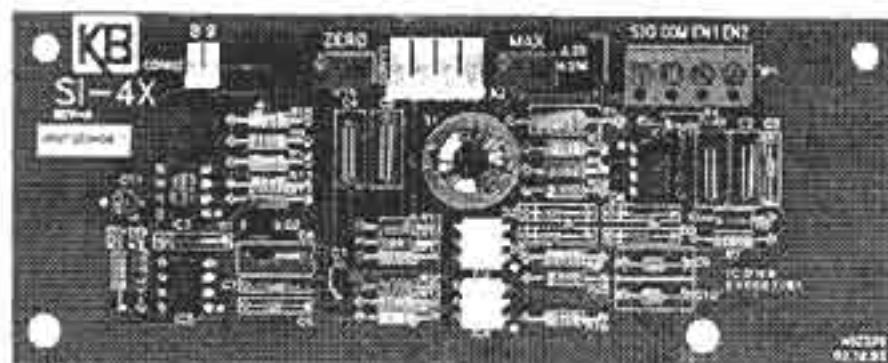


INSTALLATION AND OPERATING IINSTRUCTIONS

MODEL SI-4X

KB Part No. 8801
Bipolar Signal Isolator for
Models KBRG-240D, 225D, 212D and 255 Regenerative Drives


See Page 1







See Safety Warning on Page 1

The information contained in this manual is intended to be accurate. However, the manufacturer retains the right to make changes in design which may not be included herein.

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A COMPLETE LINE OF MOTOR DRIVES

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i. SAFETY WARNING! — PLEASE READ CAREFULLY

This product should be installed and serviced by a qualified technician, electrician or electrical maintenance person familiar with its operation and the hazards involved. Proper installation, which includes wiring, mounting in proper enclosure, fusing or other overcurrent protection and grounding, can reduce the chance of electric shocks, fires or explosion in this product or products used with this product, such as electric motors, switches, coils, solenoids and/or relays. Eye protection must be worn and insulated adjustment tools must be used when working with control under power. This product is constructed of materials (plastics, metals, carbon, silicon, etc.) which may be a potential hazard. Proper shielding, grounding and filtering of this product can reduce the emission of radio frequency interference (RFI) which may adversely affect sensitive electronic equipment. If information is required on this product, contact our factory. It is the responsibility of the equipment manufacturer and individual installer to supply this safety warning to the ultimate user of this product. (SW effective 11/92)

This control contains electronic Start/Stop and inhibit circuits that can be used to start and stop the control. However, these circuits are never to be used as safety disconnects since they are not fail-safe. Use only the AC line for this purpose.

The input circuits of this control (potentiometer, start/stop, Inhibit) are not isolated from AC line. **Be sure to follow all instructions carefully. Fire and/or electrocution can result due to improper use of this product.**



This product complies with all CE directives pertinent at the time of manufacture. Contact factory for detailed installation instructions and Declaration of Conformity.

I. INTRODUCTION

The SI-4X bipolar signal isolator is designed to provide input signal isolation for regenerative drive models when used with nonisolated input voltage following signal sources. (See fig. 1A.) The unit installs easily, and is equipped with multiturn "zero" and "Max" trimpots. It contains a jumper selection for input voltage range (0 to ± 25 , 0 to ± 250 VDC) and isolated enable circuit. The isolator is especially useful when connecting a programmable controller or process controller with analog output card to the KBRG. A separate power supply is not required since the SI-4X contains a built-in supply. The SI-4X is factory calibrated so that a 0 to ± 10 VDC input signal will provide 0 to $\pm 110\%$ of motor speed.

