F80 FIELD EXCITER SUBSYSTEM - FIELD CURRENT CONTROL

I. INTRODUCTION

The F80 Field Exciter Subsystem includes a TPM assembly and three associated plug in cards. The TPM assembly operates from single phase AC and provides full wave, phase controlled, rectified DC for control of field current. The TPM assembly can be either a single or a dual converter. The plug in cards provide coordination for the selection of the proper thyristors, generate a picket fence pulse train for the thyristor gates at a controlled gating angle (α) and provide an inner field current loop into which any desired outer loops must operate. An optional feature on the cards is a field loss or an overexcitation function.

Figures 1 and 2 are pictures of the single converter and dual converter TPM assemblies. For a more detailed explanation of the associated cards referenced in this leaflet refer to I.L. 16-800-265 (GS&D), I.L. 16-800-266A (GC) and I.L. 16-800-281 (BS 1).

II. RATINGS AND SPECIFICATIONS

A. AC Input:

Transformer secondary voltages should be 230VAC or 460VAC, 60 Hz or 50 Hz, single phase. Tolerance +10%, -5%.

B. Line Frequency: 60 ±2 Hz and 50 ±2 Hz.

C. DC Output:

Maximum output voltages are 180VDC for 230VAC input and 360VDC for 460VAC input.
Maximum current ranges are:

10A - 20A 20A - 40A 40A - 60A	For Single Converter
10A - 20A 20A - 40A 40A - 80A	For Dual Converter

D. Ambient Temperature range: $0^{o}C$ to $40^{o}C$.

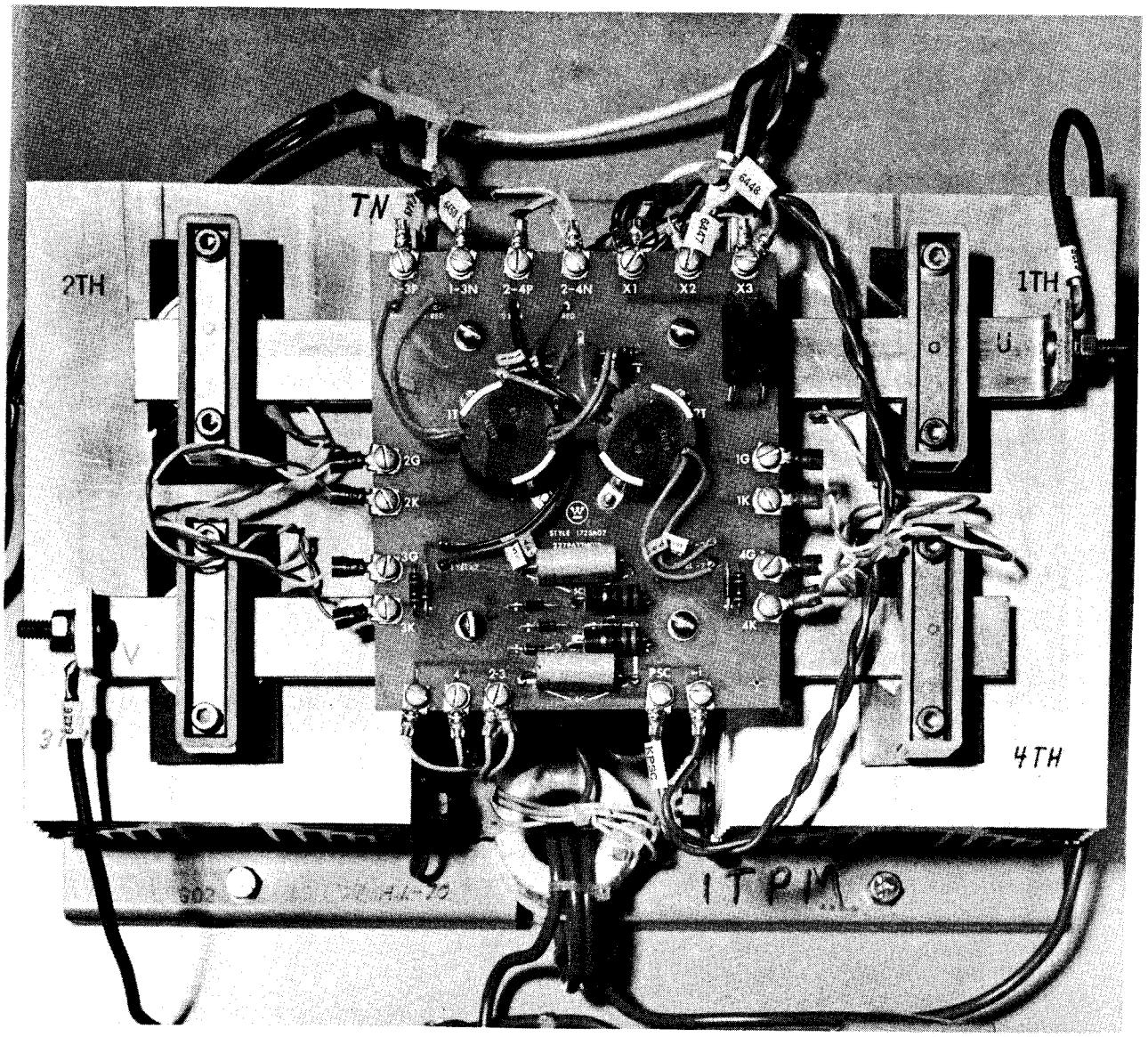
E. Elevation limit: 3300 feet above sea level (without derating).

