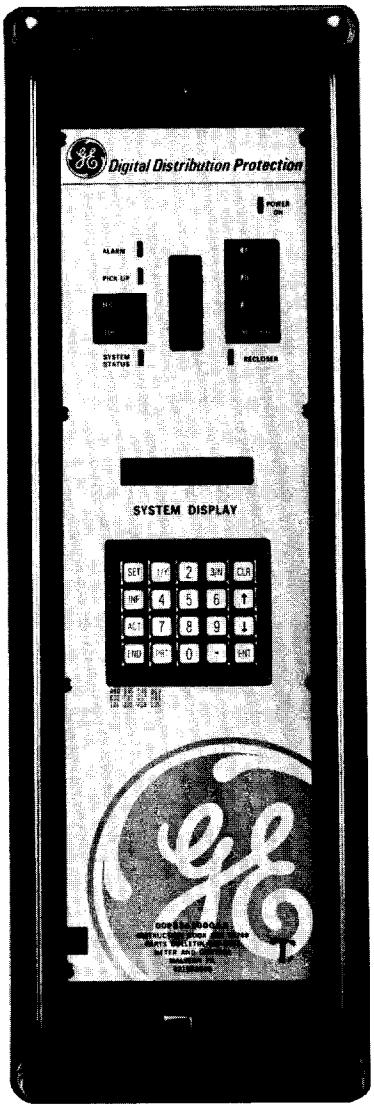
GEK-99269C
DDP
DIGITAL DISTRIBUTION
PROTECTIVE RELAYING SYSTEM



Meter and Control
Business Department

General Electric Company
Protection & Control Division
205 Great Valley Parkway
Malvern, PA 19355

These instructions do not purport to cover all details or variations in equipment nor 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 purpose, the matter should be referred to the General Electric Company.

To the extent required the products described herein meet applicable ANSI, IEEE, and NEMA standards; but no such assurance is given with respect to local codes and ordinances because they vary greatly.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

PRODUCT DESCRIPTION

GENERAL

The DDP is a micro-processor based digital protection, control and metering system. It uses waveform sampling of three-phase and neutral current inputs and appropriate algorithms to provide distribution feeder protection and related functions.

User interaction with the DDP can be either via a keypad local man-machine interface or an RS232 communications interface. The keypad is provided with the basic relay; the communications interface is a user selectable option.

Models of the DDP are available for control voltages of 48, 125 and 250 VDC. Each has a different model number, which must be specified in the ordering procedure.

A block diagram of the DDP is shown in Figure PD-1. A typical external connection diagram is shown in Figure PD-2.

APPLICATION

The DDP is designed for application on distribution feeders and other circuits where three-phase and ground time and instantaneous non-directional overcurrent protection is desired. Other functions are provided as described in the following sections.

More detailed application considerations are contained in the remaining headings of this section and in the CALCULATION OF SETTINGS section.

FUNCTIONS

The following functions are available with the DDP (See also available features later in this section):

Protection
Control (Automatic Reclosing) - Available as an optional function
Sequence Coordination
Metering
Breaker Interrupting Duty

Protection

Three-phase and ground time and instantaneous non-directional overcurrent protection is provided. Two instantaneous overcurrent functions, a high set and a low set, are included with independent settings. Time and instantaneous settings can be independently set for both phase and ground.

Four user selectable time overcurrent characteristics are included. They are inverse, very inverse, extremely inverse, and definite time. These characteristics can be independently selected for phase and ground by the user. Inverse, very inverse, and extremely inverse time current characteristics are shown in Figures PD-3 to PD-5. The instantaneous overcurrent characteristic is shown in Figure PD-6.

Depending on the DDP model selected, the time overcurrent pickup range for phase and ground is either 0.1 to 2.4 A or 0.5 to 12.0 A. Similarly, depending on the model selected the instantaneous overcurrent pickup range is either 0.10 to 32.00 A or 0.50 to 160.00 A.

Three separate trip contact outputs are provided which are user programmable. The user can select phase and ground for the time overcurrent and the two instantaneous overcurrent functions to be assigned to any of the three trip outputs.

Capability is included in the DDP for the user to set two different values for selected protection function settings. Switching from one set of protection settings to the other can be accomplished, if this capability is enabled by the

associated setting (GRP-SW), and then activated either by using the communications interface or by closing an external contact input to the DDP.

The DDP includes capability for the user to change settings from the remote point via the communications interface. However, it is necessary for the user to first cut Jumper J1 on the backplane of the DDP to enable this capability.

Provision for an external contact input (TORQUE) is included to allow programmable control of both the instantaneous and time overcurrent protection functions.

Control (Automatic Reclosing) - Optional Function

The DDP is available either with or without the automatic reclosing function. The reclosing function in the DDP is similar to the GE SLR12. Automatic reclosing can be used to close a circuit breaker up to four times following tripping by the DDP protection functions. Any, or all, of the reclosures can be selected. If all four reclosures are selected, the first reclosure will always be instantaneous, followed by three time-delayed reclosures. If three, or less, reclosures are selected, all three may be time-delayed, or one instantaneous reclosure followed by up to two time-delayed reclosures. The instantaneous reclosure has no intentional time delay. The reclosure and reset times for all reclosures are as follows:

	Time Range Seconds	**Resolution**	**Time Multiplier**
Instantaneous Reclosure	No intentional time delay (<50 ms)	-	
First Timed Reclosure	0.1 to 15.9	0.1	0.5, 1, 2, 4
Second Timed Reclosure	1 to 159	1	
Third Timed Reclosure	1 to 159	1	
Reset Time	1 to 159	1	

The time multiplier works on all time ranges concurrently: i.e., it is not possible to change only one recloser time range. The time multiplier has no effect on the instantaneous reclosure.

The reclosing function is coordinated with the overcurrent functions of the DDP. A setting, RECLON52 will determine when the recloser operates. If RECLON52 is set to YES, the reclosing function is initiated by the operation of the breaker 52b contact and an externally ordered trip will also cause the reclosing function to begin its sequence unless it is otherwise blocked. Refer to the typical external connection diagram in Figure PD-2. If RECLON52 is set to NO, the recloser will operate only if the DDP caused the trip.

Block Instantaneous Tripping

A setting, BLK-IOC is available that allows the user to block the instantaneous overcurrent from tripping after the first reclosure. To prevent causing a slow pumping operation of the breaker, reclosing reset is delayed if feeder current is above the time overcurrent pickup setting following reclose and if the BLK-IOC setting is set to YES to block instantaneous overcurrent from tripping after the first reclose. Switch S1 must be set in either Pause Reset, or Pause Reset and Reclose (Refer to Figure CS-2). Also, the PAUSE setting should be set to a value long enough to extend the reset time of that recloser, which will allow TOC to trip during the reset time; thus, allowing it to go through its sequences.

The user may also set the reclosing function to inhibit reclosing following pickup of the high-set instantaneous overcurrent function using the BLK-REC setting. Also, the instantaneous overcurrent function will be disabled automatically during the reset time following manual close of the breaker if the BLKIOCLO setting is set to YES.

Recloser Inputs and Outputs

Four contact inputs and four contact outputs are provided with the reclosing function. These are listed below:

Contact Inputs	Contact Outputs
Delay Reclose (DR)	Reclose (REC)
Pause (P)	Relay Spare (RS)
52a	In Progress (IP)
52b	Lockout (LO)

The input contacts are used as follows:

- DR may be used to skip the first selected reclose signal.
- P may be used to delay the start of the reclose signal, or to extend the reset time, or both.
- 52a, 52b auxiliary contacts of the breaker are used to indicate the status (opened or closed) of the breaker.

The output contacts are used as follows:

- REC is the reclose signal.
- RS is a pair of auxiliary relay contacts that can be operated at any selected reclose with adjustable pickup and dropout times.
- IP is used to indicate that the reclosing function is in progress for a reclose or reset.
- LO is used to indicate that the reclosing function is in lockout.

Operation

Once the reclosing function is enabled, with setting REC-EN set to YES and protection on, operation is controlled by the breaker auxiliary "a" and "b" switches and the breaker control switch 52CS. As noted earlier, the DDP can be programmed so that an externally ordered trip will not cause the reclosing function to operate. If the breaker is closed when the reclosing function is enabled, it will recognize that the "a" switch is closed and that the "b" switch is open and will awaken in the reset position. 'RES.' will be displayed on the LCD for the reclosing function. If the breaker is open when the reclosing function is enabled, the auxiliary switches will be in the opposite states and the reclosing function will awaken in the LO (Lockout) state with 'L.O.' displayed on the LCD. When the breaker is closed manually, the auxiliary switches will transfer state ("a" closes, "b" opens) and the reclosing function will start to count down from a time equal to the reset setting (this can be observed on the LCD). At the end of the reset period, the recloser will assume the reset position and RES. will be displayed on the LCD. If the breaker were to trip as the reclosing function was counting down, the auxiliary switches would again change state and the reclosing function would immediately go to the lockout position, thus preventing any further reclosures. At that time, L.O. would be displayed on the LCD.

If the breaker is tripped manually, no reclosure will take place if the manual trip was commanded through the man-machine interface of the DDP (keypad) or from the remote point via the communications interface or if RECLON52 is set to NO. If the breaker is closed manually/externally while the reclosing function is counting down during any of its reclose cycles, reclosing goes into lockout for the reset period.

If the setting RECLON52 = YES, then for a manual trip via an external control switch, contacts of the control switch must be arranged to open the close circuit since the reclosing function will count down to the first reclosure selected (no countdown if instantaneous was selected) and at that time will produce an output to reclose the breaker. No reclosure will take place, however, if the contacts of the control switch are arranged to open the close circuit. At the instant that the reclose output is produced, the reclosing function will check to see if the breaker auxiliary switches transfer; i.e. if "b"

opens and "a" closes. A time limit is built into the reclosing function for this transfer to occur, and is equal to 0.9 times the time multiplier in seconds (see Multiplier in the CALCULATION OF SETTINGS section). Thus, if a time multiplier of 1.0 is selected, the transfer of the auxiliary switches must occur within 0.9 seconds after a reclose output is produced. If the transfer does not occur within this time period, the reclosing function will immediately go to lockout.

When the breaker is tripped by the DDP overcurrent protection functions, the reclosing function will go through its set reclosing sequence following closure of the "b" switch. When the first reclosure point is reached, a reclose output will be produced to close the breaker. If the breaker closes successfully, as indicated by a transfer of the auxiliary switches within the specified time limit, the reclosing function will start to count down to reset. If no tripping occurs during this period, the reclosing function will reset and be ready to initiate another complete reclose cycle when required. If a trip does occur during the reset period, the reclosing function will then go on to the next reclosure, if one has been selected. If the breaker retrips following each reclosure, the reclosing function will go through its complete cycle. Following the last reclosure, the reclosing function will immediately go to lockout when the breaker retrips. The set time for each reclosure is independent of previous reclosures; i.e. the reclose times are not cumulative and do not start from the time that the breaker is first tripped.

Recloser Features

Additional features are provided with the automatic reclosing function. These include Delayed Reclose, Pause, Memory, Reclose Spare, and Time Multiplier. All of these features and their settings are more fully described in the CALCULATION OF SETTINGS section.

Delayed Reclose

The DR input is included to allow the first selected reclosure to be skipped and to go directly to the next reclosure. For example, if the instantaneous, first, and third reclosures are selected, an input (contact closure) at the DR input will cause the instantaneous reclosure to be skipped and the reclosing function will go directly to the first time delay reclosure.

Pause

The Pause input, in conjunction with a switch on the MMI panel, can be used to delay a reclose output and/or the reset time of the reclosing function.

Memory

The reclosing function is provided with a memory feature that is useful in cases where the input power can be lost during a reclose cycle. The memory feature can be enabled or disabled, using the DEF-MEM setting, at the user's discretion. When it is enabled, it will remember what stage in the reclose cycle the recloser had reached when power was lost, and will return to the beginning of that reclose cycle when the power is restored.

The setting RLY-MEM is used to select which combination of the Relay Spare, In Progress, and Lockout contact outputs will be remembered after power is lost then restored.

Relay Spare

A pair of output contacts, one normally open and one normally closed, designated RS (Relay Spare) are provided for use in external control circuits. The RS contacts can be set to be activated at any one, but only one, of the selected reclosures. They can be set to operate with pickup delay and dropout delay if desired. These delays are both measured starting at the reclosure selected to activate RS.

Time Multiplier

A Time Multiplier setting is included to allow the range of all time settings in the recloser to be changed by multiplying them by a factor of 0.5, 1, 2, or 4. The instantaneous reclose is not affected.

Sequence Coordination

The purpose of the sequence coordination function is to provide coordination of the DDP instantaneous overcurrent protection functions with a recloser (or reclosers) located downstream on the distribution feeder. This function, when enabled by the user, utilizes a short settable time delay (TSEQ-DLY set from .05 to .50 seconds) with the instantaneous overcurrent functions to allow time for the remote recloser to clear a fault beyond it before the DDP instantaneous overcurrent protection operates.

Note: Normally, the instantaneous protection at the feeder breaker will be set so as not to overreach the downstream recloser. However, the DDP includes capability for delaying the instantaneous protection in case this coordination is necessary.

If the remote recloser trips, the DDP instantaneous protection will reset and be blocked from tripping for a settable time period (TSEQ-RES set from 5 to 600 seconds) to allow the remote recloser to go through its reclosing cycle and either clear the fault or go to lockout.

To further facilitate coordination with the sequence coordination function, time delay on pickup of the instantaneous overcurrent functions can be set from 0 to 250 milliseconds for the low-set pickup and 0 to 50 milliseconds for the high-set pickup. When the sequence coordination function is enabled, by setting SEQ to YES, the time setting for the low-set instantaneous overcurrent function is automatically added to the time set for TSEQ-DLY. If another setting (SEQ-BLKH) is set to YES, then the time delay setting for the high-set instantaneous overcurrent function is added to TSEQ-DLY.

As mentioned earlier, the instantaneous functions at the feeder breaker will normally be set so as not to overreach the downstream recloser.

The DDP time overcurrent protection function remains operative during the period when the instantaneous overcurrent functions are blocked and it is necessary for the user to coordinate these settings with those of the remote recloser. The DDP instantaneous overcurrent protection will be re-enabled automatically after a settable time period, TSEQ-RES.

The low-set instantaneous overcurrent function is automatically inhibited following operation of the remote recloser when the sequence coordination function is enabled if the downstream recloser operates within the combined time delays described above. The high-set instantaneous overcurrent function is inhibited if the downstream recloser operates before the combined time delays for it and TSEQ-DLY expire and if SEQ-BLKH is set to YES. Operation of the remote recloser is sensed by the DDP when the feeder current at the DDP goes below the instantaneous pickup settings without the DDP issuing the trip command, and without the local feeder breaker opening (as sensed by the 52b contact). If the DDP does not have a 52b contact to check, it makes the decision strictly by sensing current going below the pickup settings and knowing that it did not issue a trip.

Some users may elect to leave the high-set instantaneous overcurrent functions in service (SEQ-BLKH set to NO) during this period to cover a second contingency condition such as a fault occurring between the feeder breaker and the remote recloser while the remote recloser is still going through the reclosing sequence for a fault beyond it.

Operation of the sequence coordination function is further described in the flowchart shown in Figure PD-7.

Metering

The metering function provides RMS currents for each phase current and for ground current. These values are displayed on the 16 character alphanumeric display on a continuing basis if the display is not being used for some other purpose. Each current is displayed for 4 seconds and then the next value is displayed, i.e. phase A current for 4 seconds, phase B current for 4 seconds, etc. The value displayed during each 4 second

interval is a constant value that is the latest value calculated prior to the beginning of that 4 second interval. The displayed value does not change during the 4 second interval.

In addition, demand currents are calculated for each phase current based on a settable time interval of either 15, 30, or 60 minutes. The DDP saves the latest 24 hours of demand current values for each phase. It also saves the maximum value of demand current for each phase (on a 15 minute interval basis) until a new higher value is measured. The time and calendar date for these maximum values of demand current are also retained. These demand values and the time and calendar date for the peak demand values are saved in RAM and will be lost in the event power is lost to the DDP.

Breaker Interrupting Duty

A cumulative total of breaker interrupting duty for each phase is maintained by the DDP in EEPROM. This quantity for each phase is calculated and displayed as $(Amperes)^2$-Seconds. It is necessary for the user to enter an input value (ARC-TIME setting) for typical operating time for the breaker with which the DDP is associated. This time is used by the DDP in the interrupting duty calculation.

The user also may enter a number corresponding to 100% interrupting duty, which enables the DDP to calculate for each phase the % cumulative interrupting duty. The alarm contact is operated when 80% of the interrupting duty is exceeded.

FEATURES

The following features are available with the DDP:

Man-Machine Interface
Trip Circuit Monitor
Self Test
Remote Communications
Fault Report
Alarms
Breaker Control
Graphical Display

Man-Machine Interface

A local MMI incorporating a keypad and a liquid crystal display (LCD) is provided to allow the user to enter settings, display present values, view fault target information, and access stored data. Those DDP models that include the automatic reclosing function include a second LCD that is associated with reclosing only.

The following light-emitting-diode (LED) display is provided for indication purposes:

DC Power On	POWER ON	Green
Phase and/or Ground Trip	A,B,C,NEUTRAL	Red
Time Overcurrent Trip	TOC	Red
Instantaneous Overcurrent Trip	IOC	Red
Current above TOC Pickup	PICK-UP	Amber
DDP Critical Failure/Protection Off	ALARM	Red
Reclose Output Active**	RECLOSER	Green
Protection On, DDP OK	SYSTEM STATUS	Green

**Indicates recloser output contact will be closed unless block reclose (BLK-REC) is enabled, or some other condition exits that blocks recloser output.

The use and functioning of the MMI is fully described in the INTERFACE section.

Trip Circuit Monitors

Trip Voltage Monitor:
Within the DDP relay system, the DC battery voltage across the TRIP1 contact is continuously monitored (except during a trip) to determine if the associated trip circuit is intact. If the DC across the TRIP1 contact dips below the minimum battery voltage, the DDP detects it and reports WARNING #23 and opens the alarm contact.

Trip Current Monitor:
When the DDP issues a trip it monitors current through the respective output contacts i.e. TRIP1, TRIP2, and TRIP3 contacts. If trip current is absent (less than 150mA for 50 msec) following a trip command, or if trip current persists (beyond 300 msec following a trip command) indicating that the breaker failed to open, then the DDP will issue WARNING #21 and open the alarm contact. This function replaces the red light indicator often used for trip current monitoring.

Self-Test

The DDP includes extensive self-test features. Many of the self-tests are performed both at start-up and in background mode with the DDP in service. Some of the self-tests and actions that are made are listed below:

- Consistency of DDP model number with installed hardware options, (e.g. Recloser.)
- CRC check of PROM
- Write/Read test of RAM
- Write/Read test of shared RAM
- CRC check of EEPROM
- Range check of settings in EEPROM
- Analog input reference voltage check
- Real-time clock test
- Interprocessor communications timeout test
- Display busy timeout test
- Spurious interrupt tests
- CRC check of communications
- Watchdog timer (if not updated) issuance of hardware restart
- Hardware lockout for more than 3 restarts within 10 second period

Remote Communications

Five terminals are provided on the rear of the DDP case to permit the user to communicate with the DDP from an IBM PC compatible computer. An optional flexible connector cable, 5 feet in length, is available for connection to these terminal points. This cable includes an RS232 compatible 25 pin connector at its other end. This cable is available to facilitate connection by the user to a modem for communicating to a remote computer, or to a computer within 50 feet of the DDP via an appropriate cable.

Unique PC software is required to communicate with the DDP. The capabilities are described in the SOFTWARE section.

Fault Report

Fault data is captured and retained in non-volatile memory by the DDP for the latest 30 fault events. This data includes the RMS value of current for each phase and ground. These values are calculated based on the cycle of data following the issuance of the trip command. Fault report data includes date and time of the trip command, and the DDP protection function (instantaneous low-set, instantaneous high-set, or time overcurrent and which phases and/or ground) that issued the trip command. If more than one DDP protection function orders tripping for a given fault, each is indicated in the fault report. The currents shown are associated with the first protection function that issued the trip command. Time-tagging is to the nearest millisecond.

Fault data also includes time-tagged reclosing commands when issued by the DDP reclosing function.

A full description of this function is included in the INTERFACE section.

Alarms

A single alarm contact is provided. When operated, it indicates that either self-test has detected a problem for which the DDP can no longer protect the distribution feeder, a warning condition exists, protection is off, a power supply failure has occurred, or that 80% of the entered breaker I2T limit has been exceeded.

A separate contact output is available that indicates that phase or ground current is above pickup level for the time overcurrent protection function.

Detection by the self-test function that a critical failure has occurred within the DDP, rendering it incapable of continuing to provide protection, results in the DDP automatically turning protection off. In this event, the red Alarm LED is lit.

Breaker Control

By using the local MMI or a remote PC connected to the DDP via the communications connector, it is possible to trip and close the distribution feeder breaker. To enable breaker control from the remote point, it is necessary for the user to cut Jumper J2 on the backplane of the DDP.

Graphical Display

DDP supports graphical display of Demand Currents, Breaker Interrupting Duty, and Disturbance Data. Data is stored in the memory of the DDP for the latest 24 hours for the demand currents for each phase at a settable time interval of either 15, 30, or 60 minutes. This data can be transferred to a remote PC via a communications link and DDP-LINK software. Other software (DDP-DATA) is available to translate this data at the PC into a graphical display of 24 hours of data or to zoom into a smaller time period. This data may be saved at the PC into files so that data for different 24 hour periods can be displayed. Similarly, the cumulative breaker interrupting duty for each phase and disturbance data for the latest fault may be displayed at the remote PC.

A full description of this feature is described in the SOFTWARE section.

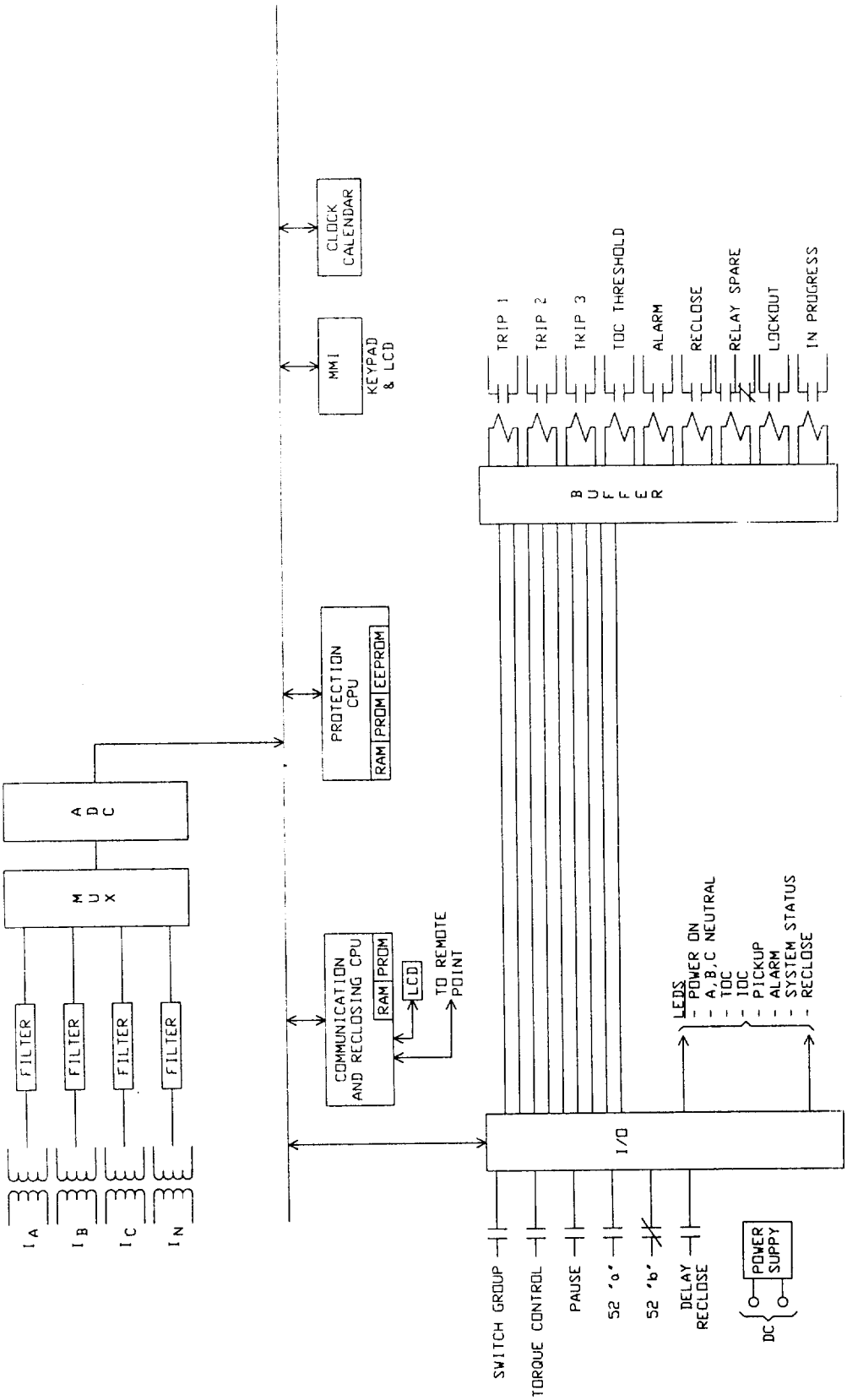


Figure PD-1 (0179C8408 [2]) Block Diagram
DDP (with Recloser Option)

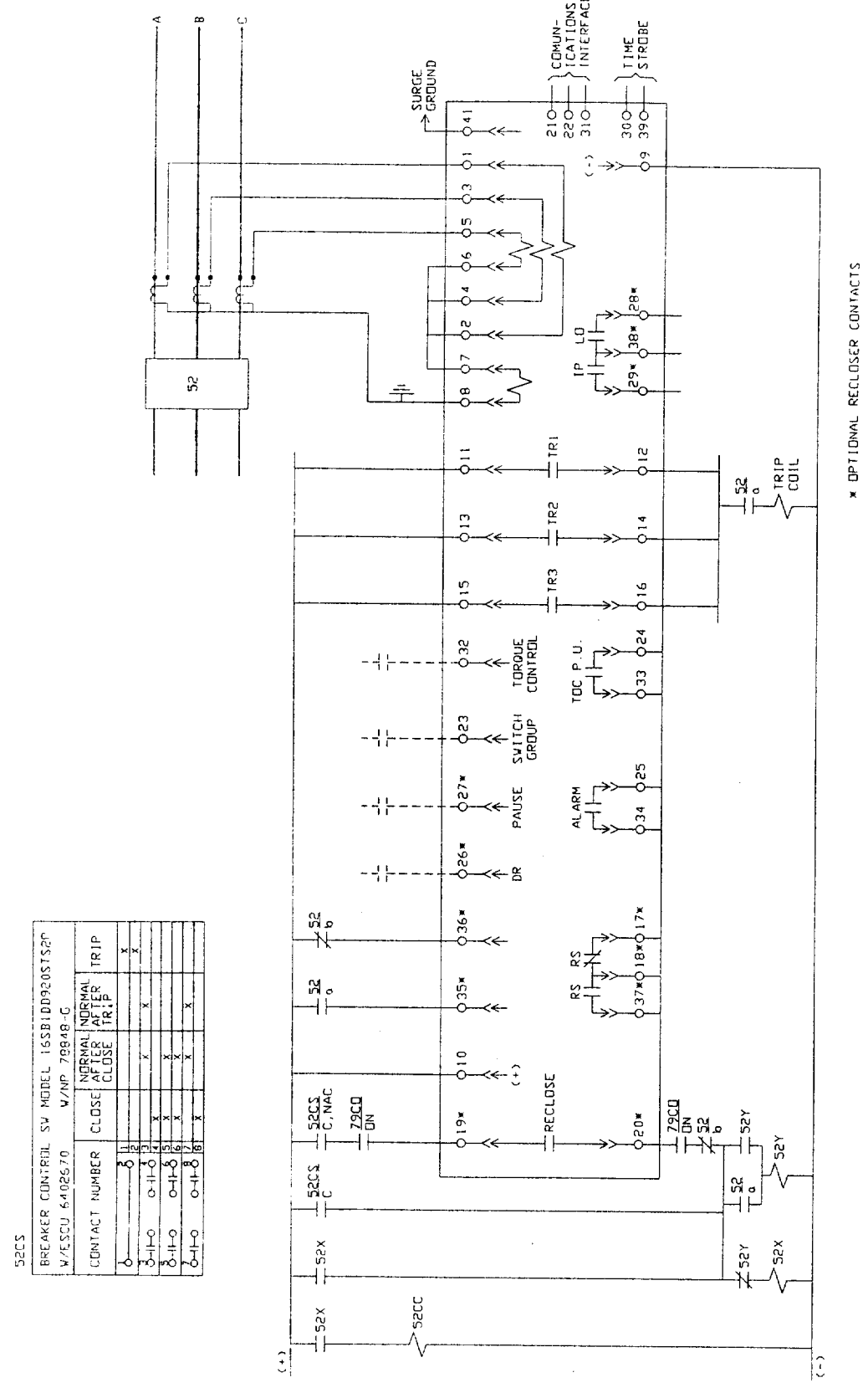


Figure PD-2 (0179C8409 [3]) Typical External Connection Diagram
DDP DC Powered Model (with Recloser Option)