FIG. 1A – KBRG CONTROL USED WITH NONISOLATED SIGNAL SOURCE

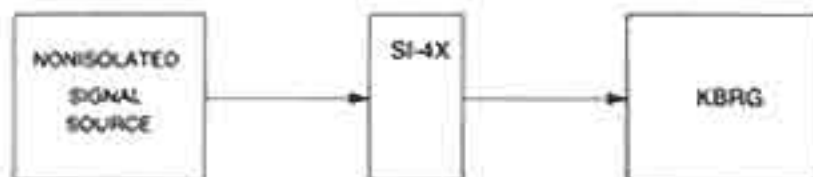


FIG. 1B – MULTIPLE KBRG CONTROLS USED WITH SINGLE ISOLATED OR NONISOLATED SIGNAL SOURCE

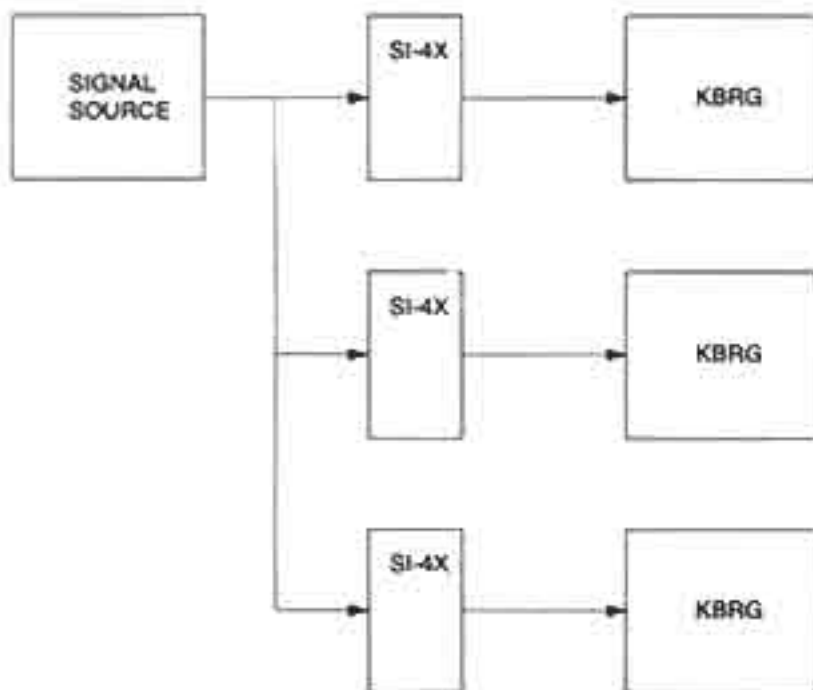


TABLE 1 – MECHANICAL SPECIFICATIONS

Signal Input Voltage	0 – ± 25 , 0 – ± 250 VDC
Range of Zero Trimpot	0 – $\pm 30\%$ Motor Speed
Range of Max Trimpot	0 – Full Motor Speed, 0 – 5VDC Input
Linearity	$\pm 0.2\%$
Temperature Drift	4 mV per $^{\circ}\text{C}$
Temperature Operating Range	0 – 50 $^{\circ}\text{C}$

II. MOUNTING

- A. **Model KBRG-240D** – Mount the SI-4X circuit board under the top logic board of the KBRG. Secure with the two (2) 6-32 allen screws provided. Tighten at approx. 10 in/lbs (do not over tighten) using allen wrench provided. See fig. 2, p. 3.
- B. **Models KBRG-225D and KBRG-255** – Remove and save two (2) 6-32 \times $\frac{1}{2}$ " allen screws on the top end (opposite side of terminal blocks) of heatsink frame. Mount the SI-4X circuit board under the top logic board. Secure with the two 6-32 \times $\frac{1}{2}$ " allen screws just removed. See fig. 3, p. 4
- C. **KBRG-212D** – Installation kit KB P/N 8820 must be used in order to install the SI-4X onto the KBRG-212D. (See fig. 4, p. 5.) Mount the SI-4X to the accessory mounting bracket using four (4)* 6-32 \times $\frac{3}{8}$ " screws provided. Be sure to install insulator with shoulder washers (shoulder washers facing up) between the SI-4X and bracket base. Mount bracket with SI-4X installed to KBRG-212D as shown using two (2) 6-32 \times $\frac{1}{4}$ " screws. **Note:** Some SI-4X models have provision for three (3) mounting screws.