F. DC Power Requirements for plug in pc cards.

PSP	+24V	DC	±0.1V	@	100ma	@ 50ma	Single Conv.
PSN	-24V	DC	±0.1V	@	90ma	@ 40 ma	Single Conv.
LP15	+15V	DC	±1.5V	@	105 ma	@ 50ma	Single Conv.
RP1	+24V	DC	± 2V	@	200ma AVE		Dual Conv.

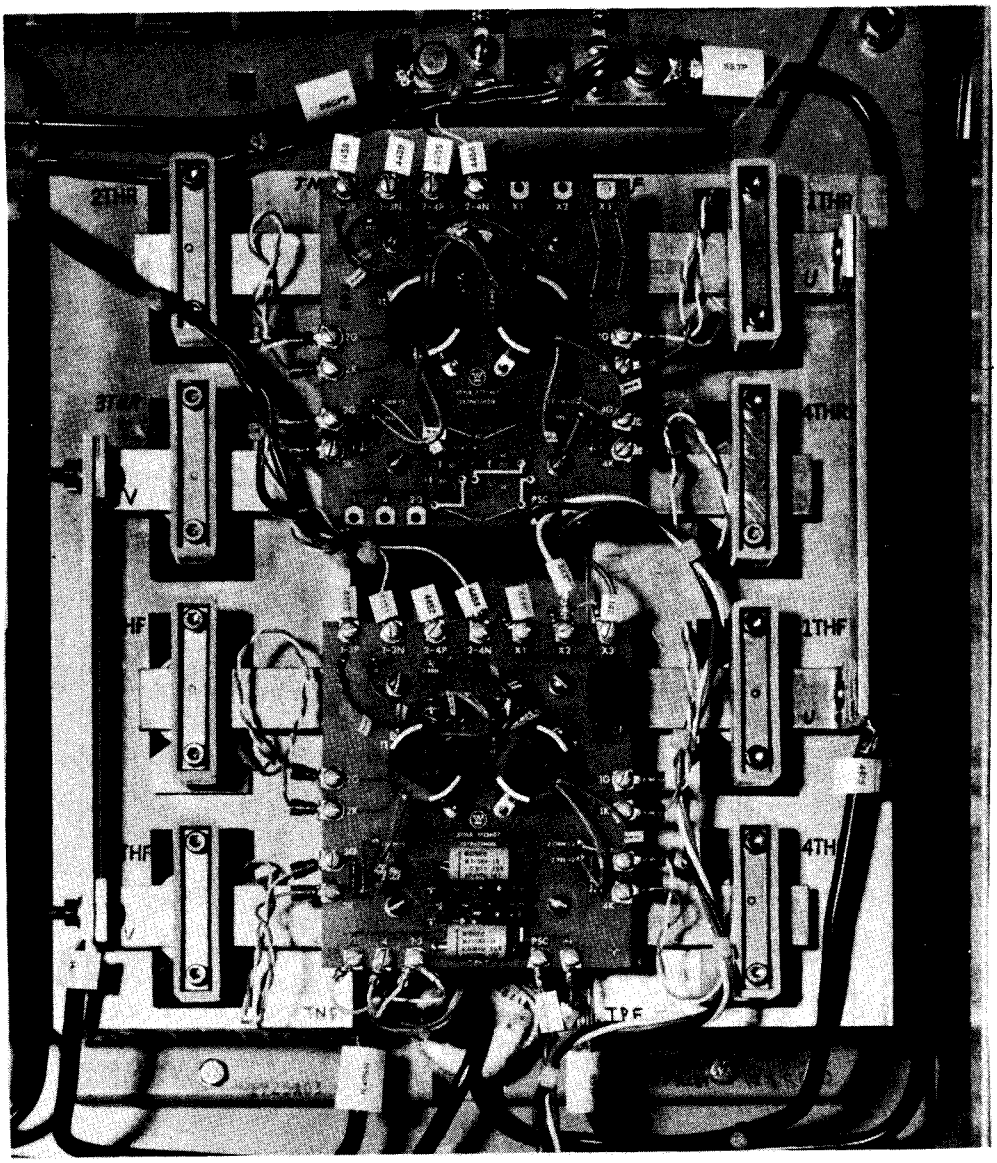
Peak current drawn by pulsing stage will be 0.5A during pulse.

