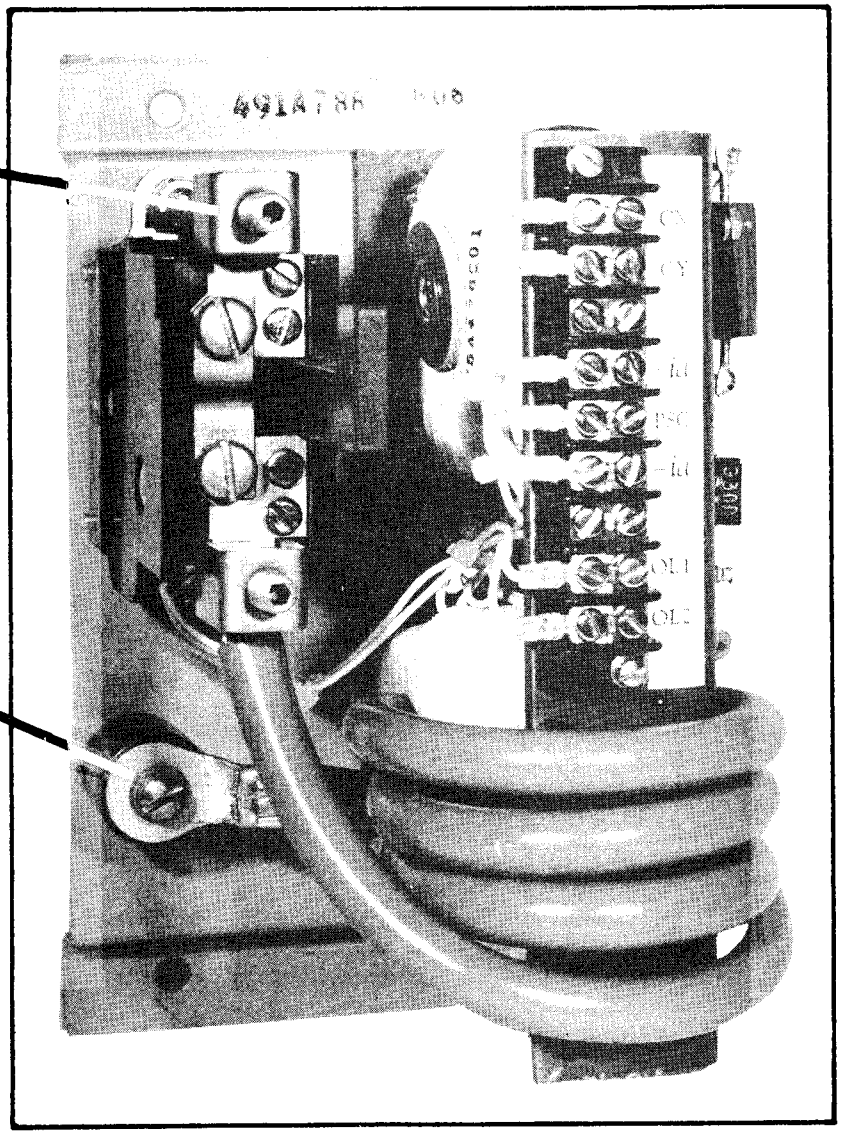
SIZE 4-5 TRANSDUCTOR
For Use in S-56

I. INTRODUCTION

The size 4-5 transductor, drawing 491A788, 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. All low-power electrical connections are made to 1TB (excitation voltage CX-CY, thermal overload contacts OL1-OL2, and dc output voltage $V_{(-ia)}$; $V_{(+ia)}$ to PSC). High-power connections are made to one side of the thermal overload and a stud (2X5 and 2X6 on Figure 1).



SIZE 4 & 5 TRANSDUCTOR
FIGURE 1

A typical transfer curve relating output voltage and primary ampere turns (A.T.) excitation is given in Figure 2. Where a linear correspondence is required, A.T. excitation must not exceed 250%.