FIG. 2 – MOUNTING THE SI-4X ON KBRG-240D

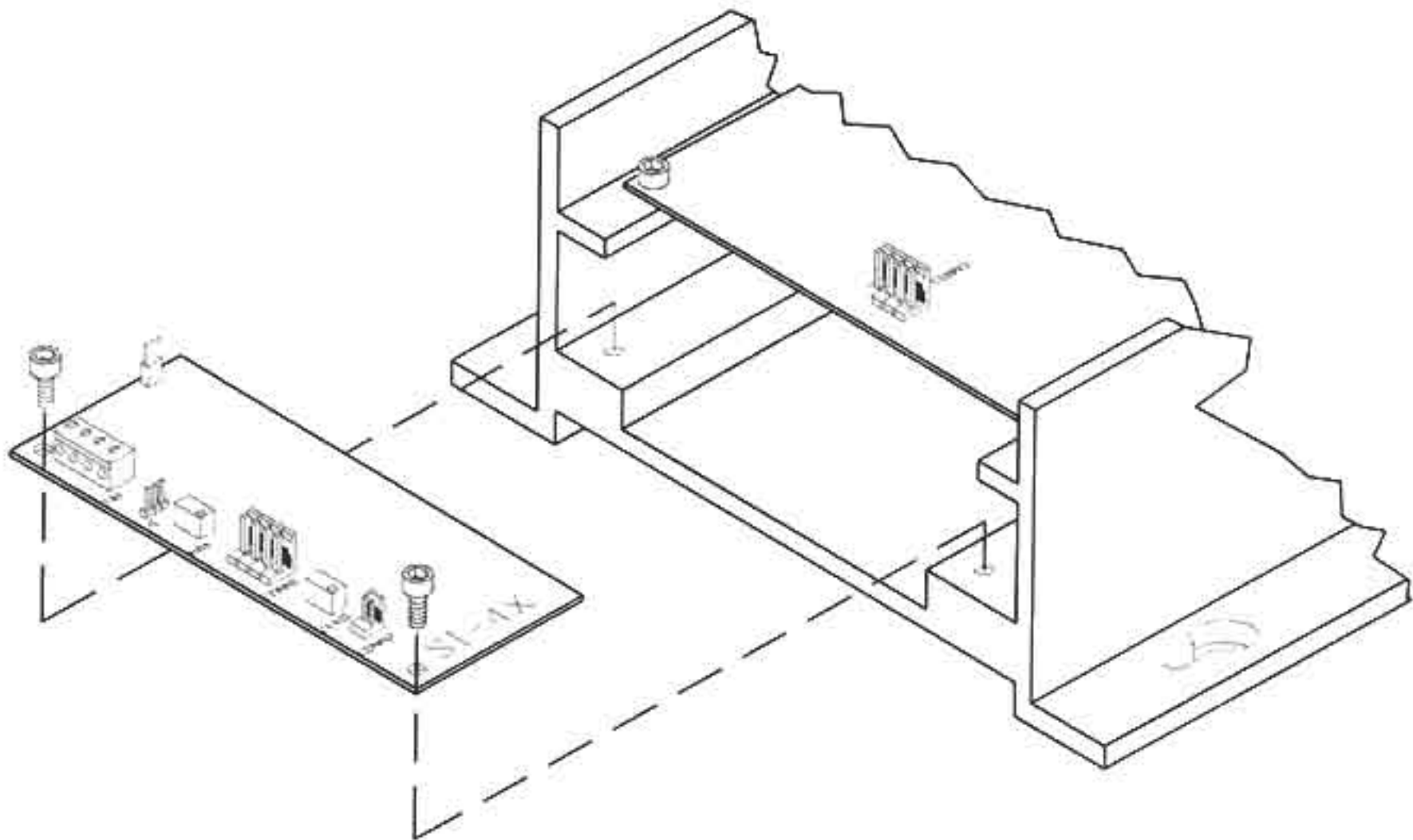


FIG. 3 – MOUNTING THE SI-4X