INSTRUCTIONS

MOTOR FIELD REMOTE SUPPLY

36C774345BAG01

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to General Electric Company.

GENERAL ELECTRIC

WARNING

ELECTRIC SHOCK CAN CAUSE PERSONAL INJURY OR LOSS OF LIFE. CIRCUIT BREAKERS, IF SUPPLIED AS PART OF THE TOTAL SYSTEM, MAY NOT DISCONNECT ALL POWER TO THE EQUIPMENT. SEE SYSTEM ELEMENTARY DIAGRAMS. WHETHER THE AC VOLTAGE SUPPLY IS GROUNDED OR NOT, HIGH VOLTAGE TO GROUND WILL BE PRESENT AT MANY POINTS.

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

NOTE: If non-standard field (150 and 300V DC are standard) or AC line voltages are used and voltage correction transformers are required, verify that the phase sequence is the same as the line feeding the conversion bridge and that there is no phase shift between the conversion bridge and Motor Field Remote Supply AC inputs.

INTRODUCTION

The Motor Field Remote Supply is an SCR controlled power supply intended for use as an adjustable voltage exciter for highly inductive loads. It is used primarily as a motor field supply for use with drive systems. It is structured to be used in a number of operating modes which may be selected by jumper connections and proper selection of control input/output (I/O) points (see Table 1).

GENERAL DESCRIPTION

The power unit uses "two-thirds wave" rectification with a single thyristor (SCR) operating in a phase control mode. The nominal output voltage may be up to:

150V DC from a 230V AC three-phase source, or
300V DC from a 460V AC three-phase source.

The two-thirds wave rectification utilizes three diodes (one acts as a "free wheeling" diode in parallel with the field, see Figure 2). The three diodes and the SCR are contained in a single isolated base power module.

ASSEMBLY DESCRIPTION (Figure 1)

Figure 1 shows a typical installation of two Motor Field Remote Supplies. The unit on the left is in the closed position showing the MFC Suppression card (MSD) and heatsink assembly. The unit on the right is in the open position, showing the Motor Field Remote (MFR) card. The heatsink assembly consists of a fuse block, di/dt choke and power module. The MSD card contains RC snubbers, MOVs and a current transformer. The MFR card contains signal conditioning circuitry, regulators, fault detectors, phase control circuitry, etc.

OPERATION (Figures 2 thru 6)

The operation of the MFR may be best understood by refering to Figures 2 thru 6. The Power Circuit diagram (Figure 2) shows the field control power components. Field power is supplied through fuses CFU1-3 on the heatsink assembly. MOVs protect from line spikes and transients.

The AC power to the motor field control is "two-thirds" wave rectified via the field power module. The SCR in the field power module controls field current. Power flows as follows: when AC line L1 is high with respect to L2 and L3 and the SCR is fired, current passes through the diode between DX and DW to the F1 output lead to the field. The circuit is completed through the SCR and returns through the choke to AC line L3. When L2 becomes high, current flows through the diode between DY and DW to F1 and back through the SCR, choke and to L3. When L3 becomes high, the SCR is reversed biased and the energy stored in the field winding circulates current through the diode between DZ and DW (acting as a free wheeling diode) until L1 becomes high again and the SCR is fired.

Current is sensed by T1, mounted on the MSD card and fed back to the MFR card through FCPL. Figure 3 shows the outline of the MSD card and proper wiring for the T1 transformer.

The Block Diagram (Figure 4) shows "blocks" or circuit functions that the MFR is capable of performing. Figure 5 is the MFR card elementary diagram and Figure 6 shows the position of jumpers, pots, test points, connections and LEDs on the card.

There are seven operating modes, as indicated in Table 1, and not all functions are used in any one particular operating mode. Jumpers and adjustment pots are shown with their associated function blocks.

Current is sensed by a current transformer (T1), as mentioned previously, that uses two primary coils. SCR current flows through one and free wheeling diode current flows through the other. Since the time average of SCR and free wheeling diode current is not necessarily zero as the firing angle moves through its operating range, special conditioning circuitry is required. The secondary of the CT is connected through a two-point plug, Y1 and Y2. Jumpers JP1-JP4 select burden resistors for 5 ranges of field current. The FSCAL, pot P8, is factory adjusted to trim the output gain. The output of the CURRENT FDBK function may be used to regulate the field current and may also be used to indicate the field current level. A buffer amplifier with an adjustable gain provides the FCMET output. The FCMET pot, P9, will adjust the FCMET/FC gain from 1 to 6.

In some applications it may be necessary to close the loop on field voltage rather than field current. An example would be an application with multiplicity of motors with their fields in parallel especially if the number of fields in parallel is changed during various system operating modes. The output voltage which is connected to the card at points DW and AF is resistance isolated and filtered in the VOLTAGE FDBK ISOL function.

The FDBK SELECT function (JP15) is used to select either voltage or current as the regulated quantity. The feedback is scaled by the FMAX pot, P11, and compared with the output field reference amplifier (FR AMP) in the REGULATOR function. JP12 is provided for changing the regulator gain to stabilize the field if required.

The output of the REGULATOR function is the input to the PHASE CONTROL function. The PHASE CONTROL also requires synchronizing signals which are introduced at DW and KF and resistance isolated in the SYNCH ISOL function. Jumper JP14 is used to set the retard limit for 50 or 60 Hertz operation.

The output of the PHASE CONTROL normally is directed to the FIRING PULSE ISOL function by jumper JP13. This jumper may be used to substitute external firing pulses introduced at FFC for the internal phase control. In this mode of operation, the input voltage phasing is critical and must agree with the synchronizing of the external source of the firing pulses. The firing pulses are directed to the SCR by a two-point plug FSPL (GF-KF).

In some modes of operation, it is desired to weaken the field to regulate the motor CEMF as speed is increased above base speed. To this end, signals proportional to motor terminal voltage and armature current may be introduced at VMET and CFBB. A signal proportional to CEMF is derived by subtraction of a fraction of the CFBB signal from the VMET signal. The fraction subtracted may be adjusted by the COMP pot, P4. The CEMF signal is directed to the CROSSOVER function where it is absoluted and compared against a threshold level set by the CROSS pot, P5, and integrated. The integrated output is subtracted from a fixed reference by the SREF AMP function if this mode is selected by the EXT/INT REFERENCE SELECT function, JP5. The use of crossover is optional and the fixed reference only will be introduced to the SREF AMP by not connecting signals at VMET and CFBB or by setting the crossover threshold "out of the way" with the CROSS pot, P5, fully CW.

As an alternate to the fixed reference (with or without crossover) an external reference may be introduced at FRI and directed to the SREF AMP function by jumper JP5. To do this the DIAGNOSTIC/FLD MATCH MODE SELECT function is used. Jumpers JP6-JP8 are set to make the FLD MATCH/DIAG pot P7 a field match function. Then P7 may be used to adjust the amount of reference produced by the input at FRI.

The selected reference, external or internal may be modified by two additional inputs to the SREF AMP function. They are from the FIELD ECON and FIELD WEAK functions. Pulling point FE to COM will decrease the reference to go into field economy mode. The amount of weakening is adjusted by the FIELD ECON pot, P1.

