Cable Assy., Freq. Out	6-25
404995	Oscillator Assy., 3351E	6-26
401822	PCB Assy., Doubler	6-27
431822	Schematic, Doubler	6-28

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3351R

404946-001	Final Assy., 3351R	6-7
401991	PCB Assy., Freq. Distribution	6-10
431991	Schematic, Freq. Distribution	6-11
404979-001	Cable Assy., Freq. Distribution	6-24
404979-002	Cable Assy., Freq. Distribution	6-24
404979-003	Cable Assy., Freq. Distribution	6-24
404980-001	Cable Assy., Freq. Out	6-25
404980-002	Cable Assy., Freq. Out	6-25
404980-003	Cable Assy., Freq. Out	6-25

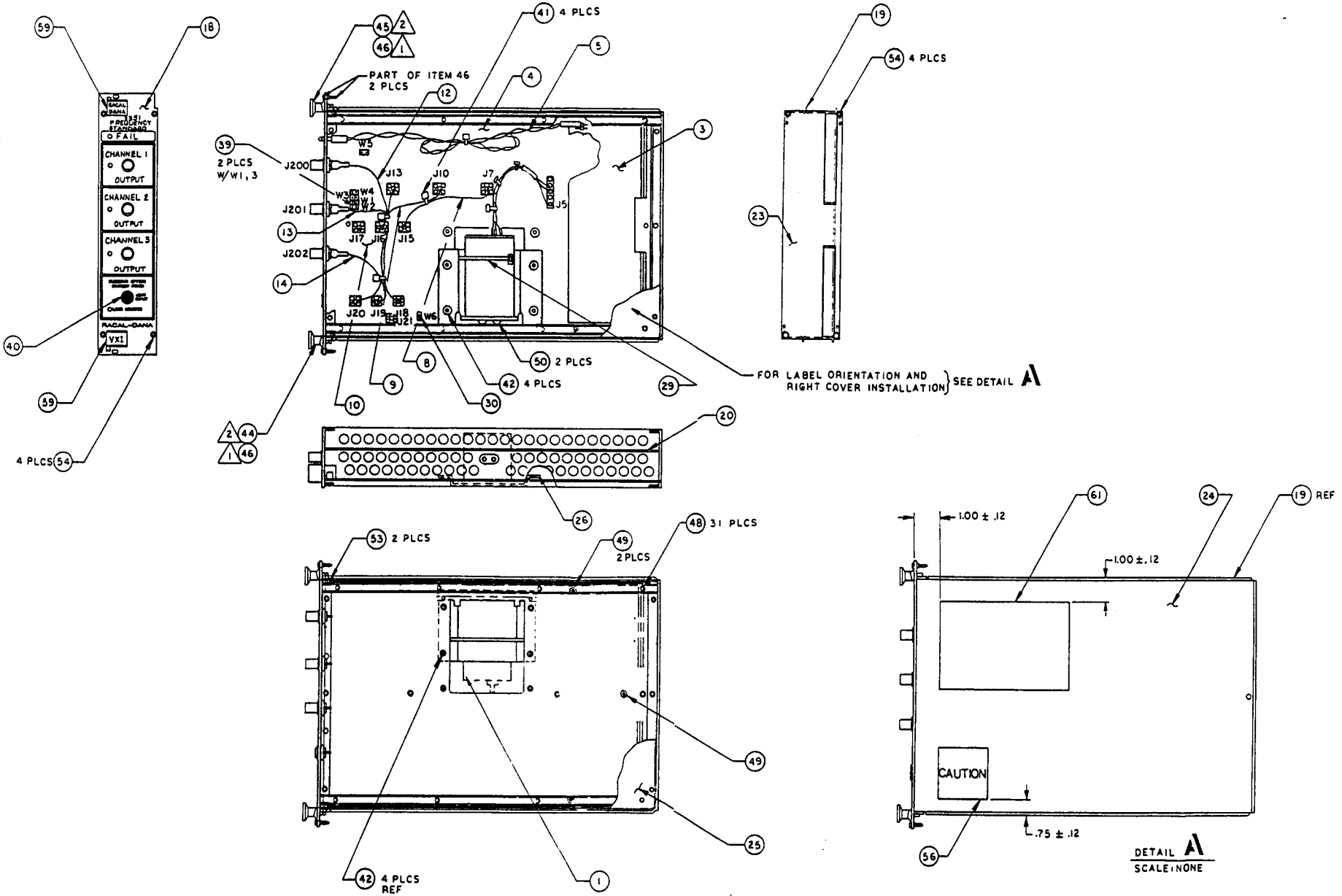
3351R/01

404946-002	Final Assy., 3351R, Opt.01	6-8
401991	PCB Assy., Freq. Distribution	6-10
431991	Schematic, Freq. Distribution	6-11
404979-001	Cable Assy., Freq. Distribution	6-24
404979-002	Cable Assy., Freq. Distribution	6-24
404979-003	Cable Assy., Freq. Distribution	6-24
404980-001	Cable Assy., Freq. Out	6-25
404980-002	Cable Assy., Freq. Out	6-25
404980-003	Cable Assy., Freq. Out	6-25

3351R/10M

404946-003	Final Assy., 3351R	6-9
401991	PCB Assy., Freq. Distribution	6-10
431991	Schematic, Freq. Distribution	6-11
404979-001	Cable Assy., Freq. Distribution	6-24
404979-004	Cable Assy., Freq. Distribution	6-24
404980-001	Cable Assy., Freq. Out	6-25
404980-002	Cable Assy., Freq. Out	6-25
404980-003	Cable Assy., Freq. Out	6-25

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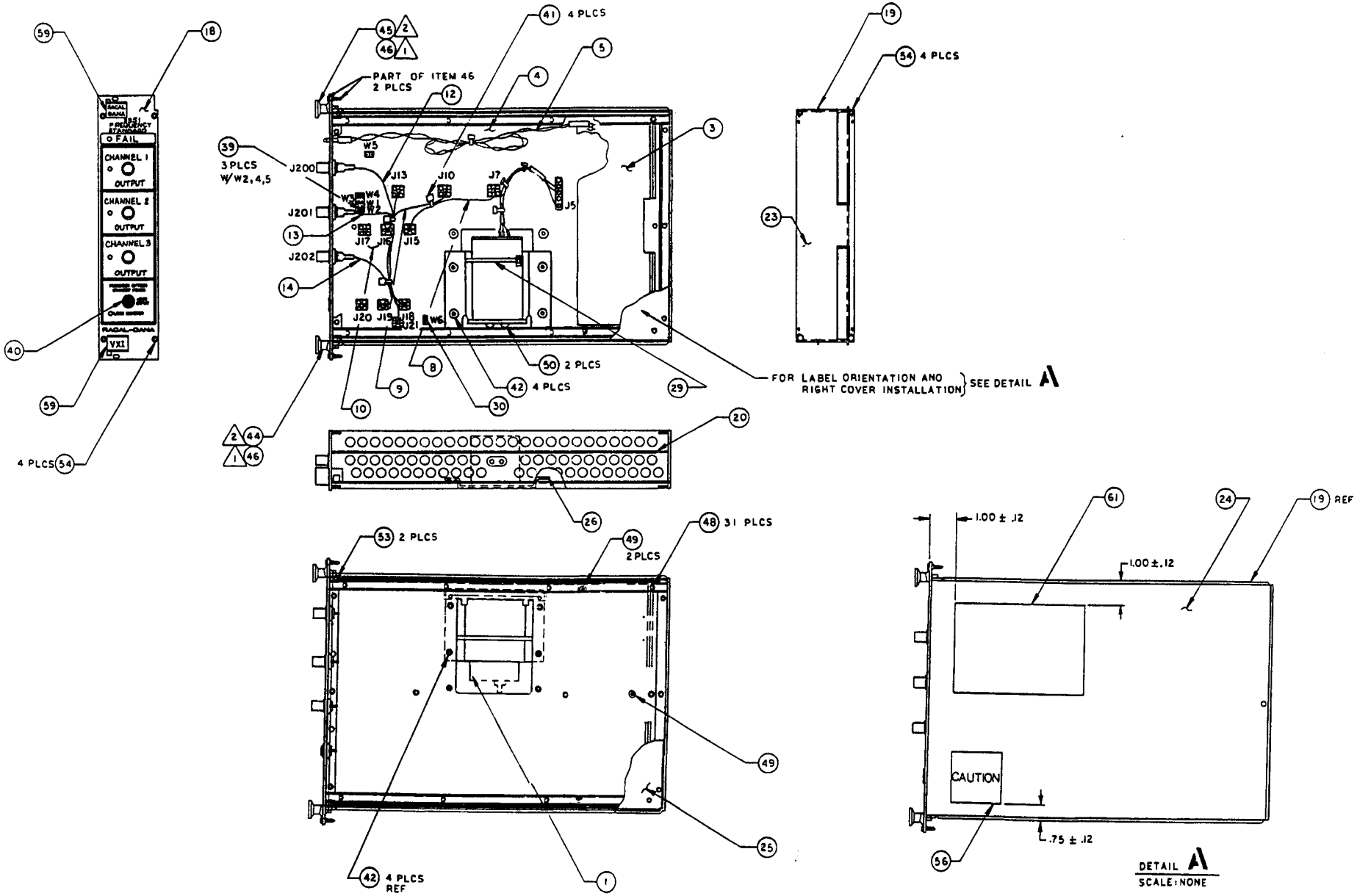
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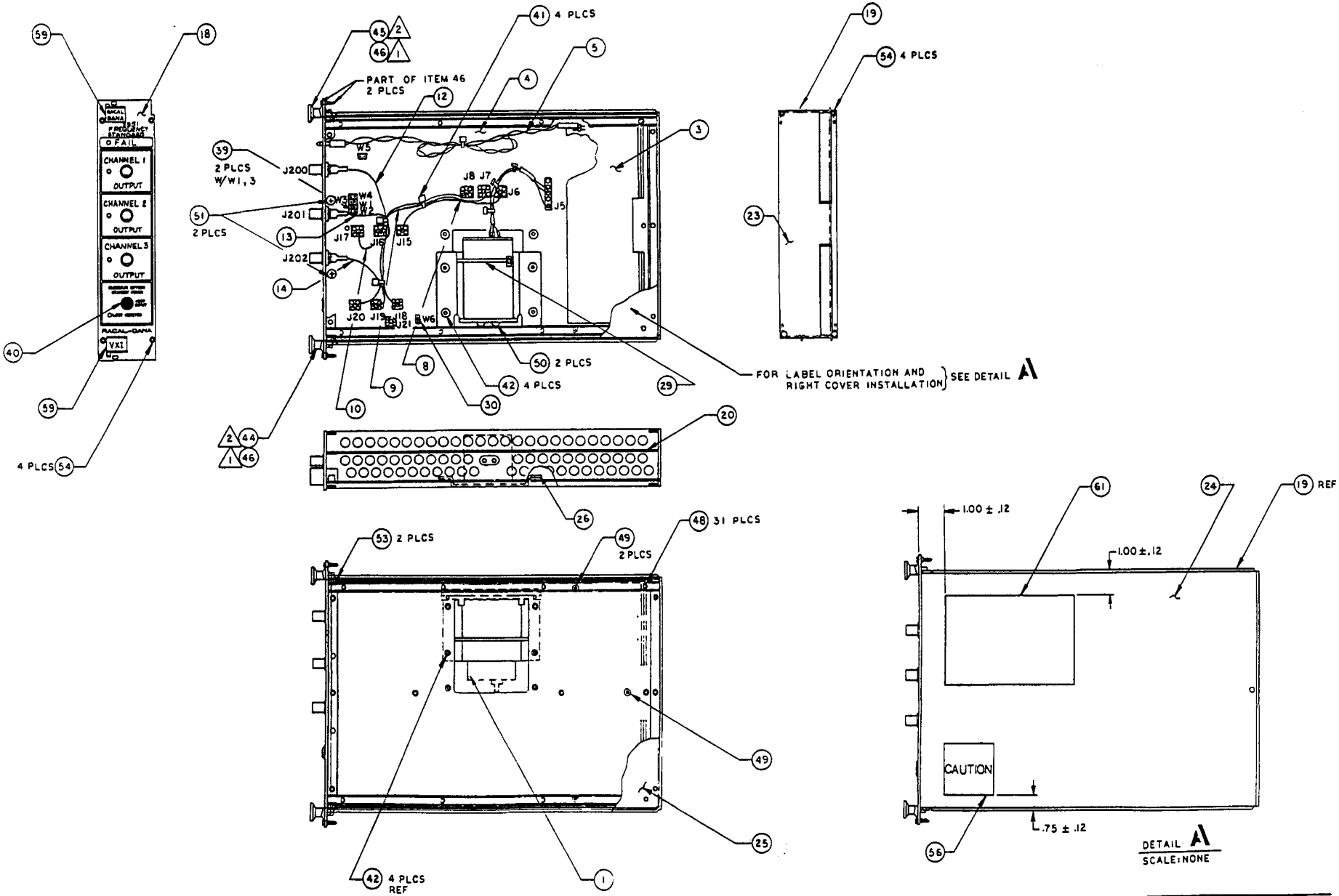
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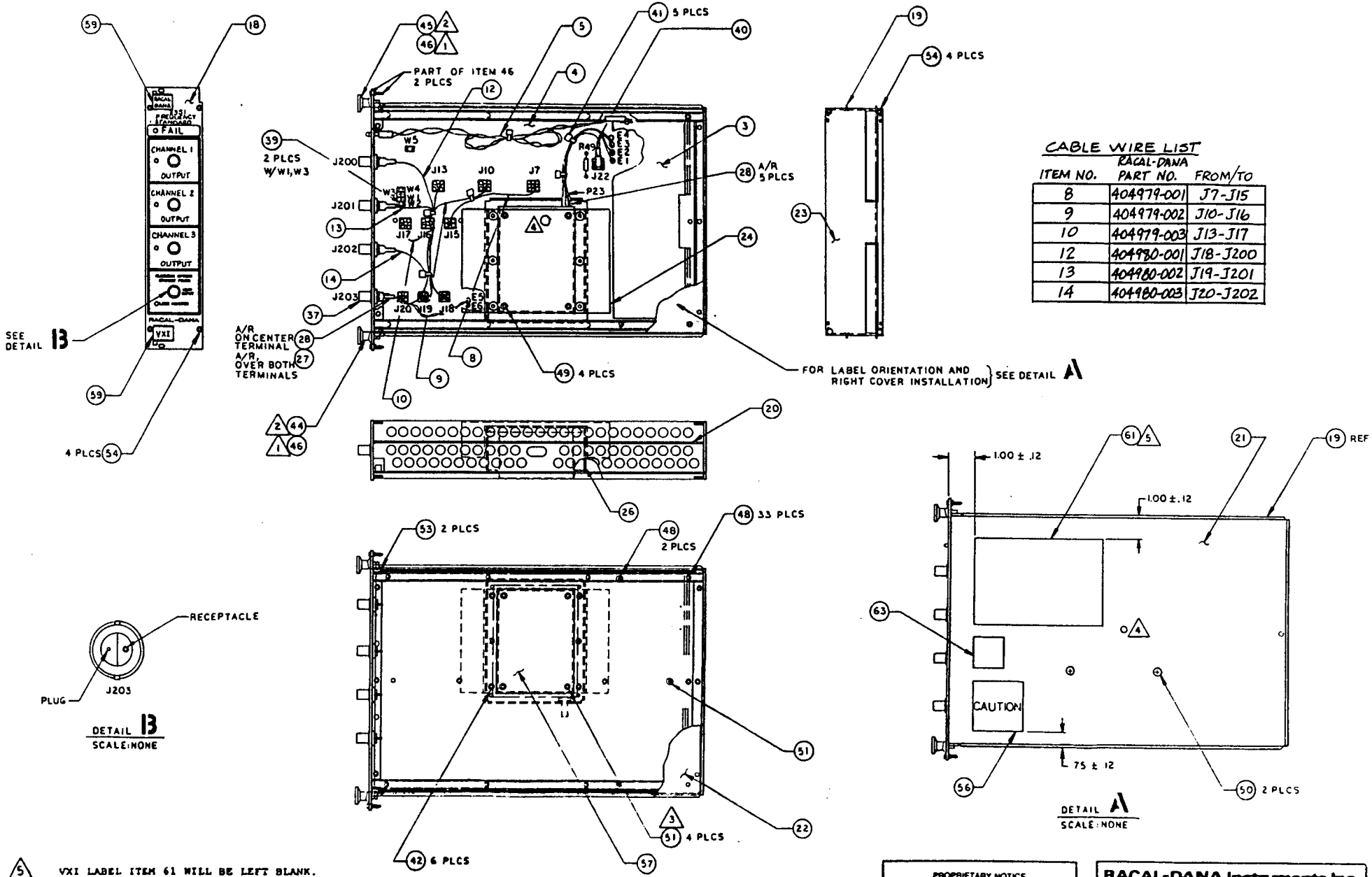
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CABLE WIRE LIST

ITEM NO.	RACAL-DANA PART NO.	FROM/TO
8	404979-001	J7-J15
9	404979-002	J10-J16
10	404979-003	J13-J17
12	404980-001	J18-J200
13	404980-002	J19-J201
14	404980-003	J20-J202

5 VXI LABEL ITEM 61 WILL BE LEFT BLANK.

4 HOLES ON RIGHT COVER AND HEATSINK MUST ALIGN WITH ADJUSTMENT SCREW IN OSCILLATOR.

3 ITEM 51, REPLACE PANHEAD WITH FLATHEAD SCREWS, 4 PLCS.

2 ITEM 44 CONSISTS OF 1 BOTTOM HANDLE, MOUNTING BLOCK AND ASSOCIATED PARTS. ITEM 45 IS THE SAME (AS ITEM 44), BUT THE HANDLE IS FOR THE TOP.