ON KBRG-225D OR KBRG-255D

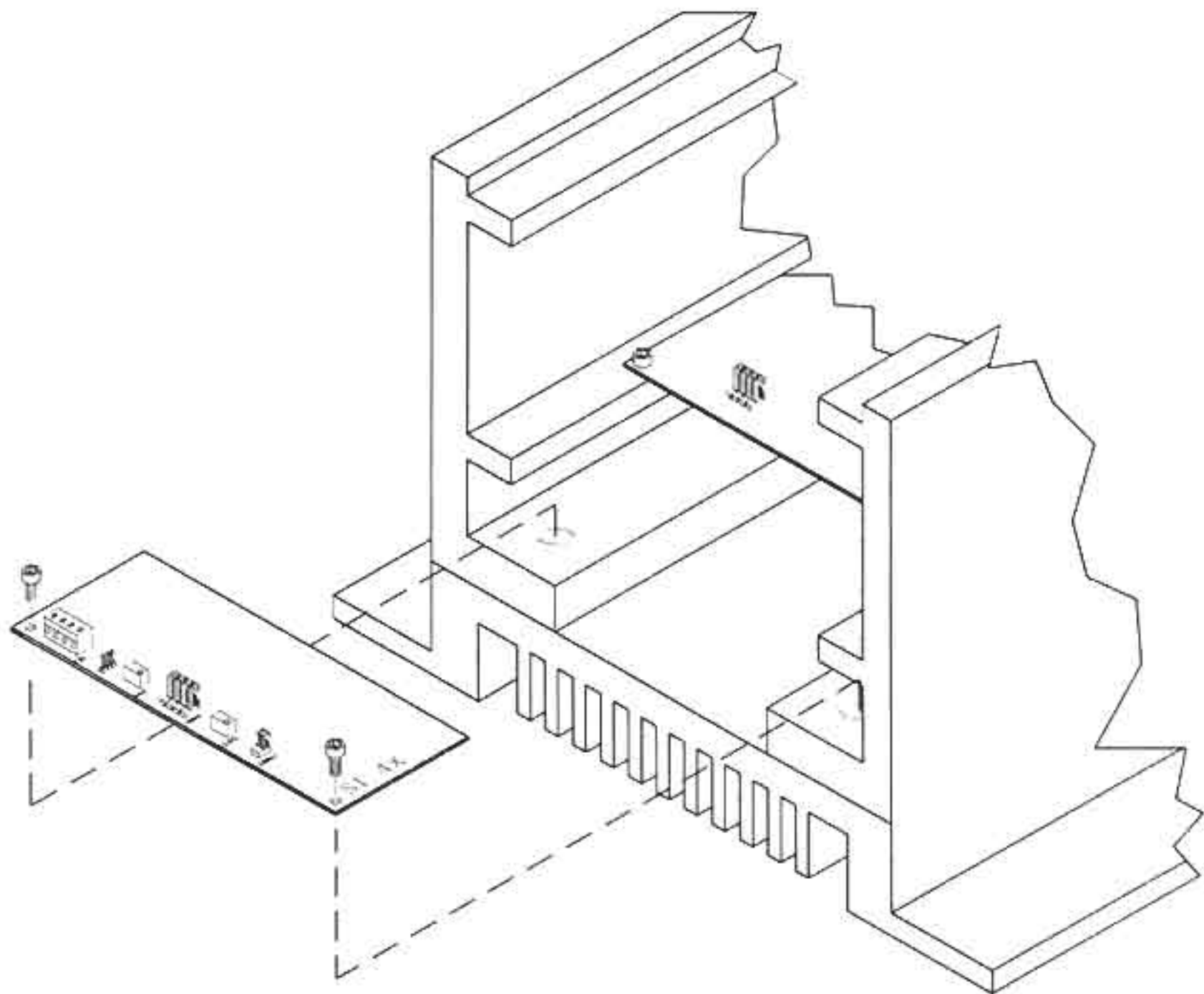
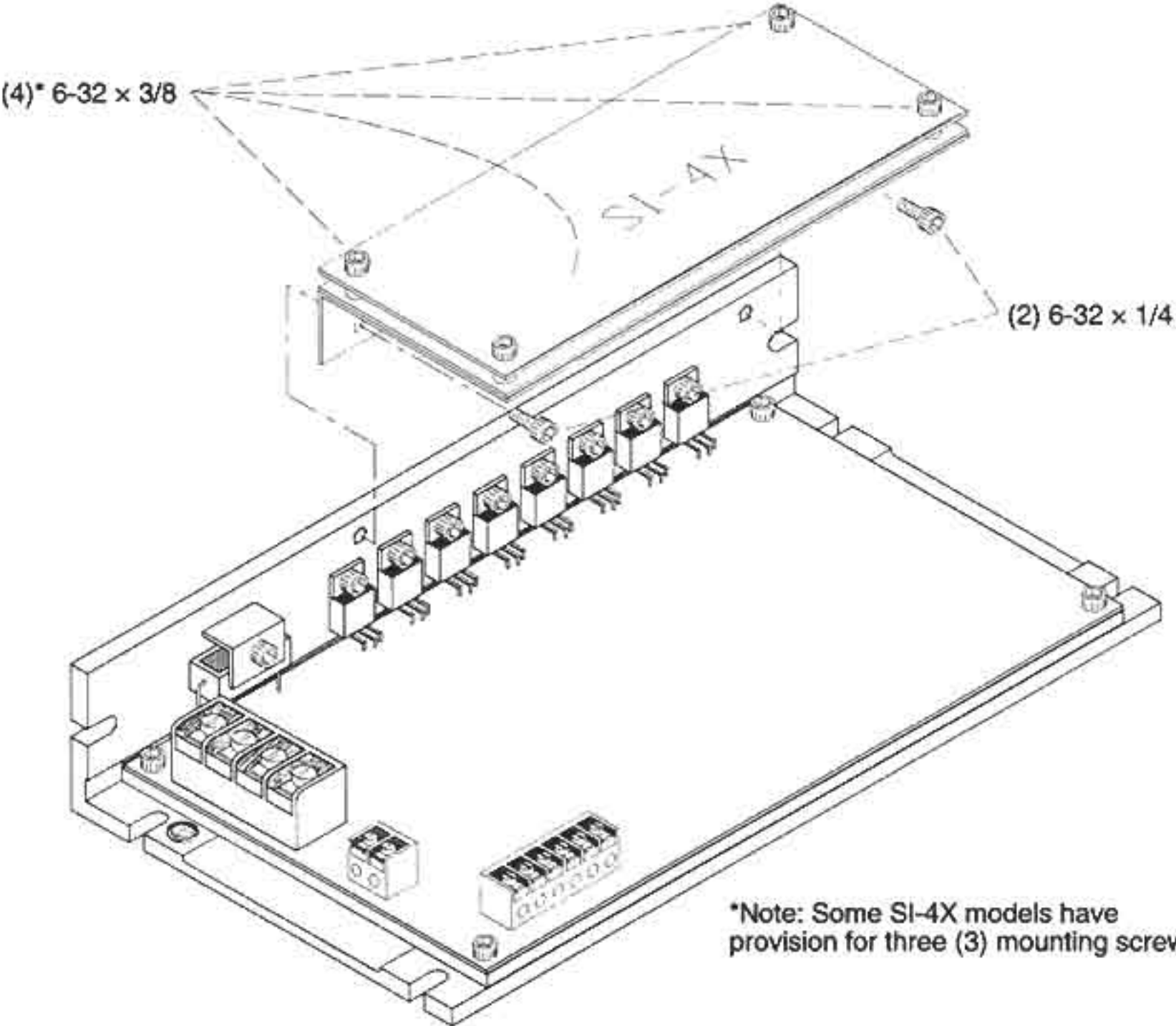


