GE Drive Systems

INSTRUCTIONS

531X187VCTA_G1 VOLTAGE TO CURRENT TRANSDUCER CARD

Renewal Part

IMPORTANT
INFORMATION

CAUTION: To ensure proper operation of the motor drive controller, these instructions must be followed for proper set-up and installation of this replacement card.

WARNING - BURN AND SHOCK HAZARD:

Always disconnect the drive before removing or installing a printed circuit card. Failure to do so may cause serious injury to personnel and damage to the drive or driven machinery.

NOTE: *Refer to all* **WARNINGS, CAUTIONS,** *and* **NOTES** *as listed in the appropriate instruction book (GEK) for the particular drive unit prior to installing or removing this card.*

GENERAL DESCRIPTION

The Voltage to Current Transducer card is a two channel device designed for use with a Drives Products Operation Adjustable Speed Drive. The card may be used as a voltage-to-isolated current or voltage-to-isolated voltage transducer.

MOUNTING

The card may be S-22 pan mounted or mounted on the Control card in place of the "Local" Programmer Module (DC-300™, AC-300™ or AC-500™ drives with version 531X300 control cards only). An opening is provided in the card to permit viewing the diagnostic LEDs on the Control card.

When pan mounted, the power and signal inputs are made by way of the edge connector of the card. The two isolated outputs are from the terminal boards labeled ATB and BTB. When the card is mounted on the Control card, the power and signal outputs are made by connection to terminal board CTB. Outputs are still from ATB and BTB.

OPERATION

+24 VDC is supplied to the card to produce two isolated power supplies for the output side of the two channels. This is implimented by an oscillator/chopper/transformer arrangement operating at about 30KHz.

Power supplies for the input electronics are +/- 15 VDC or +/- 20 VDC. When +/-20 VDC is applied, series zener diodes are used to reduce the voltage to +/- 15 VDC.

Two identical channels of signal conditioning and isolation are provided. The input to output isolation is 600V RMS. The input stages are differential to avoid common line drop problems when using low input voltages.

The common mode input voltage should be limited to +/-10V. The input network incorporates filtering. Jumpers are provided to allow adjustment of the filtering time constant. Switches are provided to allow selecting the input level which will produce full scale output.

After input conditioning and gain selection, the signals are applied to optical isolation amplifiers. Jumpers are provided to invert or absolute the input signals to the isolation amplifiers.

The output of the isolation amplifiers may be set up with jumpers to be current (4 to 20mA or 1 to 5mA) or voltage (0 to +/-10 VDC).

CONNECTIONS

The Voltage to Current Transducer (VCT) card was originally designed around the Drives Products Operation's Micropowered Muscle™ Adjustable Speed Drives (DC-300, AC-300, AC-500, etc) but may be used with other Drives Products Operation drives. The following lists the connection points between the VCT card and the various type of controllers.

POWER SUPPLY INPUTS

VCT Card Nomenclature	Tab Number	CTB Point	3TB Point Micropowered Muscle Drive	Other Controllers
+24 VDC	17	4	3TB59, MUP3*	+24 VDC
PCOM	16	5	3TB28, PSPL	Common
+20 VDC	31		Not used	+20 VDC
+15 VDC	20	1	3TB66, +15V	Not used
ACOM	15	6	3TB67, ACOM	Common
-15 VDC	12	9	3TB64, -15V	Not used
-20 VDC	2		Not used	-20 VDC

** Verify that the following jumpers are set properly on the control card: JP28 set 2-3; JP30 set 1-2. (Refer to controller instruction book.)*

SIGNAL INPUTS

VCT Card Nomenclature	Tab Number	CTB Point
Input (+) Channel A	18	3
Input (-) Channel A	19	2
Input (+) Channel B	14	7
Input (-) Channel B	13	8

SIGNAL OUTPUTS

Current Mode:

Output A (+)	ATB (1)
Output A (-)	ATB (3)
Output B (+)	BTB (1)
Output B (-)	BTB (3)

Voltage Mode:

Output A (+or-)	ATB (3)
Output A (COM)	ATB (1)
Output B (+or-)	BTB (3)
Output B (COM)	BTB (1)