1 ITEM 46 CONSISTS OF MOUNTING HARDWARE FOR HANDLES AND ASSOCIATED PARTS. DISCARD UNUSED HARDWARE SUPPLIED WITH ITEM 46.

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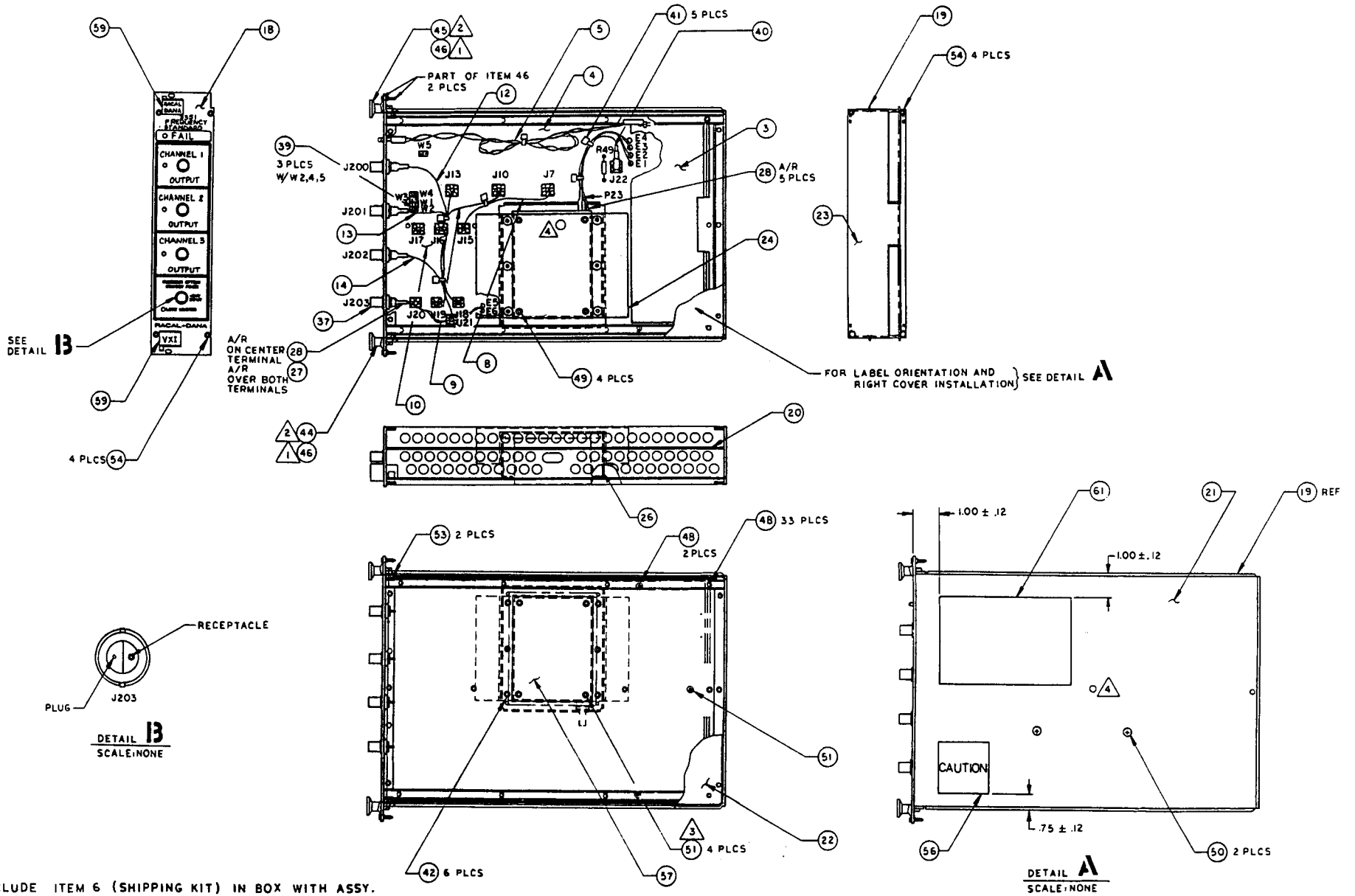
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D	21793	404946-001	A

SCALE —— SHEET 1 OF 4

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5. INCLUDE ITEM 6 (SHIPPING KIT) IN BOX WITH ASSY.

4 HOLES ON RIGHT COVER AND HEATSINK MUST ALIGN WITH ADJUSTMENT SCREW IN OSCILLATOR.

3 ITEM 51, REPLACE PANHEAD WITH FLATHEAD SCREWS, 4 PLCS.

2 ITEM 44 CONSISTS OF 1 BOTTOM HANDLE, MOUNTING BLOCK AND ASSOCIATED PARTS. ITEM 45 IS THE SAME (AS ITEM 44), BUT THE HANDLE IS FOR THE TOP.

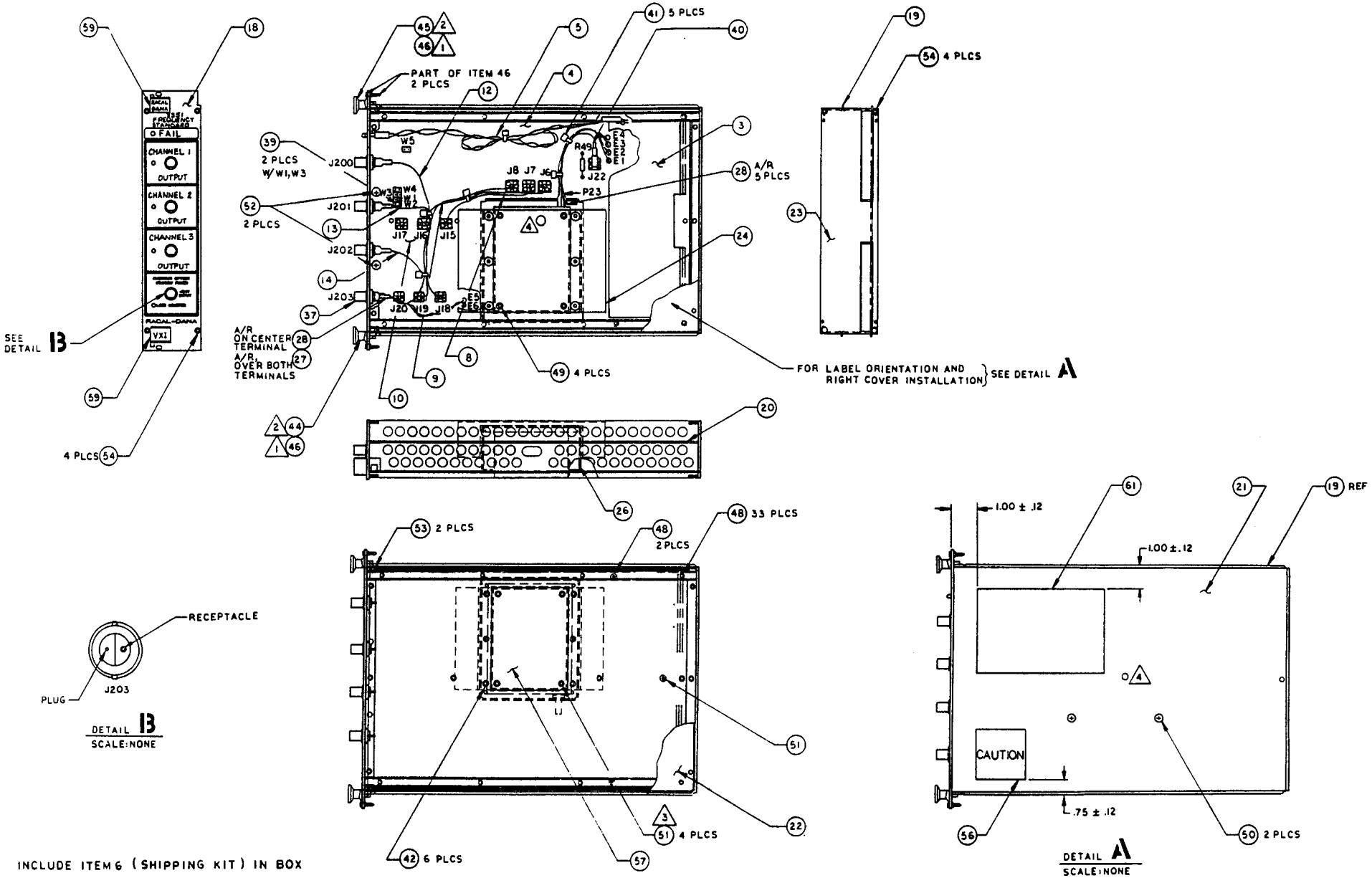
1 ITEM 46 CONSISTS OF MOUNTING HARDWARE FOR HANDLES AND ASSOCIATED PARTS. DISCARD UNUSED HARDWARE SUPPLIED WITH ITEM 46.

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4 GOODYEAR, IRVINE, CALIFORNIA 92714

DOCUMENT TITLE			
FNL ASSY 3351R, OPT 01			
SIZE	CODE IDENT NO.	DOCUMENT NO	REV
D	21793	404946-002	A
SCALE —		SHEET 1	OF 4

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5. INCLUDE ITEM 6 (SHIPPING KIT) IN BOX WITH ASSY.

△4 HOLES ON RIGHT COVER AND HEATSINK MUST ALIGN WITH ADJUSTMENT SCREW IN OSCILLATOR.

△3 ITEM 51, REPLACE PANHEAD WITH FLATHEAD SCREWS, 4 PLCS.

△2 ITEM 44 CONSISTS OF 1 BOTTOM HANDLE, MOUNTING BLOCK AND ASSOCIATED PARTS. ITEM 45 IS THE SAME (AS ITEM 44), BUT THE HANDLE IS FOR THE TOP.

△1 ITEM 46 CONSISTS OF MOUNTING HARDWARE FOR HANDLES AND ASSOCIATED PARTS. DISCARD UNUSED HARDWARE SUPPLIED WITH ITEM 46.

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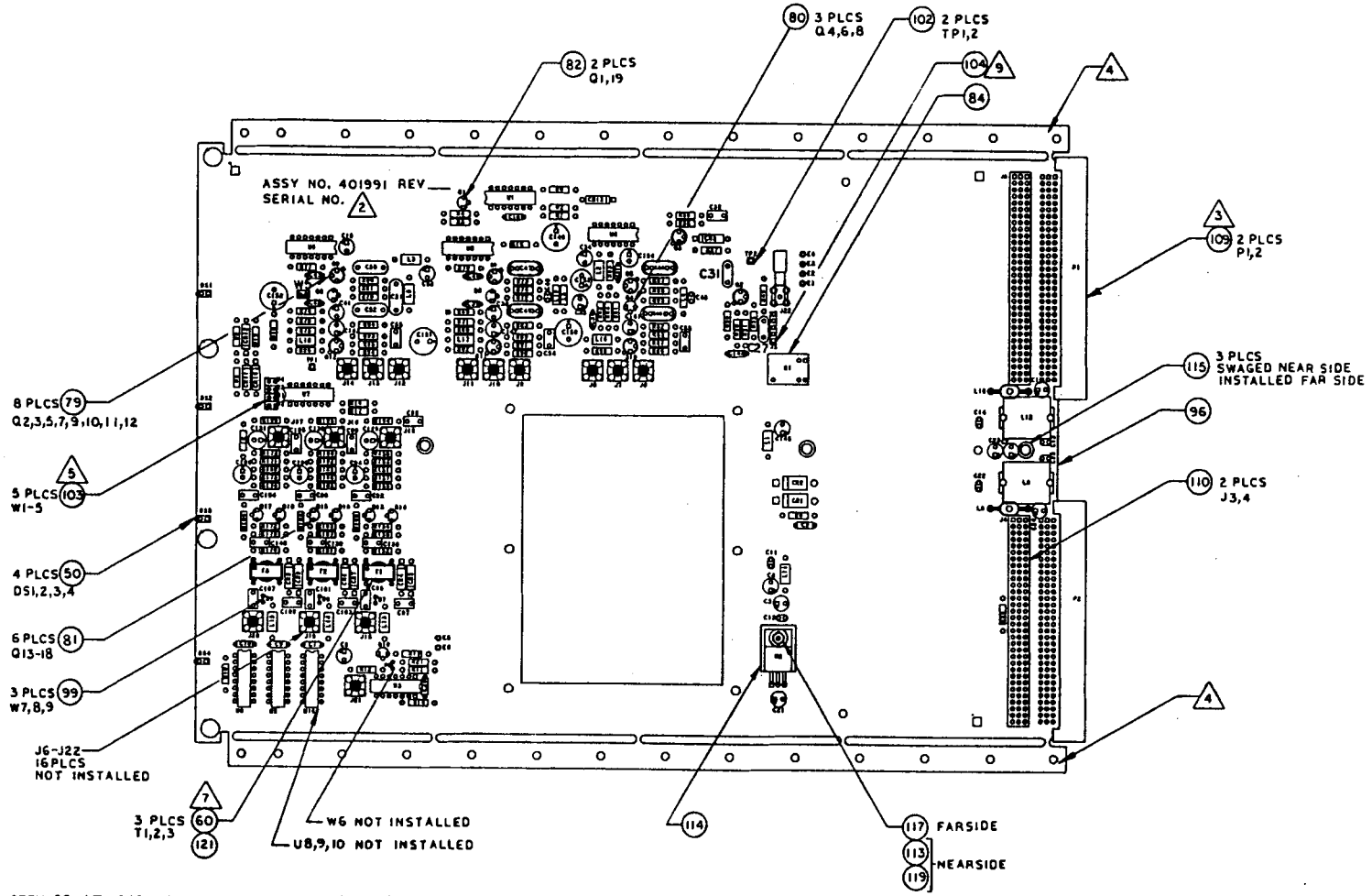
RACAL-DANA Instruments Inc.
4 GOODYEAR, IRVINE, CALIFORNIA 92714

DOCUMENT TITLE: FINAL ASSY., 3351R/10M

SIZE	CODE IDENT NO.	DOCUMENT NO	REV.
D	21793	404946-003	A

SCALE — SHEET 1 OF 4

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10. ON FAR SIDE, SOLDER ITEM 99 (JUMPER WIRE) FROM NEGATIVE LEAD OF C41 TO NEGATIVE LEAD OF C143; FROM NEGATIVE LEAD OF C38 TO NEGATIVE LEAD OF C142; AND FROM NEGATIVE LEAD OF C141 TO GROUND END OF R82.

△9 CUT OFF PIN 2 ON J5.

8. THE FOLLOWING COMPONENTS ARE NOT INSTALLED: C36,37,39,40,42,43 & R49.

△7 SECURE ITEM 60 (T1,2 & 3) TO ITEM 96 (PC BOARD) USING ITEM 121 (ADHESIVE BACKED TAPE) AS REQUIRED.

6. ALL SOLDER TAILS ON FAR SIDE OF PCB TO BE TRIMMED TO A MAXIMUM HEIGHT OF .045.

△5 INSTALL WITH SHORT PINS INTO PCB.

△4 REMOVE SIDE PANELS AND FILE PCB EDGE SMOOTH AFTER ASSY IS COMPLETE.

△3 P1 & P2 MUST BE INSTALLED FLUSH AT RIGHT ANGLE TO PCB.

△2 INK STAMP SERIAL NUMBER, ASSY NUMBER AND CURRENT REV. ON NEAR SIDE IN INDICATED AREA.

1. REFERENCE SCHEMATIC 431991 .

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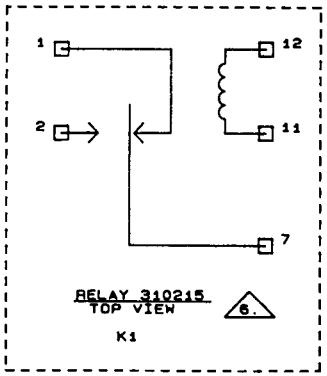
RACAL-DANA Instruments Inc.
4 GOODYEAR, IRVINE, CALIFORNIA 92714

DOCUMENT TITLE
PCB ASSY, FREQ. DISTR 3351R/E

SIZE	CODE IDENT NO	DOCUMENT NO	REV
D	21793	401991	A

SCALE — SHEET 1 OF 4

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W9
U7
TP2
T3
R196
Q19
P2
L19
K1
J22
E6
DS4
CR13
C154
HIGHEST REF. DES.

