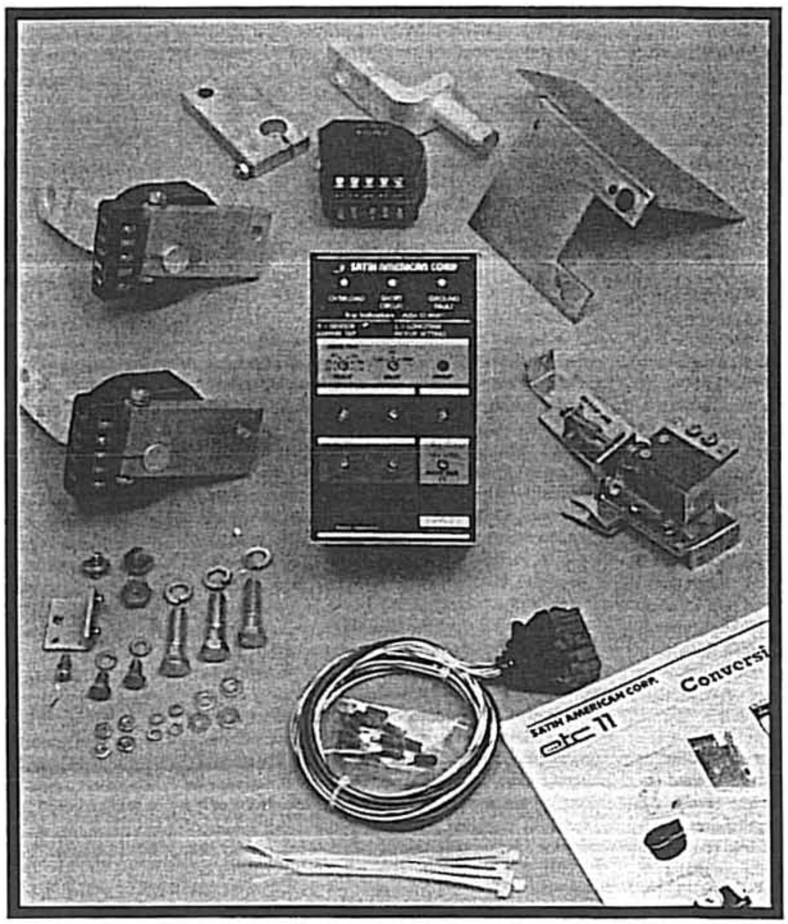
Solid State Retrofit Tripping Systems

etc

etc.11/11r RETROFIT KIT INSTALLATION INSTRUCTIONS
SECTION II - B

101-610-0527B



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INSTALLATION INSTRUCTIONS
etc.11r RETROFIT KIT
SECTION II-B

TABLE OF CONTENTS

1. INTRODUCTION

2. These instructions serve as supplemental guidelines to enable personnel with circuit breaker maintenance experience to install and test the **etc.** solid state overcurrent trip device on low voltage air circuit breakers.

3. **These instructions are designed to be used in conjunction with the Satin American Corp. Section One Installation Instructions for your particular air circuit breaker while installing an etc. solid state retrofit kit.**

4. Kit installation requires familiarity with circuit breaker maintenance, careful workmanship and compliance with these instructions. Conversion will require partial disassembly of the breaker, removal of existing trip devices and installation of **etc.** components. The process may involve minor modification and relocation of components.

5. Kit installation does not require customized assembly work and, in most instances, can be accomplished on-site. **Converted breakers must be performance-tested before they are returned to service.**

6. Retrofitted breakers must be applied within their short-circuit ratings. **If a breaker's trip elements are changed from instantaneous to short-time, the short-time rating then governs the breaker's application.**

7. Before beginning the conversion, make certain that the kit components listed in the Bill of Material, at the end of the Section One Installation Manual, and the necessary tools and references are available.

REQUIRED TOOLS

* Socket Set - 3/8" drive
* Open End Wrenches - Set
* Screwdrivers - Assorted
* Allen Wrenches - Assorted
* Tru-arc Pliers - Assorted
* Silicone Adhesive
* Center Punch
* Pliers - assorted
* Drill - Electric
* Drill Bits - Assorted
* Scale - 6"
* Crimping Tools
* 9 or 12 Volt Battery
* 8-oz Ball Peen Hammer
* Scotch-Brite 7447 General Purpose Hand Pad or Equiv.

REFERENCES

* Manufacturers Maintenance Manual - Applicable to Breaker

WARNING

TO PREVENT ELECTRICAL SHOCK OR INJURY, DISCONNECT THE BREAKER FROM ALL PRIMARY AND SECONDARY POWER SOURCES AND BE SURE THE BREAKER IS OPEN AND CHARGING SPRINGS DISCHARGED BEFORE DOING ANY WORK.

8. **etc.11/11r DESCRIPTION**

9. The **etc.11** and **etc.11r** is a solid state circuit breaker overcurrent protection device which operates from a current sensor(s) and trips the circuit breaker through a magnetically latch trip device (flux trip device).

10. The units are designed to operate with a maximum of four (4) inputs (three (3) phase inputs and one (1) neutral input) or a minimum of one (1) input.

11. The programmer is self powered and derives it's operating current from the current sensor(s) being monitored. There is no requirement for an external power supply nor an internal battery supply.

12. The current sensor(s) and the flux trip device are devices that are specifically designed to operate the **etc.11** and **etc.11r** programmers only and it is not recommended that any other monitoring systems be attached to the current sensor(s) supplied.

13. **etc. THEORY OF OPERATION**

NOTE

Single phase primary and single phase secondary injection testing must be accomplished per paragraphs 30 through 44 inclusive (as applicable).

14. The front panel of the **etc.11** and **etc.11r** programmers is divided into six (6) color coded areas, the function of which is described below. All user accessible controls are mounted in the front panel of the programmer. See fig. 1.

15. The trip indicators (located in the upper row of the front panel) provide indication that the **etc.11** or **etc.11r** has tripped the breaker and whether that the breaker opening was caused by an overload, short-circuit, or a ground fault (ground fault is an optional trip element).

A. The trip indicator labeled "OVERLOAD" operates when the trip signal originated in the portion of the time current curves labeled "LONG-TIME"; see the enclosed time current curves drawing #001-600-0001.

B. The trip indicator labeled "SHORT-CIRCUIT" operates when the trip signal originates either in the portion of the time current curves labeled "SHORT-TIME" (low or high range), "SHORT-TIME I2T", or "INSTANTANEOUS" ; see the enclosed time current curves drawing #001-600-0001.

C. The trip indicator labeled "GROUND FAULT" operates when the trip signal originated by an input from the difference signal between the sum of the inputs or from an input from the neutral current sensor and represents ground fault current, as shown in the enclosed time current curves drawings #001-600-0002, #001-600-0003, and #001-600-0004.