Similarly a weak field mode may be entered by pulling point FW to COM. The amount of weakening is set by the FIELD WEAK pot, P2. The logic is interlocked such that pulling both FE and FW low will select the field economy mode.

The output of the SREF AMP function is directed to the FR AMP function which results in a gain of minus one. Also the FR AMP function permits the selection of a field force mode. This mode is entered by pulling point FF low and the amount of forcing is set by the FIELD FORCE pot, P3. If FE and FF are both pulled low, the field will go to the economy level.

However, the field weak and field force mode may be independently selected and their effects will be cumulative. For instance, if the full field level is 5 amps and field weak reduces it by one ampere to 4 amps while field force increases the field by 1.5 amps to 6.5 amps, selecting both field weak (FW) and field force (FF) will result in 5.5 amps. (5 - 1 +1.5)

The output of the FR AMP function is buffered by the FIELD REF OUT BUFFER (unity gain) to give the FRO signal. It could be used for the FRI signal of another assembly which is slaved to the master assembly.

The output of the FR AMP function is compared with the output of the FDBK SCALE function in the REGULATOR.

Two inputs to reduce or turn off the field are provided. The RF input acts by way of the REGULATOR function. Applying +15V to RF will put the regulator into full phase-back but the SCR will continue to fire. Also, the field loss circuit is defeated. To suppress firing pulses completely, point FO may be connected to common. This point turns off the field even if external pulses are being supplied at FFC while RF is functional only when internal phase control is being used. The FO function does not defeat the field loss function.

If the DIAGNOSTIC/FIELD MATCH MODE SELECT function is set up to make the FLD MATCH/DIAG pot, P7, be a diagnostic pot, it may be used to test the operation of the internal phase control. If the EXT/INT REFERENCE SELECT function is used to select the external reference path, P7 could be used to provide the reference, P7 can apply +15 to -15 volts to the external reference path and since only a negative reference will turn on the field, only one-half of the pot rotation will be functional. If the internal reference path is selected, jumpers JP6-JP8 may be arranged to exercise the crossover circuitry and phase control. If P7 is rotated to provide negative voltage, the CROSSOVER function will be operated. This allows the FMIN pot, P6 to be set. Rotating P7 to provide positive voltage will end a weakening signal to SREF AMP function without the FMIN clamp being functional. This can be used to check and/or adjust the operation of the field loss detection circuitry.

Two trip functions are provided. The FTRP function has two actuating inputs, field-loss/out-of-range condition. The field-loss input triggers FTRP if FC is less than a threshold set by the FLOSS pot, P10. The phase-loss/out-of-range condition triggers when the REGULATOR is in its clamp too long. This occurs if more current or voltage is being called for than the system can provide. This could indicate misadjustment or phase loss. Certain combinations of fuse failure or field loss could allow the system to operate in 1/2 wave mode which might provide enough output voltage to keep the field above the FLOSS level but not enough to achieve the desired current. This would be detected by the function described. If the unit is misadjusted, it could also actuate without a fuse failure/phase loss. This portion of the FTRP function may be defeated with jumper JP11. Defeat is desirable under certain operating conditions. If the motor field hot drop is too high, nuisance trips occur. These adjustments can be properly set to give desired field current when the field is cold, but, as the field heats up, it is possible that the desired field current could not be delivered by the unit even at its maximum output voltage. The above comments apply only if the unit is in a current regulator mode. A delay in this operating mode is provided to avoid trips when the unit is calling for a field increase. In this mode the regulator may hit the clamp while the current is building up (L/R time constant of field). The field loss detection is defeated by the application of voltage to RF to allow that input to reduce the field below the FLOSS level without a trip. Jumper JP9 is provided to change the sense of the FTRP signal on trip (pulled up to LVR on trip or pulled to common on trip). Indication of operation is provided by LED1.

The other trip circuit is a field timed overcurrent detector. The TOC detects and integrates a disparity between the output of the FDBK SCALE function (P11-FMAX) and the SREF AMP function. The integration starts if field forcing is greater than about 11% of the FMAX setting. A forcing level of 30% will result in a signal at OVFL in about 30 seconds. Operation is indicated by the LED2. Jumper JP10 will change the sense of OVFL (pulled up to LVR on trip or pulled to common on trip).