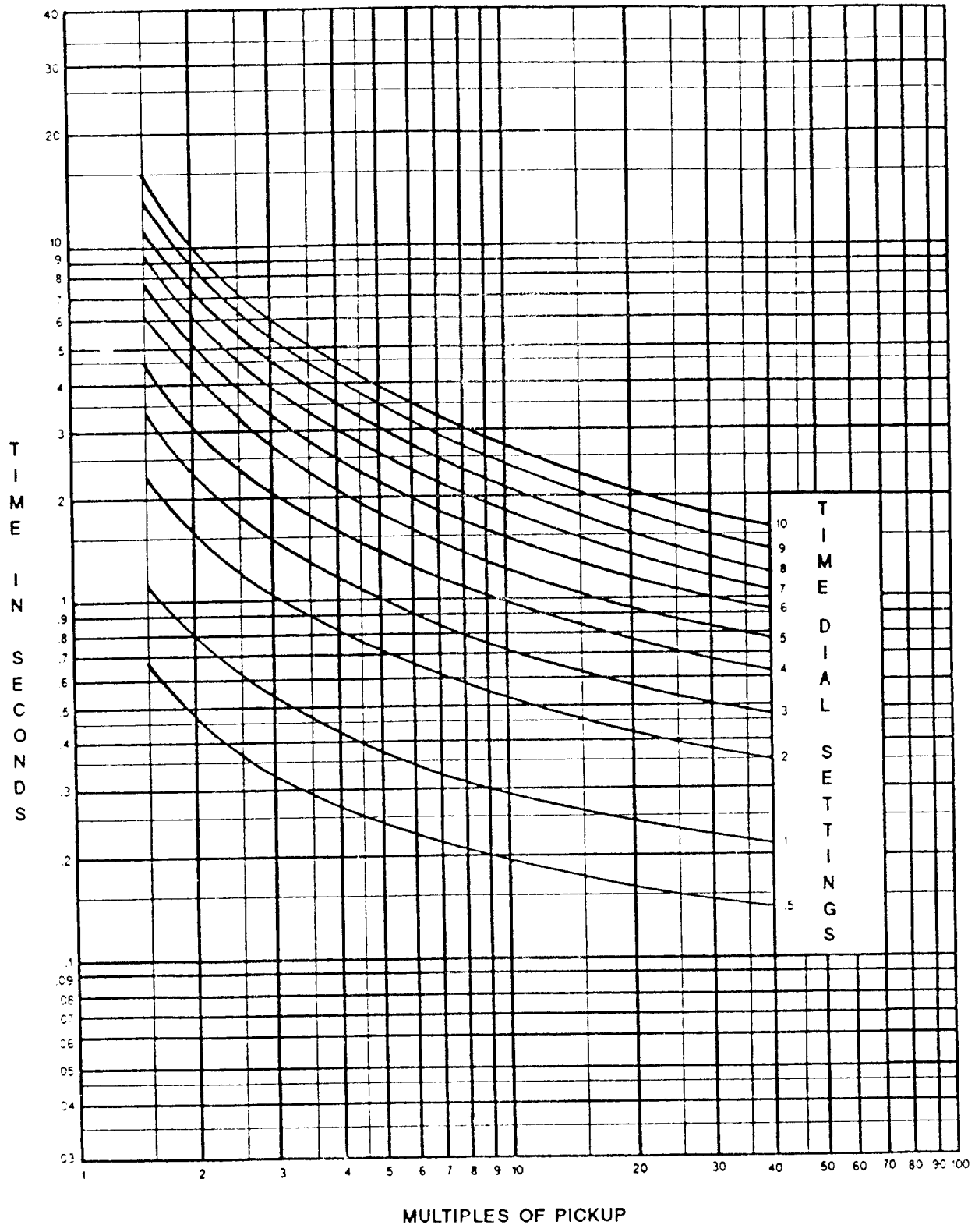


Figure PD-3 (0285A5373 [1]) Inverse Time Overcurrent Curve

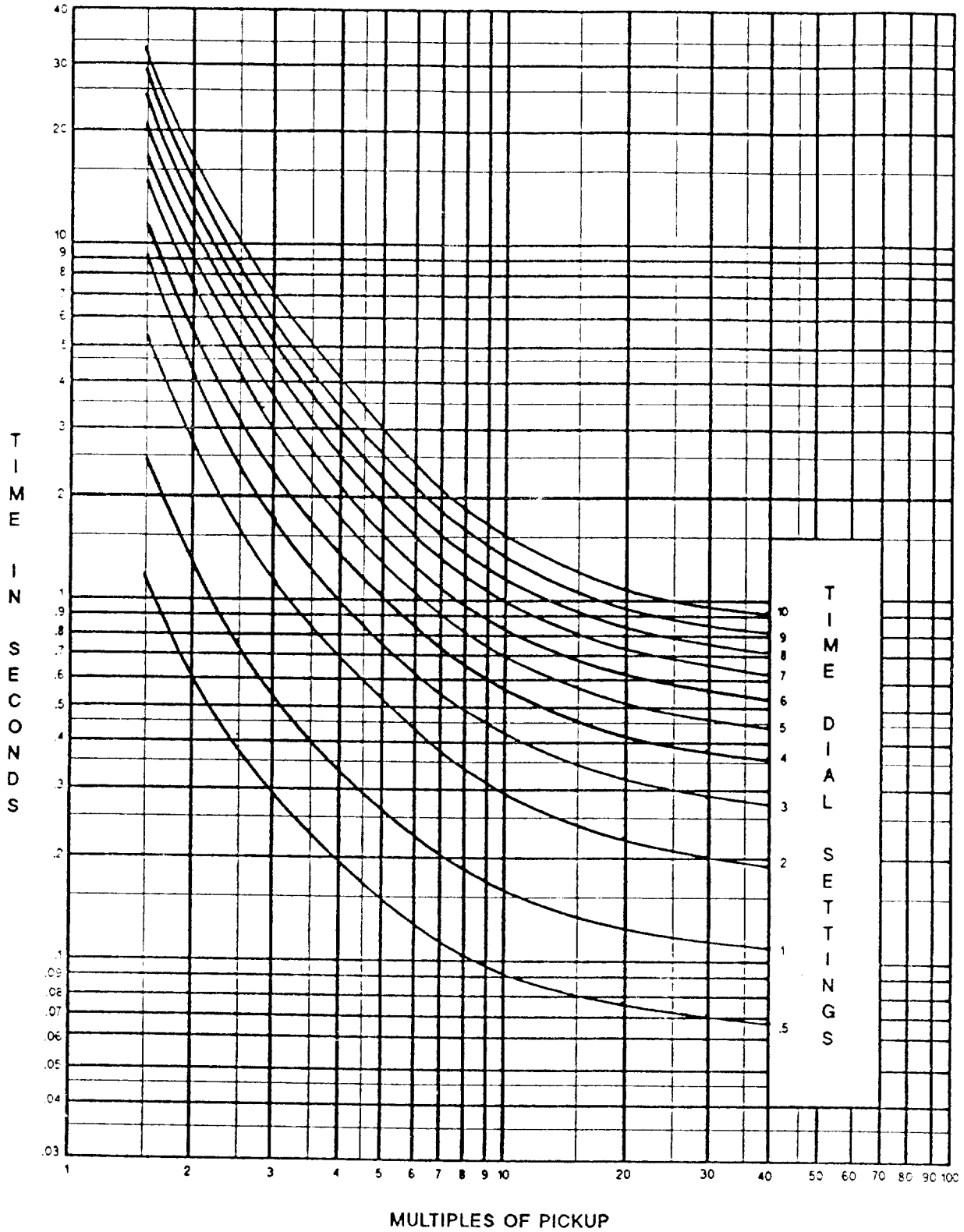


Figure PD-4 (0285A5375 [1]) Very Inverse Time Overcurrent Curve

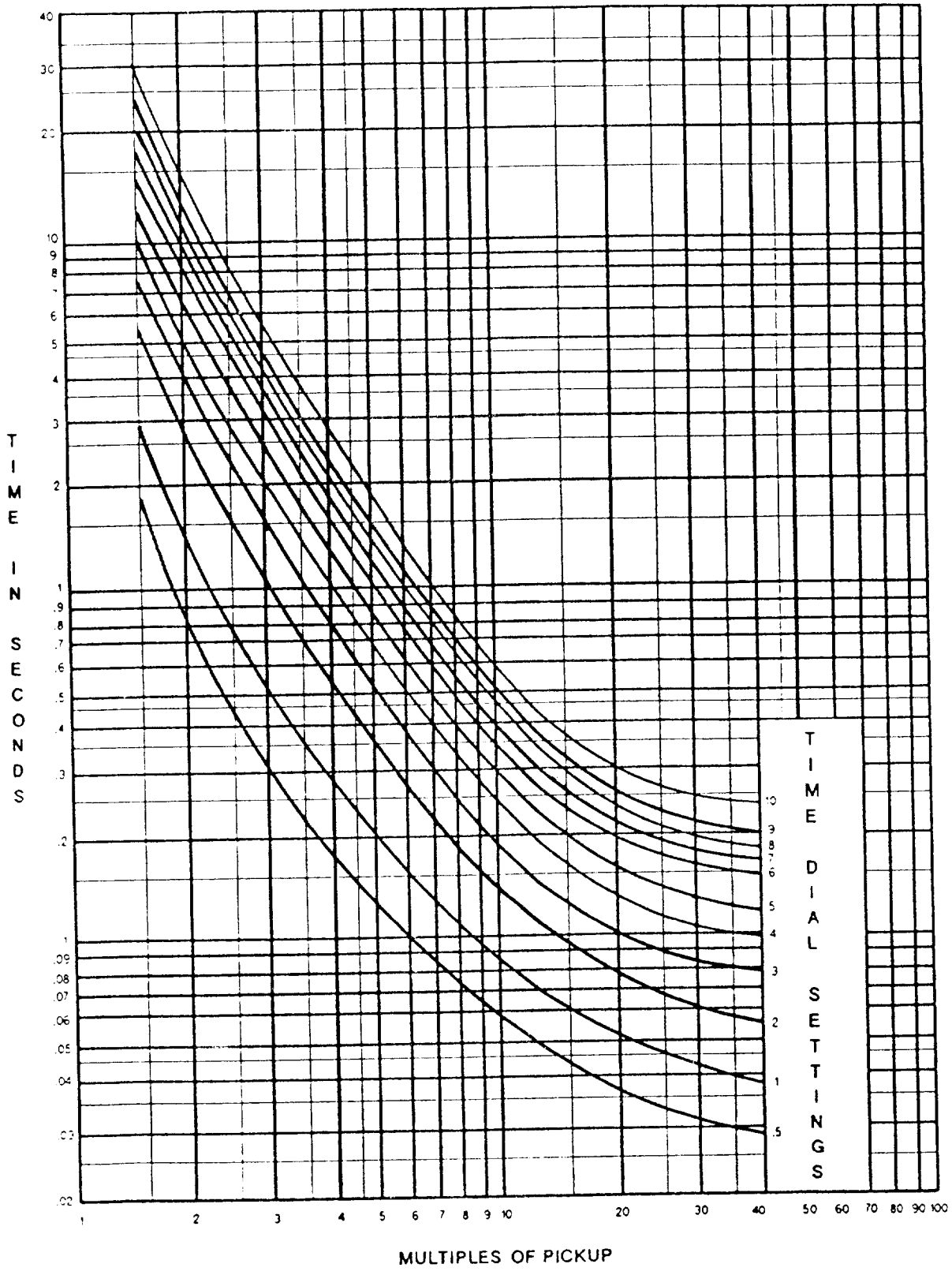


Figure PD-5 (0285A5374 [1]) Extremely Inverse Time Overcurrent Curve

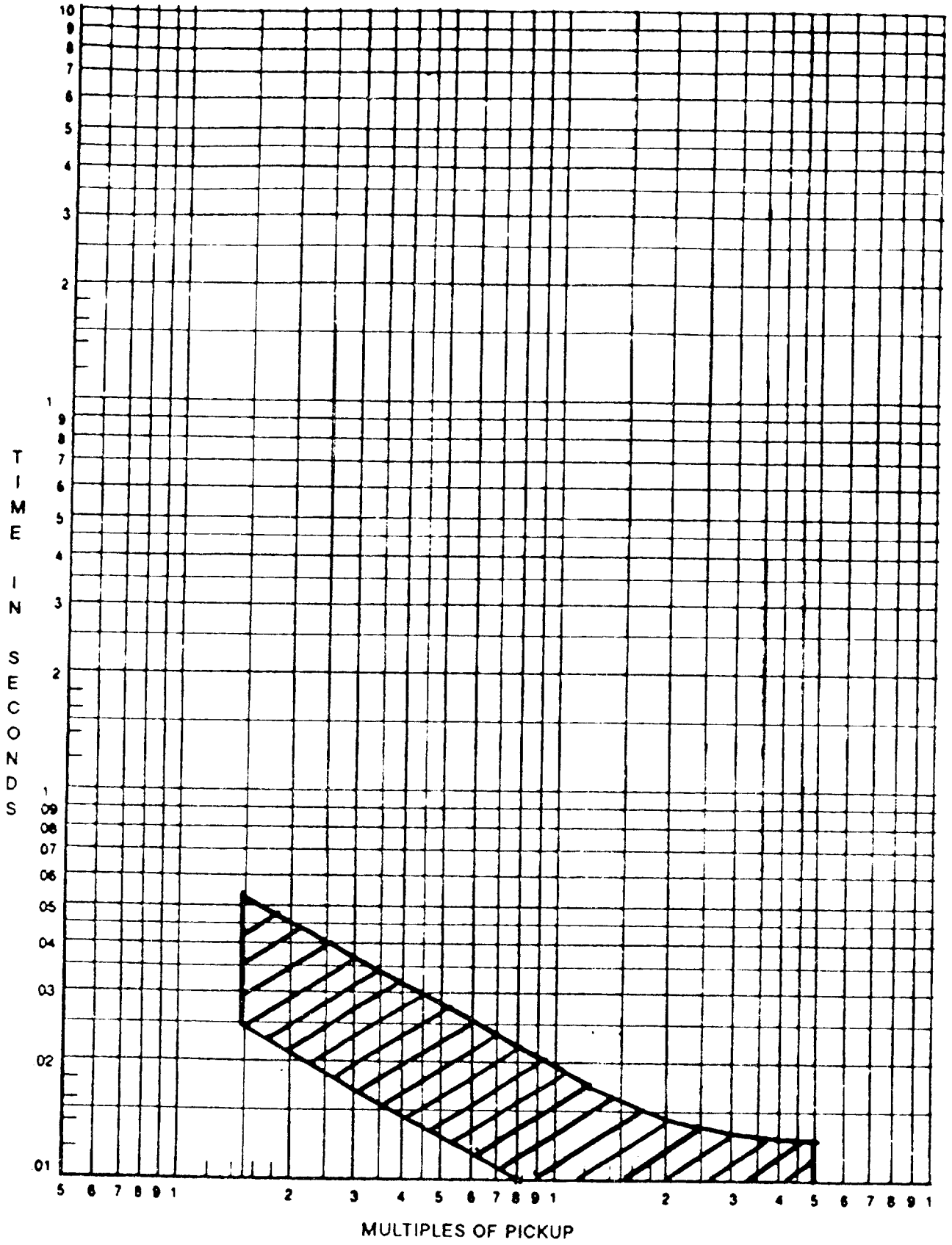


Figure PD-6 (0285A5385 [2]) Instantaneous Overcurrent Characteristic

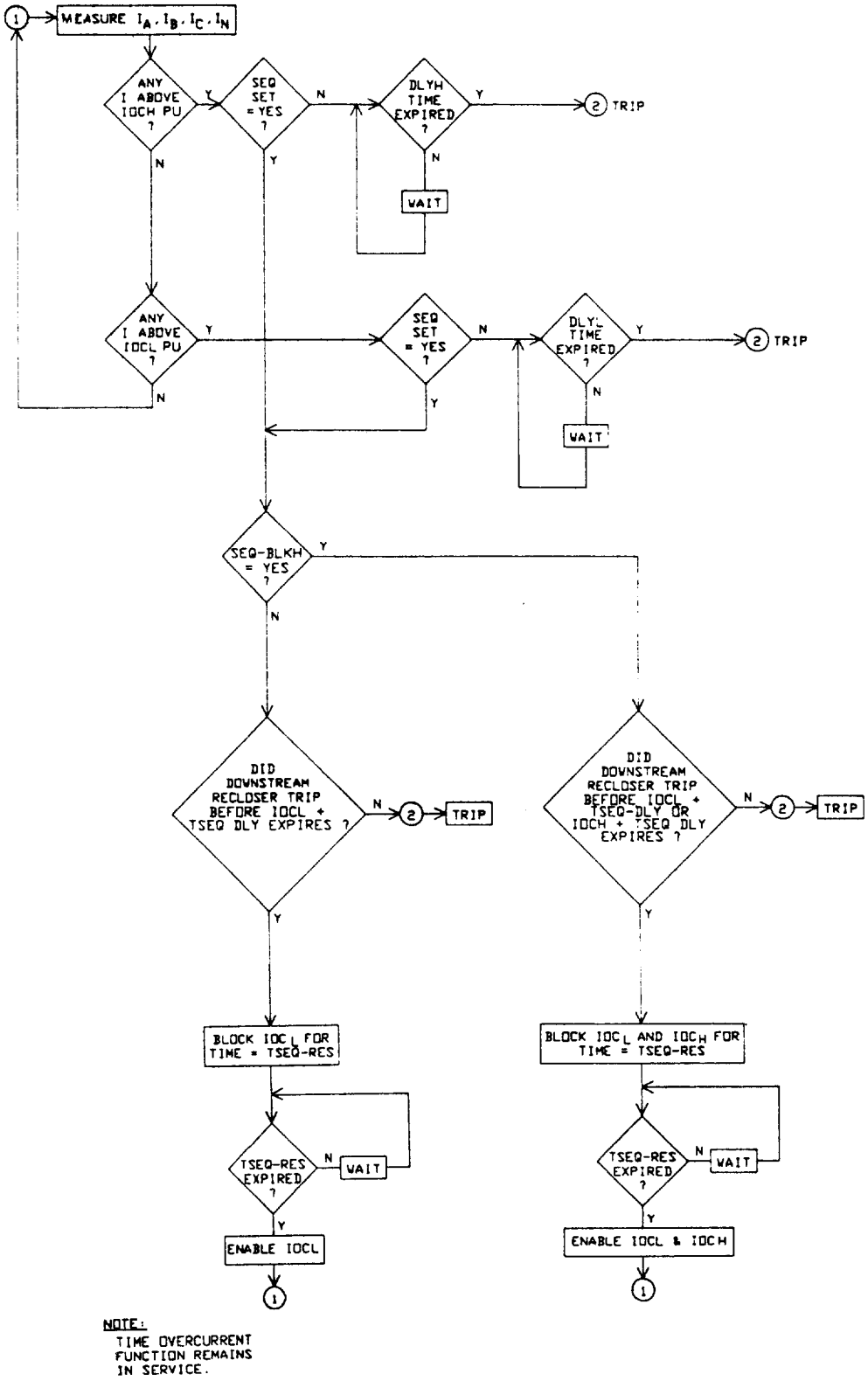
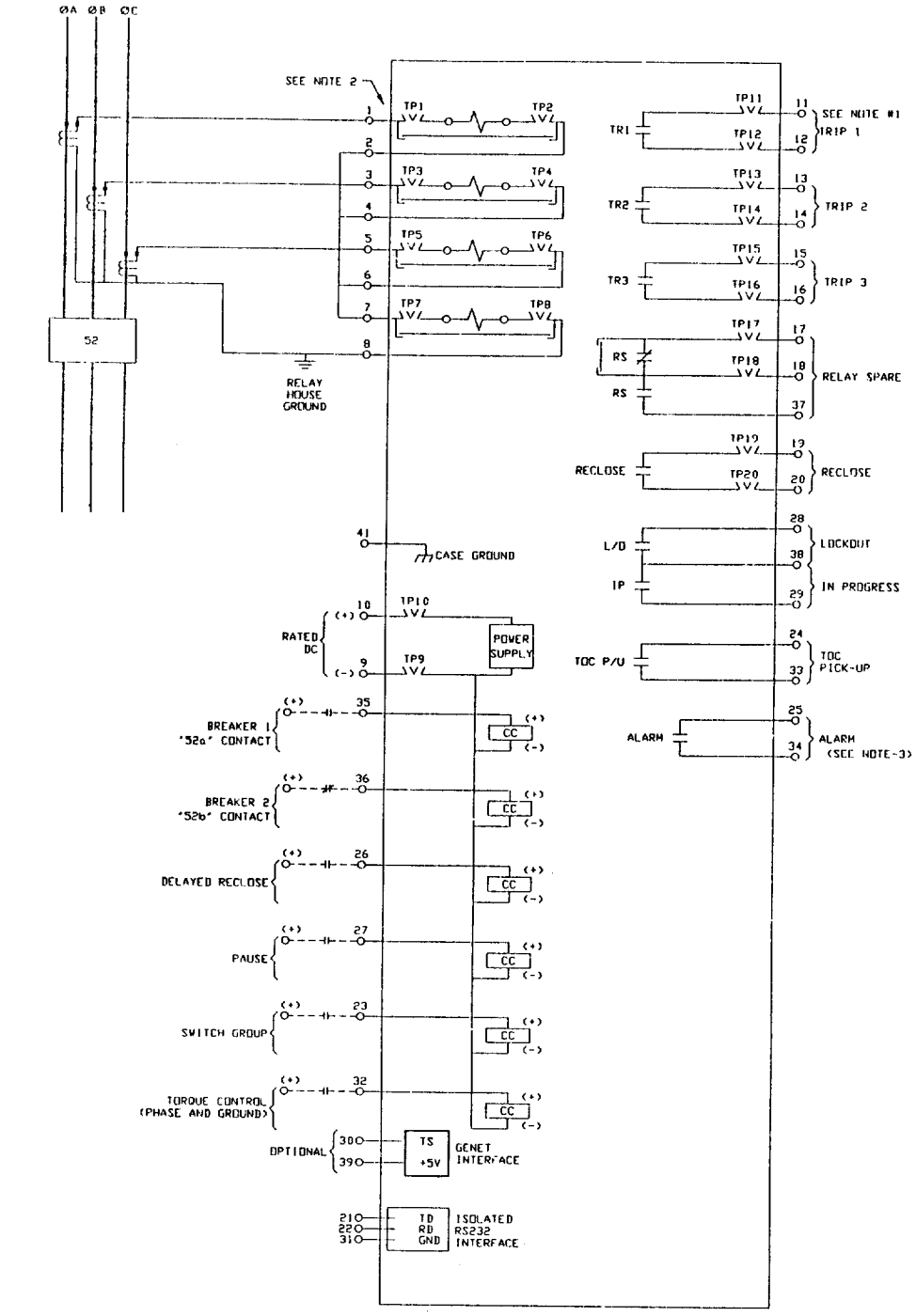


Figure PD-7 (0215B8552 [1]) DDP Sequence Coordination Function



NOTES:

1) TERMINAL 11 CONNECTS TO (+) SIGN OF DC SUPPLY.
2) _\/\/_ TEST FACILITY.
3) CONTACT SHOWN DE-ENERGIZED. UNDER NORMAL CONDITIONS, CONTACT IS ENERGIZED.

Figure PD-8 (0153D7844 [4]) Elementary Diagram
DDP DC Powered Model (with Recloser Option)

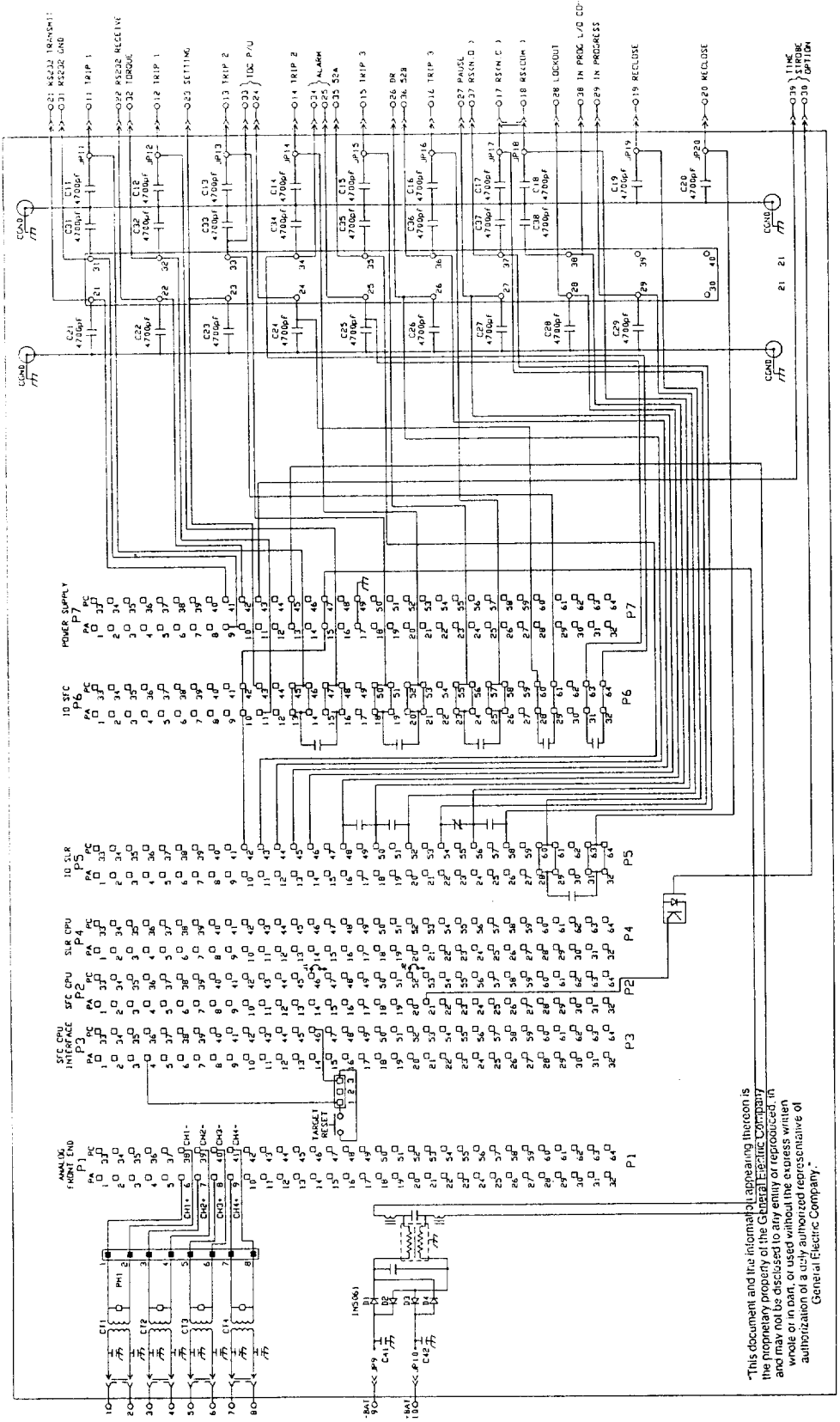


Figure PD-9 (0184B5687 [5]) Internal Connection Diagram

CALCULATION OF SETTINGS

This section provides information to assist the user in determining the required settings for the DDP relay system.

Table CS-1 lists all the settings and the corresponding ranges and units. The column entitled FACTORY SETTINGS indicates the DDP settings stored in memory as shipped from the factory. All current settings are in secondary values.

The settings are divided into eight categories as listed below:

Category	Description
1	Protection Group 1
2	Protection Group 2
3	Common Settings
4	Control (Automatic Reclosing if Provided)
5	Metering
6	Communications
7	DDP Unit Identification
8	Calibration Factors

TABLE CS-1: SETTINGS AND RANGES

NBR.	SETTING GROUP 1 (Category 1)	RANGE	UNITS	FACTORY SETTINGS
01	PHCURV	0 to 3 0 Inverse 1 Very Inverse 2 Extremely Inverse 3 Definite Time		2
02	GNCURV	0 to 3 0 Inverse 1 Very Inverse 2 Extremely Inverse 3 Definite Time		2
03	PU-TOCP	0.10 to 2.40, or 0.50 to 12.00 (Depends on Model)	Amps	0.40 2.00
04	PU-TOCG	0.10 to 2.40, or 0.50 to 12.00 (Depends on Model)	Amps	0.20 1.00
05	T-DIALP	0.5 to 10.0		5.0
06	T-DEFP	0.5 to 30.0	sec	5.0

TABLE CS-1 SETTINGS AND RANGES (cont'd.)

NBR.	SETTING	RANGE	UNITS	FACTORY SETTINGS
07	T-DIALG	0.5 to 10.0		5.0
08	T-DEFG	0.5 to 30.0	sec	5.0
09	PU-IOCLP	0.10 to 32.00, or 0.50 to 160.00 (Depends on model)	Amps	1.00 5.00
10	PU-IOCHP	0.10 to 32.00, or 0.50 to 160.00 (Depends on Model)	Amps	2.00 10.00
11	PU-IOCLG	0.10 to 32.00, or 0.50 to 160.00 (Depends on Model)	Amps	1.00 5.00
12	PU-IOCHG	0.10 to 32.00, or 0.50 to 160.00 (Depends on Model)	Amps	2.00 10.00
13	T-IOCLP	0 to 250	msec	50
14	T-IOCHP	0 to 50	msec	0
15	T-IOCLG	0 to 250	msec	10
16	T-IOCHG	0 to 50	msec	0
17	TSEQ-DLY	0.05 to 0.50	sec	0.25
18	TSEQ-RES	5 to 600	sec	300
19	TORQUE	0 to 63		63
20	GRP1TIME	0 to 60	minutes	60

GROUP 2
(Category 2)

NBR.	SETTING	RANGE	UNITS	FACTORY SETTINGS
01	PHCURV	0 to 3 0 Inverse 1 Very Inverse 2 Extremely Inverse 3 Definite Time		2
02	GNCURV	0 to 3 0 Inverse 1 Very Inverse 2 Extremely Inverse 3 Definite Time		2
03	PU-TOCP	0.10 to 2.40, or 0.50 to 12.00 (Depends on Model)	Amps	2.40 10.50
04	PU-TOCG	0.10 to 2.40, or 0.50 to 12.00 (Depends on Model)	Amps	1.20 6.00
05	T-DIALP	0.5 to 10.0		6.0
06	T-DEFP	0.5 to 30.0	sec	10.0
07	T-DIALG	0.5 to 10.0		6.0
08	T-DEFG	0.5 to 30.0	sec	10.0
09	PU-IOCLP	0.10 to 32.00, or 0.50 to 160.00 (Depends on Model)	Amps	2.00 10.00
10	PU-IOCHP	0.10 to 32.00, or 0.50 to 160.00 (Depends on Model)	Amps	30.00 150.00
11	PU-IOCLG	0.10 to 32.00, or 0.50 to 160.00 (Depends on Model)	Amps	10.00 50.00
12	PU-IOCHG	0.10 to 32.00, or 0.50 to 160.00 (Depends on Model)	Amps	20.00 100.00
13	T-IOCLP	0 to 250	msec	100
14	T-IOCHP	0 to 50	msec	10
15	T-IOCLG	0 to 250	msec	20
16	T-IOCHG	0 to 50	msec	10
17	TSEQ-DLY	0.05 to 0.50	sec	0.50
18	TSEQ-RES	5 to 600	sec	600
19	TORQUE	0 to 63		63
20	GRP2TIME	0 to 60	min	60

TABLE CS-1 SETTINGS AND RANGES (cont'd.)

COMMON SETTINGS
(Category 3

NBR.	SETTING	RANGE	UNITS	FACTORY SETTINGS
1	GRP-SW	YES/NO		NO
2	ARC-TIME	20 to 200	msec	100
3	RECLON52	YES/NO		NO
4	TCM-ENAB	YES/NO		NO
5	BLK-IOC	YES/NO		NO
6	BLK-REC	YES/NO		NO
7	BLKIOCLO	YES/NO		NO
8	SEQYES/NO			NO
9	SEQ-BLKH	YES/NO		NO
10	IOCLP	YES/NO		NO
11	IOCHP	YES/NO		NO
12	IOCLG	YES/NO		NO
13	IOCHG	YES/NO		NO
14	TOCP	YES/NO		NO
15	TOCG	YES/NO		NO
16	TRIP1	0 to 63		48
17	TRIP2	0 to 63		12
18	TRIP3	0 to 63		3

Note: Settings 3, 5, 6 and 7 are not applicable if reclosing is not included.

CONTROL: (AUTOMATIC RECLOSING)
(Category 4)

NBR.	SETTING	RANGE	UNITS	FACTORY SETTINGS
01	INST	YES/NO		YES
02	REC1	YES/NO		YES
03	REC2	YES/NO		YES

GROUP 2
(Category 2)

NBR.	SETTING	RANGE	UNITS	FACTORY SETTINGS
01	PHCURV	0 to 3 0 Inverse 1 Very Inverse 2 Extremely Inverse 3 Definite Time		2
02	GNCURV	0 to 3 0 Inverse 1 Very Inverse 2 Extremely Inverse 3 Definite Time		2
03	PU-TOCP	0.10 to 2.40, or 0.50 to 12.00 (Depends on Model)	Amps	2.40 10.50
04	PU-TOCG	0.10 to 2.40, or 0.50 to 12.00 (Depends on Model)	Amps	1.20 6.00
05	T-DIALP	0.5 to 10.0		6.0
06	T-DEFP	0.5 to 30.0	sec	10.0
07	T-DIALG	0.5 to 10.0		6.0
08	T-DEFG	0.5 to 30.0	sec	10.0
09	PU-IOCLP	0.10 to 32.00, or 0.50 to 160.00 (Depends on Model)	Amps	2.00 10.00
10	PU-IOCHP	0.10 to 32.00, or 0.50 to 160.00 (Depends on Model)	Amps	30.00 150.00
11	PU-IOCLG	0.10 to 32.00, or 0.50 to 160.00 (Depends on Model)	Amps	10.00 50.00
12	PU-IOCHG	0.10 to 32.00, or 0.50 to 160.00 (Depends on Model)	Amps	20.00 100.00
13	T-IOCLP	0 to 250	msec	100
14	T-IOCHP	0 to 50	msec	10
15	T-IOCLG	0 to 250	msec	20
16	T-IOCHG	0 to 50	msec	10
17	TSEQ-DLY	0.05 to 0.50	sec	0.50
18	TSEQ-RES	5 to 600	sec	600
19	TORQUE	0 to 63		63
20	GRP2TIME	0 to 60	min	60

TABLE CS-1 SETTINGS AND RANGES (cont'd.)

COMMON SETTINGS
(Category 3

NBR.	SETTING	RANGE	UNITS	FACTORY SETTINGS
1	GRP-SW	YES/NO		NO
2	ARC-TIME	20 to 200	msec	100
3	RECLON52	YES/NO		NO
4	TCM-ENAB	YES/NO		NO
5	BLK-IOC	YES/NO		NO
6	BLK-REC	YES/NO		NO
7	BLKIOCLO	YES/NO		NO
8	SEQYES/NO			NO
9	SEQ-BLKH	YES/NO		NO
10	IOCLP	YES/NO		NO
11	IOCHP	YES/NO		NO
12	IOCLG	YES/NO		NO
13	IOCHG	YES/NO		NO
14	TOCP	YES/NO		NO
15	TOCG	YES/NO		NO
16	TRIP1	0 to 63		48
17	TRIP2	0 to 63		12
18	TRIP3	0 to 63		3

Note: Settings 3, 5, 6 and 7 are not applicable if reclosing is not included.

CONTROL: (AUTOMATIC RECLOSING)
(Category 4)

NBR.	SETTING	RANGE	UNITS	FACTORY SETTINGS
01	INST	YES/NO		YES
02	REC1	YES/NO		YES
03	REC2	YES/NO		YES

TABLE CS-1 SETTINGS AND RANGES (cont'd.)

NBR.	SETTING	RANGE	UNITS	FACTORY SETTINGS
04	REC3	YES/NO		YES
05	T1	0.1 to 15.9	sec	0.5
06	T2	1 to 159	sec	1
07	T3	1 to 159	sec	2
08	TRES	1 to 159	sec	3
09	MULT	0 to 3 0 0.5 1 1 2 2 3 4		3
10	PAUSE	0 to 7 0 0 1 1 2 4 3 16 4 64 5 256 6 1024 7 Infinity	 sec sec sec sec sec sec sec	6
11	RS-DO	0 to 3 0 6 1 12 2 24 3 Lockout	 sec sec sec	3
12	RS-PU	0 to 3 0 0 1 1 2 2 3 4	 sec sec sec sec	0
13	RS-SEL	0 to 3 0 INST 1 R1 2 R2 3 R3		2
14	DEF-MEM	YES/NO		NO

TABLE CS-1 SETTINGS AND RANGES (cont'd.)

NBR.	SETTING	RANGE	UNITS	FACTORY SETTINGS
15	RLY-MEM (Controls power down memory function; i.e. allows IP, LO, and RS relays to stay latched during power-down)	0 to 7 RS IP LO 0 NL NL NL 1 NL NL L 2 NL L NL 3 NL L L 4 L NL NL 5 L NL L 6 L L NL 7 L L L		0
16	REC-EN	YES/NO		NO

METERING:
(Category 5)

NBR.	SETTING	RANGE	UNITS	FACTORY SETTINGS
01	X-RATIOP	1 to 1000		1
02	X-RATIOG	1 to 1000		1
03	DMND-INT	0 to 2 0 15 1 30 2 60	 minutes minutes minutes	1

COMMUNICATIONS:
(Category 6)

NBR.	SETTING	RANGE	UNITS	FACTORY SETTINGS
01	BAUD	0 to 4 0 300 1 1200 2 2400 3 4800 4 9600	 baud baud baud baud baud	2

UNIT ID:
(Category 7)

NBR.	SETTING	RANGE	UNITS	FACTORY SETTINGS
01	UNIT-ID	4 Digit		0000

TABLE CS-1 SETTINGS AND RANGES (cont'd.)

CALIBR FACTOR:
(Category 8)

NBR.	SETTING	RANGE	UNITS	FACTORY SETTINGS
01	A	0 to 99 (Gain 0.5, Ph.A)		XX
02	B	0 to 99 (Gain 0.5, Ph.B)		XX
03	C	0 to 99 (Gain 0.5, Ph.C)		XX
04	D	0 to 99 (Gain 0.5, Ph.G)		XX
05	E	0 to 99 (Gain 8, Ph.A)		XX
06	F	0 to 99 (Gain 8, Ph.B)		XX
07	G	0 to 99 (Gain 8, Ph.C)		XX
08	H	0 to 99 (Gain 8, Ph.G)		XX
09	I	0 to 99 (Gain 24, Ph.A)		XX
10	J	0 to 99 (Gain 24, Ph.B)		XX
11	K	0 to 99 (Gain 24, Ph.C)		XX
12	L	0 to 99 (Gain 24, Ph.G)		XX
13	M	0 to 99 (Magnetics Ph.A)		50
14	N	0 to 99 (Magnetics Ph.B)		50
15	O	0 to 99 (Magnetics Ph.C)		50
16	P	0 to 99 (Magnetics Ph.G)		50

where "XX" should match with the calibration numbers on the calibration sticker located below the keypad.

Note : The following settings may only be changed via the local MMI, and not through DDP-LINK communication software:

Baud Rate
Unit ID
Calibration Factors

GROUP 1 SETTINGS

Phase Time Overcurrent Characteristic, PHCURV

PHCURV is used to specify the time overcurrent characteristic for phase protection. The available selections are inverse, very inverse, extremely inverse, and definite time. The desired characteristic is selected by a setting of 0, 1, 2, or 3 respectively. The selected characteristic applies to all three phases.

Inverse time relays are generally used where the short-circuit current magnitude is dependent largely upon the system generating capacity at the time of the fault. Very inverse relays are generally applied on systems where the magnitude of the fault current flowing through a given relay is dependent mainly on the relative location of the fault with respect to the relay. Extremely inverse relays are intended for applications where sufficient time delay must be provided to allow a re-energized circuit to pick up without unnecessary tripping during the inrush period and, at the same time, coordinate properly with power fuses and fuse cutouts. The definite time characteristic is used when a constant value of relay operating time is required when pickup is exceeded.

Ground Time Overcurrent Characteristic, GNCURV

GNCURV is used to specify the time overcurrent characteristic for ground protection. The available selections are inverse, very inverse, extremely inverse, and definite time. The desired characteristic is selected by a setting of 0, 1, 2, or 3 respectively. Since the magnitude of zero-phase-sequence current generally varies significantly with fault location, the more inverse

characteristics are often used for ground protection.

Phase Time Overcurrent Pickup, PU-TOCP

PU-TOCP can be set from 0.10 to 2.40 A or from 0.50 to 12.00 A depending on the DDP model. This setting determines the pickup value for the phase time overcurrent protection and applies to all three phases. Generally, the pickup value should be set low enough to insure that the minimum fault current is at least 1.5 times the pickup value.

Ground Time Overcurrent Pickup, PU-TOCG

PU-TOCG can be set from 0.10 to 2.40 A or from 0.5 to 12.00 A depending on the DDP model. This setting determines the pickup value for the ground time overcurrent protection. If the distribution system three-phase load is balanced, normal ground current is near zero. In that case the ground relay should not be affected by load current and could have a sensitive setting. Unfortunately, distribution system loads typically have some unbalance. Many ground relays are set to pick up at about 50% of load current. The ground setting should be set as sensitively as possible, yet not trip for inrush or for unbalance on heavy load currents.

Phase Time Overcurrent Time Dial, T-DIALP

The time dial selection, T-DIALP, for the phase time overcurrent inverse, very inverse, and extremely inverse characteristic curves is settable from 0.5 to 10.0. The time dial selected should be chosen on the basis of providing selectivity with the protection of adjacent system elements. The time overcurrent function has a maximum reset time of 50 milliseconds when current is instantaneously reduced to below pickup value.

Phase Definite Time Overcurrent Time Delay, T-DEFP

Definite time delay, T-DEFP, can be set from 0.5 to 30.0 seconds. The definite time characteristic and time delay is used in those cases where a constant relay operating time is desired for fault currents above the pickup level.

Ground Time Overcurrent Time Dial, T-DIALG

The time dial selection, T-DIALG, for the ground overcurrent inverse, very inverse, and extremely inverse curves can be set from 0.5 to 10.0. It is selected on the basis of providing selectivity with the protection of adjacent circuit elements. Maximum reset time is 50 milliseconds.

Ground Definite Time Overcurrent Time Delay, T-DEFG

Definite time delay, T-DEFG, can be set from 0.5 to 30.0 seconds. The definite time characteristic and time delay is used in those cases where a constant relay operating time is desired for fault currents above the pickup level.

Phase Instantaneous Overcurrent Low Set Pickup, PU-IOCLP

PU-IOCLP can be set from 0.10 to 32.00 A or from 0.50 to 160.00 A depending on the model. The instantaneous overcurrent function is normally set so that its pickup is approximately 25% higher than the maximum current the DDP will see for a three-phase fault at the end of the protected section. With this setting, the instantaneous function should provide protection for about 80% of the protected line.

Phase Instantaneous Overcurrent High Set Pickup, PU-IOCHP

PU-IOCHP can be set from 0.10 to 32.00 A or from 0.50 to 160.00 A depending on the model. This function is used when it is desired to provide a second level of instantaneous protection. One of the output contacts can be dedicated to this function. One possible use is to block automatic reclosing, when an external automatic reclosing relay is utilized, and fault current is sufficiently high to indicate that reclosing probably would be unsuccessful due to the fault location; e.g. underground cable circuit from substation. Another utilization is the capability to leave this function in service when the low-set instantaneous overcurrent function is taken out of service during the operation of the sequence coordination function. It can be used to provide instantaneous protection for faults between the substation and downstream recloser. PU-IOCHP must be set equal to or higher than PU-IOCLP.

Ground Instantaneous Overcurrent Low Set Pickup, PU-IOCLG

PU-IOCLG can be set from 0.10 to 32.00 A or from 0.50 to 160.00 A depending on the model. The pickup must be set above the maximum

zero-sequence current unbalance that can exist. The setting should also be made so that the instantaneous unit will not overreach any other protective device such as a downstream recloser.

Ground Instantaneous Overcurrent High Set Pickup, PU-IOCHG

PU-IOCHG can be set from 0.10 to 32.00 A or from 0.50 to 160.00 A depending on the model. The pickup must be set above the maximum zero-sequence current unbalance that can exist. The setting should also be made so that the instantaneous unit will not overreach any other protective device such as a downstream recloser. One application for the high-set ground instantaneous unit may be to set it high enough to indicate fault location in an outgoing cable circuit for which reclosing may not be successful and to use one of the contact outputs to block relosing if an external recloser is used at the feeder breaker. PU-IOCHG must be set equal to or higher than PU-IOCLG.

Phase Instantaneous Overcurrent Low Set Time Delay, T-IOCLP

T-IOCLP can be set from 0 to 250 milliseconds and is used to delay tripping of the low-set phase instantaneous overcurrent unit. Operation of this function with the sequence coordination function is described in the PRODUCT DESCRIPTION section.

Phase Instantaneous Overcurrent High Set Time Delay, T-IOCHP

T-IOCHP can be set from 0 to 50 milliseconds and is used to delay tripping of the high-set phase instantaneous overcurrent unit.

Ground Instantaneous Overcurrent Low Set Time Delay, T-IOCLG

T-IOCLG can be set from 0 to 250 milliseconds and is used to delay tripping of the low-setground instantaneous overcurrent unit.

Ground Instantaneous Overcurrent High Set Time Delay, T-IOCHG

T-IOCHG can be set from 0 to 50 milliseconds and is used to delay tripping of the high-set ground instantaneous overcurrent unit.

Time Sequence Delay, TSEQ-DLY

This setting is used to provide a short time delay with the instantaneous overcurrent functions, both phase and ground, to allow coordination with a downstream recloser when the sequence coordination function is enabled. The setting range is from 0.05 to 0.50 seconds.

Time Sequence Restore, TSEQ-RES

This setting is used to specify the time that the instantaneous overcurrent functions are taken out of service when the sequence coordination function operates (i.e. function enabled and downstream recloser operates in less time than combined time delay of instantaneous function and TSEQ-DLY). The setting range for TSEQ-RES is from 5 to 600 seconds. At the end of this time, either the instantaneous overcurrent low-set functions or both the low-set and the high-set instantaneous overcurrent functions (depending on the setting of SEQ-BLKH) are automatically restored to service. The high-set instantaneous functions would remain in service if SEQ-BLKH is set NO.

Torque, TORQUE

TORQUE can be set from 0 to 63. This range covers all combinations of the six protection functions IOCHG, IOCLG, TOCG, IOCHP, IOCLP, and TOCP.
It permits the user to disable any combination of the time and instantaneous phase and ground overcurrent functions through a contact connected to Terminal 32 of the DDP.This feature would be utilized to block operation of the selected protection functions, which are already enabled, by opening a normally closed

contact on the TORQUE input. An example of a use for this function would be blocking the operation of ground protection while switching the feeder breaker for maintenance purposes without having to change settings.

Note that a value of 0 for this setting will cause the DDP to ignore the torque control input; that is, it will not matter whether the contact is closed or open. See TABLE CS-2 for a list of values and corresponding functions that are disabled.

A value of 63 will cause the DDP to disable each of the six functions that are enabled, using protection settings 310 through 315, when the contact is open. It will enable each of the six functions, if they are already enabled in the settings, when the contact is closed.

TABLE CS-2 TORQUE Qualifier Look-up Table

TORQUE Setting Values	Functions Disabled (D) IOCHP	IOCLP	TOCP	IOCHG	IOCLG	TOCG
0	-	-	-	-	-	-
1	-	-	-	-	-	D
2	-	-	-	-	D	-
3	-	-	-	-	D	D
4	-	-	-	D	-	-
5	-	-	-	D	-	D
6	-	-	-	D	D	-
7	-	-	-	D	D	D
8	-	-	D	-	-	-
9	-	-	D	-	-	D
10	-	-	D	-	D	-
11	-	-	D	-	D	D
12	-	-	D	D	-	-
13	-	-	D	D	-	D
14	-	-	D	D	D	-
15	-	-	D	D	D	D
16	-	D	-	-	-	-
17	-	D	-	-	-	D
18	-	D	-	-	D	-
19	-	D	-	-	D	D
20	-	D	-	D	-	-
21	-	D	-	D	-	D
22	-	D	-	D	D	-
23	-	D	-	D	D	D
24	-	D	D	-	-	-
25	-	D	D	-	- D	

TABLE CS-2 TORQUE Qualifier Look-up Table (cont'd.)

TORQUE Setting Values	Functions Disabled (D) IOCHP	IOCLP	TOCP	IOCHG	IOCLG	TOCG
26	-	D	D	-	D	-
27	-	D	D	-	D	D
28	-	D	D	D	-	-
29	-	D	D	D	-	D
30	-	D	D	D	D	-
31	-	D	D	D	D	D
32	D	-	-	-	-	-
33	D	-	-	-	-	D
34	D	-	-	-	D	-
35	D	-	-	-	D	D
36	D	-	-	D	-	-
37	D	-	-	D	-	D
38	D	-	-	D	D	-
39	D	-	-	D	D	D
40	D	-	D	-	-	-
41	D	-	D	-	-	D
42	D	-	D	-	D	-
43	D	-	D	-	D	D
44	D	-	D	D	-	-
45	D	-	D	D	-	D
46	D	-	D	D	D	-
47	D	-	D	D	D	D
48	D	D	-	-	-	-
49	D	D	-	-	-	D
50	D	D	-	-	D	-
51	D	D	-	-	D	D
52	D	D	-	D	-	-
53	D	D	-	D	-	D
54	D	D	-	D	D	-
55	D	D	-	D	D	D
56	D	D	D	-	-	-
57	D	D	D	-	-	D
58	D	D	D	-	D	-
59	D	D	D	-	D	D
60	D	D	D	D	-	-
61	D	D	D	D	-	D
62	D	D	D	D	D	-
63	D	D	D	D	D	D

NOTE: A '-' indicates the corresponding function is not affected by the contact input.

Example for Using TABLE CS-2

Example 1:
Assume the following PROTECTION Category settings have been made by the user to select which protection functions are in service.

Setting #	Function Enabled	Function Disabled
310 = YES	IOCLP	
311 = NO		IOCHP
312 = YES	IOCLG	
313 = NO		IOCHG
314 = YES	TOCP	
315 = YES	TOCG	

119 = 0 (TORQUE)

Also assume the TORQUE CONTROL contact is closed initially.

If the TORQUE CONTROL contact is then opened, the functions above will not be effected.

Example 2:

Assume the same PROTECTION Category settings as above for settings #310 through #315, but the TORQUE setting, #119, is set to 3 (see TABLE CS-2).

When the TORQUE CONTROL contact is closed; IOCLP, IOCLG, TOCP, and TOCG will be in service as in Example 1.

If the TORQUE CONTROL contact is then opened; the PROTECTION Category settings for IOCLG and TOCG will be overridden and only IOCLP and TOCP will remain in service.

Group 1 Time, GRP1TIME

The protection settings will be switched automatically back to the first group of settings (from the second group) after a settable time. The range for this time is 0 to 60 minutes and starts at the time the external contact commanding the contact to switch groups is opened. If the command to switch to the second group was received from a remote point via the communications interface, the time starts at the time the command is received to switch back to the first group of settings.

GROUP 2 SETTINGS

Alternate settings can be made for each of the following 20 items.

- PHCURV
- GNCURV
- PU-TOCP
- PU-TOCG
- T-DIALP
- T-DEFP
- T-DIALG
- T-DEFG
- PU-IOCLP
- PU-IOCHP
- PU-IOCLG
- PU-IOCHG
- T-IOCLP
- T-IOCHP
- T-IOCLG
- T-IOCHG
- TSEQ-DLY
- TSEQ-RES
- TORQUE
- GRP2TIME

The setting range for each of the above is given in Table CS-1 and is the same as described for the corresponding protection setting. The second settings group capability allows the user to make a second pre-set group of settings for the specified functions. This settings group might be arranged based on a different operating condition or configuration such as cold load pickup condition or a feeder reconfiguration. The DDP switches from an original group of protection functions to the other group on command by the user, either via the RS-232 communications interface or by an external contact input. GRP-SW must be set to YES for the switch of settings to occur.

COMMON PROTECTION SETTINGS

Switch Protection Settings Group, GRP-SW

The DDP includes capability for the user to set a second group of settings for the protection functions that have been described above. GRP-SW may be set to either YES or NO. If the setting is YES, the DDP will switch between the groups of settings on command by the user through an external contact closure or through the RS232 communications interface.

Breaker Arc Time, ARC-TIME

One of the functions of the DDP is to calculate the Amperes squared multiplied by seconds (I2T) for each pole of the feeder breaker during the time the breaker is opening to clear a fault. This calculation is made each time the DDP orders a trip and a cumulative total is kept for each pole. It is necessary for the user to specify the breaker opening time; the setting range is 20 to 200 milliseconds.

Reclose on the 52b Contact, RECLON52

If the setting is set to NO, the recloser will operate only if the DDP trips. A setting of YES will allow the recloser to operate on any 52b action regardless of which relay trips the breaker.

Trip Voltage Monitor Enable, TCM-ENAB

The Trip Voltage Monitor that monitors the voltage across the trip circuit can be enabled or disabled, YES will enable this feature.

Block Instantaneous Overcurrent, BLK-IOC

BLK-IOC can be set to either YES or NO. When it is set to YES, the instantaneous overcurrent functions are blocked from tripping after the first close operation of the DDP automatic reclosing function (if provided). The instantaneous overcurrent functions remain blocked from tripping until the DDP recloser goes to the reset state. They are also blocked from tripping if the DDP recloser is in the lockout state. If BLK-IOC is set to NO, then the instantaneous overcurrent functions remain in service throughout the DDP reclosing sequence (but see also BLKIOCLO and SEQ-BLKH settings).