6. RELAY K1 IS RACAL DANA P/N 310215.
RELAY SHOWN IN DE-ENERGIZED POSITION.

5. R49 IS INSTALLED ON 3351A ONLY.

4. W6 IS INSTALLED ON 3351E ONLY.

3. W2, W4 AND W5 ARE INSTALED WITH OPTION 01.
W1 AND W3 ARE INSTALLED WITHOUT OPTION 01.

2. RESISTORS ARE IN OHMS 1/4W +/-5% UNLESS OTHERWISE SPECIFIED.

1. CAPACITOR VALUES ARE IN MICROFARADS, 35V, +/-20% UNLESS OTHERWISE SPECIFIED.

NOTES: UNLESS OTHERWISE SPECIFIED

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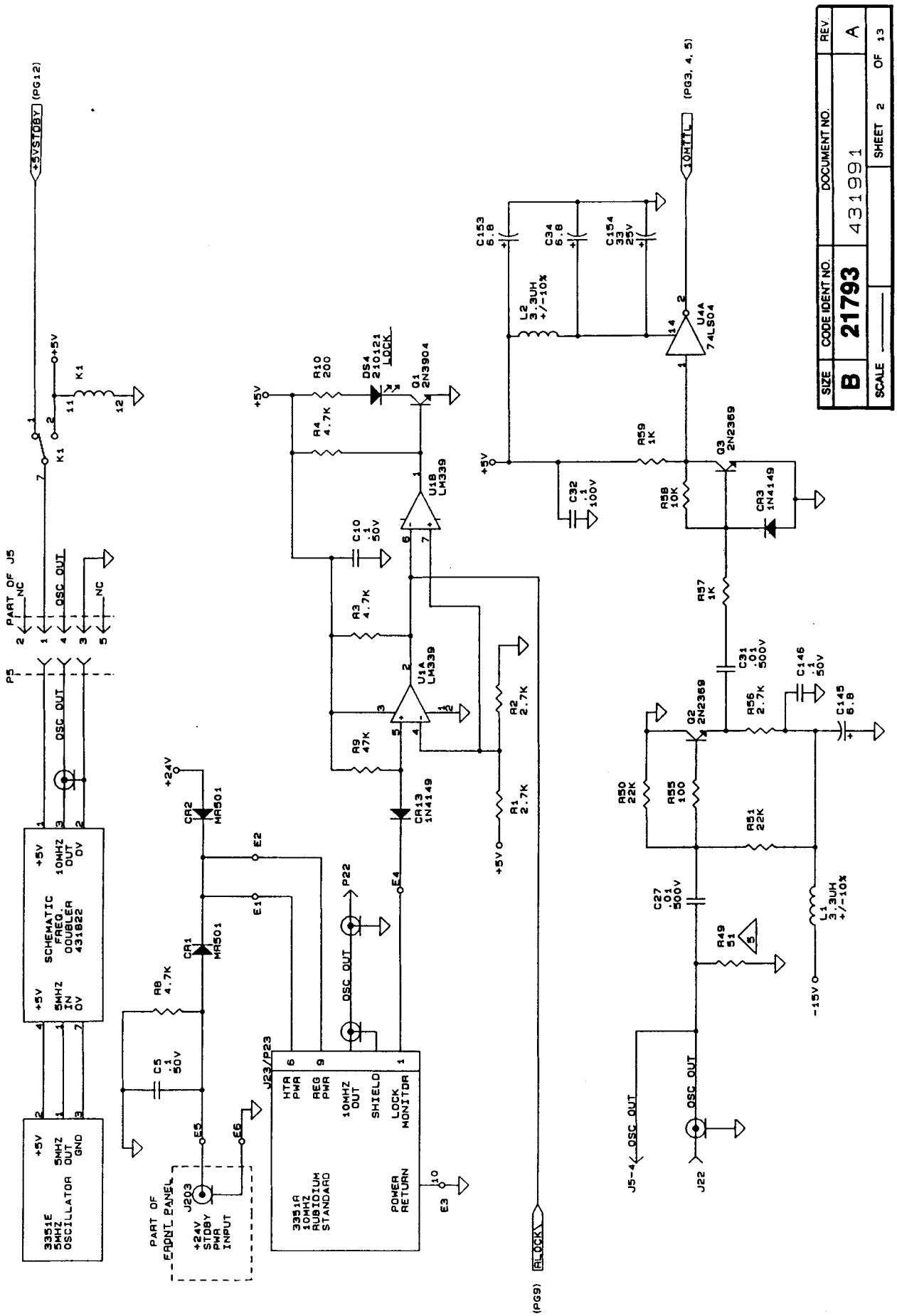
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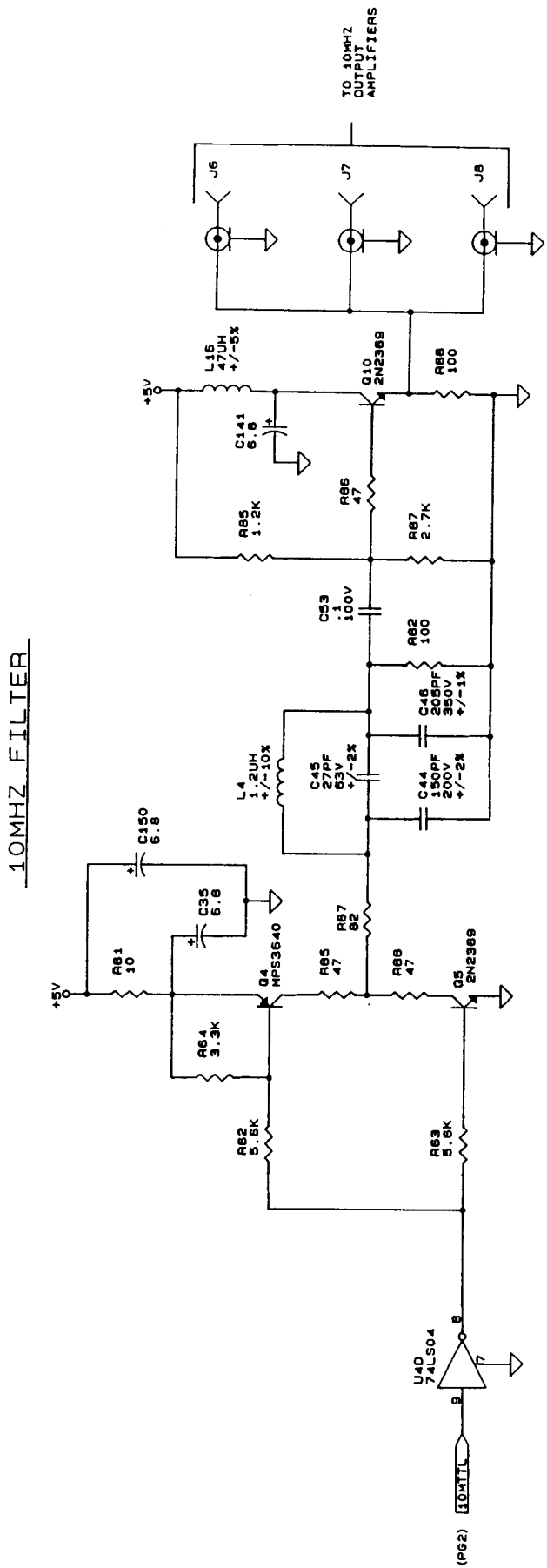
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B	21793	431991	A

SCALE —— SHEET 1 OF 13

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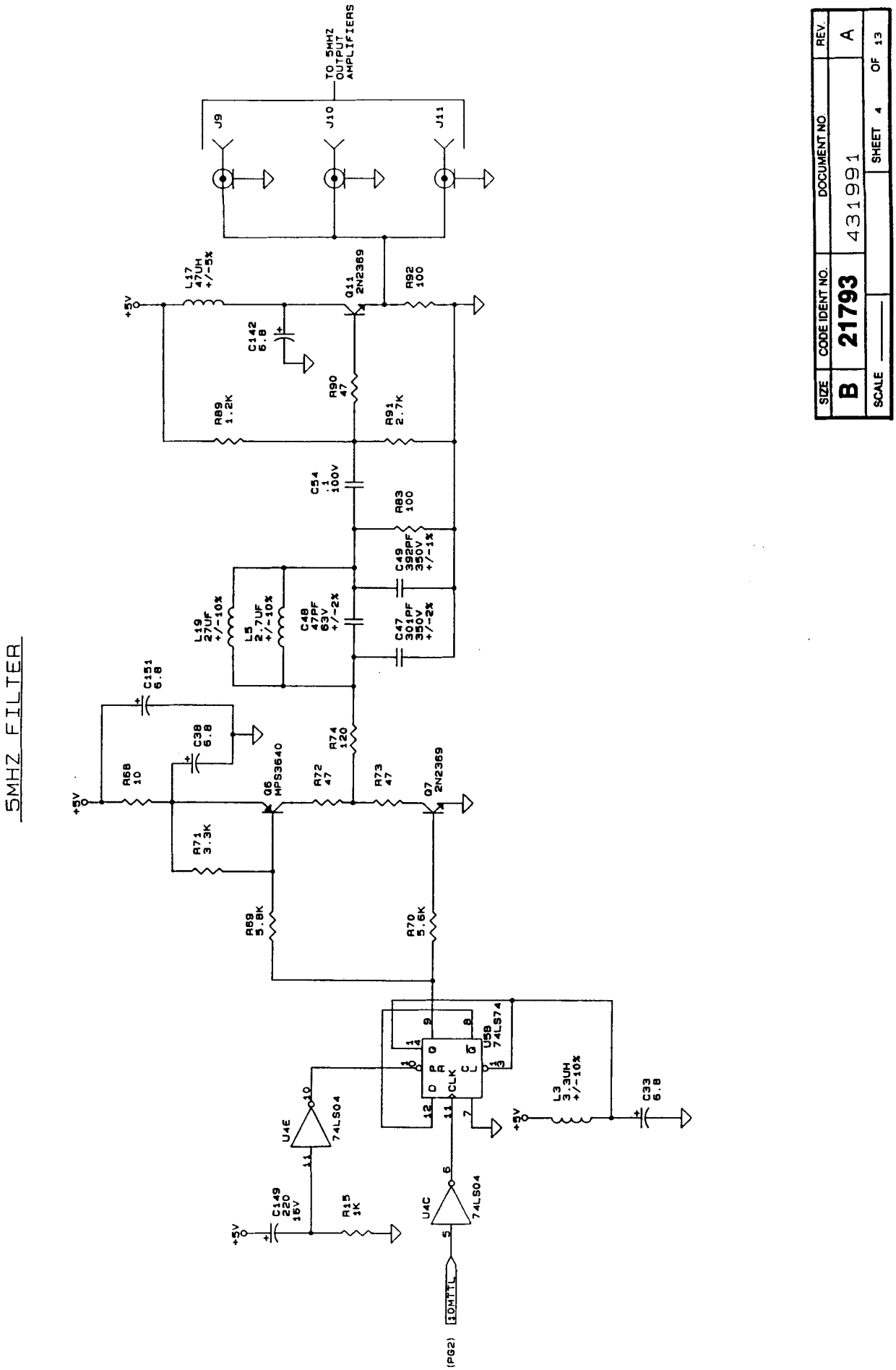


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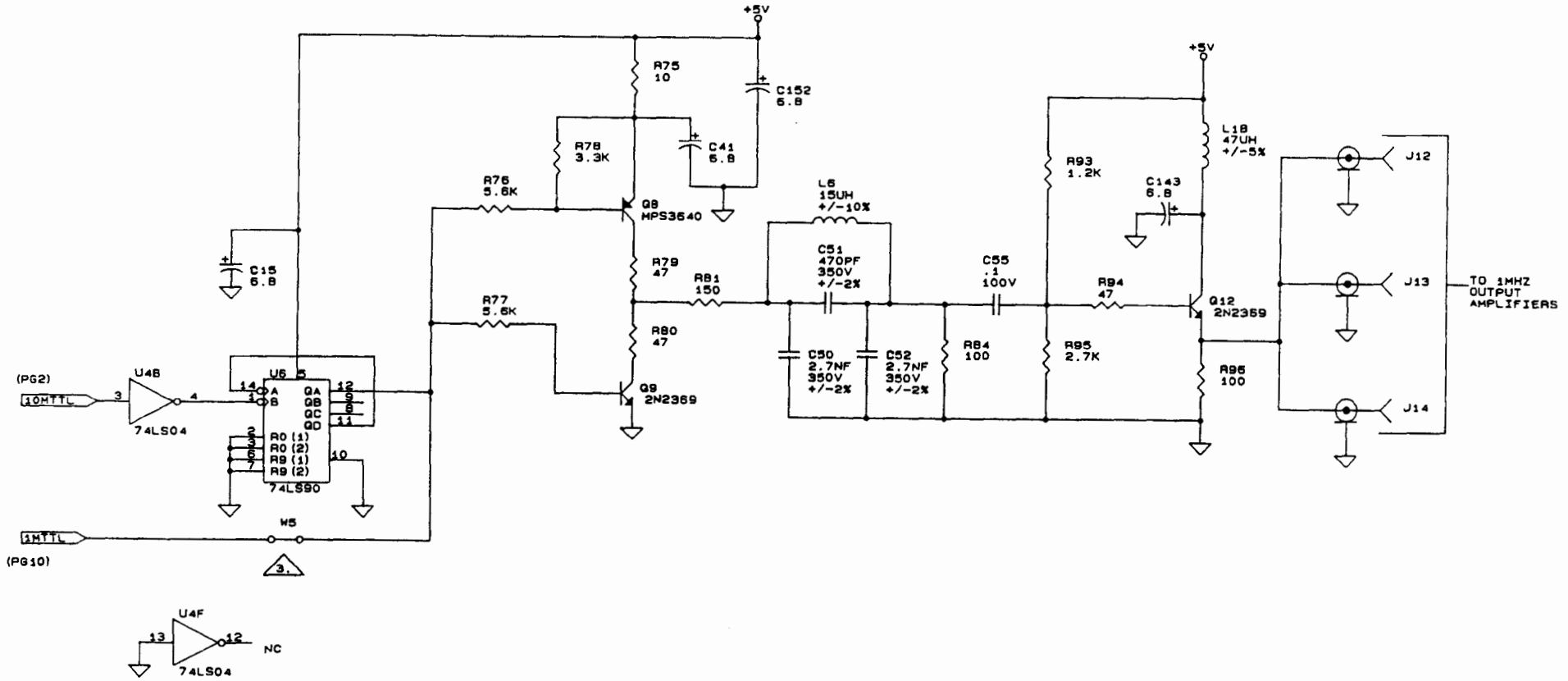
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B	21793	431991	A
SCALE		SHEET 3	OF 13

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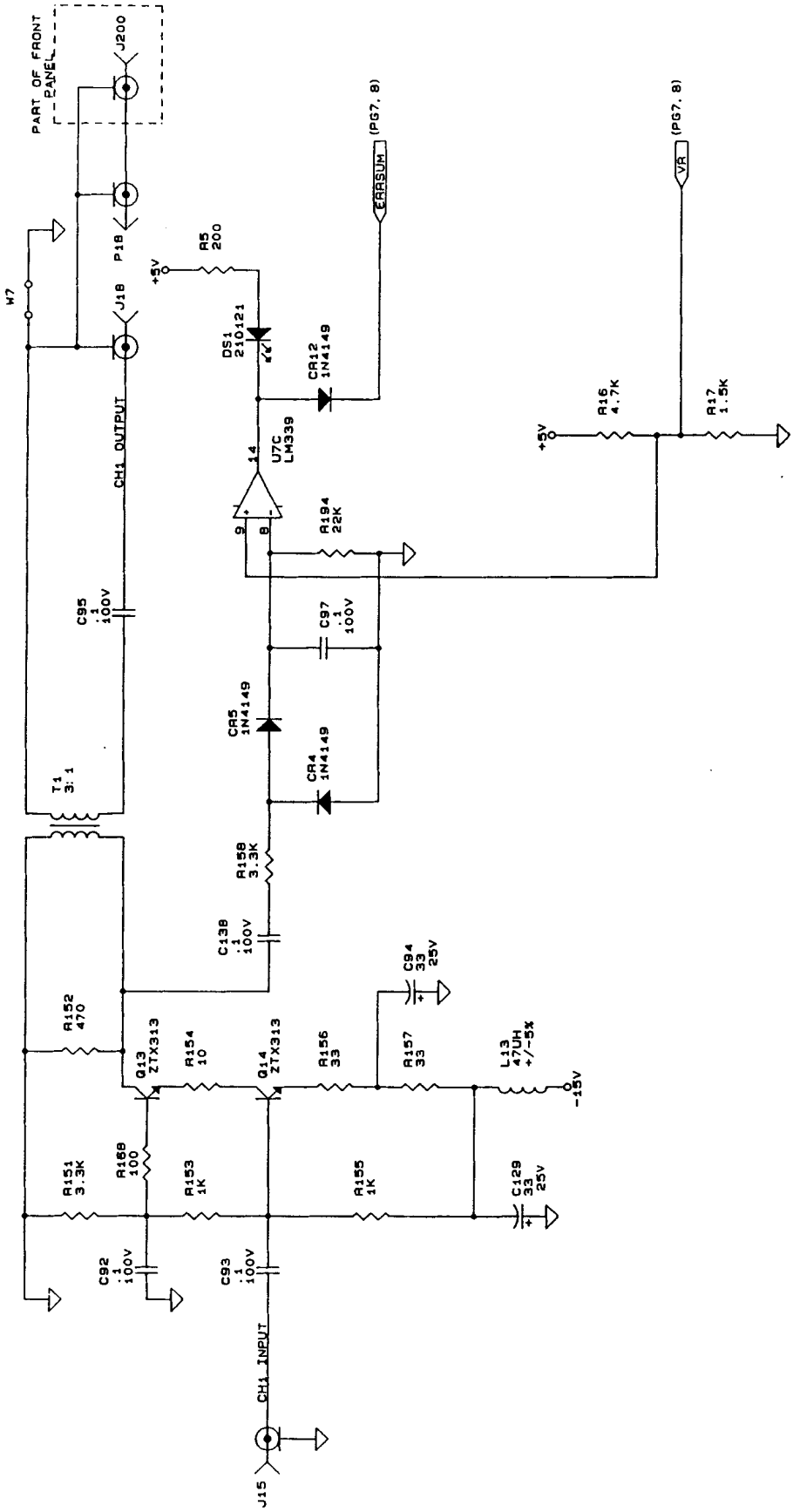
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1MHZ FILTER



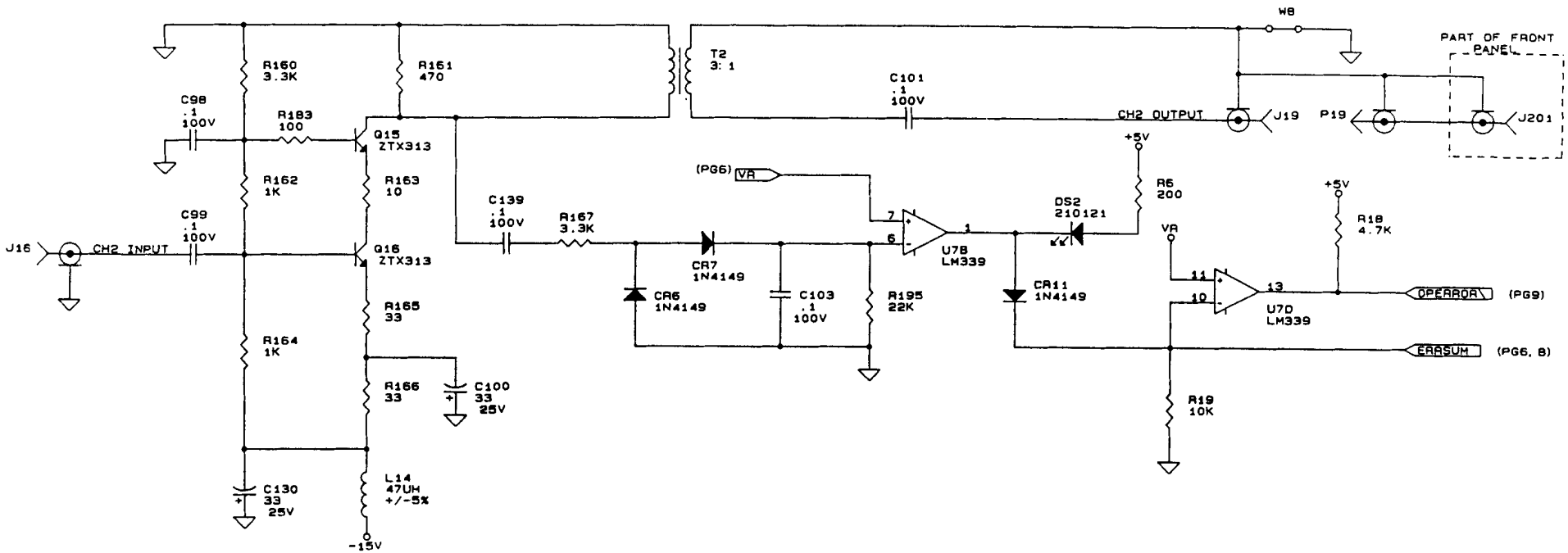
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SCALE _____		SHEET 5	OF 13

