Instructions for Field Testing Of Ground Fault Systems Utilizing Cutler-Hammer Type DS and DSII Circuit Breakers

The National Electrical Code makes the following statement regarding ground fault conformance testing:

NEC 230-95C

"The ground fault protection system shall be performance tested when first installed. The test shall be conducted in accordance with approved instructions which shall be provided with the equipment. A written record of this test shall be made and shall be available to the authority having jurisdiction."

This document is intended to provide instructions for conformance testing of ground fault systems utilizing type DS and DSII drawout circuit breakers. Although the most common system variations are specifically illustrated, they are also used to form the basis for more complex systems. These instructions may be applied, accordingly, on these systems as well. Refer to order specific drawings to determine the actual ground fault system supplied.

DANGER

DO NOT ATTEMPT TO TEST THIS EQUIPMENT WHILE IT IS ENERGIZED. DEATH OR SEVERE PERSONAL INJURY COULD RESULT. TURN OFF ALL POWER SUPPLYING THIS EQUIPMENT AND CHECK FOR VOLTAGE BEFORE TESTING.

Overall system selectivity and performance of integral ground fault protection equipment can be field tested only by using the high current primary injection method. When testing with this method, the following rules must be followed:

1. Tests are to be conducted by qualified personnel only.
2. The incoming line or source transformer must be disconnected from the switchgear.
3. Loads must be disconnected from the switchgear when testing feeder breaker ground fault. If only the mains or ties are to be tested, all feeder breakers must be open.
4. A single phase high current power supply will be required (approx. 1200A at approx. 2.5V). A flexible jumper cable, equal to the current that will be applied, will also be required.

GROUND FAULT PICK-UP VALUES FOR DS AND DSII BREAKERS HAVING DIGITRIP OR AMPTECTOR TRIP UNITS.

TABLE A — "DIGITRIP RMS"

GROUND FAULT PICKUP SETTINGS IN AMPERES ①

INSTALLED RATING PLUG SIZE	A②	B②	C②	D②	E②	F	H	K
100	25	30	35	40	50	60	75	100
200	50	60	70	80	100	120	150	200
250	63	75	88	100	125	150	188	250
300	75	90	105	120	150	180	225	300
400	100	120	140	160	200	240	300	400
600	150	180	210	240	300	360	450	600
800	200	240	280	320	400	480	600	800
1000	250	300	350	400	500	600	750	1000
1200	300	360	420	480	600	720	900	1200
1600	400	480	560	640	800	960	1200	1200
2000	500	600	700	800	1000	1200	1200	1200
2400	600	720	840	960	1200	1200	1200	1200
2500	625	750	875	1000	1200	1200	1200	1200
3000	750	900	1050	1200	1200	1200	1200	1200
3200	800	960	1120	1200	1200	1200	1200	1200
4000	1000	1200	1200	1200	1200	1200	1200	1200
5000	1200	1200	1200	1200	1200	1200	1200	1200

① TOLERANCES ON PICKUP LEVELS ARE +/-10% OF VALUES SHOWN.

② FOR TESTING PURPOSES ONLY: WHEN USING AN EXTERNAL SINGLE PHASE CURRENT SOURCE TO TEST LOW LEVEL GROUND FAULT CURRENT SETTINGS, IT IS ADVISABLE TO USE THE AUXILIARY POWER MODULE (APM). ESPECIALLY WHEN THE SINGLE PHASE CURRENT IS LOW, WITHOUT THE APM IT MAY APPEAR AS IF THE TRIP UNIT DOES NOT RESPOND UNTIL THE CURRENT IS WELL ABOVE THE SET VALUE, LEADING THE TESTER TO BELIEVE THERE IS AN ERROR IN THE TRIP UNIT WHEN THERE IS NONE. THE REASON THIS OCCURS IS THAT THE SINGLE PHASE TEST CURRENT IS NOT A GOOD SIMULATION OF THE NORMAL THREE PHASE CIRCUIT. IF THREE PHASE HAD BEEN FLOWING, THE TRIP UNIT WOULD HAVE PERFORMED CORRECTLY. USE THE APM FOR CORRECT TRIP UNIT PERFORMANCE WHEN SINGLE PHASE TESTS ARE MADE.

*TOLERANCES ON PICKUP LEVELS ARE +/-10% OF VALUES SHOWN.

5. For T500 and T510 Digitrip, an auxiliary power supply module will be required for each breaker undergoing simultaneous testing. For T600,T610, T700, T800, T810 or T910 Digitrip, either an auxiliary power supply module (Cat. No: PRTAAPM) will be required or the power/relay module must be energized through its breaker secondary terminals. (See Table "A" Footnote 2).

DIAL SETTING	TABLE B – "AMPTECTOR" Ground Fault Pickup Settings In Amperes SENSOR RATING 100	150	200	300	400	600	800	1200	1600	2000	2400	3200	4000	SECONDARY CURRENT
A	57	60	65	80	110	145	180	260	330	400	530	640	800	1.00
B	67	75	85	110	150	205	260	385	505	600	770	1000	1200	1.50
C	75	85	100	130	185	260	325	480	625	760	960	1200	N.A.	1.90
D	100	120	145	200	270	385	500	730	970	1200	N.A.	N.A.	N.A.	3.00

6. On 4-wire systems, check to ensure that there are no additional grounds on the feeder breaker neutral conductors.

OPTIONAL ZONE SELECTIVE INTERLOCKING GROUND FAULT OPERATION

Under a ground fault condition, the downstream breaker will send a restraining signal to the upstream breaker. This signal tells the upstream breaker to begin timing (assuming the fault current is above their pickup settings). The downstream breaker should then clear the fault. If the downstream breaker fails to trip, the upstream breaker will then time out and clear the fault condition.

If the fault condition is located between the upstream breaker and the downstream breaker, the downstream breaker will not sense the fault and no restraining signal will be sent. The upstream breaker will then trip at its minimum time band, regardless of the time setting.

The pickup and time delay settings on the main, tie, and feeder breakers must be selectively coordinated.

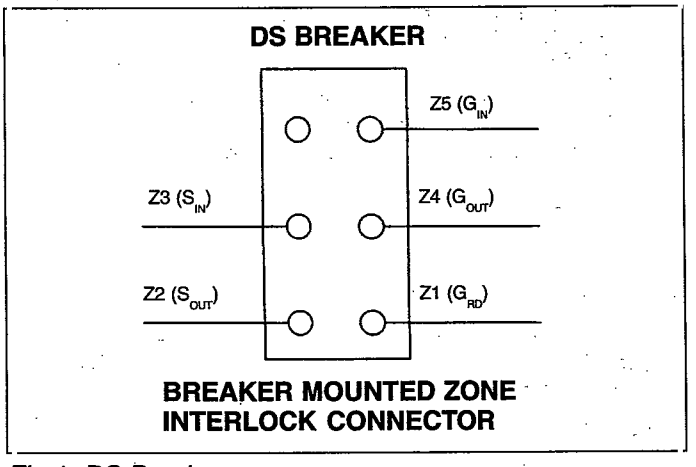

Fig.1 DS Breaker

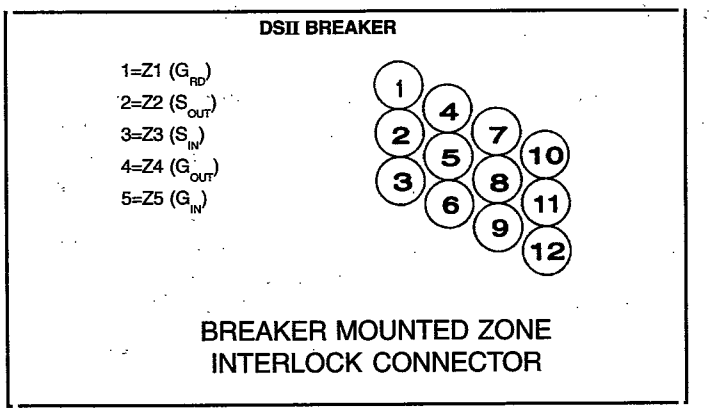

Fig. 2 DSII Breaker

NOTE: If individual breaker testing is performed with the breaker withdrawn from the connected position, Terminals Z4 & Z5 must be jumpered to obtain time delay.