16. The next row of controls (colored yellow) consists of the long-time pickup selector, long-time delay selector, and the long-time pickup light. The function of each is described below:

A. The "LONG-TIME PICKUP" selector allows the operator to select the percentage of the current sensor tap rating which they desires the **etc.** programmer to begin to time (operate).

B. The "LONG-TIME DELAY" selector allows the operator to select the slope of the long-time curve (time current) from the three (3) ranges (MIN., INT., MAX.) listed in the time current curve drawing #001-600-0001.

C. The "LONG-TIME PICKUP" light (LED) indicates whenever the current being monitored exceeds the **etc.** programmer settings.

17. The left portion of the next row (colored red) consists of the short-time pickup and the short-time delay selectors. The function of each is described below:

A. The "SHORT-TIME PICKUP" selector allows the operator to select the multiple of the long-time pickup setting at which the **etc.** programmer's timing will switch from the long-time curve to the short-time curve, as shown in the time current curves drawing #001-600-0001.

B. The "SHORT-TIME DELAY" selector allow the operator to select the amount of time delay from three (3) ranges (MIN., INT., MAX.) before the circuit breaker trips; see the time current curves drawing #001-600-0001.

18. The right portion of the same row (colored red) consists of the instantaneous pickup selector. The selector allows the operator to set the multiple of the long-time pickup setting at which the **etc.** programmer will trip the circuit breaker with no intentional delay.

19. The left portion of the next row (colored green) consists of the ground fault pickup and the ground fault delay selectors. The function of each is described below:

A. The "GROUND FAULT PICKUP" selector allows the operator to select the ground fault current at which the **etc.** programmer will trip the circuit breaker as shown in the time current curves drawings #001-600-0002, #001-600-0003, and #001-600-0004.

B. The "GROUND FAULT DELAY" selector allows the operator to select the time delay from three (3) ranges (MIN., INT., MAX.) before the circuit breaker trips; see the time current curves drawings #001-600-0002, #001-600-0003, and #001-600-0004.

20. The right portion of the same row (colored blue) consists of the short-time I2t selector. This control operates on the short-time pickup curve, as shown in the time current curve drawing #001-600-0001, and acts as a switch to turn on or off a delay slope into the short time characteristics similar to the long-time delay slope.

21. <u>RMS THEORY OF OPERATION</u>

22. The RMS version of the **etc.** trip device is delineated by the addition of the "r" at the end of the style designation.

23. The **etc.11r** programmers contain in principle a complete **etc.11** unit which is a peak detecting trip device. The initial processing is identical for both the peak and rms sensing units, with the rms detection being accomplished by the addition of a rms processing board.

24. The rms board passes the combined input signal through an rms conversion circuit, wherein the signal is continuously converted to it's rms equivalent. The signal is then sent to the controller board where it is compared with the trip limits selected by the customer (as specified by the selector board switch settings). The controller will then start timing or act to trip the circuit breaker as required.

25. The rms sensing will protect the system against any distortion (i.e. harmonics, spikes, etc.) by using a continuously sensing analog circuit design. The limiting factors of our rms package is the crest factor of the circuit which is a ten to one ratio. This means that the circuitry will accurately calculate the rms value of the waveform as long as the amount of distortion (I peak) does not exceed ten times the rms value (I rms) of the waveform.

26. The peak and rms package will attenuate any distortion signals above ten kilohertz due to the magnetic structure of the **etc.** programmer. This translate that any distortion carried on the waveform will simply not be reproduced within our circuitry and hence these distortions will be eliminated from the waveform.

27. If reproduction of this distortion above ten kilohertz is required, special current sensors are available upon request.

NOTE

The Satin American Corporation rms detection is a continuous system as opposed to sampling methods used by many competitors.

28. **TORQUE REQUIREMENTS**

29. Prior to performance testing the retrofitted air circuit breaker, all mounting hardware associated with the **etc.** solid state retrofit kit must be secure per table one.

TABLE 1

TORQUE REQUIREMENTS	
BOLT	TORQUE
#6-32 TPI	9 IN/LB
#8-32 TPI	19 IN/LB
#10-32 TPI	30 IN/LB
1/4"-20 TPI	5 FT/LB
5/16"-18 TPI	12 FT/LB
3/8"-16 TPI	20 FT/LB
1/2"-13 TPI	50 FT/LB

30. **TESTING**

WARNING

TO PREVENT ELECTRICAL SHOCK OR INJURY, DISCONNECT THE BREAKER FROM ALL PRIMARY AND SECONDARY POWER SOURCES AND BE SURE THE BREAKER IS OPEN AND CHARGING SPRINGS DISCHARGED BEFORE DOING ANY WORK.

WARNING

NEVER ENERGIZE A BREAKER WITH THE WIRE HARNESS DISCONNECTED FROM THE etc. PROGRAMMER OR FROM THE CURRENT SENSORS AND NEVER DISENGAGE THE WIRE HARNESS CONNECTOR FROM THE etc. PROGRAMMER OR FROM THE CURRENT SENSORS ON A BREAKER THAT IS CARRYING CURRENT. EITHER WILL OPEN-CIRCUIT THE CURRENT SENSORS, ALLOWING DANGEROUS AND DAMAGING VOLTAGES TO DEVELOP. BE SURE THAT THE WIRE HARNESS IS CONNECTED TO THE etc. PROGRAMMER AND TO THE CURRENT SENSORS BEFORE PROCEEDING.

31. **Conduct a full performance test on the retrofitted circuit breaker prior to energizing the breaker.**

32. Full function testing of the **etc.** programmer can be performed using the **Satin American Corp. etc/pts** portable test set.

33. Primary injection testing can be performed on the retrofitted circuit breaker for any current value above one-hundred (100) amps.

NOTE

The very low output voltage and impedance of typical primary injection test sets (MULTI-AMP or similar) at operating current levels of less than one-hundred (100) amps will result in erratic operation of the **etc.** programmer when testing is attempted at these low current values.

For current values less than one-hundred (100) amps, primary injection testing of the **etc.** programmer can be accomplished with a test set using a load bank and a minimum output voltage of sixty (60) VAC.

34. PRIMARY INJECTION TESTING PROCEDURES

WARNING

IF YOU ARE PLANNING TO PRIMARY INJECTION TEST AN ETC. FUSE RETROFITTED AIR CIRCUIT BREAKER, BE SURE TO REMOVE THE FUSE(S) FROM THE AIR CIRCUIT BREAKER AND INSTALL A COPPER SHUNT IN PLACE OF THE FUSE PRIOR TO TESTING. FAILURE TO ADHERE TO THIS WARNING WILL RESULT IN BLOWING YOUR EXISTING FUSE(S) ON YOUR AIR CIRCUIT BREAKER. A COPPER SHUNT IS AVAILABLE FROM SATIN AMERICAN CORPORATION.

35. These procedures will serve as guidelines to enable personnel with circuit breaker maintenance and testing experience to primary injection test the **etc.** solid state overcurrent trip device retrofitted on low voltage air circuit breakers.