JUMPER FUNCTIONS

Jumper / Channel* A	Jumper / Channel* B	Function	Position / Description
JP1	JP12	Input Filter Time Constant	**1-2:** T = 4ms **2-3:** T = 13ms
JP2	JP13	Input Polarity Selection	**1-2:** Non-inverting **1-3:** Inverting **2-4:** Absoluting
JP3	JP14	Reverse Polarity Clamp	**1-2:** Clamped **2-3:** Unclamped
JP4-10	JP15-21	Current/Voltage Mode Selection	See Next Chart.
JP11	JP22	Output Range (current mode)	**1-2:** 4-20 MA **2-3:** 1-5mA

**Jumpers JP1 to JP11 are associated with channels A; JP12 to JP22 are associated with channel B.*

NOTE: *Setting up for* ***current*** *or* ***voltage*** *mode involves changes on both sides of the isolation barrier. A number of jumpers are involved to change output and feedback circuitry. Jumpers JP4 to JP10 and JP15 to JP21 control this function as follows:*

	Channel A			Channel B	
Jumper	**Current**	**Voltage**	**Jumper**	**Current**	**Voltage**
JP4, 5*	1-2, 3-4	1-3, 2-4	JP15, 16*	1-2, 3-4	1-3, 2-4
JP6	1-2	2-3	JP17	1-2	2-3
JP7	1-2	2-3	JP18	1-2	2-3
JP8	1-2	2-3	JP19	1-2	2-3
JP9, 10*	1-2, 2-3	1-3, 2-4	JP20, 21*	1-2, 3-4	1-3, 2-4

**These jumpers are in "box" pairs so that they must be changed in pairs.*

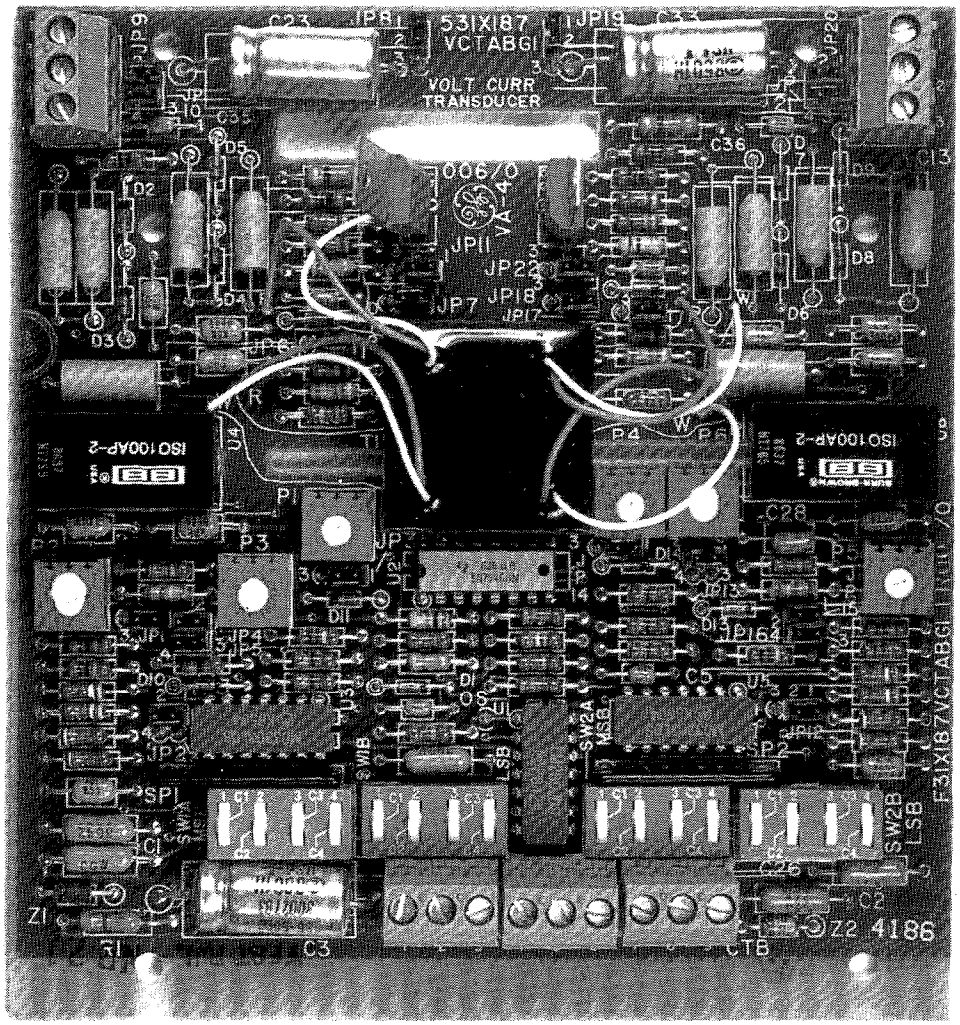

Figure 1. VOLTAGE TO CURRENT TRANSDUCER CARD

GAIN SWITCHES

Full scale output is defined as 5 or 20mA in the current mode or 10 volts in the voltage mode. The input voltage necessary to achieve full scale output is selected by setting 8 switches for each channel. This scaling follows the equation:

$$\text{Full Scale Input} = (1 + K)\ 0.05 \text{ volts.}$$

or

$$K = (20 \times \text{Full Scale Input}) - 1$$

where K is the equivalent of the binary number set by the appropriate switches. The maximum value of K is 255 so the highest input is 12.8 volts. Setting K=0 would give full scale output at a .05 volt input, but this pushes the circuit far below its intended limits. As a practical matter, K should not be set lower than 19. This gives full scale output at 1 volt input.

The most significant bit (MSB) for channel A is set by switch SW1A-1 and the least significant bit (LSB) is set by switch SW1B-4. Corresponding switches for channel B MSB and LSB are SW2A-1 and SW2B-4. The switches and bit weights are as follows;

Channel A		Channel B	
Switch*	Bit Weight	Switch*	Bit Weight
SW1A-1	128	SW2A-1	128
SW1A-2	64	SW2A-2	64
SW1A-3	32	SW2A-3	32
SW1A-4	16	SW2A-4	16
SW1B-1	8	SW2B-1	8
SW2B-2	4	SW2B-2	4
SW1B-3	2	SW2B-3	2
SW1B-4	1	SW2B-4	1

**Push the top of the rocker (numbered end) IN to set the bit.*

POTENTIOMETERS

The potentiometers are initially set at the factory. They set the zero, bias, and gain for each channel.

There is no adjustment for offset in the input amplifier circuitry, and its importance is increased when the gain switches are used to decrease the full scale input required (K decreased). Therefore, it is wise to adjust zero at the calculated K value.

The gain in the voltage mode depends on the tolerance of the different feedback resistors (R22, R23, R24, R27, and R28 on the Channel A; R42, R43, R44, R47, and R48 on Channel B) used in the two modes and the gain of the transistor (Q1 on Channel A; Q2 on Channel B) used in the current mode.

The zero in the voltage mode may be affected by changing to the inverting or absoluting mode. This may also affect the output at zero input in the current mode. Zero is also affected by changes in the gain switch settings.

The bias adjustment sets the appropriate output in current mode (1mA or 4mA) for zero input. Bias is not functional in the voltage mode. When in current mode, bias and zero are interactive, therefore, the zero adjustment must be made first in the voltage mode, then the bias adjusted in the current mode.

ADJUSTMENT / SET-UP PROCEDURE

Adjustment procedure is as follows:

1. Calculate K and set gain switches as required.
2. Select non-inverting, inverting or absoluting as appropriate.
3. Set for voltage mode.
4. Adjust P3-ZERO A or P6-ZERO B with zero input by removing the signal wires from the signal source and tying them together. (For the best accuracy, tie an equivalent resistance of the source impedance across the wires.)
5. **If the voltage mode is desired**, proceed to the gain adjustment (step 8). The bias pot is inoperative in this mode.
6. **If the current mode is desired**, set the jumpers accordingy. The output range (1-5mA or 4-20 mA) must also be selected.
7. Apply zero input signal as mentioned in step 4. Adjust P2-BIAS A or P5-BIAS B for an output of 1mA or 4mA as appropriate.
8. Reconnect the signal wires and apply the appropriate input signal polarity and level. Use P1-GAIN A or P4-GAIN B to set the output at the proper level. This may be done at full scale or the level at which best accuracy is desired.