A breaker pumping problem is sometimes encountered with automatic reclosing when the instantaneous overcurrent is blocked after the first reclose. An example is a low level fault current that is not high enough to cause the time overcurrent functions to trip before the automatic reclosing function resets. This problem can be avoided without disabling the BLK-IOC capability by setting the automatic reclosing Pause jumper, Switch S1, to either "Reset" or "Reset and Reclose" and to set the Pause Time Delay control setting (PAUSE) to an "infinite" value. When a fault occurs and BLK-IOC is set to YES, the DDP checks the current while instantaneous overcurrent is blocked. If current is above the time overcurrent pickup, the PAUSE input is activated, which extends the reset delay period indefinitely. This allows the time overcurrent function to trip and reclosing to proceed to the next step. When the currents drop below the time overcurrent pickup, the PAUSE input is deactivated allowing reset delay to proceed. If time overcurrent is not enabled, automatic reclosing will remain in the paused reset delay mode until the currents drop below the pickup level or until protection is turned off or a restart occurs.

Block Recloser, BLK-REC

BLK-REC can be set to either YES or NO. If it is set to YES, the DDP automatic reclosing function will be blocked from reclosing if the high-set instantaneous overcurrent functions operate. If set to NO, the DDP reclosing function will go through the set sequence regardless of whether the high-set overcurrent functions operate assuming the reclosing function is enabled.

Block Instantaneous Overcurrent on Recloser Lockout, BLKIOCLO

BLKIOCLO can be set to either YES or NO. If it is set to YES, the instantaneous overcurrent functions will be blocked from tripping while the DDP automatic reclosing function is in the lockout state. The instantaneous overcurrent functions will be unblocked from tripping after the DDP reclosing function resets.

Enable/Disable Sequence Coordination, SEQ

SEQ can be set to either YES or NO to place the sequence coordination function in or out of service. A setting of YES places the function in service.

Inhibit Instantaneous Overcurrent High Set Protection by Sequence Coordination, SEQ-BLKH

SEQ-BLKH can be set to either YES or NO. If set to YES, the instantaneous phase and ground high-set overcurrent functions will be disabled if the sequence coordination function is enabled and if the downstream recloser operates before the combined time delay for the instantaneous overcurrent function and TSEQ-DLY expires. This assumes that SEQ is also set to YES.

As examples of the operation of the instantaneous overcurrent functions and the sequence coordination function, the following cases are described considering the feeder one-line diagram shown in Figure CS-1.

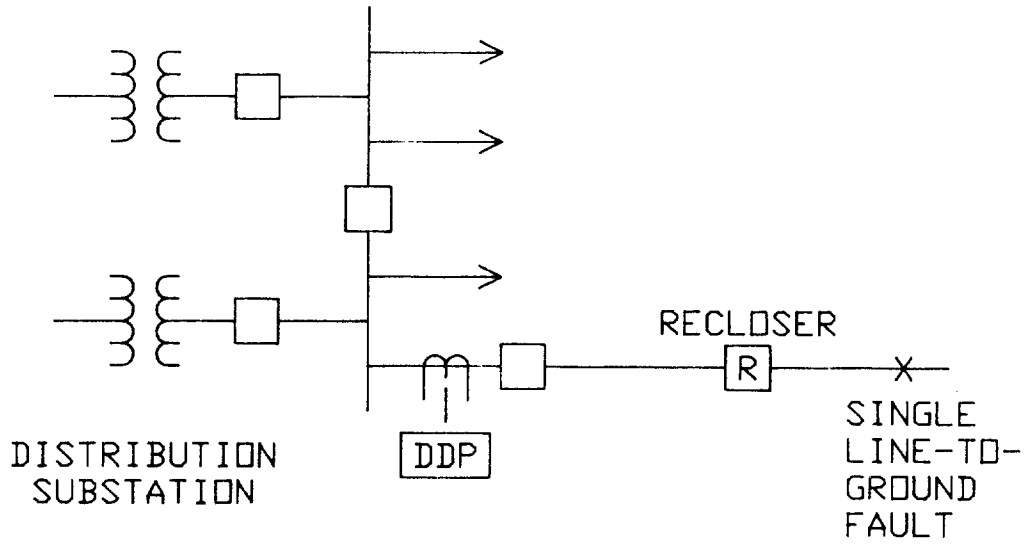


Figure CS-1 (0285A5302) DDP Sequence Coordination

Enable/Disable Phase Instantaneous Overcurrent Low-Set Function, IOCLP

IOCLP can be set to either YES or NO to place the phase instantaneous overcurrent low-set function in or out of service. A setting of YES places the function in service.

Enable/Disable Phase Instantaneous Overcurrent, High-Set Function, IOCHP

IOCHP can be set to either YES or NO to place the phase instantaneous overcurrent high-set function in or out of service. A setting of YES places the function in service. IOCHP can be enabled only if IOCLP is enabled.

Enable/Disable Ground Instantaneous Overcurrent Low-Set Function, IOCLG

IOCLG can be set to either YES or NO to place the ground instantaneous overcurrent low-set function in or out of service. A setting of YES places the function in service.

Enable/Disable Ground Instantaneous Overcurrent High-Set Function, IOCHG

IOCHG can be set to either YES or NO to place the ground instantaneous overcurrent high-set function in or out of service. A setting of YES places the function in service. IOCHG can be enabled only if IOCLG is enabled.

Enable/Disable Phase Time Overcurrent Protection, TOCP

TOCP can be set to either YES or NO to place the phase time overcurrent function in or out of service. A setting of YES places the function in service.

Enable/Disable Ground Time Overcurrent Protection, TOCG

TOCG can be set to either YES or NO to place the ground time overcurrent function in or out of service. A setting of YES places the function in service.

Trip Output 1 Configuration, TRIP1

TRIP1 is assigned to the contact between output terminals 11 and 12. Any combination of the functions TOCP, TOCG, IOCHP, IOCHG, IOCLP, IOCLG can be assigned to TRIP1. The functions are ORed together to produce the trip output. TRIP1 has a value range of 0 to 63. The configuration of the items that can be programmed is described below in TABLE CS-3.

Trip Output 2 Configuration, TRIP2

TRIP2 is assigned to the contact between output terminals 13 and 14. Any combination of the functions TOCP, TOCG, IOCHP, IOCHG, IOCLP, IOCLG can be assigned to TRIP2. The functions are ORed together to produce the trip output. TRIP2 has a value range of 0 to 63. The configuration of the items that can be programmed is described below in TABLE CS-3.

Trip Output 3 Configuration, TRIP3

TRIP3 is assigned to the contact between output terminals 15 and 16. Any combination of the functions TOCP, TOCG, IOCHP, IOCHG, IOCLP, IOCLG can be assigned to TRIP3. The functions are ORed together to produce the trip output. TRIP3 has a value range of 0 to 63. The configuration of the items that can be programmed is described below in TABLE CS-3.

TABLE CS-3 Trip Configuration Look-up Table

TRIP Setting Values	Functions Activated(A) TOCP	TOCG	IOCHP	IOCHG	IOCLP	IOCLG
0	-	-	-	-	-	-
1	-	-	-	-	-	A
2	-	-	-	-	A	-
3	-	-	-	-	A	A
4	-	-	-	A	-	-
5	-	-	-	A	-	A
6	-	-	-	A	A	-
7	-	-	-	A	A	A
8	-	-	A	-	-	-
9	-	-	A	-	-	A
10	-	-	A	-	A	-
11	-	-	A	-	A	A
12	-	-	A	A	-	-
13	-	-	A	A	-	A
14	-	-	A	A	A	-
15	-	-	A	A	A	A
16	-	A	-	-	-	-

TABLE CS-3 Trip Configuration Look-up Table (cont'd.)

TRIP Setting Values	Functions Activated(A) TOCP	TOCG	IOCHP	IOCHG	IOCLP	IOCLG
17	-	A	-	-	-	A
18	-	A	-	-	A	-
19	-	A	-	-	A	A
20	-	A	-	A	-	-
21	-	A	-	A	-	A
22	-	A	-	A	A	-
23	-	A	-	A	A	A
24	-	A	A	-	-	-
25	-	A	A	-	-	A
26	-	A	A	-	A	-
27	-	A	A	-	A	A
28	-	A	A	A	-	-
29	-	A	A	A	-	A
30	-	A	A	A	A	-
31	-	A	A	A	A	A
32	A	-	-	-	-	-
33	A	-	-	-	-	A
34	A	-	-	-	A	-
35	A	-	-	-	A	A
36	A	-	-	A	-	-
37	A	-	-	A	-	A
38	A	-	-	A	A	-
39	A	-	-	A	A	A
40	A	-	A	-	-	-
41	A	-	A	-	-	A
42	A	-	A	-	A	-
43	A	-	A	-	A	A
44	A	-	A	A	-	-
45	A	-	A	A	-	A
46	A	-	A	A	A	-
47	A	-	A	A	A	A
48	A	A	-	-	-	-
49	A	A	-	-	-	A
50	A	A	-	-	A	-
51	A	A	-	-	A	A
52	A	A	-	A	-	-
53	A	A	-	A	-	A
54	A	A	-	A	A	-
55	A	A	-	A	A	A
56	A	A	A	-	-	-
57	A	A	A	-	-	A
58	A	A	A	-	A	-
59	A	A	A	-	A	A
60	A	A	A	A	-	-
61	A	A	A	A	-	A
62	A	A	A	A	A	-
63	A	A	A	A	A	A

NOTE: '-' indicates the corresponding function is not assigned to the output contact

Sample Cases

Case A: Assume that a single line-to-ground fault occurs beyond the remote recloser and that the recloser operates to interrupt the fault 100 milliseconds after the fault occurs. Assume DDP settings as below:

IOCLP = NO
IOCHP = NO
T-IOCHG = 10 ms
T-IOCLG = 150 ms
SEQ = YES
SEQ-BLKH = YES
TSEQ-DLY = 200 ms
TSEQ-RES = 300 seconds

Since the sequence coordination function is enabled (SEQ =YES), and the instantaneous overcurrent high-set functions are set for block (SEQ-BLKH = YES), and since the faulted circuit is opened by the remote recloser in less than either T-IOCHG + TSEQ-DLY or T-IOCLG + TSEQ-DLY, both instantaneous ground functions (and the phase instantaneous functions) will be blocked for 300 seconds (TSEQ-RES = 300) after the first opening of the remote recloser.

Case B: If the same situation as in Case A is assumed except that SEQ-BLKH is set to NO, or if SEQ is set to NO, then the instantaneous ground overcurrent high-set function will deliver a trip output signal after approximately 10 milliseconds.

Case C: Assume the same situation as in Case A, but with the settings below:

T-IOCHG = 10 ms
T-IOCLG = 10 ms
SEQ = YES
SEQ-BLKH = YES
TSEQ-DLY = 50 ms
TSEQ-RES = 300 seconds

In this case, both the instantaneous ground overcurrent high-set and low-set functions will deliver a trip output signal after approximately 60 milliseconds.

CONTROL (AUTOMATIC RECLOSING) SETTINGS

The automatic reclosing function is available as an optional function for the DDP. Settings for this function are described in the following:

2

Instantaneous Reclosure, INST

INST can be set to either YES or NO and is used to specify whether instantaneous reclosing will be included in the automatic reclosing sequence following a trip by the DDP overcurrent protection functions. With this step there is no intentional time delay, but the actual delay may be approximately 50 milliseconds.

First Timed Reclosure, REC1

REC1 can be set to either YES or NO and is used to specify whether this step of reclosing will be included in the automatic reclosing sequence following a trip by the DDP overcurrent protection functions.

Second Timed Reclosure, REC2

REC2 can be set to either YES or NO and is used to specify whether this step of reclosing will be included in the automatic reclosing sequence following a trip by the DDP overcurrent protection functions.

Third Timed Reclosure, REC3

REC3 can be set to either YES or NO and is used to specify whether this step of reclosing will be included in the automatic reclosing sequence following a trip by the DDP overcurrent protection functions.

First Timed Reclosure Time Delay, T1

T1 can be set from 0.1 to 15.9 seconds and defines the time delay before the first timed reclosure in the automatic reclosing sequence following a trip by the DDP overcurrent protection functions.

Second Timed Reclosure Time Delay, T2

T2 can be set from 1 to 159 seconds and defines the time delay before the second timed reclosure in the automatic reclosing sequence following a trip by the DDP overcurrent protection functions.

Third Timed Reclosure Time Delay, T3

T3 can be set from 1 to 159 seconds and defines the time delay before the third timed reclosure in the automatic reclosing sequence following a trip by the DDP overcurrent protection functions.

Reset Time, TRES

TRES can be set from 1 to 159 seconds. It is used to specify the time that the associated breaker must remain closed in order for the automatic reclosing sequence to reset following a close command by the DDP reclosing function and/or to reset from lockout following a manual close command.

Multiplier, MULT

MULT can be set from 0 to 3. This setting provides a multiplier of 0.5, 1, 2, or 4 respectively for the following time settings in the automatic reclosing function:

- First Timed Reclosure Time Delay, T1
- Second Timed Reclosure Time Delay, T2
- Third Timed Reclosure Time Delay, T3
- Reset Time, TRES
- Pause Time, PAUSE
- RS Dropout Time, RS-DO
- RS Pickup Time, RS-PU
- Reclose Signal Time Limit**

**The reclose signal time limit is the time allowed for the breaker to close following a reclose signal. If the breaker does not close in that time as indicated by the transfer of the breaker "a" and "b"switches, the reclosing function will go directly to lockout. The reclose signal time limit with a time multiplier of 1 is 0.9 seconds.

Pause Time, PAUSE

PAUSE can be set from 0 to 7. This setting provides a pause time of 0, 1, 4, 16, 64, 256, 1024, or infinite seconds respectively. The pause feature can be used to control a reclose output and/or the reset time of the reclosing function depending on the setting of S1, as follows:

PAUSE in Reclose Mode

When used in the reclose mode, a reclose output will be delayed for up to the value (in seconds) of the pause setting or until a contact is closed at the pause terminal input to the DDP. If a pause input occurs within the pause period, the reclose output will be produced immediately; otherwise the reclosing function will go directly to lockout when the pause time has expired.

The DDP cannot produce a reclose output unless the pause input is present at a time a reclose is called for or is applied during the pause period. The pause period begins at the time that a reclose output would normally occur.

For example, if a 16 second pause setting were selected, the reclosing function would count down to each reclosure, and at that time would reclose the breaker if a pause input is present (contact closed) or would wait 16 seconds from that time for a pause input to be applied. If a pause input is applied during that time, reclosing would occur immediately; otherwise lockout will occur when the pause time elapses (provided the pause time is not set to infinity, in which case the DDP will wait forever for a pause input).

PAUSE in Reset Mode

When used in the reset mode, the reset time can be delayed for up to the value (in seconds) of the pause setting. Here again, the pause time will be initiated if there is no pause input and the pause time will be terminated by a contact closure at the pause input to the DDP. A continuous pause input will produce the reset times stored in memory. The reset time can be extended by up to the pause time, or for a lesser time, by controlling the time that the pause input is open during the reset period.

For example, with a pause setting of 16 seconds, the reset time can be extended for a maximum of 16 seconds by opening a contact at the pause input. If the contact is open for 16 seconds or longer, the reset time will be extended by 16 seconds. If the contact is open for a lesser time, then the reset time extension will be equal to the time that the contact is open. The pause input (contact opening) can be applied at any time during the reset period.

Switch S1 (accessible from the right front of the DDP, behind the nameplate) is provided to select the pause feature for reclose only, during reset only, or during both reclose and reset. Because there is only one pause setting, the same delay applies to both the reclose and/or the reset periods. Switch S1 positions are as follows:

SW 1 Position	Pause In
1	Both reclose and reset
2	Reset
3	Reclose

RS "Relay Spare" Dropout Time, RS-DO

The RS "Relay Spare" is an output signal that can be selected to operate at the same time as, or with a selectable time delay from, one of the four reclose signals. The dropout time, RS-DO, starts at the selected reclose (see RS-SEL). RS-DO can be set from 0 to 3 to specify times of 6, 12, 24, or L respectively. If 'L' is selected, the RS output signal will stay active until lockout.

RS "Relay Spare" Pickup Time, RS-PU

RS-PU can be set to either 0, 1, 2, or 3 to select the times of 0, 1, 2, or 4 seconds respectively. This pickup time starts at the selected reclose and defines the time at which the RS signal will pickup.

RS "Relay Spare" Operate Select, RS-SEL

RS-SEL can be set to either 0, 1, 2, or 3 to select the instantaneous, first, second, and third timed delay reclosure, respectively. This setting is used to specify the step in the automatic reclosing sequence at which the RS "Relay Spare" output signal is to operate.

As an example of this setting and the two preceding settings, assume the following: RS-SEL = 2, RS-PU = 3, and RS-DO = 0. Then the RS output will operate 4 seconds after the second timed delay reclose and stay picked up for 2 seconds. If RS-SEL is set to operate at the instantaneous reclose, and the instantaneous reclose is skipped because of a delayed reclose input, the RS timing will start with the 52b (breaker closing) input signal to the DDP.

Default Memory, DEF-MEM

DEF-MEM can be set to either YES or NO. When it is set to YES, the DDP will remember the point in the reclose cycle it was operating when the power was lost, and will return to the beginning of that reclose cycle when the power is restored. For example, assume that the first reclosure was set to operate in 15 seconds and that the power was lost when the reclosing function was halfway through the countdown. When the power is restored, the reclosing function will pick up in the first reclose period, but will start counting down at 15 seconds rather than at the halfway point where the power was lost. When the countdown is complete, the first reclose output will be produced to close the breaker and then the reclosing function will proceed through the remainder of its set sequence. If DEF-MEM is set to NO, the reclosing function will awaken in reset if the breaker is closed when the power is restored, or in lockout if the breaker is open.

Relay Memory, RLY-MEM

RLY-MEM can be set from 0 to 7 and is used to select whether the state of the Relay Spare (RS), In Progress (IP), and the Lockout (LO) functions are retained when power is lost and then restored. The settings specify the following:

RLY-MEM	RS	IP	LO
0	NL	NL	NL
1	NL	NL	L
2	NL	L	NL
3	NL	L	L
4	L	NL	NL
5	L	NL	L
6	L	L	NL
7	L	L	L

In the above table, L indicates that if that function is picked up when power is lost, it will remain in that state until power is restored. NL indicates that the state of the function will be ignored after power is lost.

Automatic Reclosing Enable, REC-EN

REC-EN can be set to either YES or NO. This setting is used to place the automatic reclosing function either in or out of service. The recloser

function is enabled when REC-EN is set to YES and disabled when set to NO.

METERING SETTINGS

Current Transformer Ratio, X-RATIOP

X-RATIOP is settable from 1 to 1000. It is used to specify the primary to secondary ratio of the current
transformers connected to the DDP from phases A, B, and C. For example, a current transformer ratio of 1200/5 would be entered as 240.

Current Transformer Ratio, X-RATIOG

X-RATIOG is settable from 1 to 1000. It is used to specify the primary to secondary ratio of the current transformer (or transformers), which the DDP uses to measure ground currents. If the DDP is connected to a separate CT (through terminals 7 and 8) for ground current, the ratio of this CT should be entered. For example, a current transformer ratio of 50/5 would be entered as 10. If ground current is measured from the residual connection of the phase connected CT's, then the ratio of the phase CT's should be entered, which would be the same as the X-RATIOP setting.

Demand Interval, DMND-INT

DMND-INT is settable at either 0, 1, or 2. This setting is used to specify the interval of time in minutes over which the demand currents are calculated for each phase. The settings define time intervals of 15, 30, and 60 minutes respectively.

COMMUNICATIONS SETTINGS

Communications Rate, BAUD

BAUD is settable at either 0, 1, 2, 3, or 4. Baud rates corresponding to these settings are 300, 1200, 2400, 4800, and 9600 respectively.

UNIT IDENTIFICATION SETTINGS

DDP Unit Identification, UNIT-ID

A four digit setting, UNIT-ID, from 0 to 9999 is used to specify the unit identification of the DDP. This unit identification must be used in logging into the DDP from a remote point via a communications channel.

CALIBRATION FACTOR SETTINGS

There are 12 calibration factors associated with the current inputs for the three phases and ground and three gain channels (one for each current times three gain channels). The calibration factors are stored on EEPROM memory on the Analog Board in the DDP. Each calibration factor is a number between 00 and 99, where 00 represents a correction factor of 0.950 and 99 represents a correction factor of 1.049. A calibration factor of 50 represents a correction factor of 1.0. Similarly, there are four calibration factors associated with the magnetics hardware, one for each current input (three phases and ground). These four factors must have a value of 50. The magnetics calibration factors (13 through 16) are not listed on the front panel since they do not change.

The correct values for these calibration factors are shown on the analog front end board and on the relay front panel. If the analog board is changed, it will be necessary to change the calibration factors through the man-machine interface to agree with the calibration factors that will be provided by the factory along with the new analog front end board.

HARDWARE DESCRIPTION

CONSTRUCTION

The components of the relay are mounted on a cradle assembly that can easily be removed from the relay case, refer to Figures HD-1 through HD-4. The cradle is locked in the case by latches at the top and bottom. The electrical connections between the case blocks and the cradle blocks are completed through removable connection plugs, as shown in Figure HD-5, to permit testing the relay in its case. The cover is attached to the front of the case and includes two interlocking arms that prevent the cover from being replaced until the connection plugs have been inserted.

The case is suitable for semi-flush mounting on panels. Hardware is available for all panel thicknesses up to two inches. A panel thickness of 1/8 inch will be assumed unless otherwise specified on the order.

The printed circuit boards are mounted behind the nameplate and can be accessed by removing the four screws securing the nameplate and MMI board assembly and unplugging the ribbon cable(s) from the horizontal board(s). The boards are mounted horizontally in guides. Each board is labeled to correspond to a given location. Use GE part number 286A2847P1 card puller or other suitable means to remove the circuit boards. If you do not have a card puller, be careful not to damage or bend any components when removing the boards.

RECEIVING, HANDLING AND STORAGE

This relay contains electronic components that could be damaged by electrostatic discharge currents if those currents flow through certain terminals of the components. The main source of electrostatic discharge currents is the human body, and the conditions of low humidity, carpeted floors and isolating shoes are conducive to the generation of electrostatic discharge currents.

Where these conditions exist, care should be exercised when removing and handling the modules to make settings on the internal switches. The persons handling the module should make sure that their body charge has been discharged, by touching some surface at ground potential, before touching any of the components on the modules.

These relays, when not included as part of a control panel, will be shipped in cartons designed to protect them against damage. Immediately upon receipt of a relay examine it for any damage sustained in transit. If damage resulting from handling is evident, file a damage claim at once with the transportation company and promptly notify the nearest General Electric Sales Office.

If the relays are not to be installed immediately, they should be stored in their original cartons in a place that is free from moisture, dust and metallic chips.

INSTALLATION PROCEDURE

The relay should be installed in a clean, dry location, free from dust and excessive vibrationIt should be mounted on a vertical surface. The outline and panel-drilling dimensions are shown in Figure HD-6.

Surge Ground

The case stud should be permanently connected to ground by a conductor not less than AWG No. 12 copper wire or equivalent. This connection is made to ground the relay case and the surge suppression networks in the relay. The surge ground lead should be as short as possible, preferably 10 inches or less, to provide maximum protection from surges. Figure HD-2 shows the rear view of an L2T case, illustrating the position of the case grounding stud.

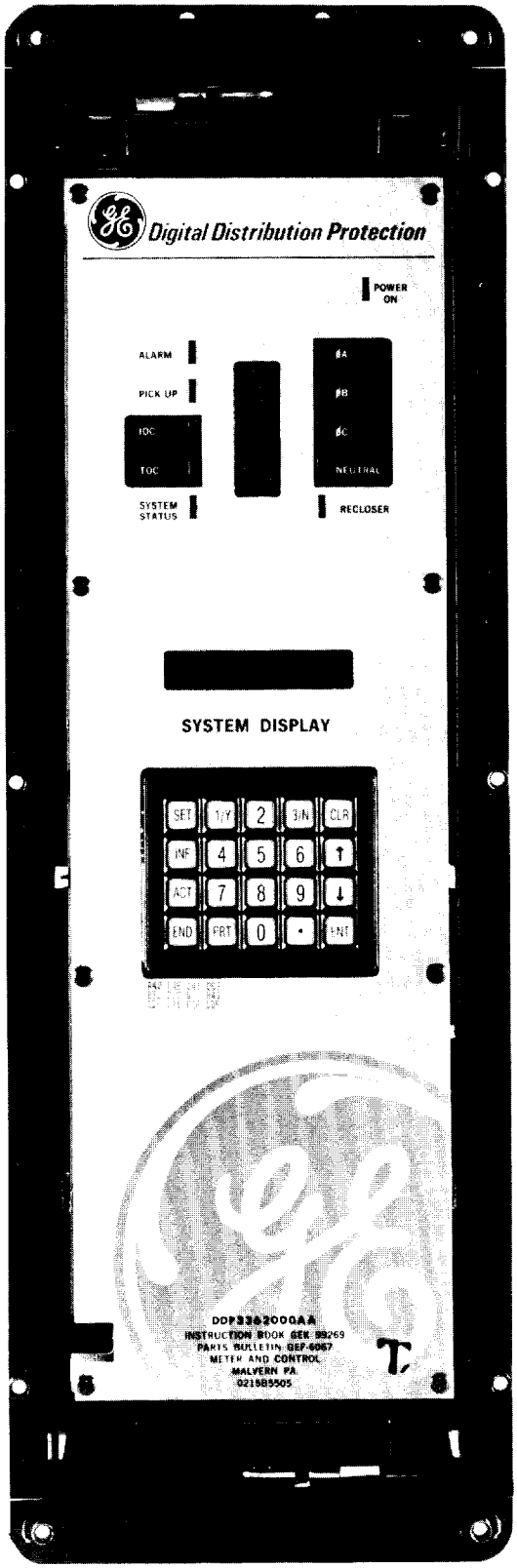


Figure HD - 1 (8919353) DDP with Front Cover Removed

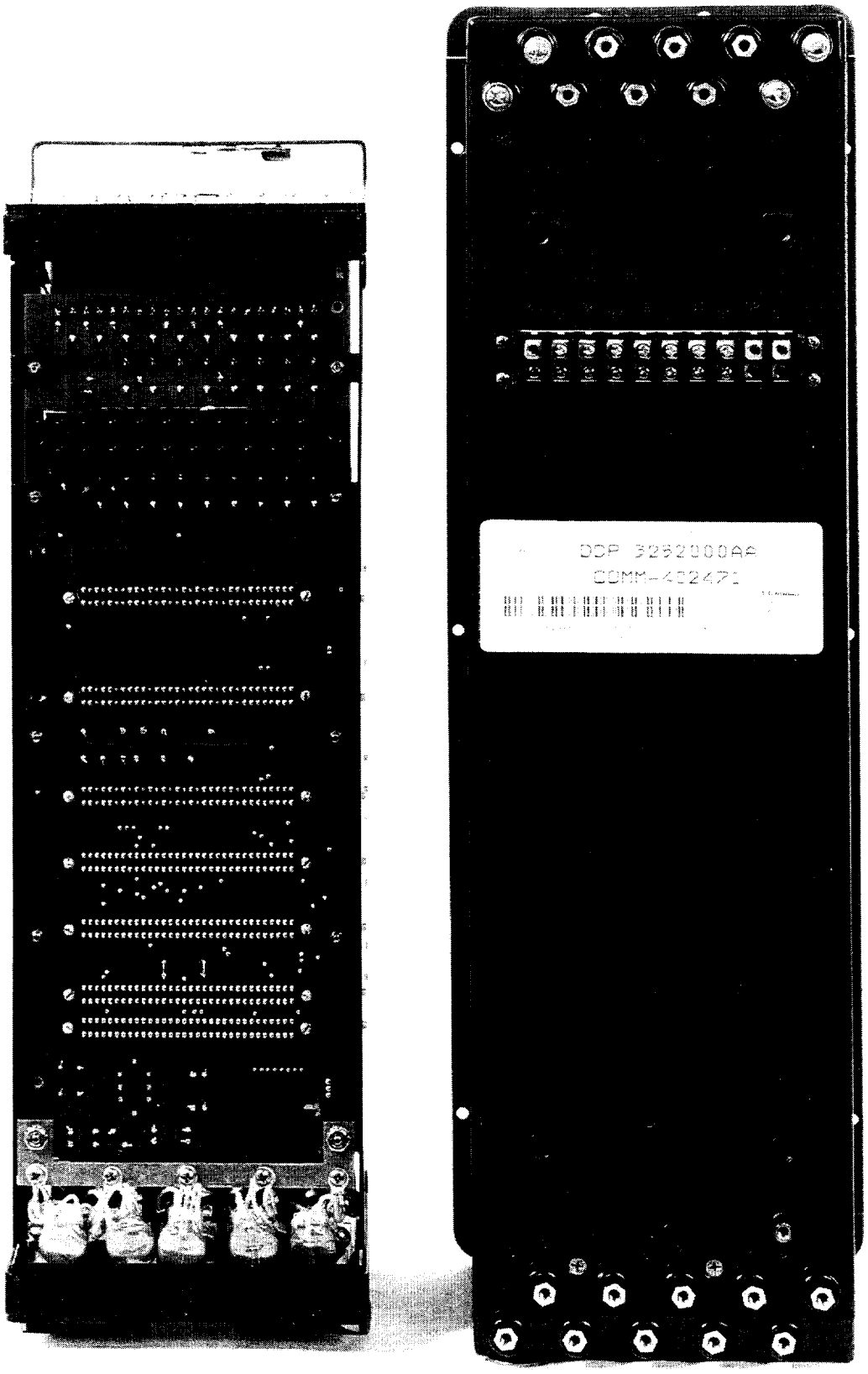


Figure HD-2 (8919358) Rear View of Relay Case and Drawout Cradle

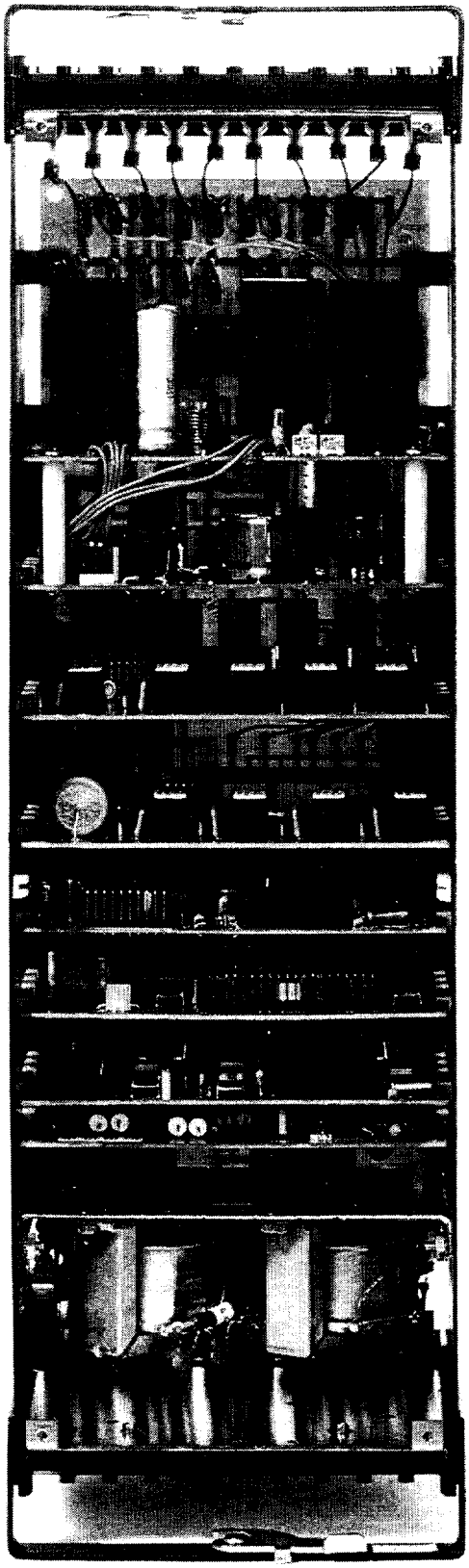


Figure HD-3 (8919355) DDP Front View with MMI Assembly Removed

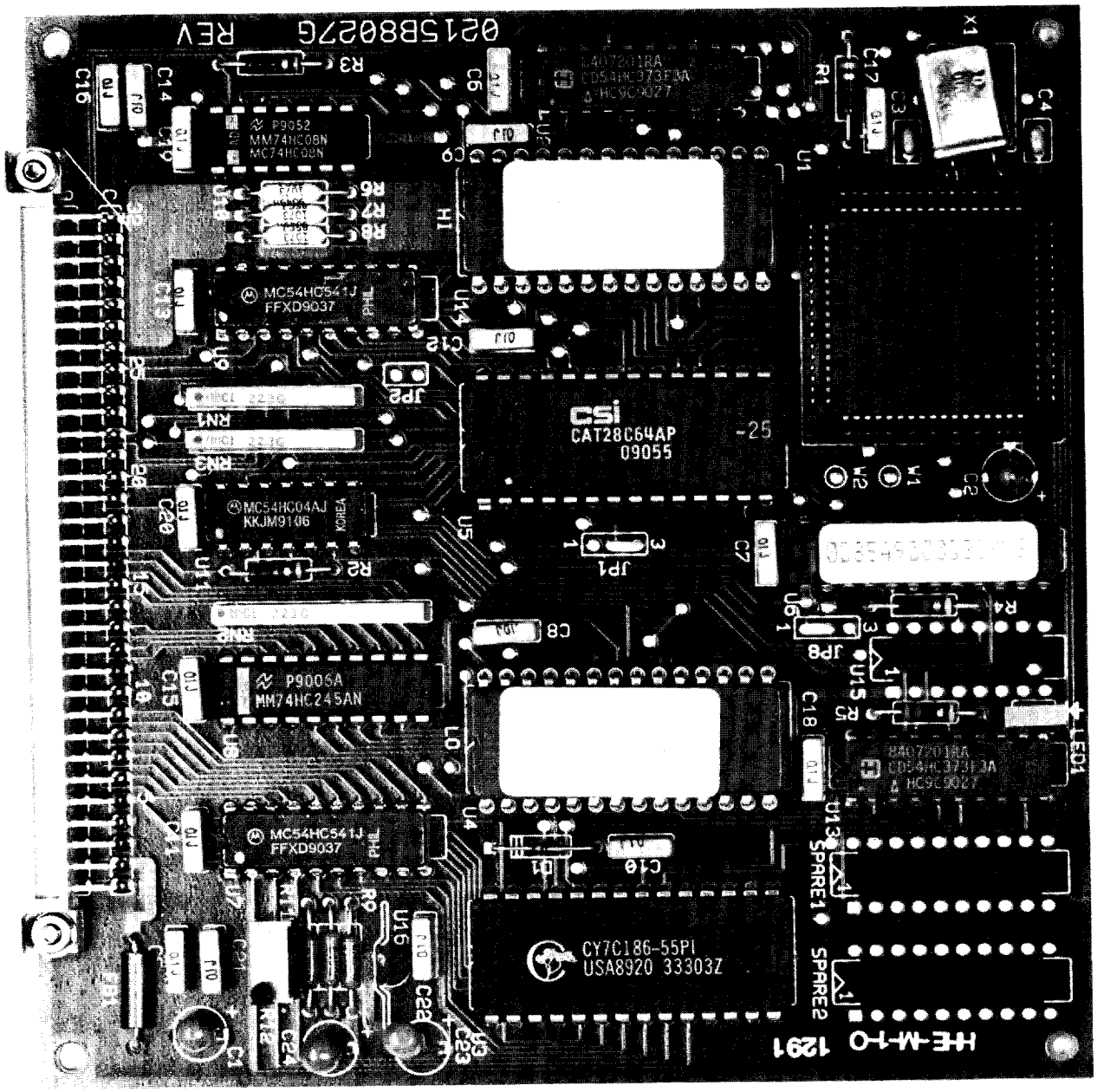
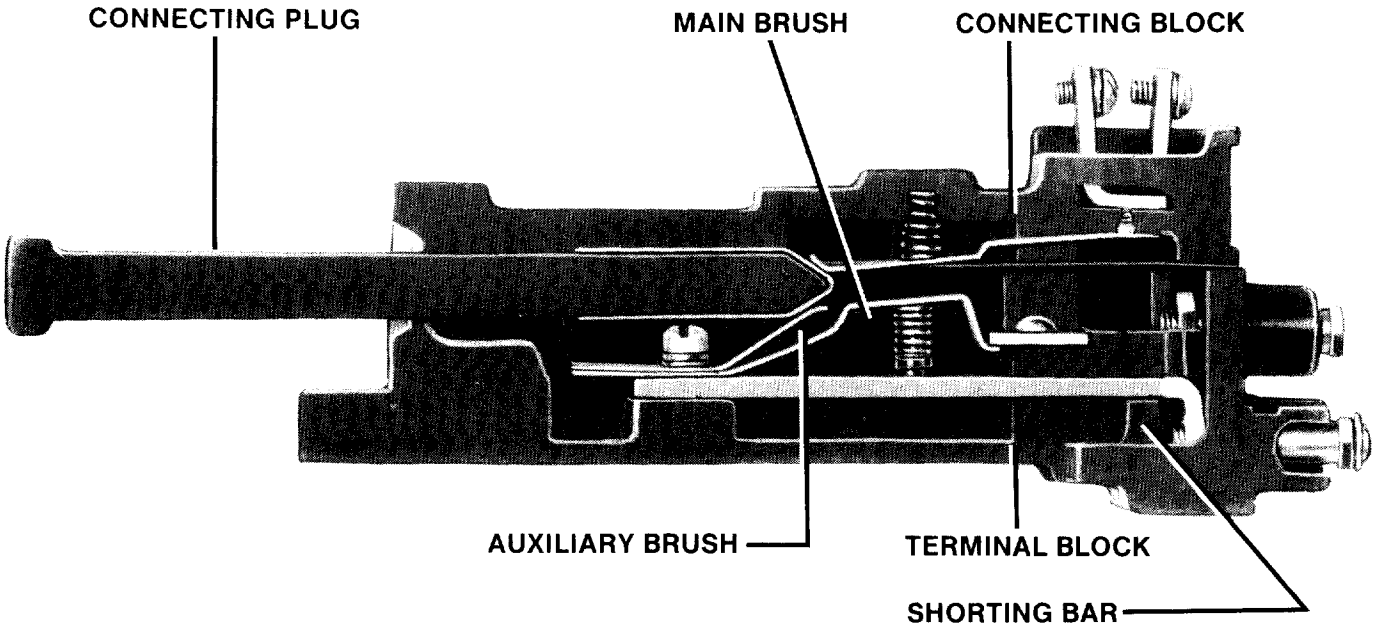


Figure HD-4 (8919357) View of a Typical Removable Module



NOTE: AFTER ENGAGING AUXILIARY BRUSH CONNECTING PLUG TRAVELS ¼ INCH BEFORE ENGAGING THE MAIN BRUSH ON THE TERMINAL BLOCK.

Figure HD-5 (8025039) Drawout Case Contact Assembly

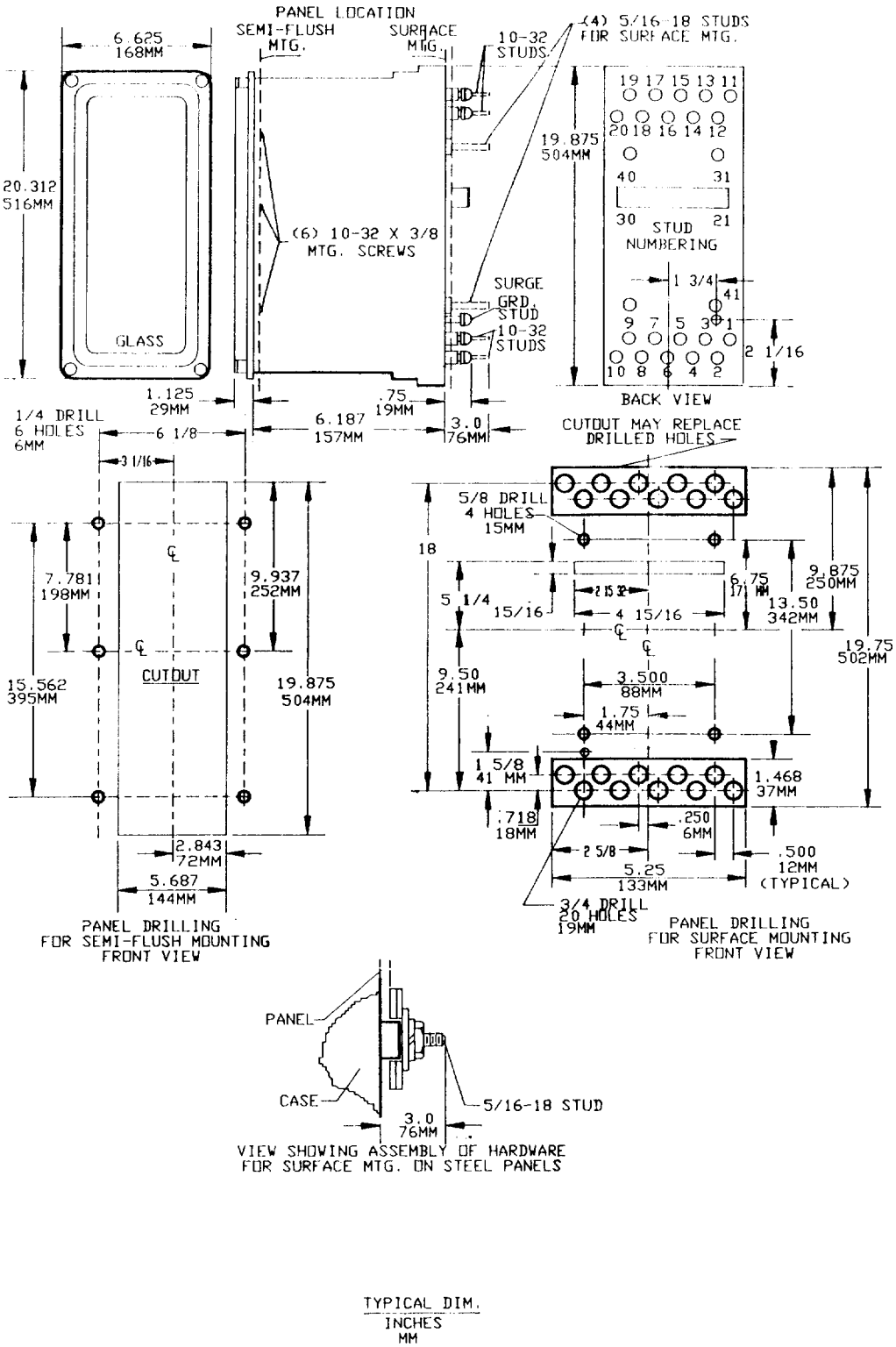


Figure HD-6 (0184B5789) Outline and Mounting Dimensions for DDP

ACCEPTANCE TESTS

CAUTION

Power Down the relay by removing the test plugs before removing or inserting modules. Failure to do so can permanently damage the relay.