36. **Prior to primary injection testing, the retrofitted circuit breaker must be lubricated and adjusted per the original manufacturer's maintenance instructions.**

NOTE

Only perform the trip characteristic tests listed below that are applicable to the trip elements supplied with your **etc.** programmer.

37. LONG-TIME PICKUP TEST

A. PURPOSE: To verify that the long-time pickup occurs within tolerance. For any given pickup setting, this is achieved in two (2) steps.

1. Test for **NO PICKUP** at a value below the published lower tolerance limit.

2. Test for **PICKUP** at a value within the published upper and lower tolerance limits.

B. NO PICKUP:

1. Preset the test current level to ninety (90) percent of the long-time pickup setting.

2. Allow the **etc.** programmer to run until the time delay of table two has expired. The programmer should **NOT** trip.

3. Repeat the **NO PICKUP** test for all three (3) phases.

TABLE TWO	
Long-Time Delay Setting	Time In Seconds
Minimum	300
Intermediate	725
Maximum	1650

C. PICKUP:

1. Raise the test current level until the long-time pickup light illuminates. The pickup light should illuminate between one-hundred twenty eight to one-hundred forty eight (128-148) percent of the long-time pickup setting.

2. Repeat the **PICKUP** test for all three (3) phases.

38. LONG-TIME DELAY TEST

A. PURPOSE: To verify that the long-time delay characteristics conforms to its upper and lower time limits. This test requires measurement of delay times at three (3) different test current values.

1. Preset one (1) of the test current levels listed in table three.

2. Allow the **etc.** programmer to run at the test current level. The programmer **SHOULD** trip within the published times of table three.

3. Repeat the long-time delay test for all three test current levels and on all three (3) phases.

TABLE THREE			
Test Current(*)	Time In Seconds (Long Time Delay Settings)		
	Minimum	Intermediate	Maximum
200%	65.7-89.2	160.1-218.7	361.9-493.0
400%	17.2-23.1	41.7-56.4	93.7-126.5
800%	4.7-6.2	11.4-15.1	25.2-33.4

(*) - Test Current is a percentage of the long-time pickup setting.

39. **INSTANTANEOUS PICKUP AND DELAY TEST**

A. PURPOSE: To verify that the instantaneous pickup and delay occurs within tolerance. This requires measurement of the instantaneous pickup point and measurement of the instantaneous delay time beyond the knee of the published curves.

B. PICKUP:

1. Preset the lower test current from table four.

2. Test incremental increases in test current until an instantaneous trip occurs. This is the actual instantaneous pickup point. The pickup point should fall between the upper and lower test current limits shown in table four.

NOTE

To ensure that an instantaneous trip will occur, the incremental test in the previous step should not last longer than 0.095 seconds. The programmer is still subject to and will respond, if so equipped, to delayed trip signals from long-time and short-time trip elements. In either case, the delayed trip signal will be longer than the trip signal generated by the instantaneous trip element. See drawing number 001-600-0001.

3. Repeat the instantaneous pickup test for all three (3) phases.

TABLE FOUR		
Instantaneous Pickup Setting	Test Current(*)	
	60 Hz	
	Lower Limit	Upper Limit
4L	481%	586%
5L	607%	738%
6L	752%	909%
8L	977%	1186%
10L	1260%	1520%
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(*) - Test Current is a percentage of the long-time pickup setting.

C. Delay:

1. Preset a test current fifty (50) percent above the nominal instantaneous pickup setting.

2. Allow the **etc.** programmer to run at the test current. The programmer **SHOULD** trip within 0.05 seconds. Note, the actual instantaneous delay time will vary depending upon the mechanical reaction time of the breaker.

3. Repeat the instantaneous delay test for all three (3) phases.

40. SHORT-TIME PICKUP AND DELAY TEST

A. PURPOSE: To verify that the short-time pickup and delay occurs within tolerance. This requires measurement of the short-time pickup point and measurement of the short-time delay time beyond the knee of the published curves.

B. PICKUP:

1. Preset the lower test current from table five.

2. Test incremental increases in test current until a short-time trip occurs. This is the actual short-time pickup point. The pickup point should fall between the upper and lower test current limits shown in table five. Be sure to set the instantaneous pickup setting, if applicable, to OFF and set the I2t, if applicable, to OUT.

NOTE

To ensure that a short-time trip will occur, the incremental test in the previous step should not last longer than 1.10 seconds. The programmer is still subject to and will respond, if so equipped, to delayed trip signals from the long-time element. In either case, the delayed trip signal will be longer than the trip signal generated by the short-time trip element.

3. Repeat the short-time pickup test for all three (3) phases.

TABLE FIVE		
Short-Time Pickup Setting	Test Current(*)	
	60 Hz	
	Lower Limit	Upper Limit
1.75L	173%	218%
2L	205%	257%
2.25L	241%	300%
2.5L	277%	342%
3L	335%	414%
4L	442%	547%
5L	568%	699%
6L	683%	840%
8L	917%	1128%
10L	1158%	1418%

(*) - Test Current is a percentage of the long-time pickup setting.

C. DELAY:

1. Preset a test current that is fifty (50) percent above the nominal short-time pickup setting.

2. Allow the **etc.** programmer to run at the test current. The programmer **SHOULD** trip between the upper and lower time limits shown in table six. Be sure to set the I2t element, if applicable, to OUT.

3. Repeat the short-time delay test for all three (3) delay bands on one (1) phase and at least one (1) delay band for the remaining phases.

TABLE SIX	
Short-Time Delay Setting	Time In Seconds
Minimum	0.095-0.19
Intermediate	0.21-0.32
Maximum	0.35-0.50

41. SHORT-TIME I2t DELAY TEST

A. PURPOSE: To verify that the I2t delay occurs within tolerance. This requires measurement of time delays at two (2) different test current levels.

1. Set the **etc.** programmer to the following points (if applicable):

   Long-Time Pickup = 1.0X
   Long-Time Delay = Max.
   Instantaneous Pickup = 12L
   Short-Time Pickup = Set At Lowest Pickup Setting
   Short-Time Delay = Int.
   Short-Time I2t = IN

2. Preset a test current from table seven.

3. Allow the **etc.** programmer to run at the test current. The programmer **SHOULD** trip between the upper and lower time limits shown in table seven.

4. Repeat the short-time I2t delay test for all three (3) phases.

TABLE SEVEN

Short-Time Pickup Setting	Test Current(*)	Time In Seconds
(LOW RANGE) 1.75L	300%	1.34-5.34
	400%	1.66-2.76
(HIGH RANGE) 3L	500%	0.99-2.09
	800%	0.42-0.75

(*) - Test Current is a percentage of the long-time pickup setting.