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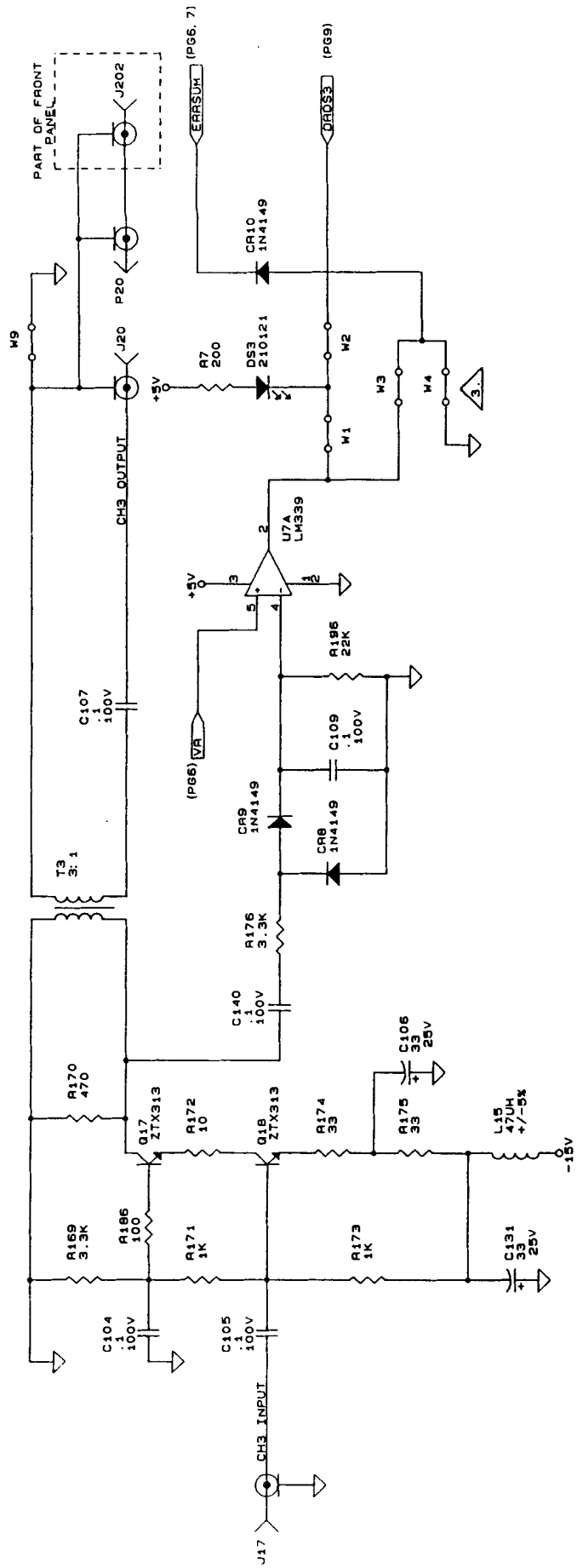
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B	21793	431991	A
SCALE ——		SHEET 6	OF 13

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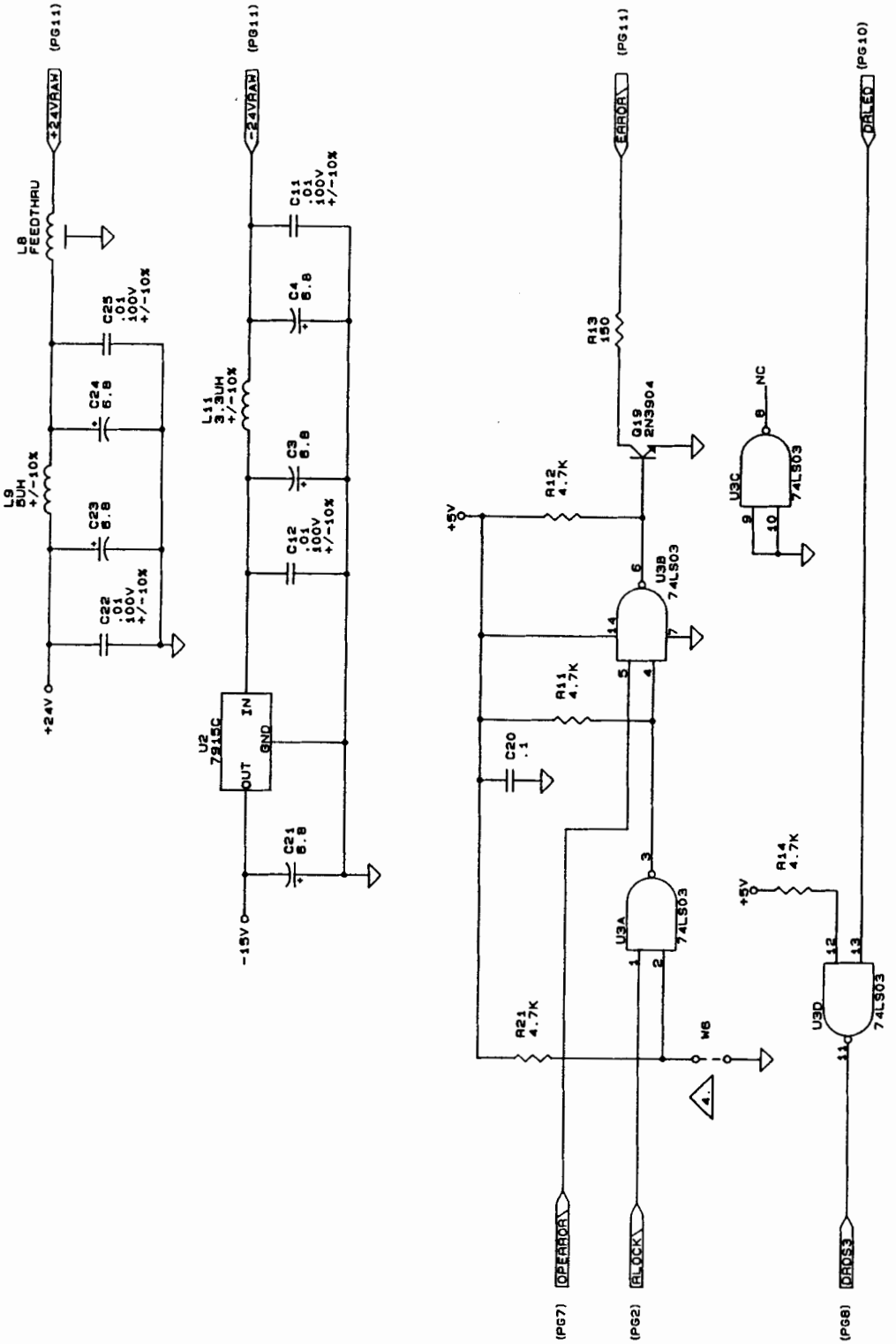
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SCALE ———		SHEET 7	OF 13

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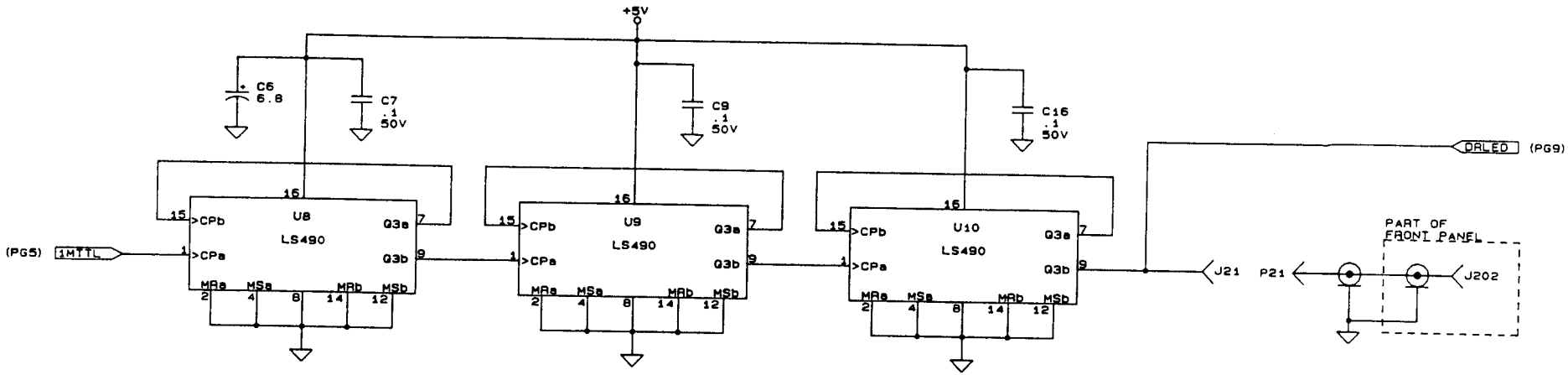
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B	21793	431991	A
SCALE		SHEET 8	OF 13

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SIZE	CODE IDENT NO.	DOCUMENT NO.	REV.
B	21793	431991	A
SCALE ____		SHEET 9	OF 13

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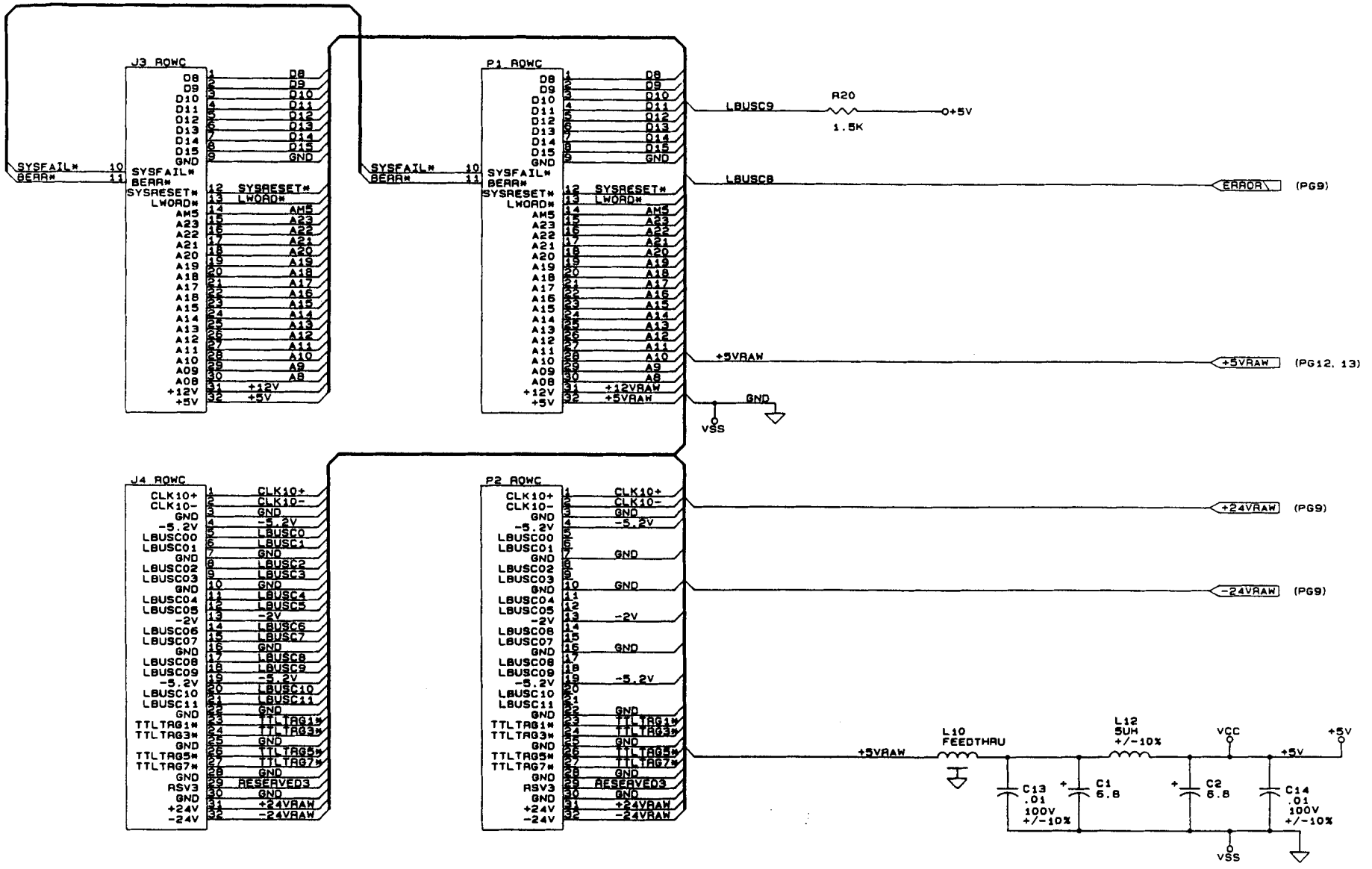


OPTION 01 ONLY

1PPS OUTPUT

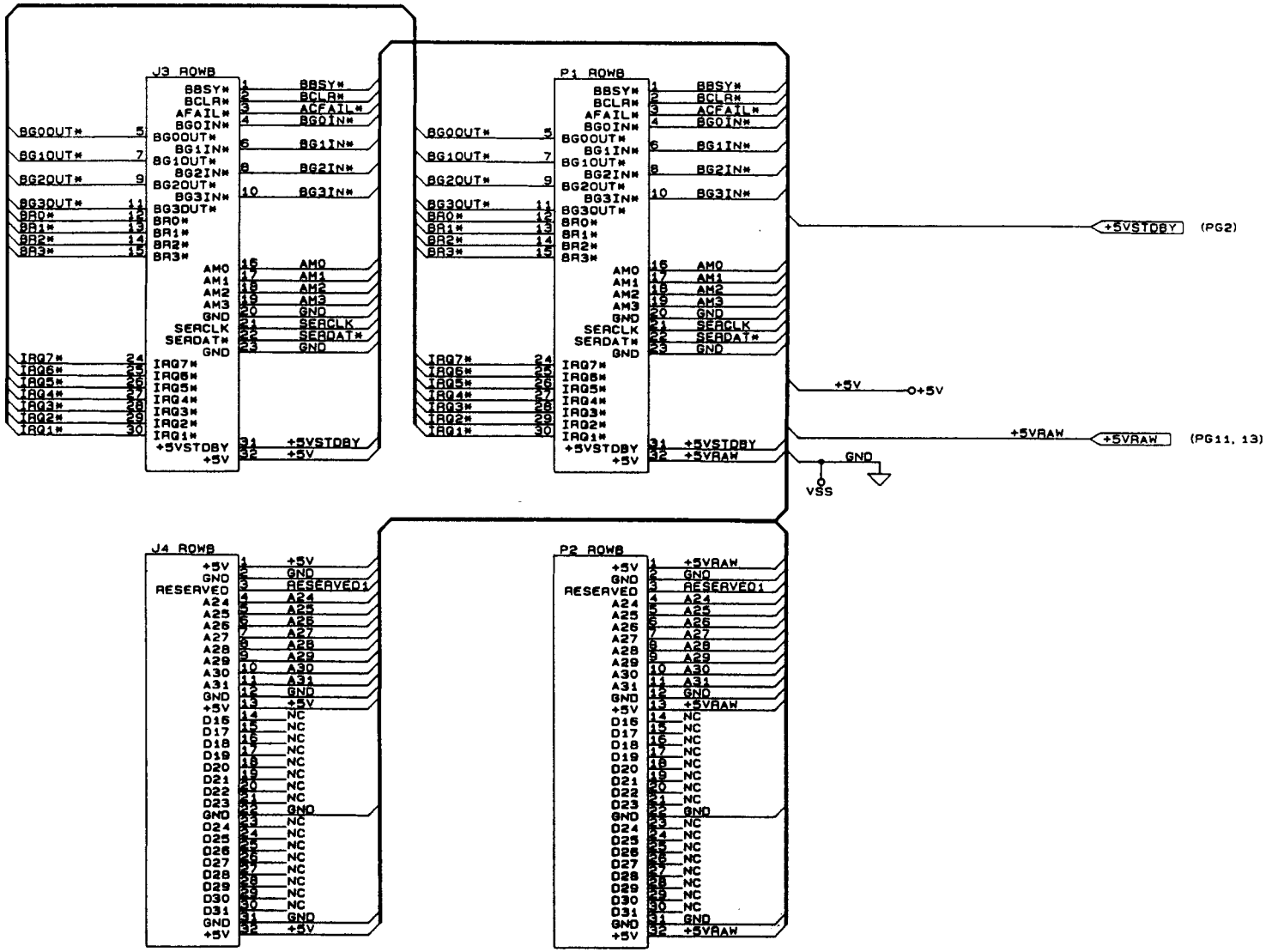
SIZE	CODE IDENT NO.	DOCUMENT NO.	REV.
B	21793	431991	A
SCALE		SHEET 10 OF 13	

