



USER'S MANUAL  
**SCT-EU**  
Signal Converter Eurocard

No. 146-760-00 C

October 1988

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## Introduction

This manual contains descriptive, calibration, installation and maintenance information for the Eurocard Signal Converter Transmitter, Model SCT-EU. The SCT-EU converts standard (or non-standard) input signals to different type (or range) output signals. Because of its versatile input/output conversions, the SCT-EU is a universal interface module.

## Description

The SCT-EU is used in process control systems to provide isolation between a floating input and a grounded common output or a grounded common input and a floating output. The unit can also convert a standard, or in some cases, a non-standard input signal to a different type or a different range of output signal (e.g., 1-5mA input to 4-20mA output). There is complete isolation between the input, the output and the power terminals. And, the unit is highly stable. The output circuit allows either a current or voltage output signal.

The SCT-EU is configured to allow for high-density installation in a plug-in Eurorack. Twelve Eurocard transmitters may be installed in a single 19-inch (483mm) Eurorack. Installation dimensions and plug-in details are presented in figure 1.

## Specifications

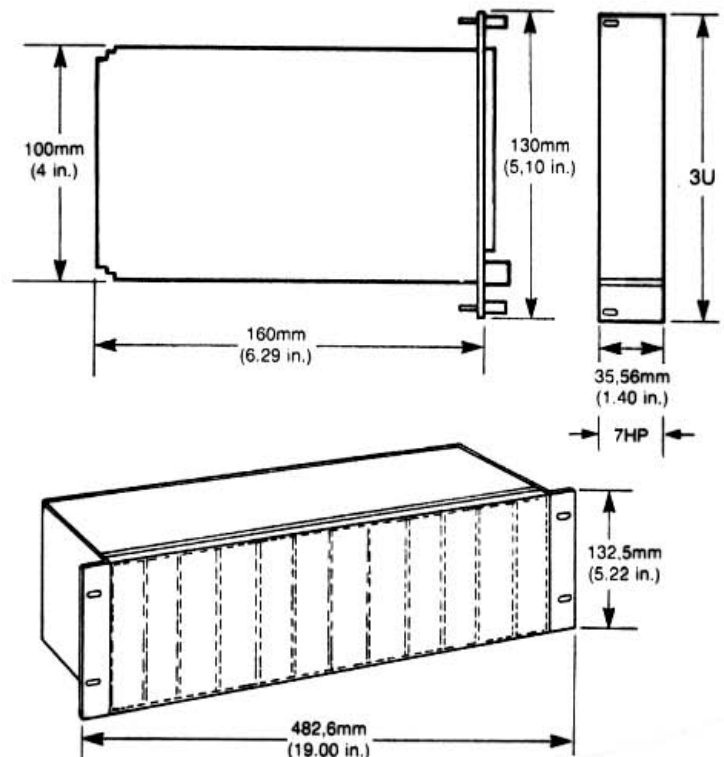
A complete set of specifications for the SCT-EU is shown in table 1. This specification contains complete information on input, output, and performance.

## Model Number Explanation and Use

Moore Industries' model numbers identify the type of instrument, functional characteristics, operating parameters, any options ordered, and housing. If all

accompanying documentation of a unit is missing, the model number can be used to obtain technical information. The model number for the SCT-EU is located on the inside of the front panel.

A complete history is kept on every Moore Industries' unit. This information is keyed to the serial number. Whenever service data is required on a unit, it is necessary to provide the factory with the serial number. This information is engraved on the printed circuit board of the unit.



**Figure 1. SCT-EU Installation Dimensions**

**Important Note:** This document is complete as of the printing date; however, subsequent product changes may be reflected in companion documents.

# SCT-EU

## Specifications

Characteristics: SCT-EU	Ordering Specifications	
<p><b>Front Panel Adjustments</b> Adjustable with multiturn potentiometers  <b>Span:</b> With full scale input, adjusts output to 100% <math>\pm 10\%</math>  <b>Zero:</b> With minimum input, adjusts output to 0% <math>\pm 10\%</math></p> <p><b>Calibration Capability</b> Linearity and Repeatability <math>\pm 0.1\%</math> of span</p> <p><b>Ambient Temperature Range</b> <math>-18^{\circ}\text{C}</math> to <math>+82^{\circ}\text{C}</math>  <math>(-4^{\circ}\text{F}</math> to <math>+180^{\circ}\text{F})</math></p> <p><b>Performance</b> <b>Ambient Temperature Effect:</b> <math>\pm 0.005\%/^{\circ}\text{F}</math> over above specified range  <b>Frequency Response:</b> 5 Hz maximum at the <math>-3\text{dB}</math> point  <b>Isolation:</b> Input, output, and power input are transformer isolated with no dc connections. Common mode rejection exceeds 120dB at 60 Hz with a limit of 500 volts rms.</p> <p><b>Weight</b> Approximately 300 grams (11 oz.)</p>	<p><b>Input</b> <b>Current:</b>            1-5mA into 200<math>\Omega</math>, nominal            4-20mA into 50<math>\Omega</math>, nominal            10-50mA into 20<math>\Omega</math>, nominal  <b>Voltage:</b>            0-5V, 0-10V, 1-5V standard;            10M<math>\Omega</math> minimum input impedance. Other voltages available.</p> <p><b>Output</b> Operational amplifier feedback current source; output limited to 150% of maximum output range value  <b>Current:</b>            1-5 MA into 0-4800<math>\Omega</math> load            4-20 MA into 0-1200<math>\Omega</math> load            10-50 MA into 0-480<math>\Omega</math> load  <b>Voltage:</b>            0-5V, 1-5Vdc standard into 20K<math>\Omega</math> minimum; 0-10Vdc standard into 40K<math>\Omega</math>  <b>Ripple:</b> 10 MV P/P at maximum span and maximum load resistance.  <b>Load Effect:</b> <math>\pm 0.01\%</math> of span from 0 to maximum load resistance (current output)</p> <p><b>Power</b> 24Vdc, 5 watts nominal.</p> <p><b>Line Voltage Effect:</b> <math>\pm 0.005\%</math>/1% line change</p>	<p><b>Options</b></p> <ul style="list-style-type: none"> <li>-ATH Maintains 10M<math>\Omega</math> input impedance for 10V inputs</li> <li>-ATL Attenuated input, 200K<math>\Omega</math> input impedance for any voltage over 5V</li> <li>-BI Bailey input</li> <li>-CS Coding strip</li> <li>-DI Dual input</li> <li>-DO Dual output</li> <li>-FU 400 mA power fuse</li> <li>-HI High current output 20 mA max 1-5V</li> <li>-RO Reverse output, current or voltage</li> <li>-TX 2-wire transmitter excitation, 35Vdc @ 25mA output to 2-wire transmitter, 4-20mA only</li> <li>-VL Voltage limiting to 15V on 4-20 mA outputs</li> </ul> <p><b>Housing</b> EUR Eurocard</p>
<p><b>When Ordering Specify:</b> Unit / Input / Output / Power / Options [Housing]</p> <p><b>Model number example:</b> SCT-EU / 1-5V / 4-20MA / 24DC / -DO [EUR]</p>		

Table 1. SCT-EU Specifications

## Calibration

This section provides information necessary to adjust and calibrate the unit. Each unit is adjusted and checked at the factory for proper performance before shipping.

After the SCT-EU unit is unpacked, general operation level checks of the individual unit are recommended. Generally these checks, which are specified in the Calibration portion of this section, require little or no adjustments.

## Control Description and Location

The SCT-EU has ZERO and SPAN controls located on the front panel of the unit. Each of these controls has a multiturn potentiometer that is adjustable with a blade screwdriver.

### **CAUTION**

*The screwdriver blade should not be more than 0.1 inches (2.54 mm) wide. A wider blade may cause permanent damage to the potentiometer mounting.*

The type of potentiometer used with these controls usually requires 20 turns of the shaft to move the wiper from one end of its range to the other. It is equipped with a slip clutch at each end to prevent damage if the control is turned beyond the wiper stop. Usually a slight change can be felt when the clutch is at the end of a range (i.e., it is slipping). However, if this change is not felt, either end can be reached by turning the shaft 20 turns in the desired direction.

## Equipment and Tools Required

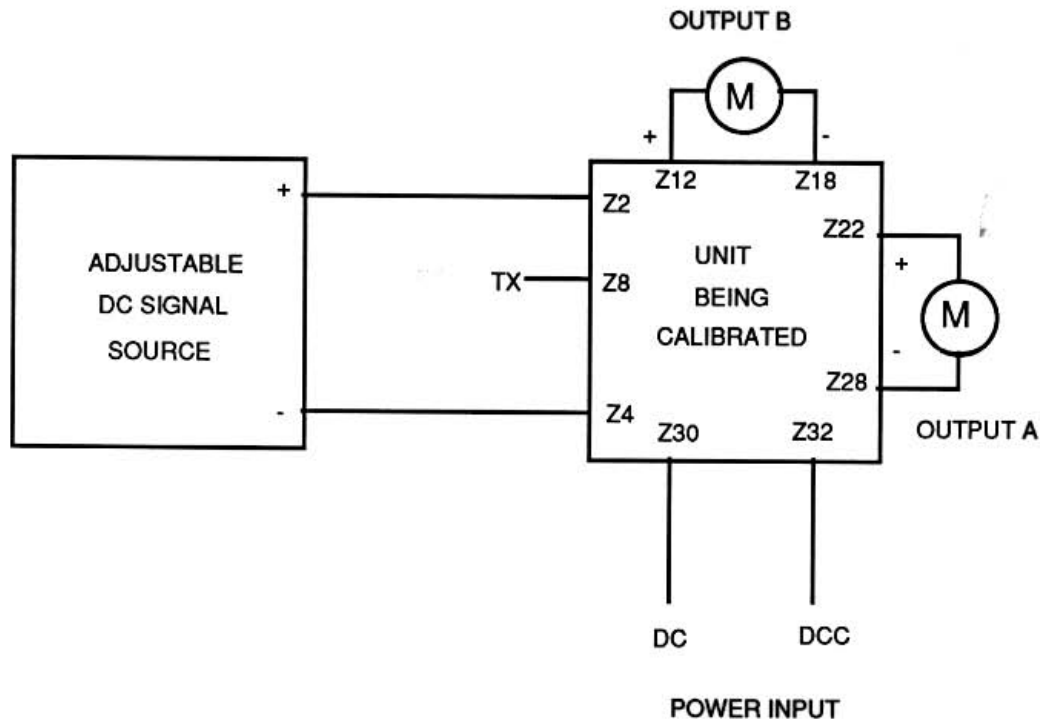
Test equipment and tools required to calibrate the SCT-EU are listed in Table 2. Test equipment and tools are not supplied with the unit and must be provided by the user.