42. GROUND FAULT PICKUP AND DELAY TEST

A. PURPOSE: To verify that the ground fault pickup and delay occurs within tolerance. This requires measurement of the ground fault pickup point and measurement of the ground fault delay time beyond the knee of the published curves. See tables 8 & 9 for test values.

B. PICKUP:

1. Preset a lower test current from table eight.

2. Test incremental increases in test current until a ground fault trip occurs within less than 1.0 seconds. This is the actual ground fault pickup point. The pickup point should fall between the upper and lower test current limits shown in table eight. If a ground fault defeat cable was used, be sure to remove this cable and reconnect the wire harness assembly to the **etc.** programmer prior to energizing the air circuit breaker.

NOTE

In order to ensure that a ground fault trip will occur, do not let the above test exceed more than 1.0 seconds. If the programmer is allowed to operate longer than 30.0 seconds, a trip signal can be received from the long-time trip element for some programmer setting combinations.

3. Repeat the **PICKUP** test for all three (3) phases.

TABLE EIGHT

Ground Fault Pickup Setting	Test Current(*)			
	60 Hz		50 Hz	
	Lower Limit	Upper Limit	Lower Limit	Upper Limit
0.18X	15.7%	20.4%	15.2%	19.8%
0.2X	17.4%	22.7%	16.9%	22.0%
0.22X	19.2%	24.9%	18.6%	24.2%
0.25X	21.8%	28.3%	21.2%	27.5%
0.27X	23.5%	30.6%	22.9%	29.7%
0.3X	26.0%	34.0%	25.4%	33.0%
0.35X	30.5%	39.7%	29.6%	38.5%
0.37X	32.3%	41.9%	31.3%	40.6%
0.4X	34.8%	45.3%	33.9%	44.0%
0.5X	43.6%	56.7%	42.4%	55.0%
0.6X	52.3%	68.0%	50.8%	65.9%
0.7X	61.1%	79.3%	59.3%	76.9%
0.8X	69.8%	90.6%	67.8%	87.9%
1.0X	87.3%	113.3%	84.7%	109.9%
1.5X	130.0%	170.2%	127.0%	165.5%
2.0X	174.6%	227.0%	169.4%	220.7%

(*) - Test Current is a percentage of the tap setting on the current sensors.

C. DELAY:

1. Preset a test current one-hundred (100) percent above the nominal ground fault pickup setting.

2. Allow the **etc.** programmer to run at the test current. The programmer **SHOULD** trip between the upper and lower time limits shown in table nine.

3. Repeat the **DELAY** test for all three (3) delay bands on one (1) phase and at least one (1) delay band for the remaining phases.

TABLE NINE	
Ground Fault Delay Setting	Time In Seconds
Minimum Intermediate Maximum	0.065-0.15 0.165-0.27 0.30-0.43

43. After all testing and settings have been made on the **etc.** programmer unit, apply the two (2) **Satin American Corp.** stickers supplied to each side of the programmer unit as an "entry detection" device. See fig. 1.

44. If there are any problems or questions concerning the equipment supplied within this retrofit kit or with any of the procedures listed in the instruction manual, please feel free to call us at **1-800-272-7711.**

45. TROUBLE-SHOOTING GUIDE

TROUBLE : The programmer operates correctly (i.e. the long-time pickup light illuminates, targets release) but the circuit breaker fails to trip.

POSSIBLE CAUSES :	SOLUTIONS :
The wire harness is not connected to the flux trip device.	Connect the wire harness to the flux trip device in accordance with the wiring diagrams included in this installation manual.
The wire leads are connected to the flux trip device but are reversed.	Reconnect the wire harness to the flux trip device in accordance with the wiring diagrams included in this installation manual.
Incorrect gap adjustment between the flux trip device plunger and the breaker's trip paddle.	Adjust the spacing between the flux trip device plunger and the trip paddle in accordance with this installation manual.
The wire harness is not properly connected to the programmer. **(* - SEE WARNING BELOW!!)**	For etc.11 & etc.11r units, the wire harness includes a polarized plug. Be sure that the plug key is aligned correctly and inserted until the locking mechanism engages. For etc.21, 21r, 31, & 31r programmers, be sure that the wire harness is connected to the programmer terminal block in accordance with this installation manual.

*** - WARNING!! IF THE BREAKER HAS BEEN SUBJECTED TO ANY AMOUNT OF PRIMARY CURRENT WITH AN INCORRECTLY CONNECTED WIRE HARNESS OR HARNESS CONNECTOR. IT IS HIGHLY PROBABLE THAT THE PROGRAMMER AND THE CURRENT SENSORS HAVE BEEN DAMAGED. CONSULT THE FACTORY FOR FURTHER ASSISTANCE.**

TROUBLE : The programmer operates correctly (i.e. the long-time pickup light illuminates, targets release) but the breaker trips early or immediately.