EXAMPLE:

Range 4-20mA
Full Scale input 5 volts
K = 99
Expected operating level = 2 volts

Adjust gain at input = 2.00 volts

$$\text{Output} = \text{min. output} + \frac{\text{actual input}}{\text{max.input}} (\text{max. output} - \text{min. output})$$

$$\text{Output} = 4\text{mA} + \frac{2\text{V}}{5\text{V}} (20\text{mA} - 4\text{mA}) = \mathbf{10.4mA}$$

PERFORMANCE

Inputs: Differential +/-12.8 VDC MAX
Common mode +/-10 VDC
NOTE: *Minimum full scale input of 1 VDC for full scale output.*

Outputs: **Voltage mode:** +/-10 VDC
Min load resistance = 2K ohms

Current mode: Range 1-5 mA or 4-20mA
Open circuit V = 30V minimum.
Max load res. = 1500 ohm (4-20mA range) - 600 ohm (1-5mA range)

Input-Output Isolation: 600V RMS, 0-360 Hz

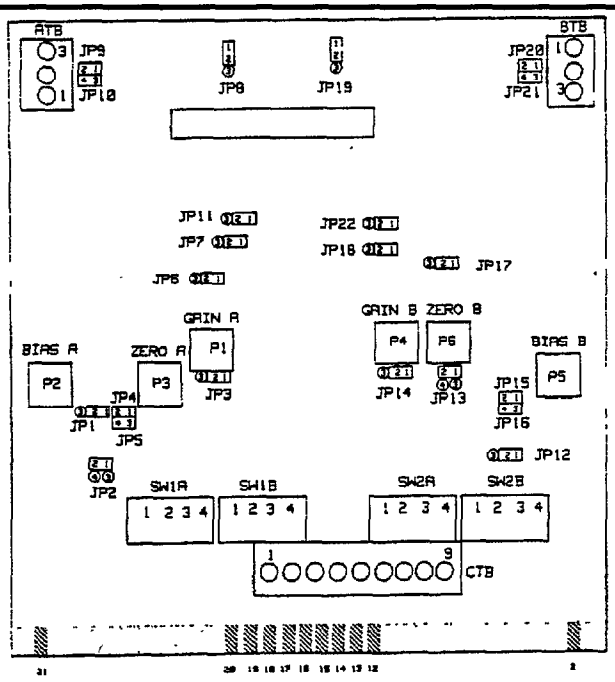

Figure 2. VOLTAGE TO CURRENT TRANSDUCER CARD LAYOUT DIAGRAM

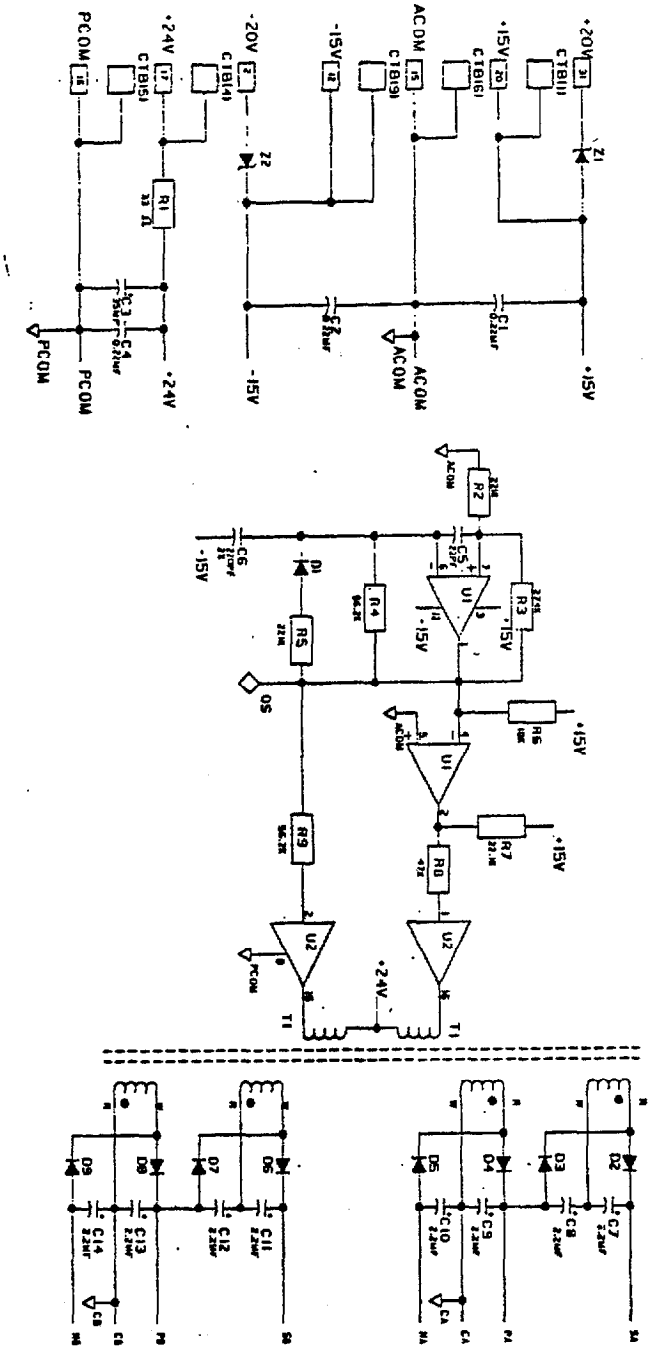

Figure 3. VOLTAGE TO CURRENT TRANSDUCER CARD ELEMENTARY DIAGRAM (Part 1 of 3)