FIG. 4 – MOUNTING THE SI-4X ON KBRG-212D (Mounting Kit Required – KB P/N 8820)

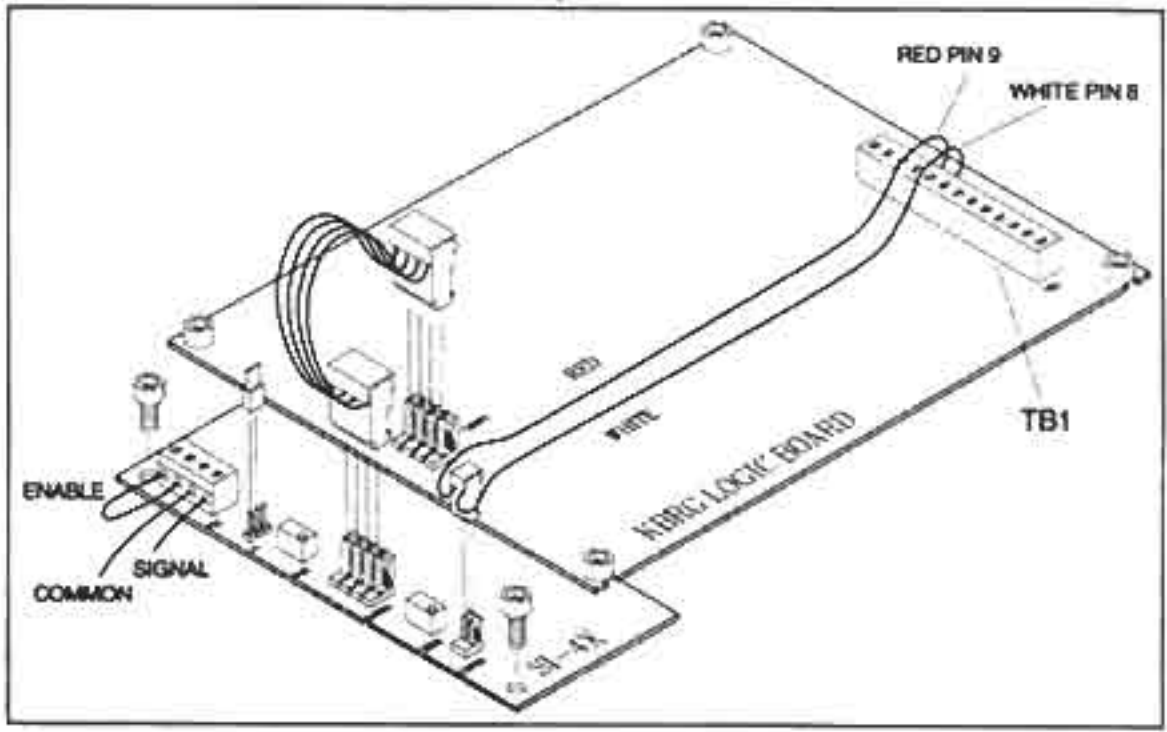


III. WIRING

FIG. 5 – CONTROL LAYOUT AND SETUP FOR KBRG-240D, 225D AND 255

A. Models KBRG-240D, 225D and 255.

- i. Install the 4-wire interconnect cable between Conn 1 on the SI-4X to Conn 3 on the KBRG logic board as shown in fig. 5.
- ii. Install the 2-wire interconnect cable between Conn 2 on the SI-4X to terminals "8" and "9" on terminal block TB1 (Note: Terminal "8" on Conn 2 is connected to terminal "8" on TB1 and "9" on Conn 2 is connected to "9" on TB1 – See fig. 5.)



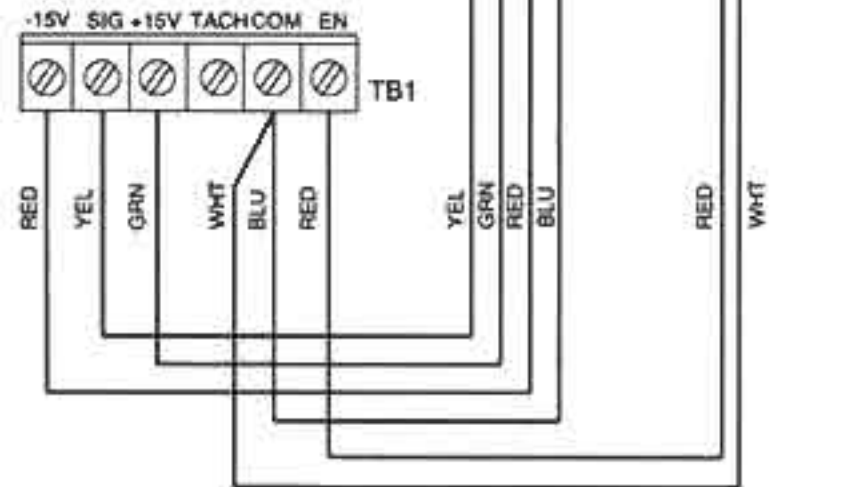
Be sure to observe the orientation of the connector and the wiring color code. (White to terminal 8 and Red to terminal 9.)

B. Model KBRG-212D only (see fig. 6 on page 7).

- i. Install the 4-wire connector found in the KBRG-212D accessory mounting kit (KB P/N 8820). Connect the four (4) wires to the KBRG-212D terminal block TB1 (Red to - 15). (Yellow to SIG), (Green to +15) and (Blue to COM) as shown in fig. 6, p. 7.
- ii. Enable – Install the 2-wire connector (Red and White) supplied with the SI-4X. As shown, connect the red and white wires from CONN2 of the SI-4X to terminal block TB1 of the KBRG-212D.

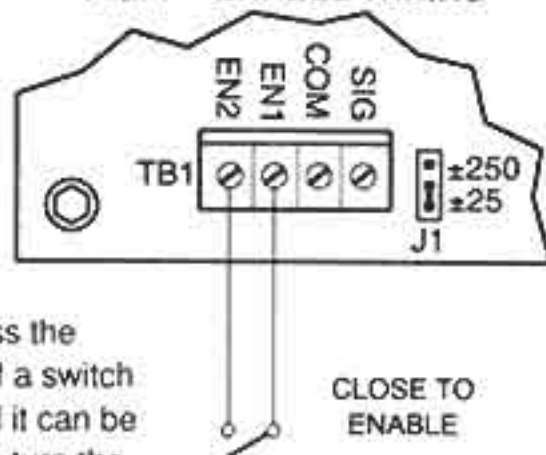
Note: The Red wire is connected to EN and the White wire is connected to COM. Be sure to follow the wiring as illustrated in fig. 6, p. 7 .

FIG. 6 – CONNECTION DIAGRAM FOR KBRG-212D ONLY



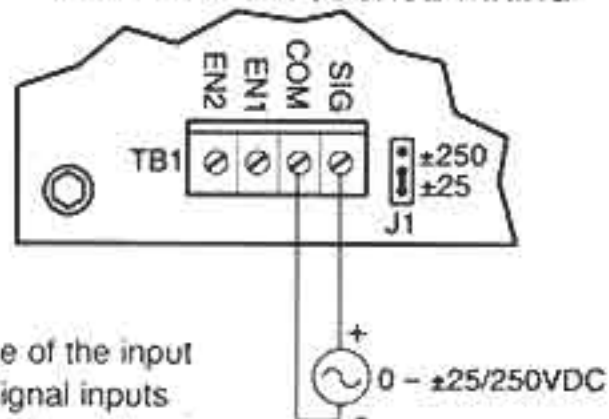
C) Enable Operation (All models) – A jumper or switch must be wired between EN1 and EN2 on terminal block TB1 of the SI-4X. The control will not operate unless the jumper is installed. If a switch or contact is installed it can be used to electronically turn the KBRG "on" and "off." **WARNING:** Do not use enable as a safety stop – use only the AC line for that purpose.)