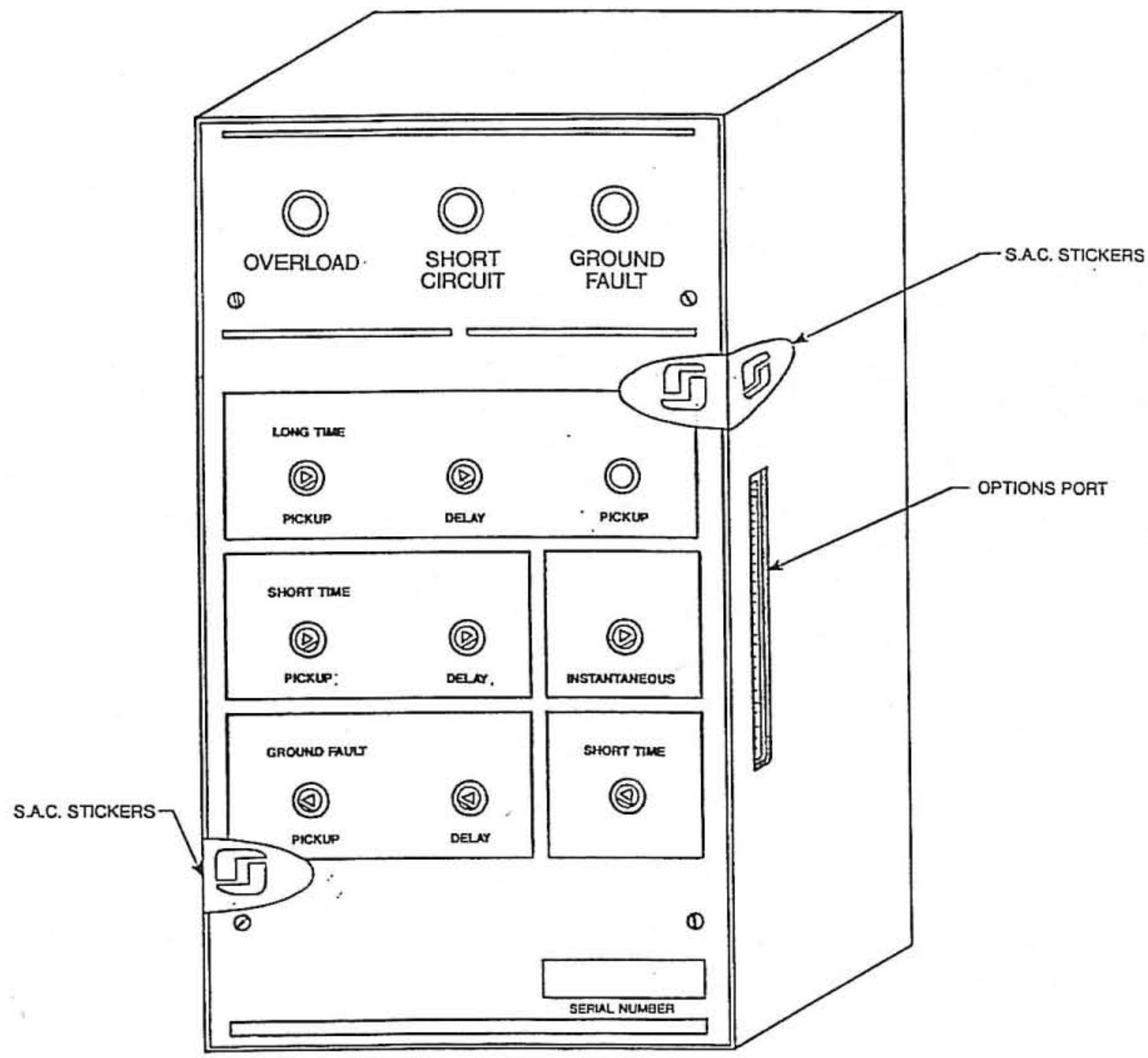
POSSIBLE CAUSE :	SOLUTIONS :
For programmers including ground fault, single-phase testing of the breaker without using a ground fault defeat cable.	If the programmer supplied contains a ground fault trip element, a ground fault defeat cable must be used to test any trip element other than ground fault.
The wire harness is not connected to the same tap on all current sensors.	Be sure that all current sensors have the wire harness connected to the same tap. This includes the neutral sensor on systems utilizing a fourth wire ground fault trip element.
The current sensor polarity markings are not facing the same direction.	Be sure that the all current sensor polarity markings are in the same direction with regards to the current path. For breakers utilizing a fourth wire neutral sensor, be sure that the neutral sensor is mechanically installed in accordance with this installation manual. The mechanical orientation of the neutral sensor establishes the polarity of the primary winding.
The wire harness is connected to the current sensors incorrectly.	Check the wire harness connections on all current sensors to assure that the polarity connections have been made in accordance with this installation manual.

TROUBLE : The programmer operates correctly (i.e. the long-time pickup light illuminates, targets release) but the breaker trips early or immediately.

POSSIBLE CAUSE :	**SOLUTIONS :**
One of the selector switches on the programmer is set in between settings or one of the selector switches were changed during the operation of the programmer.	The selector switches by design do not allow a change in the settings during the operation. Thus a switch positioned in between settings will signal the programmer to trip the breaker. All of the selector switches are supplied with positive detents which do minimize this situation but the operator should take care to avoid this situation and check each selector switch to be sure it is properly positioned.

If the etc. programmer still fails to perform properly, please contact the Satin American Corp. at 1-800-272-7711 for further assistance.

FIG. 1 - TAMPER PROOF DIAGRAM



AFTER ALL SETTINGS HAVE BEEN MADE ON THE **etc.**PROGRAMMER APPLY THE TWO (2) SATIN AMERICAN CORP.STICKERS SUPPLIED TO EACH SIDE OF THE PROGRAMMER BOX AS AN "ENTRY DETECTION."