GENERAL

This section is a guide for testing the relay. It is not necessary that the tests be performed for incoming inspection. The relay has been tested at the factory with automated test equipment. The DDP is a digital relay controlled by "self checking" software. If a system failure is detected it will be reported through the MMI.

The following tests are included:

General Tests

- T1 MMI Status and Display Tests (Self Tests)
- T2 Current measurement test

Instantaneous Function Tests

- T3 IOC low-set phase
- T4 IOC high-set phase
- T5 IOC low-set ground
- T6 IOC high-set ground

Time Overcurrent Function Tests

- T7 TOC phase pickup
- T8 TOC ground pickup
- T9 TOC ground trip
- T10 TOC phase trip

Torque Control Test

- T11 Torque control

Switch Settings Group Test

- T12 Switch settings group

Recloser Function Tests

- T13 Recloser READ
- T14 Recloser built-in TEST
- T15 Recloser functional

TEST EQUIPMENT

1. Single-phase source of current at rated frequency.
2. DC Control voltage source
3. AC ammeter
4. A continuity tester or Ohm meter
5. A Precision Timer for testing timed events.

The specific requirements of the equipment are given in the text of this section, and in the associated circuit diagrams.

DRAWINGS:

The following drawings should be used for reference during testing. They are located in the PRODUCT DESCRIPTION (PD), and the CALCULATION OF SETTINGS (CS) sections.

1. The Elementary Diagram	FIG PD-8
2. The Internal Connection Diagram	FIG PD-9
3. The TOC and IOC curves	FIG PD-3,4,5,6
4. The External Connection Diagram	FIG PD-2
5. Factory Relay Settings	TABLE CS-1

EQUIPMENT GROUNDING

All equipment used in testing the DDP relay should be connected to a common grounding point to provide noise immunity. This includes the current source, as well as the DDP itself.

The ground connection on the DDP is terminal #41 (see Figure HD-2 in the HARDWARE DESCRIPTION section).

REQUIRED SETTINGS

Most tests will utilize the Factory Settings. If setting changes are required, they will be listed prior to the test procedure.

For periodic testing purposes, see the following section. It provides details on doing the relay test with user-specific settings.

GENERAL INSTRUCTIONS

CAUTION

The TOC pickup contact will chatter when the unit under test is near its threshold. DO NOT let it continue. Remove the test current. A single contact closure is enough to determine that the unit has picked up.

1. A continuity tester with high-input impedance such as a Digital Ohmmeter should be used to monitor the contacts during the testing of the relay.

WARNING

TRIPPING CONTACTS WILL OPERATE DURING THE TEST.

2. Where appropriate, current levels are defined with two numbers as: xx(yy), xx is the value to be used for relays rated at 5 amperes and (yy) is the value to be used for 1 ampere relays. However, when this is not true it will be stated.

3. During the test one or possibly more of the electronic current sources may not be used. If the source is not used it must be set to zero (0) in addition to being turned OFF. Also, the current sources should only be powered on or off with the currents set at or near zero (0).

4. Typing an entry on the keypad will be shown as ["key"] where "key" is the alphanumeric label of the key to be pressed. For tests that require a setting change, the setting number will be shown in parentheses next to the setting to allow direct access to the setting. This is performed by pressing the [SET] key, the setting number (nnn), and [ENT]. The new setting may then be entered.

At the end of testing, make sure that all settings are returned to initial values.

SETTING CHANGES

Setting changes required for a particular test will be listed before the test. A sample setting change is shown below. Refer to the INTERFACE section for further details on making setting changes.

Sample Setting Change

To change the pickup of the TOC phase in the GROUP 2 protection category to 2.3 Amps:

1. Apply rated DC and wait for relay initialization to complete as indicated by display going into default display mode (scrolling through input currents). Note: If WARNING error #21, #22, or #23 occurs, press the clear key to remove the message and the display should scroll the input currents.

2. Press the [SET] "settings" key. Scroll with the arrow key until "GROUP 2" is displayed, then press the [ENT] "enter" key.

3. Scroll through the GROUP 2 settings until you get to "PU-TOCP =#.#".

4. Type "2.3" on the keypad. The typed inputs will be shown on the MMI display and the "=" sign will change to blinking ":". This represents that a change is made but not yet entered.

5. When the correct pickup is keyed in, press the [ENT] "enter" key. The alarm LED should turn ON(red) indicating that a setting has been altered, and the relay is out of service.

6. To finalize the setting change, press the [END] "end" key followed by the [ENT] "enter" key. The MMI display will change to default display after 10 seconds (i.e. scroll the currents) and alarm LED will go OFF and system status LED will turn ON, indicating that the setting is in and the relay is in service.

NOTE

Press "END" "ENT" after any settings changes are complete.

INITIAL TEST SETUP

Before beginning the test, the relay settings should be verified with that of the factory settings listed in the CALCULATION OF SETTINGS section. Scroll through each setting and make sure they match the factory settings listed.

The readability of the MMI display can be improved by using the CONTRAST ADJUST and BACKLIGHT features from the ACT key menu. Refer to the INTERFACE section.

GENERAL RELAY TESTS

T1 - MMI Status and Display Tests

The Relay's Status is reported through the MMI alarm contact. If a system error caused relaying functions to cease, the alarm LED on the MMI would turn ON , system status LED would turn OFF, the alarm contact would open, and a "FAIL" message will appear on the MMI display. A failure (WARNING) that did not interrupt relaying would be indicated by opening of the alarm contact, however, the alarm LED would stay OFF , and system status LED would stay ON, and a "WARN" message would appear on the MMI display.

The preceding paragraph demonstrates the use of the MMI to check relay status. See the SERVICING section for further information.

The MMI test is built into the software. It allows the user to test the keypad, the LEDs, and the display.

1. Connect the relay as shown in figure AT-1. The AC inputs are not required for this test, only the DC power supply voltage. Apply rated DC power and wait for initialization to complete.

2. Press the target reset lever and make sure all LEDs turn ON.

3. Press the [ACT] "action" key. Then scroll with the arrow keys until the heading "ACT: MMI TEST" is displayed.

4. Press the [ENT] "enter" key.

   The display should be sixteen fully lit rectangles. After about 10 seconds it will change to LED TEST ?

5. Press the [1/Y] key followed by the [ENT] key.

   The display will blink TESTING and all the LEDs (except the power LED, and either the SYSTEM STATUS or the ALARM LED) will blink ON/OFF. If Protection is ON, the SYSTEM LED will not blink but will stay permanently ON. If

protection is OFF, the ALARM LED will not blink but will stay permanently ON.

6. Next, the display will prompt you for the keyboard test with "KEYBRD TST?".

7. Press the [1/Y] key followed by the [ENT] key.

8. At this point the MMI is in the keyboard test. Press every key on the keypad, except for the [CLR] "clear" key. As you press each key verify that the display indicates the key that was pressed. Example: pressing the up arrow would be displayed by the word "UP ARROW". The other keys will match the description that is on the key itself.

9. When all the keys have been checked press the [CLR] key to end the test.

WARNING !

DO NOT LEAVE CURRENT CONTINUOUSLY CONNECTED TO THE RELAY AT MORE THAN 4 TIMES THE RATING OF THE CTs.

T2 - Current Measurement Test

1. Connect the relay as shown in figure AT-2.

2. Apply 1 Amp RMS current (0.2 for models with the 2nd digit 2) to phase A. Press INF key scroll until Meter appears in the display, press ENT. Use the arrow keys until IA=xx.xx appears in the display. Press the ENT key and the current will be updated with each press. Read the current the DDP and verify that it is between 0.9 and 1.1 (0.18 and 0.22).

3. Repeat above for phase B and C.

4. Apply 1 Amp RMS current (0.2 for models with the 2nd digit 2 or 3) to phase N. Read the current at the DDP and verify that it is between 0.9 and 1.1 (0.18 and 0.22).

5. Apply 10.0 Amp RMS current (2.0 for models with the 2nd digit 2) to phase A. Read the current and verify that it is between 9.8 and 10.2 (1.96 and 2.04).

6. Repeat above for phase B and C.

7. Apply 10.0 Amp RMS current (2.0 for models with the 2nd digit 2 or 3) to phase N. Read the current at DDP and verify that it is between 9.8 and 10.2 (1.96 and 2.04).

T3 IOC Low-Set Phase Trip Test

Settings:
(310) IOCLP = YES

1. Connect as per figure AT-3

2. Close TORQUE switch and make sure SWITCH GROUP switch is open.

3. Apply Iop to phase "A", 4.7 A (0.94 if second digit of Model number is 2) and the TRIP3 contact should stay open. Increase Iop to 5.25 A (1.05). The TRIP3 contact should close, IOC and phase "A" LEDs should turn ON.

4. Reduce Iop to zero and reset the targets.

T4 IOC High-Set Phase Trip Test

Settings:
(311) IOCHP = YES

1. Apply Iop to phase "A", 4.7 A (0.94 if second digit of Model number is 2), move continuity tester to terminals 15 and 16, and the TRIP2 contact should stay open.

Increase Iop, to 10.5 A (2.1). The TRIP2 contact should close, IOC and phase "A" LEDs should turn ON.

2. Reduce Iop to zero and reset the targets.

T5 IOC Low-Set Ground Trip Test

Settings:
(310) IOCLP = NO
(311) IOCHP = NO
(312) IOCLG = YES

1. Connect the relay as per figure AT-4

2. Apply Iop to phase "C" and "N" in series, 0.94 A (4.7 if second digit of Model number is 1) and the TRIP3 contact should stay open. Increase Iop to 1.05 A (5.25). The TRIP3 contact should close, IOC, and phase "N" LEDs should turn ON.

3. Reduce Iop to zero and reset the targets.

T6 IOC High-Set Ground Trip Test

Settings:
(313) IOCHG = YES

1. Connect as per figure AT-4 except move the continuity tester to terminals 13 & 14.

2. Apply Iop to phase "C" and "N" in series, 1.9 A (9.5 if second digit of Model number is 1) and the TRIP2 contact should stay open. Increase Iop to 2.1 A (10.5). The TRIP2 contact should close, IOC, and phase "N" LEDs should turn ON.

3. Reduce Iop to zero and reset the targets.

T7 TOC Phase Pickup Test

Settings:
(314) TOCP = YES
(312) IOCLG = NO
(313) IOCHG = NO

1. Connect the relay as per figure AT-5.

2. Apply Iop to phase "B", 1.9 A (0.38 if second digit model number is 2) and TOC PU contact should stay open. Increase Iop to 2.1 A (0.42). The TOC PU contact should close and the PICKUP LED should turn ON.

3. Reduce Iop to zero.

T8 TOC Ground Pickup Test

Settings:
(314) TOCP = NO
(315) TOCG = YES

1. Connect the relay as per figure AT-6.

2. Apply Iop to phase "B" and "N" in series, 0.18 A (0.95 if second digit model number is 1) and TOC PU contact should stay open. Increase Iop to 0.22 A (1.06). The TOC PU contact should close and the PICKUP LED (amber color) should turn ON.

3. Reduce Iop to zero.

T9 TOC Ground Trip Test

Settings:
(310) IOCLP = NO
(311) IOCHP = NO
(312) IOCLG = NO
(313) IOCHG = NO

1. Connect the relay as per figure AT-7.

2. Apply Iop to phase "B" and "N" in series, 0.3 A (1.5 if second digit model number is 1) and TRIP1 contact should close between 11.2 seconds and 12.8 seconds.

LEDs "N", TOC, and PICKUP should turn ON.

3. Reduce Iop to zero and reset the targets.

4. Apply Iop to phase "B" and "N" in series, 2.0 A (10.0 if second digit model number is 1) and TRIP1 contact should close between 290 milli seconds and 334 milli seconds. LEDs "N", TOC, and PICKUP should turn ON.

5. Reduce Iop to zero **immediately** and reset the targets.

T10 TOC Phase Trip Test

Settings:
(314) TOCP = YES
(315) TOCG = NO

1. Connect the relay as shown in figure AT-7

2. Apply Iop to phase "B" and "N" in series, 3 A (0.6 if second digit model number is 2) and TRIP1 contact should close between 11.2 seconds and 12.8 seconds. LEDs "B", TOC, and PICKUP should turn ON.

3. Reduce Iop to zero and reset the targets.

4. Apply Iop to phase "B" and "N" in series, 20.0 A (4.0 if second digit model number is 2) and TRIP1 contact should close between 290 milliseconds and 334 milliseconds. LEDs "B", "N", TOC, and PICKUP should turn ON.

5. Reduce Iop to zero **immediately** and reset the targets.

T11 Torque Control Test

Settings:
(119) TORQUE = 63

1. Connect as per figure AT-6 and Open the TORQUE switch.

2. Apply Iop to phase "B" and "N" in series, 3 A (0.6 if second digit model number is 2) and pickup contact should stay open. Close the TORQUE switch and the TOC contact should close. LEDs "B" and PICKUP should turn ON.

3. Reduce Iop to zero and reset the targets.

T12 Switch Settings Group Test

Settings:
(301) GRP-SW = YES
(310) IOCLP = YES
(220) GRP2TIME = 0

1. Connect the relay as per figure AT-4.

2. Close the SWITCH GROUP switch and make sure TORQUE switch is closed.

3. Apply Iop to phase "B" , 9.0 A (1.5 if second digit model number is 2) and the TRIP3 contact should stay open. Increase the current to 10.5 A (2.1) and the contact should close immediately.

4. Open the SWITCH GROUP switch, then reduce Iop to zero and reset the targets.

NOTE

DO THE FOLLOWING TESTS ONLY IF YOU HAVE A RECLOSER IN YOUR DDP i.e. the 1st digit of the DDP model number is a 3. The DDP recloser is similar in operation to the GE SLR 12.

T13 Recloser READ Test

1. Connect the DDP as per figure AT-8 and make sure SW1 (behind the front nameplate and bottom right, see Figure CS-2 in the CALCULATION OF SETTINGS section) is in position 2 before

power is turned ON. Note that if the switch position is changed with relay power ON, the DDP may display "WARM START", and if the message appears 3 times in 1 hour the DDP will display "FAIL: ERR #1" after the warm start. If this happens turn power OFF, change the position of the switch and then turn power ON.

2. Press the ACT key and use the arrow keys until the system LCD displays READ SLR. Press the ENT key. Display will show READ SLR ? Press the 1/Y key then the ENT key. The Recloser display will read out the data programmed for the recloser as shown in Figures AT-9a) through h). The data is displayed in 8 readings of 4 seconds each. Any function not used is skipped, which shortens the read cycle. The following is a description of each 4 second read.

2.1. Figure AT-9a) Reclosure selected
All reclosures selected (I, 1, 2, 3) will be on solid and REC. will blink for the 4 seconds.

2.2. Figure AT-9b) Time of reclose (1st)
The number of the timed reclosure (1) along with the time, (2.0 sec) will be on solid, and REC. will blink for 4 seconds.

2.3. Figure AT-9c) Time of reclose (2nd)
The number of the timed reclosure (2), along with the time, (4 sec) will be on solid, and REC. will blink for 4 seconds.

2.4. Figure AT-9d) Time of reclose (3rd)
The number of the timed reclosure (3), along with the time, (8 sec) will be on solid, and REC. will blink for 4 seconds.

2.5. Figure AT-9e) Time of reset
The time for reset (12 sec) will be on solid, and RES. will blink for 4 secs.

2.6. Figure AT-9f) Time of pause limit
The time for pause (4096 sec) will be on solid and pause wll blink for 4 seconds.

2.7. Figure AT-9g) Pickup and dropout time of RSThe pickup and dropout times (L, 0) will be on solid, and R.S. and D.O./P.U. will blink for 4 seconds.

2.8. Figure AT-9h) Reclose portion of RS
The RS start position (2) will be on solid, and R.S. will blink for 4 seconds.

T14 Recloser Built-in TEST

Setting:
(416) REC-EN = YES

1. Connect the DDP as per Figure AT-8.

2. Press the ACT key and use the arrow keys until the display indicates TEST SLR. Press the ENT key and the display will show NORMAL TEST. Pressing the ENT key will display TEST SLR?. Pressing 1/Y, ENT keys will execute the recloser test. The test circuit of the recloser is designed to test the system hardware while running the program information entered into memory. The test operates all circuits except the input networks and output relays. During the test, the recloser assumes that the circuit breaker is working into a fault so that each time the circuit breaker closes it will re-open immediately. The output relays do not change state. Reclose signals are indicated by the reclose LED.

If the circuit breaker is closed at the beginning of the test (52a closed and 52b open), the recloser LCD will display as shown in Figure AT-10a) through f).

2.1. The recloser begins in Normal Reset condition as shown in Figure AT-10a).

2.2. The display will change to that shown in Figure b). The 2 seconds for the first timed reclosure will count down in 0.5 second intervals. B.I. will be visible indicating that there is an instantaneous reclose programmed. REC. and B.I. are blinking.

2.3. The display will change to that shown in Figure c). The 4 seconds for the second timed reclosure will count down in 1 second intervals. REC. and B.I. are blinking.

2.4. The display will change to that shown in Figure d). The 8 seconds for the third timed reclosure will count down in 1 second intervals. R.S. is now visible because the Relay Spare contact is programmed for the second reclose. REC. and B.I. are blinking.

2.5. The display will change to that shown in Figure e). The relay is in Lockout. B.I. and L.O. are blinking.

2.6. The display will change to that shown in Figure f). The 12 second reset time will count down in 1 second intervals. RES., B.I., and L.O. are blinking. After the reset is timed out, the LCD will again appear as in Figure a).
If the DDP is in lockout at the beginning of the test. The LCD will first appear as shown in Figure e), proceed through Figures f), a), b), c), and d) and stop with the display shown in Figure e).

3. Press the ACT key and use the arrow keys until the display indicates TEST SLR. Press the ENT key and the display will show NORMAL TEST. Use the up arrow key until the display shows DEL. REC. TEST. (DEL. REC. TEST is the same as NORMAL test except it skips the first selected reclose, simulating a DR input). Press the ENT key and display will change to TEST SLR?. Pressing the 1/Y and ENT keys will execute the DR "Delayed Reclose" test. The LCD will look the same as for the NORMAL TEST described above except that because the instantaneous reclose is skipped, B.I. will not appear in Figure AT-10b).

T15 Recloser Functional Test

Settings: (410) PAUSE = 0

1. Connect the DDP as shown in Figure AT-8 and power up the unit with 52A open and 52B closed.

2. The recloser should be in lockout with B.I. and L.O. appearing on the recloser LCD. Relay LO "lockout" will be picked up.

3. Before starting the functional testing, monitor the output contacts of interest.

4. Push the CLOSE button for 1 second and then release. The 52 relay of the test circuit will pick up, along with the IP "In Progress" relay of the recloser. RES. "Reset" of the LCD will come on and the LCD will count down the 12 second reset time. After the reset time, BI, LO, and IP relays will drop out and only RES. will appear on the LCD. The recloser is now in the reset condition.

5. Push the OPEN button for 1 second and then release. During the 1 second period, the following occurs:

5.1. The 52 relay of the test circuit drops out.

5.2. The IP, and REC "Reclose" relays will pick up.

5.3. RES. of the LCD will go out and the reclose LED will come on.

5.4. B.I. of the LCD will come on and the LCD will start counting down the 3.6 second

reclose-signal time limit. (During the 1 second time period, 3 will appear for .6 second and 2 will appear for 0.4 second.)

6. As soon as the OPEN button is released, the following occurs:

6.1. The 52 relay of the test circuit picks up.

6.2. The REC relay will drop out.

6.3. RES. of the LCD will come on and the reclose LED will go out.

6.4. The LCD will start counting down the 12 second reset time.

7. Before the 12 second reset time is complete, push the OPEN button for 1 second and then release. As soon as the OPEN button is pushed, the RES. of the LCD will go out, REC.1 (1st reclose) of the LCD will come on, and the LCD will start counting down the 2 second 1st reclose in 0.5 second intervals. When the OPEN button is released, the LCD continues to count down the 2 second 1st reclose. After the 2 second 1st reclose time, the REC relay will pick up and the reclose LED will come on. The REC relay and the reclose LED will only be on until the 52 relay of the test circuit picks up and the recloser responds to the change of state of the 52 relay. Because the pickup time for 52 is short, the reclose LED will appear to have a single blink during reclose. Now that the 52 relay is picked up, REC.1 of the LCD has gone out and RES. of the LCD has come on. At this time the recloser is counting down the 12 second reset time.

8. Before the 12 second reset time is complete, push the OPEN button for 1 second and then release. The recloser will now do REC.2 (2nd reclose). The 2nd reclose is similar to the 1st, except the second reclose has a time delay of 4 seconds counted down in 1 second intervals and initiates the RS "Relay Spare" relay when the 2nd reclose of 52 takes place. R.S. of the LCD will come on to indicate that the RS relay has picked up. It should be noted that the 2nd reclose is the second timed reclose and the 3rd reclose of the reclose cycle, due to Instantaneous reclose being called for. With 52 picked up, the recloser is in reset and is counting down the 12 second reset time.

9. Before the 12 second reset time is complete, push the OPEN button for 1 second and then release. The recloser will now do REC.3 (3rd reclose). The 3rd reclose is similar to the first, except the third reclose has a time delay of 8 seconds, counted down in 1 second intervals. At the end of the 8 seconds, the 52 test relay will pick up, and the recloser will start counting down the 12 second reset time.

10. Before the 12 second reset time is complete, push the OPEN button for 1 second and then release. When the recloser responds to the 52 relay of the test circuit, it will proceed to lockout with the following results:

10.1. The IP and RS relays will drop out and the LO relay will pick up.

10.2. RES. and R.S. of the LCD will go out and L.O. of the LCD will come on.

The recloser is now back in lockout condition, where the test started.

Make sure that all settings are returned to the initial values.

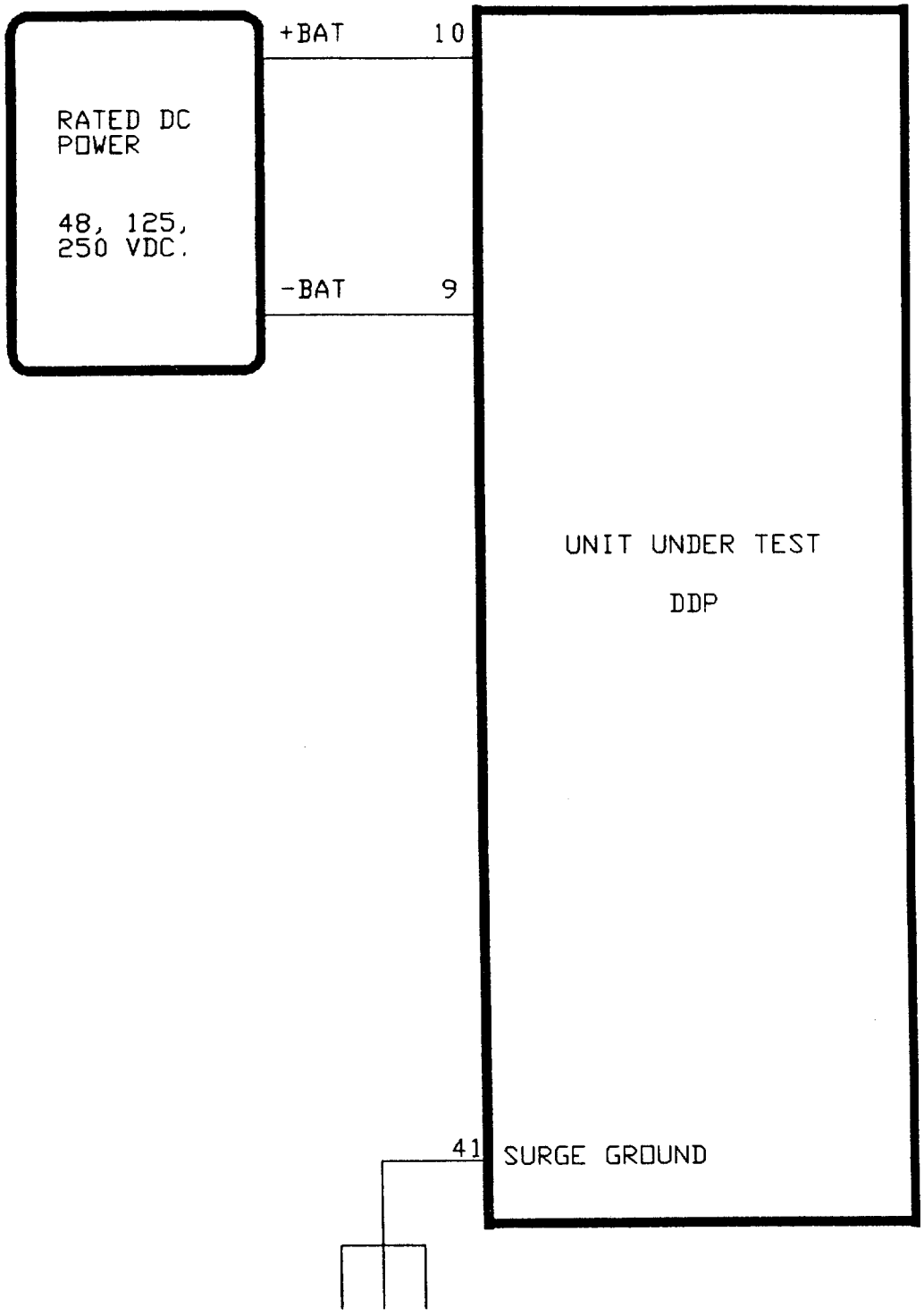
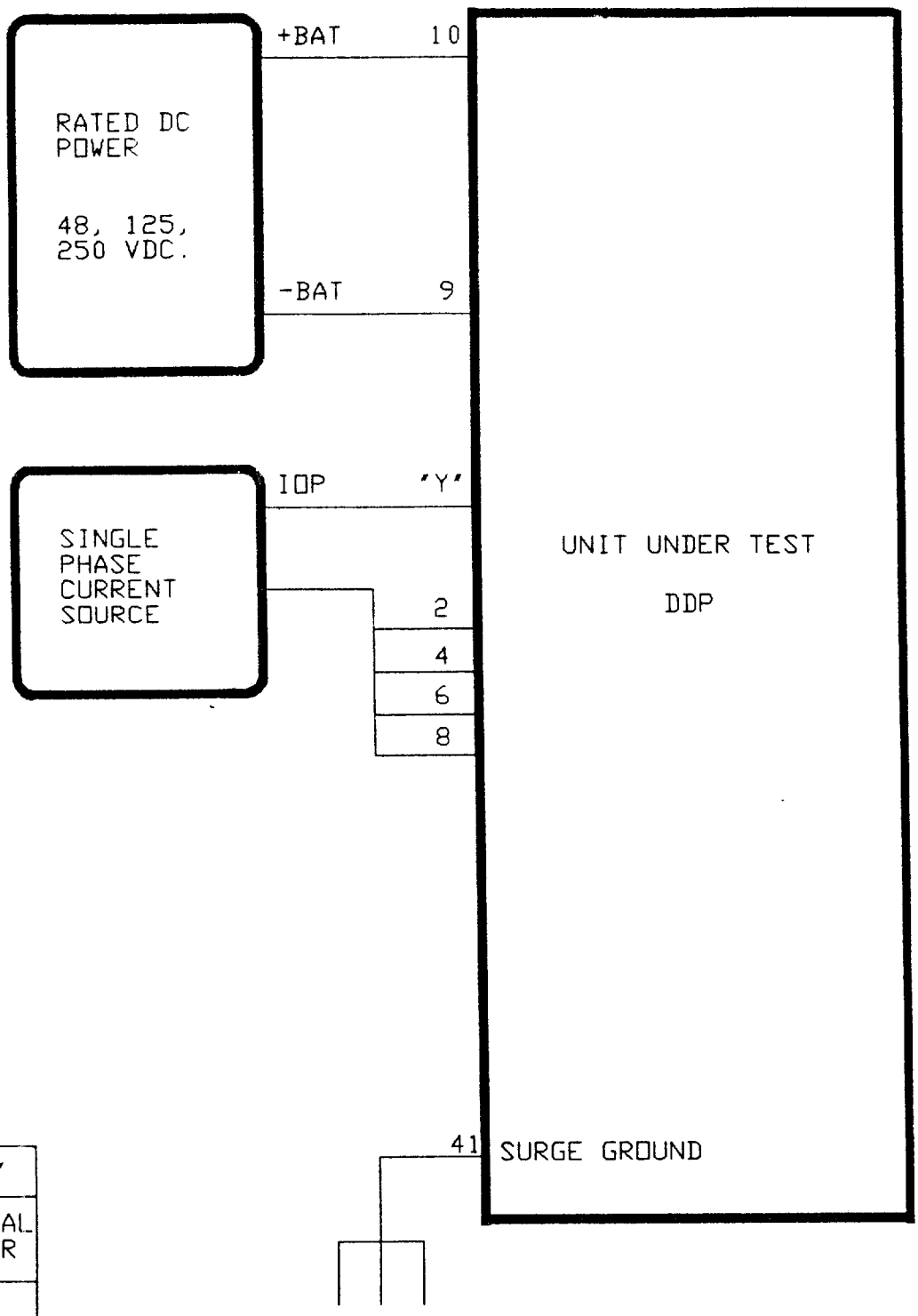