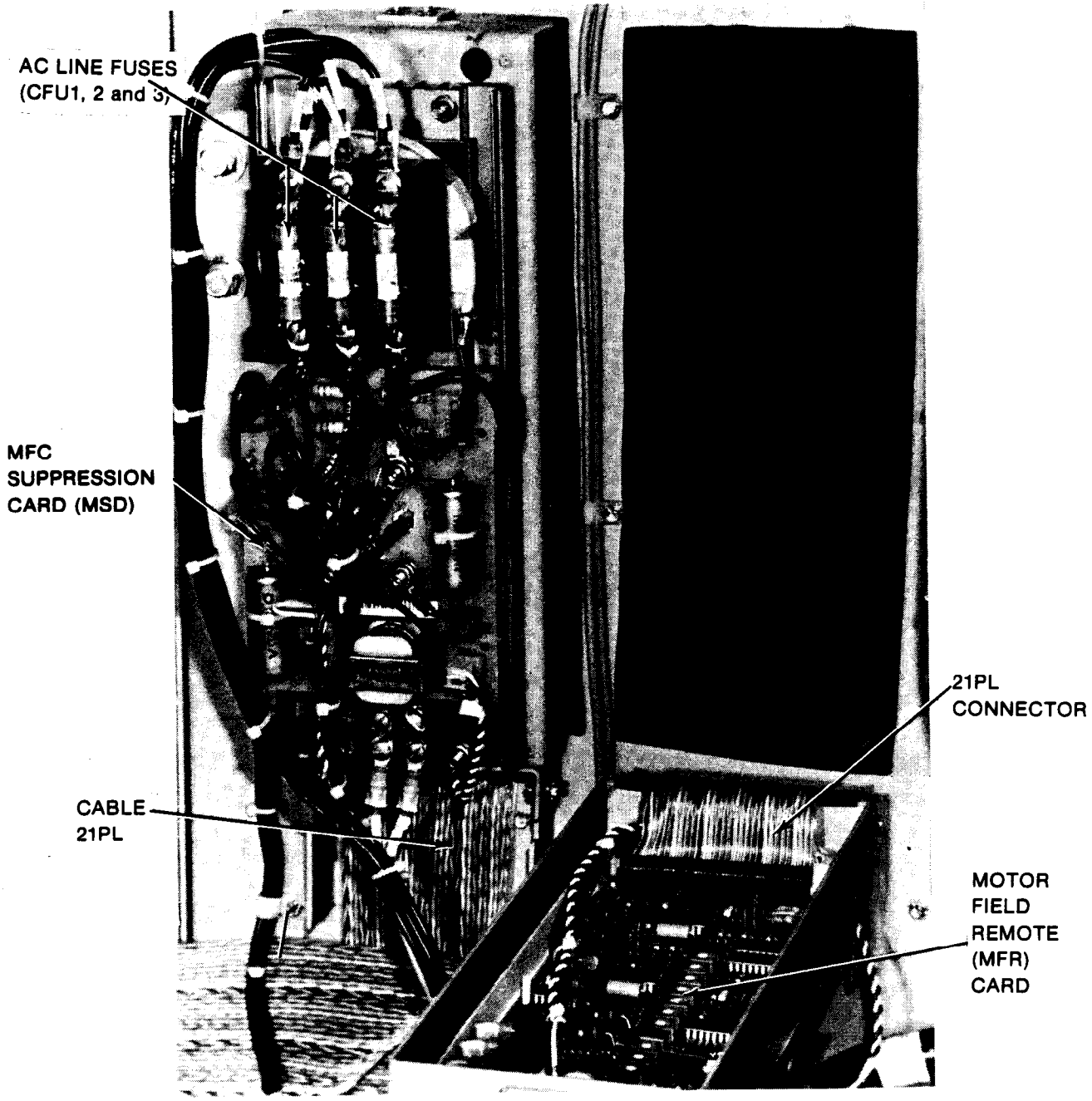


FIGURE 1
MOTOR FIELD REMOTE INSTALLATION

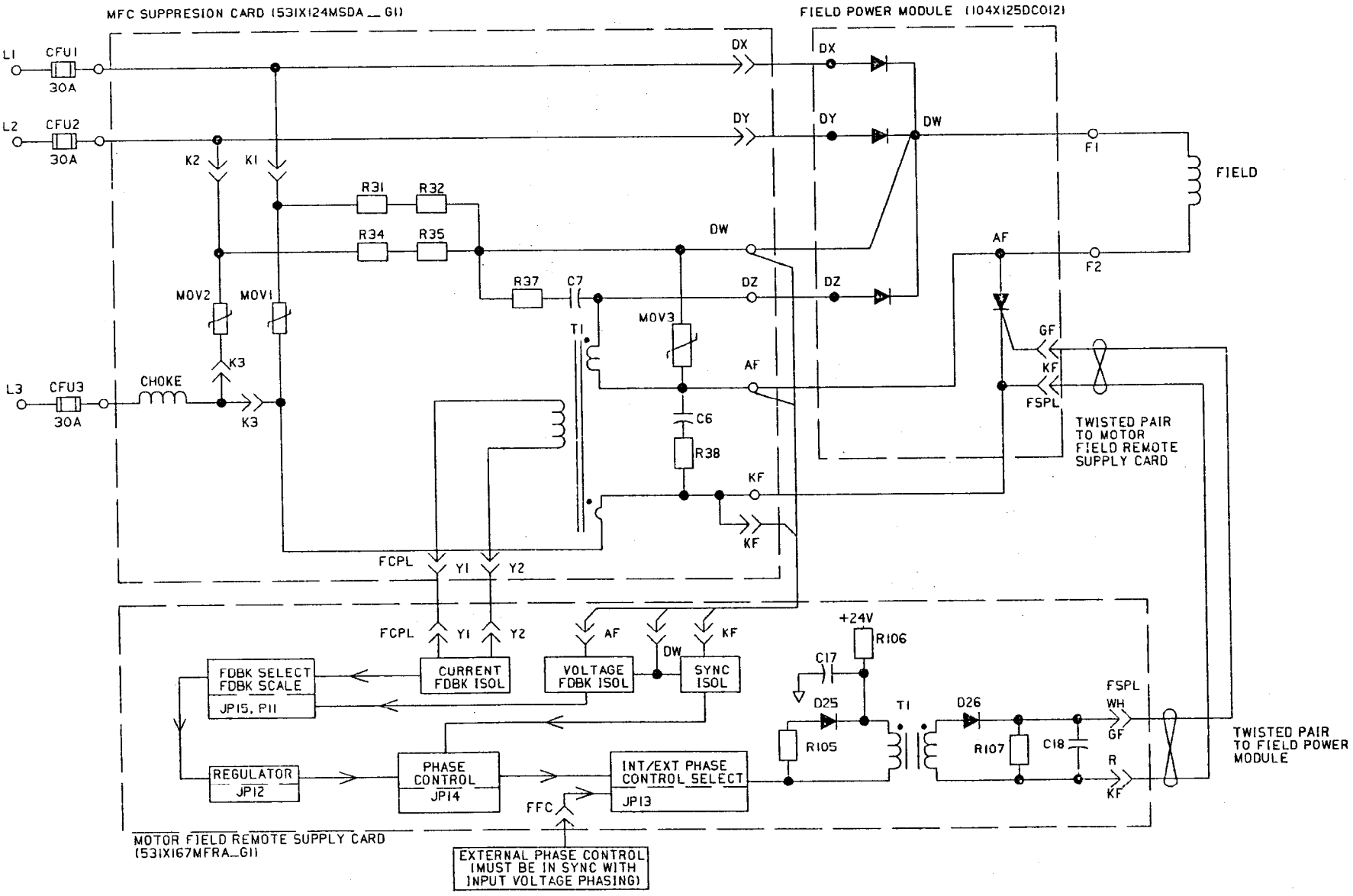
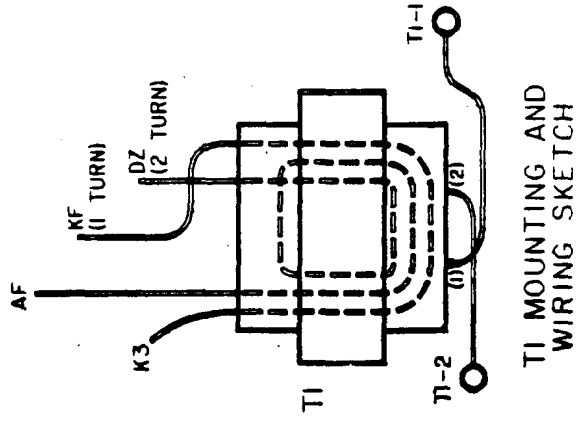