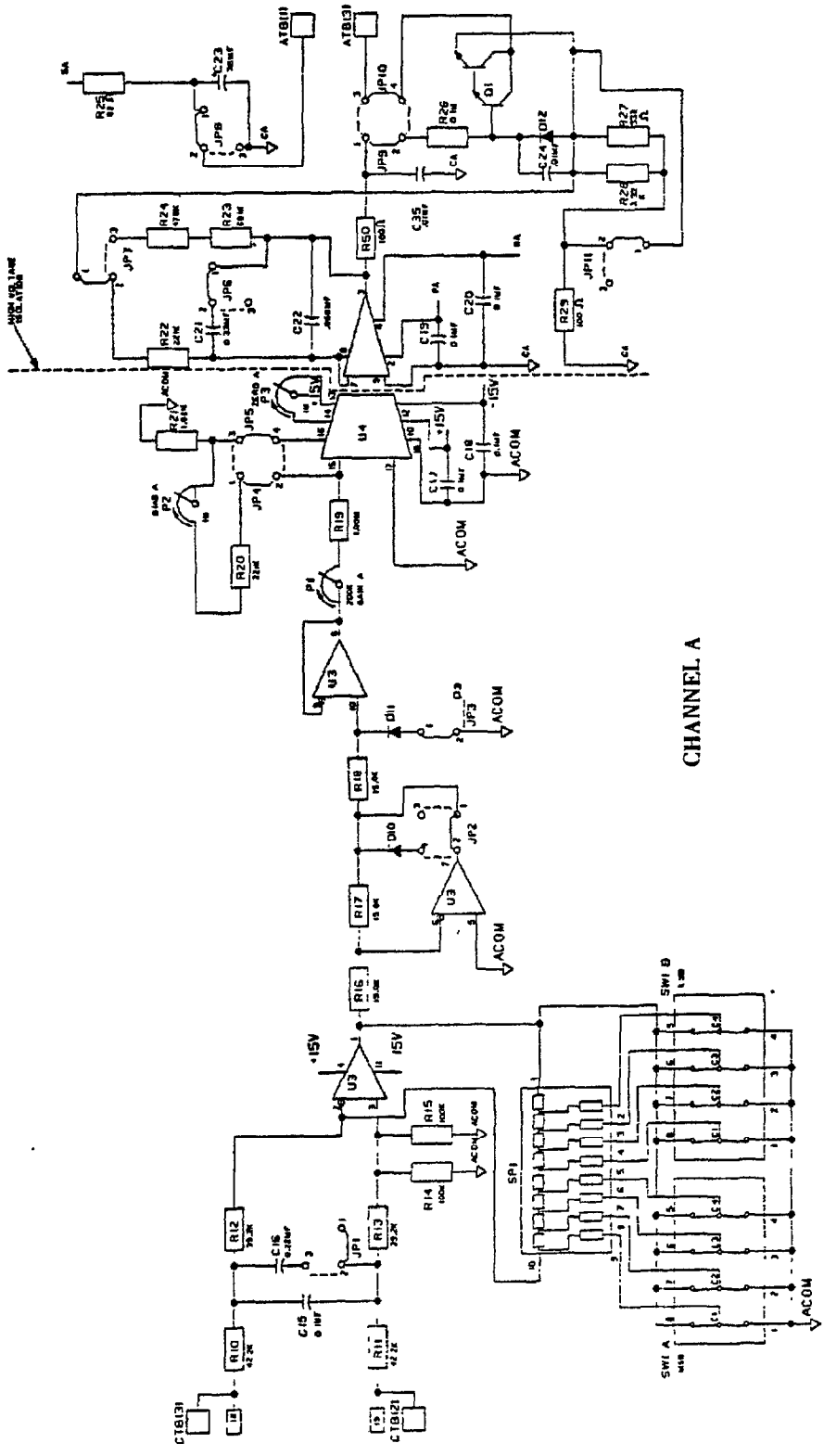

Figure 3. VOLTAGE TO CURRENT TRANSDUCER CARD ELEMENTARY DIAGRAM (Part 2 of 3)