FIG. 1
TAMPER - PROOF DIAGRAM

FIG. 2A - etc.11/11r CABLING DIAGRAM - 3W LOAD

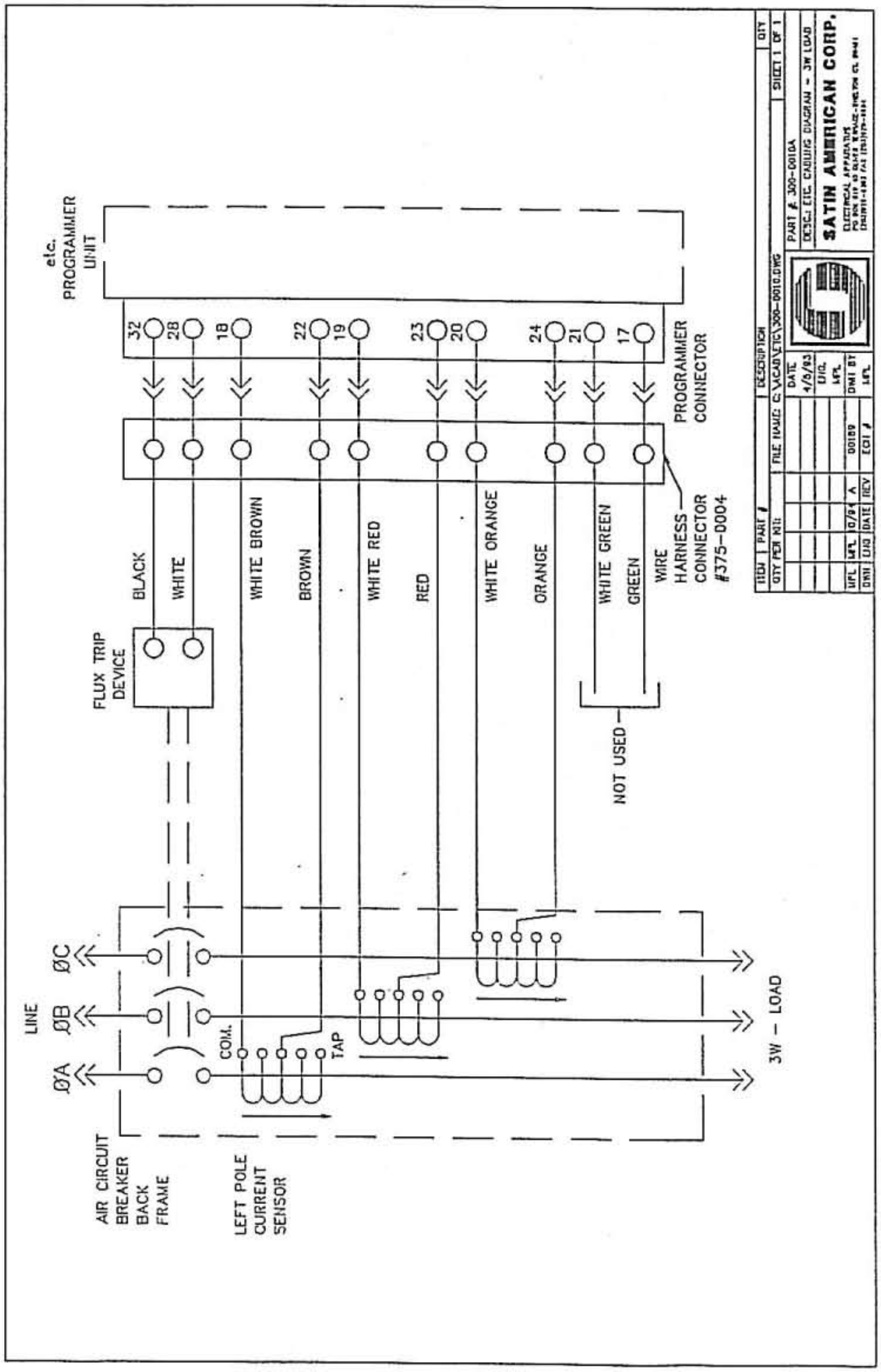


FIG. 2B - etc.11/11r CABLING DIAGRAM - 4W LOAD

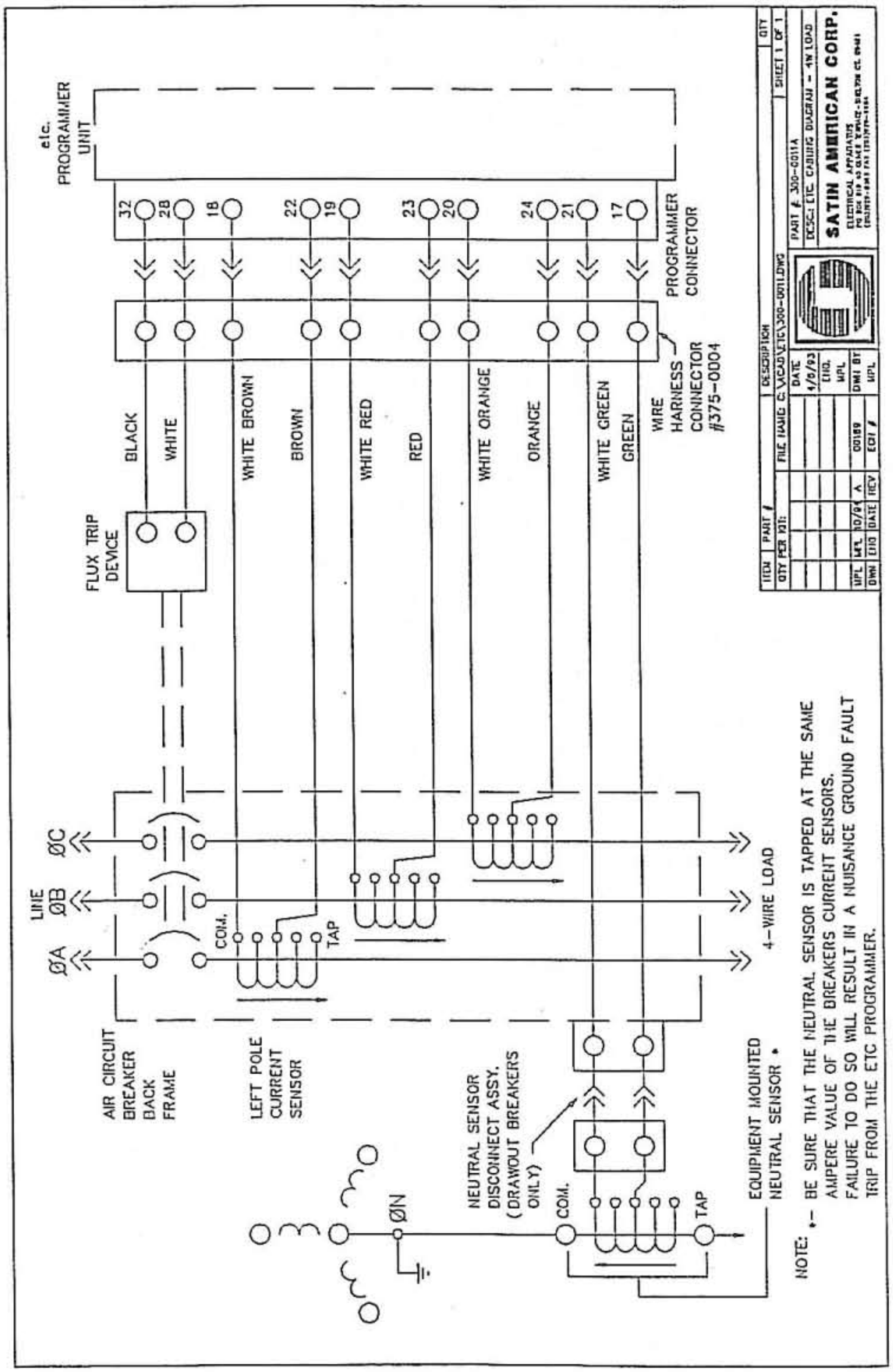


FIG. 3 - ACCESSORY CABLING DIAGRAM

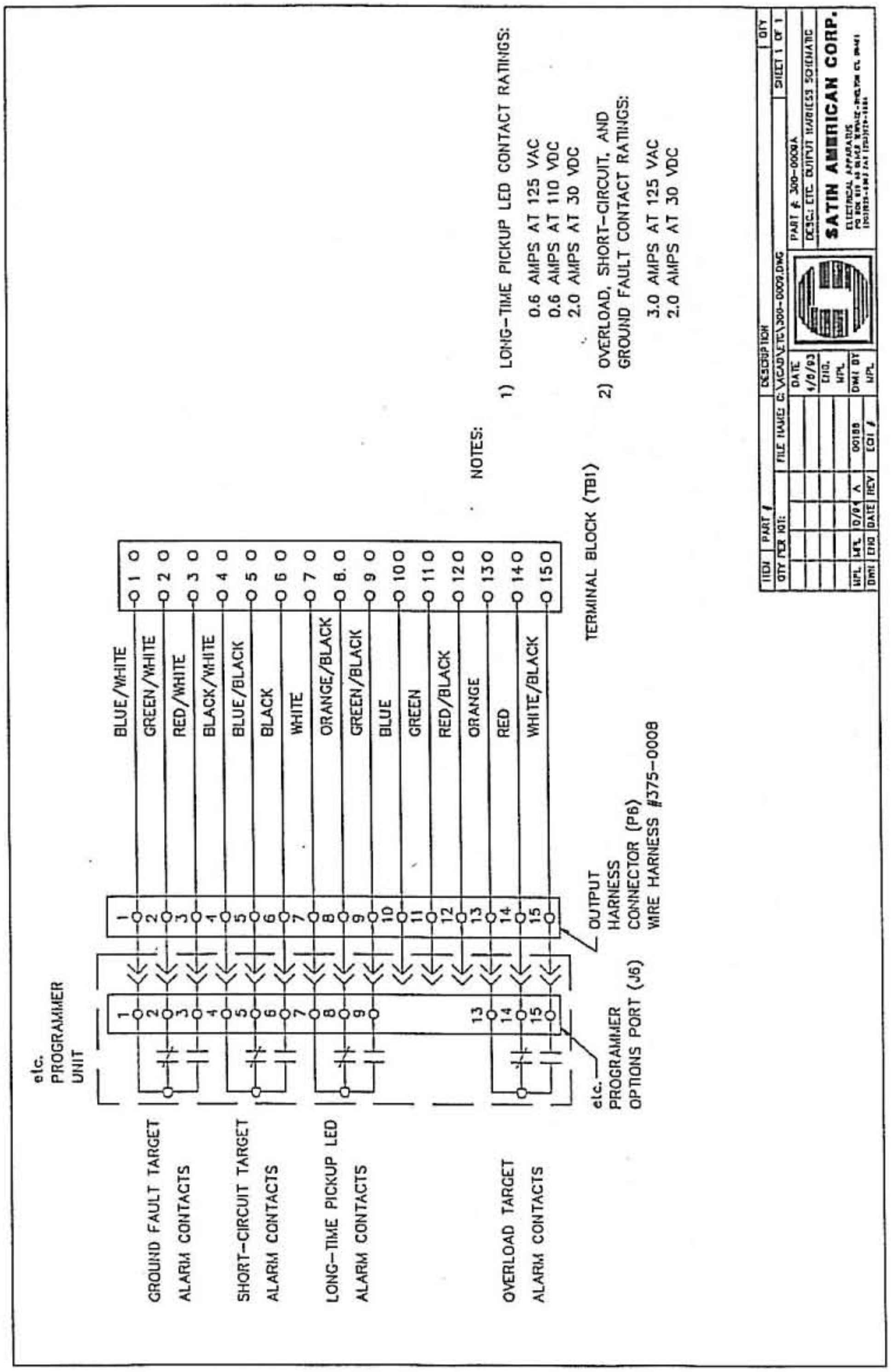


FIG. 4 - GROUND HARNESS ASSY - CABLING DIAGRAM

