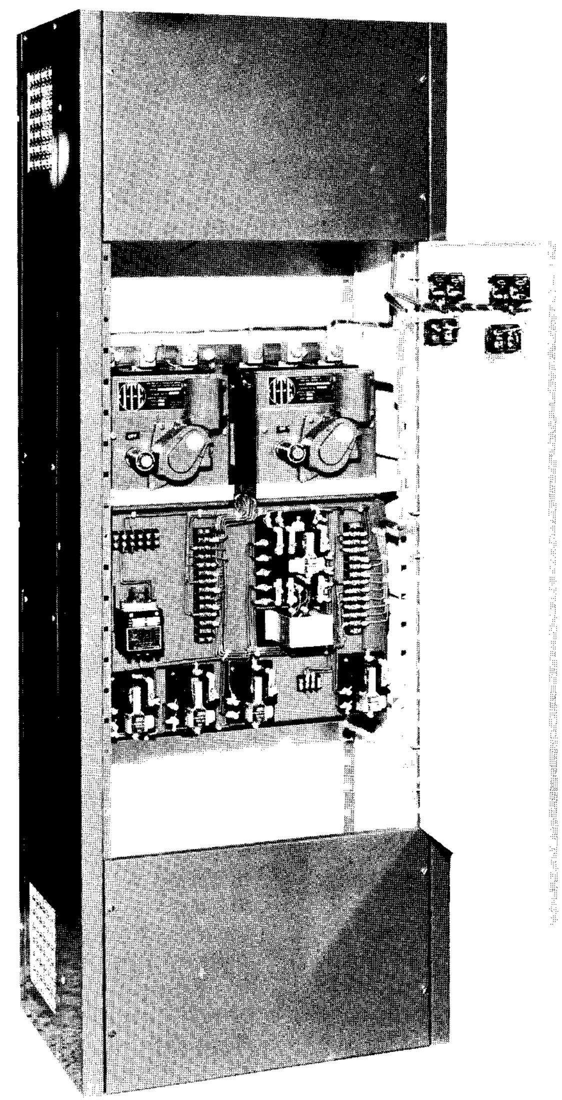
IB-15.5.1
ISSUE A

TELEMAND AUTOMATIC TRANSFER UNITS

INSTRUCTIONS

DESCRIPTION, OPERATION, MAINTENANCE

METAL-ENCLOSED, LOW-VOLTAGE



I-T-E IMPERIAL CORPORATION

specified interval. It also maintains the emergency supply on a demand basis in the event the normal supply is not solidly restored.

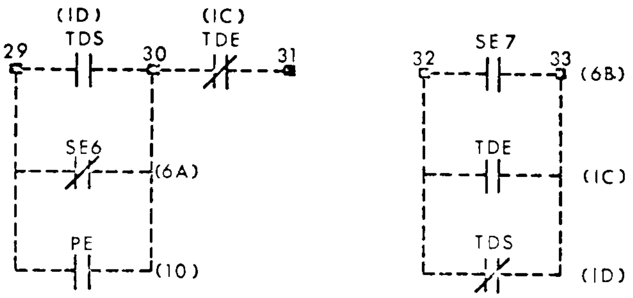


FIG - 5 ENGINE START OPTIONS

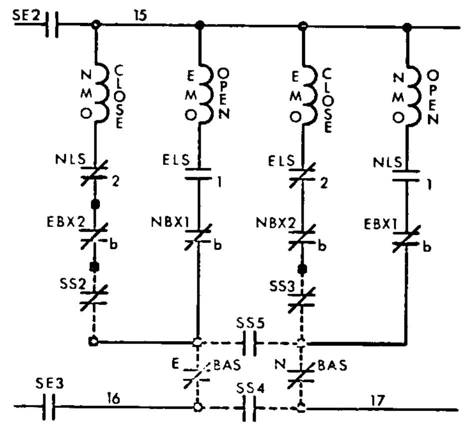


FIG - 6

TDS functions by having its coil in parallel with LO on the emergency (Fig. 3) control bus and its contact around the engine start contact (Fig. 5). TDS operates as a delay on dropout, (delay on de-energize). Its coil is de-energized by the change in state of SE4 and SE5 at the moment of retransfer to the normal supply. Its contact in the engine circuit will not change state until the time set has expired, and then the engine will be shut down.