Figure AT-1(0285A5376) DDP MMI Test Connections



INPUT 'Y'	
PHASE UNDER TEST	TERMINAL NUMBER
IA	1
IB	3
IC	5
IN	7

Figure AT-2(0285A5377) DDP Current Measurement Test Connections

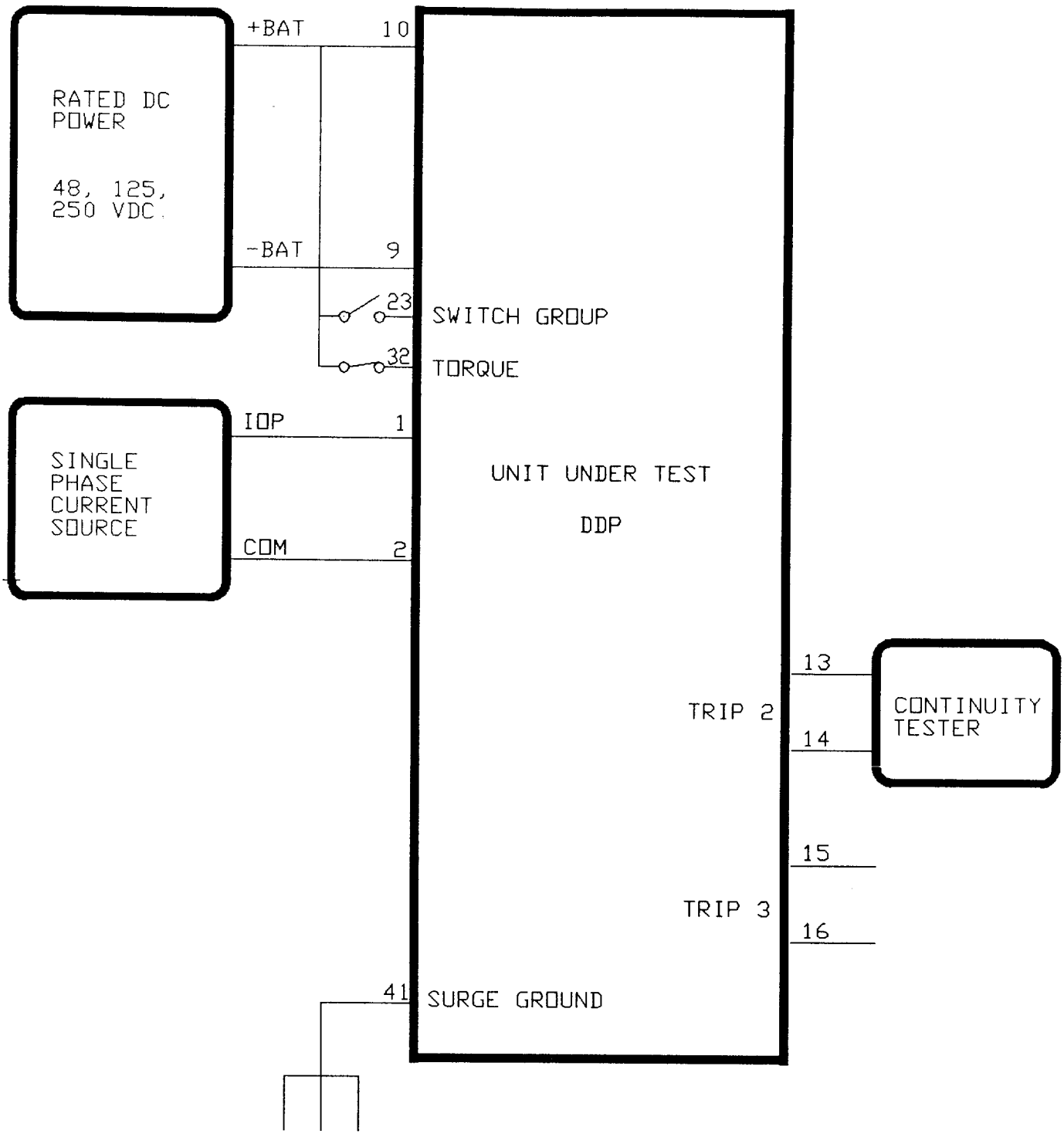


Figure AT-3(0285A5378 [2]) DDP IOC Phase Trip Test Connections

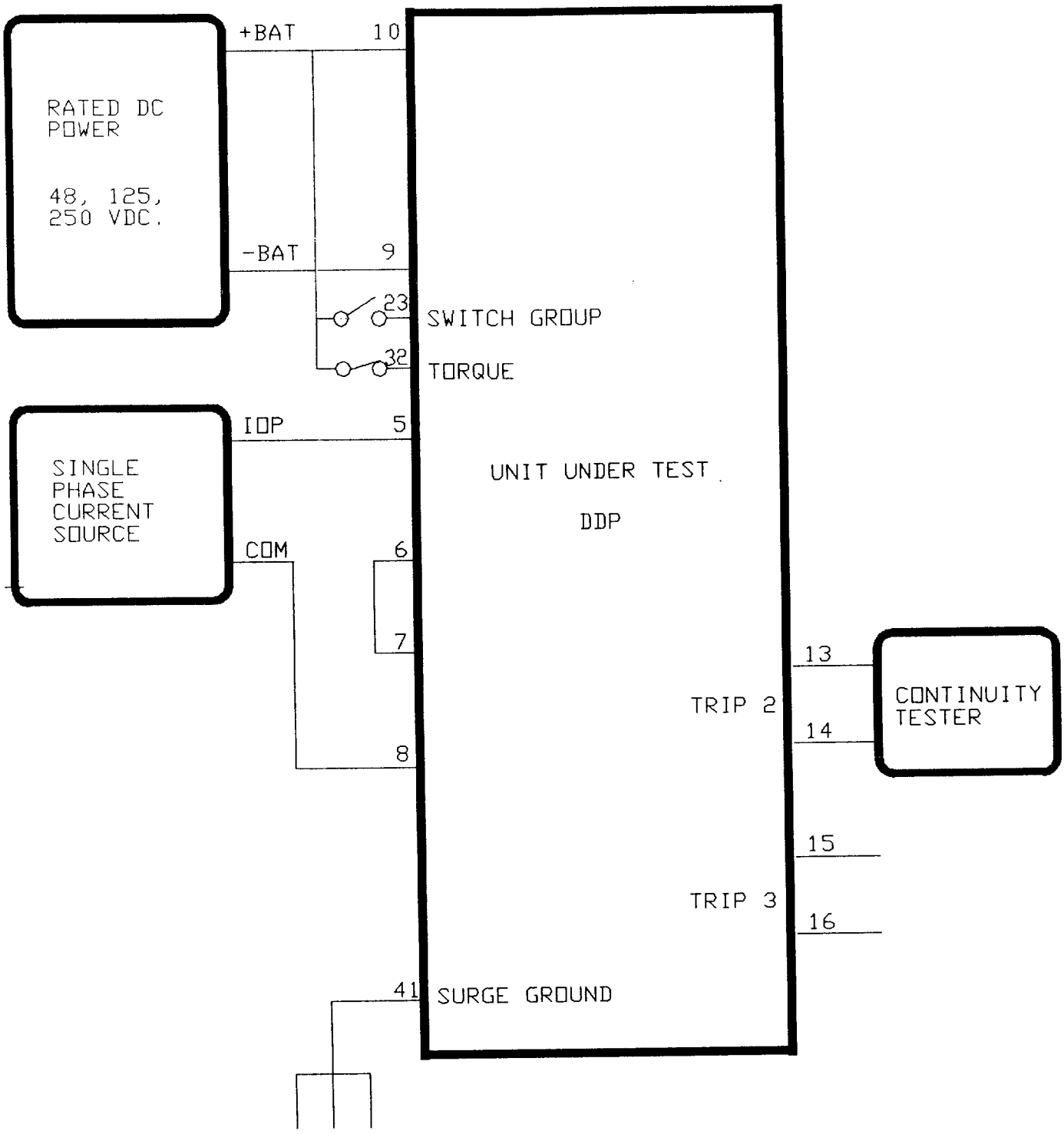


Figure AT-4(0285A5379 [2]) DDP IOC Ground Trip Test Connections

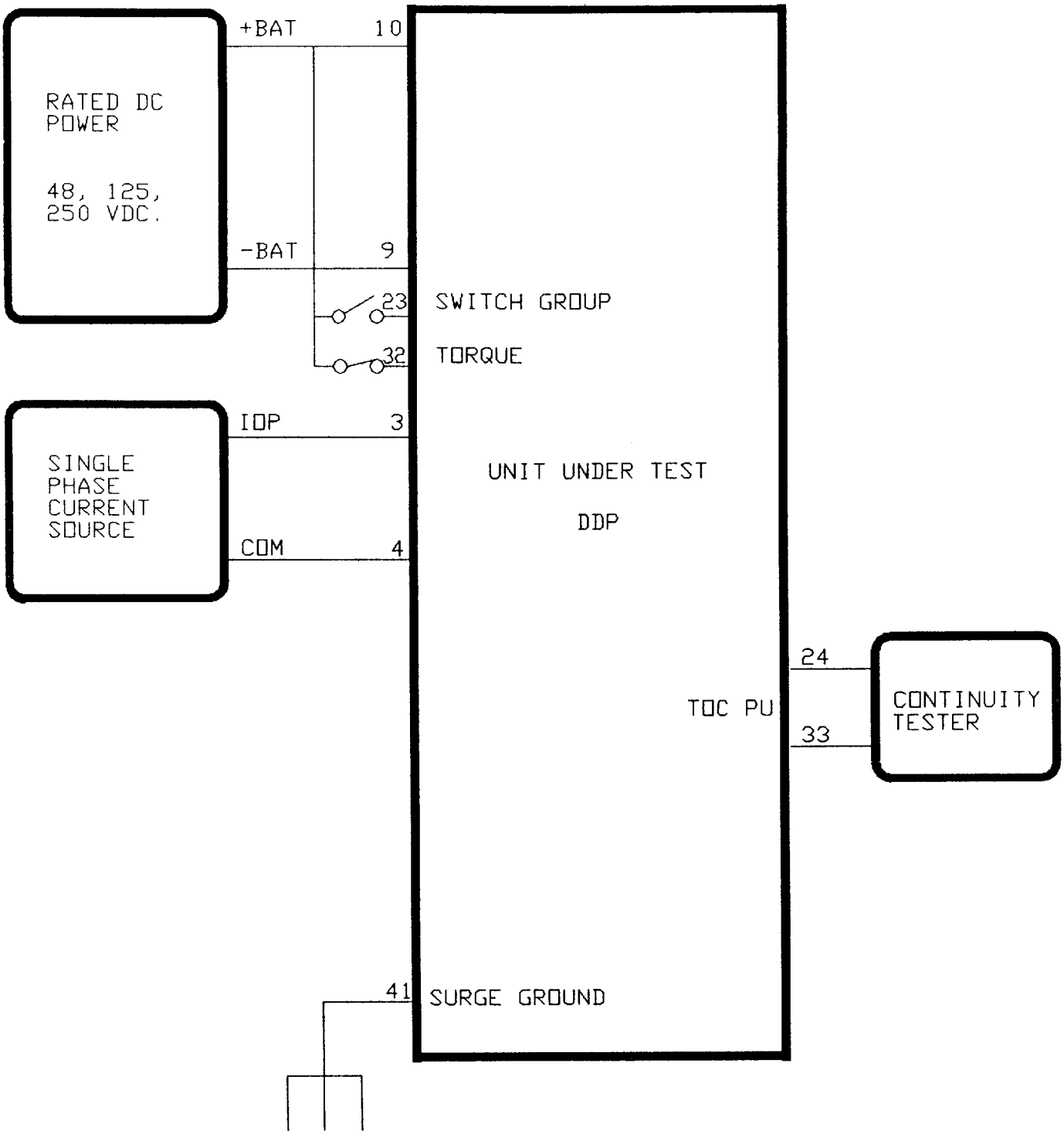


Figure AT-5(0285A5380 [2]) DDP TOC Phase Pickup Test Connections

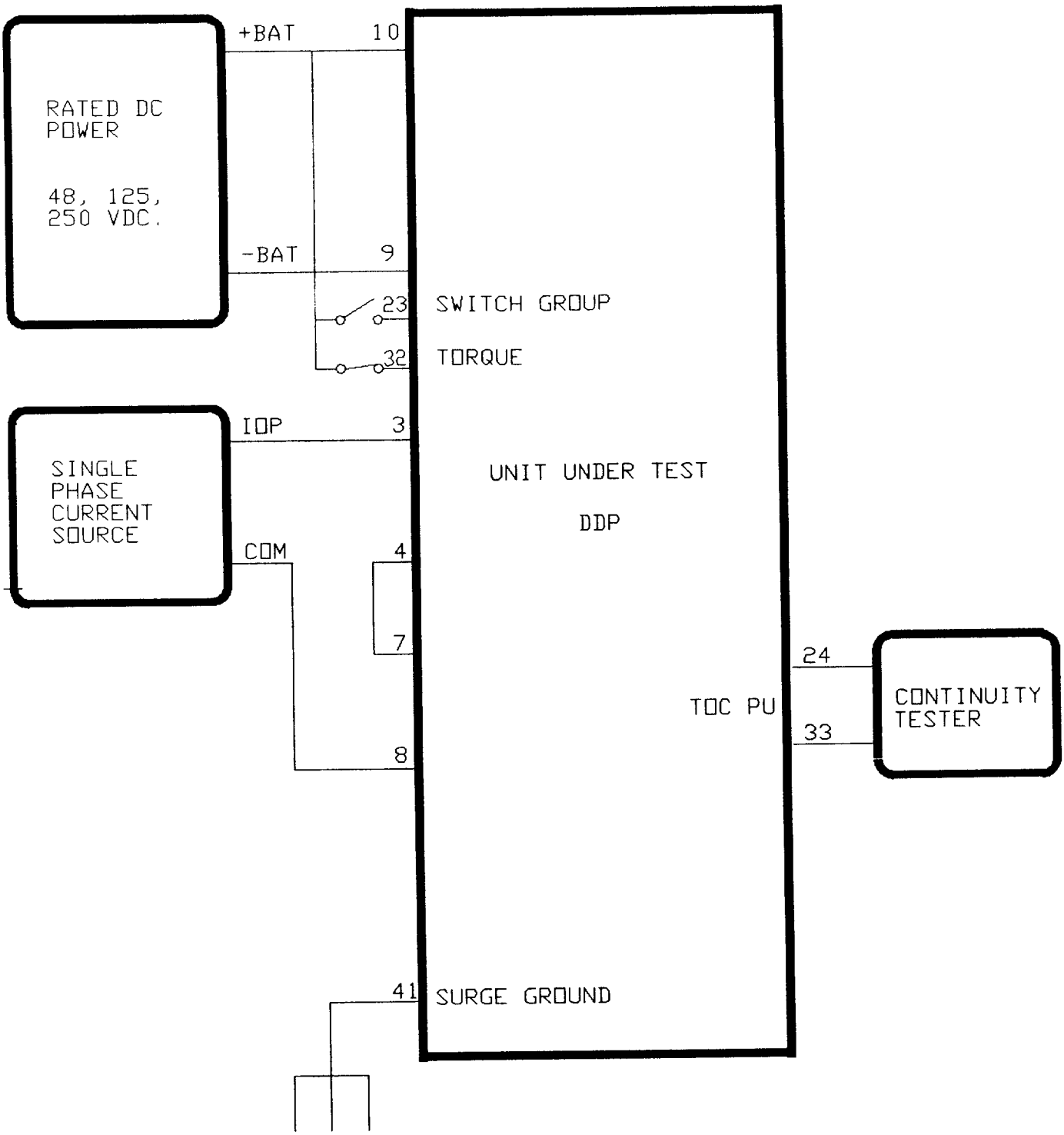


Figure AT-6(0285A5381 [2]) DDP TOC Ground Pickup Test Connections

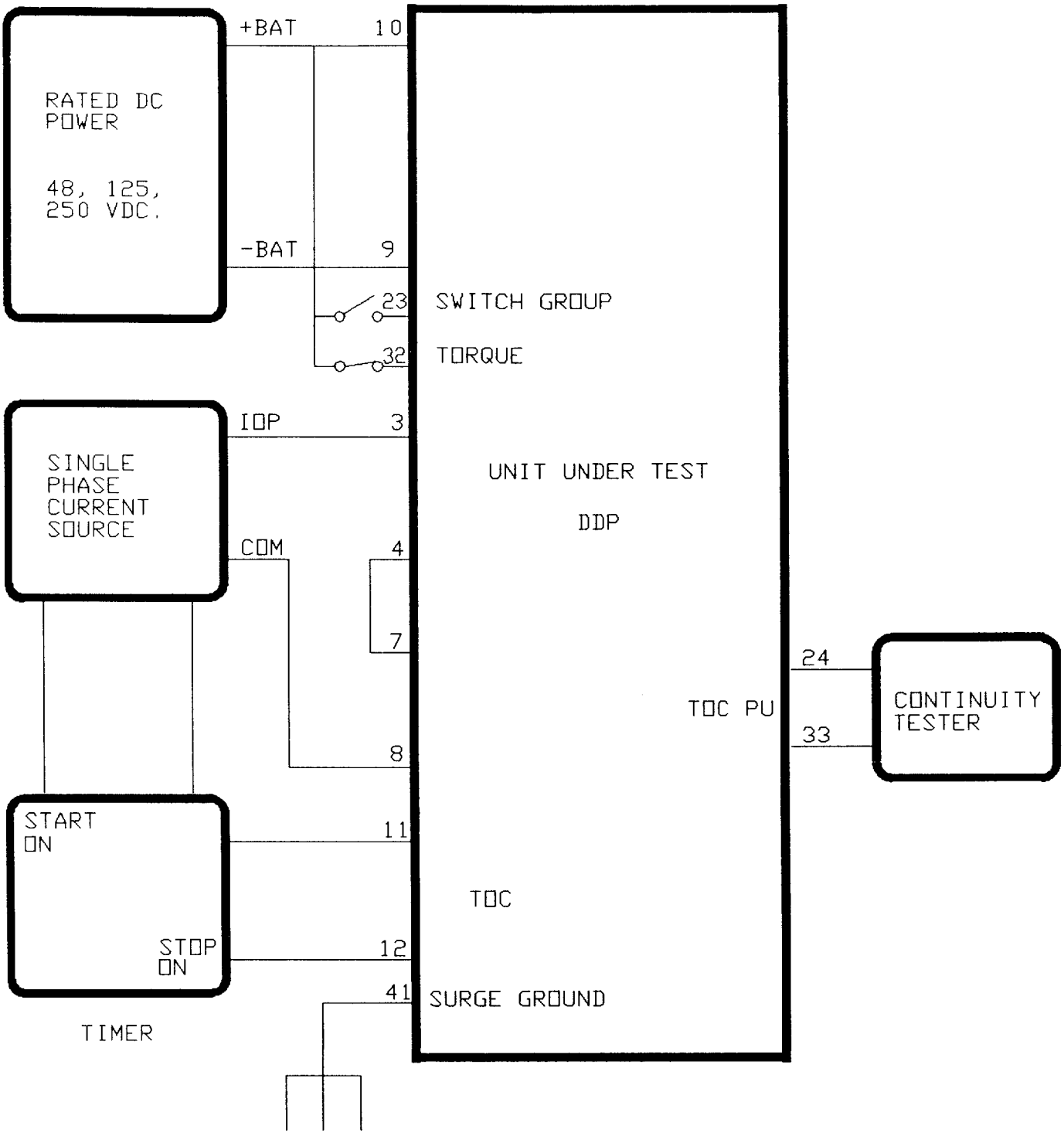


Figure AT-7(0285A5382 [2]) DDP TOC Ground Trip Test Connections

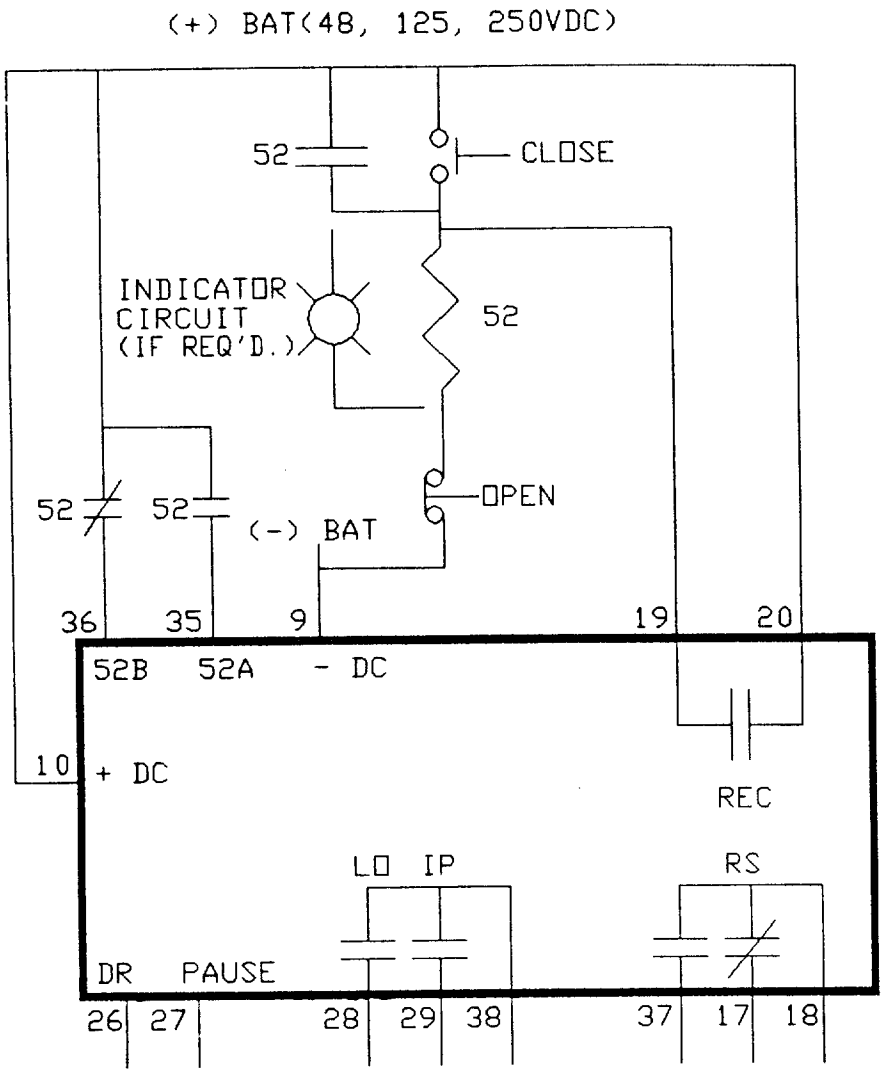


Figure AT-8(0285A5383) DDP Automatic Recloser Test Connections

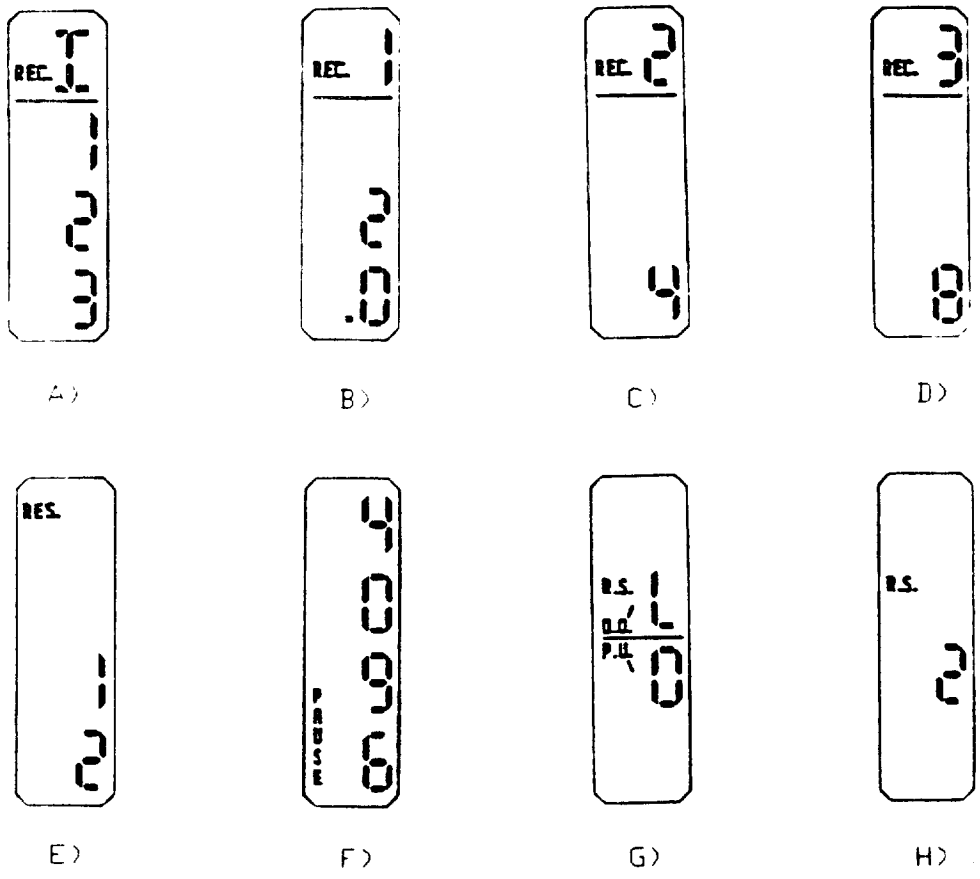
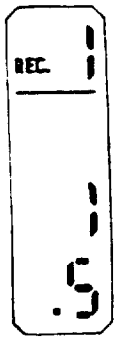


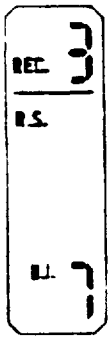
Figure AT-9(0286A3597) DDP Automatic Recloser Read Test

A)NORMAL RESET

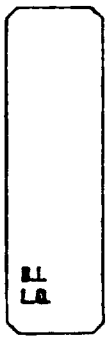


B)1ST TIMED RECLOSE

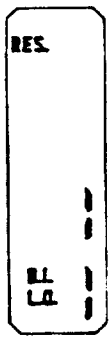
C)2ND TIMED RECLOSE



D)3RD TIMED RECLOSE



E)LOCKOUT



F)RESET TIMEOUT

Figure AT-10(0286A3598) DDP Automatic Recloser Built-in Test

PERIODIC TESTS

CAUTION

Power Down the relay by removing the test plugs before removing or inserting modules. Failure to do so can permanently damage the relay.

GENERAL

This section is a guide for testing the relay. It is not necessary that the tests be performed for incoming inspection. The relay has been tested at the factory with automated test equipment. the DDP is a digital relay controlled by "self checking" software. If a system failure is detected it will be reported through the MMI.

The following tests are included:

General Tests

T1	MMI Status and Display Tests (Self Tests)
T2	Current measurement test

Instantaneous Function Tests

T3	IOC low-set phase
T4	IOC high-set phase
T5	IOC low-set ground
T6	IOC high-set ground

Time Overcurrent Function Tests

T7	TOC phase pickup
T8	TOC ground pickup
T9	TOC ground trip
T10	TOC phase trip

Torque Control Test

T11	Torque control

Switch Settings Group Test

T12	Switch settings Group

Recloser Function Tests

T13	Recloser READ
T14	Recloser built-in TEST
T15	Recloser functional

TEST EQUIPMENT

1. Single-phase source of current at rated frequency.
2. DC Control voltage source
3. AC ammeter
4. A continuity tester or Ohm meter
5. A Precision Timer for testing timed events.

The specific requirements of the equipment are given in the text of this section, and in the associated circuit diagrams.

DRAWINGS:

The following drawings should be used for reference during testing. They are located in the PRODUCT DESCRIPTION (PD), and the CALCULATION OF SETTINGS (CS) sections.

1. The Elementary Diagram	FIG PD-8
2. The Internal Connection Diagram	FIG PD-9
3. The TOC and IOC curves	FIG PD-3,4,5,6
4. The External connection diagram	FIG PD-2
5. Factory Relay Settings	TABLE CS-1

EQUIPMENT GROUNDING

All equipment used in testing the DDP relay should be connected to a common grounding point to provide noise immunity.

This includes the current source, as well as the DDP itself.

The ground connection on the DDP is terminal #41 (see Figure HD-2 in the HARDWARE DESCRIPTION section).

GENERAL INSTRUCTIONS

CAUTION

The TOC pickup contact will chatter when the unit under test is near its threshold. DO NOT let it continue. Remove the test current. A single contact closure is enough to determine that the unit has picked up.

1. A continuity tester with high-input impedance such as a Digital Ohmmeter should be used to monitor the contacts during the testing of the relay.

WARNING

TRIPPING CONTACTS WILL OPERATE DURING THE TEST.

2. Where appropriate, current levels are defined with two numbers as: xx(yy), xx is the value to be used for relays rated at 5 amperes and (yy) is the value to be used for 1 ampere relays. However, when this is not true it will be stated.

3. During the test one or possibly more of the electronic current sources may not be used. If the source is not used it must be set to zero (0) in addition to being turned OFF. Also, the current sources should only be powered on or off with the currents set at or near zero (0).

4. Typing an entry on the keypad will be shown as ["key"] where "key" is the alpha numeric label of the key to be pressed. For tests that require a setting change, the setting number will be shown in parentheses next to the setting to allow direct access to the setting. This is performed by pressing the [SET] key, the setting number (nnn), and [ENT]. The new setting may then be entered.

5. These tests assume that the functions TOCP and TOCG are programmed to be on the TRIP1 contact, IOCHP and IOCHG are on TRIP2, and IOCLP and IOCLG are on TRIP3. That is, settings 316, 317, and 318 have values 48, 12, and 3, respectively. If the DDP has different settings, contacts other than those shown in the figures and called out in the instructions may trip.

At the end of testing, make sure that all settings are returned to initial values.

SETTING CHANGES

Setting changes required for a particular test will be listed before the test. A sample setting change is shown below. Refer to the INTERFACE section for further details on making setting changes.

Sample Setting Change
To change the pickup of the TOC phase in the GROUP 2 protection category to 2.3 Amps:

1. Apply rated DC and wait for relay initialization to complete as indicated by display going into default display mode (scrolling through input currents). Note: If WARNING error #22 or #23 occurs press the clear key to remove the message and the display should scroll the input currents.

2. Press the [SET] "settings" key. Scroll with the arrow key until "GROUP 2" is displayed, then press the [ENT] "enter" key.

3. Scroll through the GROUP 2 settings until you get to "PU-TOCP =#.#".

4. Type "2.3" on the keypad. The typed inputs will be shown on the MMI display and the "=" sign will change to blinking ":". This represents that a change is made but not yet entered.

5. When the correct pickup is keyed in, press the [ENT] "enter" key. The alarm LED should turn ON(red) indicating that a setting has been altered, and the relay is out of service.

6. To finalize the setting change, press the [END] "end" key followed by the [ENT] "enter" key. The MMI display will change to default display 10 seconds later (i.e. scroll the currents) and alarm LED will go OFF and system status LED will turn ON indicating that the setting is in and the relay is in service.

NOTE

Press "END" "ENT" after any settings changes are complete.

INITIAL TEST SETUP

Before beginning the test, the relay settings should be recorded for verification. Scroll through each setting and make sure they match the required settings of the relay. If the relay has communication save the original settings in a file using the UP-LOAD function (see DDP-LINK SOFTWARE section).

GENERAL RELAY TESTS

T1 - MMI Status and Display Tests

The Relay's Status is reported through the MMI, alarm contact. If a system error caused relaying functions to cease, the alarm LED on the MMI would turn ON , system status LED turning OFF, and the alarm contact would open. A failure (WARNING) that did not interrupt relaying would be indicated by opening of the alarm contact however the alarm LED would stay OFF , and system status LED would stay ON, and by a "FAIL" or "WARN" message on the MMI display.

The preceding paragraph demonstrates the use of the MMI to check relay status. See the SERVICING section for further information.

The MMI test is built into the software. It allows the user to test the keypad, the LEDs, and the display.

1. Connect the relay as shown in figure AT-1. The AC inputs are not required for this test, only the DC power supply voltage. Apply rated DC power and wait for initialization to complete.

2. Press the target reset lever and make sure all LEDs turn ON.

3. Press the [ACT] "action" key. Then scroll with the arrow keys until the heading "ACT: MMI TEST" is displayed.

4. Press the [ENT] "enter" key.

The display should be sixteen fully lit rectangles. After about 10 seconds it will change to LED TEST ?

5. Press the [1/Y] key followed by the [ENT] key.

   The display will change to blinking TESTING and all the LEDs (except the power LED and either the SYSTEM STATUS or the ALARM LED) will blink ON/OFF. If Protection is ON, the SYSTEM LED will not blink but will stay permanently ON. If protection is OFF, the ALARM LED will not blink but will stay permanently ON.

6. Next, the display will prompt you for the keyboard test with "KEYBRD TST?".

7. Press the [1/Y] key followed by the [ENT] key.

8. At this point the MMI is in the keyboard test. Press every key on the keypad, except for the [CLR] "clear" key. As you press each key verify that the display indicates the key that was pressed. Example: pressing the up arrow would be displayed by the word "UP ARROW". The other keys will match the description that is on the key itself.

9. When all the keys have been checked press the [CLR] key to end the test.

WARNING !

DO NOT LEAVE CURRENT CONTINUOUSLY CONNECTED TO THE RELAY AT MORE THAN 15A (for 0.5 - 12.0A PICKUP RANGE) OR 3A (for 0.1 - 2.4A PICKUP RANGE).

T2 - Current Measurement Test

1. Connect the relay as shown in figure AT-2.

2. Apply Iop Amp RMS current to phase A. Press the INFO key followed by ENT key. Use the arrow keys until the display shows METERING. Press the ENT key. Use arrow key to display IA = XX.XX. Each time the ENT key is pressed DDP will update the current readings. Use the table below to determine the percent accuracy of current readings. Note that current displayed is in primary amperes.

3. Repeat above for phase B, C, and N.

TABLE PT-1 Percent Accuracy vs. Current

Pickup Range	Current Range	Accuracy
0.5 to 12.0A	1 to 2 Amps	5%
0.5 to 12.0A	2 and up	3%
0.1 to 2.4A	0.2 to 0.4 Amp	5%
0.1 to 2.4A	0.4 and up	3%

NOTE

The second digit (from left) of DDP model number indicates the combination of CTs (current transformers) in the DDP magnetics.

Model number: DDPxXxxxxxxA

1. All CTs 0.5 to 12.0A pickup range
2. All CTs 0.1 to 2.4A pickup range
3. Phase CTs 0.5 to 12.0A pickup range and Ground CT 0.1 to 2.4A pickup range

T3 IOC Low-Set Phase Trip Test

Settings:
(109) PU-IOCLP = XXX.XX ; Desired pickup
(110) PU-IOCHP = YYY.YY ; Must be equal to or greater than PU-IOCLP
(310) IOCLP = YES

1. Connect the relay as shown in figure AT-3.

2. Close TORQUE switch and make sure SWITCH GROUP switch is open.

3. Apply Iop to phase "A", 5% below pickup and the TRIP3 contact should stay open. Increase Iop to 5% higher than pickup setting. The TRIP3 contact should close, IOC and phase "A" LEDs should turn ON.

4. Reduce Iop to zero and reset the targets.

T4 IOC High-Set Phase Trip Test

Settings:
(109) PU-IOCLP = XXX.XX ; Must be equal to or less than PU-IOCHP
(110) PU-IOCHP = YYY.YY ; Desired pickup
(310) IOCLP = YES ; IOCLP must be enabled to enable IOCHP
(311) IOCHP = YES

1. Connect the relay as shown in figure AT-3. Move continuity tester to 13 & 14.

2. Close TORQUE switch and make sure SWITCH GROUP switch is open.

3. Apply Iop to phase "A", 5% lower than the desired pickup and the TRIP2 contact should stay open. Increase Iop, to 5% above pickup. The TRIP2 contact should close, IOC and phase "A" LEDs should turn ON.

4. Reduce Iop to zero and reset the targets.

T5 IOC Low-Set Ground Trip Test

Settings:
(111) PU-IOCLG = XXX.XX ; Desired pickup
(112) PU-IOCHG = YYY.YY ; Must be equal to or greater than PU-IOCLG
(310) IOCLP = NO
(311) IOCHP = NO
(312) IOCLG = YES

1. Connect the relay as shown in figure AT-4

2. Close TORQUE switch and make sure SWITCH GROUP switch is open.

3. Apply Iop to phase "C" and "N" in series, 5% below pickup and the TRIP3 contact should stay open. Increase Iop to 5% higher than pickup. The TRIP3 contact should close, IOC, and phase "N" LEDs should turn ON.

4. Reduce Iop to zero and reset the targets..

T6 IOC High-Set Ground Trip Test

Settings:
(111) PU-IOCLG = XXX.XX ; Must be equal to or less than PU-IOCHG
(112) PU-IOCHG = YYY.YY ; Desired pickup
(310) IOCLP = NO
(311) IOCHP = NO
(312) IOCLG = YES ; IOCLG must be enabled to enable IOCHG
(313) IOCHG = YES

1. Connect the relay as shown in figure AT-4. Move continuity tester to 13 & 14.

2. Close TORQUE switch and make sure GROUP SWITCH switch is open.

   Apply Iop to phase "C" and "N" in series 5% below pickup, and the TRIP2 contact should stay open. Increase Iop to 5% higher than pickup. The TRIP2 contact should close, IOC, and phase "N" LEDs should turn ON.

4. Reduce Iop to zero and reset the targets.

T7 TOC Phase Pickup Test

Settings:
(103) PU-TOCP = XX.XX ; Desired pickup
(314) TOCP = YES

1. Connect the relay as shown in figure AT-5.

2. Apply Iop to phase "B", 5% below pickup and TOC PU contact should remain open. Increase the current to 5% above pickup setting. The TOC PU contact should close and the pickup LED should turn ON.

3. Reduce Iop to zero.

T8 TOC Ground Pickup Test

Settings:
(104) PU-TOCG = XX.XX ; Desired pickup
(314) TOCP = NO
(315) TOCG = YES

1. Connect the relay as shown in figure AT-6.

2. Apply Iop to phase "B" and "N" in series, 5% below pickup and TOC PU contact should remain open. Increase Iop to 5% above pickup. The TOC PU contact should close and the pickup LED should turn ON.

3. Reduce Iop to zero.

T9 TOC Ground Trip Test

Settings:
(102) GNCURVE = X ; Desired curve
(104) PU-TOCG = XX.XX ; Desired pickup
(107) T-DIALG = XX.X ; Desired time-dial
(314) TOCP = NO
(315) TOCG = YES

1. Connect the relay as shown in figure AT-7.

2. Close TORQUE switch and make sure SWITCH GROUP switch is open.

3. Apply Iop to phase "B" and "N" in series, with magnitude at desired multiples (>1.5) of pickup. The TRIP1 contact should close within +/, 7% of time obtained from the curves PD-3, 4, 5. LEDs "N", TOC, and pickup should turn ON.

4. Reduce Iop to zero **immediately** and reset the targets.

T10 TOC Phase Trip Test

Settings:
(101) PHCURVE = X ; Desired curve
(103) PU-TOCP = XX.XX ; Desired pickup
(105) T-DIALP = XX.X ; Desired time-dial
(314) TOCP = YES
(315) TOCG = NO

1. Connect the relay as shown in figure AT-7.

2. Close TORQUE switch and make sure SWITCH GROUP switch is open.

3. Apply Iop to phase "B" and "N" in series, with magnitude at desired multiples (>1.5) of pickup. The TRIP1 contact should close within +/, 7% of time obtained from the curves PD-3, 4, 5. LEDs "B", TOC, and pickup should turn ON.

4. Reduce Iop to zero **immediately** and reset the targets.

T11 Torque Control Test

Settings:
(119) TORQUE = 63

1. Repeat any of the above tests, T3 through T10. When the TORQUE switch is closed that particular function will pickup/trip. When the switch is open it will not pickup/trip.

T12 Switch Settings Group Test

Settings:
(301) GRP-SW = YES

1. Close the SWITCH GROUP switch and make sure TORQUE switch is closed.

2. Select any of the above tests except for the current measurement test. Program the DDP so that there are two different levels of pickup in the GROUP 1 and GROUP 2 protection settings. Closing and opening the SWITCH GROUP input will enable the GROUP 2 settings for the time programmed in GRP2TIME, (setting #220) after the time programmed in GRP1TIME (setting #120) has expired. Apply a current that is between the two levels of pickup. If the pickup in the GROUP 1 setting is lower than the GROUP 2 setting, then, when the DDP will pickup/trip when it is not using GROUP 2 settings. If the DDP is using GROUP 2 it will not pickup/trip.

3. Reduce Iop to zero and reset the targets.

NOTE

DO THE FOLLOWING TESTS ONLY IF YOU HAVE A RECLOSER IN YOUR DDP, i.e. if the 1st digit of the DDP model number is a 3.

The DDP recloser is similar in operation to the GE SLR-12.

T13 Recloser READ Test

1. Connect the DDP as per figure AT-8 and make sure SW1 (behind the front nameplate and bottom right, see Figure CS-2 in the CALCULATION OF SETTINGS section) is in position 2 before power is turned ON. Note that if the switch position is changed with relay power ON, the DDP may display "WARM START", and if the message appears 3 times in 1 hour, the DDP will display "FAIL: ERR #1" after the warm start. If this happens turn power OFF, change the position of the switch and then turn power ON.

2. Press the ACT key and use the arrow keys until the system LCD displays READ SLR. Press the ENT key Display will show READ SLR ? Press the 1/Y key then the ENT key. The recloser display will read out the data programmed for the recloser. The data is displayed in 8 readings of 4 seconds each. Any function not used is skipped, which shortens the read cycle. The following is a description of each 4 second read.

2.1. Reclosure selected
All reclosures selected will be on solid, and REC. will blink for the 4 seconds.

2.2. Time of reclose (1st)
The number of the timed reclosure (1) along with the time will be on solid, and REC. will blink for 4 seconds.

2.3. Time of reclose (2nd)
The number of the timed reclosure (2), along with the time, will be on solid, and REC. will blink for 4 seconds.

2.4. Time of reclose (3rd)
The number of timed reclosure (3), along with the time, will be on solid, and REC. will blink for 4 seconds.

2.5. Time of reset
The time for reset will be on solid, and RES. will blink for 4 secs.

2.6. Time of pause limit
The time for pause will be on solid and pause will blink for 4 seconds.

2.7. Pickup and dropout time of RS
The pickup and dropout times will be on solid, and R.S. and D.O./P.U. will blink for 4 seconds.

2.8. Reclose position of RS
The RS start position will be on solid, and R.S. will blink for 4 seconds.

T14 Recloser Built-in Test

Setting:
(416) REC-EN = YES

1. Connect the DDP as per Figure AT-8.

2. Press the ACT key and use the arrow keys until the display indicates TEST SLR. Press the ENT key and the display will show NORMAL TEST. Pressing the ENT key will display TEST SLR?. Pressing 1/Y, ENT keys will execute the recloser test. The test circuit of the recloser is designed to test the system hardware while running the program information entered into memory. The test operates all circuits except the input networks and output relays. During the test, the recloser assumes that the circuit breaker is working into a fault so that each time the circuit breaker closes it will re-open immediately. The output relays do not change state. Reclose signals are indicated by the reclose LED.

If the circuit breaker is closed at the beginning of the test (52a closed and 52b open), the recloser LCD will display as described below. Any functions that are not programmed will be skipped. R.S. will be displayed after the reclose corresponding to the setting RS-SEL has occurred and the delay in setting RS-PU has timed out. R.S. will blink for the time programmed in the RS-DO setting.

2.1 The recloser begins in Normal Reset condition. RES. is displayed.

2.2 The display will then count down the first timed reclosure in 0.5 second intervals. B.I. will be blinking if there was an instantaneous reclose programmed. REC. is blinking.

2.3 The display will then count down the second timed reclosure in 1 second intervals. REC. and B.I. are blinking.

2.4 The display will then count down the third timed reclosure in 1 second intervals. REC. and B.I. are blinking.

2.5 The display will show the Lockout condition. B.I. and L.O. are blinking.

2.6 The display will then count down the reset time in 1 second intervals. RES., B.I., and L.O. are blinking. After the reset is timed out, the LCD will again show the Normal Reset condition.

If the DDP is in lockout at the beginning of the test, the LCD will first appear as described in 2.5, proceed through 2.6, 2.1, 2.2, 2.3, and 2.4 and stop again with the display in 2.5.

3. Press the ACT key and use the arrow keys until the display indicates TEST SLR. Press the ENT key and the display will show NORMAL TEST. Use the up arrow key until the display shows DEL. REC. TEST. (DEL. REC. TEST is the same as NORMAL test except it skips the first selected reclose, simulating a DR input). Press the ENT key and the display will change to TEST SLR?. Pressing the 1/Y and ENT keys will execute the DR "Delayed Reclose" test. The LCD will look the same as for the NORMAL TEST described above but with the first programmed reclose skipped.

T15 Recloser Functional Test

1. To perform the functional periodic test follow the same general procedure outlined in the ACCEPTANCE TEST section. Keep in mind that the following times are multiplied by the MULT setting (309):

(405) T1:	Time of first timed reclose
(406) T2:	Time of second timed reclose
(407) T3:	Time of third timed reclose
(408) TRES:	Reset time
(410) PAUSE:	Pause time
(411) RS-DO:	Relay spare dropout time
(412) RS-PU:	Relay spare pickup time

The reclose signal time limit is 0.9 second when the multiplier is unity.

CAUTION

When testing is completed verify that all settings are returned to values prior to the test. Also make sure SW1 is in the same position as prior to testing.

SERVICING

SPARES

There are two possible servicing methods for the DDP. They are: spare module replacement and component level repair. The preferred method is module replacement using the DDP's automatic self-tests to isolate failed modules. When the defective module is found, it can be replaced with a spare, and the system can be returned to service. This method typically yields the shortest "down time" of the system. To further reduce "down time" it is recommended that a complete set of spare modules be kept at the maintenance center.

It is not recommended that the relay be serviced at the component level. This requires a substantial investment in test/repair equipment, and in technical expertise, and usually results in longer "down times" than module replacement. For those who do wish to trouble-shoot to the component level, drawings can be obtained by requesting them from the factory. When requesting drawings, the following information must be supplied to the factory:

1. The assembly number of the module. This is found on the component side of the printed circuit board. It is an eight digit number with a letter inserted between the fourth and fifth digit and suffixed with a group identification, e.g. 0215B8025G001.

2. The revision number. This is found on the printed circuit board adjacent to the assembly number of the board.

CAUTION

Power down the relay by removing the test plugs before removing or inserting modules. Failure to do so can permanently damage the relay.

SERVICING WITH THE RELAY SELF-TEST

The DDP automatically performs tests of major functions and critical hardware components and reports their status via the MMI Display/LED and the alarm contact. The failure report is dependent on the type or level of the failure. Some failures will operate the alarm contact, the MMI alarm LED will turn ON, and the system status LED will turn OFF. For non-critical failures only the alarm contact will be operated, alarm LED will stay OFF, and system status LED will remain ON.

There are two levels of self-test performed by the relay. The first level indicates severe relaying failures. They are indicated by a "FAIL" message on the MMI, an opening of the alarm contact, and by the MMI alarm LED turning ON. These failures are the most critical because they indicate that the relay is not providing protection.

The second level of self-test displays warning messages. They are indicated by a "WARN" message on the MMI, and opening of the alarm contact. The alarm LED stays OFF and the system status LED stays ON. These failures are a less critical condition. The relay is still providing protection.

TROUBLE SHOOTING

Trouble shooting the relay requires three steps. The first step is to determine the type of failure. The type is either a critical or non-critical failure (TABLE SE-1). Next, the list of failure codes or warning codes is used to determine what module is defective. Lastly, the defective

module is replaced in accordance with safety and static-discharge precautions.

The trouble shooting sections are as follows:

1. Servicing a Critical Failure "FAIL"
2. Servicing a Non-Critical Failure "WARN"

NOTE

Refer to the ACCEPTANCE TEST section for test of the MMI display and keypad.

Using the Information Command

Table SE-1 shows the FAIL codes and the WARN codes. Table SE-2 shows the last two digits of the board(s) that can be the source of the problem.

The INFORMATION ALARMS command is invoked as follows:

1. Apply rated DC power to the relay and wait for initialization to complete.

2. Press the "Information" key. Then scroll with the arrow keys until the heading "INF:ALARMS" is displayed.

3. Press the [ENT] "enter" key. The display will change to "L1=XXXXXXXXXXXXX", where each "X" is either a "0", meaning good or "1", meaning bad. By using the arrow keys you can look at all of the four alarm buffers i.e. L1, C1, L2, and C2. Each bit in C1 and C2 buffers indicate the present alarm status of the relay. L1 and L2 have one to one correspondence with C1 and C2 respectively. L1 and L2 keeps a permanent record (non-volatile) of the C1 and C2 buffers. C1 and C2 buffers are volatile, that is, information is lost if power is lost and the problem does not recur. L1 and L2 can be reset using ACT command (see MMI section).

SERVICING A CRITICAL FAILURE "FAIL"

A critical failure indicates total interruption of the protection function. When a failure occurs on one of the modules (excluding the power supply) the alarm contact will open, and the alarm LED will turn ON. Remove and re-apply the DC power to bring up the fail message on the display. If the DDP successfully restarts the alarm LED will turn OFF and the system status LED will turn ON.

The Fail message has the format "FAIL: ERR xx". The "xx" field is the numeric code that indicates the nature of the critical failure. The Fail message remains on the display until a key is pressed or until the DDP restarts successfully (with no self-test failures). See Table SE-1 for the list of Failure codes and their meanings.

Locating the Defective Module

Use the table SE-2 to isolate the cause of the failure from the failure number or as an alternative the "Information" command can be used along with table SE-2 to isolate the cause of the failure. When the suspected module is found, power down the unit and replace it. Re-apply power. If the "FAIL" message is gone then the unit has been successfully repaired. If the message has changed it is possible that another module requires replacement.

SERVICING A NON-CRITICAL FAILURE "WARN"

A non-critical failure does not interrupt the relay's protection. When a "WARN" condition occurs, the DDP's alarm contact will open. The system status LED will remain ON. Turn off the

DC input power, then re-apply. The "WARN" message should appear if the failure still exists. The Warn message has the format "WARN: ERR xx". The "xx" field is the numeric code that indicates the nature of the failure. The WARN message remains on the display until a key is pressed or until the DDP restarts successfully (with no self-test failures). See Table SE-1 for the list of Warning codes and their meanings.

Locating the Defective Module

Use the table SE-2 to isolate the cause of the failure from the failure number or as an alternative, the "Information" command can be used along with table SE-2 to isolate the cause of the failure. Power down the unit and replace the suspected module if appropriate. Re-apply power and the WARN message should clear. If the "WARN" message is gone then the unit has been successfully repaired. If the message has changed, it is possible that another module requires replacement.

TABLE SE-1 Error Messages Description

FAILURE ERROR CODES

#	MEANING
1	System Watchdog timer caused a restart.
2	PROTECT CPU RAM test error.
3	PROTECT CPU EEPROM CRC mismatch
4	PROTECT CPU EPROM CRC mismatch.
5	Setting out of range.
6	A to D converter/power supply error
7	CAR CPU RAM test error
8	CAR CPU EPROM test error
9	PROTECT CPU Shared RAM test error
10	Recloser not present. The Recloser was not found but the model number indicates that it should be present.
11	CAR CPU not present. The CAR CPU must always be present.

WARNING ERROR CODES

#	MEANING
20	PROTECT CPU Communication error. Communication between the PROTECT and CAR CPUs had an error. It was found by the PROTECT CPU processor.
21	Trip circuit monitor error.
22	Realtime clock error
23	TOC trip circuit error
24	PROTECT CPU Spurious interrupt
25	LCD Display-busy signal timed out
26	CAR CPU Remote PC communication error
27	CAR CPU communication error. Communication between the PROTECT and CAR CPUs had an error. It was found by the CAR CPU.
28	CAR CPU Spurious interrupt
30	Recloser should not be present. The Recloser was found, but the model number indicates that it should not have been.
31	Total Breaker Interrupting I2T>Limit
32	NMI Time store failure

TABLE SE-2 Error Codes to Board Number

ALARMS:

DISPLAY			DESCRIPTION
L1=XXXXXXXXXXXXXX			#1 latched alarms. X = 1-error, 0-no error
C1=XXXXXXXXXXXXXX			#1 currently active alarms. X= 1-bad, 0-good
ERROR CODE	**LAST 2 DIG.'s OF BRD. #**		
6	37,36,27	**Right most**	PROTECT CPU, pwr supply, A to D converter
3,5	27		memory EEPROM PROTECT CPU
4	27		memory EPROM PROTECT CPU
2	27		memory SRAM PROTECT CPU
23	34		Trip voltage monitor
22	26		Realtime clock
9	29,27		Shared RAM
21	34		Trip current monitor
20	29,27		CAR-PROTECT communication error found by PROTECT CPU
1			Watchdog timer
24	29,27		PROTECT CPU Spurious interrupt
25	30		LCD display busy signal timeout
31	N/A	**Left most**	Total breaker interrupting I2T> limit.
L2=XXXXXXXXXXXXXX			#2 latched alarms. X = 1-bad, 0-good
C2=XXXXXXXXXXXXXX			#2 currently active alarms. X= 1-bad, 0-good
ERROR CODE	**LAST 2 DIG.'s OF BRD. #**		
10,11	29	**Right most**	CAR CPU OR Recloser not present
30	29		Recloser should not be present
8	29		memory EPROM CAR CPU
7	29		memory SRAM CAR CPU
			spare
			spare
			spare
26			CAR CPU Remote PC communication error
27			CAR-PROTECT communication error found by CAR CPU
32	27		NMI time strobe failure
28			CAR CPU Spurious interrupt
			spare
		Left most	spare

6

RENEWAL PARTS

It is recommended that sufficient quantities of renewal parts be carried in stock to enable the prompt replacement of any that are broken or damaged.