RP +24V DC ± 2V @ 40ma for field loss/overexcitation relay.



SINGLE CONVERTER TPM ASSEMBLY

FIGURE 1



DUAL CONVERTER TPM ASSEMBLY

FIGURE 2

III. TPM CONSIDERATIONS

Mounting of the TPM assemblies is restricted to the positions shown in Figures 1 and 2.

All components are front removable for easy access. When replacing thyristors, procedures outlined in I.L. 16-800-280 must be followed to insure proper heat transfer from device junctions.

TPM's requiring substantial electrical or mechanical repair should be returned to:

Westinghouse Electric Corporation
Industrial Equipment Division
P. O. Box 225
Buffalo, New York 14240

IV. POWER TRANSFORMERS

The power transformers for the F80 TPM's provide an interface between the primary AC line voltage and the secondary AC voltages required by the TPM. In addition, these transformers introduce an impedance for fault protection of the TPM. For a list of designed transformers refer to Thyristor Power Transformers, F80 Single Phase Field Exciters in the Reference Data Book.

V. TPM SCHEMATICS

Figures 3 and 4 are the schematics for the single and dual converter TPM assemblies. As can be seen on the schematics, there are two groups for each converter assembly. These two groups are for the different input voltages: G01 for 230VAC input and G02 for 460VAC input. Current range selection is performed by wiring an appropriate number of turns through the current sensor transformer when the TPM assembly is wired in a cabinet.

VI. CURRENT SENSING

Current sensing is performed with an AC current sensor 1CT. The sensor transformer has two 800 turn secondary windings around two separate cores. In each half cycle of operation, one of the sensor transformers generates an output signal while the other transformer is resetting. When a field current range is selected, the number of turns of the primary winding for the current sensing transformer is also selected. When the TPM assembly is wired in a cabinet, the U lead from the power transformer must be passed through the current sensor core the required number of times before it is bolted to the TPM bus work.

