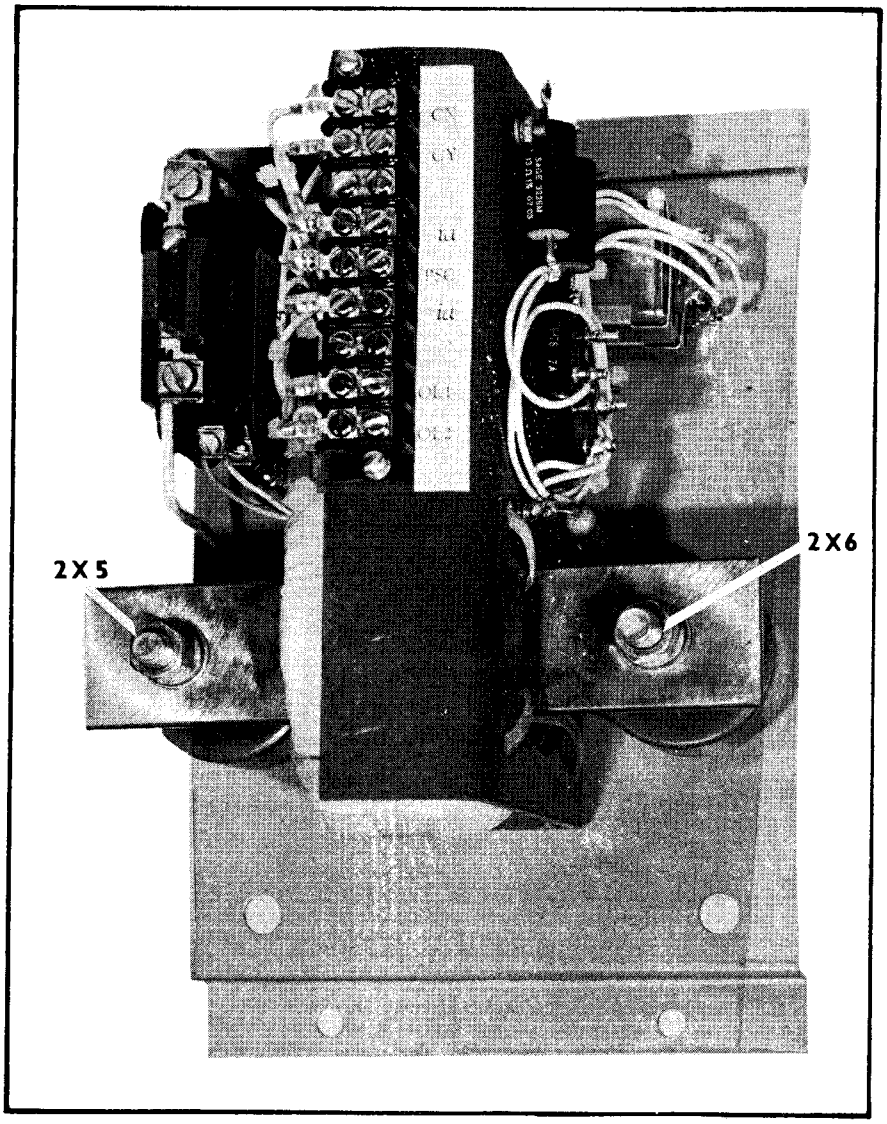
SIZE 7-9 TRANSDUCTOR
For Use in S-56

I. INTRODUCTION

The size 7-9 transductor, drawing 491A789, provides isolated positive and negative voltages proportional to a monitored dc current, and thermal overload protection for the motor.

It is designed for panel mounting and must be installed in the position shown in Figure 1. A separately-mounted transformer must be provided to supply isolated 115 VAC for excitation voltage. All low-power electrical connections are made to 1TB (excitation voltage CX-CY, thermal overload contacts OL1-OL2, and dc output voltages $V_{(-ia)}$; $V_{(+ia)}$ to psc). High-power connections are made to studs 2X5 and 2X6 on the transductor assembly.



SIZE 7-9 TRANSDUCTOR
FIGURE 1

A typical transfer curve relating output voltage and primary ampere turns (A.T.) excitation is given in Figure 2. Also shown is the relationship between (A.T.) and current flow in the overload relay heater.