Another option, the test switch SS1, is used to initiate a transfer for operational test purposes without regard to the actual condition of the normal supply. Refer to Fig. 2. SS1 performs its function by opening the coil circuit of SE. Following the nominal 2-second dropout delay of SE, all the SE contacts change state. It is to be assumed here that an SE engine start contact (Fig. 5) is used or that emergency power is available on a continuous basis. If the former is the case, then the engine cranking commences when SE drops out—(this description presumes no delay options are used) when generator voltage and frequency are substantially correct the LO relay picks up and the transfer action proceeds as described. When the test operation has been completed, retransfer to normal is accomplished by returning the test switch to the auto position. This action restores the SE coil circuit and, assuming normal supply is within tolerance, transfers the control circuit to the normal control bus and the unit retransfers to the normal supply bus. The engine start circuit would revert to normal and the engine would be shut down.

If a continuous standby power source is used instead of the engine plant, the transfer and retransfer would be performed with only the delay of the SE relay interrupting the action.

The three position selector switch functions in the same manner as the test switch but with one more function. The added function is to open both breakers while blocking the closing of either breaker. This is known as both the reset and the maintenance position. The reset function will operate any time there is voltage available on either bus. See Fig. 6.

When trip devices have not been specified, the switch performs a maintenance function only. That is, the isolating of the load bus from both supply buses. When trip devices are used, the reset switch serves to electrically reset a tripped breaker. When either breaker is to be reset, note that **BOTH** breakers will be operated to the reset position unless special selective reset circuitry has been specified. So the load will be interrupted during reset. If the unit had been operating on emergency and the normal breaker is reset, the unit will retransfer to normal at once when SE operates. Note that this reset of the normal breaker is independent of the selector switch and occurs as soon as voltage appears on the emergency control bus. This is prevented by the optional breaker alarm switch, which will also block the transfer of the unit following a fault trip action. This operation is true also of the emergency breaker and it will block retransfer to normal until it is reset. With both breakers, operating the selector switch to reset will reset the breakers and the alarm switches. This action will be followed by the closing of the priority breaker, determined by the position of the SE relay.

Switches SS2 and SS3 open in the reset position to prevent pumping between the operators. SS4 only is used to supply reset voltage except when the optional breaker alarm switches (BAS) are specified and then SS5 is also used to tie around an open BAS.

With reference to Fig. 2, the SE coil circuit has 2 modes of operation. When TDT is not used, wire 11 is strapped direct to SE and wire 10 is not used. This is shown in Fig. 7.

When TDR is used, wire 10 is required as are contacts TDR, SE1 and LO2. SE1 is required to maintain stability prior to a retransfer action when a line dip would chatter TDR and restart the timing cycle. The stability is achieved by the nominal 2-second dropout time of the SE relay. The LO2(b) contact serves the purpose of by-passing the delay on retransfer when operating on the emergency supply and that supply fails. This permits retransfer immediately upon restoration of the normal supply.

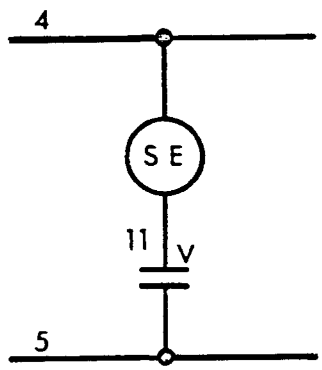


FIG - 7

When the transfer switch is applied to a combined AC and DC bus circuit, special circuitry is employed within the unit to compensate for the frequency discrimination of the normally used LO relay and the low DC rating of the auxiliary switches. However, the circuit description in this booklet is still valid from a functional point of view for the DC application.

The plant exerciser (PE) is a motor operated device which periodically and for a preset duration, tests the standby facility. For a no load test, the PE contact operates in the engine start circuit, Fig. 5. For a load test, the PE contact is operated in series with the V relay string. Here it functions the same as the test switch. The PE obtains operating voltage from the load bus.

When it is supplied, the shunt trip device circuit will contain a cutoff switch to break the coil circuit. The ST device provides a means of rapid opening of the breaker without waiting the some 15 cycles required by the motor operator. This is desirable where the unit is operated in a relaying loop. This option is available only with the overcurrent trip devices. See Fig. 8.