The variation in turns associated with the current transformer maintains a consistent level of feedback signal to the regulator cage. The current feedback signal will have a maximum level between 4V and 8V and is always negative in polarity. The maximum output voltages corresponding to the current levels are:

I_{max}	$-i_f$	# Turns
40A - 80A	4.1V - 8.2V	1
20A - 40A	4.1V - 8.2V	2
10A - 20A	4.1V - 8.2V	4

The above ratings and feedback signals are for both single and dual converter assemblies. The single converter 40A - 60A rating will yield a 4.1V to 6.15V signal level of current feedback. In order to insure that the maximum field current is not exceeded it is necessary to provide an attenuator pot on the controller output that feeds the reference signal to the appropriate F80 card. This attenuator pot should be adjusted to an appropriate point to limit field current to the desired maximum point when the controller output is in limit. The level of feedback signal can be determined from

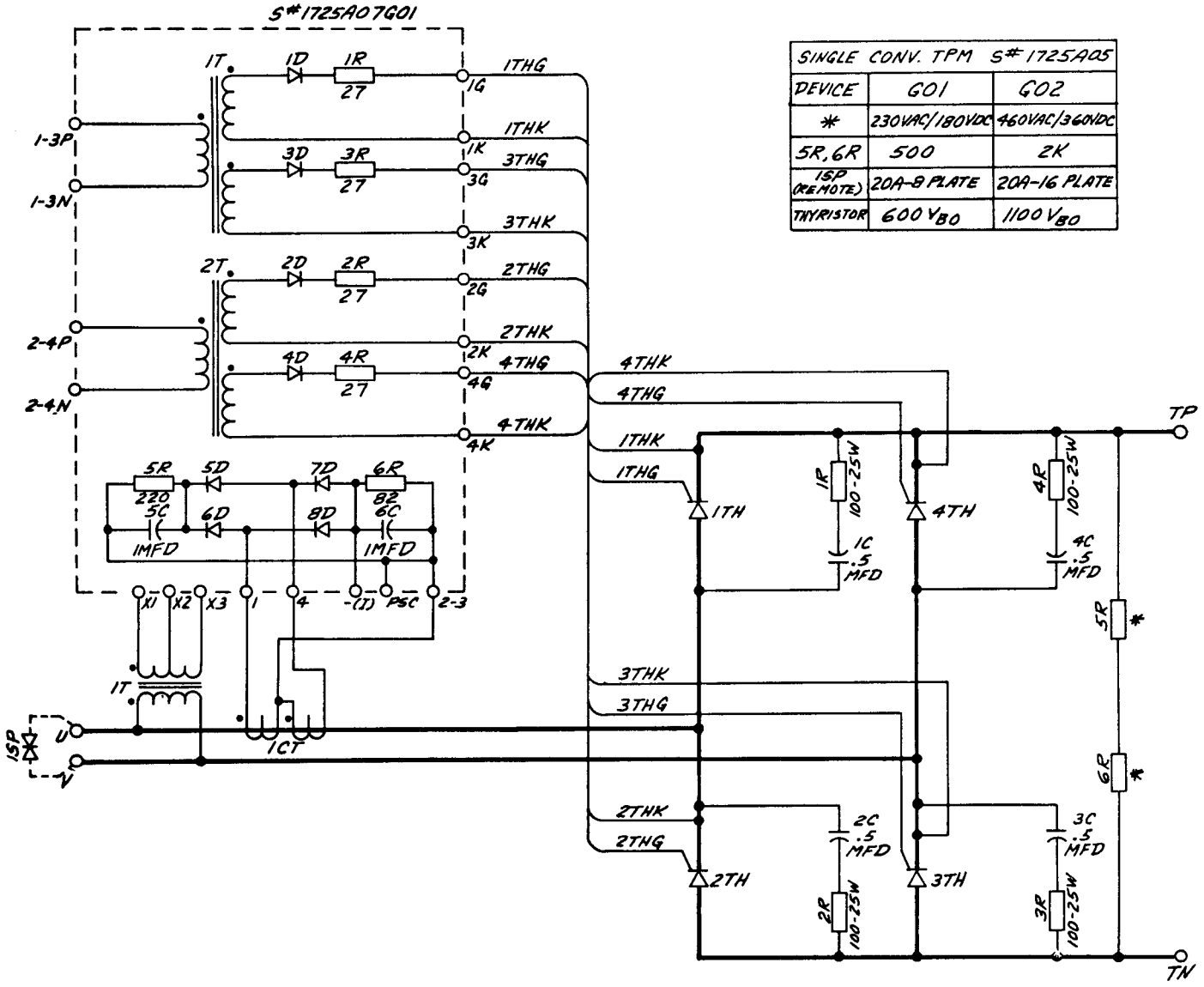
$$-|i_f| = I \times \frac{N}{800} \times 82 \text{ Volts}$$

where I is the primary current and N is the number of primary turns.