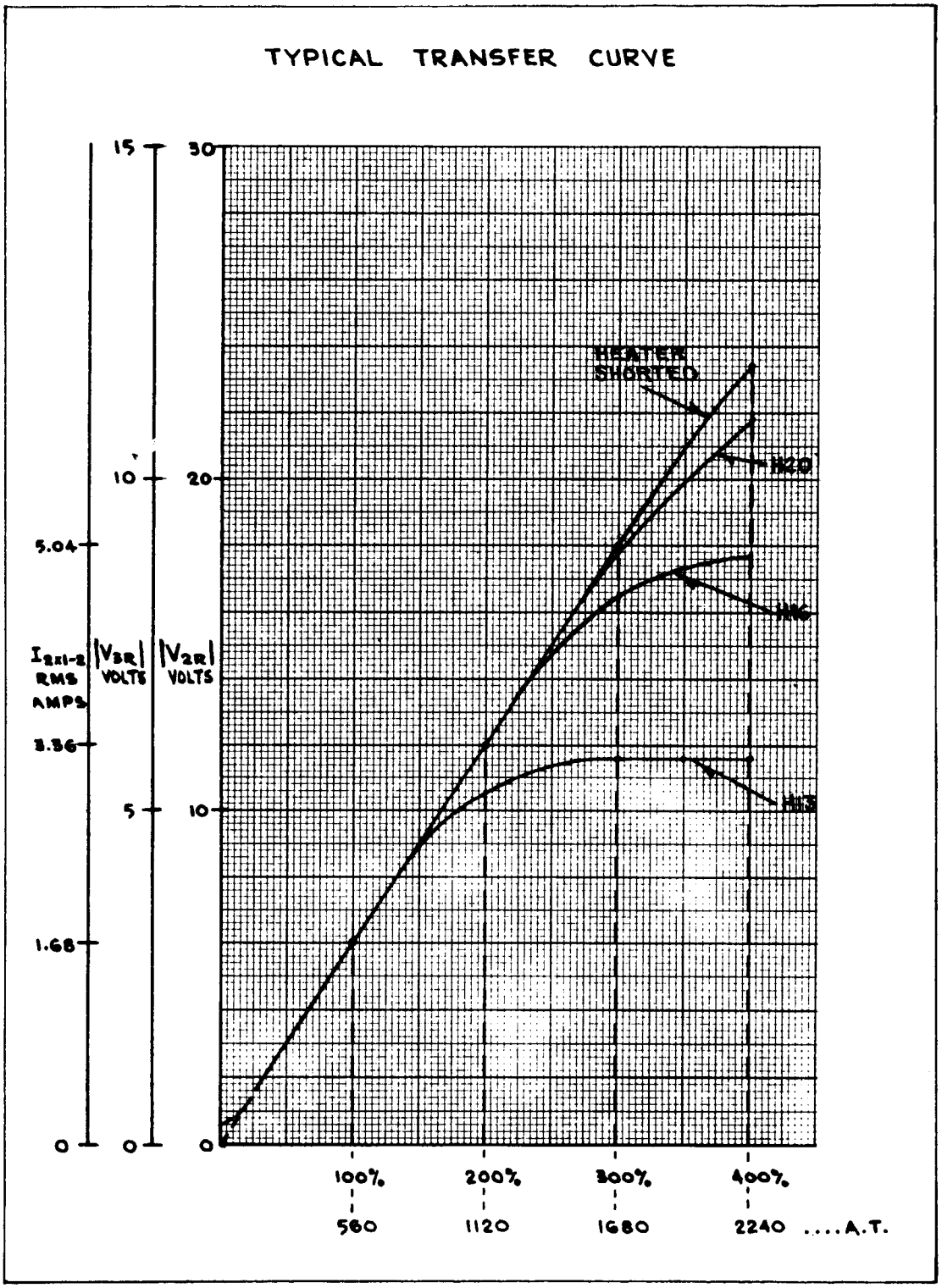


FIGURE 2

The transductor was designed specifically to provide feedback signals for current limit, gate pulse suppression, and IR compensation in S-56 systems. Standard groups available are tabulated in Figure 3. Three groups dictated by primary turns allow steady-state currents from 140 to 560 amperes to be monitored.

Drawing 491A789	100% to 200% Current Range in Amps	NP Primary Turns	Application Notes
G01	140-280	4	
G02	280-560	2	Not to be used where steady-state currents exceed 360 A
G03	560-1120	1	Not to be used where steady-state currents exceed 590 A

FIGURE 3

II. DESCRIPTION OF OPERATION

Transductor operation will be explained with reference to the schematic diagram, Figure 4.