## Calibration Setup

Off-line calibration for all SCT-EU units requires the same test equipment setup regardless of the physical configurations or types of options used. Refer to the test equipment setup for unit calibration as shown in Figure 2 or 3.

**Table 2. Test Equipment and Tools Required**

Equipment or Tool	Characteristics	Purpose
Screwdriver (blade)	Blade not wider than 0.1 inches (2.54 mm)	Front panel control adjustments
Adjustable DC Signal Source	Must be capable of producing signal ranges defined by INPUT requirements of purchased unit.	Simulate input signal
DC Voltmeter	Must be accurate to within $\pm 0.05\%$ or better	Output signal monitoring (voltage outputs only)
DC Milliammeter	Must be accurate to within $\pm 0.05\%$ or better	Output signal monitoring (current outputs only)

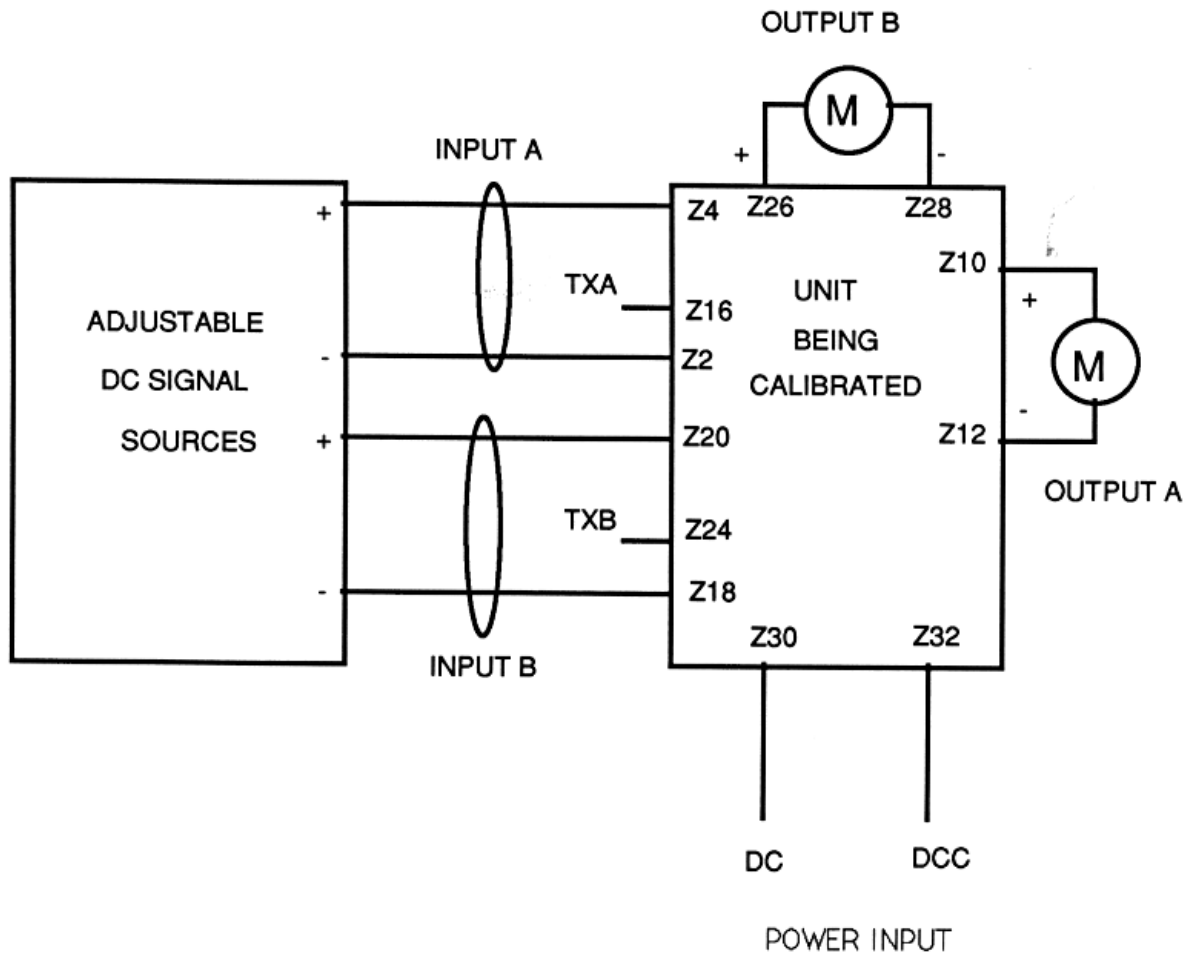


**Figure 2.** Test Equipment Setup for Calibration of the SCT-EU and SCT-EU Dual Output

## Calibration Procedure

Calibration consists of simulating the input signal and adjusting the unit to obtain the specified output. An adjustable input signal source and input and output monitoring devices are required.

1. Connect the unit and test equipment as shown in Figure 2 or 3. For SCT-EU dual output units, connect the unit one output at a time as instructed in the figure.
2. Make sure the input signal source is adjusted to zero output, then apply power to the unit.
3. Adjust the input signal source to the minimum input specified for the unit (e.g., 1mA, 4mA)
4. Adjust the ZERO potentiometer to obtain 0% output (1 mA, 4 mA, 10 mA, 1 Vdc, or whatever the specified 0% output is for the unit) with the minimum input signal applied per step 3.
5. Adjust the input signal source to the maximum input specified for the unit (e.g., 5mA, 20mA).
6. Adjust the SPAN potentiometer to obtain 100% output with the maximum input signal applied per step 5.
7. Repeat steps 3 through 6 until no further adjustment of either the ZERO or SPAN potentiometer is required.
8. Apply 0% input plus 25%, 50%, and 75% of the span successively and check that the output is linearly proportional (to within  $\pm 0.1\%$  of the span).
9. After step 8 has been successfully completed, turn off the power to the unit and disconnect the test equipment.



**Figure 3.** Test Equipment Setup for Calibration of the Dual Channel SCT-EU

## Installation

This section provides information for mechanical installation, electrical connections, and power connections for the SCT-EU. The front panel dimensions for the unit are shown in Figure 1.

### Mechanical Installation

*Rack Mounted (RMR-EU) Euro-Card Rack.* These rack enclosures are designed to be flush-mounted in a standard 19-inch relay rack. Twelve position RMR racks are available. Each enclosure is provided with standard EIA hole patterns and is rear-accessed for rack wiring convenience. DC power supplies are available. Refer to the Electrical Connections portion of the installation section for a more detailed description of electrical connections to the card rack. Individual PC cards are front loaded. Edge connectors can be keyed to assure that the units are plugged into the proper position. Key positions may be altered in the

field if the system configuration changes. Filler cards are available for positions not used by any modules.

### Electrical Connections

Terminals used for electrical connections for both standard and optional units are listed in table 3.

All electrical connections are made to the terminals on the mating connector of the unit, located in the rack. No special wire or cable is required for signal connections (The terminals are designed for 16AWG maximum wire size).

To avoid transients and stray pickups, it is recommended that twisted conductors be used where the signal wires run close to other services (i.e., power wiring). The DC power source should be regulated to within  $\pm 10\%$  of the nominal voltage and should be capable of delivering 5 watts.

**Table 3. Terminal Nomenclature for the SCT-EU**

Terminal Positions																	
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	ROW
SCT	+IN	-IN		TX							+OUT			-OUT	(+) DC	(-) DCC	Z
SCT DUAL OUT	+IN	-IN				+OUT B			-OUT B		+OUT A			-OUT A	(+) DC	(-) DCC	Z
SCT DUAL CHANNEL	-IN A	+IN A			+OUT A	-OUT A		TXA	-IN B	+IN B		TXB	+OUT B	-OUT B	(+) DC	(-) DCC	Z

**Legend:** DC DCC +DC Power Input -DC Power Input A, B, C, & D  $\pm$  OUT Signal Input Signal Output



## Theory of Operation

This section describes the unit operation. The functional description is based on the block diagram in figure 4.

The SCT-EU operates by chopping the applied dc input signal into an ac signal, using ac coupling to the following stages, and then synchronously demodulating the resulting ac signal to produce a dc output proportional to the input. In this way, complete isolation is obtained between the input and the output terminals. High stability is achieved by using operational amplifiers with large amounts of feedback. A variation in the output circuit allows the unit to produce either current or voltage output.

### Power Supply Circuit

Units are supplied for use with a dc power input that is applied directly to the power inverter, with diode protection to prevent damage to the power inverter if the dc power input is accidentally connected with reverse polarity.

### Power Inverter Circuit

The power inverter produces a number of different ac (square wave) and dc outputs from the dc applied to its input. Four separate square-wave outputs at approximately 3KHz are developed, and are used as drive voltages for the input switches and demodulator.

Two isolated sets of regulated (+) and (-) dc outputs are also produced and used as operating voltages for the amplifiers in the input section of the unit. The inverter also produces a higher (+) dc output as the operating voltage for the power amplifier.

### Input Network and Zero Adjust Circuit

The floating input signal is provided with the proper termination by the input network and combined with the voltage from the zero adjust circuit. The zero adjust circuit, which operates from  $\pm$ DC supply #1,

adds an adjustable voltage of the proper polarity to the basic input signal. With the minimum input signal applied, the zero adjust circuit is adjusted so the voltage added to the applied input signal results in the required minimum output signal. The composite input signal (applied input signal plus the voltage introduced by the zero adjust circuit) is then applied to the series input switch.

### Input Switches

The input switches produce a 3KHz square-wave output with an amplitude proportional to the input signal applied to the unit. Each switch is operated by a separate 3KHz square-wave drive signal from the power inverter. During one half of the drive signals, the series switch passes the composite input signal to the input of the next stage (operational amplifier). At the same time, the drive signal applied to the shunt switch causes this switch to act effectively as an open circuit. During the next half cycle of the drive signals, the series switch opens and the shunt switch acts as a short-circuit to the ground. In this manner, the dc input signal is chopped into a proportional 3KHz signal so ac coupling can be used from this point to the demodulator. The use of both a series and a shunt switch for chopping virtually eliminates any loading of the composite input signal by the circuit following the switches.