CAUTION: The TPM should not be excited with primary loops through the C.T.'s and the C.T. secondaries disconnected from the burden resistors on the pulse transformer pc board ...Terminals 1, 2, 3, and 4 of S#1725A07G01.

VII. SYSTEM DIAGRAMS

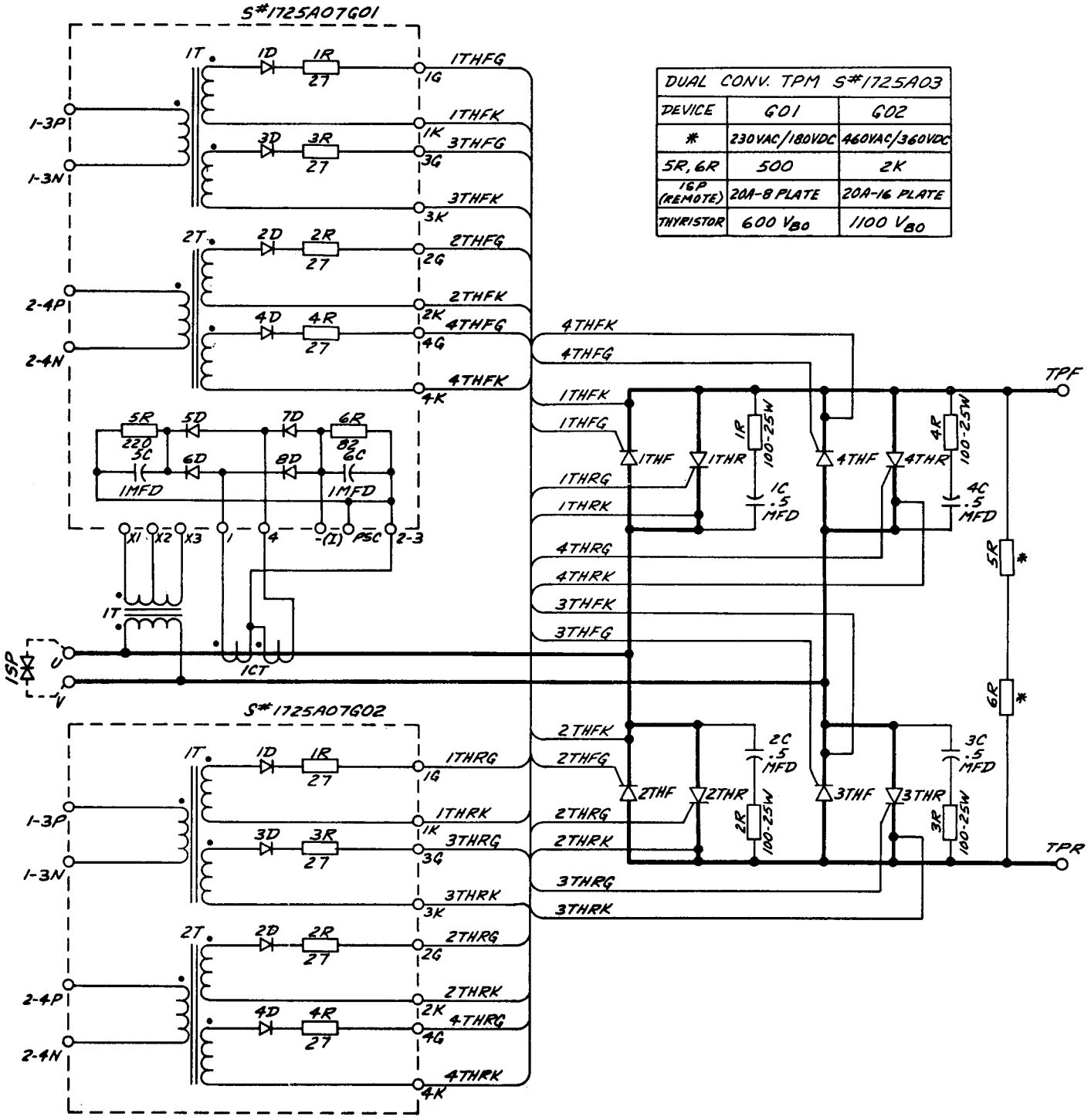
Figures 5 and 6 are system block diagrams for the Field Current loop. Gain in the Field Current loop is adjustable by a pot (1P) and a gain jumper on the Gate Controller card. The gain of the loop should be adjusted to obtain a crossover of approximately 15 rad/sec. Figure 7 is a typical transfer curve of the gating system.