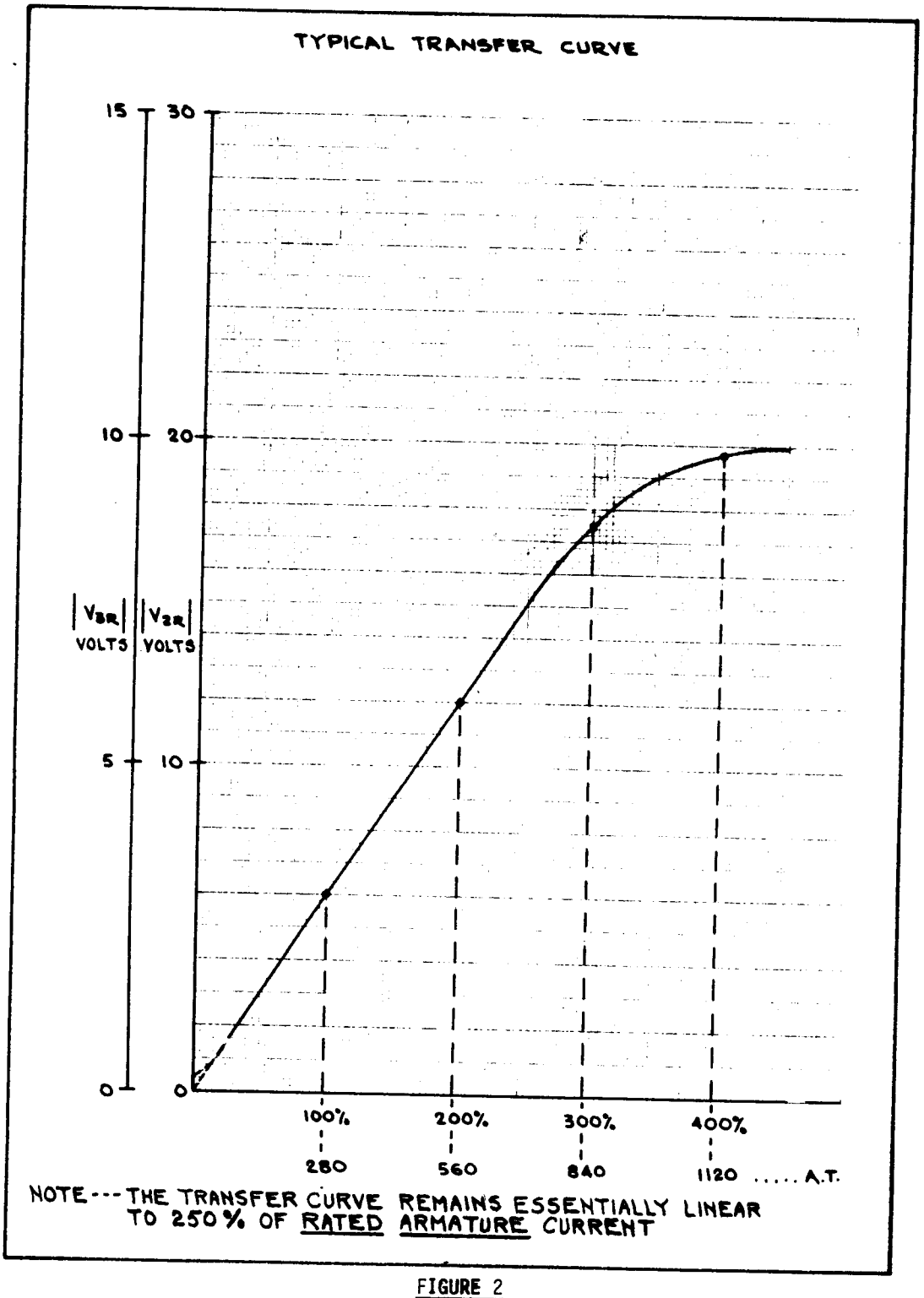


FIGURE 2

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. Four primary groups dictated by primary turns allow steady-state currents from 4.4 to 160 amperes to be monitored, while further sub grouping allows the smallest O.L. relay amenable to full-load motor amps to be selected.