DIGITRIP RMS FIELD TESTING OF OPTIONAL ZONE INTERLOCKING

The following is a general procedure to check the zone interlocking functions and wiring. Primary injection is not required for this test. Drawout breakers must be in the connected position. The breakers must not be energized except for the control power required for the power/relay module or auxiliary power modules (2 auxiliary power modules are required if they are used in lieu of the power/relay module), such that the Digitrip RMS green status "LEDS" are flashing.

PRELIMINARY:

For ease of testing, make the following settings. They should be turned back to the desired settings after testing is complete. Make these settings on both the downstream and upstream devices.

ON TRIP UNIT SET:

Test Amps	= GFT
Ground Fault Pick-up	= C
Ground Fault Time	= .5

TEST 1 - Self Interlocked Feeders

Verify each feeder breaker trips with time delay when self interlocked.

Push test pushbutton and release to start the test. The breaker should trip with time delay. Push reset on Digitrip and reclose breaker. Do this for each feeder breaker and verify delayed tripping occurs.

NOTE: Self interlocking is defined as the feeder breaker having a jumper installed on terminals "Z4 and Z5" of its zone interlock connector (shown in Fig. 1 and 2). When this jumper is installed, it allows the ground fault time delay to operate at the trip unit setting. Without this jumper, the ground fault time delay will always revert to the minimum time setting (0.1) regardless of the trip unit setting. The self interlocked jumpers should only be on the furthest downstream breakers in the zone interlock scheme.

TEST 2 - No Delay Trip On Upstream Breakers
(Normally mains and ties)

Verify that each upstream breaker will trip with no time delay (minimum setting 0.1), when not receiving a restraint signal from a downstream breaker.

Push test pushbutton and release to start the test. The breaker should trip without any time delay (minimum setting 0.1), Push reset on Digitrip and reclose breaker, repeat test for each upstream breaker.

TEST 3 - Delayed Trip

Verify that restraint signal sent by a downstream breaker to an upstream breaker does cause a time delay trip.

Push test pushbutton and release on downstream breaker. Breaker will trip. Do not reset Digitrip on the downstream breaker. (For "00" series trip unit, the trip unit would now be sending a restraint signal to upstream devices. For "10" series trip units, the restraint signal is sent only during the timing period and both trip unit test buttons must be pushed and released at the same time.) Push test pushbutton and release on the upstream breaker. This breaker should now time delay trip in approximately 0.5 seconds.

This exercise should be done on all downstream breakers that feed interlock signals to an upstream breaker. Reset each downstream breaker before proceeding to the next one. Also, keep in mind that this simulation of pushing and releasing test pushbuttons to initiate a test (a fault), actually happens to both breakers simultaneously when a real fault occurs on a system. Again, these are general procedures. Wiring variations may affect results. For example, if a feeder breaker is wired interlocked to a downstream breaker, no time delay will occur.

3 WIRE FEEDER BREAKER WITH RESIDUAL GROUND FAULT

DANGER

DO NOT ATTEMPT TO TEST THIS EQUIPMENT WHILE IT IS ENERGIZED. DEATH OR SEVERE PERSONAL INJURY COULD RESULT. TURN OFF ALL POWER SUPPLYING THIS EQUIPMENT AND CHECK FOR VOLTAGE BEFORE TESTING

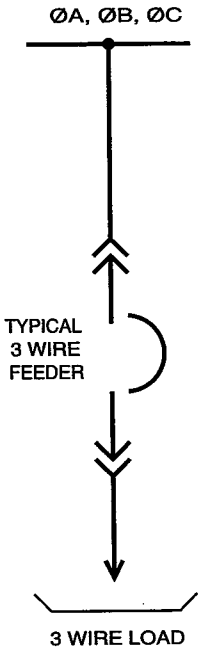

FIG. 3
SINGLE LINE DIAGRAM
OF FEEDER

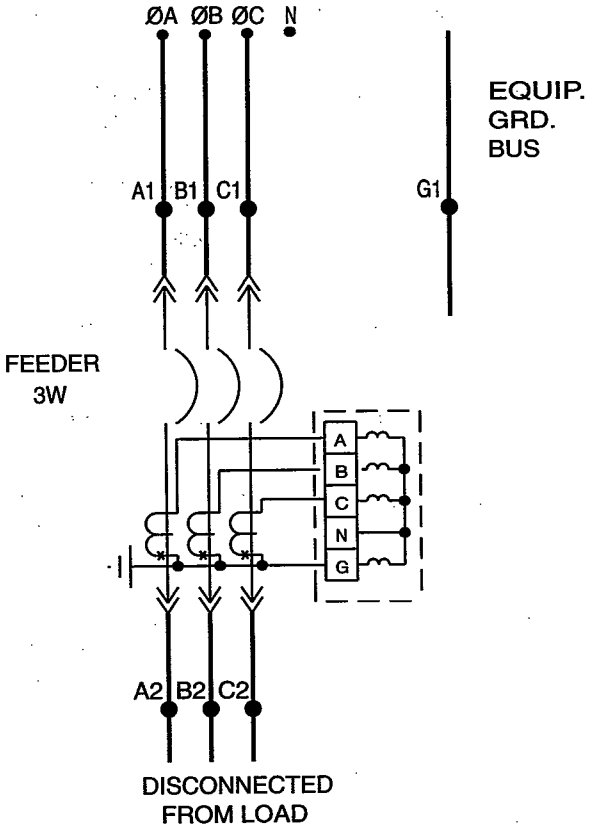

FIG. 4
THREE LINE DIAGRAM
INDICATING TEST POINTS

BREAKER STATUS FEEDER	APPLY1Ø POWER TO	INSTALL JUMPER FROM	RESULTS	REMARKS
CLOSED	A1 & G1	A2 & G1	FEEDER TIMES OUT AND TRIPS	

REPEAT THE ABOVE TEST FOR "B" PHASE & "C" PHASE

NOTE: If the above test does not pass, utilize Internal Test Panel on Digitrip Unit or Secondary Injection Test Kit (S# 140D481G03 for breakers manufactured through February 1994; S# 140D481G04 for all breakers manufactured after February 1994) to verify correct trip unit operation. If trip unit tests properly, check to see if incoming lines and loads are disconnected and that test power supply and jumper connections are correct.