### Operational Amplifier Circuit

The operational amplifier following the input switches is used to provide gain and a low impedance source for driving the primary of the isolation transformer between the input and output sections. High stability is achieved through the use of feedback. In addition, the gain of the amplifier is varied by the span adjust circuit to establish the maximum output signal when the maximum specified signal is applied to the input of the unit. The transformer couples the signal from the output of the operational amplifier to the output switch and also completely isolates the input section from the output section of the unit.

# SCT-EU

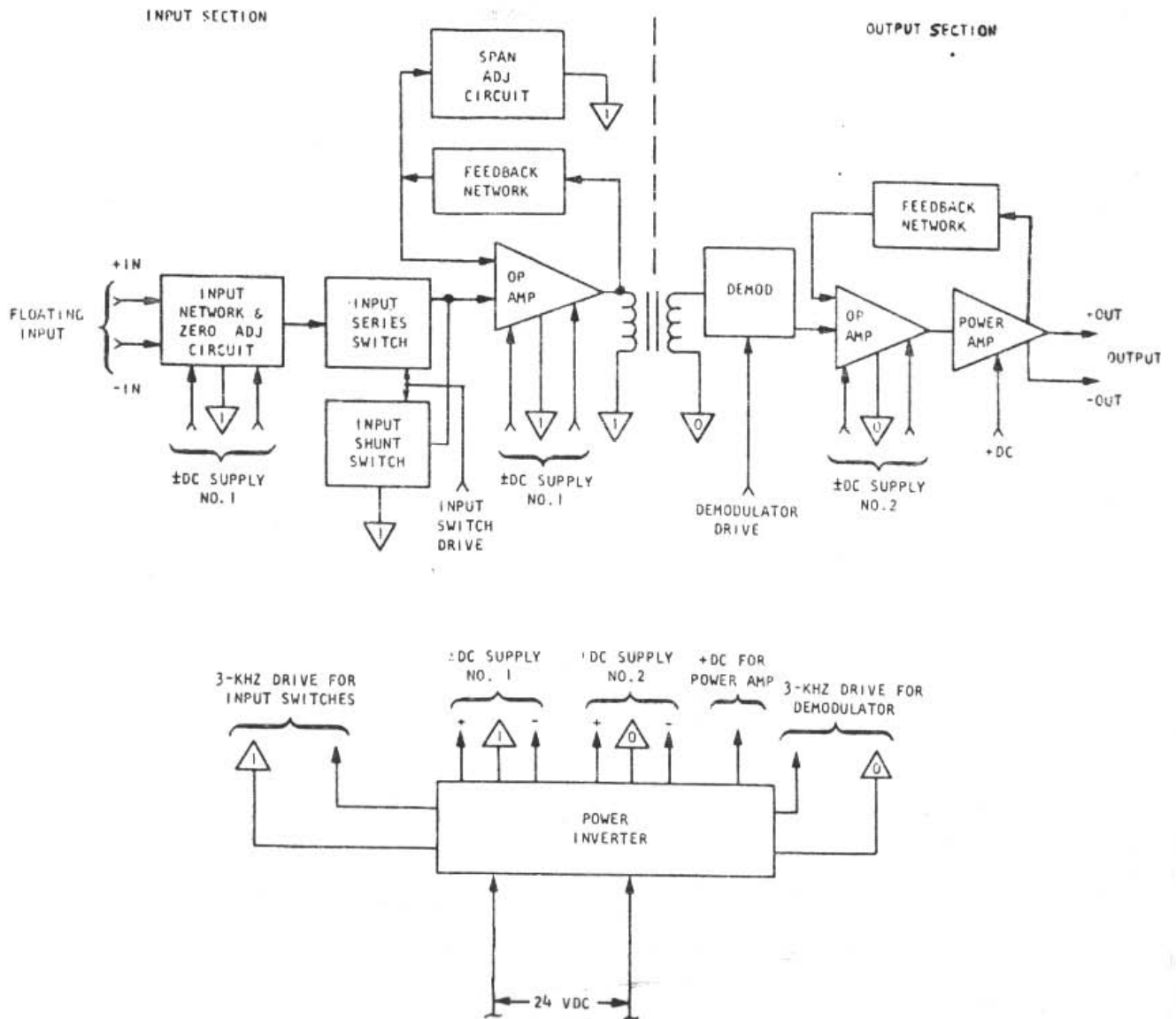


Figure 4. SCT-EU Block Diagram

## Demodulator Circuit

The demodulator accepts the 3KHz signal from the secondary of the transformer and converts it back into a proportional dc level. The power converter provides a 3KHz demodulator drive signal that is out of phase with the drive signal applied to the series input switch. This phase relationship between the two drive signals satisfies the drive requirements for simultaneous (i.e., synchronous) identical switching action of solid-state devices with opposite-type channels, thereby assuring proper operation of the unit.

## Output Circuit

The output circuit consists of an operational amplifier and power amplifier. Feedback is used to achieve high stability and a nearly ideal output impedance for the type of output used. The operational amplifier operates from the higher positive voltage from the power inverter.

## Maintenance

In general, maintenance is limited to checking that the unit is properly seated in the rack and that the electrical connections are tight and free from corrosion. Periodically, the calibration of the unit may be checked.

## Troubleshooting

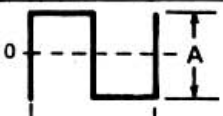


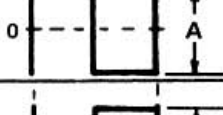
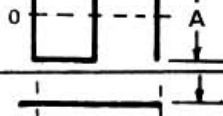


The schematic diagrams include flagged numbers at various points in the circuit. Table 4 gives the voltages and waveforms at these points for specified input signal conditions. The assembly drawings show the physical locations of the parts on the circuit board.

In general, troubleshooting is carried out by tracing the signal with an oscilloscope and referring to the schematic diagram to determine what component might be causing an observed abnormal indication. If the original symptom was a complete failure of the unit to operate, the most likely components to suspect are those associated with the power supply. If the unit is producing an incorrect (but not zero) output, check the outputs from the voltage regulator, and, if these are normal, apply a standard input signal and trace the resulting signal through the unit.

## Drawings

This section consists of assembly and schematic drawings, and a list of materials.

Table 4. Waveforms and Voltages

TEST POINT(S) (See Note 1)	WAVE FORM OR VOLTAGE LEVEL	INPUT SIGNAL AND WAVEFORM AMPLITUDE OR VOLTAGE LEVEL (See Note 2)					
		CURRENT	0-1V	0-2V	0-5V	1-5V	0-10V
2		37V	37V	37V	37V	37V	37V
3		0.2 to 1V	0.25 to 1.25V	0.5 to 2.5V	1.25 to 6.25V	1 to 5V	0.25 to 1.25
4		.87-4.47	.87-4.47	.87-4.47	1.78-8.94	1.78-8.94	.87-4.47
5		0.4 to 2V	0.4 to 2V	0.4 to 2V	.4-2	.4-2	.4-2
6		40V	40V	40V	40V	40V	40V
7,8		0.2 to 1V	0.2 to 1V	0.2 to 1V	.2-1	.2-1	.2-1
9		<b>POWER INPUT &amp; WAVE FORM AMPLITUDE</b>					
		<b>POWER</b>	<b>24VDC/117V AC/220V AC</b>			<b>45V DC</b>	
		A (Amp.)	48V			90V	

**NOTES:**

- All test points values except 6 assume non-zero based output.
- Low value of amplitude or voltage level corresponds to low end of input and high value to high end of input.  
*Example: Wave form #3, 0-1V input; amplitude is 0.25V for 0V input and 1.25V for 1V input.*  
Levels shown assume output signal has elevated zero (i.e., 4-20 mA, 1-5V).