FIG. 7 – ENABLE WIRING



D) Signal Source Wiring – Wire input signal voltage to terminals "SIG" and "COM" on the SI-4X terminal block TB1. (See fig. 8.) Be sure the signal input does not exceed the voltage setting of jumper J1 (0 to ± 25 or 0 to ± 250) on the SI-4X. Source impedance of signal must be less than 1 KΩ. Use shielded cable if signal wires are over 18." **Do not bundle signal wires with AC line and motor wires.**

FIG. 8 – SIGNAL SOURCE WIRING

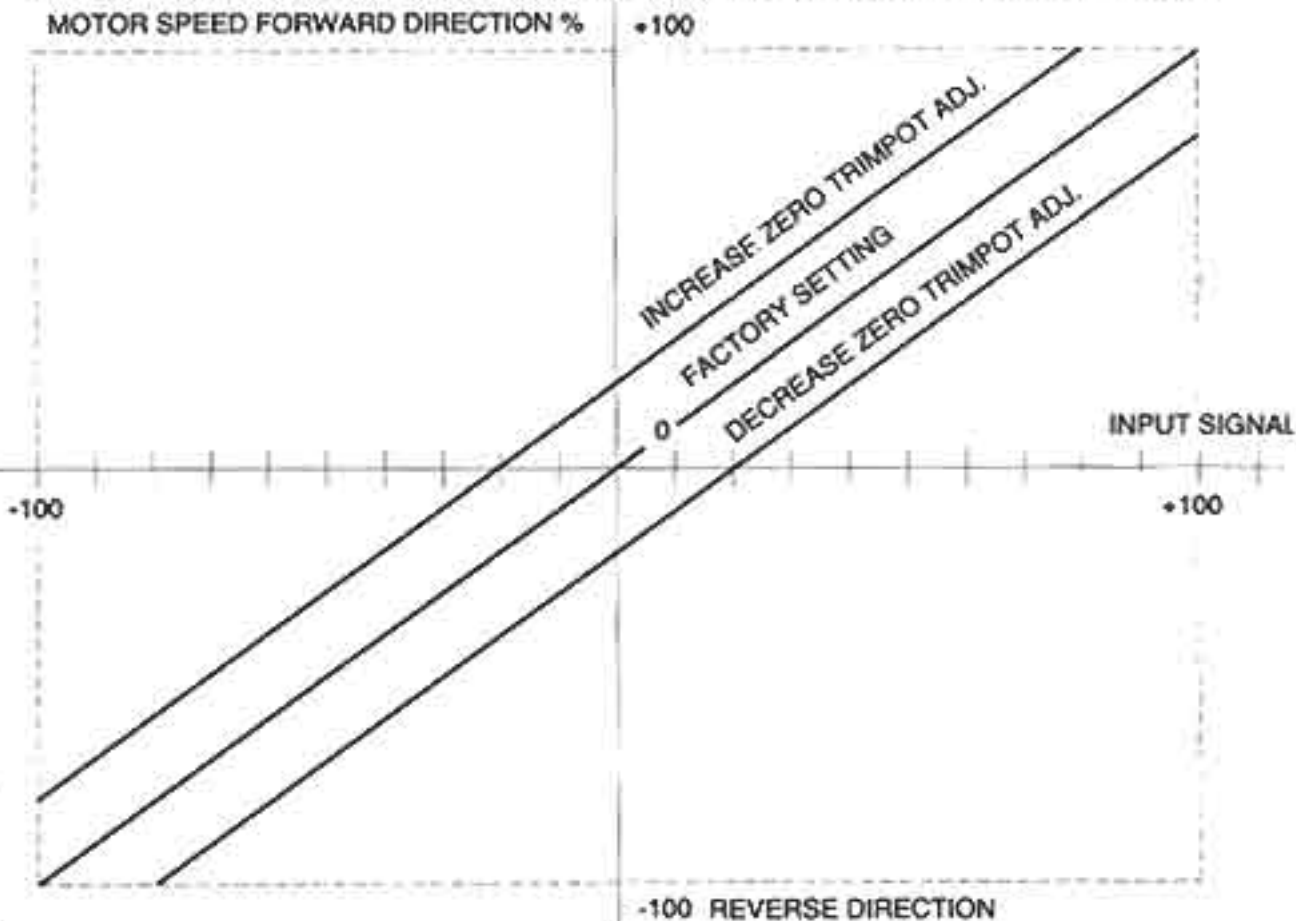


IV. SETUP AND CALIBRATION

- A)** Set Jumper J1 on the SI-4X to the position that corresponds to the range of the input signal voltage. For signal inputs up to ± 25 VDC set J1 to "± 25." For signal inputs above ± 25 VDC and below ± 250 VDC set J1 to "±250." **Note:** To maximize following response, adjust FWD ACCEL and REV ACCEL trimpots on KBRG control completely CCW.
- B)** "Zero" trimpot adjustment. The zero trimpot operates similar to a minimum speed trimpot except it can provide a minimum speed in either forward or reverse direction. Note: This trimpot is a multi-turn type and can be rotated approx. 12 turns clockwise or counter clockwise (total 24 turns).

The zero trimpot is factory adjusted so that the motor will not run with a zero input signal. Increasing the zero trimpot setting (cw. rotation) will cause the motor to increase in speed proportionally in the forward direction. Decreasing the zero trimpot setting (ccw. rotation) will cause the motor to increase in speed proportionally in the reverse direction. Note: The full range of the zero trimpot is up to 30% of full motor speed. The overall effect of the zero trimpot is to offset the input signal versus motor speed relationship.

FIG. 9 – MOTOR SPEED vs INPUT SIGNAL AND ZERO TRIMPOT SETTING



- C) **Max Trimpot.** The Max trimpot is used to set the maximum output motor speed based on the input signal. The SI-4X has been factory calibrated so that a ± 10 VDC input signal will yield approximately $\pm 110\%$ of full motor speed. Rotating the trimpot clockwise will increase motor speed and conversely, rotating it counterclockwise will decrease motor speed. (See fig. 10.)