This Drawing Group	Current Limit Range in Amps	Heater Range in Amps	OL Relay Type	NP Primary Turns
01 02	17.5-35	8.8-27 27-35	AN11P AN21P	16
03 04 05	35-70	17.5-27 27-35 35-70	AN11P AN21P AN31P	8
06 07	70-140	35-95 95-140	AN31P AN41P	4
08* 09* 10*	140-280	70-95 95-140 140-160	AN31P AN41P MW41	2
11	8.8-17.5	4.4-17.5	AN11P	32
*NOTE: Gr. 08-09-10 not to be used where steady-state currents exceed 200 Amps				

FIGURE 3

II. DESCRIPTION

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

Transformer 1X provides isolation and steps down the 115 vac input to 57 volts, required ac excitation level. With no primary current in transformer 2X, excitation voltage divides equally across the two secondaries and only a small magnetization current flows. This current varies, dependent primarily on the core, 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 winding 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:

$$V_{(-i_a)} = - \frac{\text{(A.T.) primary X 26}}{1200} \text{ Volts}$$

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

Assuming no losses and an excitation voltage of 57 vac, the sum of output voltages would be limited to 51 vdc. Ohmic losses in 1X and 2X and bridge diode losses reduces the available saturation voltage to approximately 35 vdc.

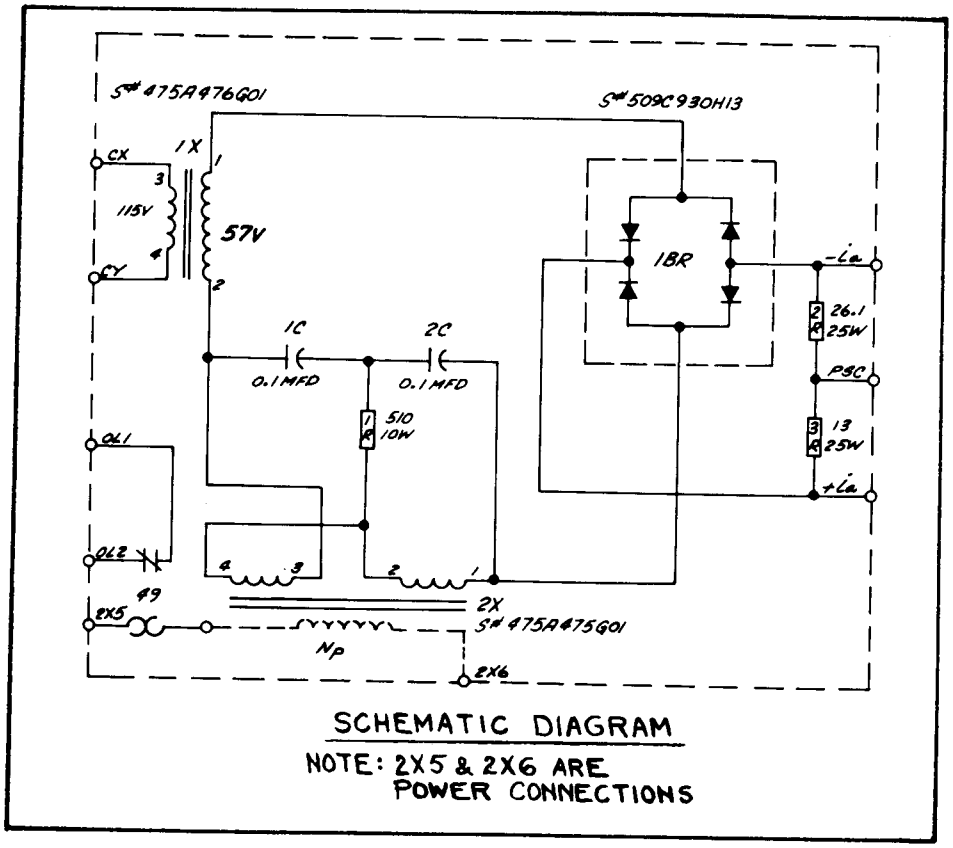


FIGURE 4

Capacitors 1C, 2C and resistor 1R limit the magnitude of voltage transients at the secondary of 2X to less than 200 volts peak.

Following is a list of electrical specifications for the size 4-5 transductor.

(1) Input power: CX-CY

115V ±10%
50/60 hertz
50 volt amps

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

(3) Output at 250% (700 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) $1X_{1-2}$ --- 57V
(2) $2X_{1-2}$ --- 28V
(3) $2X_{3-4}$ --- 28V.

Deviations from the listed voltages of greater than 10% is a good indication of failure of magnetic components.

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.