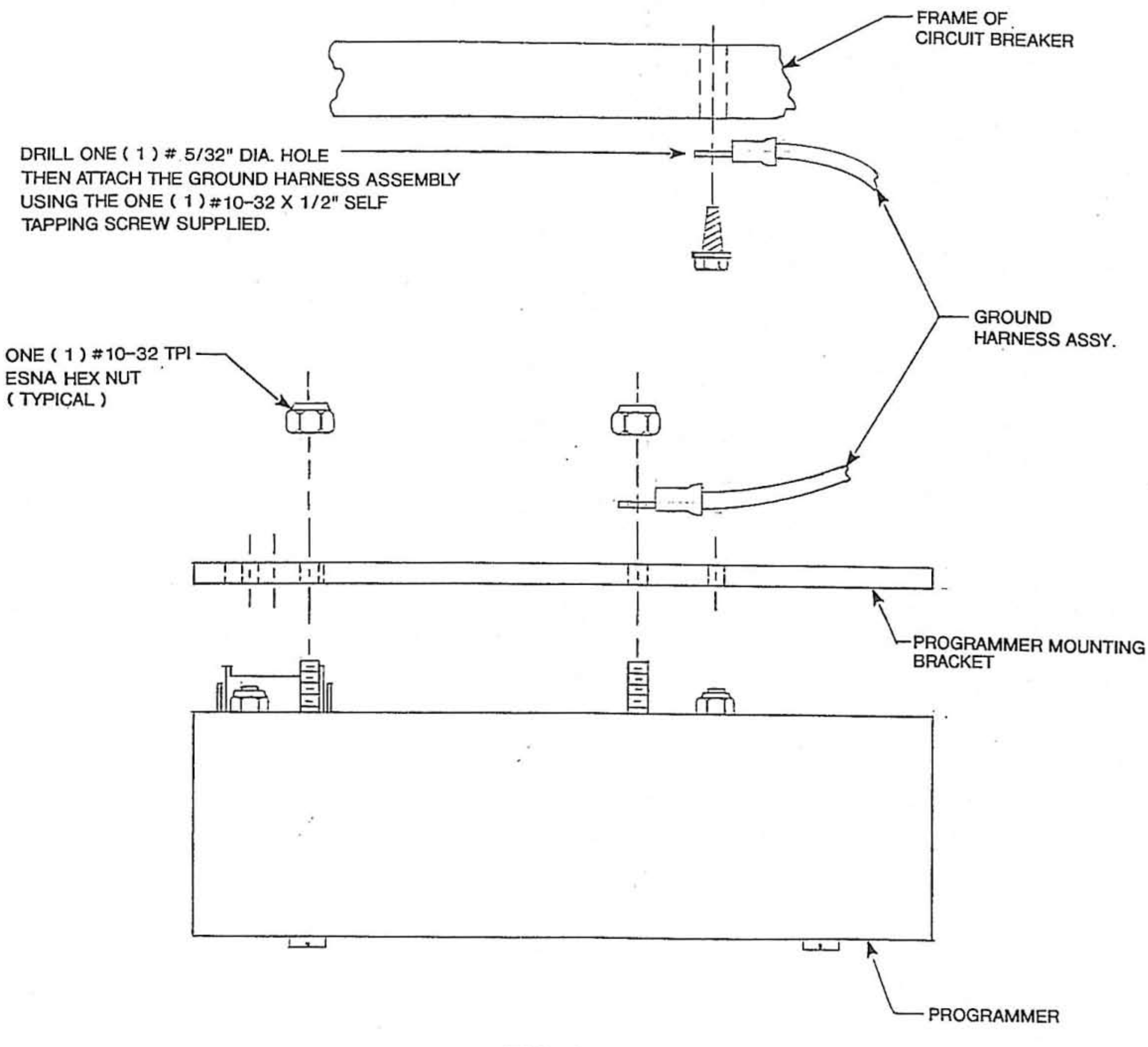


FIG. 4

PROGRAMMER GROUND HARNESS ASSEMBLY
CABLING DIAGRAM

FIG. 5 - KNIFE DISCONNECT ASSEMBLY INSTRUCTIONS

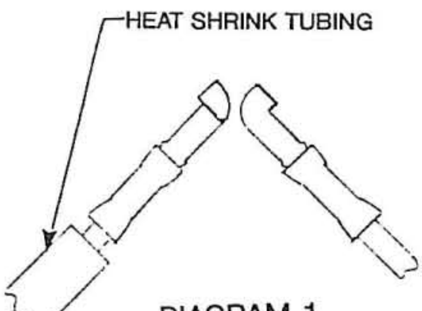


DIAGRAM 1

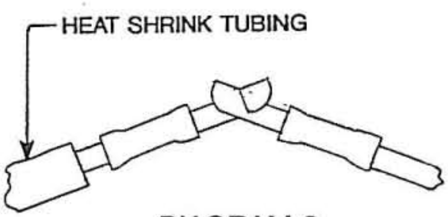
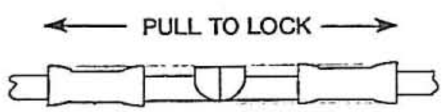
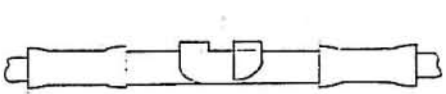