When ordering renewal parts address the nearest Sales office of the General Electric Company.

Specify the quantity required, the name of the part wanted, the part number if known, and the complete model number of the relay for which the part is required. The table below lists the part numbers for the most common replacement parts. See Figure SE-1 for board line up.

It is recommended that renewal parts only be obtained from the General Electric Company. See Table SE-3.

Table SE-3 Renewal Parts

MODEL NUMBER:	FUNCTION	PART NUMBER
DDPXX6XXXXXA	ANALOG BOARD	0215B8025G001
DDPXX5XXXXXA		0215B8025G002
DDPXXXXXXXXA	INTERFACE BOARD	0215B8026G001
	PROTECTION CPU	0215B8027G001
DDP2XXXXXXXA	CAR(SLR) CPU	0215B8029G002
DDP3XXXXXXXA		0215B8029G001
DDP1XXXXXXXA	MMI BOARD	0215B8030G002
DDP2XXXXXXXA		0215B8030G002
DDP3XXXXXXXA		0215B8030G001
DDPXXX1XXXXA	I/O SLR BOARD	0215B8033G001
DDPXXX2XXXXA		0215B8033G002
DDPXXX3XXXXA		0215B8033G003
DDPXXX1XXXXA	PROTECTION I/O	0215B8034G001
DDPXXX2XXXXA		0215B8034G002
DDPXXX3XXXXA		0215B8034G003
DDPXXXXXXXXA	BACKPLANE	0215B8035G001
DDPXXX1XXXXA	PWR. SUPPLY(DCC)	0215B8036G001
DDPXXX2XXXXA		0215B8036G002
DDPXXX3XXXXA		0215B8036G003

Table SE-3 Renewal Parts (cont'd)

MODEL NUMBER:	FUNCTION	PART NUMBER
DDPXXXXXXXXA	PWR. SUPPLY(PSR)	0215B8037G001
DDP1XXXXXXXA	NAME PLATE	0215B5528
DDP2XXXXXXXA		0215B5528
DDP3XXXXXXXA		0215B5505
DDPXXXXXXXXA	EXTENDER BOARD	0215B8031G001
	CONNECTION PLUG	M-6118736G005
	TEST PLUG(XLA)	12XLA12A1
	CARD PULLER	207A5404P1
	UPPER CRADLE BLK.	0184B8624G011
	LOWER CRADLE BLK.	0215B5532G001
	UPPER CASE BLOCK	006418058G647
	LOWER CASE BLOCK	006418058G129
	FRONT COVER	P-6229807G061
	RS232 CABLE	246A9866P001

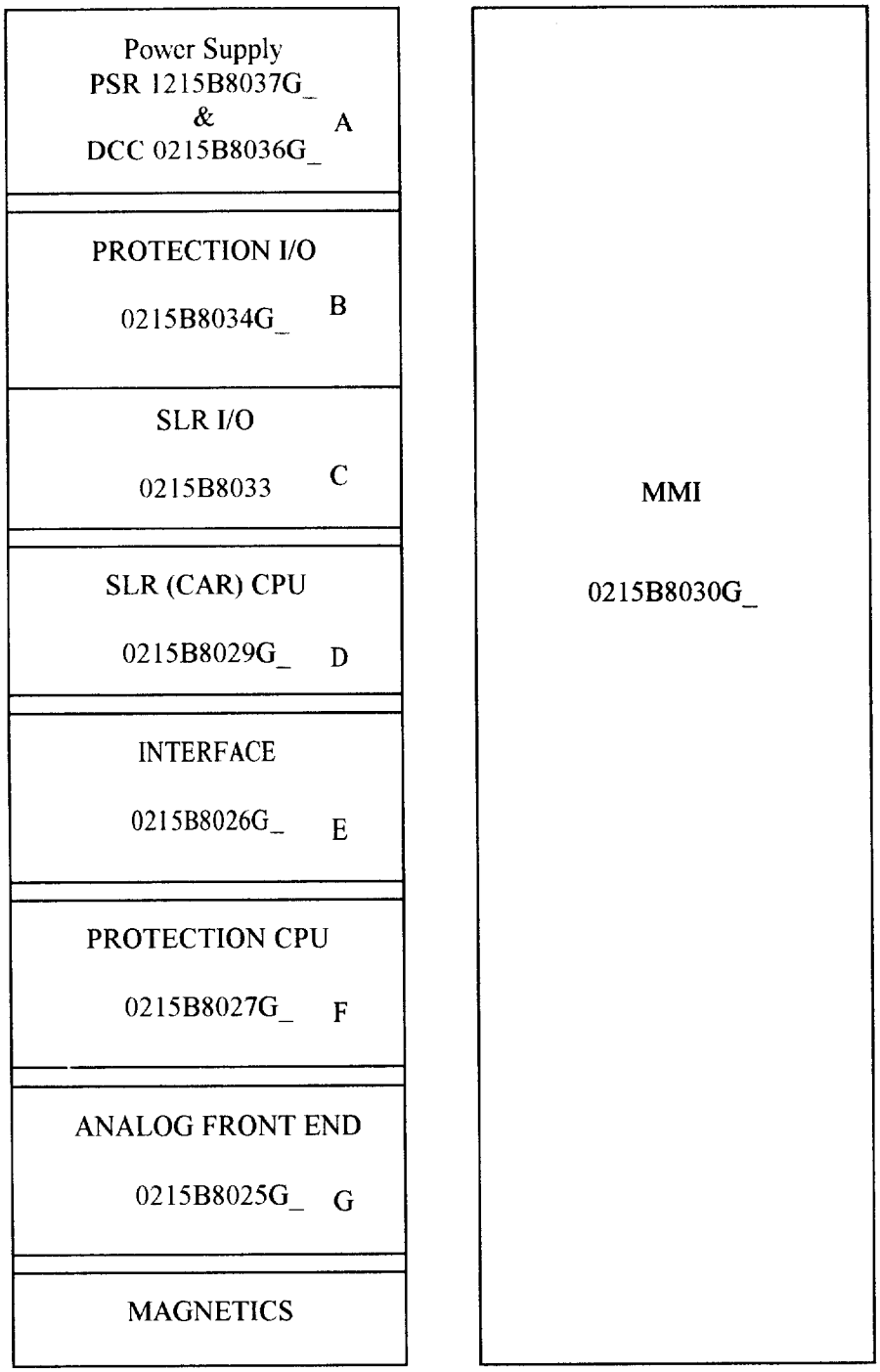


Figure SE-1 DDP Module Line-up

NOTE:

PSR and DCC are assembled together.
Bold letters after each board number indicate the module location.

SPECIFICATIONS

RATINGS

Rated Frequency	50 or 60 Hertz
DC Control Voltage	48VDC, Operating Range 38.5-60 VDC 110/125VDC, Operating Range 88-150 VDC 220/250VDC, Operating Range 176-300 VDC

Input Circuit Current Ratings

	TOC Pickup Range	
	0.5 to 12.0A	0.1 to 2.4A
Continuous	15A	3A
One Second	500A	100A

Ambient Temperature Range Storage Operation	30C to + 75C per ANSI C37.90
Humidity	95% without condensation
Insulation Test Voltage	2kV 50/60 Hz, one minute
Impulse Voltage Withstand	5kV peak, 1.2/50 milliseconds, 0.5 joules
Interference Test Withstand	SWC, per ANSI C37.90.1 IEC 255

BURDENS

Current Circuits	Ohms	VA @ 5A
0.1-2.4A	0.09 ohm, 2.84 DEG at 60Hz	2.25
0.1-2.4A	0.09 ohm, 2.37 DEG at 50Hz	2.25
0.5-12.0A	0.01 ohm, 11.56 DEG at 60Hz	0.25
0.5-12.0A	0.01 ohm, 9.67 DEG at 50Hz	0.25

DC Battery (for contact converters)	2.5 milliamperes at rated DC Input voltage
DC Battery (power supply)	20 Watts

CONTACT DATA

Trip Outputs	Continuous Rating =3 amperes Make and carry for tripping duty: = 30 amps, (per ANSI C37.90).
Trip Circuit Monitor Sense Current	150 milliamperes
Auxiliary Outputs (including alarms)	Continuous Rating =3 amperes

OVERCURRENT CURVES

INVERSE
VERY INVERSE
EXTREMELY INVERSE
DEFINITE

OVERCURRENT SETTINGS

	RANGE IN AMPS		RESOLUTION
TOC	0.5-12.0	0.1-2.4	0.01
IOC	0.5-160.0	0.1-32.0	0.01

TOC TIME DIAL SETTING

RANGE	RESOLUTION
0.5-10	0.1

DEFINITE TIME

RANGE	RESOLUTION
0.5-30 SEC	0.1

RECLOSER

4 SHOTS:	RANGE	RESOLUTION
Instantaneous(<50ms)		
First timed	0.1-15.9	0.1
Second timed	1-159	1
Third timed	1-159	1
Reset time	1-159	1
Time multiplier	0.5,1,2,4	

ACCURACY

Current Measurement

PICKUP RANGE	SECONDARY AMPS(RMS)	ACCURACY
0.5 - 12.0A	1-2	5 %
	2-240	3 %
0.1 - 2.4A	0.2-0.4	5 %
	0.4-48	3 %

TOC Pickup

0.5 - 12.0A	1-2	5 %
	2-12	3 %
0.1 - 2.4A	0.2-0.4	5 %
	0.4-2.4	3 %

IOC Pickup

0.5 - 160.0A	13-27	5 %
	27-160	3 %
0.1 - 32A	2.7-5.4	5 %
	5.4-32	3 %

TOC Time

+ or -7% over rated temperature range,
repeatability +or -5% at 25 degree C.

IOC Transient Overreach 5%

CASE GE L2T

DIMENSIONS

Height: 20.312 inches (516 millimeters)
Width: 6.625 inches (168 millimeters)
Depth: 8.06 inches (205 millimeters, including front cover and terminals at back)

WEIGHT

Maximum shipping weight 32 pounds (14.5 kilograms)

ACCURACY

Current Measurement

PICKUP RANGE	SECONDARY AMPS(RMS)	ACCURACY
0.5 - 12.0A	1-2	5 %
	2-240	3 %
0.1 - 2.4A	0.2-0.4	5 %
	0.4-48	3 %

TOC Pickup

0.5 - 12.0A	1-2	5 %
	2-12	3 %
0.1 - 2.4A	0.2-0.4	5 %
	0.4-2.4	3 %

IOC Pickup

0.5 - 160.0A	13-27	5 %
	27-160	3 %
0.1 - 32A	2.7-5.4	5 %
	5.4-32	3 %

TOC Time

+ or -7% over rated temperature range,
repeatability +or -5% at 25 degree C.

IOC Transient Overreach 5%

CASE GE L2T

DIMENSIONS

Height: 20.312 inches (516 millimeters)
Width: 6.625 inches (168 millimeters)
Depth: 8.06 inches (205 millimeters, including front cover and terminals at back)

WEIGHT

Maximum shipping weight 32 pounds (14.5 kilograms)

INTERFACE

LOCAL MAN-MACHINE INTERFACE (MMI)

Display

The display consists of one LCD, 16 alphanumeric character positions, 11 LEDs, and optional custom LCD display if the DDP is packaged with optional GE SLR12 (control function) relay.

The 11 LEDs are for indicating various control/protection functions.

These LEDs are:

POWER ON:	DC power, green
A,B,C,NEUTRAL:	3 phase and ground (target), red
TOC:	Time Over Current (target), red
IOC:	Instantaneous Over Current (target), red
PICKUP:	TOC Threshold detector, amber
ALARM:	Critical Failure and Protection is Off when lit, red
RECLOSER:	Reclose, green
SYSTEM STATUS:	Protection On and system OK when lit, green

Every keystroke at the MMI produces some feedback on the display. Numeric keys are echoed as they are pressed, function keys produce an abbreviated word when they are pressed, and the ENT key always causes some change in what is being displayed.

All messages on the display are the result of some DDP keyboard action, with 3 exceptions: the Trip message when the DDP has caused a protective trip, the Failure message when the DDP has discovered a critical self-test failure, the Warning message when the DDP has discovered a non-critical self-test failure.

The blinking TRIP message will remain on the display permanently until removed by pressing the CLR key on the keyboard or the Target Reset switch located at the left bottom of the front cover. If the DDP restarts or is powered down and up, the trip indicator will be remembered and redisplayed. The Trip message is the only message, except for the LED Testing message, which blinks.

The Fail message has the format "FAIL: ERR xxx". The field "xxx" is a numeric code which indicates the nature of the critical self-test failure.

The FAIL message remains on the display until the CLR key is pressed or until the DDP restarts successfully (with no self-test failures). See Appendix I.

The Warning message has the format "WARN: ERR xxx". The field "xxx" is a numeric code which indicates the nature of the non-critical self-test failure. The Warning message remains on the display until the CLR key is pressed. See Appendix I.

If a WARN message is displayed and a trip occurs, the TRIP message will override the WARN message. When the TRIP message is cleared, the lowest numbered FAIL or WARN message which has occurred is displayed. If a WARN or FAIL message is displayed and a WARN or FAIL with a lower number occurs, then the one with the lower number is displayed. When the lower number message is cleared, the next higher numbered WARN or FAIL message is displayed. If a TRIP message is displayed and

a WARN or FAIL occurs, it will be seen when the TRIP message has been cleared.

All other messages, which are the result of keyboard operations, remain on the display until another key is pressed, the CLR key is pressed (which is required for certain messages), or until no keys have been pressed for a period of 15 minutes; at the end of this time-out interval, the Default Screen is displayed. When the Default Screen is displayed, MMI is in its Idle State. The Default Screen displays each of the three phase and ground current values, one after the other. The Default Screen is described more fully in the section called "MMI Default Display".

Keyboard

The keyboard is comprised of twenty keys -- a 10-key numeric pad, a decimal point, and nine function keys (See Figure IN-1).

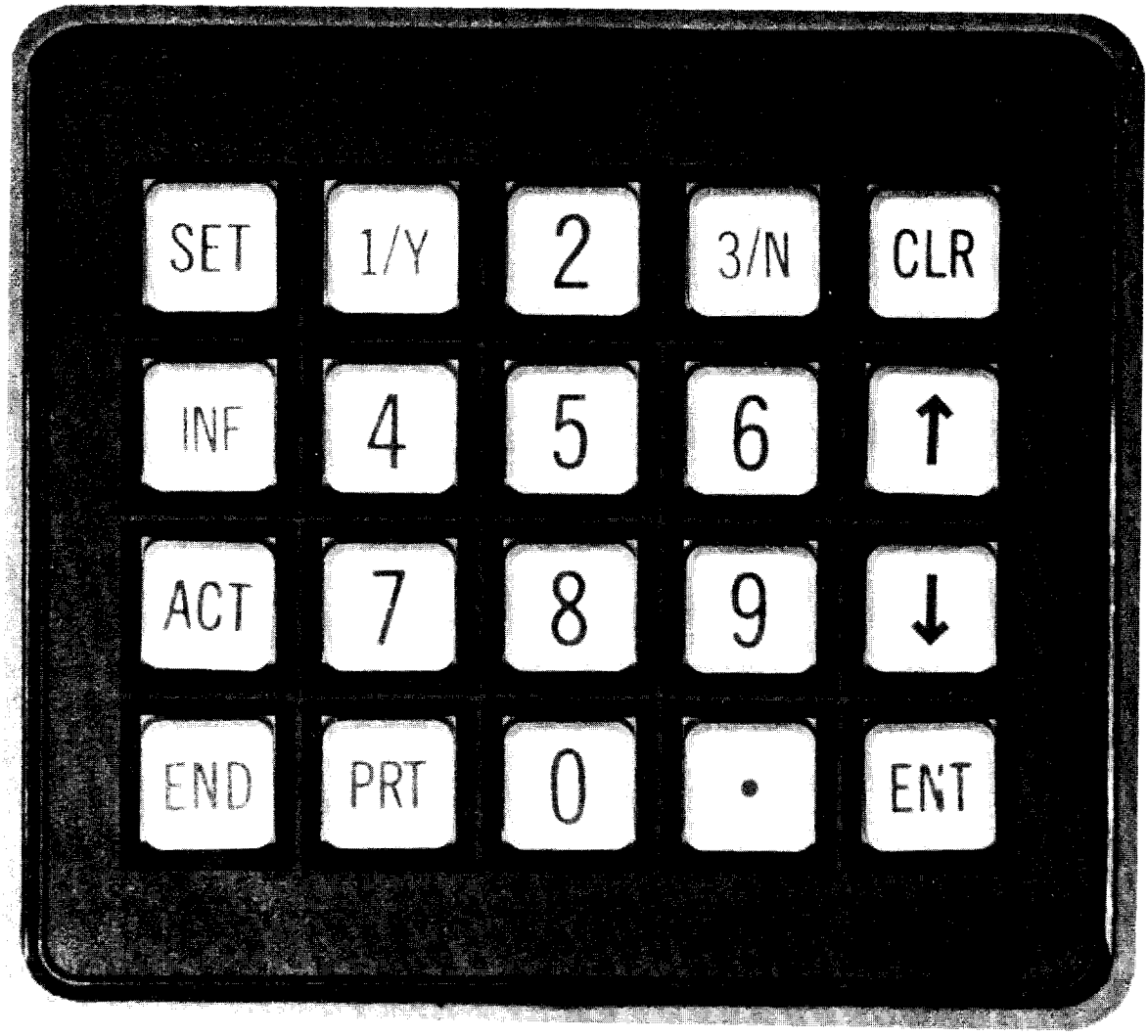


Figure IN-1 (photo 8043811) DDP Keyboard

The twenty keys are divided into three groups:

COMMAND KEYS: Those which begin a command

SETTINGS(SET)
INFORMATION(INF)
ACTIONS(ACT)

CONTROL KEYS: Those keys which cause the display to be altered:

ENTER(ENT)
PRINT(PRT) Not used in the DDP
UP-ARROW(/)
DOWN-ARROW(/)
CLEAR (CLR)
END

DATA ENTRY KEYS: Those keys which enter data into the DDP or answer prompts:

All numeric keys (0-9)
Decimal point (.)

In the following description, it is useful to think of the Command keys SET, INF, and ACT, taking the user into a list of Categories, and each Category being comprised of one or more Items. For example, the INF key gives the user access to several Categories of information: request protection information, request fault information, etc.

Control Keys

Clear Key (CLR)

The CLEAR key has 2 uses.

1. It is used to correct a wrong entry the user has made. The information the user has entered is blanked.
2. It indicates the user has seen a message displayed by the DDP. The message is then removed.

If there is user entered information on the display, only that information will be blanked. For example, if the user is entering a Setting value when the CLEAR key is pressed, only the user's input will be blanked; the name of the setting will remain on the display. As another example, if the user is responding to an Action prompt, only the user's input will be blanked; the prompt question will remain on the display.

If an error message is being displayed, the user must press the CLEAR key to blank the error message (all other keys will be ignored). When the error message is blanked, the last message will be displayed allowing the user to re-enter the correct response.

Arrow Keys

The ARROW keys are used to "walk" through the list of categories within a Command key or to walk through the list of items within a category. For example, pressing the INF key will produce the name of the first category (e.g., "GROUP 1") on the display. Pressing the UP-ARROW key will then produce the name of the second category (e.g., "CONTROL") on the display. When the user reaches the desired category, pressing the ENT key will then produce the first item of that category on the display. From that point on, pressing the UP-ARROW key will produce each subsequent item in the category on the display.

While the UP-ARROW key walks in a "forward" direction through a list of categories or items, the DOWN-ARROW key can be used to walk "backward" through a list; i.e., the user may return to the previously displayed item by pressing the DOWN-ARROW key.

When the user is walking through a list of categories or items with the UP-ARROW key and gets to the last item in the list, pressing the UP-ARROW key again will produce the first category or item on the display (wrap-around). Using the DOWN-ARROW key will likewise wrap-around from the first category or item to the last. If the user is walking through items within a category and wants to get out of that category, pressing the Command key again will display the current category name. The user

may then use the ARROW keys to walk through the categories.

Enter Key (ENT)

The ENT key is used to enter data or to enter a choice. When a category name is shown on the display (as the result of pressing a Command key followed by zero or more ARROW key presses) and the user presses the ENT key, he is "choosing" that category to begin walking through. When the user is establishing or changing a setting, he uses the numeric keys and decimal point to indicate the value; after the last digit, he presses the ENT key to indicate "this is the value to use". When the display prompts the user to enter a number (e.g., for Fault Analysis Information, which of the 30 stored faults), the user enters the number which represents his choice followed by the ENT key.

END Key

The END key causes two actions. First it is used to indicate that no more setting changes will be made. Protection processing is halted as soon as any setting change is made, and will not be resumed until the user indicates that all setting changes are complete. Second it is used to end a session. That is when the user presses the END key, the MMI becomes idle (without the 15 minute time-out). The key sequence for indicating the end of setting changes and/or the end of a session is:

END ENT

When the user presses the END key, the display shows

"HIT ENT TO END".

When the user presses the ENT key, one of two messages will appear on the display. If protection/control activities had been stopped, the DDP will now reinitialize itself to use the new setting values. The following message is displayed for 10 seconds if protection has been successfully turned on (or was not off in the first place):

"ENDED"

After the "ENDED" message is removed, the Default Screen is displayed, which means the MMI is back in the Idle State.

Before turning on protection, some of the settings are checked for consistency with one another. If an inconsistency is found, an error message is displayed:

"SET ER:css,css"

The numbers css and css indicate which two settings are in error. The left-most digit of the 'css', is the Category and the right two digits are the setting number within the Category. See below or Appendix I for setting and category numbers. For example, the following message may appear:

"SET ER:109,110"

This means that the setting in Category 1 with Setting Number 09, and the setting in Category 1 with setting number 10 are inconsistent. By using Appendix I, you can see that these settings are PU-IOCLP and PU-IOCHP.

The following settings in both the GROUP 1 and GROUP 2 categories are checked for consistency:

1. PU-IOCLP must be equal to or less than PU-IOCHP.

2. PU-IOCLG must be equal to or less than PU-IOCHG.

The following settings in the COMMON category are checked for consistency:

1. IOCHP cannot be enabled (=YES) if IOCLP is disabled (=NO).

2. IOCHG cannot be enabled (=YES) if IOCLG is disabled (=NO).

For convenience the Category and Setting numbers for the above settings are shown here:

SETTING NAME	GROUP 1 CAT-SET#	GROUP 2 CAT-SET#
PU-IOCLP	109	209
PU-IOCHP	110	210
PU-IOCLG	111	211
PU-IOCHG	112	212
IOCLP	310	---
IOCHP	311	---
IOCLG	312	---
IOCHG	313	---

If the consistency checks pass, but Protection cannot be enabled for any other reason, (if a critical error exists for example) an error message is displayed:

"PROTECT NOT ON"

If the message "HIT ENT TO END" is on the display, one of the command keys can be pressed to abort the 'END ENT' sequence and the selected command category will be displayed. If the CLEAR key is pressed, the Default Screen will be displayed. However, in either case, Protection will NOT be turned on.

When the "ENDED" message is on the display one of the command keys can be pressed and the selected command category will be displayed. The ENT key can also be pressed and will result in the default screen being displayed. If no key is pressed during the 10 seconds after the "ENDED" message is displayed, the default screen will be displayed.

Data Entry Keys

The Data Entry keys consist of the numeric keys and the decimal point. These keys are used to enter data into the DDP or to make choices in response to prompts.

The numeric keys 1 and 3 have two meanings. If the user is entering numeric values, the 1 and 3 keys are processed and echoed as 1 and 3. If the user is responding to a YES/NO prompt, the 3 key is processed and echoed as a NO and the 1 key is processed and echoed as a YES.

Command Keys

Settings Key (SET)

The SET key is used to display or change settings. Settings are divided into categories; the categories are defined in Appendix I. The categories, and the settings within each category, can be walked through using the ARROW keys. For convenience, each setting is also assigned a number, so that the user may go directly to the setting to be viewed or changed.

The key sequence for selecting settings is:

SET [c[ss]] ENT

Where:
css is an optional 3 digit Category-Setting number.

c = 1: Group 1
2: Group 2
3: Common
4: Control (if DDP has a recloser)
5: Metering
6: Communication
7: Unit ID
8: Calibration Factors

and ss is the optional 2 digit setting number.

8

For example, the second setting in the Group 1 category is selected with css = 102.

When the user presses the SET key, the display shows "SET:" in the first 4 positions and the name of the first category starting in position 5. If the user wants the first category, he presses the ENT key to display the first item; otherwise, he uses the ARROW keys to get to the desired category, or enters the 3 digit Category-Setting number then the ENT key. If only the Category Number is entered and ENT is pressed the selected category name is displayed.

The displayed names for the categories listed above are:

c = 1: "GROUP 1"
c = 2: "GROUP 2"
c = 3: "COMMON"
c = 4: "CONTROL"
c = 5: "METERING"
c = 6: "COMM"
c = 7: "UNIT ID"
c = 8: "CALIBR FACTOR"

When the user presses the ENT key following the displayed name of a category, the first item in the category is displayed as an abbreviated name of the setting and its value. For example:

"PU-TOCP = 1.00 A"
i.e. TOC phase pickup current = 1 Amp

When the user presses one or more digits, the name of the category is blanked and the digits are displayed starting in position 5. When the user presses the ENT key following the last digit, the setting corresponding to the entered setting number is displayed as described above. If the setting number is invalid, an error message is displayed.

The user may walk through all of the settings in a category using the ARROW keys. If the user wishes to leave that category, pressing the SET key will cause the current category name to be displayed.

Then the user may go to another category by using one of the ARROW keys or may enter a setting number followed by the ENT key to go to another setting.

If the user wants to change a setting, he must first display that setting (item) as described above. With the present value of the setting displayed, he then uses the Data Entry keys to enter the new value. When the first Data Entry key is pressed, the abbreviated name will remain on the display but the value will be blanked and a blinking ":" symbol will appear at the end of the name in place of the "=" symbol. Each Data Entry key will be displayed as it is pressed.

Note that there are some settings which logically represent a state rather than a number (i.e., ENABLED=YES/DISABLED=NO). Numeric keys are used to indicate the state; we adopt the convention that 3 = NO and 1 = YES. For this type of setting, when the user presses one of these digits, the word "YES" or "NO" will be displayed instead of the digit.

After the last digit of the new value is pressed, the user presses the ENT key and the DDP will store the new value as the value of the setting, if the value is a valid entry. If the user presses any Command key, either ARROW key, or the CLEAR key instead of the ENT key, the new value will not be stored, and the old value will be retained.

When a setting value is entered, the value is checked against the range of values for that setting. If the value does not fall within the range of values, an error message is displayed. If the setting is a YES/NO type, its value is checked to make sure it is set to either YES or NO. If the user enters any other digit for this type setting, an error message is displayed. If an error message is displayed, the setting name and unchanged value will be displayed again when the CLEAR key is pressed.

After changing the value of a setting, the setting name and the new value will remain on the display. The user may press one of the ARROW keys to move to the next setting in the category. He may also press any Command key to begin performing other operations. If the user presses the SET key, the current category will be

displayed and the user may then use the ARROW keys to go to another category. If the user presses the SET key again, the first setting category will be displayed. If the user presses any of the other Command keys, the first category associated with that Command key will be displayed.

It is important to note that as soon as any value is entered and accepted (i.e. no error) for any setting, the DDP will stop its Protection/Control activities. This is done to allow the user to change all desired settings one after another without causing Protection/Control processing to run with an inconsistent set of settings. When Protection/Control is halted, the Alarm LED will be turned ON and the System Status LED will be turned OFF until the user presses the END and ENT keys to indicate all setting changes are complete. If the subsequent re-initialization is successfully performed and protection is turned back ON, the LEDs are toggled. While the DDP is in the "protection/control halted" state, all other MMI functions can still be performed (e.g., the user can still request present values or perform a manual trip).

Actions Key (ACT)

The ACT key is used to perform actions. The categories can be walked through using the ARROW keys. For convenience, however, each category is also assigned a number so that the user may go directly to the desired category.

The key sequence for selecting actions is

ACT [cc] ENT
Where:
cc is the optional category number.

cc = 1: Date/Time
2: Contrast adjust
3: Back light
4: Read SLR
5: Test SLR
5.1: NORMAL TEST
5.2: DEL. REC. TEST
6: MMI Test
7: Trip
7.1: TRIP1
7.2: TRIP2
7.3: TRIP3
8: Close
8.1: CLOSE BREAKER
9: Reset
9.1: PEAK DEMAND
9.2: FAULT DATA
9.3: BRKR INT I2T
9.4: LATCHED ALARMS
9.5: LATCHED ALARMS
10: Model Number
11: Read Memory

NOTE

The categories of 'Read SLR', 'Test SLR' and 'TOT REC' are displayed only if the optional SLR-12 is included in the DDP.

When the user presses the ACT key, the display shows "ACT:" in the first 4 positions and the abbreviated name of the first category starting in position 5. If the user wants the first category, he presses the ENT key to display the first item; otherwise, he uses the ARROW keys to get to the desired category. If the user presses one or more digits, the category name is blanked and the entered number is displayed. Then when the user presses the ENT key, the abbreviated name of the category corresponding to the number is displayed starting in position 5. If the user enters an invalid category number, an error message is displayed.

The displayed names for the categories listed above are:

cc = 1: "DATE/TIME"
2: "CONT. ADJ"
3: "BACK LIGHT"
4: "READ SLR"
5: "TEST SLR"
6: "MMI TEST"
7: "TRIP"
8: "CLOSE"
9: "RESET"
10: "MODEL NUM"
11: "READ MEM"

When the user presses the ENT key following the displayed name of a category, the first item or prompt in that category is displayed. If the category contains a list of items, the user may

walk through the items using the ARROW keys, in the same manner as described above for Settings. He may go to the next or previous category by pressing the ACT key followed by one of the ARROW keys. If the category contains prompts, the user must respond to each prompt or press any Command key or the END key to get out of the sequence of prompts. After the user responds to the prompt and presses the ENT key, the next prompt (if any) will be automatically displayed. The DDP performs the appropriate action after the last prompt has been satisfied. As soon as the action is complete, the user will be taken back to the beginning of the category in most cases and in a few cases the user must press the CLR key first (whereby the category name is displayed, and the DDP is expecting the ENT key to produce the first prompt, an ARROW key to move to another category, or a Command key).

Date/Time

This category is used to display or change the current date and/or time stored in the DDP.

When the ENT key is pressed, the display shows "DATE: xx/xx/xx", giving the current date in the format mm/dd/yy. If the user wishes to change the date, he enters 6 digits from the numeric keypad, then presses the ENT key. If the user presses any key other than ENT, or the digits entered do not comprise a valid date, the old date is retained (new date is not stored). An error message is displayed if the date is invalid. As soon as the user begins entering digits, the 6 digits on the display are blanked, and the numeric keys pressed by the user are echoed in place of the displayed digits.

If the user presses the UP-ARROW key after viewing or changing the date, the display shows "TIME: xx:xx:xx", giving the current time in the format hh:mm:ss. If the user wishes to change the time, he enters 6 digits, then presses the ENT key. If the user presses any key other than ENT, or the digits entered do not comprise a valid time, the old time is retained (new time is not stored). An error message is displayed if the time is invalid. As soon as the user begins entering digits, the 6 digits on the display are blanked, and the numeric keys are echoed in place of the displayed digits.

Contrast Adjust

This function allows the user to adjust LCD contrast. When the ENT key is pressed, the display shows "CONT. ADJ.". The user can use arrows to set the appropriate level and use the ENT key to save that level. If any other key is pressed the original level of contrast is maintained. The contrast level is saved in non-volatile memory and so it will not be changed by turning off the power to the DDP.

Back Light

This function turns the back light on for the LCD to be readable in a dark environment. When the ENT key is pressed, the display shows "BCK. LGHT?". Pressing "Y" or "N" followed by ENT turns the back light ON or OFF, respectively. (Note: Turning ON the back light puts a heavy burden on the power supply).

Read SLR

NOTE

This function is available only if the optional recloser is included in the DDP.

This function displays the SLR settings on the SLR display. When the ENT key is pressed, the display shows "READ SLR?:". The user may select either to read by entering a "Y" and ENT key, or not to read, by pressing "N" followed by ENT. While the SLR is displaying its data, the MMI LCD displays the message "WAIT FOR READ". After approximately 30 secs the "WAIT FOR READ" message is removed and the "READ SLR?:" prompt is displayed.

Test SLR

NOTE

This function is available only if the optional recloser is included in the DDP.

This function tests the SLR as explained in the ACCEPTANCE TESTS section.

Pressing the ENT key at this category, allows the user to select via the arrows, either the Normal SLR test or the Delayed Reclose SLR Test. The two SLR Test categories displayed are:

"NORMAL TEST"
"DEL. REC. TEST"

Pressing ENT key at either of these categories displays the prompt:

"TEST SLR?:"

Pressing "Y" followed by ENT performs the selected SLR test. While the SLR is being tested, the above prompt reappears. Pressing "N" at the prompt skips the test and the current SLR Test category is displayed. To perform the test, the SLR must be enabled. This can be done by making sure the CONTROL setting REC-EN (setting# 416) is set to "YES" and Protection is enabled. If the SLR is not enabled, the error message "RECLOSR DISABLED" is displayed when the test is attempted.

MMI Test

This category is used to test the display, keyboard, and LED's.

Pressing the ENT key at the "MMI TEST" category causes all LCD display segments to become dark for about 10 seconds, enabling the user to verify that all LCD segments are working.

When the LCD test is finished, the display changes to "LED TEST?". If the user presses N followed by the ENT key, the LED test is skipped. If the user presses Y followed by the ENT key, the LEDs blink for about 10 seconds enabling the user to verify that all LEDs are working. Note however, that any LEDs that are on before the test is started, do not blink but are left on. During the LED test the LCD display blinks the word "TESTING". When the LED test is finished, the LEDs are returned to the state they were in before the LED test, either on or off. At the end of the LED test the display changes to "KEYBRD TEST?". If the user presses N followed by the ENT key, the keyboard test is skipped. If the user presses Y followed by the ENT key, the keyboard test begins. First the display is blanked, and the user is expected to press keys on the keyboard. The keys are echoed on the display. The CLEAR key terminates the keyboard test and completes the MMI test.

NOTE

The LEDs can also be tested by pushing the Target Reset switch located at the left bottom of the front cover.

Trip

This category is used to manually and individually trip the TRIP1, TRIP2 or the TRIP3 circuits. Trip signal will be applied for about a second.

When the ENT key is pressed, the display prompts the user with the message "TRIP1". The user can use the arrows to select one of the TRIP categories:

TRIP 1
TRIP 2
TRIP 3

The user can trip the selected circuit by pressing ENT. The display will show "TRIPPING BREAKER" for about 1 second. The message then changes to "TRIP ISSUED". Pressing the CLEAR key removes the message and returns to the selected circuit display (TRIP1, TRIP2, TRIP3).

Close

This category is used to manually close the breaker. The close signal will be applied for about a second.

When the ENT key is pressed, the display prompts the user with the message "CLOSE BREAKER". The user can close the breaker by pressing ENT. The display will show "CLOSING BRKR" until the close is either successful, or fails or times out after about 1 second. If it was successful the message "CLOSE ISSUED" is displayed. If it was unsuccessful, because a trip is in progress, "CLOSE FAILED" is displayed. Pressing the CLEAR key removes the message and returns to the "CLOSE BREAKER" display.

NOTE

If the Recloser option is not present, then the close signal will not be sent to the breaker even though the "CLOSE ISSUED" message is displayed.

Reset

This category allows the user to reset some of the data contained in the DDP. The arrows can be used to select one of the following actions:

PEAK DEMAND
FAULT DATA
BRKR INT I2T
TOT REC
LATCHED ALARMS

The data is reset in the following way:

1. Peak Demand All peak demand history is erased. Pressing the ENT key erases the peak demand history and displays the message "PEAK DMND RESET". The CLR key removes the message and redisplays the "PEAK DEMAND" action.

2. Fault Data All fault report history is erased. Pressing the ENT key erases the fault report history and displays the message "FAULT DATA RESET". The CLR key removes the message and redisplays the "FAULT DATA" action.

3. Brkr Int I2T This allows an initial value for total breaker interrupting I2T to be set for phases A, B and C, and for the 100 percent value used for the non-critical alarm limit check. Note that currents are secondary currents. Pressing the ENT key displays the first prompt in the following list of prompts:

"I2TA=nnnnnnnnnn"
(Range: 0 <= I2TA < 40000000.00 amps^2*Sec)

"I2TB=nnnnnnnnnn"
(Range: 0 <= I2TB < 40000000.00 amps^2*Sec)

"I2TC=nnnnnnnnnn"
(Range: 0 <= I2TC < 40000000.00 amps^2*Sec)

"100%=nnnnnnnnnn"
(Range: 0 <= 100% < 40000000.00 amps^2*Sec)

"TOT TRIPS=nnn" (Range: 0 <= TOT TRIPS < 1000)

After the value for the last prompt is entered, the "BRKR INT I2T" action is redisplayed.

4. Total Recloses Set to 0. (NOTE: This function is active only if the optional recloser is included in the DDP.) Pressing the ENT key zeros the total number of recloses and displays the message "TOT REC RESET". The CLR key removes the message and redisplays the "TOT REC" action.

5. Latched Alarms The latched alarm words are cleared to 0. The latched alarm words provide a way to view intermittent alarms. Any bits which are set in the current alarm words are also permanently saved in the latched alarm words. An alarm bit in a latched alarm word will remain set even if the condition causing the alarm is removed. Pressing the ENT key clears the latched

alarms and displays the message "ALARMS RESET". The CLR key removes the message and redisplays the "LATCHED ALARMS" action.

Model Number

This action allows the user to change the Model Number of the DDP. When the DDP is powered up the very first time, the user is prompted to enter the Factory Pass Number. The Factory Pass Number prevents unauthorized users from changing the Model Number. The Factory Pass Number must be correctly entered before the Model Number can be changed:

"FPN="

NOTE

Factory pass number is not available to the end user, since the model number can be changed only at the factory. Pressing the ACT key will let the user out of the "FPN=" display. See section INFORMATION KEY to look at the model number using the local MMI.

After the Factory Pass Number has been correctly entered, the current Model Number is displayed:

"MODEL=nnnnnnn"

The user may then change the Model Number by entering a new value for "nnnnnnn". After a valid Model Number has been entered, the user must turn off and on the power to the DDP for the new Model Number to take effect. Therefore, the following message is displayed to instruct the user to do this:

"TURN OFF POWER"

This is required because the DDP software only examines the Model Number upon power-up. The left-most 4 digits are the only digits that are range checked. When the "TURN OFF POWER" message is displayed, pressing any key, displays the "MODEL=nnnnnnn" prompt to allow the user to correct the Model Number. See Appendix I for the format of the Model Number.

If a Model Number of "0000000" is entered, then the DDP will perform a factory power-up, which initializes the following:

Default Password for communications is set to the Power-up PROM-Resident Password.
Fault Reports are cleared
Breaker Interrupting I2T values are set to 0, except 100% value is set to 5 million
Total Number of Trips is set to 0
Total Number of Recloses is set to 0
Latched Alarms are cleared
EEPROM CRC is re-calculated
The Model Number is marked as not having been entered
Baud rate is 2400
Unit ID is 0000

NOTE

Once the Factory Pass Number has been entered, no other functions can be activated. The power must be turned off to escape from this function.

Read Memory

This function is for debug use only and not intended for the end user. It allows the user to read any memory location in the Protect CPU. The user enters the address of the memory location in decimal and presses the ENT key. The display appears as follows:

"AAAAA:DDDDD SB"
where:
AAAAA - current memory address displayed.
DDDDD - Data stored in memory location AAAAA
S - Size of memory location displayed. W=word, B=byte
B - Number base. H=hex, T=decimal.

The address and data are displayed in the current number base. If the Memory size is 'W' and the

address is an odd number, the address is truncated to the next lower even number. Words are always on even byte boundaries.

The user can use the UP-ARROW key to increment the address and display the contents of that memory location. The DOWN-ARROW will decrement the address. If the Size of memory is W, the address changes by 2. If the Size of memory is B the address changes by 1.

The user can change the Size of memory by pressing the PRT key, which toggles between 'B' and 'W'.

The user can change the Number base by pressing the DECIMAL POINT key, which toggles between 'H' and 'T'.

If the user leaves the Read Memory function and then returns to it, the address the user last entered is retained.

Information Key (INF)

The INF key is used to request information. Presently, there are 8 categories. See Appendix I for a list of items within each category for which information can be requested.

The categories can be walked through using the ARROW keys. For convenience, however, each category is also assigned a number so that the user may go directly to the desired category.

The key sequence for selecting information is

INF [c] ENT

Where:
c is the optional category number
(if omitted, category 1 is assumed)
c = 1: Protection Info
2: Control Info
3: Metering Info
4: Breaker Interrupting I2T
5: Fault Analysis
6: Alarms
7: Password
8: Model Number

NOTE

The category of 'Control Info' is displayed only if the optional SLR is included in the DDP.

When the user presses the INF key, the display shows "INF:" in the first 4 positions and the abbreviated name of the first category starting in position 5. If the user wants the first category, he presses the ENT key to display the first item; otherwise, he uses the ARROW keys to get to the desired category. If the user presses a digit, the category name is blanked and the digit is displayed. Then when the user presses the ENT key, the abbreviated name of the category corresponding to the number is displayed starting in position 5. If the user enters an invalid category number, an error message is displayed, e.g. "CATEGORY INVALID".