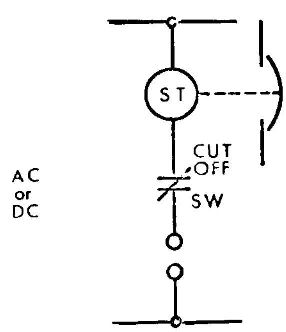


FIG - 8

Operation of the shunt trip device is essentially the same as the optional undervoltage trip device. Within the breaker case, these options function to unlatch the breaker by directly operating the trip bar of the trip device; thus, the breaker then trips free. The breaker must be reset before reclosure is possible.

In addition to the electrical interlock, the I-T-E transfer unit employs a mechanical interlock to prevent simultaneous closing of the two breakers. (In bus tie applications, the interlock feature is deleted.) This is a walking beam device with insulating plungers affixed to the ends of the beam. The beam pivots about its center and the plungers ride on the center pole of each breaker. This is accomplished by drilling through the back of the breaker cases. This arrangement does not interfere with the simultaneous opening feature.

There are two basic approaches to line sensing. One is to consider only total feeder failure and the other considers all phases. In the first case, only one sensing relay is required for any phase arrangement. In the second case, or full relay protection type, one sensing relay per phase is required. This is the more expensive and possibly the more desirable approach to supply line sensing. In either case the relays function with the same range of adjustment possible. The standard settings are for 90% pickup and 70% dropout. This refers to the rating ordered by the customer and not to the actual feeder voltage. Standard settings for a 240 volt requirement are 216 volts pickup and 168 volts dropout. The actual bus voltage may be 230 volts. In this case the 90% and 70% standards are invalid. The actual settings would become 94% and 73%. So it can be seen that the factory set percentages will be only approximations unless the actual bus voltage has been specified.

The foregoing is generally true also of the alternate, or emergency, supply; particularly where the transfer unit is used in low voltage, double-ended switchboards.

Where there are critical loads, close differential devices can be supplied to operate within a 3% voltage bandwidth.

All standard switchboard options, such as 3 phase voltage and current metering, breaker operating switches, relays, and a number of auxiliary devices, are available with the I-T-E transfer unit. In motor control applications, the Telemand unit with automatic breaker reset and shunt trip provides every desirable feature including overload and fault protection.

III. TROUBLESHOOTING

The I-T-E transfer switch unit is manufactured to very high standards under constant quality control surveillance, with only high quality components being used. The unit is properly adjusted and operated under test conditions prior to shipment. Even so, there is the possibility of a malfunction. In this event, the fault can be localized quickly by referring to the troubleshooting chart, Fig. 9. This chart presumes that the reader has an understanding of basic electricity and is otherwise qualified to effect repairs when the fault is found. There are two categories of trouble with a transfer switch: failure to transfer and failure to retransfer. Fig. 9 is divided into these two categories. In both categories it is good practice to check all connections on a device which is suspect.

In general, the I-T-E transfer unit requires minimal attention.

In the average installation, an annual routine will be adequate for the basic device.

This routine could consist of nothing more than wiping all the relay contacts with clean heavy paper and a visual inspection to locate loose, worn, or broken parts.

Dis-assembly of the motor operators and the breakers is not recommended, nor is it necessary as part of a routine.

Adjustment of the V or LO relays is not to be expected during the normal life of the individual relay. In the event it does become necessary to adjust one of these relays, it is recommended that the relay be returned to the factory. However, the adjustments can be made in the field if care and patience are employed in the procedure.

A variable voltage source, such as an adjustable autotransformer, and an AC voltmeter, are the required devices for performing the adjustments on standard differential "V" sensing relays. The relay should be set up in the vertical position, on a steel plate or mounted on the control panel. The relay is sensitive to both vertical orientation and mounting base material. Adjust the stationary contact to obtain 1/64" compression of the moving contact. Be certain the locknut is tightened.

Set the variable voltage source to the dropout voltage desired and adjust the spring screw on the armature until the relay drops out. Set the voltage to the pickup desired and adjust the armature stop screw to achieve pickup. There is some interaction between these adjustments so recheck the dropout setting and if re-adjustment is required, recheck the pickup also. Tighten locknuts and recheck both adjustments.