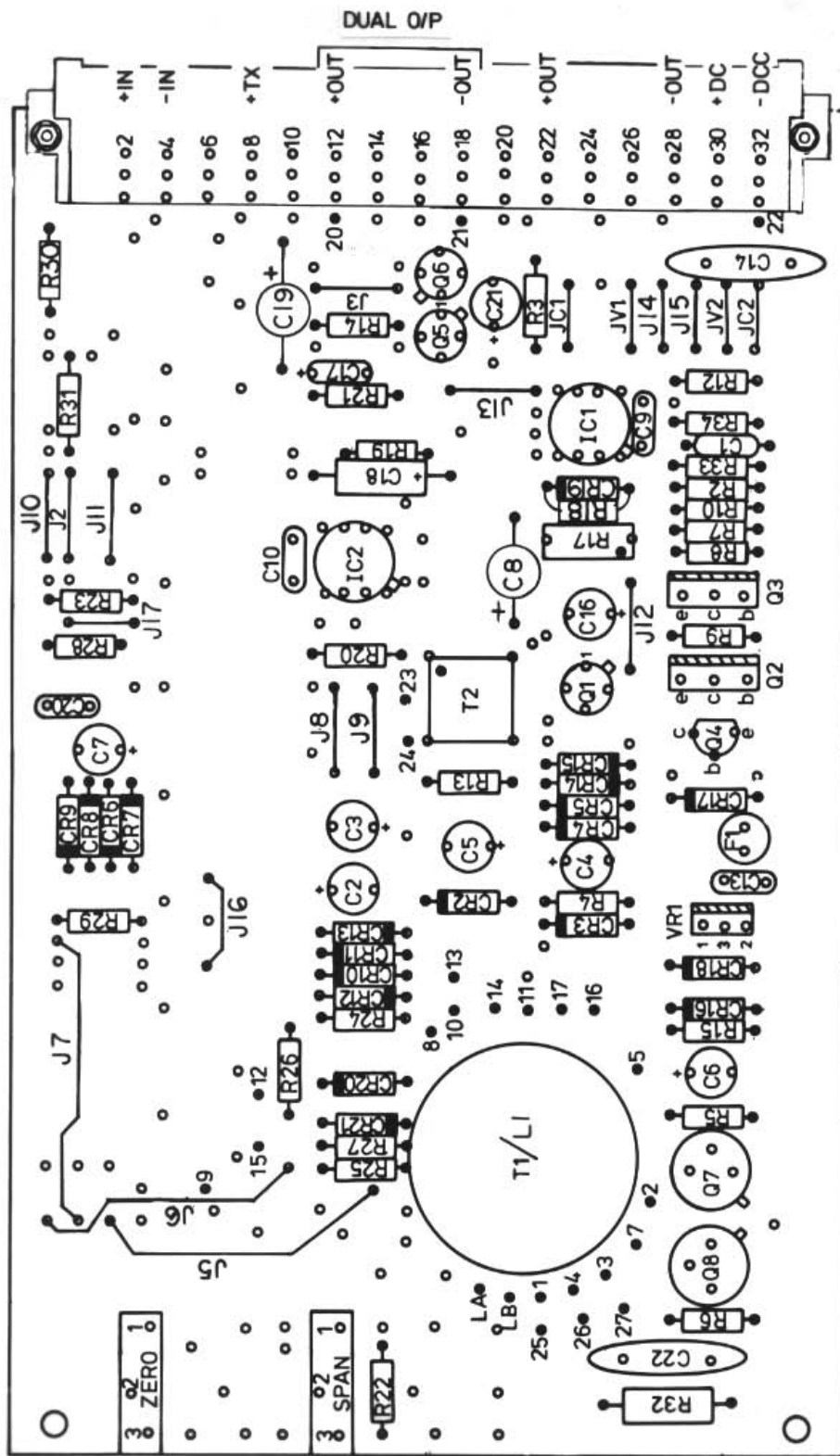
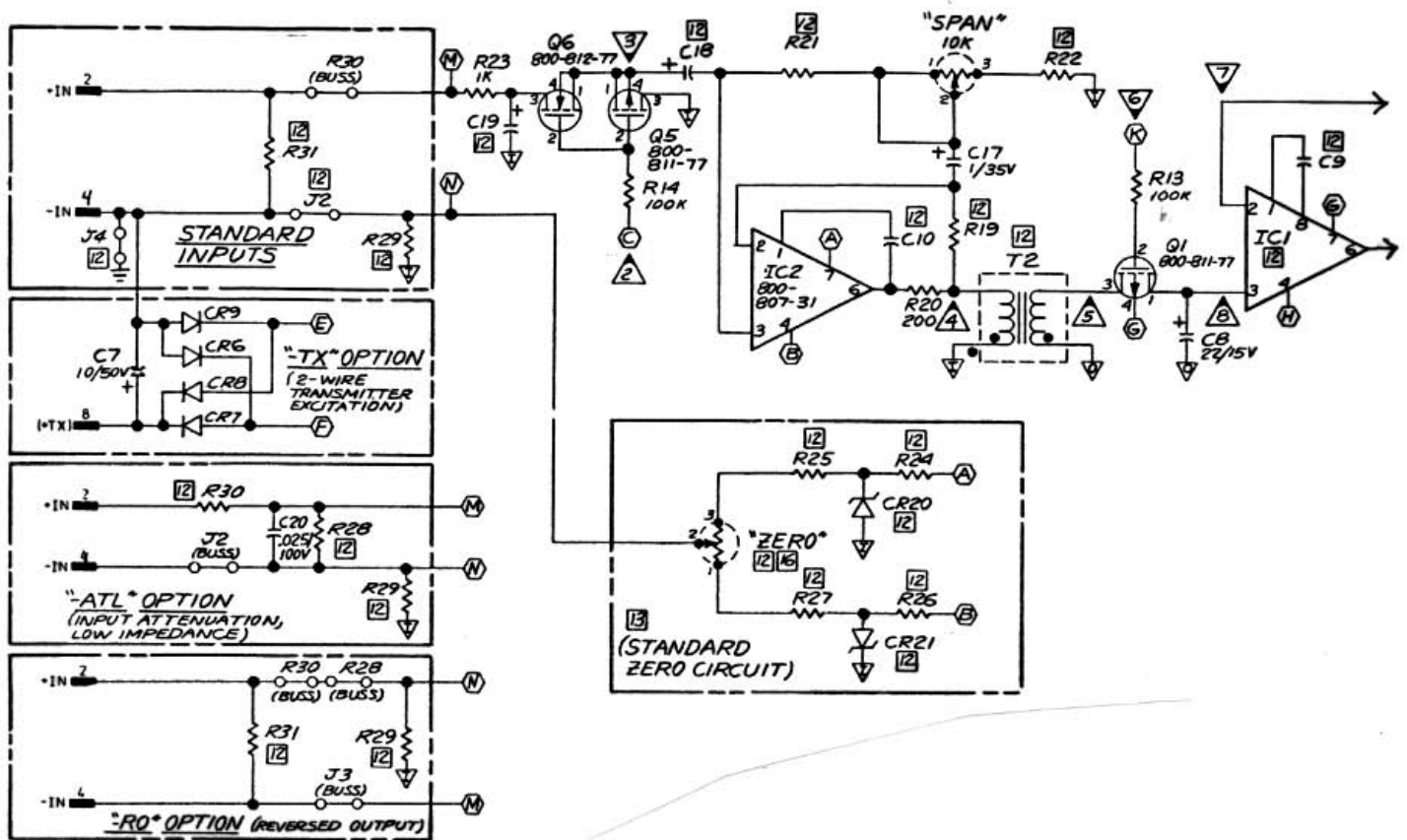


Figure 5. PC1 Assembly

# SCT-EU



- M. SEE PAGE 2 FOR ADDITIONAL INPUT & OUTPUT CONFIGURATIONS.
10. TEST POINT; FILLED END IS POINTER. REFER TO SECTION 5 OF MANUAL, "MAINTENANCE".
9. CIRCUIT COMMON (SAME LETTERS); LETTERS ARE NOT ON ASS'Y DWG. OR P.C. BD.
8. INPUT SECTION COMMON (GROUND); OUTPUT SECTION COMMON (GROUND).
7. CONTACT POSITION ON 32 PIN CONNECTOR.
- 6.
5. IDENTIFIED WIRING PAD ON P.C. BD.
4. PCI/PC2 INTERCONNECT PIN.
3. ALL POTENTIOMETERS INCREASE C.W. FROM 1 TO 3.
2. ALL DIODES ARE M.I.L. PIN 800-4148-11; RESISTORS ARE 1/4 W CARB. COMP., ±10%.
1. RESISTANCE VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS.

NOTES: UNLESS OTHERWISE SPECIFIED

Figure 6. SCT-EU Schematic (page 1 of 3)

# SCT-EU

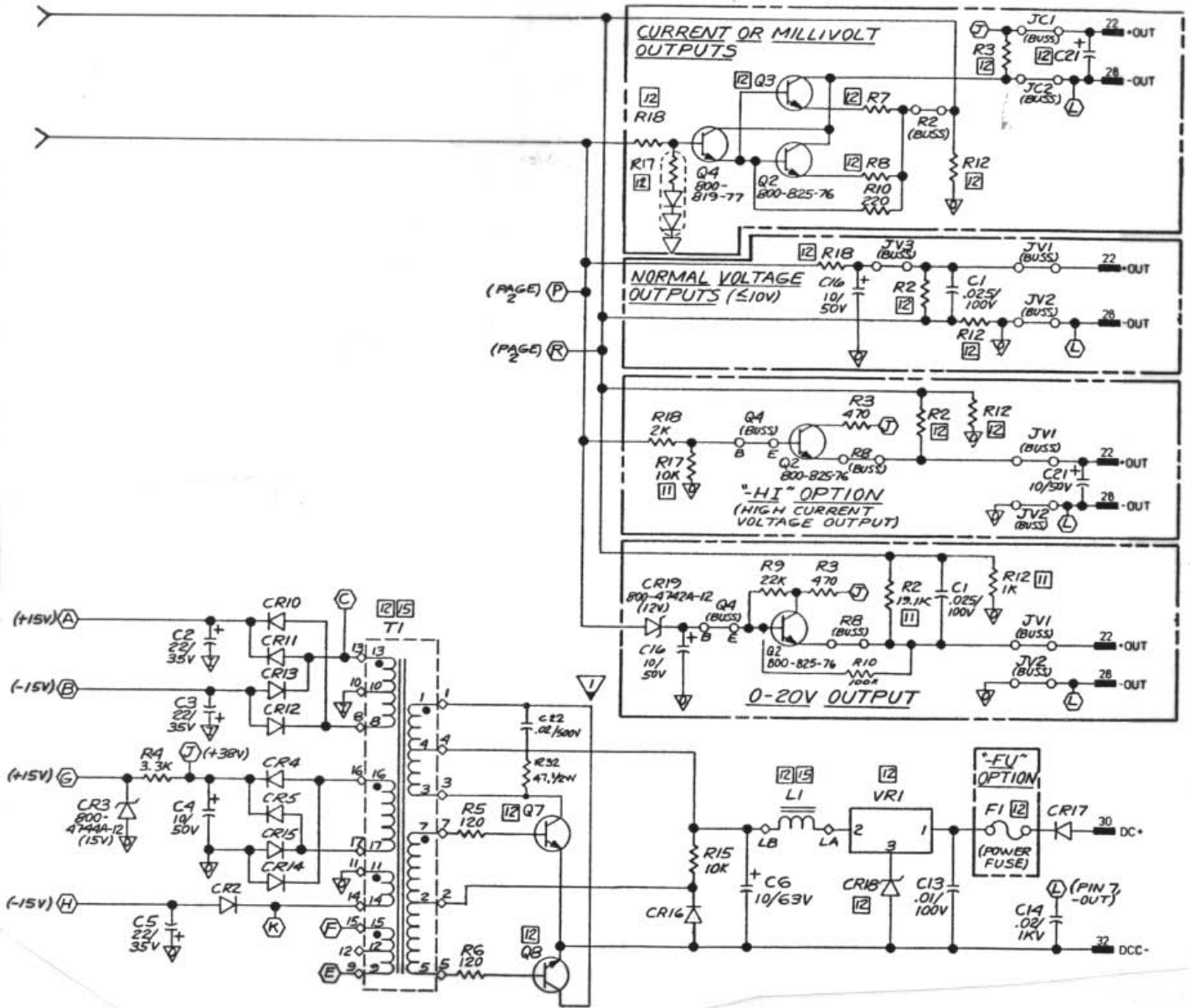


Figure 6. SCT-EU Schematic (page 2 of 3)