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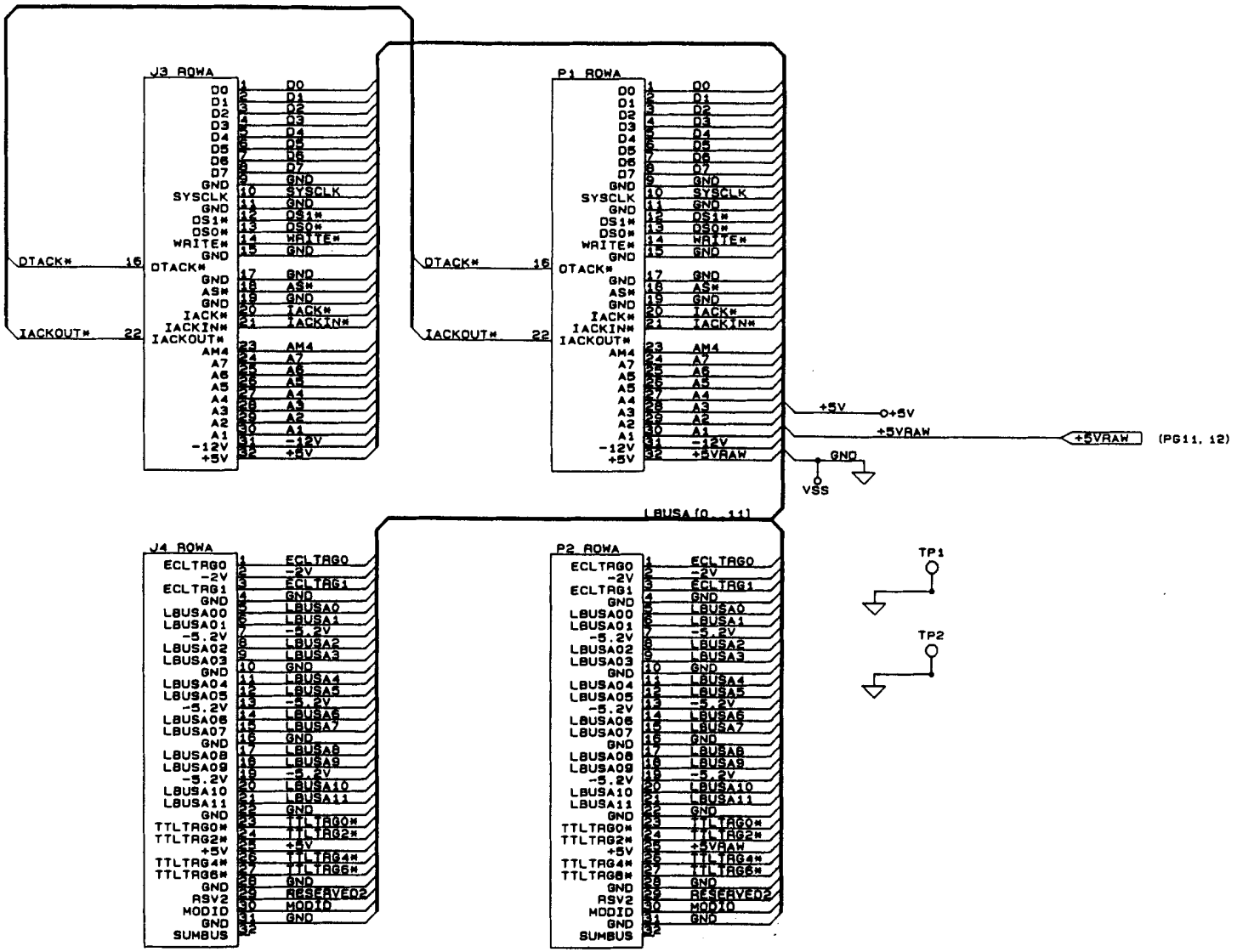
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B	21793	431991	A
SCALE		SHEET 11	OF 13

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SIZE	CODE IDENT NO.	DOCUMENT NO.	REV.
B	21793	431991	A
SCALE ———		SHEET 12 OF 13	

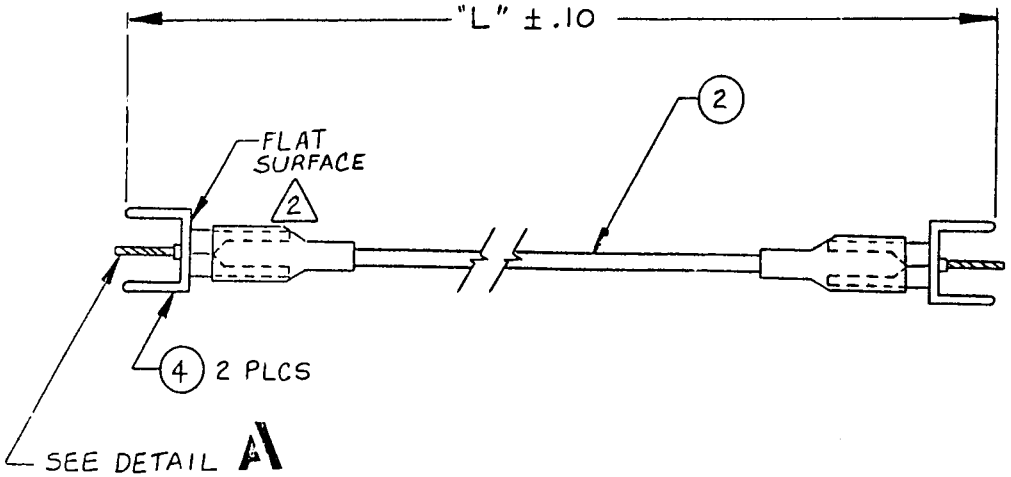
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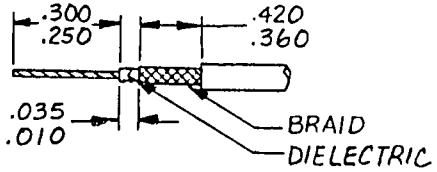


SIZE	CODE IDENT NO.	DOCUMENT NO.	REV.
B	21793	431991	A
SCALE _____		SHEET 13 OF 13	

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DETAIL A (1)
CABLE PREPARATION
SCALE : NONE

RACAL-DANA P/N	LENGTH 'L' IN INCHES
404979-001	6.0
404979-002	5.5
404979-003	4.75

3 PACKAGE AND IDENTIFY WITH RACAL-DANA PART NUMBER AND CURRENT REV. LTR.

(2) INSERT CABLE UNTIL THE BRAID CONTACTS THE FLAT SURFACE, AND THE DIELECTRIC EXTENDS THROUGH THE HOLE IN THE FLAT SURFACE.

(1) STRIP COAXIAL CABLE AS SHOWN IN DETAIL 'A'.

NOTES: UNLESS OTHERWISE SPECIFIED

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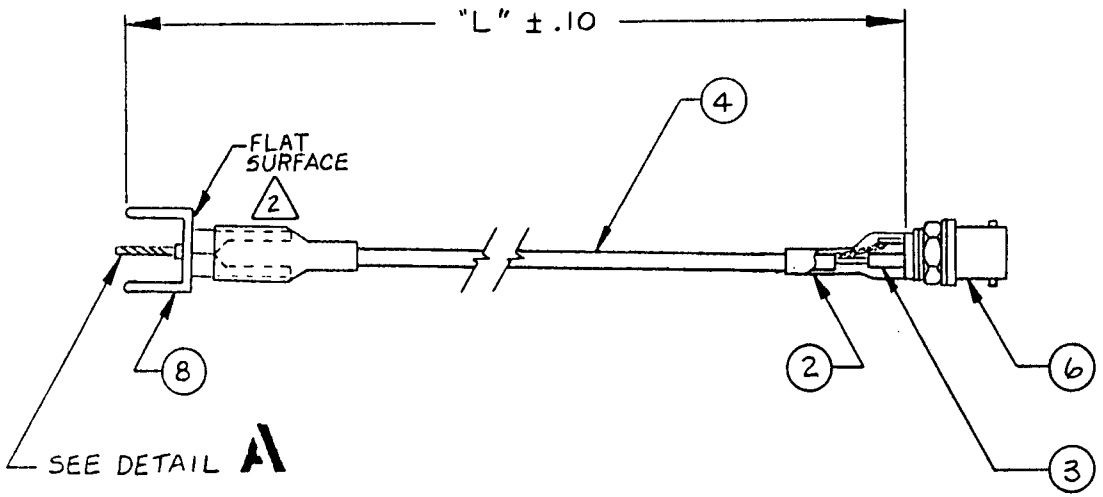
RACAL-DANA Instruments Inc.
4 GOODYEAR, IRVINE, CALIFORNIA 92714

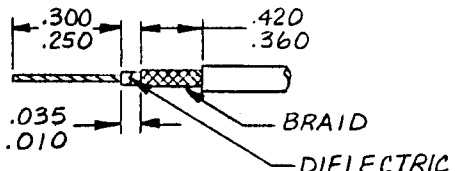
DOCUMENT TITLE

CABLE ASSY, FREQ. DIST.

SIZE	CODE IDENT NO	DOCUMENT NO	REV
B	21793	404979-001/010	A

SCALE NONE | SHEET 1 OF 2





DETAIL A (1)

CABLE PREPARATION
SCALE : NONE

RACAL-DANA P/N	LENGTH 'L' IN INCHES
404980-001	8.0
404980-002	7.0
404980-003	6.0

3. PACKAGE AND IDENTIFY WITH RACAL-DANA PART NUMBER AND CURRENT REV. LTR.

(2) INSERT CABLE UNTIL THE BRAID CONTACTS THE FLAT SURFACE, AND THE DIELECTRIC EXTENDS THROUGH THE HOLE IN THE FLAT SURFACE.

(1) STRIP COAXIAL CABLE AS SHOWN IN DETAIL 'A'.

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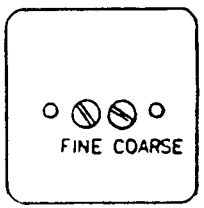
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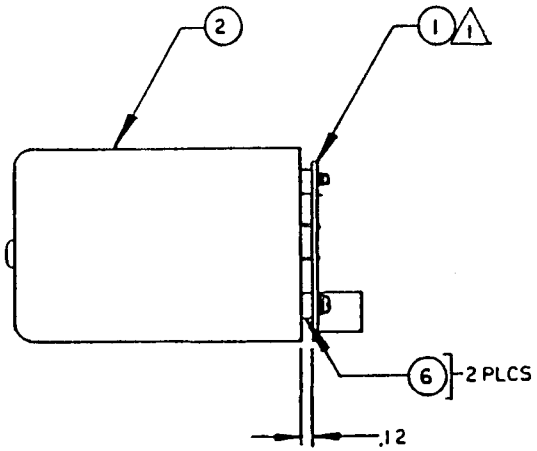
CABLE ASSY, FREQ. OUT

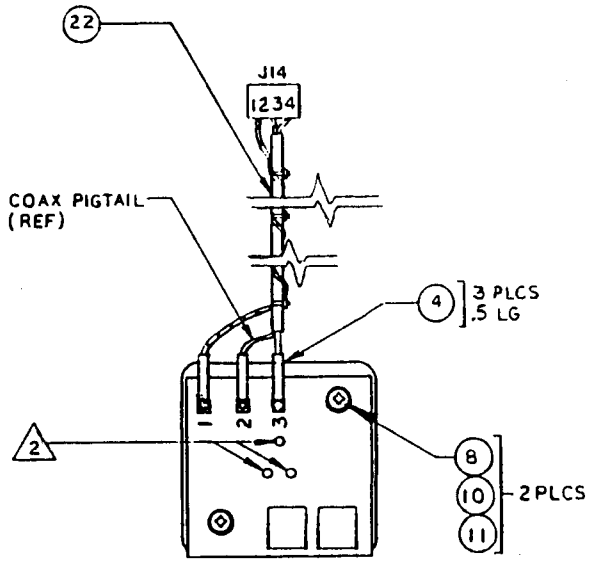
SIZE	CODE IDENT NO	DOCUMENT NO	REV
B	21793	404980-001/010	A

SCALE NONE | SHEET 1 OF 2

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2. SOLDER AT ASSY.

1. REMOVE AND DISCARD CABLE SUPPLIED WITH ITEM 1 AND REPLACE WITH CABLE ITEM 22.

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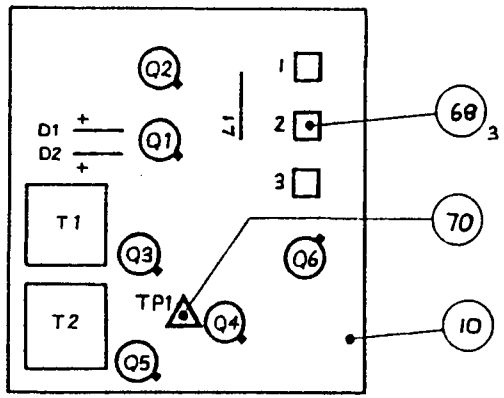
RACAL-DANA Instruments Inc.
6 GODDYEAR, IRVINE, CALIFORNIA 92714

OSCILLATOR ASSY

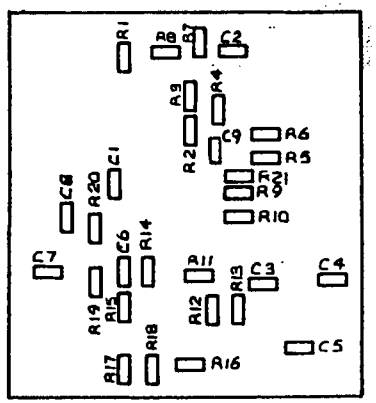
SIZE	DRAWING NO.	DOCUMENT NO.	REV
C	21793	404386	D

SCALE —— SHEET 1 OF 2

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VIEWED FROM COMPONENT SIDE



VIEWED FROM TRACK SIDE
(CIRCUIT SIDE)

NOTES

1. FIT PIN PART No. 24-3519 ITEM No. 68 IN HOLE POSITIONS MARKED □ TO PROTRUDE ON COMPONENT SIDE. 3 OFF
2. FIT PIN PART No 24-3537 ITEM No 70 IN HOLE POSITIONS MARKED △ TO PROTRUDE ON COMPONENT SIDE. 1 OFF

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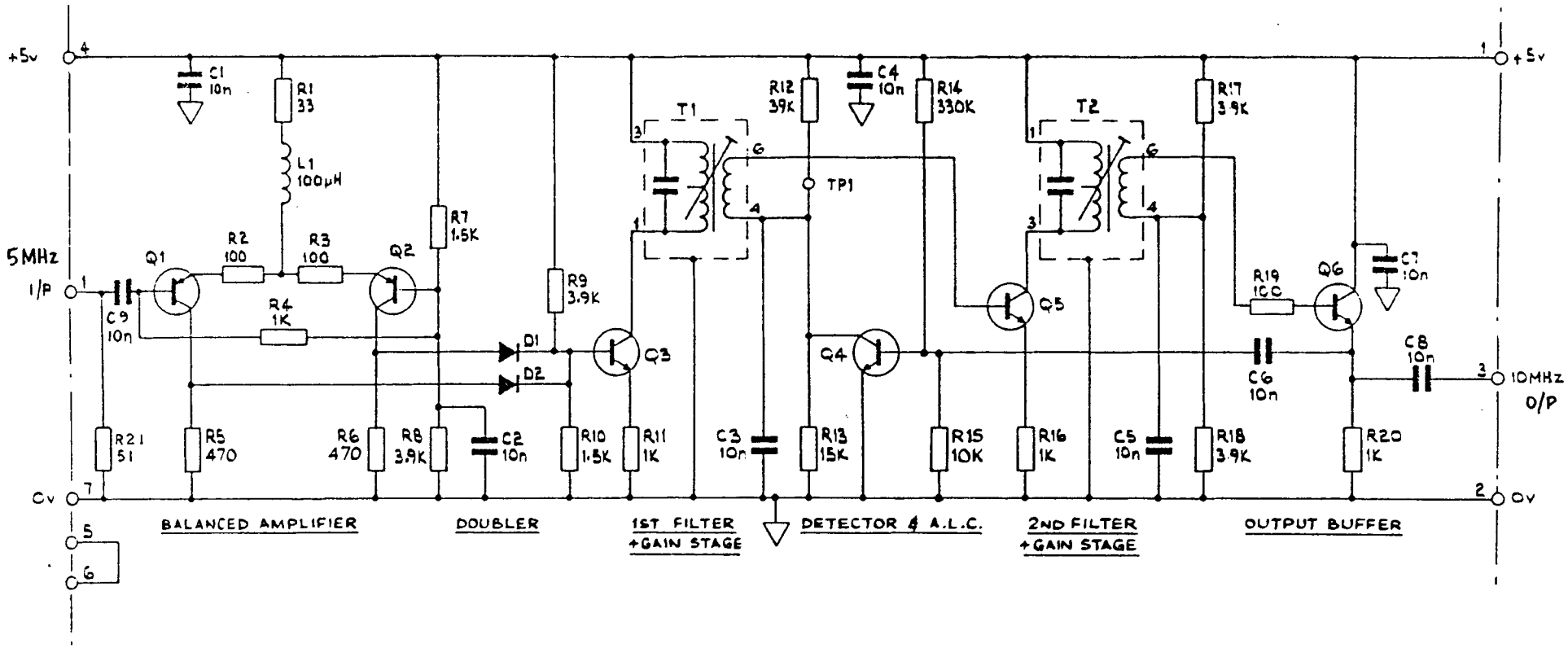
RACAL-DANA Instruments Inc.
IRVINE, CALIFORNIA

PCB ASSY, DOUBLER

SIZE	CODE IDENT NO	DWG NO.	REV
C	21793	401822	A

SCALE — SHEET 1 OF 4

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COMPONENT REF.	
R1-21	TP1
C1-9	T1,2
D1,2	L1
Q1-6	

REFERENCE	PART No	TYP. TYPE No
D1,2	22-1029	IN4149
Q3-6	22-6007	2N3904
Q1,2	22-6008	2N3906

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RACAL-DANA Instruments Inc.
IRVINE, CALIFORNIA