4 WIRE FEEDER BREAKER WITH RESIDUAL GROUND FAULT

DANGER

DO NOT ATTEMPT TO TEST THIS EQUIPMENT WHILE IT IS ENERGIZED. DEATH OR SEVERE PERSONAL INJURY COULD RESULT. TURN OFF ALL POWER SUPPLYING THIS EQUIPMENT AND CHECK FOR VOLTAGE BEFORE TESTING

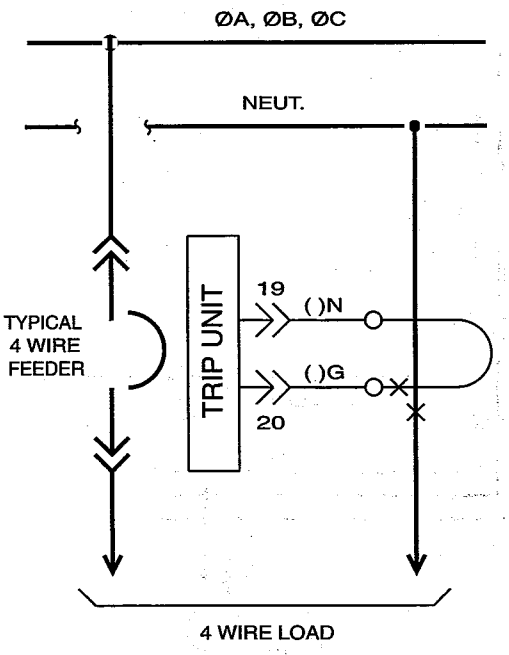

FIG. 5
SINGLE LINE DIAGRAM
OF FEEDER

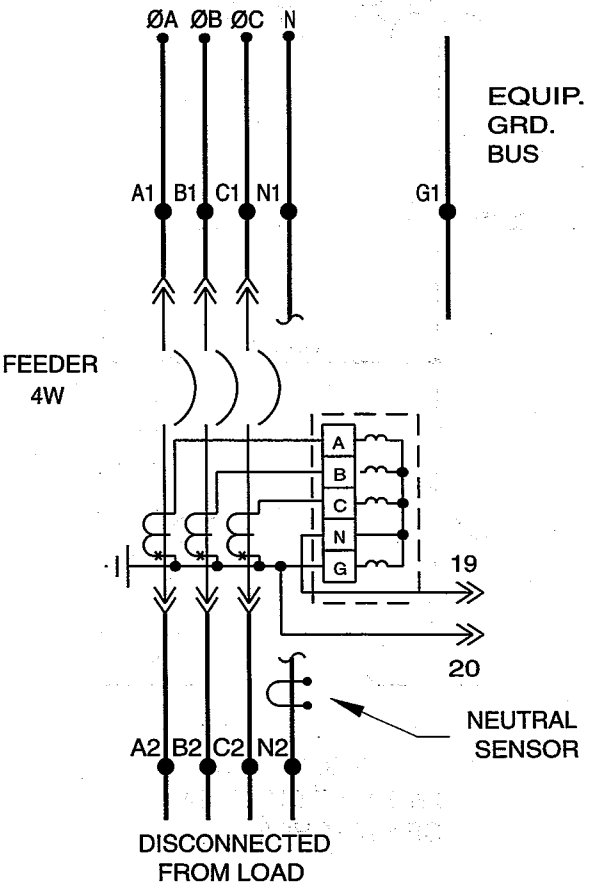

FIG. 6
THREE LINE DIAGRAM
INDICATING TEST POINTS

BREAKER STATUS FEEDER	APPLY 1Ø POWER TO	INSTALL JUMPER FROM	RESULTS	REMARKS
CLOSED	A1 & N1	A2 & N2	NO TRIP	POLARITY CHECK FOR NEUT. SENSOR
CLOSED	A1& G1	A2 & G1	FEEDER TIMES OUT AND TRIPS	

REPEAT THE ABOVE TEST FOR "B" PHASE & "C" PHASE, EXCEPT NEUT. SENSOR CHECK IS READ ONLY REQD. ON ONE PHASE.

NOTE: If any of the above tests do not pass, utilize Internal Test Panel on Digitrip Unit or Secondary Injection Test Kit (S# 140D481G03 for breakers manufactured through February 1994; S# 140D481G04 for all breakers manufactured after February 1994) to verify correct trip unit operation. If trip unit tests properly, check to see if incoming lines and loads are disconnected and that test power supply and jumper connections are correct.

If "No Trip" test fails, reverse secondary connections at neutral sensor and repeat test. If test still fails, check connections on breaker at points "N" and "G".

SINGLE ENDED, 3 WIRE SYSTEM

DANGER

DO NOT ATTEMPT TO TEST THIS EQUIPMENT WHILE IT IS ENERGIZED. DEATH OR SEVERE PERSONAL INJURY COULD RESULT. TURN OFF ALL POWER SUPPLYING THIS EQUIPMENT AND CHECK FOR VOLTAGE BEFORE TESTING

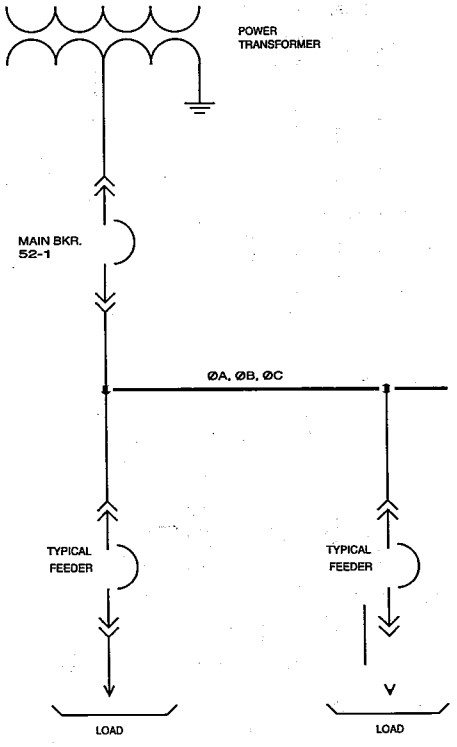

FIG. 7
SINGLE LINE DIAGRAM
OF SWITCHGEAR

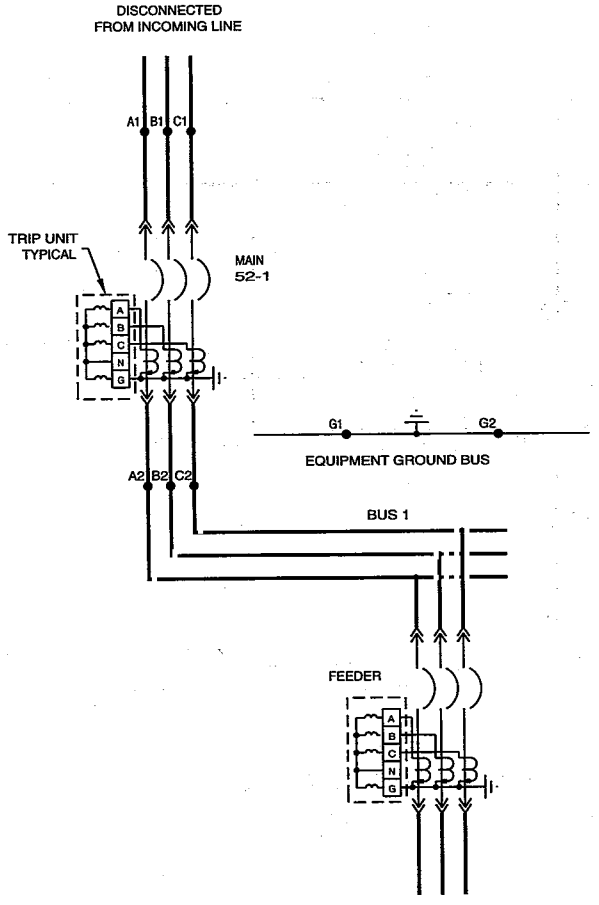

FIG. 8
THREE LINE DIAGRAM
INDICATING TEST POINTS

BREAKER STATUS		APPLY 1Ø POWER TO	INSTALL JUMPER FROM	RESULTS	REMARKS
52-1	FEEDERS				
CLOSED	OPEN	A1 & G1	A2 & G2	MAIN 52-1 TIMES OUT AND TRIPS	
FOR FEEDER BREAKER GROUND FAULT TEST REFER TO PAGE 3					

REPEAT THE ABOVE TEST FOR "B" PHASE & "C" PHASE

NOTE: If the above test does not pass, utilize Internal Test Panel on Digitrip Unit or Secondary Injection Test Kit (S# 140D481G03 for breakers manufactured through February 1994; S# 140D481G04 for all breakers manufactured after February 1994) to verify correct trip unit operation. If trip unit tests properly, check to see if incoming lines and loads are disconnected and that test power supply and jumper connections are correct.