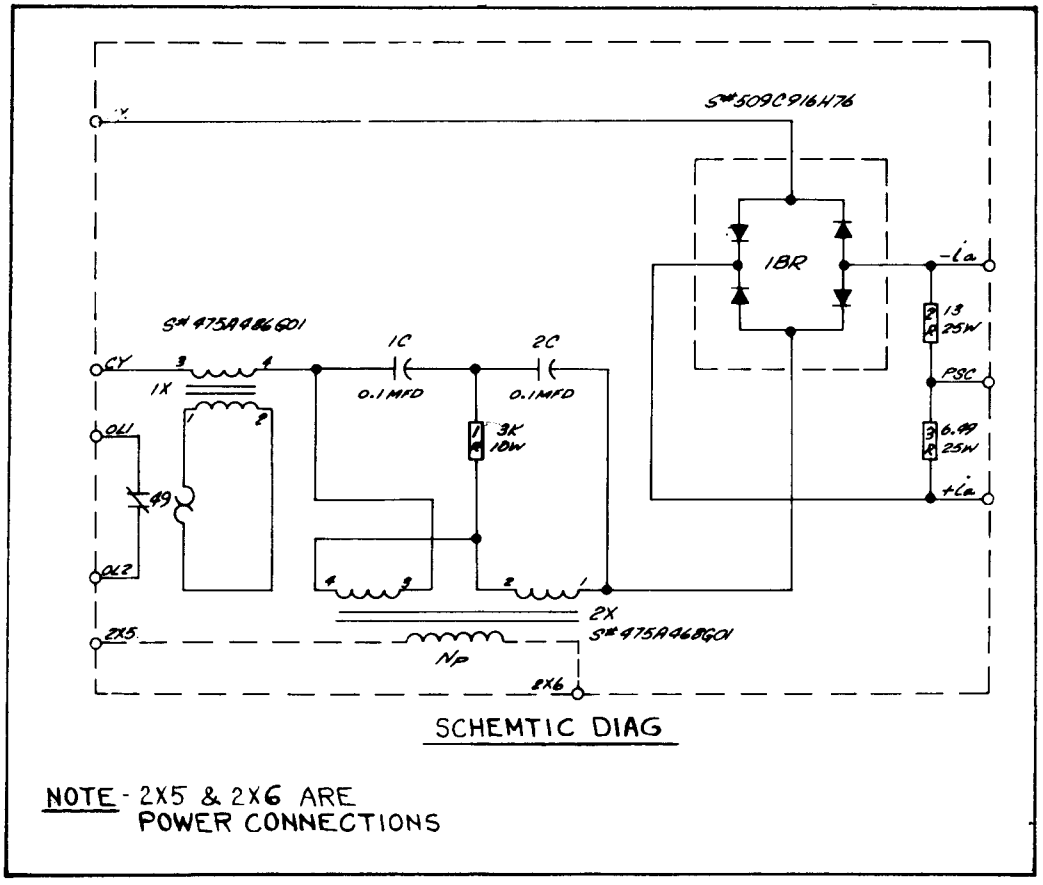


FIGURE 4

A separately-mounted transformer provides isolated 115 vac excitation voltage at CX-CY. With no primary current in transformer 2X, excitation voltage divides equally across the two secondaries and only a small magnitization current flows. This current varies, dependent primarily on core characteristics; and at zero A.T. excitation, develops an offset voltage across 2R of $\leq$0.5 volts.

Secondaries $2X_{1-2}$ and $2X_{3-4}$ are wound on separate cores, which are stacked and taped together before the common primary $2X_{5-6}$ is added. DC current in the primary induces a voltage in each secondary which, added to the ac excitation voltage, causes the cores to saturate on alternate half cycles. The unsaturated core and its windings act as a current transformer; hence, primary and secondary currents are related by the equation below:

(amps X turns) primary = (amps X turns) secondary.

Current in the secondary of 2X is rectified by 1BR and impressed across load resistors 2R and 3R. In the linear range of operation, the output voltage as a function of primary current and turns is:

$$V_{(-i_a)} = -\frac{(\text{A.T. primary})}{1200} \text{ X 13 volts}$$

$$V_{(+i_a)} = -\frac{1}{2} V_{(-i_a)}.$$

The linear operating range is primarily determined by the resistance of the heater element in the thermal overload. This resistance is reflected to winding $1X_{3-4}$ by the turns ratio squared . . . . $R_{3-4} = R_{heater}$ X $(3.6)^2$ . . . . . and as shown by the transfer curves in Figure 2, can absorb a large part of the available excitation voltage. Current in $1X_{1-2}$ is directly related to the primary current of 2X, hence, to motor armature current by the following equation:

$$\text{Amps (heater)} = (\text{A.T. primary}) \text{ X } \frac{3.6}{1200}.$$

Capacitors 1C, 2C and resistor 1R limit voltage transients appearing at the secondary of 2X to less than 400 volts peak.

Following is a list of electrical specifications for the size 7-9 transductor:

(1) Input power: CX-CY
115V ±10%
50/60 Hz
150 volt amps

(2) Allowable operating ambient temperature range: 0 to 55°C

(3) Output at 250% (1400 A.T.): $-i_a$ to PSC --- 15 volts
25 ma
$+i_a$ to PSC --- 7.5 volts
25 ma

III. SERVICE

The following tests should prove useful in checking operation of transductors suspected of malfunctioning.

A. Voltage Checks

With only excitation voltage applied (115 vac to CX-CY), measure the following ac voltages:

(1) $1X_{3-4}$ --- less than or equal 1 volt
(2) $2X_{1-2}$ --- 57 volts
(3) $2X_{3-4}$ --- 57 volts.

Deviations from the listed voltages of greater than 10% is a good indication of failure of magnetic components. A large voltage measured at $1X_{3-4}$ can also indicate the thermal overload has tripped. Allow sufficient time for the bimetal contacts to cool and reset by pushing the reset button (see Figure 1).

B. Continuity Checks

Open diodes in 1BR, faulty burden resistors, open transformer windings, etc. may be easily found by continuity checks.

C. Transfer Curves

If possible, obtain a transfer curve and check it against Figure 2---points should check within 10%. Methods for obtaining this curve can, in general, be devised but are dependent on the drive system involved.

Where proper measurements cannot be made due to unavailable equipment or restrictive systems, return the equipment to Westinghouse Electric Corporation, Industrial Systems Division, P.O. Box 225, Buffalo, New York 14240.

Where systems considerations warrant it, a spare transductor should be available for immediate replacement.