# SCT-EU

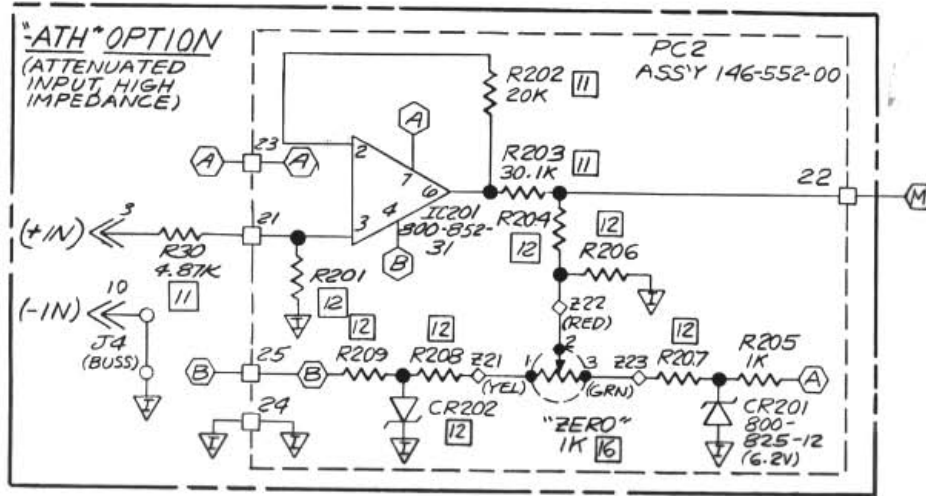


Figure 6. SCT-EU Schematic (page 3 of 3)



# SCT-EU

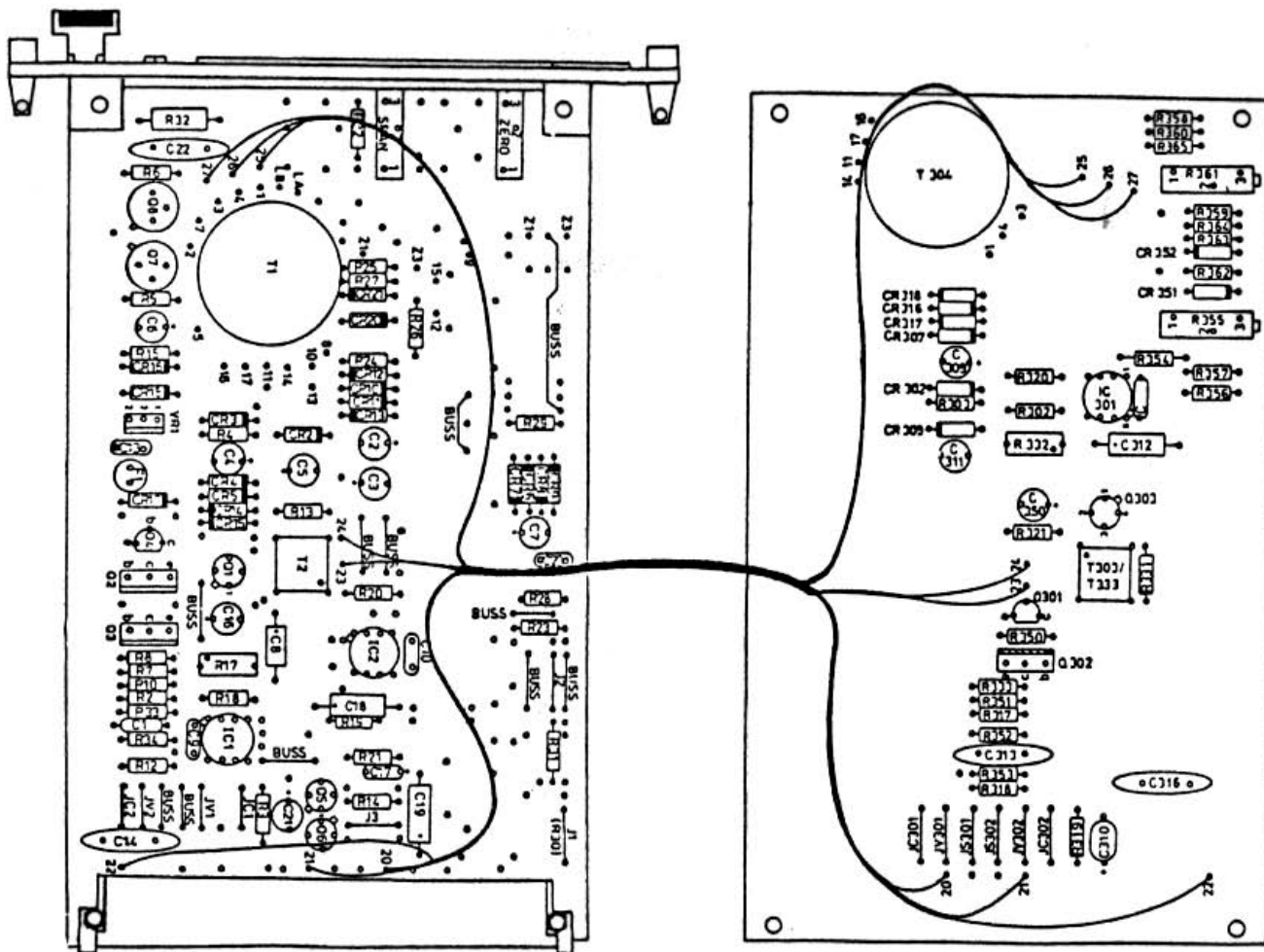


Figure 7. Dual Output Eurocard Connections

MSD 159.001

# SCT-EU

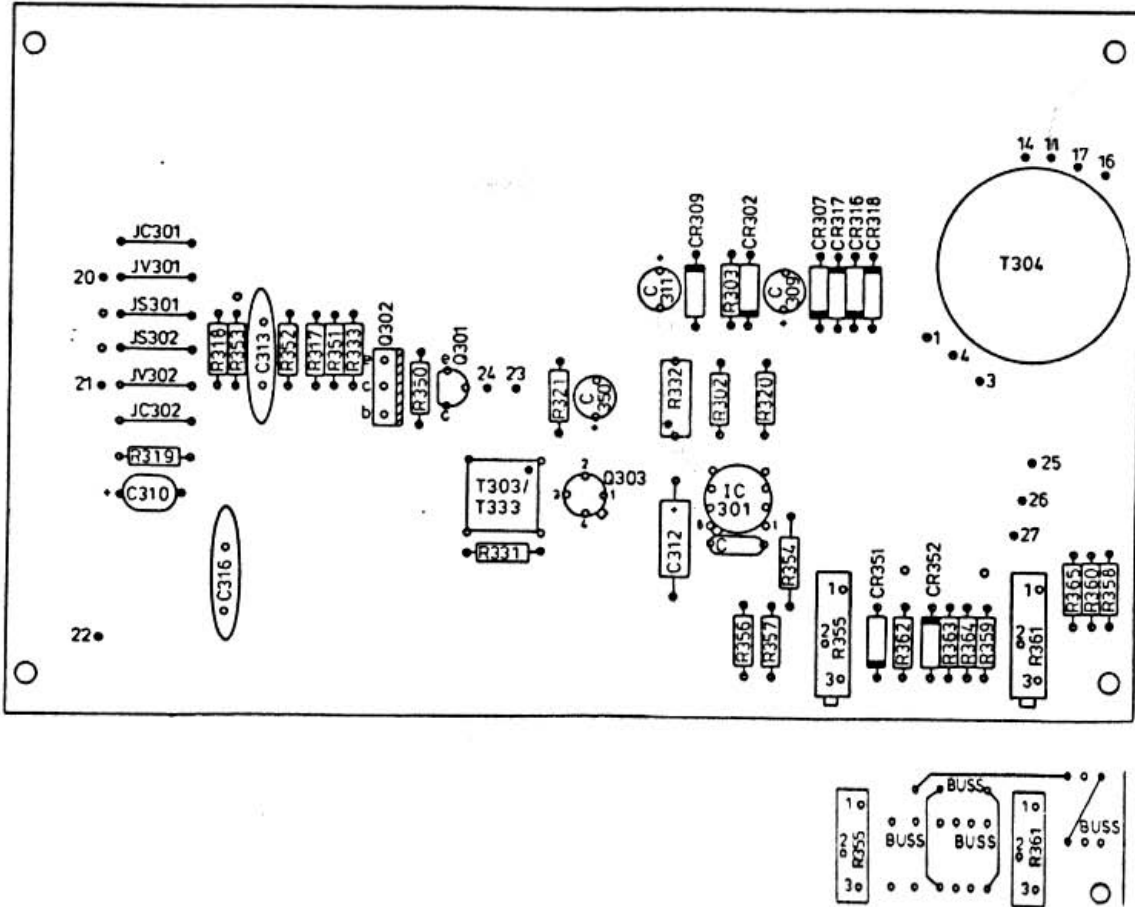
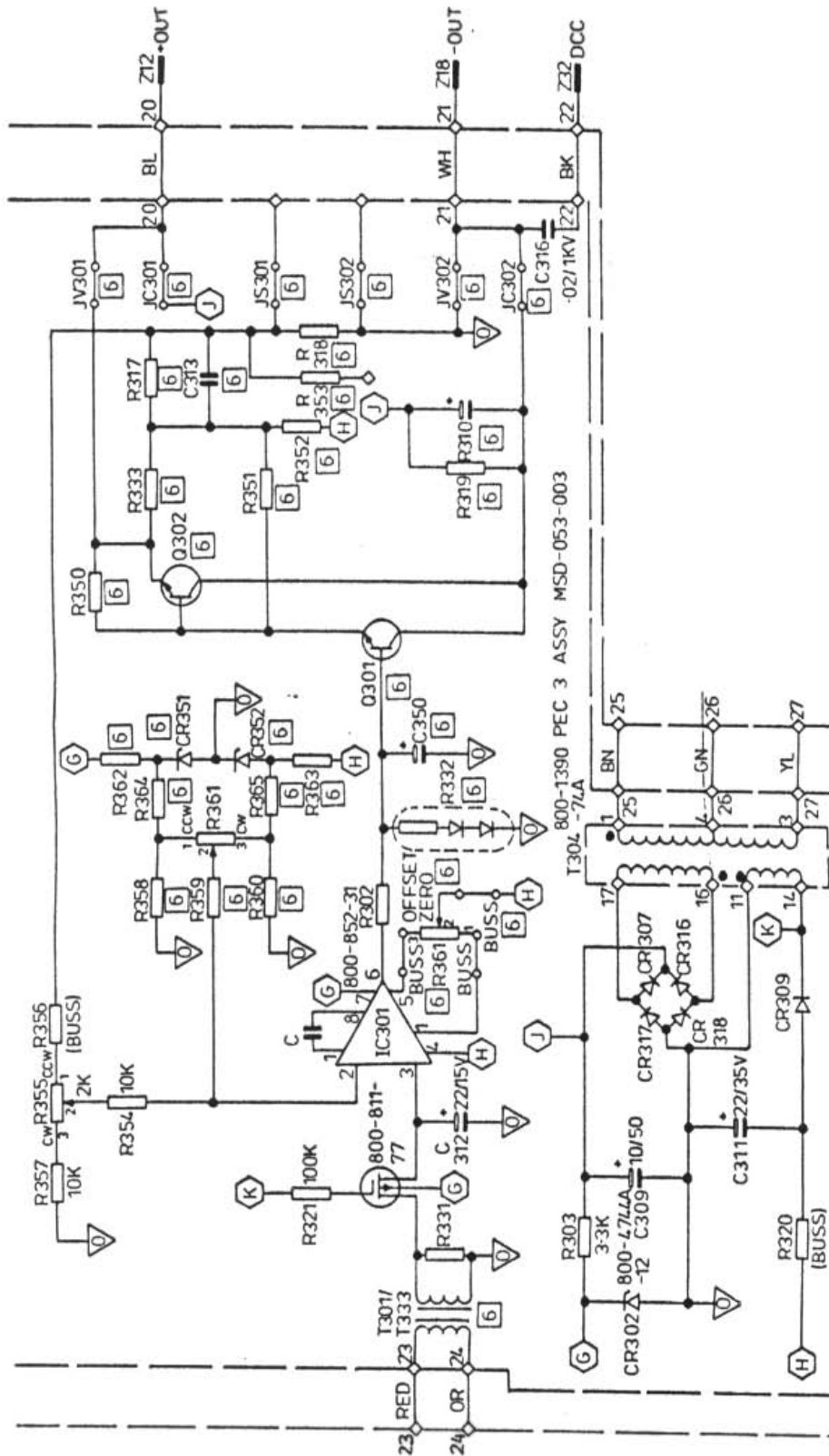