SINGLE ENDED, 4 WIRE RESIDUAL SYSTEM

DANGER

DO NOT ATTEMPT TO TEST THIS EQUIPMENT WHILE IT IS ENERGIZED. DEATH OR SEVERE PERSONAL INJURY COULD RESULT. TURN OFF ALL POWER SUPPLYING THIS EQUIPMENT AND CHECK FOR VOLTAGE BEFORE TESTING

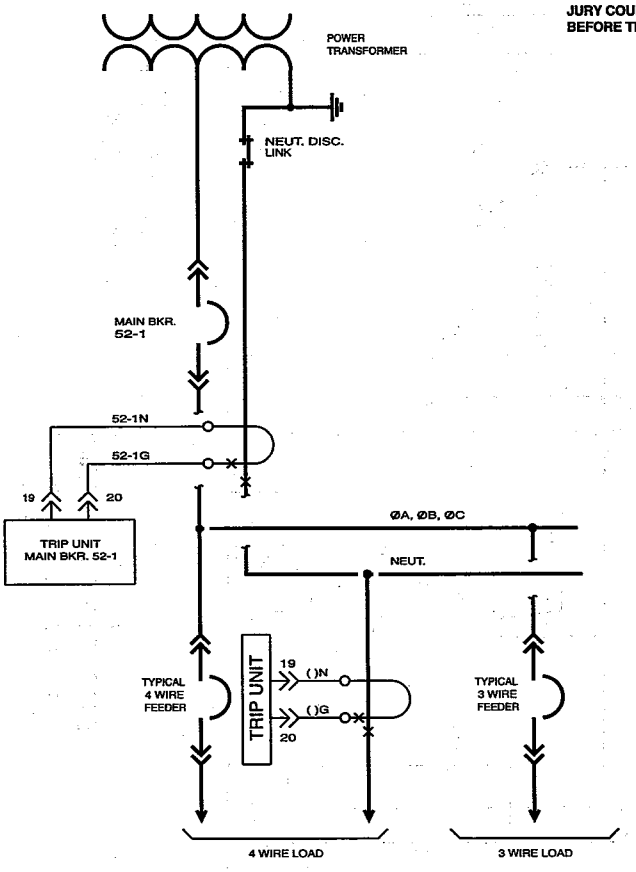

FIG. 9
SINGLE LINE DIAGRAM
OF SWITCHGEAR

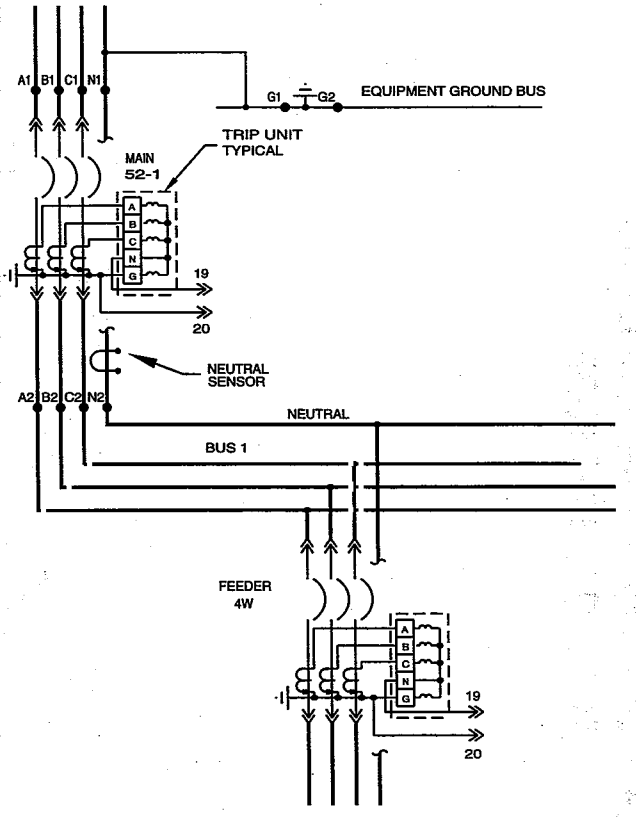

FIG. 10
THREE LINE DIAGRAM
INDICATING TEST POINTS

BREAKER STATUS		APPLY 1Ø POWER TO	INSTALL JUMPER FROM	RESULTS	REMARKS
52-1	FEEDERS				
CLOSED	OPEN	A1 & N1	A2 & N2	NO TRIP	POLARITY CHECK FOR NEUT. SENSOR
CLOSED	OPEN	A1 & G1	A2 & G2	MAIN 52-1 TIMES OUT AND TRIPS	TRIPS INST. IF ZONE INTERLOCKED
FOR FEEDER BREAKER GROUND FAULT TEST REFER TO PAGES 3 & 4					

REPEAT ALL OF THE ABOVE TESTS FOR "B" PHASE & "C" PHASE, EXCEPT NEUT. SENSOR POLARITY CHECK IS ONLY REQD. ON ONE PHASE.

NOTE: If any of the above tests do not pass, utilize Internal Test Panel on Digitrip Unit or Secondary Injection Test Kit (S# 140D481G03 for breakers manufactured through February 1994; S# 140D481G04 for all breakers manufactured after February 1994) to verify correct trip unit operation. If trip unit tests properly, check to see if incoming lines and loads are disconnected and that test power supply and jumper connections are correct.

If "No Trip" test fails, reverse secondary connections at neutral sensor and repeat test. If test still fails, check connections on breaker at points "N" and "G".