FIGURE 2
POWER CIRCUIT



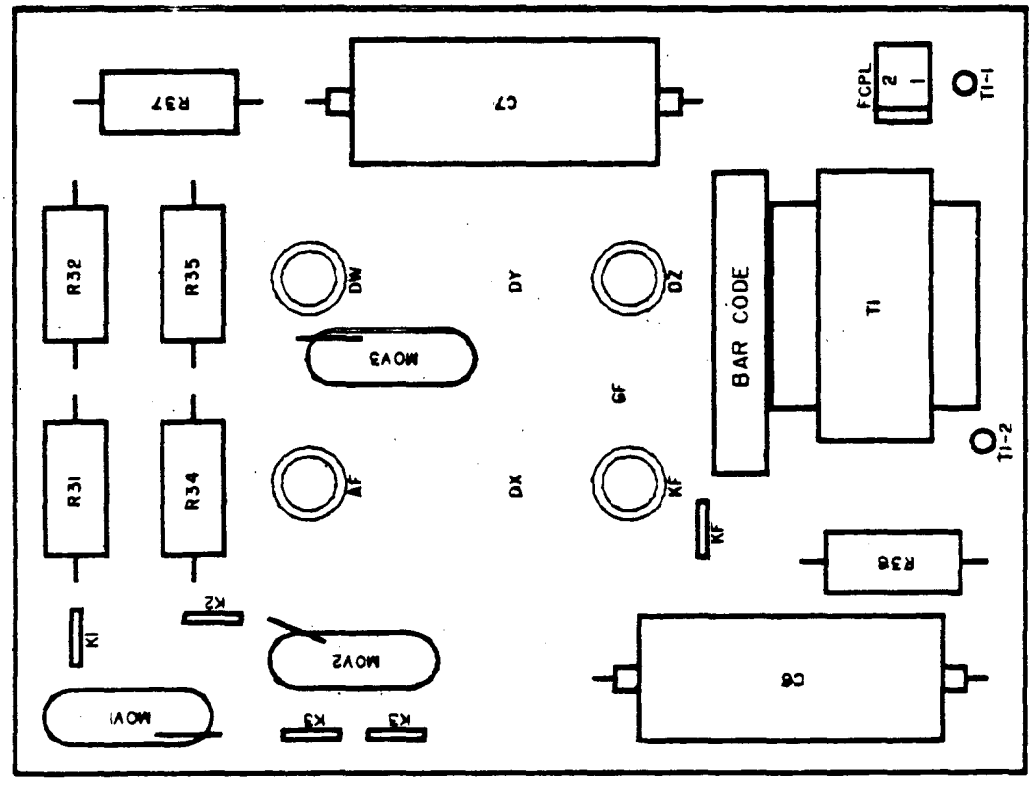


FIGURE 3
MFC SUPPRESSION CARD (MSD)

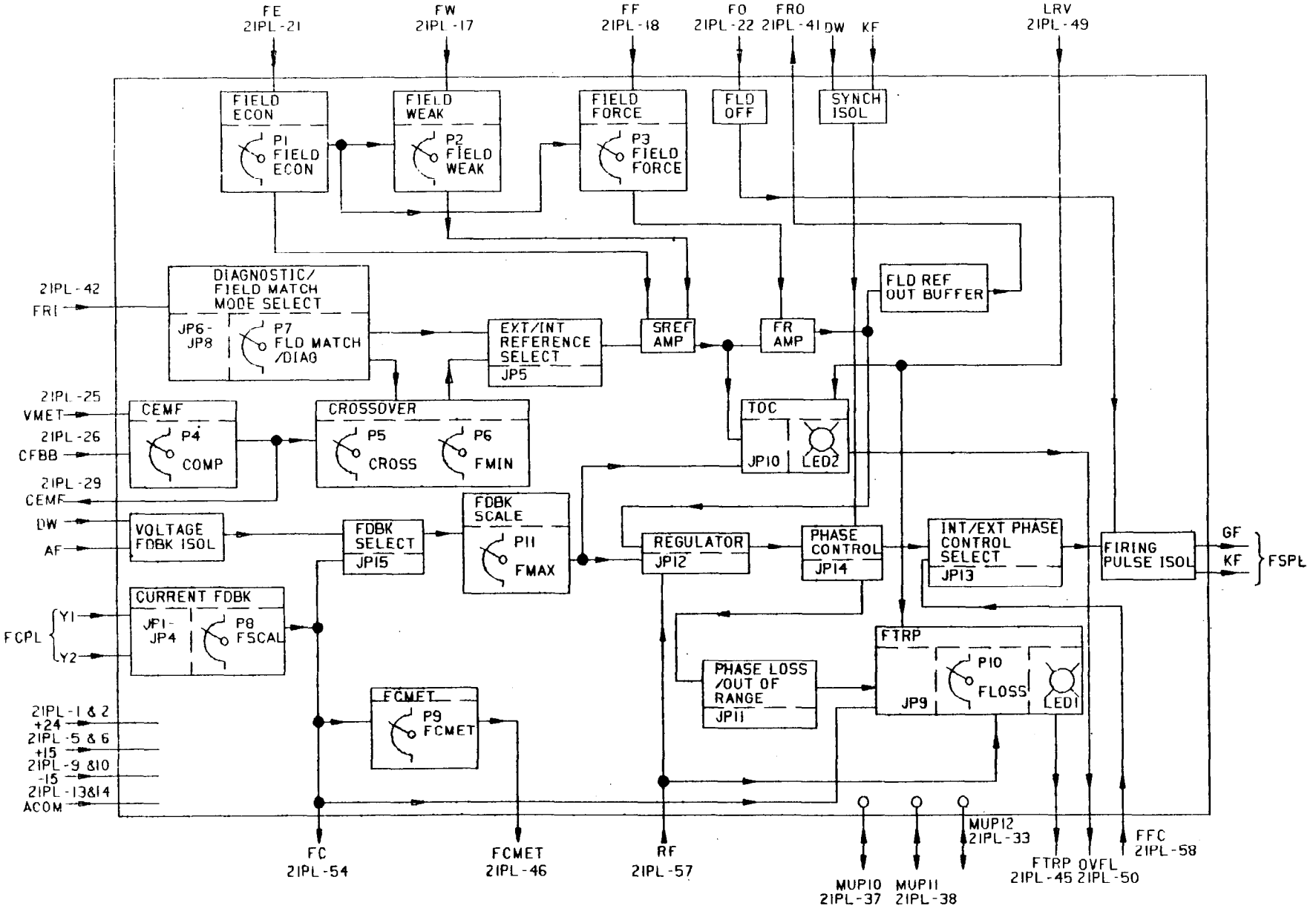


FIGURE 4
BLOCK DIAGRAM

JUMPERS and ADJUSTMENTS

JUMPERS

JP1-JP4 CURRENT FDBK (Range Selection)
Jumper combination should be chosen to give as high an FC signal as possible, but not greater than about 4.5 volts at the maximum operating current.

JP1	JP2	JP3	JP4	Gain Factor (Ir/FC)	Field Amp Range
1-2	1-2	1-2	1-2	6	12 - 24A
1-2	1-2	1-2	2-3	3	6 - 12A
2-3	2-3	1-2	2-3	1.5	3 - 6A
1-2	2-3	2-3	2-3	0.75	1.5 - 3A
2-3	2-3	2-3	2-3	0.375	0.4 - 1.5A

JP5 EXT/INT REFERENCE SELECT

1-2 Internal Reference (set JP6, JP7 and JP8 in the 2-3 position).

2-3 External Reference at FRI (Set JP6, JP7 and JP8 in the 1-2 position.)

JP6-JP8 DIAGNOSTIC/FIELD MATCH MODE SELECT

JP6	JP7	JP8	
1-2	1-2	1-2	P7 is a field match pot for external reference at FRI (JP5 at 2-3).
2-3	2-3	2-3	P7 is a Diagnostic Pot for internal reference (JP5 set on 1-2). Turn P7 CW to initiate crossover (for setting FMIN, P6) turn CCW to weaken field, bypassing FMIN limit (for setting FLOSS).
1-2	2-3	2-3	P7 is a Diagnostic substitute for external reference if JP5 set on 2-3. Turn P7 CW to turn field on (only one-half of pot is functional).

JP9 FTRP (Sense Select)

1-2 FTRP output will go high (FTRP pulled up to LRV with a 5.6K resistor) when FTRP actuated (by field loss or phase loss/out-of-range condition).

2-3 FTRP output pulled to common when FTRP actuated.

JP10 TOC (Sense Select)

1-2 OVFL output will go high (pulled to LRV through a 5.6K resistor) when OVFL actuated (field TOC operation).