SINGLE CONV. TPM S#1725A05		
DEVICE	G01	G02
*	230VAC/180VDC	460VAC/360VDC
5R, 6R	500	2K
ISP (REMOTE)	20A-8 PLATE	20A-16 PLATE
THYRISTOR	600 V_{BO}	1100 V_{BO}

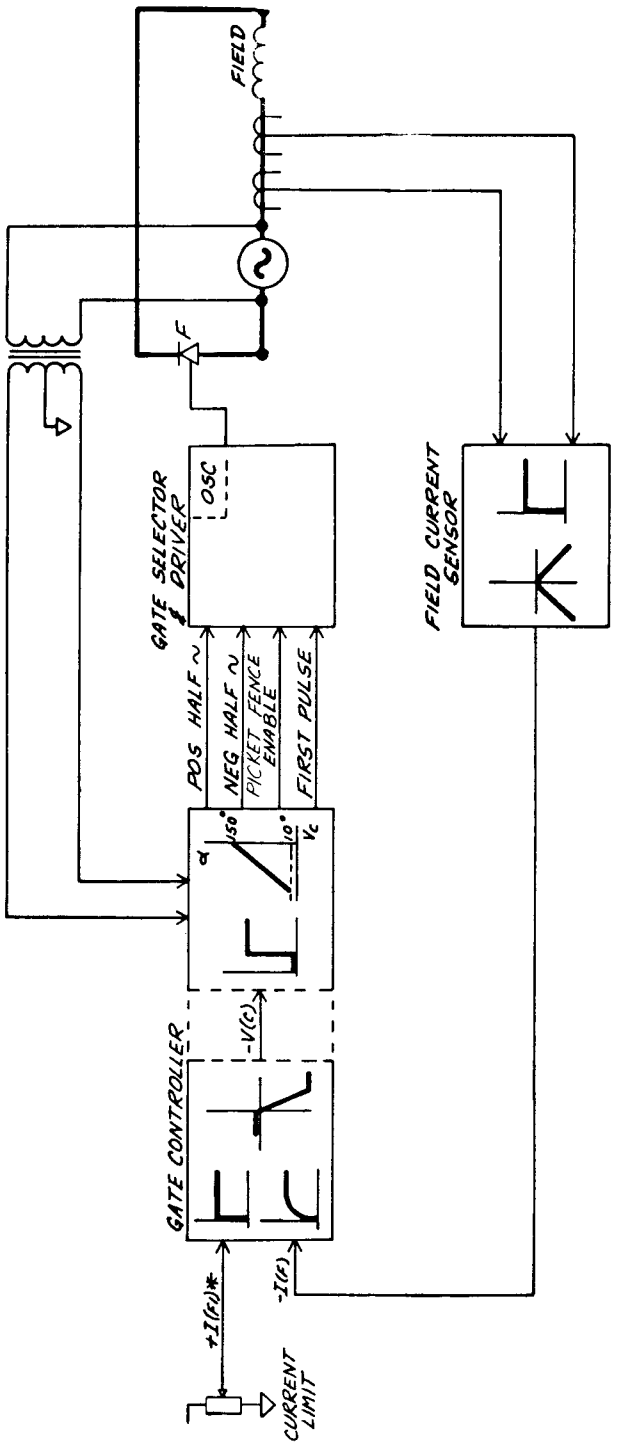
SINGLE CONVERTER SCHEMATIC

FIGURE 3



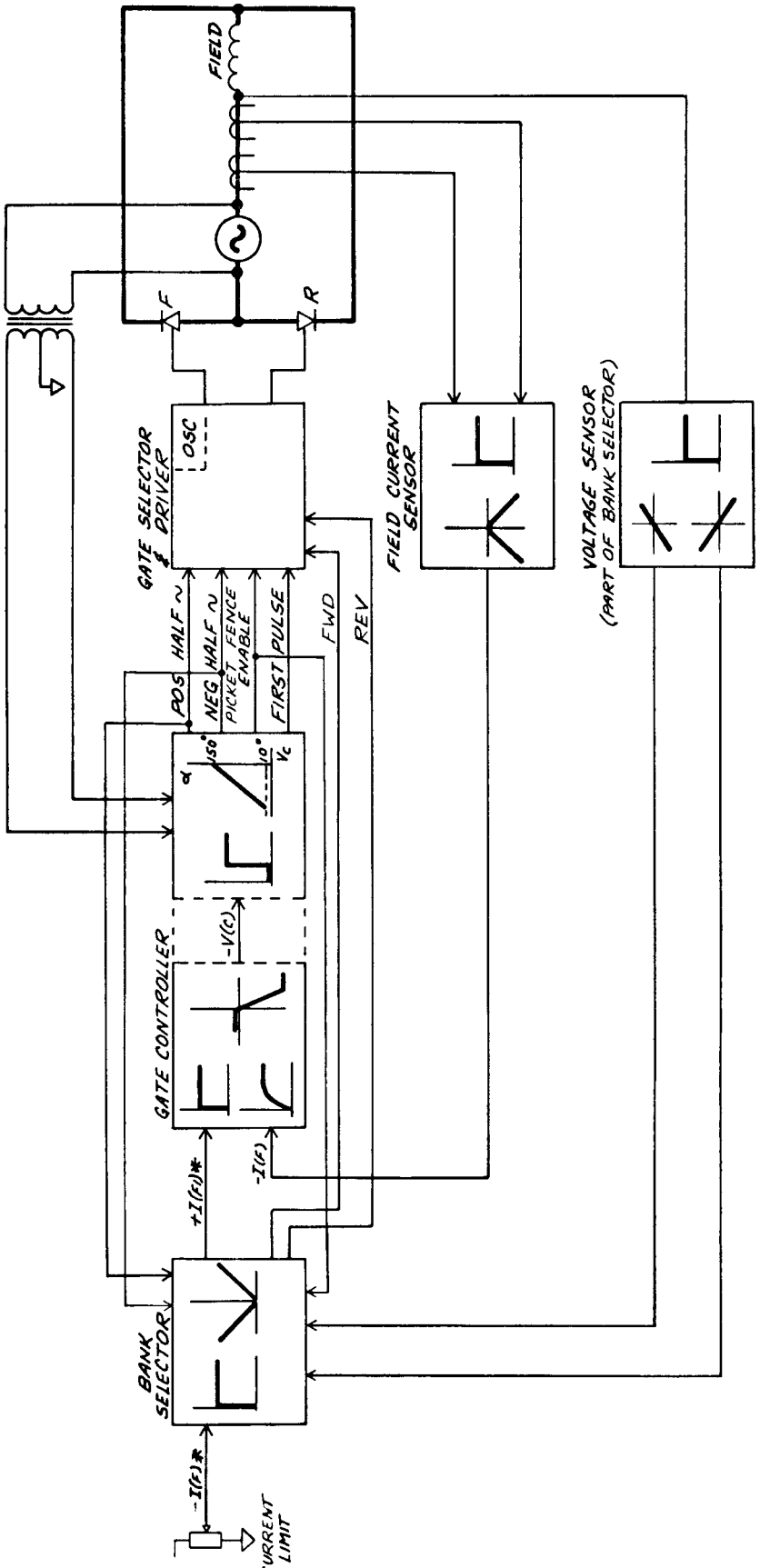
DUAL CONVERTER SCHEMATIC

FIGURE 4