DOUBLE ENDED, 4 WIRE SYSTEM, SINGLE POINT GROUNDING "T" CONNECTION

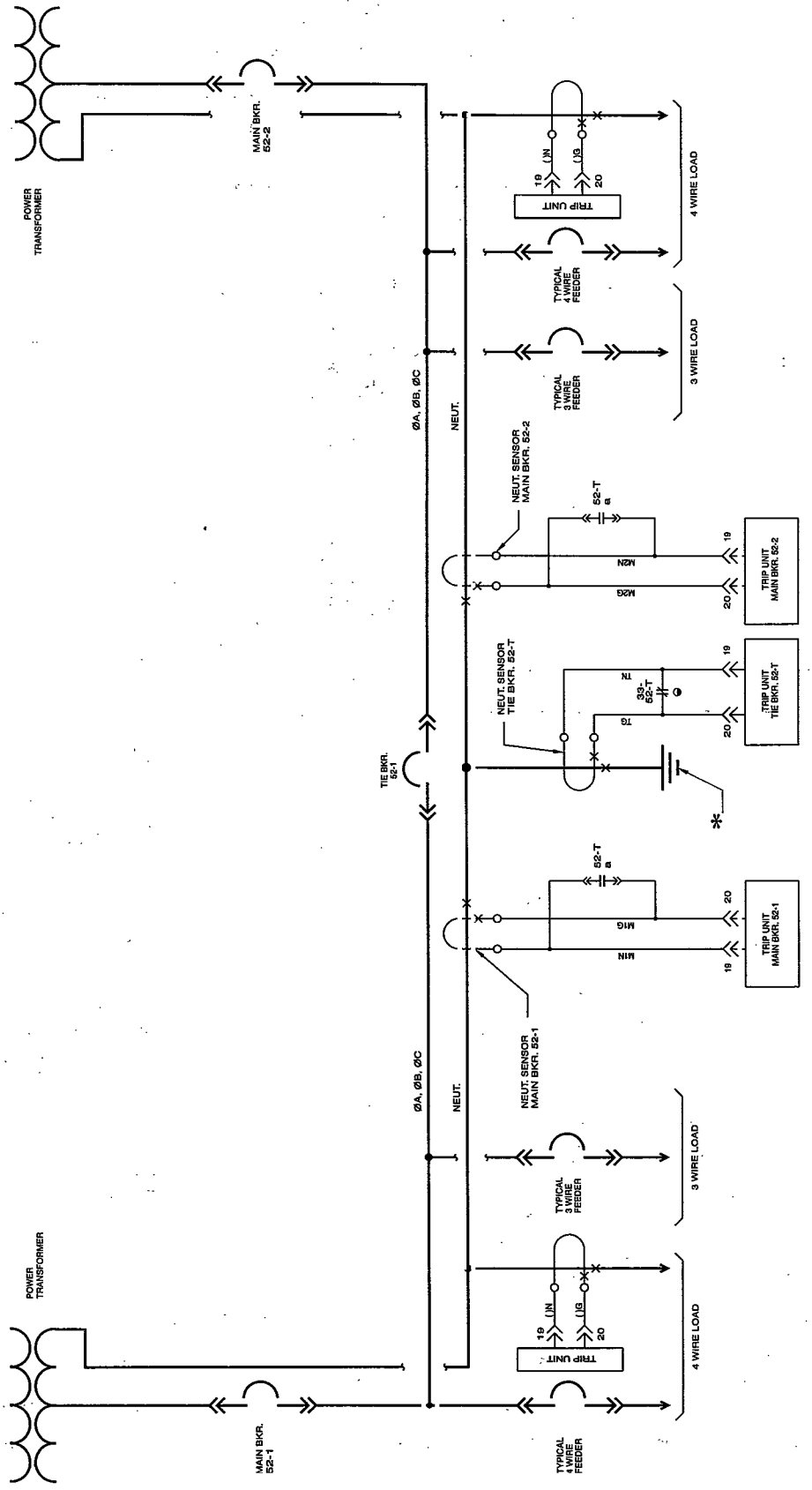

FIG. 11
SINGLE LINE DIAGRAM
OF SWITCHGEAR

BREAKER STATUS				APPLY 1Ø POWER TO	INSTALL JUMPER FROM	RESULTS	REMARKS
52-1	52-T	52-2	FEEDERS				
CLOSED	OPEN	CLOSED	OPEN	A1 & N1	A2 & G2	MAIN 52-1 TRIPS	IF NO TRIP, CHECK CONN. AT "N" AND "G"
CLOSED	CLOSED	OPEN	OPEN	A1 & N1	A2 & G2	TIE 52-T TRIPS, THEN MAIN 52-1 TRIPS*	
CLOSED	CLOSED	OPEN	OPEN	A1 & N1	A4 & G2	TIE 52-T TRIPS	
CLOSED	OPEN	CLOSED	OPEN	A3 & N3	A4 & G2	MAIN 52-2 TRIPS	
OPEN	CLOSED	CLOSED	OPEN	A3 & N3	A4 & G2	TIE 52-T TRIPS, THEN MAIN 52-2 TRIPS*	
OPEN	CLOSED	CLOSED	OPEN	A3 & N3	A2 & G2	TIE 52-T TRIPS	

FOR FEEDER BREAKER TEST REFER TO PAGES 3 & 4

REPEAT ALL OF THE ABOVE TEST FOR "B" PHASE AND "C" PHASE

*IF GROUND FAULT TIME DELAY SETTING OF THE TIE IS LESS THAN THAT OF THE MAIN

DOUBLE ENDED, 4 WIRE SYSTEM, SINGLE POINT GROUNDING "T" CONNECTION

DANGER

DO NOT ATTEMPT TO TEST THIS EQUIPMENT WHILE IT IS ENERGIZED. DEATH OR SEVERE PERSONAL INJURY COULD RESULT. TURN OFF ALL POWER SUPPLYING THIS EQUIPMENT AND CHECK FOR VOLTAGE BEFORE TESTING

DANGER

DO NOT ATTEMPT TO TEST THIS EQUIPMENT WHILE IT IS ENERGIZED. DEATH OR SEVERE PERSONAL INJURY COULD RESULT. TURN OFF ALL POWER SUPPLYING THIS EQUIPMENT AND CHECK FOR VOLTAGE BEFORE TESTING