2-3 OVFL output pulled to common when OVFL actuated.

JP11 PHASE LOSS/OUT OF RANGE (Trip Inhibit)

1-2 FTRP will operate when an out-of-range condition occurs (loss-of-phase/out-of-range/mis-adjustment) as well as field loss.

2-3 Loss-of-phase/out-of-range trip is inhibited. FTRP is operated only by field loss.

JP12 REGULATOR (Inner Loop Gain Adjustment)

1-2 Field current/voltage regulator feedback is 1Mohm in series with 1μf.

2-3 Feedback is 0.4M in series with 1μf (use to stabilize short time constant fields, i.e., L/R less than 0.25 sec.).

JP13 INT/EXT PHASE CONTROL Select

1-2 Internal phase control is used.

2-3 External firing signals are applied at FFC.

JP14 PHASE CONTROL (Retard Limit Adjustment)

1-2 60 Hz (Functional only for internal phase control).

2-3 50 Hz (Functional only for internal phase control).

JP15 FDBK SELECT

1-2 VF (voltage feedback) Functional only for internal phase control.

2-3 FC (current feedback) Functional only for internal phase control.

ADJUSTMENT POTS

P1 **FIELD ECON**

Adjusts field level when the economy mode is selected by pulling FE low. Turn CCW to reduce the field economy current.

P2 **FIELD WEAK**

Adjusts field level when the weak mode is selected by pulling FW low. Turn CCW to lower the weak field current.

P3 **FIELD FORCE**

Adjusts field level when the forcing mode is selected by pulling FF low. Turn CCW to strengthen the field forcing current.

P4 **COMP**

Adjusts the amount of IR comp in CEMF generation. Turn CW to increase IR comp.

P5 **CROSS**

Adjusts the CEMF level at which crossover (field weakening) begins. Full CW is maximum CEMF level (crossover will not occur).

P6 **FMIN**

Adjusts minimum field current level when the crossover mode is used. Turn full CW for highest minimum field current.

P7 **FIELD MATCH/DIAG**

Used to match fields when an external reference at FRI is used. Turn full CCW for minimum attentuation of FRI. May also function as a diagnostic pot to check FMIN and FLOSS settings or to serve as a field reference (see JP5, JP6, JP7 and JP8 settings).

P8 **FSCAL**

Trims gain of the FC circuitry (factory adjustment).

P9 **FCMET**

Adjusts FCMET output (FCMET/FC gain approximately 1 to 6). Turn full CCW for a gain of 1.

P10 **FLOSS**

Adjust the field current loss trip threshold. Turn full CW for minimum current trip level (no FLOSS trip).

P11 **FMAX**

Adjusts the full field current level (scales FC or VF feedback depending on JP15 setting). Turn CW to increase the full field current level.

CONNECTOR 21PL PINOUTS

PIN	NOMENCLATURE	DESCRIPTION
1	+24V	+24V DC power supply input.
2	+24V	+24V DC power supply input.
3	—	No connection.
4	—	No connection.
5	+15V	+15V DC power supply input.
6	+15V	+15V DC power supply input.
7	—	No connection.
8	—	No connection.
9	-15V	-15V DC power supply input.
10	-15V	-15V DC power supply input.
11	—	No connection
12	—	No connection.
13	COM	Power supply common input.
14	COM	Power supply common input.
15	—	No connection.
16	—	No connection.
17	/FW	Enables the field weakening function when connected to common. See also P2-FIELD WEAK.
18	/FF	Enables the field forcing function when connected to common. See also also P3-FIELD FORCE.
19	—	No connection.
20	—	No connection.
21	/FE	Enables the field economy function when connected to common. See also P1-FIELD ECON.
22	/FO	Enables the field off function when connected to common.
23	—	No connection.
24	—	No connection.
25	VMET	Armature voltage feedback input for CEMF calculator function. 4V DC at rated armature (terminal) volts.
26	CFBB	Armature current feedback input for CEMF calculator function. 1V DC at rated armature current.
27	—	No connection.
28	—	No connection.
29	CEMF	Motor CEMF signal generated by the MFR card COMP circuit. See also P4-COMP. $CEMF = \frac{(VRATED - IR) \times 4V\ DC}{VRATED}$
30	—	No connection.
31	—	No connection.
32	—	No connection.
33	MUP12	Multiuse point 12 — connects to test point MUP12, which may be jumpered to a signal test point.
34	—	No connection.
35	—	No connection.
36	—	No connection.
37	MUP10	Multiuse point 10 — connects to test point MUP10, which may be jumpered to a signal test point.
38	MUP11	Multiuse point 11 — connects to test point MUP11, which may be jumpered to a signal test point.

CONNECTOR 21PL PINOUTS (continued)

PIN	NOMENCLATURE	DESCRIPTION
39	—	No connection.
40	—	No connection.
41	FRO	Output from the field reference amplifier. May be used as a FRI signal for another MFR. -4V DC at full field reference.
42	FRI	Field reference input for use in field match mode. See also JP6, 7 and 8 and P7-FLD MATCH/DIAG. -4V DC equals full field.
43	—	No connection.
44	—	No connection.
45	FTRP	Activated on a field loss or phase loss/out-of-range condition. Refer to JP9 to determine output sense when tripped.
46	FCMET	Field current meter output signal. Gain is adjustable from 1 to 6 of FC. Maximum 4mA. See also P9-FCMET.
47	—	No connection.
48	—	No connection.
49	LRV	Logic reference voltage for fault output functions. 24 to 48V DC maximum.
50	OVFL	Indicates when a field timed overcurrent occurs. See also JP10 to determine sense when tripped.
51	—	No connection.
52	—	No connection.
53	—	No connection.
54	FC	Field current feedback signal from T1 on MSD card. Maximum external loading is 1mA. $FC = \frac{\text{MAX RATED MOTOR FIELD AMPS X 4V DC}}{\text{MAX FIELD CURRENT SET BY JP1 THRU 4}}$
55	—	No connection.
56	—	No connection.
57	RF	Allows reduction or turn off of field with SCR phased back. +15V DC equals full field reduction.
58	FFC	Field firing control pulses from external source. Allows external field firing signals from separate regulator.
59	—	No connection.
60	—	No connection.

ADJUSTMENT PROCEDURE

Adjustment sequences differ for the various operating modes. It is assumed that input power and the load have been connected, as well as all the I/O connections required in the desired operating mode. Jumpers should be set per Table 3 or as supplemented by any special operating notes.

TABLE I

OPERATING MODES

1. Internal Phase Control — Current Regulated
2. Internal Phase Control — Current Regulated with Crossover
3. Internal Phase Control — Voltage Regulated
4. Internal Phase Control — Voltage Regulated with Crossover
5. Internal Phase Control — External Reference, Current Regulated
6. Internal Phase Control — External Reference, Voltage Regulated
7. External Phase Control — Slave Operation From External Firing Pulses.