Figure 8. Dual Output Assembly

MSD-053-003 B



- NOTES (UNLESS OTHERWISE STATED):
1. RESISTANCE VALUES ARE IN OHMS; CAPACITANCE IN MICROFARADS.
  2. DIODES ARE IN4148; RESISTORS ARE CARBON COMP (RC07G) ±10% TOL.
  3. POTENTIOMETERS INCREASE CLOCKWISE FROM PIN 1 TO PIN 3.
  4. ◯ INDICATES ELECTRICAL COMMON (SAME LETTER).
  5. ITEM MOUNTED EXTERNAL OF PC BOARD.
  6. [ ] SEE LIST OF MATERIALS FOR USAGE, VALUE AND PART N°.
  7. ◊ INDICATES PCI/PC2 INTERCONNECT PIN.
  8. ▽ INDICATES OUTPUT SECTION COMMON (GROUND).
  9. ——— INDICATES PLUG-IN CONNECTOR POSITIONS.

Figure 9. Dual Output Schematic

# SCT-EU

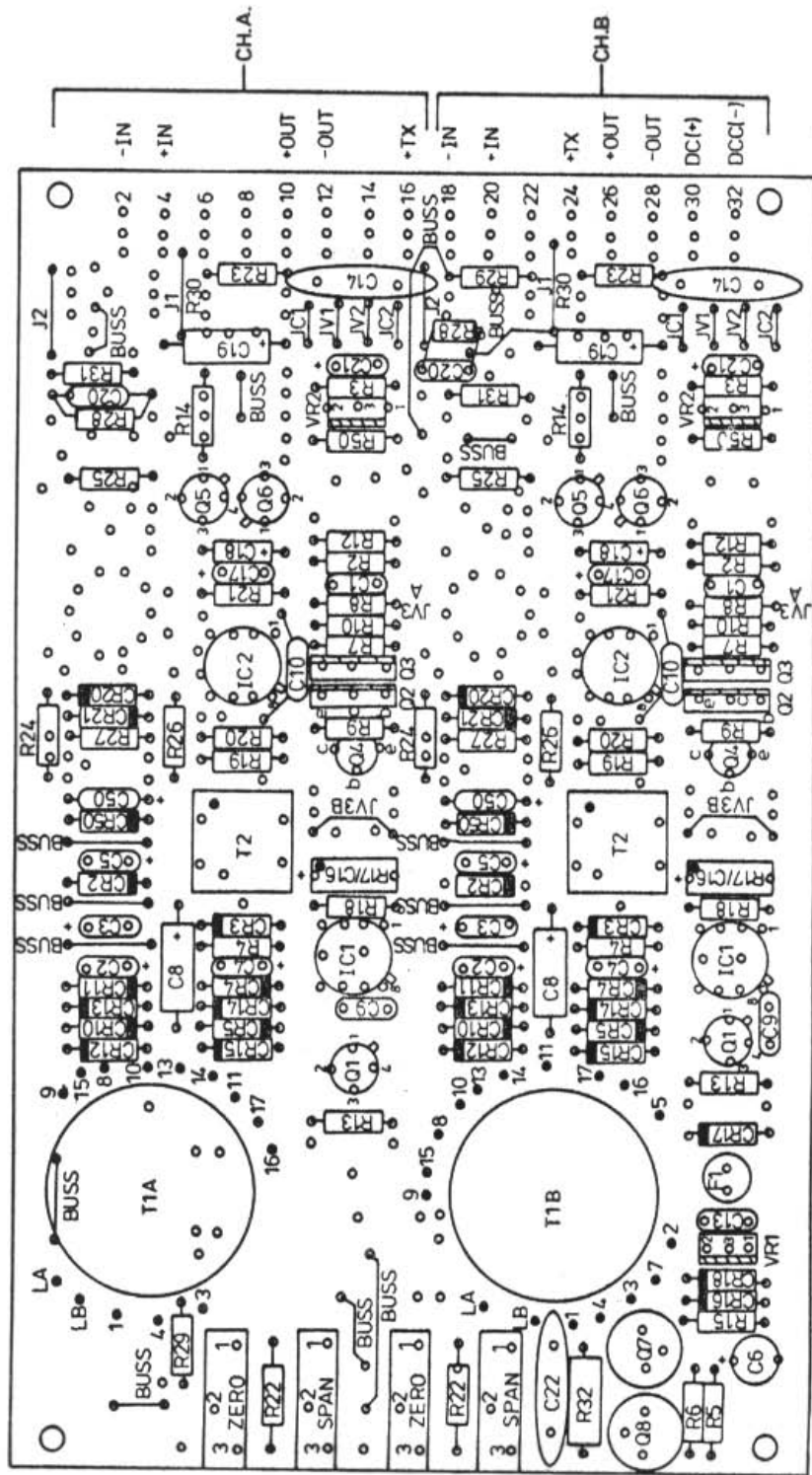
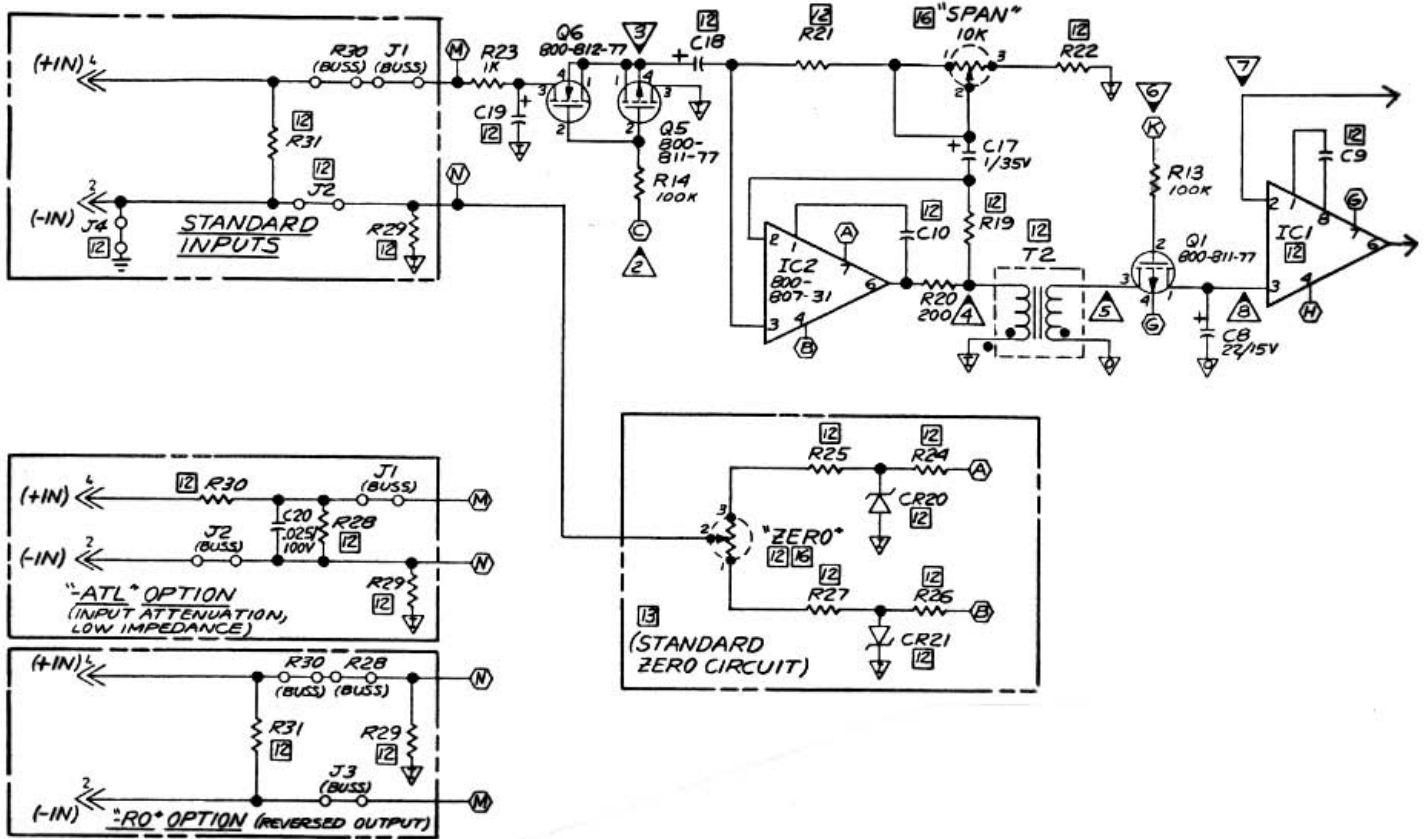