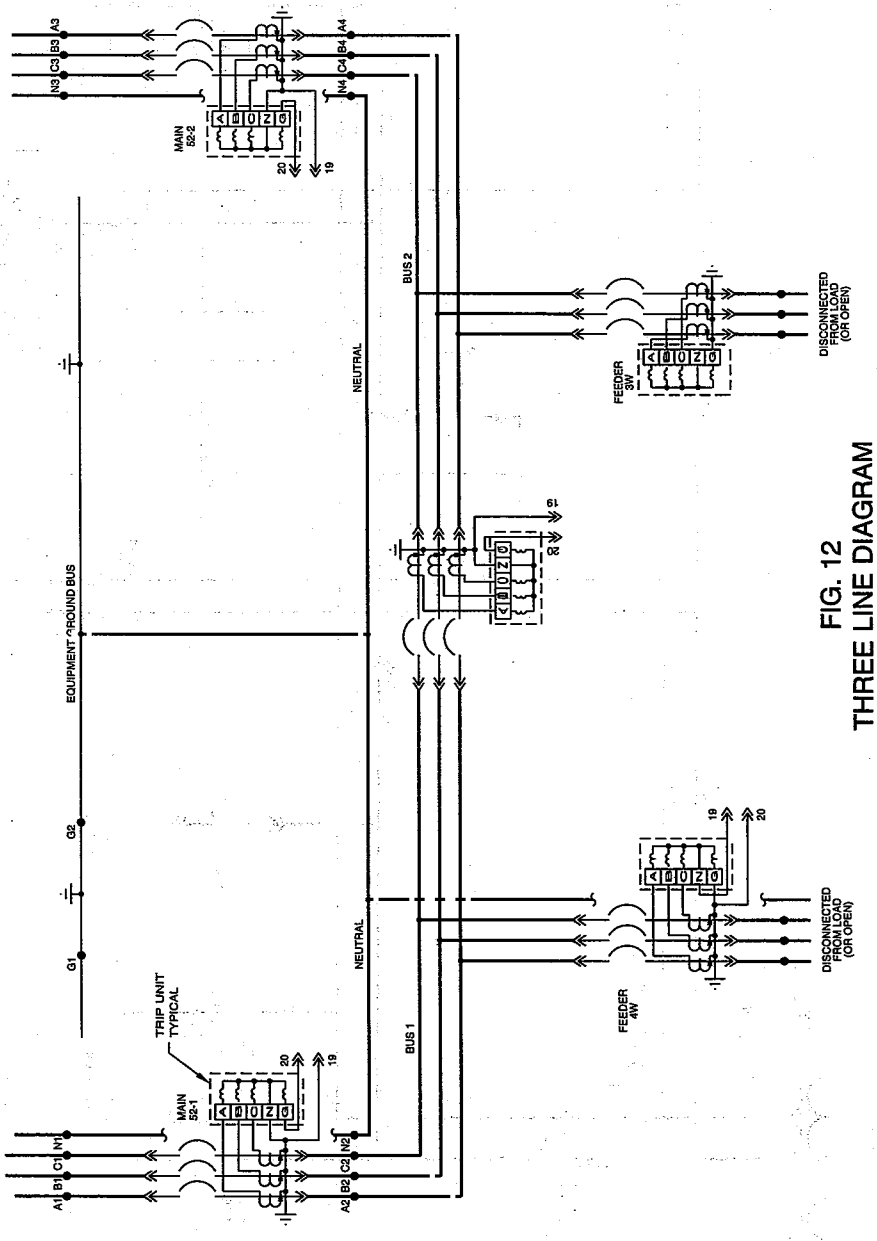

FIG. 12
THREE LINE DIAGRAM
INDICATING TEST POINTS

NOTE: If any of the above tests do not pass, utilize Internal Test Panel on Digitrip Unit or Secondary Injection Test Kit (S# 140D481G03 for breakers manufactured through February 1994; S# 140D481G04 for all breakers manufactured after February 1994) to verify correct trip unit operation. If trip unit tests properly, check to see if incoming lines and loads are disconnected and that test power supply and jumper connections are correct.

DOUBLE ENDED, 4 WIRE SYSTEM, MODIFIED RESIDUAL GROUND FAULT

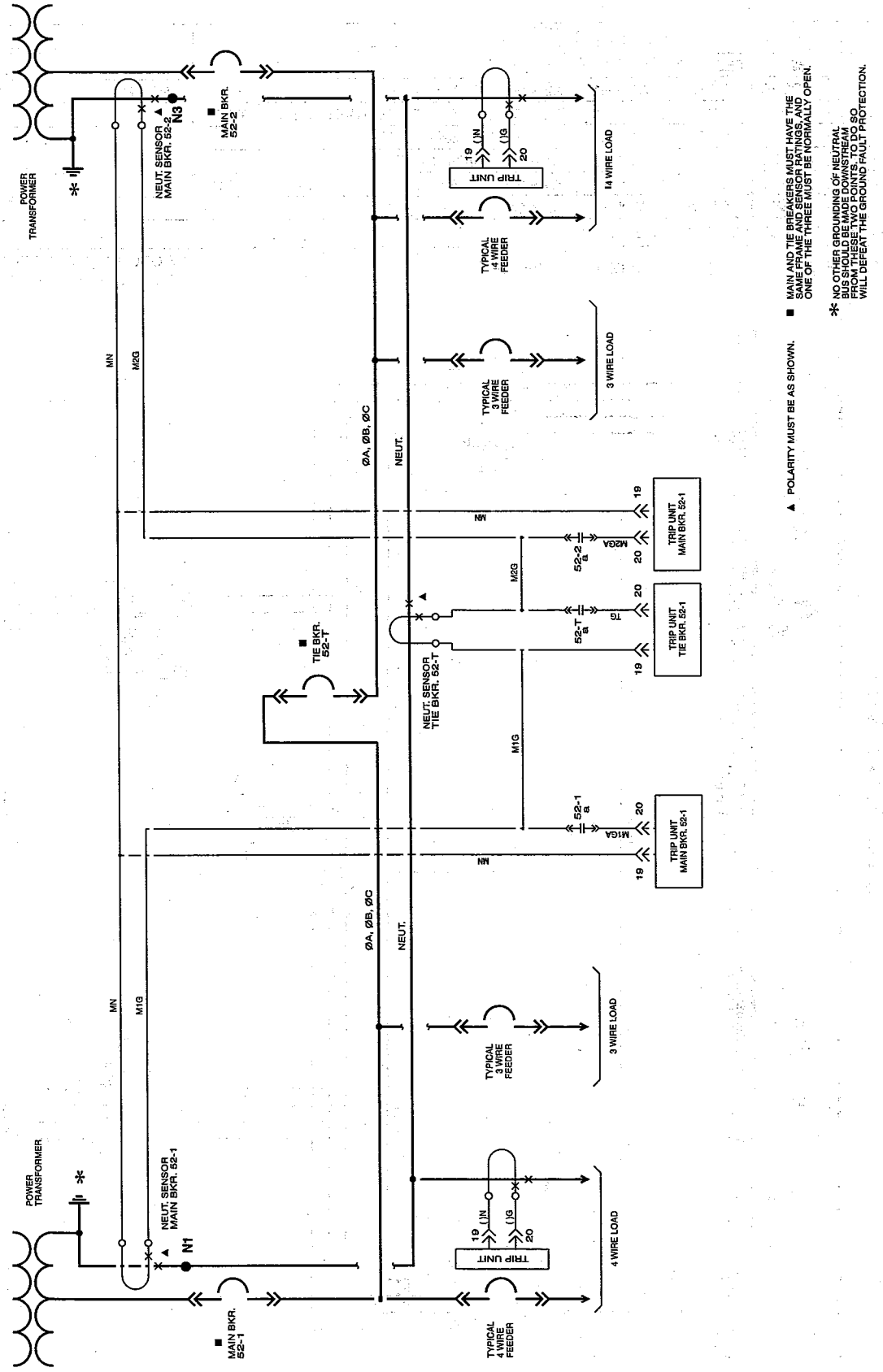

FIG. 13
SINGLE LINE DIAGRAM
OF SWITCHGEAR

BREAKER STATUS				APPLY 1Ø POWER TO	INSTALL JUMPER FROM	RESULTS	REMARKS
52-1	52-T	52-2	FEEDERS				
CLOSED	OPEN	CLOSED	OPEN	A1 & N1	A2 & N2	NO TRIP	POLARITY CHECK FOR MAIN 52-1 NEUT. SENSOR
CLOSED	CLOSED	OPEN	OPEN	A1 & N1	A4 & N4	NO TRIP	POLARITY CHECK FOR TIE 5T-T NEUT. SENSOR
CLOSED	OPEN	CLOSED	OPEN	A3 & N3	A4 & N4	NO TRIP	POLARITY CHECK FOR MAIN 52-2 NEUT. SENSOR
CLOSED	OPEN	CLOSED	OPEN	A1 & N1	A2 & G2	MAIN 52-1 TRIPS	
CLOSED	CLOSED	OPEN	OPEN	A1 & N1	A4 & G2	TIE 52-T TRIPS	
CLOSED	OPEN	CLOSED	OPEN	A3 & N3	A4 & G2	MAIN 52-2 TRIPS	
OPEN	CLOSED	CLOSED	OPEN	A3 & N3	A2 & G2	TIE 52-T TRIPS	
FOR FEEDER BREAKER TEST REFER TO PAGES 3 & 4							

REPEAT ALL OF THE ABOVE TESTS FOR "B" PHASE & "C" PHASE, EXCEPT POLARITY CHECKS

DOUBLE ENDED, 4 WIRE SYSTEM, MODIFIED RESIDUAL GROUND FAULT

DANGER

DO NOT ATTEMPT TO TEST THIS EQUIPMENT WHILE IT IS ENERGIZED. DEATH OR SEVERE PERSONAL INJURY COULD RESULT. TURN OFF ALL POWER SUPPLYING THIS EQUIPMENT AND CHECK FOR VOLTAGE BEFORE TESTING