The displayed names for categories listed above are:

c = 1: "PROTECT"
2: "CONTROL"
3: "METER"
4: "BRKR INT I2T"
5: "FAULT"
6: "ALARMS"
7: "PASSWORD"
8: "MODEL NUMBER"

When the user presses the ENT key following the displayed name of a category, the first item or prompt in that category is displayed. If the category contains a list of items, the user may walk through the items using the ARROW keys, in the same manner as described above for Settings. He may go to the next or previous category by pressing the INF key followed by one of the ARROW keys and the ENT key. If the category contains prompts, the user must respond to each prompt or press any Command key or the END key to get out of the sequence of prompts. After the user responds to the prompt and presses the ENT key, the next prompt (if any) will be automatically displayed. The DDP displays the appropriate information after the last prompt has been satisfied. Pressing the Command key at this point will take the user back to the beginning of the category (whereby

the category name is displayed, and the DDP is expecting the ENT key to produce the first prompt, an ARROW key to move to another category, or a Command key).

PROTECT:	See appendix I for information under this category.
CONTROL:	See appendix I for information under this category.
METER:	See appendix I for information under this category.
BRKR INT I2T:	See appendix I for information under this category.
FAULT DATA:	See appendix I for information under this category.
ALARMS:	See appendix I for information under this category.
PASSWORD:	This category is used to view the remote communications password (see Table IN-1 for Password Key to translate encrypted password). If the user presses the ENT key, the remote communications password is displayed in encrypted form.
MODEL NUMBER:	See appendix I for information under this category.

MMI Default Display

If no keys are pressed for 15 minutes, the MMI will go into the Idle state and display the default screen. Ending the session by pressing the END and ENT keys will also put the MMI into the Idle state. Remote communications with a PC are permitted only when the MMI is in the Idle state. The default screen displays the following values one after the other in cyclical fashion, such that each value is displayed for 4 seconds:

1. Phase A Primary RMS Value
2. Phase B Primary RMS Value
3. Phase C Primary RMS Value
4. Ground Primary RMS Value

Table IN-1 PASSWORD DECODER KEY
ENCRYPTED PASSWORD CONVERSION TABLE

MMI	DECODED	MMI	DECODED	FACTORY USE ONLY MMI	FACTORY USE ONLY DECODED
(sp)	P	:	J	Q	$
!	T	;	N	R	(
"	X	<	C	S	,
$	Q	=	G	T	!
%	U	>	K	U	%
&	Y	?	O	V	)
(	R	@	0	W	-
)	V			X	"
*	Z	A	4	Y	&
,	S	B	8	Z	*
-	W	D	1	[	.
		E	5	\	#
1	D	F	9	]	'
2	H	H	2	^	+
3	L	I	6	_	/
4	A	L	3		
5	E	M	7		
6	I	P	(sp)		
7	M				
8	B				
9	F				

*REMOTE COMMUNICATIONS INTERFACE

Hardware Jumpers

There are two factory installed hardware jumpers on the backplane (see Figure IN-2) used to inhibit the ability to perform the Remote Breaker Trip and Close function and the Remote Settings Change function.

Both the Remote Trip and Close jumper, J2, and the Remote Settings Change jumper, J1, must be removed to enable their respective functions.

Modem Connections and Settings

When establishing communication between the DDP and a remote PC, two modems connected via a phone line are required; one modem is located at the DDP and the other modem is located at the PC. The cable that connects the modem with either the DDP or the PC is shown in Figure IN-3c). Each of these modems must be "Hayes compatible", meaning that they must accept configuration commands first developed by Hayes. This is necessary since the DDP-LINK communications software that runs on the PC sends a Hayes compatible command string to the modem located at the PC. The DDP does not send any configuration commands to its modem. **Both, the DDP modem and the PC modem must be uniquely configured to permit the user to log into and communicate with the DDP using DDP-LINK software.**

The required configuration settings are presented as changes to the factory default configuration settings for a Hayes V-Series 2400 SmartModem. These default settings are:

B1	&C0	S0=0	S37=0
E1	&D0	S6=2	S38=20
L2	&G0	S7=30	
M1	&J0	S8=2	
N1	&K3	S9=6	
P	&L0	S10=14	
Q0	&P0	S11=95	
V1	&Q5	S12=50	
W0	&R0	S18=0	
X4	&S0	S25=5	
Y0	&T4	S26=1	
	&X0	S36=1	

Other "Hayes compatible" modems may implement a subset of the full Hayes command set. **It is the responsibility of the user to ascertain the exact commands accepted by a particular modem.**

The proper syntax for entering the Hayes compatible commands (sometimes referred to as the "AT" command set) is not described here. Refer to the manual for your modem for an explanation of this syntax.

PC Modem

The PC modem must be configured for "intelligent" operation (i.e., command recognition enabled). For the Hayes V-Series 2400 SmartModem this setting is made via an internal jumper. The default settings listed above are valid for DDP-LINK. Those configuration settings critical to the operation of DDP-LINK are changed by DDP-LINK. The configuration commands sent to the modem from DDP-LINK are:

+++ (set modem to command mode)
(delay 2 seconds)
ATE0L0Q0S7=60V0X4Y0 (see explanation below)

CUT J2 FOR REMOTE BREAKER CONTROL

CUT J1 FOR REMOTE SETTING CHANGE

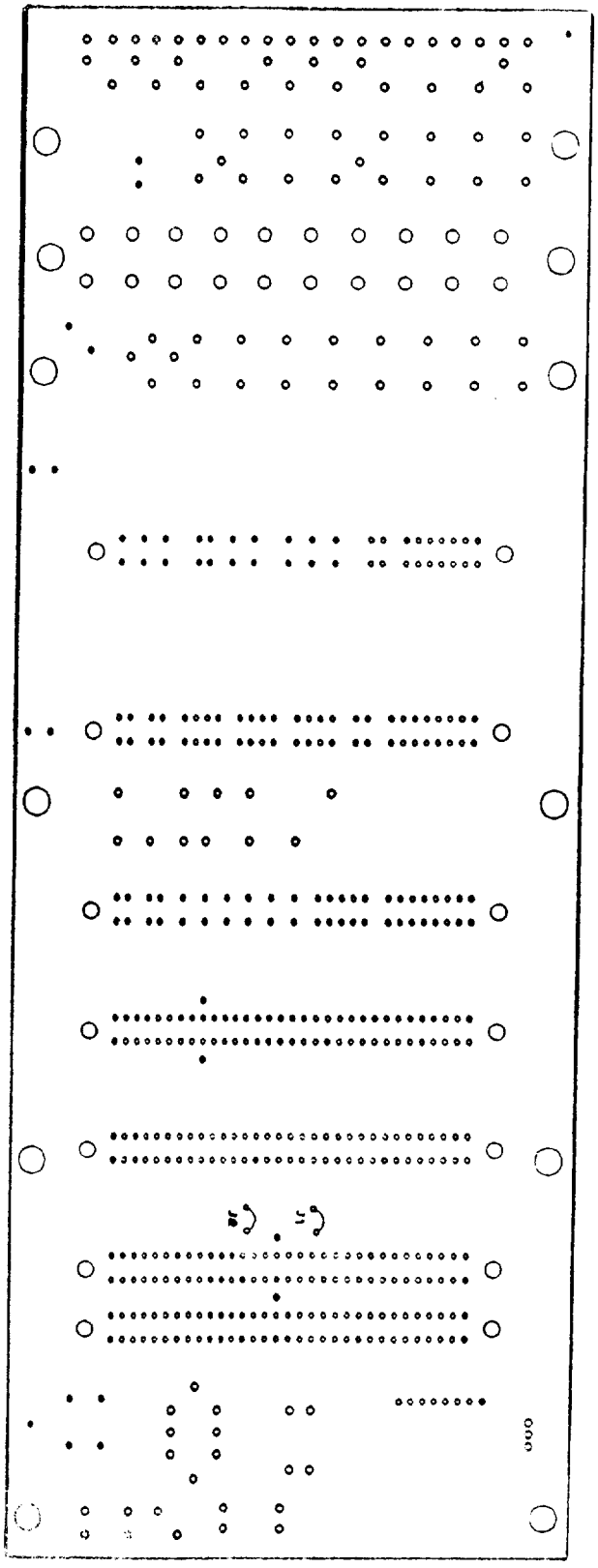


Figure IN-2 (0285A5372[1]) Back View of DDP Backplane Showing J1 and J2

Command explanation:

AT	-	modem attention command
E0	-	disable command state echo
L0	-	low speaker volume (desirable - not required)
Q0	-	modem returns result codes
V0	-	result codes returned in numeric form
X4	-	enables features represented by result codes
Y0	-	disable long space disconnect
S7=60	-	allows the modem to hang up if connection is not made within 60 seconds.

The command S7=60 is present starting in version 1.05 of DDP-LINK. Earlier versions of DDP-LINK do not execute this command leaving the time out at the default value which is typically 30 seconds.

If all of the above commands are not programmable, then the modem will not operate properly. In addition to the required configuration settings listed above, it is suggested that two other settings be made by the user. These are:

&D3 - causes the modem to reset on the ON-to-OFF transition of DTR (Data Terminal Ready)
&C1 - causes DCD (Data Carrier Detect) to track the received carrier signal

The modem will operate properly without making these two settings but the modem will not hang up if the appropriate handshaking signal is lost.

A D-LINK setting establishes the baud rate which must match the baud rate setting of the DDP. D-LINK will then set the specified PC serial port (i.e., COM1, COM2) to the proper baud rate, parity, databits, and stopbits. If the PC modem is capable of operating at more than one baud rate, then it must be able to automatically configure its baud rate, character length, and parity setting by examining the "AT" command prefix.

DDP Modem

The DDP modem must be configured for "dumb" operation (i.e., command recognition disabled). For the Hayes V-Series 2400 SmartModem this setting is made via an internal jumper. Since the DDP does not send any configuration commands to its modem, the required configuration settings must be made prior to connecting the modem to the DDP. **Additionally, the modem must be initialized to the required configuration settings each time modem power is turned OFF and then ON.** Depending on the design of the modem this is accomplished by making all the required settings via switches or saving the settings in non-volatile memory.

The required configuration settings are:

E0	-	disable command state echo
L0	-	low speaker volume (advisable - not necessary)
Q1	-	disable result code display
&C0	-	causes DCD (Data Carrier Detect) to track the received carrier signal
&D0	-	causes the modem to ignore DTR (Data Terminal Ready)
&Q0	-	asynchronous mode

If any of the above settings cannot be implemented, the modem may not answer, the DDP may not connect properly, or the user may not be able to log into the DDP.

With a Hayes V-Series 2400 SmartModem or equivalent, the DDP modem will perform a modulation handshake with the PC modem to set the baud rate of the DDP modem. The default setting of "N1" permits handshaking to occur at any baud rate supported by both modems. This is one reason why it is preferable to use identical modems at each end.

Note that auto-answering is controlled with register S0. S0=0 disables auto-answer. S0=1 will cause the DDP modem to answer the incoming call after one ring. S0 can be set for any value between 1 and 255, for the Hayes modem assumed here, if it is desirable to delay modem answering. Note that D-LINK (version 1.05 or higher) configures the PC modem to wait 60 seconds for the DDP modem to answer. If the DDP modem register S0 is set higher than 12, the PC modem may time out and hang up before the DDP modem can answer. S0=12 means that the DDP modem will answer after twelve rings and corresponds approximately to the 60 second delay (S7=60) at the PC modem, however the user should verify the number of rings corresponding to 60 seconds for a particular application.

Null Modem Connections

A PC can be connected to a DDP without the intervening modems and phone line by using a special cable called a "null modem" cable. The required connections for a null modem cable to the terminals on the back of the unit is shown in Figure IN-3 a) and b). A cable should not exceed 50 feet in length.

Communication with Multiple DDPs

D-link software can be used to communicate with multiple DDPs at a substation. Rather than requiring a dedicated line between a host PC and each DDP, the PC can be connected to communicate with a multiplexer equipment (at the substation) to which the DDPs are connected. GE does not provide the multiplexer at the present time, but it can be obtained from other vendors. For example Black Box Corporation's COS-8P or equivalent devices.

Code switches: These switches automatically select the channels requested by the host PC. The PC can communicate with one device at a time. At the PC the user must set up the configuration parameters once, with appropriate switch code for each of the DDPs. It is beyond the scope of this instruction book to describe how to set up the various code switches. However, the following will be helpful.

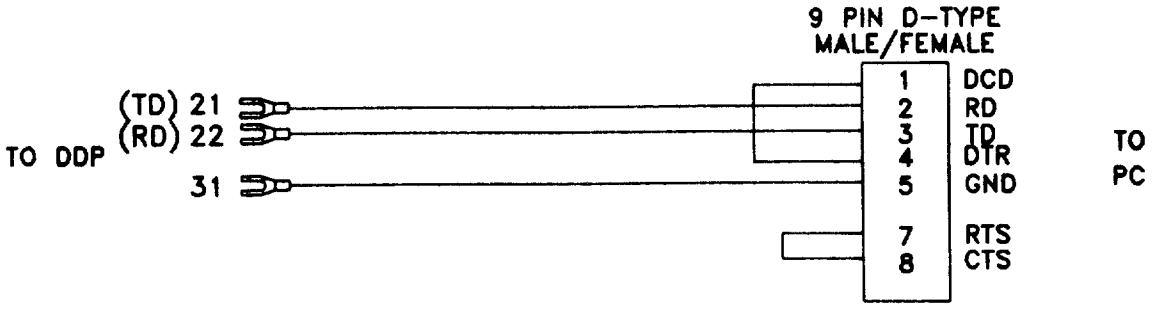
1. Make sure the baud rate of the switch matches with that of the PC and each DDP.

2. Serial data word format is: 8 data bits, 1 stop bit, and no parity.

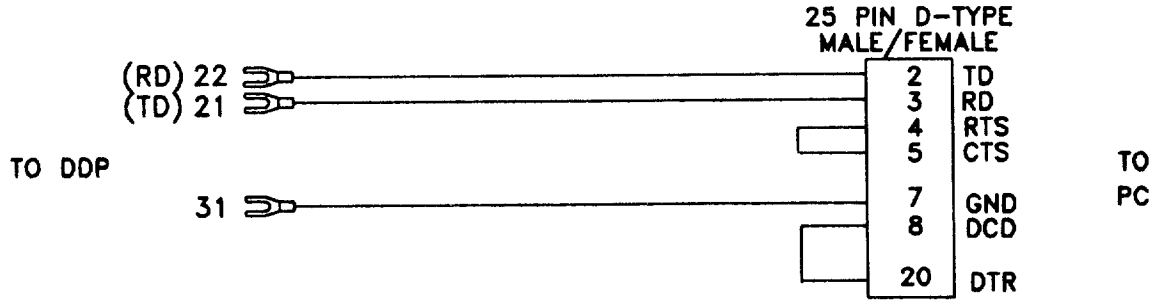
3. Disable any auto device timeout on the code switch.

4. Make sure that the switch is set up for both text and binary data. Although D-link message formats are mostly ASCII there are binary data for CRCs and oscillography.

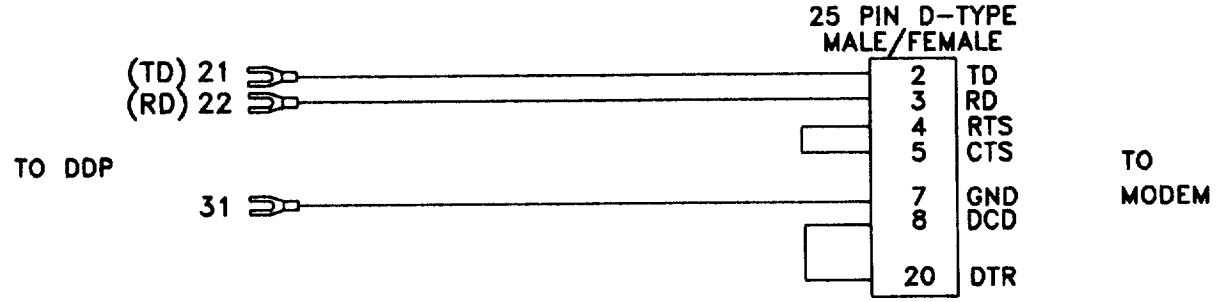
5. Make sure the DDP side of the switch is set up as DTE, and the modem/PC side of the switch is set up as DCE.



A) DDP.....AA REMOTE COMMUNICATIONS TO PC (9 PIN)



B) DDP.....AA REMOTE COMMUNICATIONS TO PC (25 PIN)

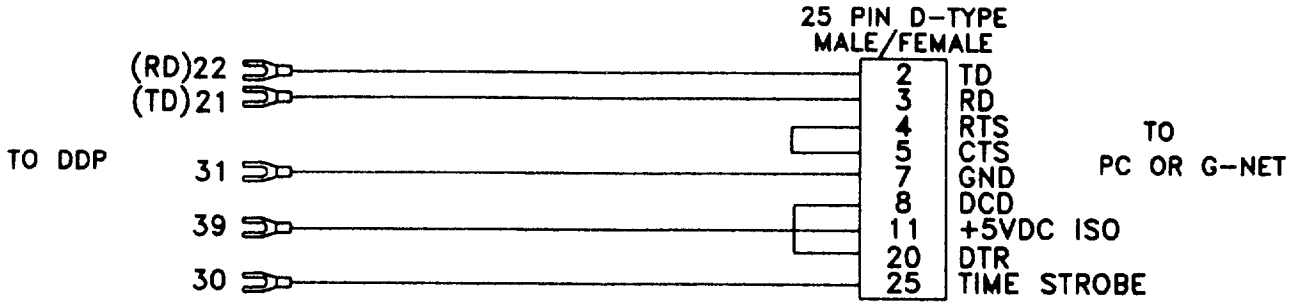


NOTE: SET UP MODEM TO IGNORE DTR FROM DDP

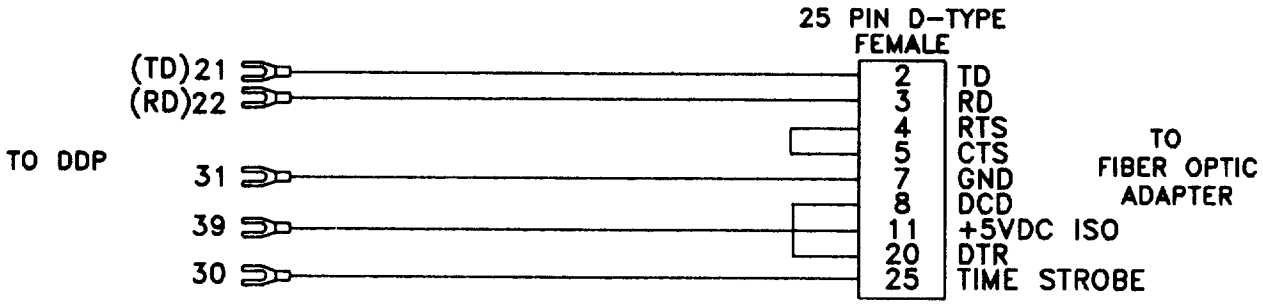
C) DDP.....AA OR DDP.....BA COMMUNICATIONS TO MODEM

CABLES AVAILABLE UNDER GE PART NO. 0246A9866. SPECIFY CABLE TYPE AND CONNECTOR GENDER.

Figure IN-3 (0286A3587, Sh.1[3]) DDP.....AA Cable Connections



D) DDP.....BA REMOTE COMMUNICATIONS TO PC (25 PIN)



E) DDP.....BA COMMUNICATIONS TO G-NET FIBER OPTIC ADAPTER

CABLES AVAILABLE UNDER GE PART NO. 0246A9866. SPECIFY CABLE TYPE AND CONNECTOR GENDER.

Figure IN-4 (0286A3587, Sh.2[2]) DDP.....BA Cable Connections

DDP-LINK SOFTWARE

OVERVIEW

A personal computer (PC) will provide a remote man-machine interface to the relay for operating personnel. The following section describes two software programs, either of which can be used to communicate with a DDP relay. The program D-LINK is the older version of the communications package. It has been superseded by DDP-LINK for the DDP relay, which has some added advantages, such as the ability to use a mouse. Although D-LINK will still be available, we feel DDP-LINK is a better program, and are supplying DDP-LINK as the standard communications software, to be found in the back pouch of this Instruction Book. If a copy of the older version of the program is needed, it can be ordered in the same way the Instruction Books are ordered.

SYSTEM REQUIREMENTS

Hardware

The minimum PC hardware requirements consists of the following components. An IBM-AT or compatible with one parallel port, a minimum of 400K bytes of free memory (RAM) to run the program in, 40MB hard drive, low density 3 1/2 inch floppy drive, EGA monitor, and a parallel printer.

Software

Requires MS-DOS (PCDOS) 3.1 or above for the PC operating system.

INSTALLATION

View the file README.TXT for updated information and installation instructions for this program. This file is found on the 3.5" floppy disk located at the end of this section.

GENERAL OPERATION

Mouse/Keyboard Usage

Either the mouse or the keyboard can be used to access all items in menus, dialog boxes and list boxes. For a description of how to use the mouse and keyboard in the various boxes and menus, refer to the following sections for menus and dialog boxes. For full manipulation of graphical data, the mouse is required.

The mouse is used to access items in menus and dialog boxes by moving the cursor to the item, followed by pressing and then releasing the left mouse button (clicking).

Main Horizontal Menu Bar

Items in the main horizontal menu are selected in one of three ways:

1. Position the mouse cursor on top of the menu item and click the left button.

2. Use a hot key. The hot key is the combination of the ALT key and the letter that is highlighted in the item description (blue).

3. Once either of the above methods has been used to select an item on the menu, indicated by one item being highlighted, the RIGHT and LEFT ARROW keys can be used to go to adjacent menu items. If the menu is not visible just below the highlighted item on the menu bar use the DOWN ARROW key to display the menu.

Pull-Down Menus

Pull-down menu items are selected in a number of ways:

Mouse

Position the mouse cursor on top of the menu item then press the left button once and release it (hereafter known as clicking on the mouse button) to display the pull-down menu. If the user wishes to select an item in the pull-down menu, position the mouse over the desired item and click on the left mouse button.

Both may be done at once by positioning the cursor over the menu item on the menu bar and holding the left mouse button down, moving the mouse cursor to the desired entry and the releasing the mouse button.

Keyboard

"Activating the hot key" is the combination of holding the ALT key and striking the highlighted key. Using a hot key will activate the associated menu or dialog box. If there is no hot key for a desired menu item, use the UP and DOWN ARROW keys to highlight the desired item, then press the ENTER key. Pressing the ENTER key will activate the associated menu or dialog box.

Dialog Boxes

Dialog boxes are generally characterized by a title bar, a grey box, and OK and CANCEL buttons. The dialog box cannot be moved, resized, or iconized. In addition, when a dialog box is displayed, the user can only access items in the dialog box, not any other items on the screen.

If an item in the dialog box has a title with a highlighted character (blue in the default color scheme), the user can access this item from the keyboard by using the ALT key with the highlighted character (the hot key). Items in a dialog box can also be accessed from the keyboard by using the cursor keys: UP/DOWN/LEFT/RIGHT ARROW keys, PAGE UP/DOWN keys and the TAB/SHIFT

TAB keys.In any dialog box the TAB key will move sequentially in one direction, or the SHIFT TAB key in the opposite direction, selecting items in the dialog box with each keystroke. The other cursor keys will generally move within a selected item.

Buttons in the dialog box can be accessed from the keyboard by using the UP/DOWN ARROW keys, the TAB/SHIFT TAB keys, or if the button has a highlighted character, the hot key. If the buttons require the user to make a selection, the selection is made by using the ENTER key.

To exit from the dialog box and clear it from the screen, the user selects either the OK button or the CANCEL button. The mouse can be used to select these buttons by moving the mouse cursor over the button and clicking the left mouse button. In addition, the keyboard can be used to select these buttons by using their hot keys. The hot key for the OK button is ALT-O and the hot key for the CANCEL button is ALT-C.

The mouse can be used to select any item in a dialog box by moving the cursor with the mouse to the desired item and clicking on it with the left mouse button.

The OK button accepts the selection(s) made by the user and allows the program to use these selections. The CANCEL button does not accept the selections made by the user and thus the program uses the previous selections. Any highlighted button can be selected by striking the ENTER key.

List Boxes

A list box is another box within a dialog box that lists all choices for an item in the dialog box (for example, a list of file names). If the list of available entries is longer than the displayed list box, the list box has a vertical scroll bar that allows the user to scroll through the list.

To operate the scroll bar with the mouse, place the tip of the pointing arrow cursor in the gray hatched area, or on the arrows at the top and

bottom of the scroll bar and click on the left mouse button. If the mouse arrow cursor is in the grey hatched area, then the contents of the list box will move a section at a time. If the mouse cursor is on one of the arrows at the top or bottom, the contents of the list box will move one line at a time. Holding down the mouse button will cause the movement to be repeated until the mouse button is released.

Once the desired item can be seen, click on the item with the left mouse button to select it. Once an item has been selected it will be highlighted.

To operate the scrolling of the list box with the keyboard, use the PAGE UP/DOWN keys to move the contents of the list box a section at a time and the UP/DOWN ARROW keys to move the contents one line at a time. Holding down the keys will cause the movement in the list box to repeat until the key is released.
Once the desired item can be seen, use the UP/DOWN ARROW keys to select it. The selected item is the highlighted one.

The following table lists the valid keys and their functions for list boxes:

UP ARROW	Move up one selection.
DOWN ARROW	Move down one selection.
PAGE UP	Move up one page of selections.
PAGE DOWN	Move down one page of selections.
HOME	Move to the first selection.
END	Move to the last selection.
RETURN	Accept the current selection and exit the list box.
ALT-X	Exit the list box without making a selection.

Entering Text and Numbers

The following keys are used when entering and editing text and numbers.

LEFT ARROW	Move the cursor one character to the left.
RIGHT ARROW	Move the cursor one character to the right.
DELETE	Delete the character at the cursor.
BACKSPACE	Delete the character to the left of the cursor.
INSERT	Toggle between the insert and overwrite mode. -Overwrite mode is indicated by an underscore-character cursor -Insert mode is indicated by a block-character cursor.
ENTER	Accept the text or number in the field/box
ESCAPE	Clear the text or number in the field/box.

The first keystroke other than the arrow keys will clear the field/box; this enables a new entry without having to clear the box first. If a minor change is desired and the user does not wish to clear the field/box, move the cursor first and then do the editing to the entry.

PROGRAM OPERATION

MAIN MENU

The main horizontal menu has the following items and hot keys.

Relay Functions	ALT-R
Local Functions	ALT-L
Setup	ALT-S
Help	ALT-H

Each item in the main horizontal menu has a pull-down menu associated with it. Some of the items will be displayed in a lighter shade or color. This is to denote the absence of the relay to perform that ability. Since DDP-LINK works for all revisons of the DDP relay there may be

some functions that are present in one relay and not in another.

Relay functions

Relay functions has the following active menu items and associated hot keys:

Login	ALT-L
lOgout	ALT-O
Hang up phone	ALT-H
Actions...	ALT-A
Information...	ALT-I
Settings...	ALT-S

Login

Login is used to gain access to the relay. When logging into a DDP for the first time, the user must use the factory password. When a user is logged in under the factory password, the only commands that can be used at the PC are those to change the password and to logout. The factory password is changed to the user's password by selecting the **change Password** menu item from the Actions menu item from the **Relay functions** pull-down menu. The current password is the factory password and the new password is the user's password. The encoded Communications password can **only** be viewed locally, on the MMI.

The Login dialog box contains a list of the currently configured DDPs, a place to enter the password, a place to enter the unit ID, a button for adding a new DDP to the configured DDP list, an OK button and a CANCEL button.

The list of currently configured DDPs contains the unit description, phone number, baud rate, and multiplexor switch code for each DDP.

The NEW RELAY button in the dialog box allows the user to add a relay that has not been previously entered into the list of configured relays. The user enters the unit description, the phone number, the multiplexor switch code, and the phone number for the new relay. The new relay is added to the list of configured relays.

Once a relay is selected from the list of relays, the user is asked for the password and the unit ID. Neither of these is echoed on the screen. Once this information is entered, the user selects the OK button to log into the relay.

lOgout

Logout disables access to the relay. A check is made to determine the status of protection at the DDP (ON or OFF). The status is displayed in the dialog box. Selecting the OK button logs out of the relay. Selecting the CANCEL button, leaves the user logged in to the relay. If the status of protection is OFF due to a setting change that was not ended, pick the CANCEL button and choose **End settings change** in **Settings** in the **Relay Functions** menu.

Hang up phone

This selection will disconnect the phone line at the modem. If the user is logged in to the relay, the logout procedure will be completed before hanging up the phone. To pick this selection, use the hot key ALT-H or click on the menu item with the left mouse button.

Actions...

change Password	ALT-P
Manual trip	ALT-M
manual Close	ALT-C
change Time and date	ALT-T
Reset data	ALT-R
Switch setting group	ALT-S

change Password

This item allows the user to change the communications password in the DDP. The password always consists of ASCII characters. The valid user password characters are A to Z, 0 to 9, and space. The factory password contains one or more characters that are not valid. The

password can only be viewed on the MMI, in encrypted form, therefore it is **IMPORTANT** that the user keep a record of the password in a safe place.

First, the user must enter the present password. If the entered password is valid, the user must then enter the new password. If the new password is valid, the user must enter the new password again for verification.

The user selects the OK button; this does not yet cause the password to be changed. The user is asked to confirm the change. If the user selects the OK button, the password is changed.

Manual trip

This item allows the user to trip the breakers manually. If two breakers are being controlled by the DDP, each must be tripped individually. Note that the breakers can not be tripped if the Remote Breaker Control Jumper, J2 on the backplane, is not cut (see INTERFACE section). To select **Manual trip**, use the hot key ALT-M or click on the menu item with the left mouse button. The user selects the breaker to trip by using the UP and DOWN ARROW keys or clicking on the breaker selection with the left mouse button.

When the user selects the OK button and a breaker is selected, the user is asked to confirm the action. If the user selects the OK button, the breaker is tripped and the user is returned to the previous screen. Selecting the CANCEL button from the confirmation dialog box will return the user to the breaker-selection dialog box, without tripping the selected breaker. Selecting the CANCEL button from the breaker-selection dialog box returns the user to the Actions menu.

manual Close

This item allows the user to close the breakers manually. If two breakers are being controlled by the DDP, each must be closed individually. Note that the breakers can not be closed if the Remote Breaker Control Jumper, J2 on the backplane, is not cut (see INTERFACE section). To select **manual Close**, use the hot key ALT-C or click on the menu item with the left mouse button.

The user selects the breaker to close by using the UP and DOWN ARROW keys or clicking on the breaker selection with the left mouse button.

When the user selects the OK button and a breaker is selected, the user is asked to confirm the action. If the user selects the OK button, the breaker is closed and the user is returned to the previous screen. Selecting the CANCEL button from the confirmation dialog box will return the user to the breaker-selection dialog box without closing the selected breaker. Selecting the CANCEL button from the breaker-selection dialog box returns the user to the Actions menu.

change Time and date

This item allows the user to set the time and date in the DDP to the specified time and date. Changing the time and date through this menu does not affect the time and date in the PC. This item is selected by using the ALT-T hot key or clicking on the menu item with the left mouse button.

First the DDP's current time and date is displayed. The time is displayed in the format HH:MM:SS (for example: 10:55:09). The date is displayed in the format MM/DD/YY (for example: 07/16/90). The user may then edit the time and date.

When the user selects the OK button, the user is asked to confirm the action. If the user selects the OK button, the time and date are changed in the DDP.

Reset data

This item allows the user to reset various data ems contained in the relay. This item is selected by using the ALT-R hot key or clicking on the menu item with the left mouse button.The user is presented with a menu of data items that can be reset in a list box:

PEAK DEMAND
FAULT DATA
BREAKER INTERUPTING I2T
TOTAL RECLOSES
LATCHED ALARMS

The user selects the data item to reset by using the UP/DOWN ARROW keys or clicking on the data item with the left mouse button. When the user selects the OK button after a data item has been selected, the user is asked to confirm the action with another dialog box. If the user selects the OK button, the selected data item is reset and the following message is displayed:

DATA HAS BEEN RESET

Selecting the CANCEL button at anytime will return the user to the previous menu without any further action.

Switch setting group

This item allows the user to enable or disable the settings group switching in the DDP. This item is selected by using the ALT-S hot key or clicking on the menu item with the left mouse button.
The user is presented with a menu of choices in a list box:

SWITCH TO GROUP 2
SWITCH TO GROUP 1

The user selects the settings group 1 or 2 by using the UP/DOWN ARROW keys or clicking on the menu item with the left mouse button.

When the user selects the OK button after a settings group has been selected, the user is asked to confirm the action with another dialog box. If the user selects the OK button, the following message is displayed (after a short time delay):

GROUP X HAS BEEN SWITCHED

Where X is the selected group 1 or 2 settings. Selecting the CANCEL button at anytime will return the user to the previous menu without any further action.

Information...

request Present values
request fault report Identification
request Fault report
request ddp Status
request ddp Model
request Demand values
save Breaker interupting i2t to file
save disTurbance data to file
save demand iNterval values to file

request Present values

This item allows the user to display, print and/or file the present values. To select this menu item, either click on it with the left mouse button or use the ALT-P hot key. Once this item is selected, a dialog box will appear with three independent choices for displaying, printing and filing the present values. To change any of the three choices, either click on it with the left mouse button or use the TAB key to highlight the selection and the space bar to change it. An X in the brackets indicates that choice has been selected and no X indicates that choice has not been selected. One must be chosen for the present values to be retrieved from the relay.

If the user chooses to save the report in a file, a file name must be entered in the box supplied. To enter the file name, either move the mouse cursor to the box and click on the left mouse button or use the TAB key to highlight the box.

Once the box has been selected, enter the filename followed by the ENTER key.

After all the choices have been made, click on the OK button, or use the ALT-O hot key, to retrieve the report from the relay. Selecting the CANCEL button will return to the Information menu without any further action. When finished viewing the report, either click on the small box in the upper left corner with the left mouse button, or use the ALT-F4 hot key (F4 is the Function key F4, not the F key followed by the 4 key.). Once the present values have been cleared from the screen the **Present values** dialog box will be redisplayed. Use the ALT-C hot key or click on the CANCEL button to exit Present values.

request fault report Identification

This item allows the user to display, file, and/or print the identification of each fault report, which includes the time, date, and trip type for each fault. This information allows the user to determine easily which fault to examine.

To select this menu item either click on it with the left mouse button or use the ALT-I hot key. Once this item is selected, a dialog box will appear with three independent choices for displaying, printing and filing the fault report identi fications. To change any of the three choices, either click on it with the left mouse button or use the TAB key to highlight the selection and the space bar to change it. An X in the brackets indicates that choice has been selected and no X indicates that choice has not been selected. One must be chosen for the fault report identifications to be retrieved from the relay.

If the user chooses to save the report in a file, a file name must be entered in the box supplied. To enter the file name either move the mouse cursor to the box and click on the left mouse button or use the TAB key to highlight the box.

Once the box has been selected, enter the filename followed by the ENTER key. After all the choices have been made, click on the OK button or use the ALT-O hot key to retrieve the identifications from the relay. Selecting the CANCEL button will return to the Information menu without any further action. If the identifications have been displayed, when finished either click on the small box in the upper left corner with the left mouse button, or use the ALT-F4 hot key (F4 is the Function key F4, not the F key followed by the 4 key). Once the identifications have been cleared from the screen, the **fault report Identification** dialog box will be redisplayed. Use the ALT-C hot key or click on the CANCEL button to exit.

request Fault report

This item allows the user to display, print and/or file a fault report and its associated events. To select this menu item, either click on it with the left mouse button or use the ALT-F hot key. Once this item is selected, a dialog box will appear with three independent choices for displaying, printing and filing the fault reports. To change any of the three choices, either click on it with the left mouse button or use the TAB key to highlight one of the selections and the UP/DOWN ARROW keys to choose one of the three choices. An X in the brackets indicates that choice has been selected and no X indicates that choice has not been selected. Use the space bar to change any of the choices. At least one must be chosen for the fault report to be retrieved from the relay. The user must enter the fault report number (from 1 to 30) in the box supplied on the first line of the **Fault report** dialog box.

If the user chooses to save the report in a file, a file name must be entered in the box supplied. To enter the file name, either move the mouse cursor to the box and click on the left mouse button, or use the TAB key to highlight the box

Once the box has been selected, enter the filename followed by the ENTER key.

After all the choices have been made, click on the OK button or use the ALT-O hot key to retrieve the fault report from the relay. Selecting the CANCEL button will return to the Information menu without any further action. To clear the fault report from the screen, if it has been displayed, either click on the small box in the upper left corner with the left mouse button or, use the ALT-F4 hot key (the F4 Function key). Once the fault report has been cleared from the screen, the **Fault report** dialog box will be redisplayed. Use the ALT-C hot key or click on the CANCEL button to exit.

The user may scroll the screen to view the events associated with the fault. To scroll through the report, use the PAGE UP/DOWN keys, or place the mouse on the UP or DOWN ARROW on the scroll bar and use the left mouse button. Clicking the left mouse button will move one line in that direction and holding the button down will cause the scrolling to happen repetitively. The events are displayed with the most recent event last.

request Demand values

This entry allows the user to display the peak values and demand values, or to save the peak values and the demand values to a disk file. The DDP saves the demand currents for the past 24 hours. The setting DMND-INT sets the demand period to be 15, 30 or 60 minutes. The user is first asked to enter the Starting and Ending numbers of the demand values. The number of demand values available to the user depends on the DMND-INT setting as follows:

DMND-INT	Interval	No. of avail. demand values
0	15 min.	96
1	30 min.	48
2	60 min	24

There are three independent choices for displaying, printing and filing the demand values. To change any of the three choices, either click on it with the left mouse button or use the TAB key to highlight the selection and the space bar to change it. An X in the brackets indicates that choice has been selected and no X indicates that choice has not been selected. One must be chosen for the demand values to be retrieved from the relay.

If the user chooses to save the report in a file, a file name must be entered in the box supplied. To enter the file name, either move the mouse cursor to the box and click on the left mouse button or use the TAB key to highlight the box. Once the box has been selected, enter the filename followed by the ENTER key.

After all the choices have been made, click on the OK button, or use the ALT-O hot key, to retrieve the demand values from the relay.

Select the CANCEL button to return to the Information menu without any further action.

request ddp Status

This item allows the user to display, print and/or file the DDP status. To select this menu item either click on it with the left mouse button or use the ALT-S hot key. Once this item is selected, a dialog box will appear with three independent choices for displaying, printing and filing the DDP status. To change any of the three choices, either click on it with the left mouse button or use the TAB key to highlight one of the selections and the UP/DOWN ARROW keys to choose one of the three choices. An X in the brackets indicates that choice has been selected and no X indicates that choice has not been selected. Use the space bar to change any of the choices. At least one must be chosen for the events to be retrieved from the relay.

If the user chooses to save the report in a file, a file name must be entered in the box supplied. To enter the file name, either move the mouse

cursor to the box and click on the left mouse button or use the TAB key to highlight the box. Once the box has been selected, enter the filename followed by the ENTER key.

After all the choices have been made, click on the OK button or use the ALT-O hot key to retrieve the status from the relay. (Selecting the CANCEL button will return to the Information menu without any further action.) To clear the status from the screen, if it has been displayed, either click on the small box in the upper left corner with the left mouse button, or use the ALT-F4 hot key (the F4 Function key). Use the ALT-C hot key or click on the CANCEL button to exit.

request ddp Model

This item allows the user to display, print and/or file the DDP model and PROM version number. To select this menu item, either click on it with the left mouse button or use the ALT-M hot key. Once this item is selected, a dialog box will appear with three independent choices for displaying, printing and filing the DDP Model number and PROM version number. To change any of the three choices, either click on it with the left mouse button or use the TAB key to highlight one of the selections and the UP/DOWN ARROW keys to choose one of the three choices. An X in the brackets indicates that choice has been selected and no X indicates that choice has not been selected. Use the space bar to change any of the choices. At least one must be chosen for the events to be retrieved from the relay.

If the user chooses to save the report in a file, a file name must be entered in the box supplied. To enter the file name, either move the mouse

cursor to the box and click on the left mouse button or use the TAB key to highlight the box. Once the box has been selected, enter the filename followed by the ENTER key.

After all the choices have been made, click on the OK button or use the ALT-O hot key to retrieve the model and PROM version from the relay. Selecting the CANCEL button will return to the Information menu without any further action. To clear the model and version from the screen, if they have been displayed, either click on the small box in the upper left corner with the left mouse button, or use the ALT-F4 hot key (the F4 Function key). Use the ALT-C hot key or click on the CANCEL button to exit.

save Breaker interupting i2t to file

This entry allows the user to get the Breaker Interupting I2T data from the DDP and store in a disk file. The file can later be read by the DDP-DATA program to produce a graphical display of the data. The saved data from the DDP includes date and time, total breaker interupting I2T for phases A, B and C and the 100 percent value. The unit description and unit ID are also saved. The user is first asked for the name of a file, in which to save the breaker interupting I2T data. After the file name has been entered, click on the OK button or use the ALT-O hot key to retrieve the data from the relay and store in a disk file. Use the ALT-C hot key or click on the CANCEL button to exit.

save disTurbance data to file

This entry allows the user to get the Disturbance Data and related Fault Report from the DDP and store them in a disk file, along with the Unit Discription, Unit ID, and Model Number. The file can later be read by the DDP-DATA progrom to produce a graphical display of the data. The data from the DDP includes disturbance date and time, Transfer Ratio setting

value, and 1 pre-disturbance cycle of currents plus 15 post-disturbance cycles of currents for phases A, B and C and ground. The fault report saved to the file is one with trip date and time closest to and later than the disturbance date and time. The user is first asked for the name of a

file, in which to save the disturbance data. After the file name has been entered, click on the OK button or use the ALT-O hot key to retrieve the data from the relay and store in a disk file. Use the ALT-C hot key or click on the CANCEL button to exit.

save demand iNterval values to file

This entry allows the user to save the previously requested demand values to a disk file The user is first asked for the name of a file, in which to save the data. After the file name has been entered, click on the OK button or use the ALT-O hot key to save the data in a disk file. Use the ALT-C hot key or click on the CANCEL button to exit.