The close differential and LO relays are adjusted in a somewhat different manner. The pickup point is adjusted with a combination of reactor tap selection, the major determinant, armature spring and stop adjustments. The dropout point is set by adjusting the series resistor. Here again, interaction is to be expected although not to the extent experienced with the standard differential relays.

IV. SERVICE

Should service beyond the limitations of this booklet be required, the local I-T-E Sales Office should be consulted. Repair and consultation service is available in the field or at the factory, under warranty or on a daily rate basis.

HAZARD ZONE

CONTROL PANEL IS HOT WITH BUS VOLTAGE—EXERCISE CAUTION

CATEGORY 1—UNIT DOES NOT TRANSFER

Symptoms	Possible Cause
LO relay did not pick up	Emergency supply too low or not available; Blown control fuses; Dirty b contacts on SE relay; LO relay coil or component.
TDT (if used) did not operate	Dirty or inoperative LO contact; TDT microswitch defective; TDT relay coil.
Normal breaker did not open	TDT1 contact; If NBAS operated, breaker is in trip position and must be reset; EBX1 b contact switch; Normal open limit switch; Motor operator coil.
Emergency breaker did not close	Selector switch SS3; NBX2 b contact switch; Emergency close limit switch; Motor operator coil.

CATEGORY 2—UNIT DOES NOT RETRANSFER

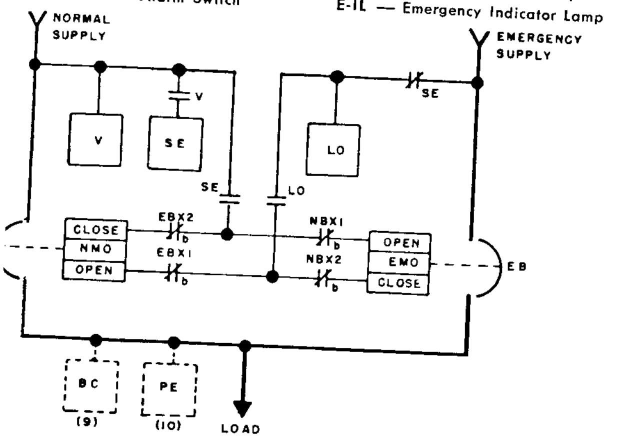
Symptoms	Possible Cause
Sensing "V" relays did not pick up	Normal supply too low or not present on all phases; Blown control fuses; Open "V" relay coils.
TDR relay did not operate	SS1 in test position or otherwise open; Dirty "V" relay contacts: Open TDR coil.
SE relay did not pick up	TDR contact switch did not operate; Open SE coil or component.
Emergency breaker did not open	Dirty SE a contacts; If EBAS operated, breaker is in trip position and must be reset; NBX1 b contact switch; Emergency open limit switch; Motor operator coil.
Normal breaker did not close	Selector switch SS2; TDB contact: EBX2 b contact switch; Normal close limit switch; Normal motor operator coil; TDB contact.