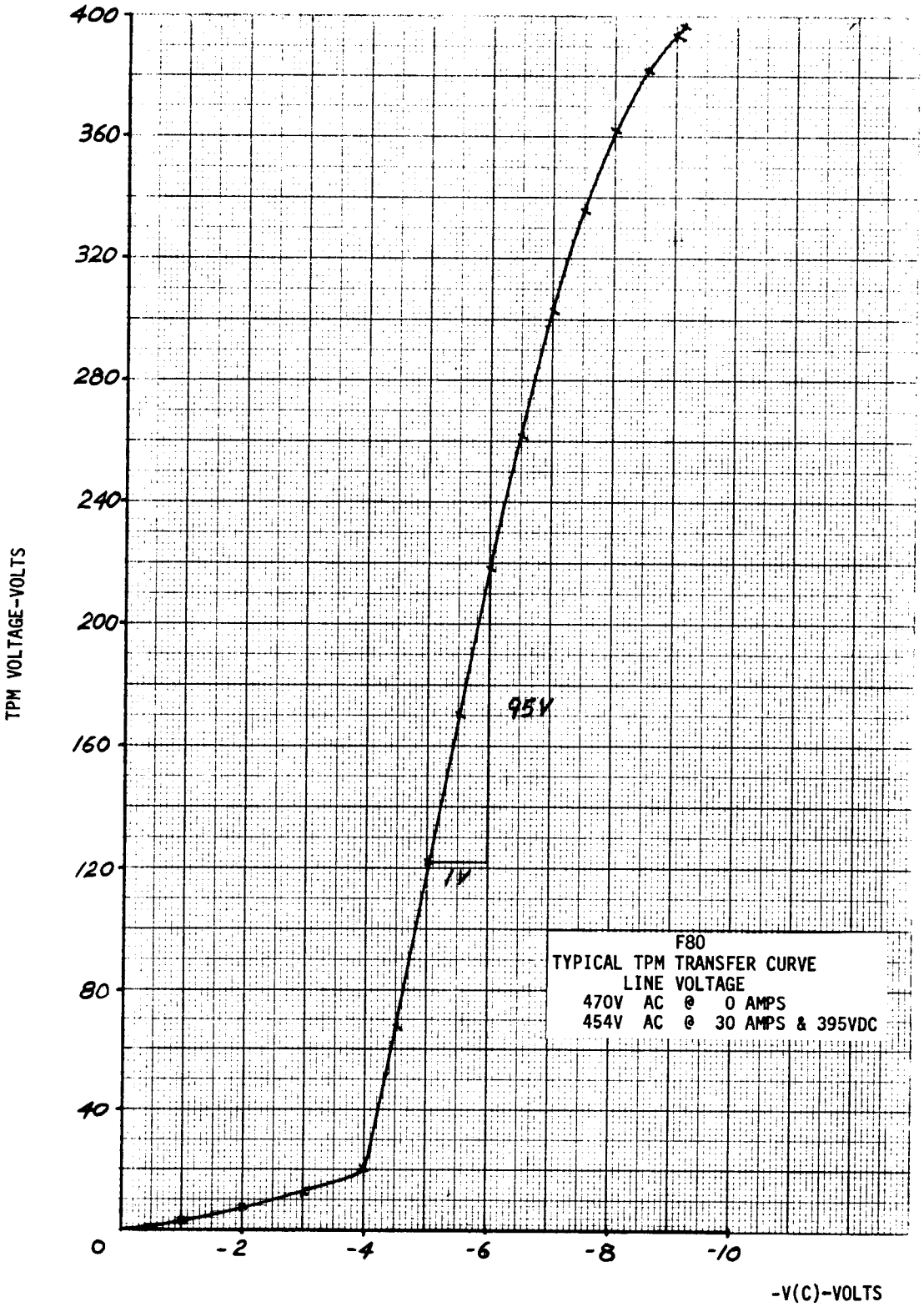
SINGLE CONVERTER BLOCK DIAGRAM

FIGURE 5



DUAL CONVERTER BLOCK DIAGRAM

FIGURE 6



GATING SYSTEM TRANSFER CURVE-TYPICAL

FIGURE 7