OPERATING MODE 1
(Current Regulated)

1. With FE, FW, FF and FO open, apply power. A positive voltage of about 20 volts will appear at test posts FE, FW, FF and FO.
2. Using an ammeter in the output, or by reading FC voltage, set the field at the desired level (normally the motor nameplate rated I_{FMAX}) with the FMAX pot, P11. See JP1—JP4 range selection table.
3. If field economy operation is desired, pull FE to common and adjust FIELD ECON pot, P1, for the desired level. Turn CCW to decrease the field current. A typical setting of FE at 70% of the value in step 2 above reduces field losses (watts) by 50%.
4. If a weak field mode is required, call for it by pulling FF to COMMON. FE should not be low at this time. Adjust the amount of weakening with the FIELD WEAK pot, P2. Turn it CCW to weaken the field.
5. If a field forcing mode is required, call for it by pulling FF to common. FE and FW should not be pulled low at this time. Adjust FIELD FORCE pot, P3 to give the desired amount of forcing. Turn it CCW to strengthen the field.
6. If the field loss function is desired, set the jumper to the D1 mode per Table 4, turn P10 full CW, and turn P7 CCW to weaken the field to the desired trip level. Then turn the FLOSS pot, P10, CCW slowly until LED1 lights. Check by using P7 to strengthen the field to turn off LED1. Field loss must be set lower than FE, FW and FMIN adjustments.
7. Return the jumpers changed in step 6 to their previous positions.

OPERATING MODE 2
(Current Regulated With Crossover)

1. Follow steps 1 to 6 of the OPERATING MODE 1 procedure.

2. Use P7 to exercise the crossover circuit by turning it CW. Apply only enough signal to weaken the field without forcing the clamp too much. Adjust the FMIN pot, P6 to give the desired minimum field level (normally the motor nameplate rated IFMIN). It must be low enough to achieve top speed with the armature voltage at the crossover level.

3. Return the jumpers changed to get MODE D1 back to the MODE 2 settings.

4. Operate the system and call for speed above base. Use the CROSS pot, P5, to decrease the CEMF level to the desired level. Check to see that the top speed may be achieved. Reduce the FMIN level if necessary.

5. Adjust the COMP pot, P4, to stabilize the drive. An alternative means of setting the COMP pot is to apply a signal to CFBB and adjust the COMP pot to give an output on CEMF of the proper level. As an example assume VMET is 4.0V at rated armature current and that the motor has a 10% IR drop. That means that signal of 1.0V applied to CFBB should contibute 0.1 x 4.0 or 0.4 volts to CEMF. The circuit subtracts IR so CEMF should be -0.4V with +1.0V applied at CFBB.

OPERATING MODE 3
(Voltage Regulator)

Using a similar procedure as for OPERATING MODE 1 except voltage is being regulated so output voltage should be measured instead of output current. This applies for the setting of economy, weak field and forced field. Field loss will be dependent on output current so the output voltage at field loss trip will change with field heating.

OPERATING MODE 4
(Voltage Regulated With Crossover)

Similar to OPERATING MODE 2 except output voltage is the regulated quantity. Set all parameters including FMIN using output voltage as the criteria. FLOSS, however, is current sensitive and not voltage sensitive.

OPERATING MODE 5
(External Reference — Current Regulated)

1. Check that FE, FW, FF and FO are not pulled to common and apply power.

2. Apply the voltage to FRI (negative) that will call for full field. Adjust P7 to get -4.0 volts at FRO.

3. Adjust the output current to the desired level with the FMAX pot, P11.

4. If field economy is to be used, call for it by pulling FE low and adjust the field with FIELD ECON pot, P1. Turning it CCW decreases the field.

5. If a weak field mode is required, call for it by pulling FW to ground and be sure that FE is not pulled low. Adjust the field with the FIELD WEAK pot, P2. Turning it CCW decreases the field.

6. If a field forcing mode is required, call for it by pulling FF low. Make sure the FE and FW are not pulled low. Adjust the field with the FIELD FORCE pot, P3. Turning it CCW increases the field.

7. For the field loss function, turn the FLOSS pot, P10, full CW and set the field at the desired trip level. Turn the FLOSS pot CCW slowly until LED1 turns on. The field may be set at the desired trip level by changing the reference input at FRI. If this is not convenient, the FIELD MATCH/DIAG pot, P7, may be used by setting JP7 and JP8 to 2-3. After doing this, return JP7 and JP8 to 1-2 and readjust P7 to give -4.0 volts at FRO when the "normal" reference is applied at FRI and FE, FW, FF are all released.

OPERATING MODE 6
(External Reference — Voltage Regulated)

Using the same procedure as for OPERATING MODE 5 except that the controlled variable is the output field voltage for all settings except for the field loss function, which is based on current.

OPERATING MODE 7
(Slave Operation From External Firing Pulses)

Most of the jumpers and post are ineffective in this mode. The FTRP function may be used to detect field loss. If possible, the external pulse firing control should be used to call for a field level at the desired trip level. Turn the FLOSS pot, P10, CCW slowly until LED1 turns on. If this is not possible, the following alternative procedure should be followed. Reset the jumpers for MODE 5 per Table 3, except for JP7 and JP8 which should be in position 2-3. This will allow the FIELD MATCH/DIAG pot to provide a field reference and the field can be adjusted to the desired trip level. Adjust FLOSS pot, P10 and return all the jumpers to the proper positions for MODE 7.

TABLE 2

DEFAULT SETTINGS

JUMPER OR POT	POSITION	COMMENTS
JP1	1-2	
JP2	1-2	I_F/FC = 6 amps/volt (I_F = actual field current)
JP3	1-2	
JP4	1-2	
JP5	1-2	Internal Reference
JP6	1-2	P7 is a field match pot and not
JP7	1-2	functional in default mode since the
JP8	1-2	Internal Reference is selected by JP5
JP9	1-2	FTRP and OVFL go high when
JP10	1-2	Tripped (pull up to LRV through 5.6Kohm)
JP11	1-2	Phase Loss/Out-of-Range Functional
JP12	1-2	Normal Regulator Gain (1Mohm and 1μF)
JP13	1-2	Internal Phase Control selected
JP14	1-2	Internal Phase Control trimmed for 60 Hz
JP15	2-3	Field Current (FC) selected as feedback
P1	CW	No Economy Input
P2	CW	No Weakening Input
P3	CW	No Forcing Input
P4	CCW	No IR COMP
P5	CW	MAX CROSSOVER
P6	CW	Highest MIN FLD
P7	MID	Pot not functional in default mode
P8	Set at Factory	I_F/FC Gain adjusted (DO NOT READJUST)
P9	CCW	FCMET/FC Gain = 1
P10	CW	No Field Loss Trip
P11	MID	Adjust to give desired field level

TABLE 3

JUMPER SETTING FOR DIFFERENT OPERATING MODES

MODE See Table 1	JP1-JP4	JP5	JP6	JP7	JP8	JP9	JP10	JP11	JP12	JP13	JP14	JP15
1	A	1-2	1-2	1-2	1-2	C	C	D	E	1-2	F	2-3
2	A	1-2	1-2	1-2	1-2	C	C	D	E	1-2	F	2-3
3	B	1-2	1-2	1-2	1-2	C	C	D	E	1-2	F	1-2
4	B	1-2	1-2	1-2	1-2	C	C	D	E	1-2	F	1-2
5	A	2-3	1-2	1-2	1-2	C	C	D	E	1-2	F	2-3
6	B	2-3	1-2	1-2	1-2	C	C	D	E	1-2	F	1-2
7	B	X	X	X	X	G	H	2-3	X	2-3	X	X

A. Select positions for JP1-JP4 per comments in jumper and adjustment section.

B. While not used in regulating output, JP1-JP4 should be set as in Note A for the FLOSS function, FC output, and FCMET output.