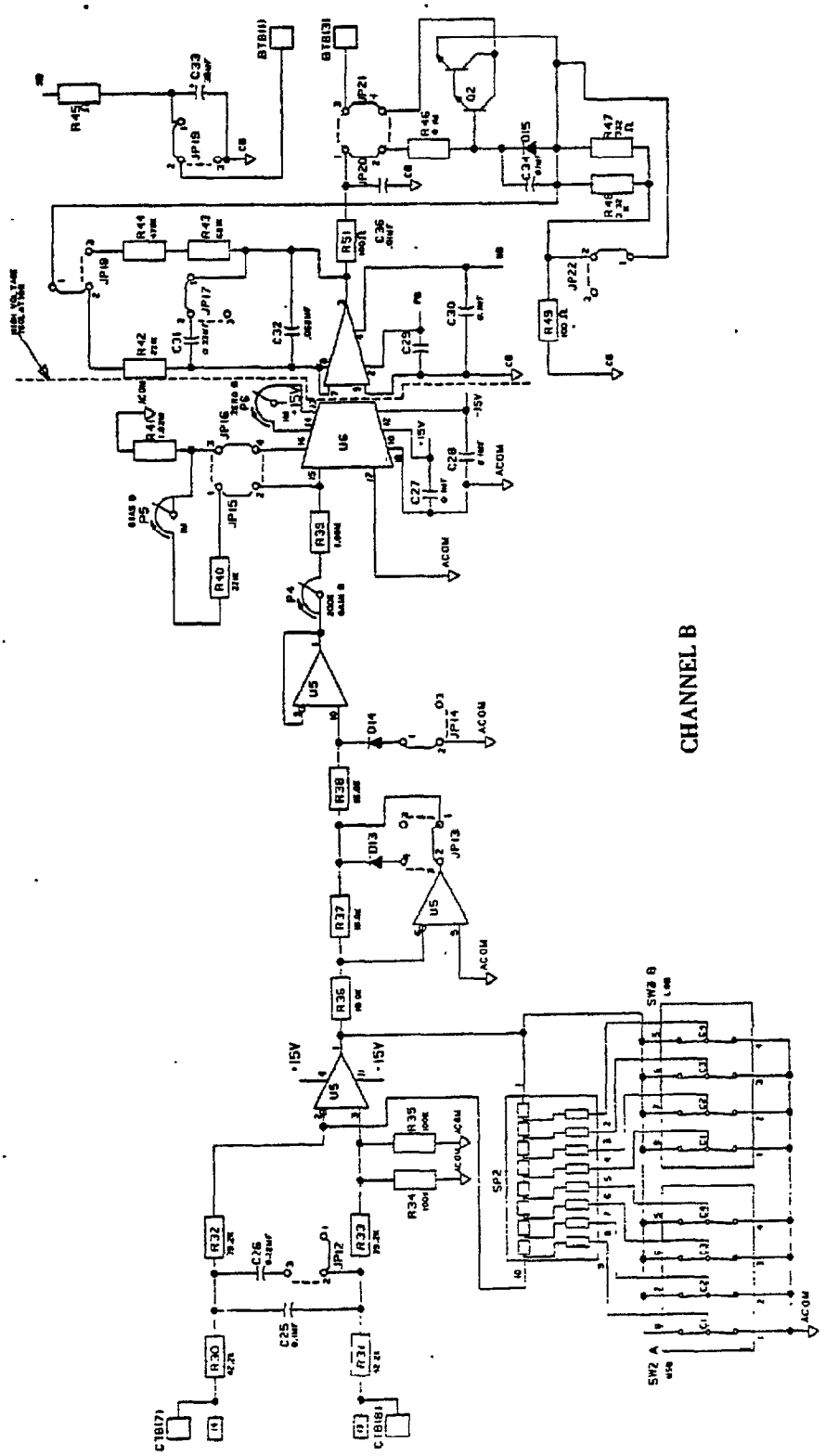

Figure 3. VOLTAGE TO CURRENT TRANSDUCER CARD ELEMENTARY DIAGRAM (Part 3 of 3)

NOTES:

GE Drive Systems

GEK-24967 (3/87)

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