Figure 10. Dual Channel Assembly

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# SCT-EU



- 16 ITEM NOT MOUNTED ON P.C.B.D.
- 15 T1 & L1 ARE A ONE-PIECE ENCAPSULATED ASS'Y.
- 14 DELETED
- 13 DELETED
- 12 SEE LIST OF MATERIALS FOR VALUE, USAGE AND/OR PART NO.
- 11 METAL FILM RESISTOR (RN55C), ± 1% TOL.
- 10. TEST POINT; FILLED END IS POINTER. REFER TO SECTION 5 OF MANUAL, "MAINTENANCE"
- 9. CIRCUIT COMMON (SAME LETTERS); LETTERS ARE NOT ON ASS'Y DWG. OR P.C. BD.
- 8. INPUT SECTION COMMON (GROUND); OUTPUT SECTION COMMON (GROUND).
- 7. CONTACT POSITION ON 15 PIN CONNECTOR.
- 6. TERMINAL BLOCK POSITION (ON REAR OF CARD RACK)
- 5. IDENTIFIED WIRING PAD ON P.C. BD.
- 4. PCI/PCB INTERCONNECT PIN.
- 3. ALL POTENTIOMETERS INCREASE C.W. FROM 1 TO 3.
- 2. ALL DIODES ARE M.I.I. PIN 800-4148-11; RESISTORS ARE 1/4 W CARB COMP, ± 10%.
- 1. RESISTANCE VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS.

NOTES: UNLESS OTHERWISE SPECIFIED

Figure 11. Channel A Schematic (page 1 of 2)

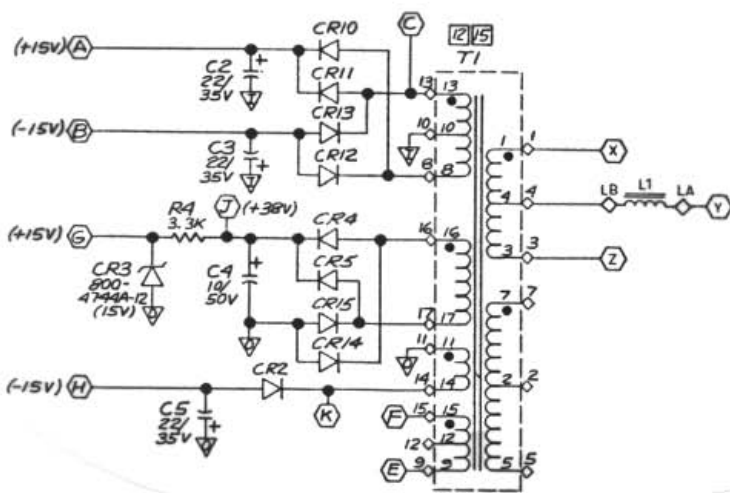
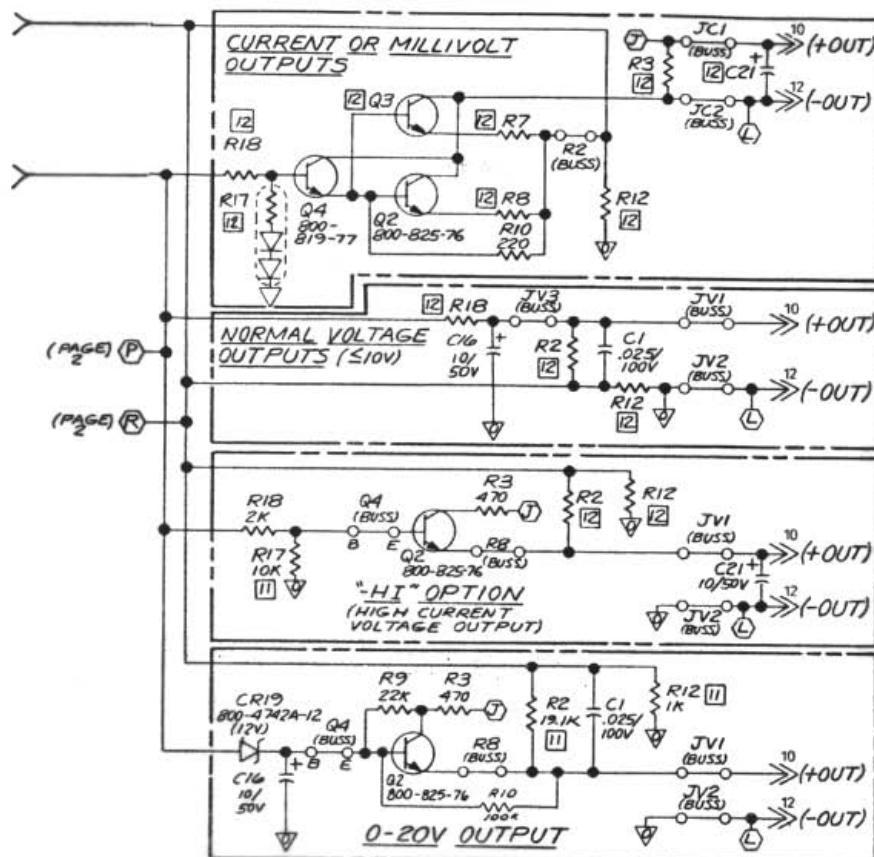
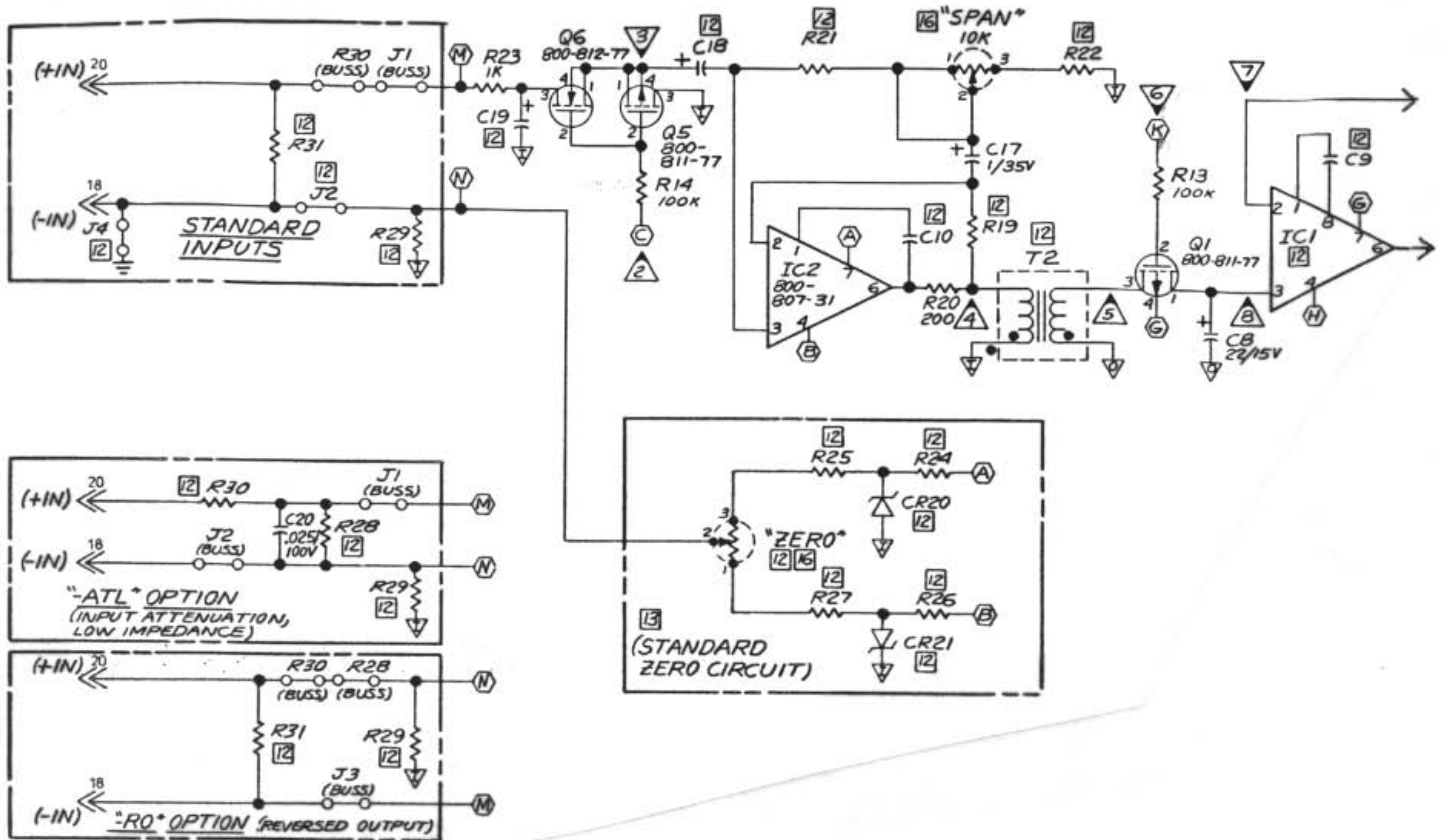


Figure 11. Channel A Schematic (page 2 of 2)