Settings...

The **Relay functions** Settings menu has the following items and hot keys:

Upload ddp settings	ALT-U
Print ddp settings	ALT-P
view/change Category of settings	ALT-C
view/change Individual settings	ALT-I
Download changed settings to ddp	ALT-D
download All settings to ddp	ALT-A
End settings change	ALT-E
Save settings to file	ALT-S

Upload ddp settings

This menu item uploads the settings from the DDP. To select this menu item, use the ALT-U hot key or click on the menu item with the left mouse button. Select the OK button, by using the ALT-O hot key or clicking on the OK button with the left mouse button, to retrieve the settings. Selecting the CANCEL button returns the user to the Settings menu.

Once the settings have been uploaded, the functions that can be performed in the Settings menu will be displayed in black writing.

Print ddp settings

This item allows the user to print all settings or a specific category of settings. First a list box is displayed with the category names, plus one additional item for printing all categories. If the desired selection is not visible, use PAGE UP/DOWN or the UP/DOWN ARROW keys to see the other entries. To select an entry, either click on it with the left mouse button or highlight the item with the cursor and hit ENTER.

After a category has been picked, selecting the OK button will print the settings. The settings are printed by category, with one setting name and value per line. Selecting the CANCEL button will return the user to the Settings menu. If CANCEL is picked before the OK button, then no settings will be printed.

view/change Category of settings

This item allows the user to change or view one or all of the settings in a category. To select this menu item, use the ALT-C hot key or click on the menu item with the left mouse button. Once the menu item has been selected, a list box of category names is displayed. The user must select a category to view or change, with the left mouse button or the UP and DOWN ARROW keys followed by the ENTER key. Once a category has been chosen, selecting the OK button will display a dialog box with the settings in the category. Selecting the CANCEL button will return the user to the Settings... menu.
The dialog box for the category consists of a list box containing the settings, the OK and CANCEL buttons, a box for a setting number to be entered, and a box for the setting value to be

changed. The TAB key will select any of the above items in the list box. The arrow keys and PAGE UP/DOWN keys will move the contents to display the unseen settings. A setting can be chosen to be changed by highlighting it with the cursor keys and hitting the ENTER key, or clicking on it with the left mouse button. After

the setting has been selected, it can be changed in the box marked setting value.

After all the settings changes have been completed selecting the OK button will save the settings changes and return to the Settings menu. Selecting the CANCEL button at any time will return to the Settings menu without any further action.

view/change Individual settings

This item allows the user to change or view one setting at a time. To select this item, either click on it with the left mouse button or use the ALT-I hot key. Once this item has been selected, a dialog box is displayed containing a field to enter a setting number, a list box containing all the settings for the DDP, a field to enter a new setting value for a selected setting, and an informational field with the valid range for the setting value. Each of the different items can be selected by using the TAB key, or click on it with the left mouse button.

The field labeled "Enter setting number" allows the user to select a setting to change. When a setting number has been entered, followed by the ENTER key, the list box scrolls to the setting and places the cursor in the setting value box so the setting may be changed. Hit ENTER after entering any setting value.

The list box contains a list of all the settings labeled "Setting list". To scroll to a setting that is not displayed, use the PAGE UP/DOWN keys or the ARROW keys, or place the tip of the mouse cursor in the scroll bar on the far-right side of the list box and click on the left mouse button. For more information see **List Boxes** near the beginning of this section.

The field labeled "Enter setting value" is used to enter a new value for the selected setting. The value is checked to make sure it is in the allowed range. The allowed range is specified in the field labeled "Setting range". When a setting valued

is changed, the word "Changed" is displayed in the list box next to the setting.

The user selects the OK button to save the setting changes. Selecting the CANCEL button will return to the Settings menu without any further action.

Download changed settings to ddp

This item allows the user to transmit all the changed settings to the DDP. Note that if the jumper J1 on the backplane is not cut, the DDP will not allow setting changes from the PC (see INTERFACE section).

Selecting Download with the ALT-D hot key or clicking on it with the left mouse button will display a dialog box with the changed settings. There is an option to end the settings change automatically. To pick this option, either place the mouse cursor over the box and click on the left mouse button or use the TAB key to highlight the selection and use the SPACE BAR to select it. Striking the SPACE BAR, or clicking the left mouse button again will deselect the option.

If the CANCEL button is selected, the Settings menu is redisplayed and no further action is taken. If the OK button is selected, another dialog box is displayed to confirm that the settings are to be downloaded. If the OK button is selected the changed settings are sent, and the changes are ended if the automatic end settings option was chosen. If the CANCEL button is selected no settings are sent and the **Download settings** dialog box is redisplayed.

download All settings to ddp

This item allows the user to transmit all of the settings in the PC to the DDP. Note that if the jumper J1 on the backplane is not cut, the DDP will not allow setting changes from the PC (see INTERFACE section).

Selecting download All settings with the ALT-A hot key or clicking on it with the left mouse button will display a dialog box with a list of all settings currently in the PC. There is an option to end the settings change automatically. To pick this option, either place the mouse cursor over the box and click on the left mouse button or use the TAB key to highlight the selection and use the SPACE BAR to select it. Striking the SPACE BAR, or clicking the left mouse button again will deselect the option.

If the CANCEL button is selected, the Settings menu is redisplayed and no further action is taken. If the OK button is selected, another dialog box is displayed to confirm that the settings are to be downloaded. If the OK button is selected the changed settings are sent, and the changes are ended if the automatic end settings option was chosen. If the CANCEL button is selected no settings are sent and the **download All settings** dialog box is redisplayed.

End setting changes

This item is selected after downloading settings to tell the DDP that settings changes are complete and protection should use the new settings. If the option to end settings changes automatically was picked when downloading settings to the DDP, then this menu item does not need to be selected. To select this menu item use the ALT-E hot key or click on it with the left mouse button. Once the item is selected, a dialog box that only contains the OK and CANCEL buttons is displayed. To end the settings changes, select the OK button with the ALT-O hot key or by clicking on it. Selecting the CANCEL button will return to the Settings menu. If the CANCEL button is selected before ending the settings changes, then the new settings will not be used.

If the OK button is selected, another dialog box will appear to confirm the choice to end the settings changes, since protection will be enabled with the new settings. If the user selects the OK button, the setting changes are ended. If the CANCEL button is selected from the confirmation dialog box, the settings changes are not ended and the previous dialog box will be active again.

Save ddp settings to file

This item allows the user to write the settings to a disk file. To select this item, use the ALT-S hot key or click on the menu item with the left mouse button. The user enters a file name (which may include a path) in the field labeled "Enter file name". The user selects the OK button to save the settings in the specified file. The CANCEL button returns to the Settings menu. If CANCEL is selected before saving the settings, no settings will be saved.

Local functions

The Local functions menu has the following items and hot keys.

Settings...	ALT-S
DDP data	ALT-P
go to DOS	ALT-D

Settings...

The **Local functions** Settings... menu has the following items and hot keys.

Load settings from file	ALT-L
Print local settings	ALT-P
view/change Category of local settings	ALT-C
view/change Individual local setting	ALT-I
Save local settings to file	ALT-S
Model/version number	ALT-M
Download local settings to ddp	ALT-D
End setting changes	ALT-E

Load settings from file

This item allows the user to read settings from a disk file into the program as local settings. To select this item, either click on it with the left mouse button or use the ALT-L hot key. This permits the user to load and work on another set of settings other than the set that is loaded into the relay.

If the user loads another set of local settings, the previous set of local settings is overwritten and lost, unless the user has saved the previous set of local settings by selecting **Save local settings to file** menu item from the Settings... menu.

Once this item has been selected, a dialog box is displayed containing several fields, including a list of files in the current directory and a list of disk drives and subdirectories. A file may be selected either by entering a file name in the field labeled "File name", or by selecting a file from the list box labeled "Files".

The field marked "File name" contains the file that is currently selected. This field may be selected by the user to specify a file containing settings (a file previously created by the **Save local settings to file** menu item or **Save ddp settings to file** menu item), or enter a partial file name using the standard DOS wild card characters * and ?.

The field labeled "Directory" indicates the current drive and directory from which the list of files is obtained. This field cannot be edited by the user.

The next two fields are list boxes. The list box labeled "Files" contains a list of files in the current directory from which the user can select a file. The list box labeled "Directories" contains a list of subdirectories and drives where the user can go for additional lists of files.

The user selects the OK button to read into DDP-LINK the local settings from the selected file.

Print local settings

This item allows the user to print all settings or categories of settings. To select this item, use the ALT-P hot key or click on it with the left mouse button. Once this item has been selected, a list box is displayed with the category names, plus one additional item for printing all categories.

The user selects the desired category of settings to print. To select a category that is not displayed use the PAGE UP/DOWN and ARROW keys or place the mouse cursor in the scroll bar or on the arrows at each end and click on the left mouse button. The highlighted item in the list box is the one that is selected. The user selects the OK button to print the settings.

The settings are printed by category, with one setting name and value per line.

view/change Category of local settings

This item allows the user to change or view one or all of the settings in a category. To select this menu item, use the ALT-C hot key or click on the menu item with the left mouse button. Once the menu item has been selected, a list box of category names is displayed. The user must select a category to view or change with the left mouse button or the UP and DOWN ARROW keys followed by the ENTER key. Once a category has been chosen, selecting the OK button will display a dialog box with the settings in the category. Selecting the CANCEL button will return the user to the Settings menu.

The dialog box for the category consists of a list box containing the settings, the OK and CANCEL buttons, a box for a setting number to be entered and a box for the setting value to be changed. The TAB key will select any of the

above items in the list box. The ARROW keys and PAGE UP/DOWN keys will move the contents to display the unseen settings. A setting can be chosen to be changed, by highlighting it with the cursor keys and then hitting the ENTER key, or clicking on it with the left mouse button. After the setting has been selected it can be changed in the box marked "Setting Value".

After all the settings changes have been completed, selecting the OK button will save the settings changes and return to the Settings menu. Selecting the CANCEL button at any time will return to the category names dialog box without any further action.

view/change Individual local setting

This item allows the user change or view one setting at a time. To select this item, either click on it with the left mouse button or use the ALT-I hot key. Once this item has been selected, a dialog box is displayed containing a field to enter a setting number, a list box containing all the settings for the DDP from the saved-settings file, a field to enter a new setting value for a selected setting, and a field with the valid range for the setting value. Each of the different items can be selected by using the TAB key or clicking on it with the left mouse button.

The field labeled "Enter setting number" allows the user to select a setting to change. Use the editing keys to enter and/or change the contents of the field. When a setting number has been entered, followed by the ENTER key, the list box scrolls to the setting and places the cursor in the setting value box so the setting may be changed. Hit ENTER after entering any setting value.

The list box labeled "Setting list" contains a list of all the settings . To scroll to a setting that is not displayed use the PAGE UP/DOWN keys and the ARROW keys, or place the tip of the mouse cursor in the scroll bar on the far right side of the list box and click on the left mouse button. See **List Boxes** under **GENERAL OPERATION** in this DDP-LINK SOFTWARE section for more information.

The field labeled "Enter setting value" is used to enter a new value for the selected setting. The value is checked to make sure it is in the allowed range. The allowed range is specified in the field labeled "Setting range". When a setting valued is changed, the word "Changed" is displayed in the list box next to the setting.

The user selects the OK button to save the setting changes. Selecting the CANCEL button will return to the Settings menu without any further action.

Save local settings to file

This item allows the user to write the settings to a disk file. To select this item either click on it with the left mouse button or use the ALT-S hot key. The user enters a file name (which may include a path) in the field labeled "Enter file name". Selecting the OK button will save the settings in the specified file. Selecting the CANCEL button will return to the Settings menu without any further action. Selecting CANCEL after saving the settings to a file will return to the Settings menu.

Model/version number

This entry displays the model number and PROM firmware revision that match the settings in the local file. To select this item, either click on it with the left mouse button or use the ALT-M hot key. These numbers must **match** any relay to which you wish to send the local settings. If they do not match, the local settings download **will fail.**

Download local settings to DDP

This item allows the user to transmit all the local settings to the DDP. To select this item, either click on it with the left mouse button or use the

ALT-D hot key. The user must be logged in to a DDP in order to use this menu item. Note that if the jumper J1 on the backplane is not cut, the DDP will not allow setting changes from the PC (see INTERFACE section). The local settings file firmware revision **must** match the PROM version number in the relay or the settings download **will fail.**

Once this item has been selected a dialog box is displayed containing a list box of all the settings being downloaded, and a selection in the lower right corner to end the settings changes automatically. To select the automatic end of settings change, either click on it with the left mouse button or use the TAB key to highlight it and the space bar to change it. If an X appears in the brackets it has been selected.

To download the settings to the relay, select the OK button with the mouse or the ALT-O hot key. To exit download at any time select the CANCEL button. If the OK button is selected, another dialog box will be displayed to confirm the download. To continue the download process select the OK button. If the settings are not to be downloaded then select the CANCEL button. When finished, select the CANCEL button from the **Download** dialog box to exit.

End setting changes

This item allows the user to tell the DDP that settings changes are complete and protection should be re-enabled. This item is not necessary if the option to automatically end settings changes was selected when the settings were downloaded. To select this item either click on it with the left mouse button or use the ALT-E hot key.

Once this item has been selected a dialog box containing the OK and CANCEL buttons is displayed. The user selects the OK button to end setting changes. Selecting the CANCEL button will exit **End setting change** without any further action. If the OK button was selected, another dialog box is displayed to confirm the ending of setting changes. Selecting the CANCEL button will return to the previous dialog box without ending the setting changes. Selecting the OK button will end the settings changes. Select the CANCEL button to exit when finished.

DDP data

The optional program DDP-DATA will be started (if present) if this entry is chosen. This enables the user to graph oscillography data without leaving DDP-LINK. The DOS path for the DDP-DATA program needs to be entered. The path is entered from the **Setup** menu (see below) and is stored for later use. For more information on DDP-DATA, refer to the pages describing DDP-DATA at the end of this SOFTWARE section.

go to DOS

This choice enables the user to temporarily leave DDP-LINK and go to the DOS prompt to execute DOS commands. Any program or command that can run in the available memory can be executed. To return to the program, type EXIT at the DOS prompt.

Setup

The **Setup** menu has the following items and hot keys.

Communication port number	ALT-C
Dial Type	ALT-D
Modem connection time	ALT-M
Relay parameters	ALT-R
Add relay to list	ALT-A
dElete relay from list	ALT-E
Set path for DDP-DATA	ALT-P
Memory available	no hot key

Communication port number

The communication port for the PC is chosen with this selection. To select this item, either

click on it with the left mouse button or use the ALT-C hot key. Once this item is selected, a dialog box containing the port number and IRQ number will be displayed. The serial port that is connected to the DDP, or the modem used to talk to the DDP, must be entered before logging in to the relay. If the port chosen is not COM1(1) or COM2(2), the IRQ number for the port chosen must be entered. Use the TAB key to move between the port and IRQ fields and the buttons, or click on the desired field with the left mouse button.

Once a field has been selected, use the editing keys to change and/or enter data. When the port and IRQ numbers are correct, select the OK button to save the numbers. If the CANCEL button is selected, the **Setup** menu will be redisplayed without any further action.

Dial type

To select this item, either click on it with the left mouse button or use the ALT-D hot key. Once this item is selected, a dialog box containing the dialing type will be displayed. Either tone or pulse dialing can be chosen. The UP and DOWN ARROW keys will toggle between the tone and pulse choices. The TAB key will move between the selected dialing type and the OK and CANCEL choices in the box. Once the dialing type has been chosen, selecting the OK button will store the change. Selecting the CANCEL button will exit Dial type without any further action.

Modem connection time

This item will change the time-out period for DDP-LINK to wait for the modem to make a connection. To select this item, either click on it with the left mouse button or use the ALT-M hot key. The modem connection time can be set for any time up to 255 seconds, provided the modem being used will accommodate that long a time-out period. This setting is useful for applications where the modem is set to pickup after a large number of rings, or if the phone system has a lot of delay in making the initial connection. Once a connection time has been set, selecting the OK button with the left mouse button or the ALT-O hot key will store the new time-out period. Selecting the CANCEL button will exit this item without any further action.

Relay parameters

Relay parameters allows the communication parameters for a specific relay unit description to be changed or viewed. An entry in the list must be selected first, by clicking on it with the mouse or using the UP and DOWN ARROW keys to highlight the selection, and pressing the ENTER key.

Once a relay unit description has been picked, another window appears with the phone number, switch code, baud rate, number of stop bits and the parity for the selected relay unit description. Any of the entry values may be selected by clicking on it with the mouse or using the TAB key to move between the items, and then using the UP and DOWN ARROW keys to select the value for that item. To exit the dialog box for that unit description, select either the OK button or the CANCEL button. The OK button will accept the values in the dialog box and store them. Selecting the CANCEL button will exit the dialog box and will use the values that were already present when the unit description was selected.

The user should note that once a unit description has been picked, there are no more hot keys available to select items. The TAB key may be used to move from item to item, or the mouse may be used to select a specific item at any time.

To enter or change the phone number, select it by clicking on it with the left mouse button or use the TAB key to move the cursor to the phone number box. The normal text-editing keys may be used to enter or modify the phone number. This is an optional item, and should only be filled in if DDP-LINK is using a modem for the unit being described.

To enter or change the switch code, select it by clicking on it with the left mouse button or use the TAB key to move the cursor to the switch code box. The normal text-editing keys may be used to enter or modify the switch code. This is an optional item, and should only be filled in if a code- operated switch is being used.

The baud rate must have one of the values selected. The baud rate item can be selected by clicking on it with the left mouse button or using the TAB key until the selected item is highlighted. The UP and DOWN ARROW keys select the desired value. A specific value can be selected by clicking on it directly with the left mouse button.

A choice of one or two stop bits must be made for communications to work properly. The stop bits item can be selected by clicking on it with the left mouse button or using the TAB key until the selected item is highlighted. The UP and DOWN ARROW keys select the desired value. A specific value can also be selected by clicking on it directly with the left mouse button.

Parity must have one of the values selected for communications to work properly. The parity item can be selected by clicking on it with the left mouse button or using the TAB key until the selected item is highlighted. The UP and DOWN ARROW keys select the desired value. A specific value can also be selected by clicking on it directly with the left mouse button.

Add relay to list

Selecting this item will enable the user to add a unit description and the related values to the list of stored relay unit descriptions. The user can either move the mouse cursor to the entry in the menu and click on the left mouse button or use the hot key ALT-A to select this entry. Once the entry has been selected, the user is prompted for a unit description. The description is limited to 20 characters. After the description has been entered, the user can either click on the OK button with the left mouse button or use the ALT-O hot key to accept it. (Selecting the CANCEL button will not add the new unit description and will exit the user from the menu entry.)

After the new unit description has been accepted, a dialog box will appear with the phone number, switch code, baud rate, stop bits and parity items. Each item can be selected with the TAB or SHIFT TAB key and a value chosen with the UP and DOWN ARROW keys, or a value can be chosen by placing the mouse cursor over the desired value and clicking on the left mouse button.

dElete relay from list

This item allows the user to delete a relay unit description from the configuration file. To select this item, either click on it with the left mouse button or use the ALT-E hot key. Once this item has been selected, a dialog box will be displayed containing a list box with all the relay unit descriptions and the OK and CANCEL buttons.

The user selects the desired relay from a list box displaying the unit descriptions and logon parameters by using the UP and DOWN ARROW keys to highlight the desired relay and pressing the ENTER key, or moving the mouse cursor to the desired relay and clicking on it with the left mouse button. Selecting the OK button with the ALT-O hot key or clicking on it with the left mouse button will mark the unit description for deletion. Selecting the CANCEL button will exit without deleting any relay unit descriptions. If the OK button is selected, the user is asked to confirm the deletion of the unit description. Selecting the OK button again will delete the relay unit description. Selecting the

CANCEL button will return to the list box without deleting any relay unit description.

Selecting the CANCEL button in the list box will exit from the menu entry.

set path for DDP-DATA

DDP-DATA (optional) can be started from DDP-LINK from the **Local functions** pull-down menu. The DOS path must first be set so DDP-LINK knows where to start the program from. To set the path, select this menu item by using the hot key ALT-P or click on it with the left mouse button. A dialog box will appear, with space to enter a path. After entering the path, select the OK button to accept the new path, or the CANCEL button to exit without changing the previous path.

memory available

To display the amount of available memory while DDP-LINK is running either click on this menu item with the left mouse button, or use the UP or DOWN ARROW keys to highlight the menu item, and hit the ENTER key. There is no hot key for this item.

Exiting DDP-LINK

There are two ways to exit DDP-LINK:

ALT-F4 will produce a dialog box with the exit message. Selecting the OK button with the mouse or using the ALT-O hot key will exit DDP-LINK. Selecting the CANCEL button will return the program without exiting.

The ALT key combined with the space bar will produce the System Menu after all menus have been cleared from the screen. Choosing the CLOSE entry, with the mouse or the hot key ALT-C, will produce a dialog box with the exit message. Selecting the OK button with the mouse or using the ALT-O hot key will exit DDP-LINK. Selecting the CANCEL button will return to the program without exiting.

NOTE:

To exit DDP-LINK, all dialog boxes and list boxes must be cleared from the screen. It is not necessary to clear all the menus from the screen.

Help

This item displays a pull-down menu with a selection of topics for which help exists. This pull-down menu is different from the other pull-down menus in that the items do not have hot keys associated with them. The user must either click on the mouse or use the UP and DOWN ARROW keys followed by the ENTER key, to access the menu items.

DDP MAN-MACHINE INTERFACE APPENDIX I

NOTES: 1. Any values used in the following are examples only and not factory values.
2. All current values for settings are secondary and all other values are primary unless noted otherwise.

SETTINGS

Protection Group 1: (Category = 1)

SET#	DISPLAY		DESCRIPTION
101	PHCURV	=X	0 TO 3 Select curve for Phase
102	GNCURV	=X	0 TO 3 Select curve for Ground
			0: INVERSE 1: VERY INVERSE 2: EXTREMELY INVERSE 3: DEFINITE TIME
103	PU-TOCP	=XX.XX A	0.10 TO 2.40 or 0.50 TO 12.00 (AMPS) (Depends on model number)
104	PU-TOCG	=XX.XX A	0.10 TO 2.40 or 0.50 TO 12.00 (AMPS) (Depends on model number)
105	T-DIALP	=XX.X	0.5 TO 10.0
106	T-DEFP	=XX.X S	0.5 TO 30.0 (SECS)
107	T-DIALG	=XX.X	0.5 TO 10.0
108	T-DEFG	=XX.X S	0.5 TO 30.0 (SECS)
109	PU-IOCLP	=XXX.XXA	0.10 TO 32.00 or 0.50 TO 160.00 (AMPS) (Depends on model number)
110	PU-IOCHP	=XXX.XXA	0.10 TO 32.00 or 0.50 TO 160.00 (AMPS) (Depends on model number)
111	PU-IOCLG	=XXX.XXA	0.10 TO 32.00 or 0.50 TO 160.00 (AMPS) (Depends on model number)
112	PU-IOCHG	=XXX.XXA	0.10 TO 32.00 or 0.50 TO 160.00 (AMPS) (Depends on model number)
113	T-IOCLP	=XXX MS	0 TO 250 (MILLISECS)
114	T-IOCHP	=XX MS	0 TO 50 (MILLISECS)
115	T-IOCLG	=XXX MS	0 TO 250 (MILLISECS)
116	T-IOCHG	=XX MS	0 TO 50 (MILLISECS)
117	TSEQ-DLY	=X.XX S	0.05 TO 0.50 (SEC) IOC pre-trip delay
118	TSEQ-RES	=XXX S	60 TO 600 (SEC) IOC block period
119	TORQUE	=XX	0 TO 63
120	GRP1TIME	=XX M	0 TO 60 (MINUTES) Group 2 settings de-activation time

Protection Group 2: (Category = 2)

SET#	DISPLAY		DESCRIPTION
201	PHCURV	=X	0 TO 3 Select curve for Phase
202	GNCURV	=X	0 TO 3 Select curve for Ground 0: INVERSE 1: VERY INVERSE 2: EXTREMELY INVERSE 3: DEFINITE TIME
203	PU-TOCP	=XX.XX A	0.10 TO 2.40 or 0.50 TO 12.00 (AMPS) (Depends on model number)
204	PU-TOCG	=XX.XX A	0.10 TO 2.40 or 0.50 TO 12.00 (AMPS) (Depends on model number)
205	T-DIALP	=XX.X	0.5 TO 10.0
206	T-DEFP	=XX.X S	0.5 T0 30.0 (SECS)
207	T-DIALG	=XX.X	0.5 TO 10.0
208	T-DEFG	=XX.X S	0.5 T0 30.0 (SECS)
209	PU-IOCLP	=XXX.XXA	0.10 TO 32.00 or 0.50 TO 160.00 (AMPS) (Depends on model number)
210	PU-IOCHP	=XXX.XXA	0.10 TO 32.00 or 0.50 TO 160.00 (AMPS) (Depends on model number)
211	PU-IOCLG	=XXX.XXA	0.10 TO 32.00 or 0.50 TO 160.00 (AMPS) (Depends on model number)
212	PU-IOCHG	=XXX.XXA	0.10 TO 32.00 or 0.50 TO 160.00 (AMPS) (Depends on model number)
213	T-IOCLP	=XXX MS	0 TO 250 (MILLISECS)
214	T-IOCHP	=XX MS	0 TO 50 (MILLISECS)
215	T-IOCLG	=XXX MS	0 TO 250 (MILLISECS)
216	T-IOCHG	=XX MS	0 TO 50 (MILLISECS)
217	TSEQ-DLY	=X.XX S	0.05 TO 0.50 (SEC) IOC pre-trip delay
218	TSEQ-RES	=XXX S	5 TO 600 (SEC) IOC block period
219	TORQUE	=XX	0 TO 63
220	GRP2TIME	=XX M	0 TO 60 (MINUTES) Group 1 settings de-activation time

Common Protection Settings (Category = 3)

SET#	DISPLAY		DESCRIPTION
301	GRP-SW	=NO	YES/NO Enable/disable switching of settings
302	ARC-TIME	=XXX MS	20 TO 200 (MILLISEC)
303	RECLON52	=NO	YES/NO YES: reclose the breaker following the 52b contact. NO: Reclose following the 52b contact ONLY after the DDP trips.
304	TCM-ENAB	=NO	YES/NO Enable/Disable the Trip Voltage Monitor, WARNING #23.
305	BLK-IOC	=YES	YES/NO Block IOC if BI Recloser output true (Only if Recloser is included)
306	BLK-REC	=NO	YES/NO Block Recloser if IOC High Set trip (Only if Recloser is included)
307	BLKIOCLO	=YES	YES/NO Block IOC if Recloser in Lockout (Only if Recloser is included)
308	SEQ	=NO	YES/NO Enable/Disable Sequence Coordination
309	SEQ-BLKH	=NO	YES/NO Enable/Disable Sequence Coordination Blocking of IOC High Set
310	IOCLP	=YES	YES/NO Enable/Disable IOC Low Set Phase
311	IOCHP	=YES	YES/NO Enable/Disable IOC High Set Phase
312	IOCLG	=YES	YES/NO Enable/Disable IOC Low Set Ground
313	IOCHG	=YES	YES/NO Enable/Disable IOC High Set Ground
314	TOCP	=YES	YES/NO Enable/Disable TOC Phase
315	TOCG	=YES	YES/NO Enable/Disable TOC Ground
316	TRIP1	=XX	0-63 Tripping Functions for TRIP1
317	TRIP2	=XX	0-63 Tripping Functions for TRIP2
318	TRIP3	=XX	0-63 Tripping Functions for TRIP3

Control: (Category = 4)

SET#	DISPLAY		DESCRIPTION
(NOTE: The Control category is displayed only if the optional Recloser is included in the DDP.)			
401	INST =YES	YES/NO	Enable/Disable Instantaneous Reclose
402	REC1 =YES	YES/NO	Enable/Disable Reclose Step 1
403	REC2	=YES	YES/NO Enable/Disable Reclose Step 2
404	REC3	=YES	YES/NO Enable/Disable Reclose Step 3
405	T1	=XX.X S	0.1 TO 15.9 (SEC)
406	T2	=XXX S	1 TO 159 (SEC)
407	T3	=XXX S	1 TO 159 (SEC)
408	TRES	=XXX S	1 TO 159 (SEC)
409	MULT	=X	0 TO 3 Corresponding to .5, 1, 2, 4
410	PAUSE	=X	0 TO 7 Corresponding to 0,1,4,16,64, 256,1024,infinite (secs)
411	RS-DO	=X	0 TO 3 Corresponding to 6,12,24 (secs), LOCKOUT
412	RS-PU	=X	0 TO 3 Corresponding to 0,1,2,4 (secs)
413	RS-SEL	=X	0 TO 3 Corresponding to INST, Reclose 1, Reclose 2, or Reclose 3
414	DEF-MEM	=YES	YES/NO Enable/Disable Recloser Default Memory feature
415	RLY-MEM	=X	0 to 7 Controls power-down Relay Memory function. It allows the IP, LO and RS relays to stay latched during power down. The following table indicates how each of the 8 RLY MEM setting values affect the Recloser number switches while the Recloser is enabled:

RLY MEM	RS	IP	LO
0	NL	NL	NL
1	NL	NL	L
2	NL	L	NL
3	NL	L	L
4	L	NL	NL
5	L	NL	L
6	L	L	NL
7	L	L	L

L = Latched, state will be remembered
NL = Not Latched, state will not be remembered

416	REC-EN	=YES	YES/NO	Enable/Disable Recloser

Metering: (Category = 5)

SET#	DISPLAY		DESCRIPTION
501	X-RATIOP	=XXXX	1 TO 1000
502	X-RATIOG	=XXXX	1 TO 1000
503	DMND-INT	=X	0 TO 2 Corresponding to 15,30,60 (mins)

Communications: (Category = 6)

SET#	DISPLAY		DESCRIPTION
601	BAUD	=X	0 TO 4 Corresponding to 300,1200,2400,4800,9600

Unit ID: (Category = 7)

SET#	DISPLAY		DESCRIPTION
701	UNIT-ID	=XXXX	4 Digit Unit ID

Calibration Factor: (Category = 8)

SET#	DISPLAY		DESCRIPTION
801	A	=XX	0 TO 99 Gain 0.5 Phase A
802	B	=XX	0 TO 99 Gain 0.5 Phase B
803	C	=XX	0 TO 99 Gain 0.5 Phase C
804	D	=XX	0 TO 99 Gain 0.5 Ground
805	E	=XX	0 TO 99 Gain 8 Phase A
806	F	=XX	0 TO 99 Gain 8 Phase B
807	G	=XX	0 TO 99 Gain 8 Phase C
808	H	=XX	0 TO 99 Gain 8 Ground
809	I	=XX	0 TO 99 Gain 24 Phase A
810	J	=XX	0 TO 99 Gain 24 Phase B
811	K	=XX	0 TO 99 Gain 24 Phase C
812	L	=XX	0 TO 99 Gain 24 Ground
813	M	=50	0 TO 99 Magnetics Phase A
814	N	=50	0 TO 99 Magnetics Phase B
815	O	=50	0 TO 99 Magnetics Phase C
816	P	=50	0 TO 99 Magnetics Ground

INFORMATION

Protection:

DISPLAY		DESCRIPTION	
PRO	=YNYYNYNYCYNO	CORRESPONDING TO:	
	Left-most	PROTECT ON	YES/NO
		IOCLP	YES/NO
		IOCHP	YES/NO
		IOCLG	YES/NO
		IOCHG	YES/NO
		TOCP	YES/NO
		TOCG	YES/NO
		SEQ-COORD	YES/NO
		GRP-SW DI	CLOSED/OPEN
		SET GRP2 (COMM)	YES/NO
		SET GRP2 IN USE	YES/NO
	Right-most	TORQUE CONTROL	CLOSED/OPEN

Control:

(NOTE: The Control category is displayed only if the optional Recloser is included in the DDP.)

DISPLAY		DESCRIPTION	
CNTRL	=YNYNYNOCOC	CORRESPONDING TO:	
	Left-most	REC-EN	YES/NO
		INST	YES/NO
		REC1	YES/NO
		REC2	YES/NO
		REC3	YES/NO
		DEF-MEM	YES/NO
		52A	CLOSED/OPEN
		52B	CLOSED/OPEN
		PAUSE	CLOSED/OPEN
	Right-most	DR	CLOSED/OPEN

NOTE: The four right-most letters spell "FAIL" if an error is found in the CAR processor.

TOT REC	=XXX	Total number of recloses

Metering:

DISPLAY		DESCRIPTION
IA	=XXXXXXX A	Phase A current (AMPS)
IB	=XXXX.X A	Phase B current (AMPS)
IC	=XXX.XX A	Phase C current (AMPS)
IN	=XX.XX A	Ground current (AMPS)
PIA	=XXXXXX A	Peak Demand Phase A current (AMPS)
MM/DD/YY HH:MM		Date and time of PIA
PIB	=XXXX.X A	Peak Demand Phase B current (AMPS)
MM/DD/YY HH:MM		Date and time of PIB
PIC	=X.XX A	Peak Demand Phase C current (AMPS)
MM/DD/YY HH:MM		Date and time of PIC

Meter: Demand Currents:

DISPLAY		DESCRIPTION
DMND INT	=XX	Interval number 1 to 96. Interval 1 is most recent.
DIA01	=XXXXXX A	Demand Phase A current (AMPS)
DIB01	=XXXX.X A	Demand Phase B current (AMPS)
DIC01	=XXX.XX A	Demand Phase C current (AMPS)

Breaker Interrupting (I2T):

DISPLAY		DESCRIPTION
TOT TRIPS	=XXX	NUMBER OF TRIPS
I2TA =XX.XX M		BREAKER INTERRUPTING I2T Phase A for 000.00 to 999.99 - ((A**2)-SEC) for 1000.00 to 999,999.99 - (K(A**2)-SEC) for 1,000,000.00 to 999,999,999,999.99 (M(A**2)-SEC)
I2TB	=X.XX K	BREAKER INTERRUPTING I2T Phase B (see I2TA)
I2TC	=XXX.XX	BREAKER INTERRUPTING I2T Phase C (see I2TA)
100%	=XXXXXX M	BREAKER INTERRUPTING I2T 100% Value (see I2TA)

Fault Data: (LAST 30 FAULTS)

DISPLAY	DESCRIPTION
FLT NUM =XX	1 to 30 Number 1 is most recent
F30 =MM/DD/YY	Trip Date of First function to trip
F30 =HH:MM:SS.MSC	Trip Time of First function to trip
F30 =PPPP NNNN Gx	PPPP = phase(s) causing trip (A,B,C,N) NNNN = function causing trip (IOCL,IOCH,TOC) Gx = 'G2' if settings group 2 was in use when the trip occurred; else G1
FA30 =XXXXXX A	Phase A fault current for first trip (AMPS)
FB30 =XXXX.X A	Phase B fault current for first trip (AMPS)
FC30 =XXX.XX A	Phase C fault current for first trip (AMPS)
FN30 =X.XX A	Phase N fault current for first trip (AMPS)
S30 =HH:MM:SS.MSC	Trip Time of Second function to trip. The time will be all 0s if no second trip.
S30 =PPPP NNNN Gx	Same as above, except for second trip. This field will be blank if no second trip.
T30 =HH:MM:SS.MSC	Trip Time of Third function to trip. The time will be all 0s if no third trip.
T30 =PPPP NNNN Gx	Same as above, except for third trip. This field will be blank if no third trip.
R30 =HH:MM:SS.MSC	Time at Lockout/Reclose. The time will be all 0s if the optional Recloser is not included in the DDP. If Recloser is included, then the time will be all 0s if Recloser has neither performed a reclose nor gone to Lockout.
R30 =NNNNNNN	INST, REC 1, REC 2, REC 3, LOCKOUT The NNNNNNN field will be blank if the optional Recloser is not included in the DDP. If Recloser is included, the field will be blank if Recloser has neither performed a reclose nor gone to Lockout.
I2TA30=XXX.XX K	Breaker interrupting I2T Phase A 000.00 to 999.99 - (K(A**2)-SEC)
I2TB30=XXX.XX K	Breaker interrupting I2T Phase B 000.00 to 999.99 - (K(A**2)-SEC)
I2TC30=XXX.XX K	Breaker interrupting I2T Phase C 000.00 to 999.99 - (K(A**2)-SEC)

Alarms:

DISPLAY			DESCRIPTION
L1	=XXXXXXXXXXXXX		#1 latched alarms. X = 1-bad, 0-good
C1	=XXXXXXXXXXXXX		#1 currently active alarms. X= 1-bad, 0-good
FAIL/ WARN	ERROR CODE		
F	6	**Right-most**	PROTECT CPU Power Supply, A-to-D
F	3,5 ,12		Memory EEPROM(OR SETTING RANGE) PROTECT CPU
F	4		Memory EPROM PROTECT CPU
F	2		Memory SRAM PROTECT CPU
W	23		Trip Voltage Monitor
W	22		Real-Time clock
F	9		Shared RAM
W	21		Trip Current Monitor
W	20		CAR-PROTECT communication error found by PROTECT CPU
F	1		Watchdog timer
W	24		Spurious interrupt
W	25		LCD Display-Busy Signal timeout
W	31	**Left-most**	Total Breaker Interrupting I2T > Limit
L2	=XXXXXXXXXXXXX		#2 latched alarms. X = 1-bad, 0-good
C2	=XXXXXXXXXXXXX		#2 currently active alarms. X= 1-bad, 0-good
FAIL/ WARN	ERROR CODE		
F	10,11	**Right-most**	CAR CPU or Recloser not present
W	30		Recloser should not be present
F	8		Memory EPROM CAR CPU
F	7		Memory SRAM CAR CPU
			spare
			spare
			spare
W	26		CAR CPU Remote PC communication error
W	27		CAR-PROTECT communication error found by CAR CPU
W	32		NMI Time Strobe Failure
W	28		CAR CPU Spurious interrupt
			spare
		Left-most	spare

Self Test Warnings and Failures:

DISPLAY	DESCRIPTION
WARN: ERR XXX	Warning message - non-critical error found by Startup or Background Self-Test logic. Protection is not turned off.
FAIL: ERR XXX	Failure message - critical error found by Startup or Background Self-Test logic. If background finds the error, the system is restarted in an attempt to recover from the problem, unless startup found a critical failure when the system was last started, or restart count limit has been exceeded. The restart count is incremented when a restart occurs. After DDP executes successfully for 1 hour, the count is zeroed, unless the count is three or more. Protection is turned off.

Failure Error Codes

#	MEANING
1	Watchdog timer caused a restart. Note that this is excluded from the 3 restart limit check done by background self-test logic because it does not occur as a direct result of a failed self-test.
2	PROTECT CPU RAM test error.
3	PROTECT CPU EEPROM CRC mismatch
4	PROTECT CPU EPROM CRC mismatch.
5	Setting out of range.
6	A to D converter / power supply error.
7	CAR CPU RAM test error.
8	CAR CPU EPROM test error.
9	PROTECT CPU Shared RAM test error.
10	Recloser not present. The Recloser was not found but the model number indicates that it should be present.
11	CAR CPU not present. The CAR CPU Must always be present.
12	EEPROM Write Failure

Warning Error Codes

#	MEANING
20	Error found by PROTECT CPU during communication between the PROTECT and CAR CPUs.
21	Trip Current Monitor error.
22	Real-Time clock error.
23	Trip Voltage Monitor error.
24	PROTECT CPU spurious interrupt.
25	LCD Display-Busy signal timed out.
26	CAR CPU Remote PC communication error.
27	Error found by CAR CPU during communication between the PROTECT and CAR CPUs.
28	CAR CPU spurious interrupt.
30	Recloser should not be present. It was found, but model number indicates that it should not have been.
31	Total Breaker Interrupting I2T > Limit.
32	**NMI Time Strobe Failure.**

Password:

DISPLAY	DESCRIPTION
AAAAAAAAAAAAAAAA	Encrypted alphanumeric password (16 chars)

Model Number:

DISPLAY	DESCRIPTION
MODEL = Digits DDP 1 2 3 4 5 6 7 * A	Numeric model number (7 digits)
1	IOC, TOC (see note 1and 2)
2	IOC, TOC, Communications
3	IOC, TOC, SLR12, Communications
1	TOC: 0.5A to 12A Pickup (3 Phase & Ground) IOC: 0.5A to 160A Pickup (3 Phase & Ground)
2	IOC: 0.1A to 2.4A Pickup (3 Phase & Ground) IOC: 0.1A to 32A Pickup (3 Phase & Ground)
3	TOC: 0.5A to 12A Pickup (3 Phase) TOC: 0.1A to 2.4A Pickup (Ground) IOC: 0.5A to 160A Pickup (3 Phase) IOC: 0.1A to 32A Pickup (Ground)
5	50 Hz Rated Frequency
6	60 Hz Rated Frequency
1	48 VDC
2	125 VDC
3	250 VDC
.....	Specials (Factory Assigned)
	001-999
A	Initial Revision Level
B	GNET Compatible Revision Level

Note 1: Basic model which, in addition to IOC and TOC, includes metering, sequence co-ordination function, settings group switching, cumulative breaker interrupting I2T function, fault analysis data, and local MMI.

Note 2: DDPI XXXXXX AA is no longer available.

GE Power Management

215 Anderson Avenue
Markham, Ontario
Canada L6E 1B3
Tel: (905) 294-6222
Fax: (905) 201-2098
www.ge.com/indsys/pm