SCHEMATIC, DOUBLER

SIZE	CODE IDENT NO.	DWG NO.	REV
C	21793	431822	A

SCALE — SHEET 1 OF 1

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List of Suppliers

FSC	SUPPLIER
00779	AMP, INC. HARRISBURG, PA
01295	TEXAS INSTRUMENTS INC. DALLAS, TEXAS
02660	AMPHENOL CORP. BROADVIEW, ILLINOIS
04222	AEROVOX CORP. (HI-Q DIVISION) MYRTLE BEACH, SC
04713	MOTOROLA, INC. (SEMICONDUCTOR PRODUCTS DIV) PHOENIX, ARIZONA
05397	UNION CARBIDE CORP. (MATERIALS SYSTEMS DIV.) CLEVELAND, OHIO
06090	RACHEM CORP. MENLO PARK, CA
06540	AMATOM ELECTRONIC HARDWARE NEW ROCHELLE, NY
14433	ITT SEMI CONDUCTORS WEST PALM BEACH, FL
16956	DENNISON MFG. CO. FRAMINGTON, MA
18324	SIGNETICS, INC. SUNNYVALE, CA
18565	CHOMETRICS, INC. WOBURN, MA
19738	AVDEL-CHOBERT TELESBORO, NJ
21793	RACAL-DANA INSTRUMENTS INC. IRVINE, CA
22119	FERRANTI ELECTRIC PLAINVIEW, NY
27014	NATIONAL SEMI-CONDUCTOR CORP. SANTA CLARA, CA
28520	HEYCO KENILWORTH, NJ
29005	STORM PRODUCTS CO. LOS ANGELES, CA
34359	THREE (3) M CO. (COMMERCIAL TAPE DIV.) ST. PAUL MINNESOTA
52072	CIRCUIT ASSY. CORP. COSTA MESA, CA
55761	BALL CORPORATION (EFRATON DIVISION) IRVINE, CA
56289	SPAGUE ELECTRIC CO. N. ADAMS, MA
62559	SCHROFF INC. WARWICK, RI
62643	UNITED CHEMICON ROSEMONT, IL
65940	ROHM CORPORATION IRVINE, CA
71468	ITT CANNON ELECTRIC SANTA ANA, CA
72982	ERIE TECHNOLOGICAL PRODUCTS, INC. ERIE, PA
77342	AMERICAN MACHINE & FOUNDRY CO. (POTTER/BRUMFIELD CO.) PRINCE, IN
78189	ILLINOIS TOOL WORKS, INC. (SHAKEPROOF DIV.) ELGIN, ILLINOIS
81349	MILITARY SPECIFICATION
83125	NYTRONICS INC. DARLINGTON, SC
86928	SEASTROM MFG CO. GLENDALE, CA
91637	DALE ELECTRONICS INC. COLUMBUS, NEBRASKA
91802	INDUSTRIAL DEVICES INC. EDGEWATER, NJ
92194	ALPHA WIRE ELIZABETH, NEW JERSEY
95275	VITRAMON, INC. BRIDGEPORT, CONNECTICUT
99800	AMERICAN PRECISION INDUSTRIES INC. (DELEVAN DIVISION) EAST AURORA, NY
K8918	RACAL-DANA INSTRUMENTS LTD SLOUGH, BERKSHIRE, ENGLAND

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404947-001 FINAL ASSY., 3351E

REF DESIG	RACAL-DANA P/N	DESCRIPTION	FSC	MANUFACTURER'S P/N
W1	601195	PLUG, JUMPER, 0.1 CTR, LOW PROFILE	00779	530153-2
W3	601195	PLUG, JUMPER, 0.1 CTR, LOW PROFILE	00779	530153-2
W6	500022	WIRE, BARE COPPER/TIN, 22 GA	21793	500022
{1}1	404386	OSCILLATOR ASSY, 5 MHZ	21793	404386
{3}1	921238	MODULE ASSY., 3351 INTERFACE	21793	921238
{4}1	401991	PCB ASSY., FREQUENCY DISTRIBUTION	21793	401991
{5}1	404782	CABLE ASSY., LED FAIL	21793	404782
{6}1	404994	SHIPPING KIT, 3351E	21793	404994
{8}1	404979-001	CABLE ASSY., FREQUENCY DISTRIBUTION	21793	404979-001
{9}1	404979-002	CABLE ASSY., FREQUENCY DISTRIBUTION	21793	404979-002
{10}1	404979-003	CABLE ASSY., FREQUENCY DISTRIBUTION	21793	404979-003
{12}1	404980-001	CABLE ASSY., FREQUENCY OUT	21793	404980-001
{13}1	404980-002	CABLE ASSY., FREQUENCY OUT	21793	404980-002
{14}1	404980-003	CABLE ASSY., FREQUENCY OUT	21793	404980-003
{18}1	455805	PANEL FRONT, 3351R	21793	455805
{19}1	455818	PANEL TOP, 3351	21793	455818
{20}1	455819	PANEL BOTTOM, 3351	21793	455819
{23}1	455822	PANEL REAR 2X.1 PCB	21793	455822
{24}1	455779	PANEL, SIDE	21793	455779
{25}1	455779-001	PANEL, STD SIDE, 3SCR, LEFT	21793	455779-001
{26}1	455831	BRACKET, OSCILLATOR MOUNTING	21793	455831
{29}A/R	500005	TIE CORD, NYLON, BLACK	92194	LC-136
{40}1	610390	PLUG, HOLE	28520	P-375
{41}4	610777	CABLE TIE	16956	08-432
{42}4	610949	RIVET, .205D X .276L	19738	1601-5307
{44}1	611264	HANDLE, EXTRACTOR, BOTTOM	62559	20817-327
{45}1	611265	HANDLE, EXTRACTOR, TOP	62559	20817-328
{46}1	611266	MOUNTING HARDWARE, HANDLE	62559	21100-745
{48}31	615539	SCREW, PFH, 4-40X. 125	-	-
{49}3	615541	SCREW, PFH, 4-40X.250	-	-
{50}2	616314	SCREW, PPH, M3X5	21793	616314
{53}2	616405	SCREW, PFH, M2.5-.45 X 12	-	-
{54}8	616480	SCREW, PFH, 4-40 X .375	-	-
{56}1	921059	LABEL, CAUTION, STATIC	21793	921059
{59}1	921148	LABEL SET, VXI-VME	21793	921148
{61}1	921212-015	LABEL, IDENTIFICATION, 3351	21793	921212-015

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404947-002 FINAL ASSY., 3351E, OPT.01

REF DESIG	RACAL-DANA P/N	DESCRIPTION	FSC	MANUFACTURER'S P/N
U8-U10	230383	IC, DUAL 4-BIT DECADE COUNTER	01295	SN74LS490N
W6	500022	WIRE, BARE COPPER/TIN, 22 GA	21793	500022
(1)1	404386	OSCILLATOR ASSY, 5 MHZ	21793	404386
(3)1	921238	MODULE ASSY., 3351 INTERFACE	21793	921238
(4)1	401991	PCB ASSY., FREQUENCY DISTRIBUTION	21793	401991
(5)1	404782	CABLE ASSY., LED FAIL	21793	404782
(6)1	404994	SHIPPING KIT, 3351E	21793	404994
(8)1	404979-001	CABLE ASSY., FREQUENCY DISTRIBUTION	21793	404979-001
(9)1	404979-002	CABLE ASSY., FREQUENCY DISTRIBUTION	21793	404979-002
(10)1	404979-003	CABLE ASSY., FREQUENCY DISTRIBUTION	21793	404979-003
(12)1	404980-001	CABLE ASSY., FREQUENCY OUT	21793	404980-001
(13)1	404980-002	CABLE ASSY., FREQUENCY OUT	21793	404980-002
(14)1	404980-003	CABLE ASSY., FREQUENCY OUT	21793	404980-003
(18)1	455805	PANEL FRONT, 3351R	21793	455805
(19)1	455818	PANEL TOP, 3351	21793	455818
(20)1	455819	PANEL BOTTOM, 3351	21793	455819
(23)1	455822	PANEL REAR 2X.1 PCB	21793	455822
(24)1	455779	PANEL, SIDE	21793	455779
(25)1	455779-001	PANEL, STD SIDE, 3SCR, LEFT	21793	455779-001
(26)1	455831	BRACKET, OSCILLATOR MOUNTING	21793	455831
(29)A/R	500005	TIE CORD, NYLON, BLACK	92194	LC-136
(39)3	601195	PLUG, JUMPER, 0.1 CTR, LOW PROFILE	00779	530153-2
(40)1	610390	PLUG, HOLE	28520	P-375
(41)4	610777	CABLE TIE	16956	08-432
(42)4	610949	RIVET, .205D X .276L	19738	1601-5307
(44)1	611264	HANDLE, EXTRACTOR, BOTTOM	62559	20817-327
(45)1	611265	HANDLE, EXTRACTOR, TOP	62559	20817-328
(46)1	611266	MOUNTING HARDWARE, HANDLE	62559	21100-745
(48)31	615539	SCREW, PFH, 4-40X. 125	-	-
(49)3	615541	SCREW, PFH, 4-40X.250	-	-
(50)2	616314	SCREW, PPH, M3X5	21793	616314
(53)2	616405	SCREW, PFH, M2.5-.45 X 12	-	-
(54)8	616480	SCREW, PFH, 4-40 X .375	-	-
(56)1	921059	LABEL, CAUTION, STATIC	21793	921059
(59)1	921148	LABEL SET, VXI-VME	21793	921148
(61)1	921212-015	LABEL, IDENTIFICATION, 3351	21793	921212-015

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404947-003 FINAL ASSY., 3351E/10M

REF DESIG	RACAL-DANA P/N	DESCRIPTION	FSC	MANUFACTURER'S P/N
W6	500022	WIRE, BARE COPPER/TIN, 22 GA	21793	500022
{1}1	404386	OSCILLATOR ASSY, 5 MHZ	21793	404386
{3}1	921238	MODULE ASSY., 3351 INTERFACE	21793	921238
{4}1	401991	PCB ASSY., FREQUENCY DISTRIBUTION	21793	401991
{5}1	404782	CABLE ASSY., LED FAIL	21793	404782
{6}1	404994	SHIPPING KIT, 3351E	21793	404994
{8}1	404979-001	CABLE ASSY., FREQUENCY DISTRIBUTION	21793	404979-001
{10}1	404979-004	CABLE ASSY., FREQUENCY DISTRIBUTION	21793	404979-004
{12}1	404980-001	CABLE ASSY., FREQUENCY OUT	21793	404980-001
{13}1	404980-002	CABLE ASSY., FREQUENCY OUT	21793	404980-002
{14}1	404980-003	CABLE ASSY., FREQUENCY OUT	21793	404980-003
{18}1	455805	PANEL FRONT, 3351R	21793	455805
{19}1	455818	PANEL TOP, 3351	21793	455818
{20}1	455819	PANEL BOTTOM, 3351	21793	455819
{23}1	455822	PANEL REAR 2X.1 PCB	21793	455822
{24}1	455779	PANEL SIDE	21793	455779
{25}1	455779-001	PANEL STD SIDE, 3SCR, LEFT	21793	455779-001
{26}1	455831	BRACKET, OSCILLATOR MOUNTING	21799	455831
{29}A/R	500005	TIE CORD, NYLON, BLACK	92194	LC-136
{39}2	601195	PLUG, JUMPER, 0.1 CTR, LOW PROFILE	00779	530153-2
{40}1	610390	PLUG, HOLE	28520	P-375
{41}4	610777	CABLE TIE	16956	08-432
{42}4	610949	RIVET, .205D X .276L	19738	1601-5307
{44}1	611264	HANDLE, EXTRACTOR, BOTTOM	52559	20817-327
{45}1	611265	HANDLE, EXTRACTOR, TOP	52559	20817-328
{46}1	611266	MOUNTING HARDWARE, HANDLE	52559	21100-745
{48}31	615539	SCREW, PFH, 4-40X. 125	-	-
{49}3	615541	SCREW, PFH, 4-40X.250	-	-
{50}2	616314	SCREW, PPH, M3X5	21793	616314
{51}2	616251	SCREW, PPH, SEMS ASSY, 4-40X.250	78189	-
{53}2	616405	SCREW, PFH, M2.5-.45 X 12	-	-
{54}8	616480	SCREW, PFH, 4-40 X .375	-	-
{56}1	921059	LABEL, CAUTION, STATIC	21793	921059
{59}1	921148	LABEL SET, VXI-VME	21793	921148
{61}1	921212-015	LABEL, IDENTIFICATION, 3351	21793	921212-015

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404946-001 MODULE ASSY., 3351R

REF DESIG	RACAL-DANA P/N	DESCRIPTION	FSC	MANUFACTURER'S P/N
J22	601264	PC TERMINATOR, RT. ANGLE	06090	DG07-10
J203	600951	CONNECTOR, BNC, RECEPTACLE	02660	31-223
R49	000510	RES, CARB COMP, 51 OHM, 5 PERCENT, 1/4W	81349	RC07GF510J
{3}1	921238	MODULE ASSY., 3351 INTERFACE	21793	921238
{4}1	401991	PCB ASSY., FREQUENCY DISTRIBUTION	21793	401991
{5}1	404782	CABLE ASSY., LED FAIL	21793	404782
{8}1	404979-001	CABLE ASSY., FREQUENCY DISTRIBUTION	21793	404979-001
{9}1	404979-002	CABLE ASSY., FREQUENCY DISTRIBUTION	21793	404979-002
{10}1	404979-003	CABLE ASSY., FREQUENCY DISTRIBUTION	21793	404979-003
{12}1	404980-001	CABLE ASSY., FREQUENCY OUT	21793	404980-001
{13}1	404980-002	CABLE ASSY., FREQUENCY OUT	21793	404980-002
{14}1	404980-003	CABLE ASSY., FREQUENCY OUT	21793	404980-003
{18}1	455805	PANEL FRONT, 3351R	21793	455805
{19}1	455818	PANEL TOP, 3351	21793	455818
{20}1	455819	PANEL BOTTOM, 3351	21793	455819
{21}1	455820	PANEL RIGHT, 3351R	21793	455820
{22}1	455821	PANEL LEFT, 3351R	21793	455821
{23}1	455822	PANEL REAR 2X.1 PCB	21793	455822
{24}1	455823	HEATSINK, 3351R	21793	455823
{26}1	455827	BRACKET, OSC. MOUNTING	21793	455827
{27}A/R	500002	TUBING, SHRINK, .187 ID	29005	RNF-100-1-3/16
{28}A/R	500064	TUBING, SHRINK, .093 ID, BLK	29005	RNF-100-1-3/32
{29}A/R	500132	WIRE, TEFLON TWISTED PAIR, 24 GA, BLK/WHT	-	-
{30}A/R	500254	CABLE, COAXIAL, 50 OHM	92194	9178B
{32}A/R	524000	WIRE, TEFLON STRANDED, 24 GA, WHT	-	-
{33}A/R	524555	WIRE, TEFLON STRANDED, 24 GA, GRN	-	-
{34}A/R	524999	WIRE, TEFLON STRANDED, 24 GA, BLU	-	-
{39}2	601195	PLUG, JUMPER, 0.1 CTR, LOW PROFILE	00779	530153-2
{41}5	610777	CABLE TIE	16956	08-432
{42}6	610949	RIVET, .205D X .276L	19738	1601-5307
{44}1	611264	HANDLE, EXTRACTOR, BOTTOM	62559	20817-327
{45}1	611265	HANDLE, EXTRACTOR, TOP	62559	20817-328
{46}1	611266	MOUNTING HARDWARE, HANDLE	62559	21100-745
{48}35	615539	SCREW, PFH, 4-40X. 125	-	-
{49}4	615542	SCREW, PFH, 4-40 X .312	-	-
{50}2	615543	SCREW, PFH, 4-40X.375	-	-
{51}5	615541	SCREW, PFH, 4-40X.250	-	-
{53}2	616405	SCREW, PFH, M2.5-.45 X 12	-	-
{54}8	616480	SCREW, PFH, 4-40 X .375	-	-
{56}1	921059	LABEL, CAUTION, STATIC	21793	921059
{57}1	921090	RUBIDIUM OSCILLATOR	55761	FRS-C-1A8A4C
{59}1	921148	LABEL SET, VXI-VME	21793	921148
{61}1	921212-016	LABEL, VXI GENERATOR	21793	921212-016
{63}1	920710	LABEL, IDENIFICATION	21793	920710

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404946-002 FINAL ASSY., 3351R, OPT.01

REF DESIG	RACAL-DANA P/N	DESCRIPTION	FSC	MANUFACTURER'S P/N
J22	601264	PC TERMINATOR, RT. ANGLE	06090	DG07-10
J203	600951	CONNECTOR, BNC, RECEPTACLE	02660	31-223
R49	000510	RES, CARB COMP, 51 OHM, 5 PERCENT, 1/4W	81349	RC07GF510J
U8-U10	230383	IC, DUAL 4-BIT DECADE COUNTER	01295	SN74LS490N
{3}1	921238	MODULE ASSY., 3351 INTERFACE	21793	921238
{4}1	401991	PCB ASSY., FREQUENCY DISTRIBUTION	21793	401991
{5}1	404782	CABLE ASSY., LED FAIL	21793	404782
{6}1	404993	SHIPPING KIT, 3351R	21793	404993
{8}1	404979-001	CABLE ASSY., FREQUENCY DISTRIBUTION	21793	404979-001
{9}1	404979-002	CABLE ASSY., FREQUENCY DISTRIBUTION	21793	404979-002
{10}1	404979-003	CABLE ASSY., FREQUENCY DISTRIBUTION	21793	404979-003
{12}1	404980-001	CABLE ASSY., FREQUENCY OUT	21793	404980-001
{13}1	404980-002	CABLE ASSY., FREQUENCY OUT	21793	404980-002
{14}1	404980-003	CABLE ASSY., FREQUENCY OUT	21793	404980-003
{18}1	455805	PANEL FRONT, 3351R	21793	455805
{19}1	455818	PANEL TOP, 3351	21793	455818
{20}1	455819	PANEL BOTTOM, 3351	21793	455819
{21}1	455820	PANEL RIGHT, 3351R	21793	455820
{22}1	455821	PANEL LEFT, 3351R	21793	455821
{23}1	455822	PANEL REAR 2X.1 PCB	21793	455822
{24}1	455823	HEATSINK, 3351R	21793	455823
{26}1	455827	BRACKET, OSC. MOUNTING	21793	455827
{27}A/R	500002	TUBING, SHRINK, .187 ID	29005	RNF-100-1-3/16
{28}A/R	500064	TUBING, SHRINK, .093 ID, BLK	29005	RNF-100-1-3/32
{29}A/R	500132	WIRE, TEFLON TWISTED PAIR, 24 GA, BLK/WHT	-	-
{30}A/R	500254	CABLE, COAXIAL, 50 OHM	92194	9178B
{32}A/R	524000	WIRE, TEFLON STRANDED, 24 GA, WHT	-	-
{33}A/R	524555	WIRE, TEFLON STRANDED, 24 GA, GRN	-	-
{34}A/R	524999	WIRE, TEFLON STRANDED, 24 GA, BLU	-	-
{39}3	601195	PLUG, JUMPER, 0.1 CTR, LOW PROFILE	00779	530153-2
{41}5	610777	CABLE TIE	16956	08-432
{42}6	610949	RIVET, .205D X .276L	19738	1601-5307
{44}1	611264	HANDLE, EXTRACTOR, BOTTOM	62559	20817-327
{45}1	611265	HANDLE, EXTRACTOR, TOP	62559	20817-328
{46}1	611266	MOUNTING HARDWARE, HANDLE	62559	21100-745
{48}35	615539	SCREW, PFH, 4-40X. 125	-	-
{49}4	615542	SCREW, PFH, 4-40 X .312	-	-
{50}2	615543	SCREW, PFH, 4-40X.375	-	-
{51}5	615541	SCREW, PFH, 4-40X.250	-	-
{53}2	616405	SCREW, PFH, M2.5-.45 X 12	-	-
{54}8	616480	SCREW, PFH, 4-40 X .375	-	-
{56}1	921059	LABEL, CAUTION, STATIC	21793	921059
{57}1	921090	RUBIDIUM OSCILLATOR	55761	FRS-C-1A8A4C
{59}1	921148	LABEL SET, VXI-VME	21793	921148
{61}1	921212-014	LABEL, VXI, 3351R	21793	921212-014