C. Position 1-2 FTRP/OVFL pulled up to LRV through 5.6K when the function is active.
Position 2-3 FTRP/OVFL pulled to COM when the function is active.

D. Position 1-2 LOSS-OF-PHASE/OUT-OF-RANGE will actuate FTRP.
Position 2-3 LOSS-OF-PHASE/OUT-OF-RANGE input to FTRP is defeated.

E. Position 1-2 for normal regulator response
Position 2-3 to change feedback from 1Mohm and 1μf to 400Kohm and 1μf (Use for field time constants less than 0.25 sec. or as otherwise required).

F. Position 1-2 for 60 Hz operation
Position 2-3 for 50 Hz operation.

G. Set as in Note C to select sense of FTRP in FLOSS operation. Defeat PHASE LOSS/OUT-OF-RANGE input to FTRP operation by putting JP11 in position 2-3 since internal phase control is not being used.

H. TOC function not available in this mode.

X. Not functional when internal phase control is not used.

TABLE 4

JUMPER SETTINGS FOR DIAGNOSTIC MODES

MODE D1

FIELD MATCH/DIAG pot, P7, used to exercise crossover or regulator for internal reference (operating modes 1-4).

Turn P7 clockwise to apply negative voltage which will actuate crossover (FMIN may be set). Turn P7 CCW to apply positive voltage which will weaken field (FMIN bypassed) (FLOSS may be set).

JP5	JP6	JP7	JP8
1-2	2-3	2-3	2-3

MODE D2

FIELD MATCH/DIAG pot, P7, used to substitute for an external reference. Turn CW to apply negative voltage which turns field on.

JP5	JP6	JP7	JP8
2-3	1-2	2-3	2-3

SPARE AND RENEWAL PARTS

Description	Catalog Number
Fuses (30 amp)	104X109AD084
Field Power Module	104X125DC012
Motor Field Control Card	531X167MFRA_G1
Suppression Card	531X124MSDA_G1

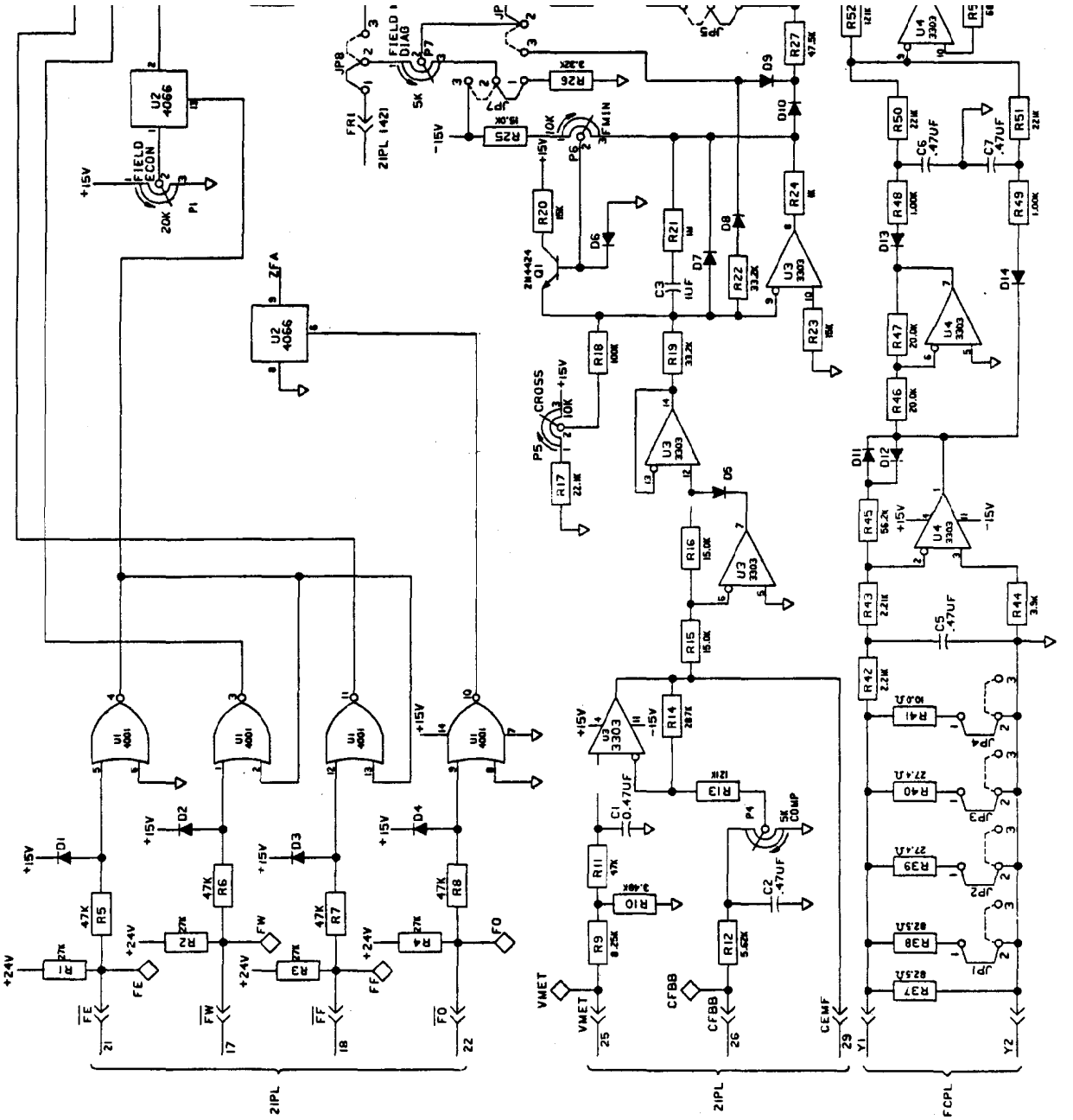


FIGURE 5
MFR CARD ELEMENTARY DIAGRAM (SH 1)