The Max trimpot is designed to produce full motor speed with a minimum input signal of ± 4 VDC. (See fig. 11.)

FIG. 10 – MAXIMUM MOTOR SPEED LEVELS WITH FIXED INPUT SIGNAL RANGE

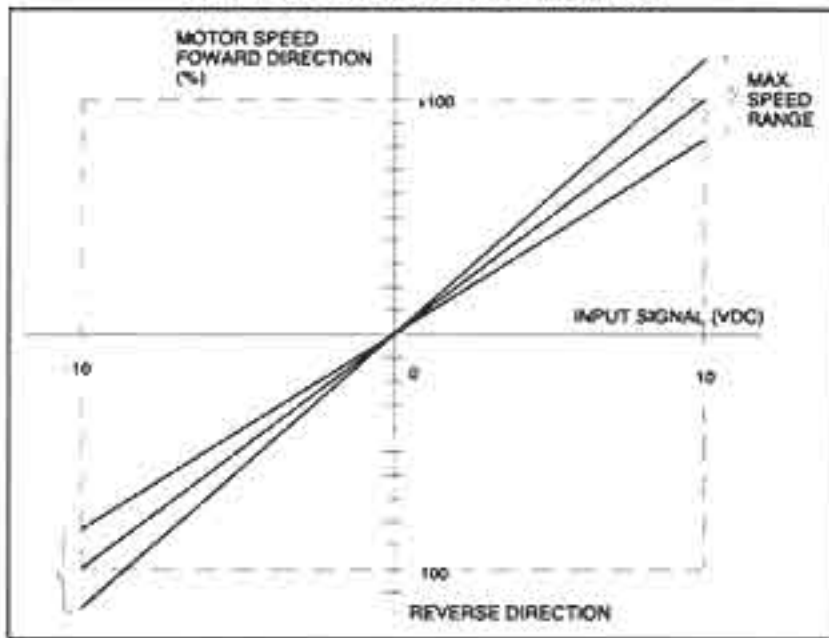


FIG. 11 – MAINTAINING FULL MOTOR SPEED WITH VARYING INPUT SIGNAL LEVELS

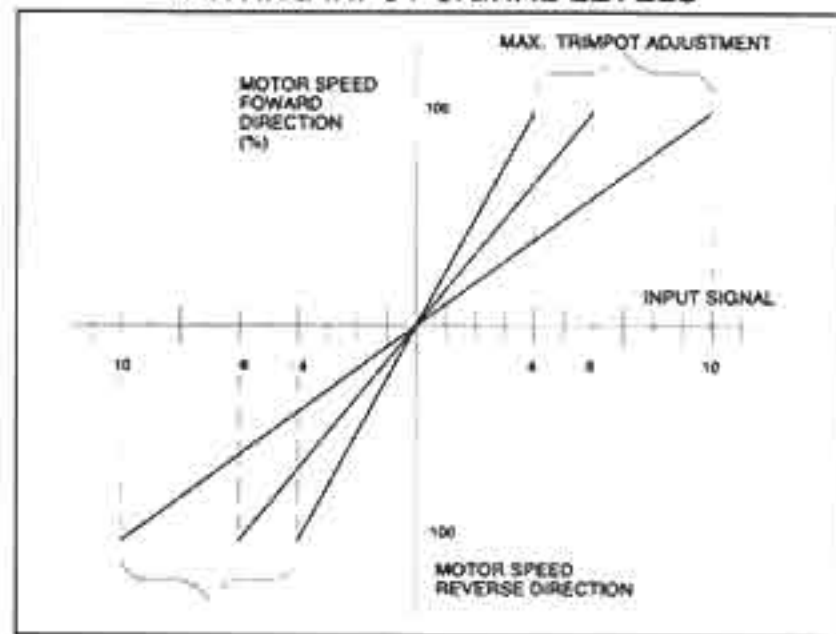


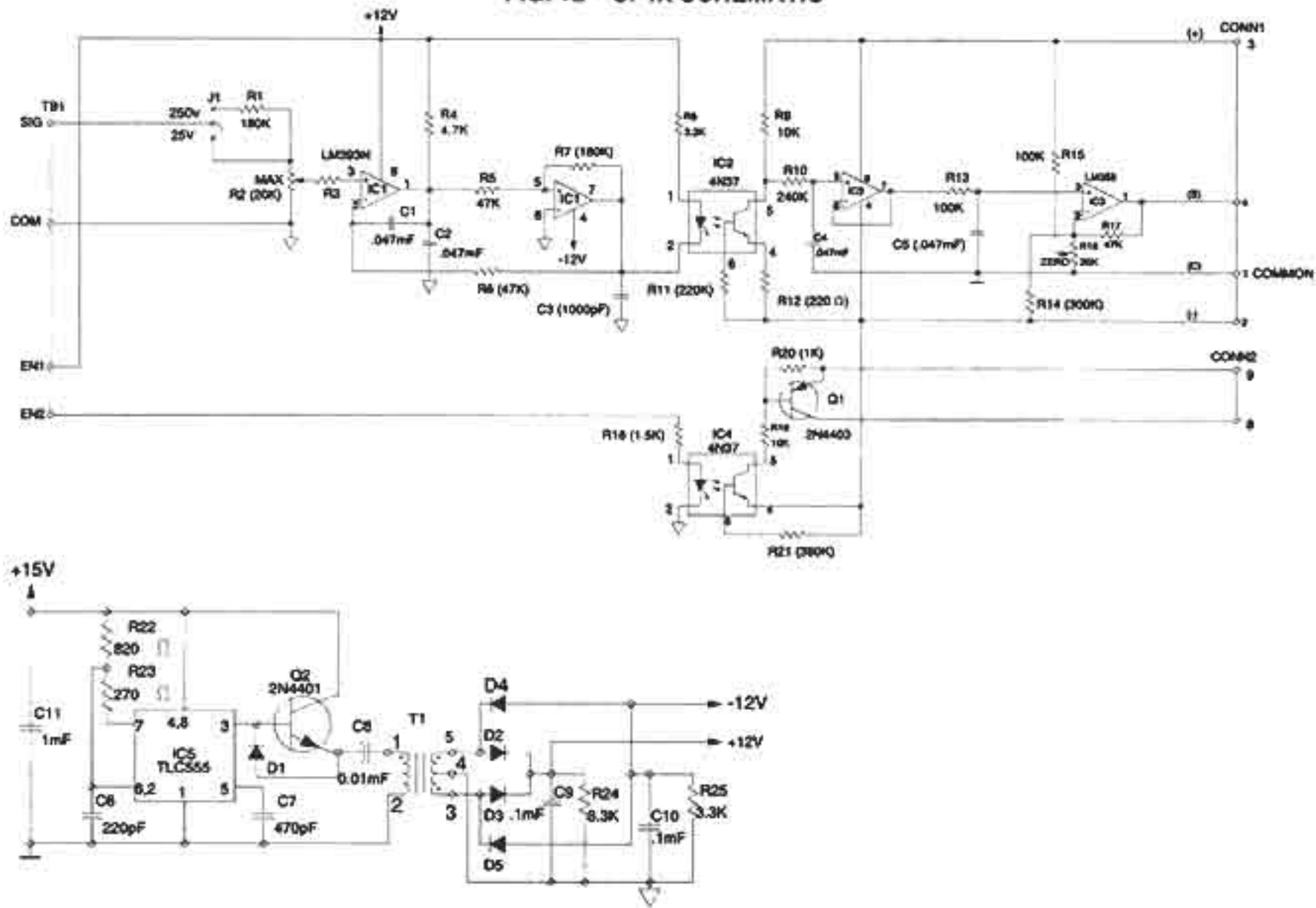
TABLE 2 – SI-4X PARTS LIST

CKT REF	SPECIFICATION	MANUFACTURER-TYPE	DESCRIPTION
C1,2,4,5	0.047 μ F-50V-20%	Metal Film	Capacitor
C3	1000pF-50V-20%	Multilayer Ceramic	Capacitor
C6	220pF-50V-10%	Multilayer Ceramic	Capacitor
C7	470pF-50V-10%	Multilayer Ceramic	Capacitor
C8	0.01 μ F-50V-20%	Metal Film	Capacitor
C9,10	0.1 μ F-50V-20%	Multilayer Ceramic	Capacitor
C11	1 μ F-35V-20%	Electrolytic	Capacitor
D1,2,3,4,5	0.15A-100PIV	1N4148	Diode

TABLE 2 – SI-4X PARTS LIST (Continued)

CKT REF	SPECIFICATION	MANUFACTURER-TYPE	DESCRIPTION
IC1	-----	LM393N	Dual Comp.
IC2,4	-----	4N37	Optoisolator
IC3	-----	LM358N	Dual Op Amp
IC5	-----	TLC555	Timer. Transistor
Q1	600mA-40V	2N4403	Transistor
Q2	600mA-40V	2N4401	Transistor
R1	180K-1W/70°C-5%	-----	Resistor
R2	20K-0.5W-10%	Pan-EVMCEGA01B24	MAX Trimpot
R3,13,15	100K-0.25W-5%	Carbon Film	Resistor
R4,24,25	4.7K-0.25W-5%	Carbon Film	Resistor
R5,6,17	47K-0.25W-5%	Carbon Film	Resistor
R7	180K-0.25W-5%	Carbon Film	Resistor
R8,18	3.3K-0.25W-5%	Carbon Film	Resistor
R9,19	10K-0.25W-5%	Carbon Film	Resistor