DANGER

DO NOT ATTEMPT TO TEST THIS EQUIPMENT WHILE IT IS ENERGIZED. DEATH OR SEVERE PERSONAL INJURY COULD RESULT. TURN OFF ALL POWER SUPPLYING THIS EQUIPMENT AND CHECK FOR VOLTAGE BEFORE TESTING

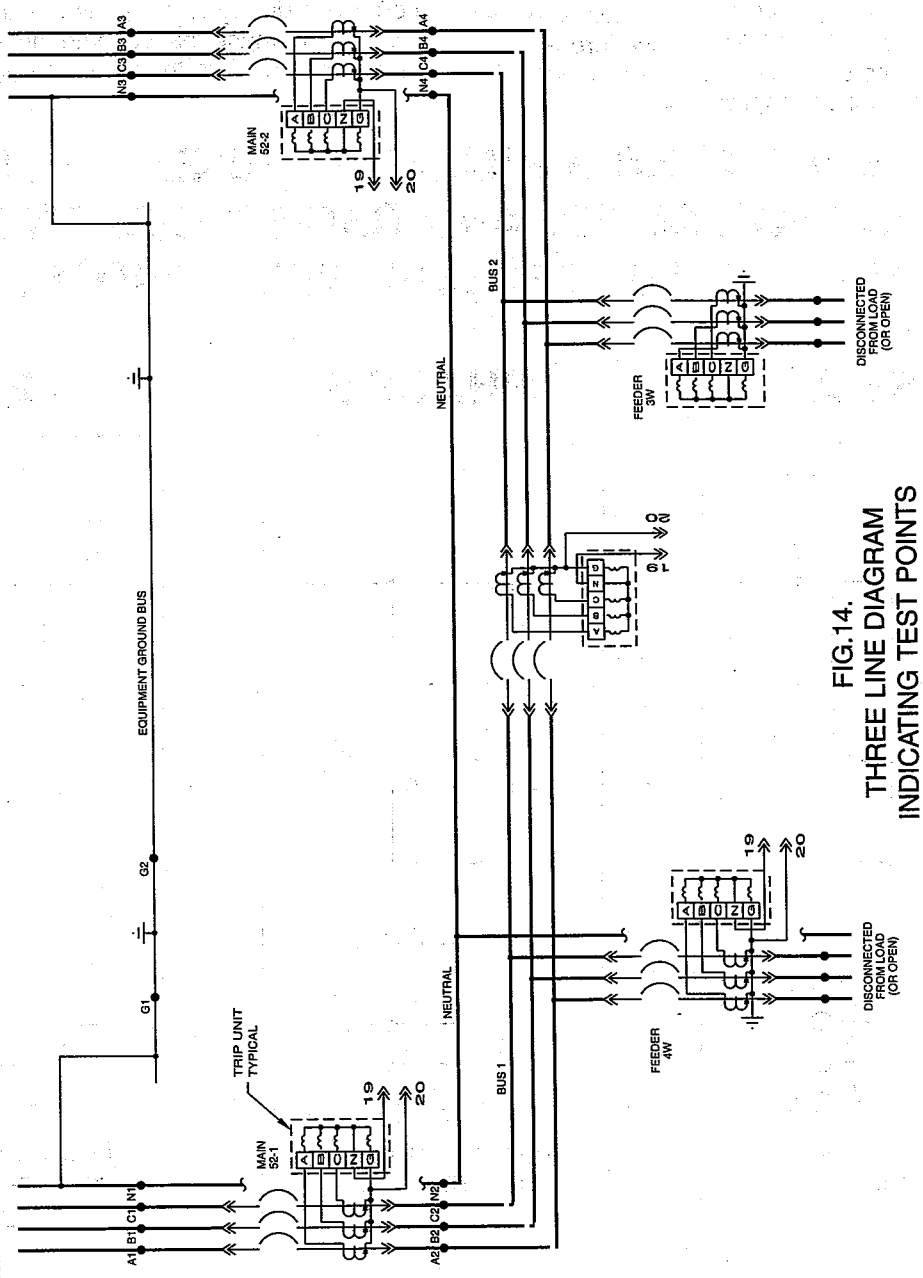

FIG.14.
THREE LINE DIAGRAM
INDICATING TEST POINTS

NOTE: If any of the above tests do not pass, utilize Internal Test Panel on Digitrip Unit or Secondary Injection Test Kit (S# 140D481G03 for breakers manufactured through February 1994; S# 140D481G04 for all breakers manufactured after February 1994) to verify correct trip unit operation. If trip unit tests properly, check to see if incoming lines and loads are disconnected and that test power supply and jumper connections are correct.

If "No Trip" test fails, reverse secondary connections at neutral sensor and repeat test. If test still fails, check connections on breaker at points "N" and "G".

The tests described previously will verify the correctness of the wiring between devices of a complete ground fault system. These tests can also be used to verify trip unit pick-up levels for all breakers except the DS-632 and DSII-632.

When testing residual ground fault systems utilizing DS-632 and DSII-632 breakers, raise test current high enough to cause tripping with current flowing through one pole of the DS-632 and DSII-632 breaker. Use this current value to complete the system test. Once the system tests are complete, and specific pick-up tests are also desired on the DS-632 and DSII-632, utilize the test procedures illustrated in Fig. 15. This procedure is not necessary for breakers utilized on "source ground" ("T" schemes or zero sequence) applications.

Single phase field testing of DS-632 and DSII-632 breakers can produce excessive ground fault trip values. The reason for these apparent excessive trip values is related to compensated sensors and the close proximity of the primary conductors with their associated sensors applied in the 3200A frame design. As a result of inductive coupling, error currents are produced in adjacent phases. This phenomenon is corrected by utilizing compensated sensors, which is to say the sensors have additional iron and damping coils designed to "compensate" for the inductive coupling during three phase application. This compensation effect produces high trip conditions during single phase field testing. This simulated three phase test scheme incorporates the compensation currents into the measurement.