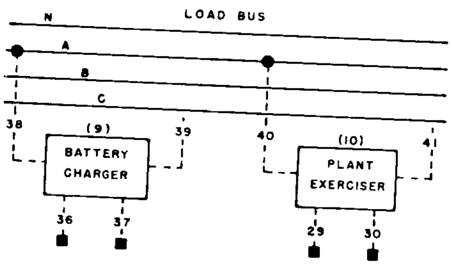
FIG - 9

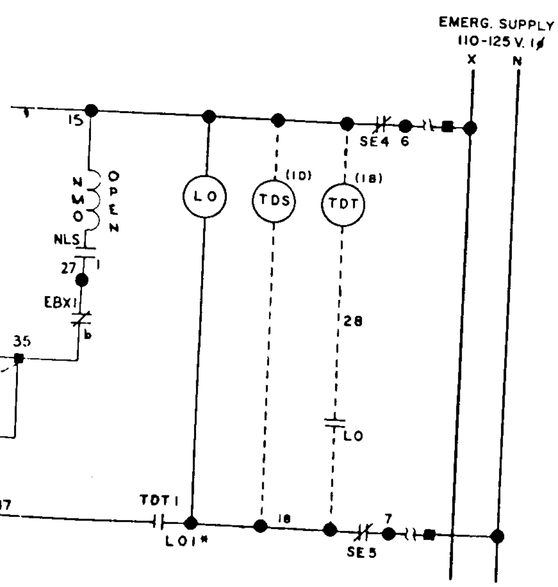
LEGEND

, 3V — Voltage Sensing Relays
— Control Transformer
— Emergency Breaker
— Emergency Limit Switch
— Emergency Motor OP
— Emergency Sensing Relay
— Normal Breaker
— Normal Limit Switch
— Normal Motor OP
— Push Button
— Breaker Alarm Switch

SE — Bus Selector Relay
SS — Selector Switch
TDB — Time Delay—Closing of NMO
TDS — Time Delay—Engine Stop
TDE — Time Delay—Engine Start
TDR — Time Delay—Re-Transfer
TDT — Time Delay—Transfer
NBX — Normal Breaker Aux Switch
EBX — Emergency Breaker Aux Switch
N-IL — Normal Indicator Lamp
E-IL — Emergency Indicator Lamp







STANDARD TELEMAND DIAGRAM

THIS UNIT IS EQUIPPED WITH THE OPTIONS CHECKED—

- ☐ 1A — Delay on re-transfer to Normal-TDR-Delay on energize. TDR is normally energized.
- ☐ 1B — Delay on transfer to Emergency-TDT-Delay on energize. TDT is normally de-energized.
- ☐ 1C — Delay on engine Start-TDE-Delay on de-energize. TDE is normally energized.
- ☐ 1D — Delay on engine Stop-TDS-Delay on de-energize. TDS is normally de-energized—energizes on Emer. supply.
- ☐ 2A — Delay on closing Normal Breaker-TDB-Delay on de-energize. TDB is normally de-energized.
- ☐ 3A — Close differential V relay 1∅ bus, 1V only, otherwise standard Diff. V relay is used.
- ☐ 3B — Close differential V relays 3∅ bus 1V, 2V, 3V otherwise standard Diff. V relays are used.
- ☐ 4 — Selector Switch-SS, 2 position—simulates normal failure only, effecting transfer to emergency.
- ☐ 5A — Push Button Re-transfer-PBI—normally used in lieu of auto re-transfer.
- ☐ 5B — Push Button PBI—used to by-pass time delay of TDR, to re-transfer without delay.
- ☐ 6A — Engine start—B Contacts of SE (and TDE when used) contacts close when normal fails.
- ☐ 6B — Engine start—A contacts SE, SEA, TDE as used, contacts open when normal fails.
- ☐ 7A — Position indicating lamp.
- ☐ 8 — Selector Switch-SS, three position—test simulates normal failure; Auto. position is normal, Maint. position open, or resets breakers & prevents electrical closing of breakers.
- ☐ 9 — Battery Charger-A-12V; B-24V; C-32V, may be Ext. mounted.
- ☐ 10 — Plant Exerciser—simulates normal failure or starts engine. Plant only, may be Ext. mounted.
- ☐ 11 — Overload protection—trip units in breakers, includes reset.
- ☐ 12 — Enclosure type—A, NEMA 1; B, NEMA 1A; C, NEMA 3.
- ☐ 13 —
- ☐ 14 —

Normal Operating Sequence

The sequence will be modified by the function of the extra features checked above.

Condition A—Normal supply energized—Emer. supply de-energized—V relay(s) picked up—relay SE picked up—normal breaker closed.

Condition B—Normal supply fails for 2 Sec.—V relay(s) drops(s) out—SE relay drops out—engine start circuit is activated.

Condition C—Emer. supply is energized—relay LO picks up—normal breaker opens—Emer. breaker closes.

Condition D—Normal supply is re-energized—V relay(s) pick-up—SE relay picks up, LO relay drops out—Emer. breaker opens—normal breaker closes.

When unit performs as a bus transfer switch only, the transfer operation would occur upon dropout of SE.

(1A) designations indicate listed options.

\# If TDT is not used, this is an LO contact.

■ Signifies connection on terminal block as required.

- - - Dotted in components are optional or in external customer Equip. Circuits shown de-energized & breakers open.