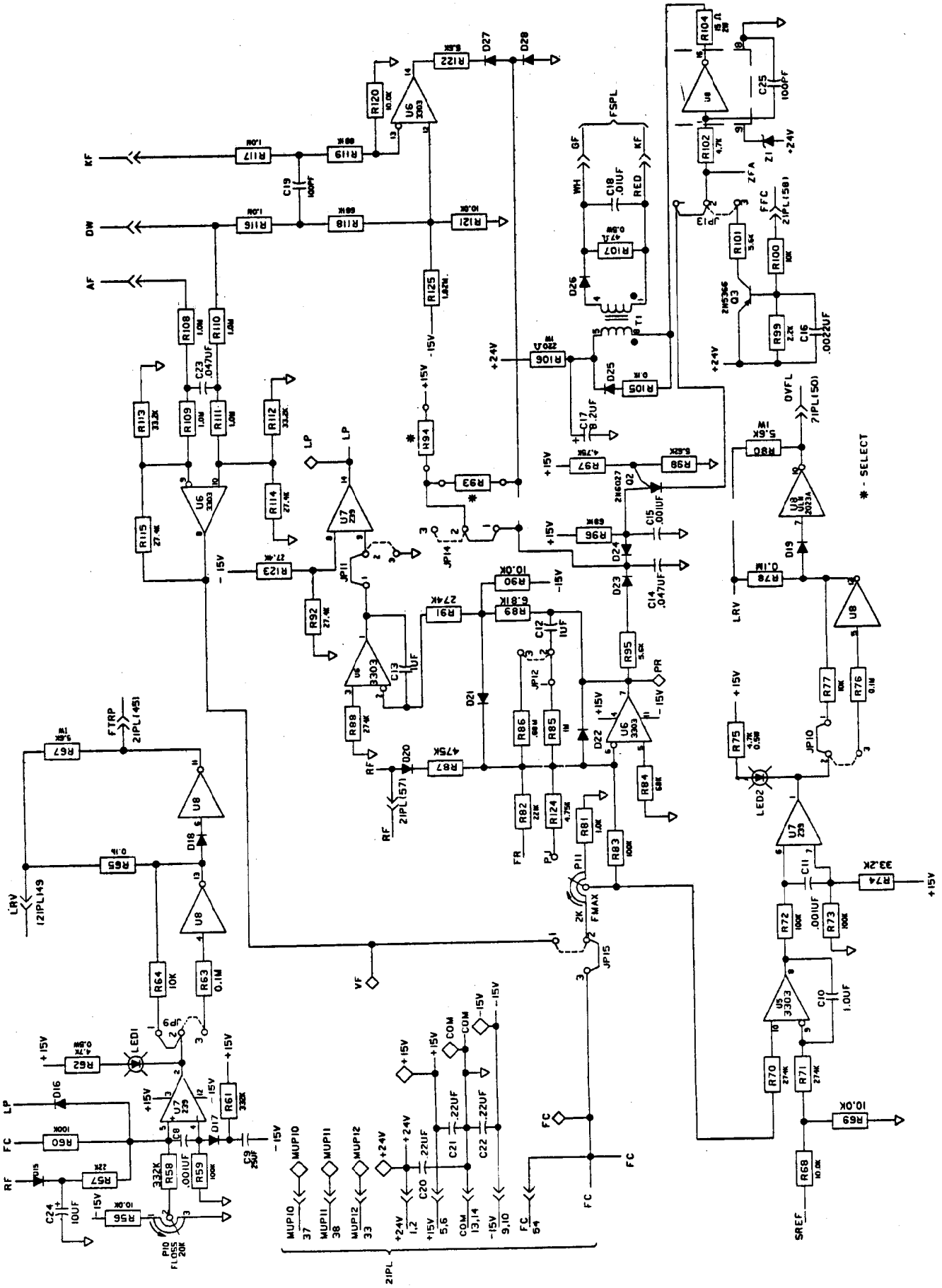


FIGURE 5
MFR CARD ELEMENTARY DIAGRAM (SH 2)

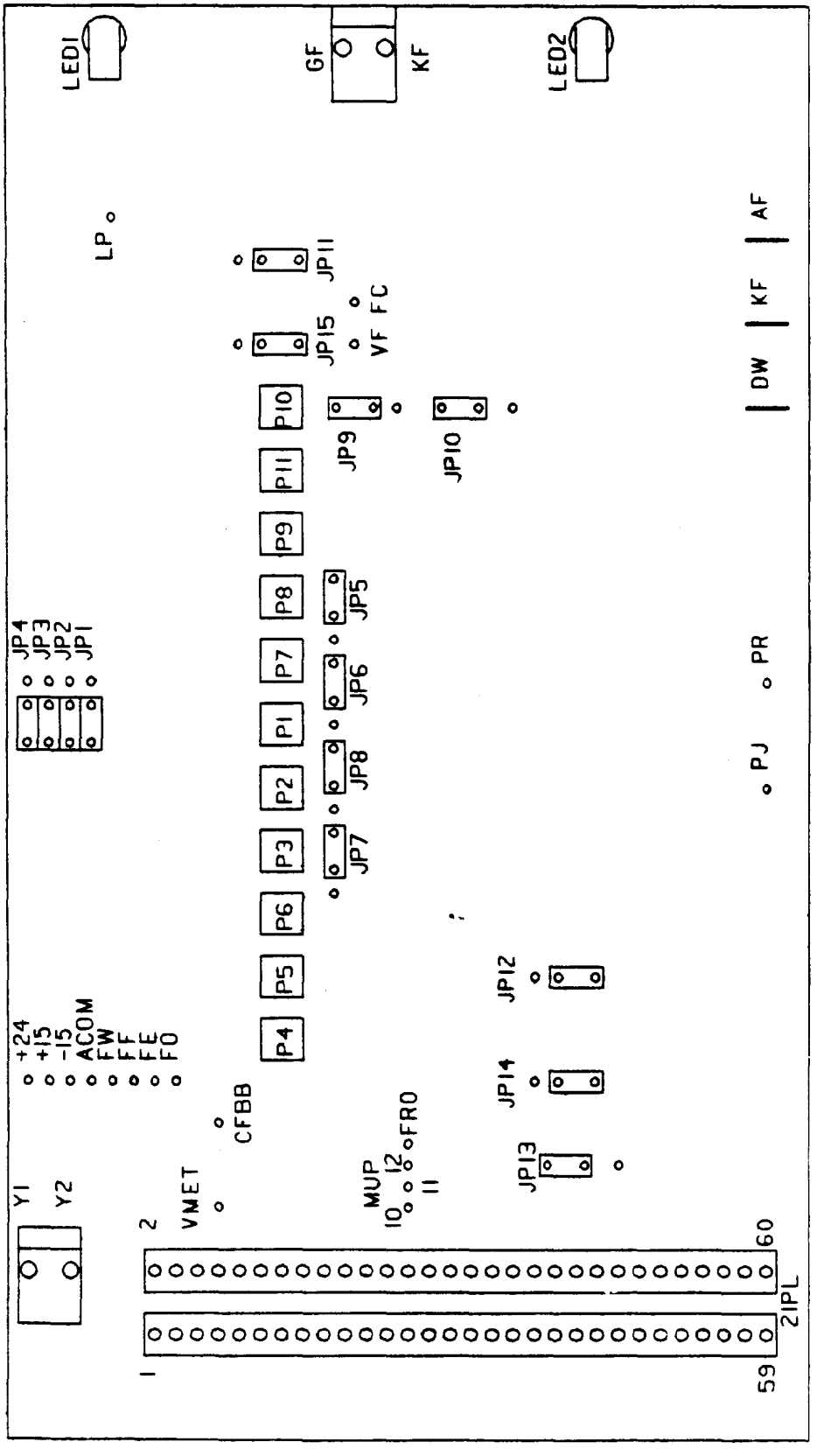


FIGURE 6
LOCATION REFERENCE

GENERAL ELECTRIC COMPANY
SPEED VARIATOR PRODUCTS OPERATION
ERIE, PENNSYLVANIA 16531

GENERAL ELECTRIC

GEK-24979 (6/87) 1M (P)