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404946-003 FINAL ASSY., 3351R/10M

REF DESIG	RACAL-DANA P/N	DESCRIPTION	FSC	MANUFACTURER'S P/N
J22	601264	PG TERMINATOR, RT. ANGLE	06090	DG07-10
J203	600951	CONNECTOR, BNC, RECEPTACLE	02660	31-223
R49	000510	RES, CARB COMP, 51 OHM, 5 PERCENT, 1/4W	81349	RC07GF510J
{3}1	921238	MODULE ASSY., 3351 INTERFACE	21793	921238
{4}1	401991	PCB ASSY., FREQUENCY DISTRIBUTION	21793	401991
{5}1	404782	CABLE ASSY., LED FAIL	21793	404782
{6}1	404993	SHIPPING KIT, 3351R	21793	404993
{8}1	404979-001	CABLE ASSY., FREQUENCY DISTRIBUTION	21793	404979-001
{10}1	404979-004	CABLE ASSY., FREQUENCY DISTRIBUTION	21793	404979-004
{12}1	404980-001	CABLE ASSY., FREQUENCY OUT	21793	404980-001
{13}1	404980-002	CABLE ASSY., FREQUENCY OUT	21793	404980-002
{14}1	404980-003	CABLE ASSY., FREQUENCY OUT	21793	404980-003
{18}1	455805	PANEL FRONT, 3351R	21793	455805
{19}1	455818	PANEL TOP, 3351	21793	455818
{20}1	455819	PANEL BOTTOM, 3351	21793	455819
{21}1	455820	PANEL RIGHT, 3351R	21793	455820
{22}1	455821	PANEL LEFT, 3351R	21793	455821
{23}1	455822	PANEL REAR 2X.1 PCB	21793	455822
{24}1	455823	HEATSINK, 3351R	21793	455823
{26}1	455827	BRACKET, OSC. MOUNTING	21793	455827
{27}A/R	500002	TUBING, SHRINK, .187 ID	29005	RNF-100-1-3/16
{28}A/R	500064	TUBING, SHRINK, .093 ID, BLK	29005	RNF-100-1-3/32
{29}A/R	500132	WIRE, TEFLON TWISTED PAIR, 24 GA, BLK/WHT	-	-
{30}A/R	500254	CABLE, COAXIAL, 50 OHM	92194	9178B
{32}A/R	524000	WIRE, TEFLON STRANDED, 24 GA, WHT	-	-
{33}A/R	524555	WIRE, TEFLON STRANDED, 24 GA, GRN	-	-
{34}A/R	524999	WIRE, TEFLON STRANDED, 24 GA, BLU	-	-
{39}2	601195	PLUG, JUMPER, 0.1 CTR, LOW PROFILE	00779	530153-2
{41}5	610777	CABLE TIE	16956	08-432
{42}6	610949	RIVET, .205D X .276L	19738	1601-5307
{44}1	611264	HANDLE, EXTRACTOR, BOTTOM	62559	20817-327
{45}1	611265	HANDLE, EXTRACTOR, TOP	62559	20817-328
{46}1	611266	MOUNTING HARDWARE, HANDLE	62559	21100-745
{48}35	615539	SCREW, PFH, 4-40X. 125	-	-
{49}4	615542	SCREW, PFH, 4-40 X .312	-	-
{50}2	615543	SCREW, PFH, 4-40X.375	-	-
{51}5	615541	SCREW, PFH, 4-40X.250	-	-
{52}2	616251	SCREW, PPH, SEMS ASSY, 4-40X.250	78189	-
{53}2	616405	SCREW, PFH, M2.5-.45 X 12	-	-
{54}8	616480	SCREW, PFH, 4-40 X .375	-	-
{56}1	921059	LABEL, CAUTION, STATIC	21793	921059
{57}1	921090	RUBIDIUM OSCILLATOR	55761	FRS-C-1A8A4C
{59}1	921148	LABEL SET, VXI-VME	21793	921148
{61}1	921212-016	LABEL, VXI GENERATOR	21793	921212-016

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401991 PCB ASSY., FREQ. DISTR. 3351R/E

REF DESIG	RACAL-DANA P/N	DESCRIPTION	FSC	MANUFACTURER'S P/N
C1-C6	110126	CAP, TANTA, 6.8UF, 35V, 20 PERCENT	05397	T355F685M035A5
C5	100150	CAPACITOR, .1 UF, 50V	04222	MD015E104MAA
C7	100150	CAPACITOR, .1 UF, 50V	04222	MD015E104MAA
C9	100150	CAPACITOR, .1 UF, 50V	04222	MD015E104MAA
C10	100150	CAPACITOR, .1 UF, 50V	04222	MD015E104MAA
C11-C14	100062	CAP, CERAM, .01 UF 100V, 10 PERCENT	05397	C320C103K1R5CA
C15	110126	CAP, TANTA, 6.8UF, 35V, 20 PERCENT	05397	T355F685M035A5
C16	100150	CAPACITOR, .1 UF, 50V	04222	MD015E104MAA
C20	100150	CAPACITOR, .1 UF, 50V	04222	MD015E104MAA
C21	110126	CAP, TANTA, 6.8UF, 35V, 20 PERCENT	05397	T355F685M035A5
C22	100062	CAP, CERAM, .01 UF 100V, 10 PERCENT	05397	C320C103K1R5CA
C23	110126	CAP, TANTA, 6.8UF, 35V, 20 PERCENT	05397	T355F685M035A5
C24	110126	CAP, TANTA, 6.8UF, 35V, 20 PERCENT	05397	T355F685M035A5
C25	100062	CAP, CERAM, .01 UF 100V, 10 PERCENT	05397	C320C103K1R5CA
C27	100063	CAP, FIXED CER	56289	C023B501E103M
C31	100063	CAP, FIXED CER	56289	C023B501E103M
C32	100133	CAP, CERAMIC, .1UF, LOW PROFILE, 20PCT	72982	8131LP-100-Z5U-1
C33-C35	110126	CAP, TANTA, 6.8UF, 35V, 20 PERCENT	05397	T355F685M035A5
C38	110126	CAP, TANTA, 6.8UF, 35V, 20 PERCENT	05397	T355F685M035A5
C41	110126	CAP, TANTA, 6.8UF, 35V, 20 PERCENT	05397	T355F685M035A5
C44	R-21-3035	CAP, SILVER MICA, 150PF, 250V, 2 PCT	71468	454-52
C45	R-21-1685	CAP, CERAM, 27PF, 63V, 2PCT	18324	632-34279
C46	R-21-2830	CAP, SILVER MICA, 205PF, 400V, 1 PCT	71468	454-52
C47	R-21-2848	CAP, SILVER MICA, 301PF, 400V, 1 PCT	71468	454-52
C48	R-21-1688	CAP, CERAM, 47PF, 63V, 2PCT	18324	632-34479
C49	R-21-2857	CAP, SILVER MICA, 392PF, 400V, 1 PCT	71468	454-52
C50	R-21-2647	CAP, SILVER MICA, 2.7NF, 400V, 2 PCT	71468	454-274
C51	R-21-2587	CAP, SILVER MICA, 470PF, 400V, 2 PCT	71468	454-273
C52	R-21-2647	CAP, SILVER MICA, 2.7NF, 400V, 2 PCT	71468	454-274
C53-C55	100133	CAP, CERAMIC, .1UF, LOW PROFILE, 20PCT	72982	8131LP-100-Z5U-1
C92	100133	CAP, CERAMIC, .1UF, LOW PROFILE, 20PCT	72982	8131LP-100-Z5U-1
C93	100133	CAP, CERAMIC, .1UF, LOW PROFILE, 20PCT	72982	8131LP-100-Z5U-1
C94	110238	CAP, ALUM, ELEC, 33UF, 25V, 20 PCT	62643	SM25VB330M
C95	100133	CAP, CERAMIC, .1UF, LOW PROFILE, 20PCT	72982	8131LP-100-Z5U-1
C97-C99	100133	CAP, CERAMIC, .1UF, LOW PROFILE, 20PCT	72982	8131LP-100-Z5U-1
C100	110238	CAP, ALUM, ELEC, 33UF, 25V, 20 PCT	62643	SM25VB330M
C101	100133	CAP, CERAMIC, .1UF, LOW PROFILE, 20PCT	72982	8131LP-100-Z5U-1
C103-C105	100133	CAP, CERAMIC, .1UF, LOW PROFILE, 20PCT	72982	8131LP-100-Z5U-1
C106	110238	CAP, ALUM, ELEC, 33UF, 25V, 20 PCT	62643	SM25VB330M
C107	100133	CAP, CERAMIC, .1UF, LOW PROFILE, 20PCT	72982	8131LP-100-Z5U-1
C109	100133	CAP, CERAMIC, .1UF, LOW PROFILE, 20PCT	72982	8131LP-100-Z5U-1
C129	110238	CAP, ALUM, ELEC, 33UF, 25V, 20 PCT	62643	SM25VB330M
C130	110238	CAP, ALUM, ELEC, 33UF, 25V, 20 PCT	62643	SM25VB330M
C131	110238	CAP, ALUM, ELEC, 33UF, 25V, 20 PCT	62643	SM25VB330M
C138-C140	100133	CAP, CERAMIC, .1UF, LOW PROFILE, 20PCT	72982	8131LP-100-Z5U-1
C141-C143	110126	CAP, TANTA, 6.8UF, 35V, 20 PERCENT	05397	T355F685M035A5
C145	110126	CAP, TANTA, 6.8UF, 35V, 20 PERCENT	05397	T355F685M035A5
C146	100150	CAPACITOR, .1 UF, 50V	04222	MD015E104MAA
C149	110237	CAP ALUM, ELEC, 220UF, 16V, 20 PCT	62643	SM16VB221M10X12
C150-C153	110126	CAP, TANTA, 6.8UF, 35V, 20 PERCENT	05397	T355F685M035A5
C154	110238	CAP, ALUM, ELEC, 33UF, 25V, 20 PCT	62643	SM25VB330M
CR1	210070	DIODE, POWER, 3A	04713	MR501
CR2	210070	DIODE, POWER, 3A	04713	MR501
CR3-CR13	R-22-1029	DIODE, SILICON	14433	1N4149
DS1-DS4	210121	DIODE, LIGHT EMITTING, GRN	91802	5350T1LC
J3	601925	CONNECTOR, PCB, RECEPT, 3 ROW, 96P	52072	618008
J4	601925	CONNECTOR, PCB, RECEPT, 3 ROW, 96P	52072	618008
J5	601208-012	CONNECTOR, PCB, PLUG, 5-PIN	52072	CA-S05-23B-43
K1	310215	RELAY, 1 FORM C, 5V COIL	77342	T81H5D312-05

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401991 PCB ASSY., FREQ. DISTR. 3351R/E

REF DESIG	RACAL-DANA P/N	DESCRIPTION	FSC	MANUFACTURER'S P/N
L1-L3	310098	CHOKE, RF, 3.3UH	99800	1537-24
L4	310218	CHOKE, RF, 1.2UH, 10PCT	99800	1025-22
L5	310216	CHOKE, RF MOLDED, 2.7UH, 10 PCT	99800	1025-30
L6	310069	CHOKE, RF, 15UH, 10 PERCENT	99800	SERIES1537
L8	100164	CAP, FEED-THRU,800PF, 50V	00779	842448-2
L9	310193	CHOKE, SHIELDED, 5UH	91637	IH-5-5-10
L10	100164	CAP, FEED-THRU,800PF, 50V	00779	842448-2
L11	310098	CHOKE, RF, 3.3UH	99800	1537-24
L12	310193	CHOKE, SHIELDED, 5UH	91637	IH-5-5-10
L13-L18	310217	CHOKE, RF, 47UH, 5PCT	99800	1537-60
L19	310219	CHOKE, RF, MOLDED, 27UH, 10 PCT	99800	1025-54
P1	601675-001	CONNECTOR, EUROCARD, 96 PIN (MODIFIED)	21793	601675-001
P2	601675-001	CONNECTOR, EUROCARD, 96 PIN (MODIFIED)	21793	601675-001
Q1	200298	TRANSISTOR, NPN	04713	2N3904
Q2	R-22-6017	TRANSISTOR, NPN	04713	2N2369
Q3	R-22-6017	TRANSISTOR, NPN	04713	2N2369
Q4	R-22-6018	TRANSISTOR, PNP	04713	MPS3640
Q5	R-22-6017	TRANSISTOR, NPN	04713	2N2369
Q6	R-22-6018	TRANSISTOR, PNP	04713	MPS3640
Q7	R-22-6017	TRANSISTOR, NPN	04713	2N2369
Q8	R-22-6018	TRANSISTOR, PNP	04713	MPS3640
Q9-Q12	R-22-6017	TRANSISTOR, NPN	04713	2N2369
Q13-Q18	R-22-6079	IC,NPN,HI SPEED SWITCH	22119	ZTX313
Q19	200298	TRANSISTOR, NPN	04713	2N3904
R1	000272	RES, CARBON,2.7K,1/4W,5 PERCENT	81349	RC07GF272J
R2	000272	RES, CARBON,2.7K,1/4W,5 PERCENT	81349	RC07GF272J
R3	000472	RES, CARB COMP, 4.7K, 5 PERCENT, 1/4W	81349	RC07GF472J
R4	000472	RES, CARB COMP, 4.7K, 5 PERCENT, 1/4W	81349	RC07GF472J
R5-R7	000201	RES, CARBON, 200 OHM, 5 PERCENT, 1/4W	81349	RC07GF201J
R8	000472	RES, CARB COMP, 4.7K, 5 PERCENT, 1/4W	81349	RC07GF472J
R9	000473	RES, CARBON,47K,1/4W,5 PERCENT	81349	RC07GF473J
R10	000201	RES, CARBON, 200 OHM, 5 PERCENT, 1/4W	81349	RC07GF201J
R11	000472	RES, CARB COMP, 4.7K, 5 PERCENT, 1/4W	81349	RC07GF472J
R12	000472	RES, CARB COMP, 4.7K, 5 PERCENT, 1/4W	81349	RC07GF472J
R13	000151	RES, CARBON,150 OHM,1/4W,5 PERCENT	81349	RC07GF151J
R14	000472	RES, CARB COMP, 4.7K, 5 PERCENT, 1/4W	81349	RC07GF472J
R15	000102	RES, CARB COMP, 1K, 5 PERCENT, 1/4W	81349	RC07GF102J
R16	000472	RES, CARB COMP, 4.7K, 5 PERCENT, 1/4W	81349	RC07GF472J
R17	000152	RES, CARBON,1.5K,1/4W,5 PERCENT	81349	RC07GF152J
R18	000472	RES, CARB COMP, 4.7K, 5 PERCENT, 1/4W	81349	RC07GF472J
R19	000103	RES, CARB COMP, 10K, 5 PERCENT, 1/4W	81349	RC07GF103J
R20	000152	RES, CARBON,1.5K,1/4W,5 PERCENT	81349	RC07GF152J
R21	000472	RES, CARB COMP, 4.7K, 5 PERCENT, 1/4W	81349	RC07GF472J
R50	000223	RES, CARBON,22K,1/4W,5 PERCENT	81349	RC07GF223J
R51	000223	RES, CARBON,22K,1/4W,5 PERCENT	81349	RC07GF223J
R55	000101	RES, CARB COMP, 100 OHM, 5 PERCENT, 1/4W	81349	RC07GF101J
R56	000272	RES, CARBON,2.7K,1/4W,5 PERCENT	81349	RC07GF272J
R57	000102	RES, CARB COMP, 1K, 5 PERCENT, 1/4W	81349	RC07GF102J
R58	000103	RES, CARB COMP, 10K, 5 PERCENT, 1/4W	81349	RC07GF103J
R59	000102	RES, CARB COMP, 1K, 5 PERCENT, 1/4W	81349	RC07GF102J
R61	000100	RES, CARB COMP, 10 OHM, 5 PERCENT, 1/4W	81349	RC07GF100J
R62	000562	RES,CARBON,5.6K,1/4W,5 PERCENT	81349	RC07GF562J
R63	000562	RES,CARBON,5.6K,1/4W,5 PERCENT	81349	RC07GF562J
R64	000332	RES, CARB COMP, 3.3K, 5 PERCENT, 1/4W	81349	RC07GF332J
R65	000470	RES, CARB COMP, 47 OHM, 5 PERCENT, 1/4W	81349	RC07GF470J
R66	000470	RES, CARB COMP, 47 OHM, 5 PERCENT, 1/4W	81349	RC07GF470J
R67	000820	RES, CARBON, 82 OHM, 1/4W, 5PCT	81349	RC07GF820J
R68	000100	RES, CARB COMP, 10 OHM, 5 PERCENT, 1/4W	81349	RC07GF100J
R69	000562	RES,CARBON,5.6K,1/4W,5 PERCENT	81349	RC07GF562J