# SCT-EU



- 16 ITEM NOT MOUNTED ON P.C.B.D.
  - 15 T1 & L1 ARE A ONE-PIECE ENCAPSULATED ASS'Y.
  - M, DELETED
  - 23 DELETED
  - 2 SEE LIST OF MATERIALS FOR VALUE, USAGE AND/OR PART NO.
  - 1 METAL FILM RESISTOR (R/N55C), ± 1% TOL.
  - 10. ▽ TEST POINT; FILLED END IS POINTER. REFER TO SECTION 5 OF MANUAL, "MAINTENANCE"
  - 9. ○ CIRCUIT COMMON (SAME LETTERS); LETTERS ARE NOT ON ASS'Y DWG. OR P.C. BD.
  - 8. ▽ INPUT SECTION COMMON (GROUND); ▽ OUTPUT SECTION COMMON (GROUND).
  - 7. << CONTACT POSITION ON 15 PIN CONNECTOR.
  - 6. ⊙ TERMINAL BLOCK POSITION (ON REAR OF CARD RACK)
  - 5. ◇ IDENTIFIED WIRING PAD ON P.C. BD.
  - 4. □ PCI/PCB INTERCONNECT PIN.
  - 3. ALL POTENTIOMETERS INCREASE C.W. FROM 1 TO 3.
  - 2. ALL DIODES ARE M.I.I. PIN 800-4148-11; RESISTORS ARE 1/4 W CARB. COMP, ± 10%.
  - 1. RESISTANCE VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS.
- NOTES: UNLESS OTHERWISE SPECIFIED

Figure 12. Channel B Schematic (page 1 of 2)



# SCT-EU

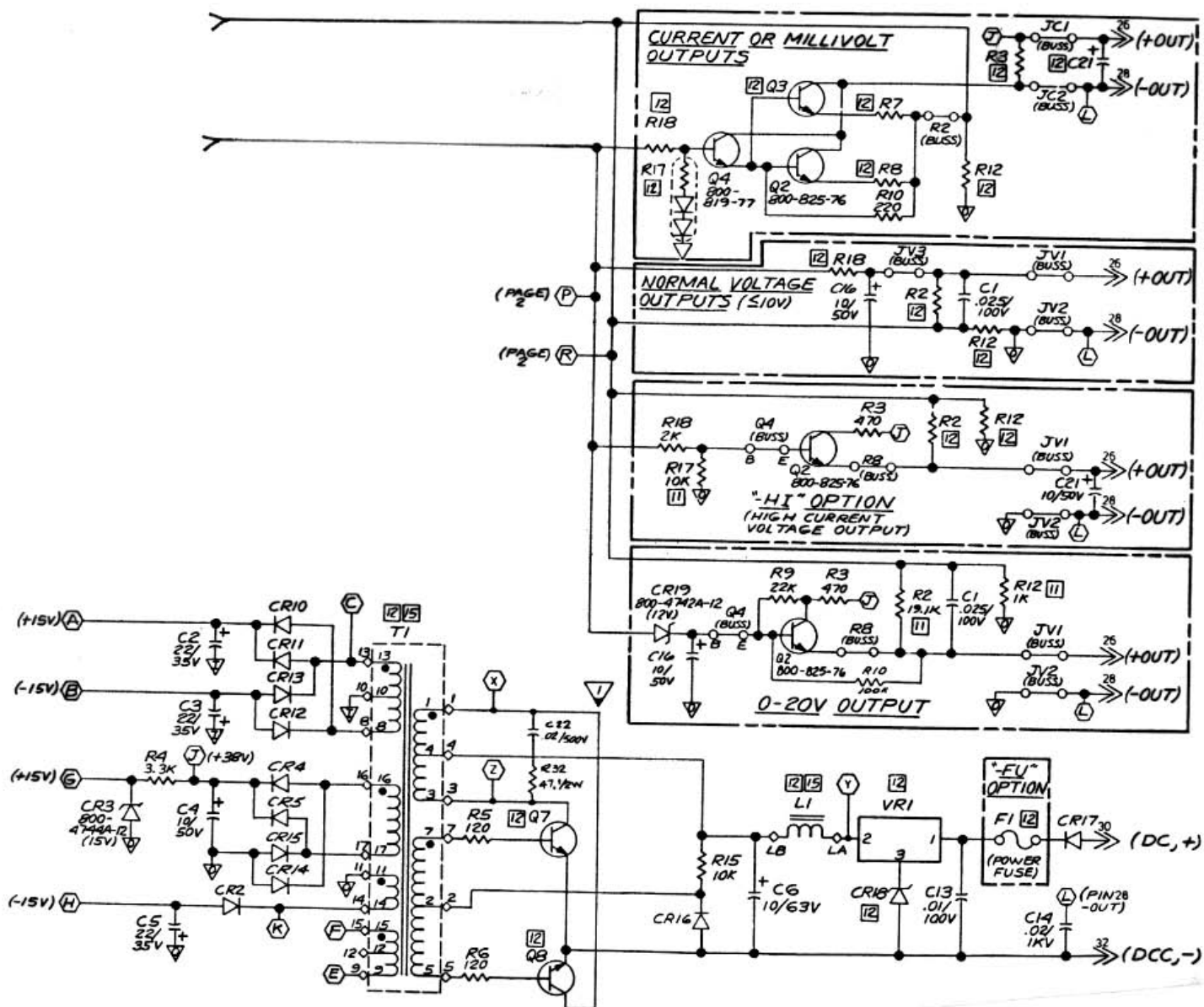


Figure 12. Channel B Schematic (page 2 of 2)

# RETURN PROCEDURES

## To return equipment to Moore Industries for repair, follow these four steps:

1. Call Moore Industries and request a Returned Material Authorization (RMA) number.

### Warranty Repair –

If you are unsure if your unit is still under warranty, we can use the unit's serial number to verify the warranty status for you over the phone. Be sure to include the RMA number on all documentation.

### Non-Warranty Repair –

If your unit is out of warranty, be prepared to give us a Purchase Order number when you call. In most cases, we will be able to quote you the repair costs at that time. The repair price you are quoted will be a "Not To Exceed" price, which means that the actual repair costs may be less than the quote. Be sure to include the RMA number on all documentation.

2. Provide us with the following documentation:
  - a) A note listing the symptoms that indicate the unit needs repair
  - b) Complete shipping information for return of the equipment after repair
  - c) The name and phone number of the person to contact if questions arise at the factory
3. Use sufficient packing material and carefully pack the equipment in a sturdy shipping container.
4. Ship the equipment to the Moore Industries location nearest you.

The returned equipment will be inspected and tested at the factory. A Moore Industries representative will contact the person designated on your documentation if more information is needed. The repaired equipment, or its replacement, will be returned to you in accordance with the shipping instructions furnished in your documentation.

### WARRANTY DISCLAIMER

THE COMPANY MAKES NO EXPRESS, IMPLIED OR STATUTORY WARRANTIES (INCLUDING ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE) WITH RESPECT TO ANY GOODS OR SERVICES SOLD BY THE COMPANY. THE COMPANY DISCLAIMS ALL WARRANTIES ARISING FROM ANY COURSE OF DEALING OR TRADE USAGE, AND ANY BUYER OF GOODS OR SERVICES FROM THE COMPANY ACKNOWLEDGES THAT THERE ARE NO WARRANTIES IMPLIED BY CUSTOM OR USAGE IN THE TRADE OF THE BUYER AND OF THE COMPANY, AND THAT ANY PRIOR DEALINGS OF THE BUYER WITH THE COMPANY DO NOT IMPLY THAT THE COMPANY WARRANTS THE GOODS OR SERVICES IN ANY WAY.

ANY BUYER OF GOODS OR SERVICES FROM THE COMPANY AGREES WITH THE COMPANY THAT THE SOLE AND EXCLUSIVE REMEDIES FOR BREACH OF ANY WARRANTY CONCERNING THE GOODS OR SERVICES SHALL BE FOR THE COMPANY, AT ITS OPTION, TO REPAIR OR REPLACE THE GOODS OR SERVICES OR REFUND THE PURCHASE PRICE. THE COMPANY SHALL IN NO EVENT BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES EVEN IF THE COMPANY FAILS IN ANY ATTEMPT TO REMEDY DEFECTS IN THE GOODS OR SERVICES, BUT IN SUCH CASE THE BUYER SHALL BE ENTITLED TO NO MORE THAN A REFUND OF ALL MONIES PAID TO THE COMPANY BY THE BUYER FOR PURCHASE OF THE GOODS OR SERVICES.

ANY CAUSE OF ACTION FOR BREACH OF ANY WARRANTY BY THE COMPANY SHALL BE BARRED UNLESS THE COMPANY RECEIVES FROM THE BUYER A WRITTEN NOTICE OF THE ALLEGED DEFECT OR BREACH WITHIN TEN DAYS FROM THE EARLIEST DATE ON WHICH THE BUYER COULD REASONABLY HAVE DISCOVERED THE ALLEGED DEFECT OR BREACH, AND NO ACTION FOR THE BREACH OF ANY WARRANTY SHALL BE COMMENCED BY THE BUYER ANY LATER THAN TWELVE MONTHS FROM THE EARLIEST DATE ON WHICH THE BUYER COULD REASONABLY HAVE DISCOVERED THE ALLEGED DEFECT OR BREACH.

### RETURN POLICY

For a period of thirty-six (36) months from the date of shipment, and under normal conditions of use and service, Moore Industries ("The Company") will at its option replace, repair or refund the purchase price for any of its manufactured products found, upon return to the Company (transportation charges prepaid and otherwise in accordance with the return procedures established by The Company), to be defective in material or workmanship. This policy extends to the original Buyer only and not to Buyer's customers or the users of Buyer's products, unless Buyer is an engineering contractor in which case the policy shall extend to Buyer's immediate customer only. This policy shall not apply if the product has been subject to alteration, misuse, accident, neglect or improper application, installation, or operation. THE COMPANY SHALL IN NO EVENT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.



**WORLDWIDE • www.miinet.com**

United States • info@miinet.com Tel: (818) 894-7111 • FAX: (818) 891-2816	Belgium • info@mooreind.be Tel: 03/448.10.18 • FAX: 03/440.17.97	China • sales@mooreind.sh.cn Tel: 86-21-62491499 • FAX: 86-21-62490635
Australia • sales@mooreind.com.au Tel: (02) 8536-7200 • FAX: (02) 9525-7296	The Netherlands • sales@mooreind.nl Tel: (0)344-617971 • FAX: (0)344-615920	United Kingdom • sales@mooreind.com Tel: 01293 514488 • FAX: 01293 536852