△ Adjust relays to

Pickup @ ______% = ________V.

Dropout @ ______% = ________V.

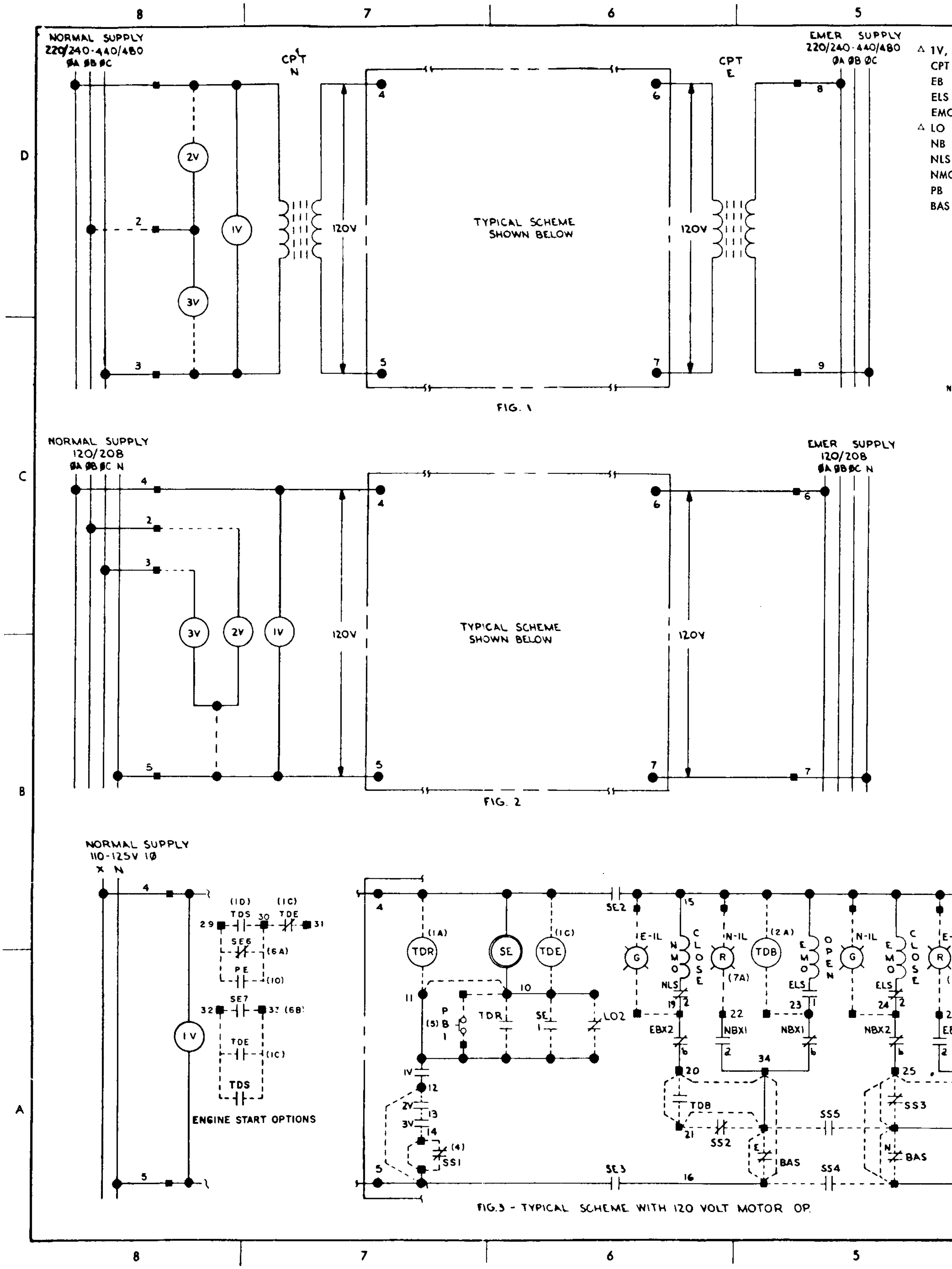


FIG. 1

FIG. 2

FIG.3 - TYPICAL SCHEME WITH 120 VOLT MOTOR OP.