SIMULATED 3 PHASE GROUND FAULT TEST FOR DS-632 AND DSII-632 BREAKERS WITH RESIDUAL GROUND FAULT PROTECTION

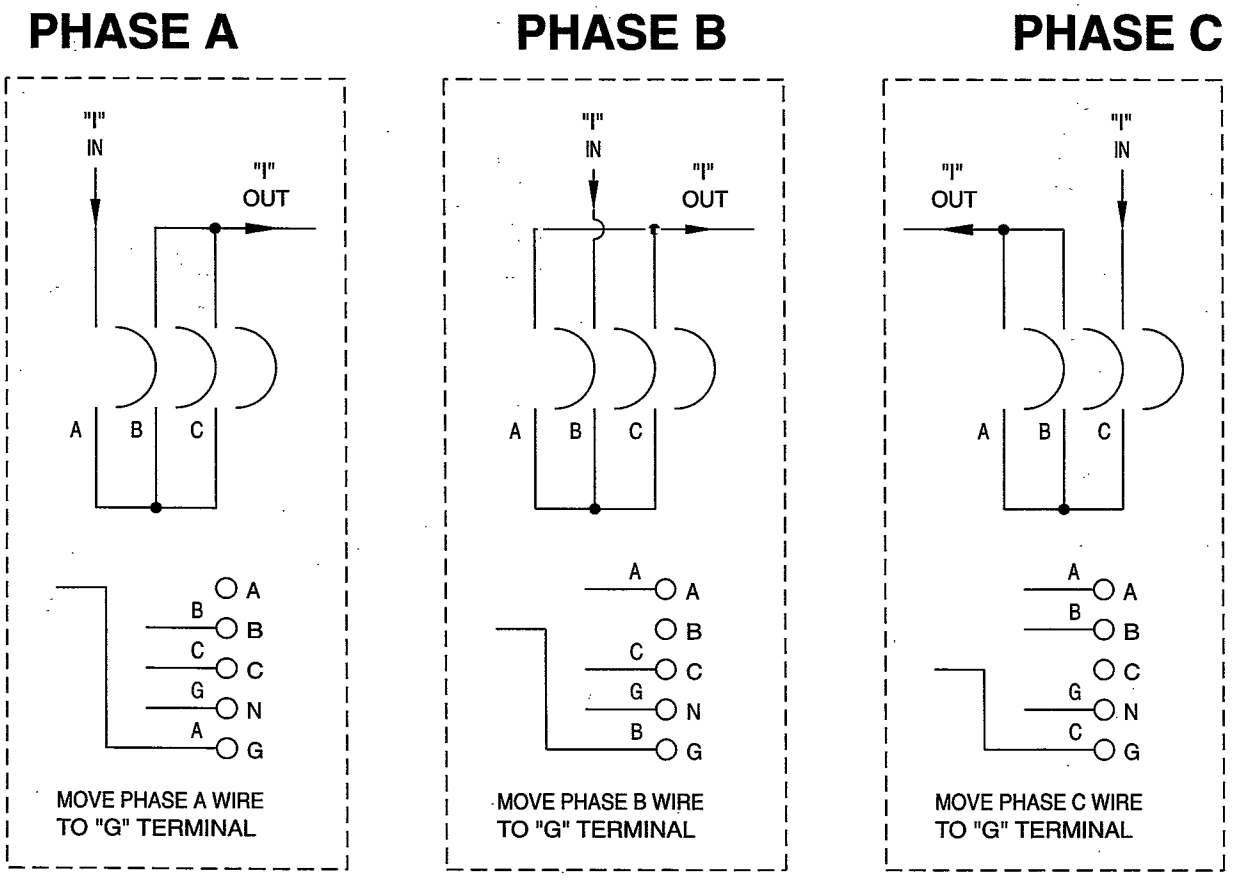

Fig. 15 Amptector or Digitrip Terminal Block Modification for Ground Fault Testing

DIGITRIP GROUND FAULT PICK-UP VALUES IN SECONDARY AMPERES

INSTALLED RATING PLUG	SENSOR RATING	PICK-UP (DIAL) SETTING VALUES IN SECONDARY AMPERES ①							
		A ② 25%	B ② 30%	C ② 35%	D ② 40%	E ② 50%	F 60%	H 75%	K 100%
100		.63	.75	.88	1.0	1.25	1.5	1.88	2.5
200	200	1.25	1.5	1.75	2.0	2.5	3.0	3.75	5.0
200		.83	1.0	1.17	1.33	1.67	2.0	2.5	3.33
250		1.04	1.25	1.46	1.67	2.08	2.5	3.13	4.17
300	300	1.25	1.5	1.75	2.0	2.5	3.0	3.75	5.0
200		.63	.75	.88	1.0	1.25	1.5	1.88	2.5
250		.78	.94	1.09	1.25	1.56	1.88	2.34	3.13
300		.94	1.13	1.31	1.5	1.86	2.25	2.81	3.75
400	400	1.25	1.5	1.75	2.0	2.5	3.0	3.75	5.0
300		.63	.75	.88	1.0	1.25	1.5	1.88	2.5
400		.83	1.0	1.17	1.33	1.67	2.0	2.5	3.34
600	600	1.25	1.5	1.75	2.0	2.5	3.0	3.75	5.0
400		.63	.75	.88	1.0	1.25	1.5	1.88	2.5
600		.94	1.13	1.31	1.5	1.88	2.25	2.81	3.75
800	800	1.25	1.5	1.75	2.0	2.5	3.0	3.75	5.0
600		.63	.75	.88	1.0	1.25	1.5	1.88	2.5
800		.83	1.0	1.17	1.33	1.67	2.0	2.5	3.33
1000		1.04	1.25	1.46	1.67	2.08	2.5	3.12	4.17
1200	1200	1.25	1.5	1.75	2.0	2.5	3.0	3.75	5.0
800		.63	.75	.88	1.0	1.25	1.5	1.88	2.5
1000		.78	.94	1.09	1.25	1.56	1.88	2.34	3.13
1200		.94	1.13	1.31	1.5	1.88	2.25	2.81	3.75
1600	1600	1.25	1.5	1.75	2.0	2.5	3.0	3.75	3.75
1000		.63	.75	.88	1.0	1.25	1.5	1.88	2.5
1200		.75	.90	1.05	1.2	1.5	1.8	2.25	3.0
1600		1.0	1.2	1.4	1.6	2.0	2.4	3.0	3.0
2000	2000	1.25	1.5	1.75	2.0	2.5	3.0	3.0	3.0
1600		.83	1.0	1.17	1.33	1.67	2.0	2.5	2.5
2000		1.04	1.25	1.46	1.67	2.08	2.5	2.5	2.5
2400	2400	1.25	1.5	1.75	2.0	2.5	2.5	2.5	2.5
1600		.63	.75	.88	1.0	1.25	1.5	1.88	1.88
2000		.78	.94	1.09	1.25	1.56	1.88	1.88	1.88
2400		.94	1.13	1.31	1.5	1.88	1.88	1.88	1.88
3000		1.17	1.41	1.64	1.76	1.88	1.88	1.88	1.88
3200	3200	1.25	1.5	1.75	1.88	1.88	1.88	1.88	1.88
2000		.63	.75	.88	1.0	1.25	1.5	1.5	1.5
2400		.75	.9	1.05	1.2	1.5	1.5	1.5	1.5
3200		1.0	1.2	1.4	1.5	1.5	1.5	1.5	1.5
4000	4000	1.25	1.5	1.5	1.5	1.5	1.5	1.5	1.5
5000	5000	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2

① EXCEPT AS NOTED, TOLERANCES ON PICK-UP LEVELS ARE +/-10% OF VALUES SHOWN.

② FOR TESTING PURPOSES ONLY: WHEN USING AN EXTERNAL SINGLE PHASE CURRENT SOURCE TO TEST LOW LEVEL GROUND FAULT CURRENT SETTINGS, IT IS ADVISABLE TO USE AUXILIARY POWER MODULE (APM). ESPECIALLY WHEN THE SINGLE PHASE CURRENT IS LOW, WITHOUT THE APM IT MAY APPEAR AS IF THE TRIP UNIT DOES NOT RESPOND UNTIL THE CURRENT IS WELL ABOVE THE SET VALUE, LEADING THE TESTER TO BELIEVE THERE IS AN ERROR IN THE TRIP UNIT WHEN THERE IS NONE. THE REASON THIS OCCURS IS THAT THE SINGLE PHASE TEST CURRENT IS NOT A GOOD SIMULATION OF THE NORMAL THREE PHASE CIRCUIT. IF THREE PHASE HAD BEEN FLOWING, THE TRIP UNIT WOULD HAVE PERFORMED CORRECTLY. USE THE APM FOR CORRECT TRIP UNIT PERFORMANCE WHEN SINGLE PHASE TESTS ARE MADE.

GROUND FAULT TEST RECORD FORM

TEST DATE	CIRCUIT BREAKER NO.	RESULTS	TESTED BY

Ground Fault Test Record should be retained by those in charge of the building's Electrical Installation in order to be available to the authority having jurisdiction.

GROUND FAULT TEST RECORD FORM

TEST DATE	CIRCUIT BREAKER NO.	RESULTS	TESTED BY

Ground Fault Test Record should be retained by those in charge of the building's Electrical Installation in order to be available to the authority having jurisdiction.

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