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401991 PCB ASSY., FREQ. DISTR. 3351R/E

REF DESIG	RACAL-DANA P/N	DESCRIPTION	FSC	MANUFACTURER'S P/N
R70	000562	RES,CARBON,5.6K,1/4W,5 PERCENT	81349	RC07GF562J
R71	000332	RES, CARB COMP, 3.3K, 5 PERCENT, 1/4W	81349	RC07GF332J
R72	000470	RES, CARB COMP, 47 OHM, 5 PERCENT, 1/4W	81349	RC07GF470J
R73	000470	RES, CARB COMP, 47 OHM, 5 PERCENT, 1/4W	81349	RC07GF470J
R74	000121	RES, CARB COMP, 120 OHM, 5 PERCENT, 1/4W	81349	RC07GF121J
R75	000100	RES, CARB COMP, 10 OHM, 5 PERCENT, 1/4W	81349	RC07GF100J
R76	000562	RES,CARBON,5.6K,1/4W,5 PERCENT	81349	RC07GF562J
R77	000562	RES,CARBON,5.6K,1/4W,5 PERCENT	81349	RC07GF562J
R78	000332	RES, CARB COMP, 3.3K, 5 PERCENT, 1/4W	81349	RC07GF332J
R79	000470	RES, CARB COMP, 47 OHM, 5 PERCENT, 1/4W	81349	RC07GF470J
R80	000470	RES, CARB COMP, 47 OHM, 5 PERCENT, 1/4W	81349	RC07GF470J
R81	000151	RES, CARBON,150 OHM,1/4W,5 PERCENT	81349	RC07GF151J
R82-R84	000101	RES, CARB COMP, 100 OHM, 5 PERCENT, 1/4W	81349	RC07GF101J
R85	000122	RES, CARB COMP, 1.2K, 5 PERCENT, 1/4W	81349	RC07GF122J
R86	000470	RES, CARB COMP, 47 OHM, 5 PERCENT, 1/4W	81349	RC07GF470J
R87	000272	RES, CARBON,2.7K,1/4W,5 PERCENT	81349	RC07GF272J
R88	000101	RES, CARB COMP, 100 OHM, 5 PERCENT, 1/4W	81349	RC07GF101J
R89	000122	RES, CARB COMP, 1.2K, 5 PERCENT, 1/4W	81349	RC07GF122J
R90	000470	RES, CARB COMP, 47 OHM, 5 PERCENT, 1/4W	81349	RC07GF470J
R91	000272	RES, CARBON,2.7K,1/4W,5 PERCENT	81349	RC07GF272J
R92	000101	RES, CARB COMP, 100 OHM, 5 PERCENT, 1/4W	81349	RC07GF101J
R93	000122	RES, CARB COMP, 1.2K, 5 PERCENT, 1/4W	81349	RC07GF122J
R94	000470	RES, CARB COMP, 47 OHM, 5 PERCENT, 1/4W	81349	RC07GF470J
R95	000272	RES, CARBON,2.7K,1/4W,5 PERCENT	81349	RC07GF272J
R96	000101	RES, CARB COMP, 100 OHM, 5 PERCENT, 1/4W	81349	RC07GF101J
R151	000332	RES, CARB COMP, 3.3K, 5 PERCENT, 1/4W	81349	RC07GF332J
R152	000471	RES, CARBON,470 OHM,1/4W,5 PERCENT	81349	RC07GF471J
R153	000102	RES, CARB COMP, 1K, 5 PERCENT, 1/4W	81349	RC07GF102J
R154	000100	RES, CARB COMP, 10 OHM, 5 PERCENT, 1/4W	81349	RC07GF100J
R155	000102	RES, CARB COMP, 1K, 5 PERCENT, 1/4W	81349	RC07GF102J
R156	000330	RES, CARBON, 33 OHM, 1/4W, 5 PERCENT	81349	RC07GF333J
R157	000330	RES, CARBON, 33 OHM, 1/4W, 5 PERCENT	81349	RC07GF333J
R158	000332	RES, CARB COMP, 3.3K, 5 PERCENT, 1/4W	81349	RC07GF332J
R160	000332	RES, CARB COMP, 3.3K, 5 PERCENT, 1/4W	81349	RC07GF332J
R161	000471	RES, CARBON,470 OHM,1/4W,5 PERCENT	81349	RC07GF471J
R162	000102	RES, CARB COMP, 1K, 5 PERCENT, 1/4W	81349	RC07GF102J
R163	000100	RES, CARB COMP, 10 OHM, 5 PERCENT, 1/4W	81349	RC07GF100J
R164	000102	RES, CARB COMP, 1K, 5 PERCENT, 1/4W	81349	RC07GF102J
R165	000330	RES, CARBON, 33 OHM, 1/4W, 5 PERCENT	81349	RC07GF333J
R166	000330	RES, CARBON, 33 OHM, 1/4W, 5 PERCENT	81349	RC07GF333J
R167	000332	RES, CARB COMP, 3.3K, 5 PERCENT, 1/4W	81349	RC07GF332J
R168	000101	RES, CARB COMP, 100 OHM, 5 PERCENT, 1/4W	81349	RC07GF101J
R169	000332	RES, CARB COMP, 3.3K, 5 PERCENT, 1/4W	81349	RC07GF332J
R170	000471	RES, CARBON,470 OHM,1/4W,5 PERCENT	81349	RC07GF471J
R171	000102	RES, CARB COMP, 1K, 5 PERCENT, 1/4W	81349	RC07GF102J
R172	000100	RES, CARB COMP, 10 OHM, 5 PERCENT, 1/4W	81349	RC07GF100J
R173	000102	RES, CARB COMP, 1K, 5 PERCENT, 1/4W	81349	RC07GF102J
R174	000330	RES, CARBON, 33 OHM, 1/4W, 5 PERCENT	81349	RC07GF333J
R175	000330	RES, CARBON, 33 OHM, 1/4W, 5 PERCENT	81349	RC07GF333J
R176	000332	RES, CARB COMP, 3.3K, 5 PERCENT, 1/4W	81349	RC07GF332J
R183	000101	RES, CARB COMP, 100 OHM, 5 PERCENT, 1/4W	81349	RC07GF101J
R186	C00101	RES, CARB COMP, 100 OHM, 5 PERCENT, 1/4W	81349	RC07GF101J
R194	000223	RES, CARBON,22K,1/4W,5 PERCENT	81349	RC07GF223J
R195	000223	RES, CARBON,22K,1/4W,5 PERCENT	81349	RC07GF223J
R196	000223	RES, CARBON,22K,1/4W,5 PERCENT	81349	RC07GF223J
T1-T3	R-17-3227	TRANSFORMER	K8918	17-3227
TP1	601197	POST, TEST, .025 SQ	00779	6-87022-6
TP2	601197	POST, TEST, .025 SQ	00779	6-87022-6
U1	230547	IC, QUAD COMPARATOR	27014	LM339N/A-1

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401991 PCB ASSY., FREQ. DISTR. 3351R/E

REF DESIG	RACAL-DANA P/N	DESCRIPTION	FSC	MANUFACTURER'S P/N
U2	230378	IC, 3-TERM NEG. REGULATOR	27014	7915CT
U3	230380	IC, QUAD MAND GATE	27014	DM74LS03N
U4	230234	IC, HEX INVERTER	01295	SN74LS04N
U5	230194	IC.DUAL D-TYPE BISTABLE	01295	SN74LS74AN
U6	230317	IC, DECADE COUNTER	01295	SN74LS90
U7	230547	IC, QUAD COMPARATOR	27014	LM339N/A-1
W1-W5	601208-010	CONNECTOR, PCB, PLUG, 2-PIN	21793	601208-010
{96}1	411991	PCB VXI FREQUENCY DIST. (UNLOADED)	21793	411991
{99}A/R	500022	WIRE, BARE COPPER/TIN, 22 GA	21793	500022
{113}1	610833	WASHER SAOLDER, NYLON	86928	5607-45
{114}1	610851	INSULATOR, TO-220	18565	60-11-5791-1674
{115}3	611258-001	STANDOFF, SWAGE 4-40 X .170	06540	8091-11B-B-440-28
{117}1	616253	SCREW, PPH, SEMS ASSY, 4-40 X .375	78189	-
{119}1	617004	NUT, HEX, 4-40	-	-
{121}A/R	921055	TAPE, DBL SIDED FOAM	34359	Y-4930

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404979-001/010 CABLE ASSY., FREQ. DISTRIBUTION

REF DESIG	RACAL-DANA P/N	DESCRIPTION	FSC	MANUFACTURER'S P/N
{2}A/R	500254	CABLE, COAXIAL, 50 OHM	92194	91788
{4}2	601263	TERMINAL, SDR, COAX, STR	06090	D-607-09

404980-001/010 CABLE ASSY., FREQ. OUT

REF DESIG	RACAL-DANA P/N	DESCRIPTION	FSC	MANUFACTURER'S P/N
{2}A/R	500002	TUBING, SHRINK, .187 ID	29005	RNF-100-1-3/16
{3}A/R	500064	TUBING, SHRINK, .093 ID, BLK	29005	RNF-100-1-3/32
{4}A/R	500254	CABLE, COAXIAL, 50 OHM	92194	91788
{6}1	600808	CONNECTOR, BNC, 150 RECEPT	02660	31-010
{8}1	601263	TERMINAL, SDR, COAX, STR	06090	D-607-09

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404386 OSCILLATOR ASSY., (04E)

REF DESIG	RACAL-DANA P/N	DESCRIPTION	FSC	MANUFACTURER'S P/N
{1}1	401822	PCB, DOUBLER	21793	401822
{2}1	454879	OSCILLATOR, 5 MHZ FREQ, STD	21793	454879
{4}A/R	500064	TUBING, SHRINK, .093 ID, BLK	29005	RNF-100-1-3/32
{6}2	610304	SPACER, .250DX.125 LG	21793	610304
{8}2	611074	SCREW, METRIC PPH, M3X10	21793	611074
{10}2	617102	WASHER, FLAT, #4, LIGHT SERIES	-	-
{11}2	617127	WASHER, LOCK, #4, LIGHT SERIES	-	-
{22}1	404691	CABLE ASSEMBLY	21793	404691

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401822, PCB ASSY., DOUBLER

REF DESIG	RACAL-DANA P/N	DESCRIPTION	FSC	MANUFACTURER'S P/N
C1-9	R-21-1801	CAP, CHIP, 10 NF	95275	VJ1206Y103MF
D1-2	R-22-1029	DIODE, SILICON	14433	1N4149
L1	310151	CHOKE, 10 PERCENT, 100 UH	83125	DD100UH
Q1-2	200299	TRANS, PNP	04713	2N3906
Q3-6	200298	TRANS, NPN	04713	2N3904
R1	R-20-5776	RES, CHIP, 33 OHM, 1/8W, 5 PERCENT, 200V	65940	MCR18-33 OHM-5 PCT
R2-3	R-20-5764	RES, CHIP, 100 OHM, 1/8W, 5 PERCENT	65940	MCR18-100 OHM-5 PCT
R4	R-20-5792	RES, CHIP, 1K, 1/8W, 5 PERCENT, 200V	65940	MCR18-1K-5 PCT
R5-6	R-20-5765	RES, CHIP, 470 OHM, 1/8W, 5 PERCENT	65940	MCR18-470 OHM-5 PCT
R7	R-20-5794	RES, CHIP, 1.5K, 1/8W, 5 PERCENT, 200V	65940	MCR18-1.5K-5 PCT
R8-9	R-20-5798	RES, CHIP, 3.9K, 1/8W, 5 PERCENT, 200V	65940	MCR18-3.9K-5 PCT
R10	R-20-5794	RES, CHIP, 1.5K, 1/8W, 5 PERCENT, 200V	65940	MCR18-1.5K-5 PCT
R11	R-20-5792	RES, CHIP, 1K, 1/8W, 5 PERCENT, 200V	65940	MCR18-1K-5 PCT
R12	R-20-5808	RES, CHIP, 39K, 1/8W, 5 PERCENT, 200V	65940	MCR18-39K-5 PCT
R13	R-20-5803	RES, CHIP, 15K, 1/8W, 5 PERCENT, 200V	65940	MCR18-15K-5 PCT
R14	R-20-5816	RES, CHIP, 330K, 1/8W, 5 PERCENT, 200V	65940	MCR18-330K-5 PCT
R15	R-20-5768	RES, CHIP, 10K, 1/8W, 5 PERCENT	65940	MCR18-10K OHM-5 PCT
R16	R-20-5792	RES, CHIP, 1K, 1/8W, 5 PERCENT, 200V	65940	MCR18-1K-5 PCT
R17-18	R-20-5798	RES, CHIP, 3.9K, 1/8W, 5 PERCENT, 200V	65940	MCR18-3.9K-5 PCT
R19	R-20-5764	RES, CHIP, 100 OHM, 1/8W, 5 PERCENT	65940	MCR18-100 OHM-5 PCT
R20	R-20-5792	RES, CHIP, 1K, 1/8W, 5 PERCENT, 200V	65940	MCR18-1K-5 PCT
R21	R-20-5814	RES, CHIP, 51 OHM, 1/8W, 5 PERCENT, 200V	65940	MCR18-51 OHM-5 PCT
T1-2	R-23-7149	TRANSFORMER	21793	R-23-7149
TP1	R-24-3537	TERMINAL ASSY.	21793	R-24-3537
{10}1	411822	PCB, DOUBLER (UNLOADED)	21793	411822
{58}3	R-24-3519	AV LUGS	19738	AVLUG1107/0208

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404946-001	Final Assy., 3351R	8-2
404946-002	Final Assy., 3351R Opt. 01	8-3
404946-003	Final Assy., 3351R/10M	8-4

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WIRE LIST

FROM	TO	CONDUCTOR TYPE GAUGE.COLOR	PART NUMBER	WIRE LENGTH	REFERENCE
P23-1	E4	TEF,STRND,24GA. WHITE	524999	5 1/2"	
P23-6	E1	TEF.STRND.24GA, GREEN	524555	5 3/4"	
P23-9	E2	TEF,STRND.24GA, GREEN	524555	5 3/4"	
P23-10	E3	TEF,STRND,24GA, BLACK	524000	5 3/4"	
P23-COAX	J22	CABLE.COAX.2 COND 1 STRND	500254	6.0"	
J203-RECEPTACLE TERMINAL J203-PLUG TERMINAL	E5 E6	TEF.STRND.24GA. WHITE TEF.STRND.24GA. BLACK	500132	5.0"	TWISTED PAIR

RACAL-DANA Instruments Inc. 4 GOODYEAR, IRVINE. CA 92718				
DOCUMENT TITLE	SIZE	CODE ID NO	DOCUMENT NO.	REV
MODULE ASSY., 3351R	A	21793	404946-001	A
	DRN			

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WIRE LIST

FROM	TO	CONDUCTOR TYPE GAUGE.COLOR	PART NUMBER	WIRE LENGTH	REFERENCE
P23-1	E4	TEF,STRND,24GA. WHITE	524999	5 1/2"	
P23-6	E1	TEF,STRND,24GA, GREEN	524555	5 3/4"	
P23-9	E2	TEF,STRND,24GA, GREEN	524555	5 3/4"	
P23-10	E3	TEF,STRND,24GA. BLACK	524000	5 3/4"	
P23-COAX	J22	CABLE.COAX.2 COND 1 STRND	500254	6.0"	
J203-RECEPTACLE TERMINAL J203-PLUG TERMINAL	E5 E6	TEF.STRND.24GA. WHITE TEF.STRND.24GA. BLACK	500132	5.0"	TWISTED PAIR

RACAL-DANA Instruments Inc. 4 GOODYEAR, IRVINE, CA 92718

DOCUMENT TITLE	SIZE	CODE ID NO	DOCUMENT NO.	REV
FINAL ASSY., 3351R, OPT. 01	A	21793	404946-002	A
	DRN			

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WIRE LIST

FROM	TO	CONDUCTOR TYPE GAUGE, COLOR	PART NUMBER	WIRE LENGTH	REFERENCE
P23-1	E4	TEF, STRND, 24GA. WHITE	524999	5 1/2"	
P23-6	E1	TEF, STRND, 24GA, GREEN	524555	5 3/4"	
P23-9	E2	TEF, STRND, 24GA, GREEN	524555	5 3/4"	
P23-10	E3	TEF, STRND, 24GA, BLACK	524000	5 3/4"	
P23-COAX	J22	CABLE, COAX, 2 COND 1 STRND	500254	6.0"	
J203-RECEPTACLE TERMINAL J203-PLUG TERMINAL	E5 E6	TEF. STRND. 24GA. WHITE TEF. STRND. 24GA. BLACK	500132	5.0"	TWISTED PAIR

RACAL-DANA Instruments Inc. 4 GOODYEAR, IRVINE. CA 92718

DOCUMENT TITLE	SIZE	CODE ID NO	DOCUMENT NO.	REV
FINAL ASSY., 3351R/10M	A	21793	404946-003	A
	DRN			

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RACAL Instruments Inc. *4 Goodyear Street, Irvine, California 92718-2202*

REPAIR AND CALIBRATION REQUEST FORM

To allow us to better understand your repair requests, we suggest you use the following outline when calling and include a copy with your instrument to be sent to the Racal Repair Facility.

Model No._____ Serial No._____ Date_____

Company Name_____ P.O.No._____

Billing Address_____
City State Zip

Shipping Address_____
City State Zip

Technical Contact_____ Phone Number ( )_____

Purchasing Contact_____ Phone Number ( )_____

1. Describe, in detail, the problem and symptoms you are having. Please include all set up details, such as input/output levels, frequencies, waveform details, etc.

_____

_____

_____

_____

2. If problem is occurring when unit is in remote, please list the program strings used and the controller type.

_____

_____

_____

3. Please give any additional information you feel would be beneficial in facilitating a faster repair time (i.e., modifications, etc.)

_____

_____

_____

4. Is calibration data required? Yes No (please circle one)

Call before shipping:

Customer Service
(800) 722-3262

Ship instrument to:

Customer Service Department
Racal Instruments Inc.
4 Goodyear Street
Irvine, CA 92718

Note: We do not accept "collect" shipments.

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