R10	240K-0.25W-5%	Carbon Film	Resistor
R11	470K-0.25W-5%	Carbon Film	Resistor
R12	220Ω-0.25W-5%	Carbon Film	Resistor
R14	330K-0.25W-5%	Carbon Film	Resistor
R16	20K-0.5W-10%	Pan-EVMCEGA01B24	Zero Trimpot
R20	1K-0.25W-5%	Carbon Film	Resistor
R21	390K-0.25W-5%	Carbon Film	Resistor
R22	820Ω-0.25W-5%	Carbon Film	Resistor
R23	270Ω-0.25W-5%	Carbon Film	Resistor
T1	-----	-----	Pulse Trans.

FIG. 12 – SI-4X SCHEMATIC



V – LIMITED WARRANTY

For a period of 18 months from date of original purchase, KB will repair or replace without charge devices which our examination proves to be defective in material or workmanship. This warranty is valid if the unit has not been tampered with by unauthorized persons, misused, abused, or improperly installed and has been used in accordance with the instructions and/or ratings supplied. The foregoing is in lieu of any other warranty or guarantee, expressed or implied, and we are not responsible for any expense, including installation and removal, inconvenience, or consequential damage, including injury to any person, caused by items of our manufacture or sale. Some states do not allow certain exclusions or limitations found in this warranty so that they may not apply to you. In any event, KB's total liability, under all circumstances, shall not exceed the full purchase price of this unit. (rev 4/88)



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