DIAGRAM 2



(CORRECT)

DIAGRAM 3



(INCORRECT)

DIAGRAM 4

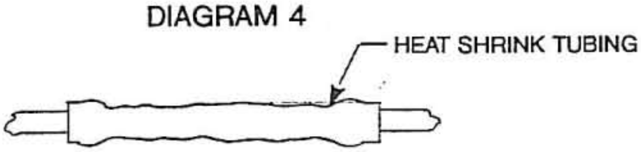


DIAGRAM 5

1. THESE INSTRUCTIONS WILL SERVE AS GUIDE LINES IN THE ASSEMBLY PROCESS FOR FLUX TRIP DEVICES THAT DO NOT CONTAIN A TERMINAL BLOCK.

2. CRIMP KNIFE DISCONNECTS ONTO THE WIRE USING THE RECOMMENDED CRIMPING TOOLS. THEN SLIDE HEAT SHRINK TUBING ONTO WIRE ASSEMBLY. SEE DIAGRAM ONE.

3. POSITION THE TWO (2) KNIFE SWITCHES AS SHOWN IN DIAGRAM ONE.

4. ENGAGE KNIFE DISCONNECTS, KEEPING BLADES IN CLOSELY LOCKED POSITION. SEE DIAGRAM TWO.

5. WITH BOTH KNIFE DISCONNECTS ENGAGED AS SHOWN IN DIAGRAM THREE, PULL WIRES IN OPPOSITE DIRECTION TO ASSURE THAT THE BLADES ARE IN A FULLY LOCKED POSITION. NOTE, IF KNIFE DISCONNECTS ARE ASSEMBLED INCORRECTLY , AS SHOWN IN DIAGRAM FOUR, BLADES MAY NOT PROVIDE GOOD CONTACT WHEN ENGAGED.

6. WITH THE BLADES LOCKED INTO POSITION (SEE DIAGRAM THREE), SLIDE THE HEAT SHRINK TUBING OVER BOTH DISCONNECTS AND APPLY A LOW HEAT SOURCE TO MAKE PERMANENT KNIFE DISCONNECT SPLICE. SEE DIAGRAM FIVE.

FIG. 5

CABLING DIAGRAM FOR FLUX TRIP SOLENOIDS
LESS TERMINAL BLOCK

FIG. 6A - etc.11/11r FUSE KIT CABLING DIAGRAM - 3W LOAD

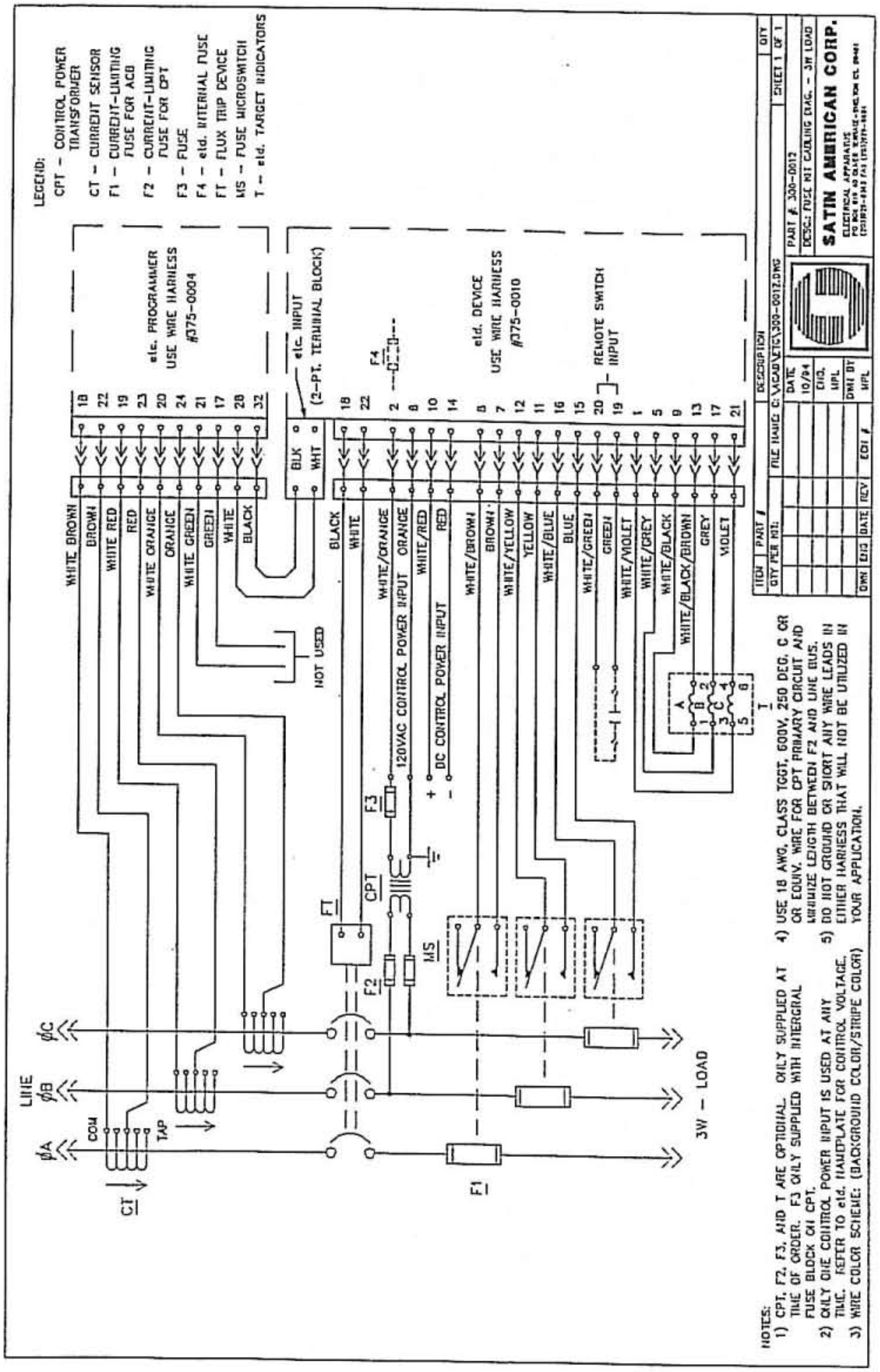


FIG. 6B - etc.11/11r FUSE KIT CABLING DIAGRAM - 4W LOAD