INSTRUCTIONS

GEK-45391B
Supersedes GEK-45391A

STATIC MEASURING UNIT

TYPE SMF51A

GENERAL ELECTRIC

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STATIC MEASURING UNIT
TYPE SMF51A

DESCRIPTION

The Type SMF51A relay measures the amplitude of the modal filter outputs and produces a logic output when the measured level equals or exceeds the set point.

The Type SMF51A relay is not intended to be used by itself but rather as part of a complement of equipment that forms a complete scheme. For a complete description of the overall scheme in which this relay is employed, refer to the overall logic diagram and its associated logic description which are supplied with each terminal of equipment.

* The SMF51A relay is packaged in a four rack unit enclosed metal case (one rack unit equals 1.75 inches high). The relay is suitable for mounting in a 19 inch rack. The mounting and outline dimensions are shown in Fig. 1. The internal connections for the SMF51A relay are shown in Fig. 2, and the component and card locations are shown in Fig. 3.

RATINGS

The Type SMF51A relay is designed for use in an environment where the air temperature outside the relay case does not exceed -20°C or +65°C.

This relay requires a ±15 VDC source which can be obtained from a type SSA power supply.

BURDENS

The SMF51A relay presents a burden of 60 milliamperes to the +15 volt DC supply and 18 milliamperes to the -15 VDC of the type SSA power supply.

OPERATING PRINCIPLES

The functions in the SMF51A are voltage level detectors which operate on the output of the modal filters.

CIRCUIT DESCRIPTION

The outputs of the modal filters drive the level detector either directly or through buffer amplifiers. Buffer amplifiers are required when more than one level detector is to be driven from the output of a modal filter. The buffer amplifiers serve two purposes, first they provide the correct load impedance to the filter outputs, and second they provide adjustable gain to drive multiple level detectors. Two buffer amplifiers are provided on a single printed circuit card.

Before the level of the signal is measured the AC modal filter outputs must be rectified. This is accomplished with a precision AC-to-DC rectifier. This type of rectifier has an extremely low threshold and can operate with input signals having a peak value of 0.1 volts without any noticeable distortion of the output voltage. This DC output voltage is now compared with a reference voltage which is adjustable, if the DC output of the rectifier is greater than or equal to the reference voltage an output will be produced. A fill-in timer follows the level detector to provide a continuous logic signal between half

*Indicates revision

cycles. These three functions (rectifier, level detector, and fill-in timer) are provided on a single printed circuit card.

MATRIX BLOCK

The level detector used to drive the dual mode or bimodal trip logic is chosen by means of a matrix block. This block is located inside the rear compartment of the relay. The outputs to the dual mode logic are C042, 43, 44 and 45. These outputs are connected to the matrix block in accordance with the option chart drawing for the particular scheme. Note these connections are made at the factory and should not be changed unless the change is recommended by The Electric Utility Systems Engineering Department (EUSED) * in Schenectady, New York. In some applications, one or more of these connections may be omitted. See overall logic diagram for the particular scheme.

SETTINGS

All level detectors in the SMF51A require field adjustment. The pickup level is to be set in accordance with the data provided by The Electric Utility Systems Engineering Department (EUSED) in Schenectady, New York.

CONSTRUCTION

* The SMF51A relay is packaged in a four rack unit enclosed metal case with a hinged front cover and a removable top cover (one rack unit = 1.75 inches high).The outline and mounting dimensions of the case and the physical location of the components are shown in Figs. 1 and 3 respectively.

The pickup level of each level detector is adjustable via a potentiometer mounted on the printed circuit card. The printed circuit cards are identified by a code number such as D111 or F145 and plug in from the front of the unit. The sockets are marked with letter designations or "addresses" (A, D, AC, etc.) which appear on the guide strips in front of each socket, on the component location drawing, on the internal connection diagram and on the printed circuit card. The test points (TP1, TP2, etc.) shown on the internal connection diagram are connected to instrument jacks on test cards in positions S, T, AS and AT, with TP1 thru TP10 on card AT, TP11 thru TP20 on card T, TP21 thru TP30 on card AS and TP31 thru 40 on card S. TP1 is at the top of the AT card and is connected to reference, TP10 is tied to +15 VDC thru a 2.2K resistor. This resistor limits the current when TP10 is used to supply a logic signal to a card. * TP2 is connected to -15 VDC.

RECEIVING, HANDLING AND STORAGE

The SMF51A relay will normally be supplied as a part of a static relay equipment, mounted in a rack or cabinet with other static relays and test equipment. Immediately upon receipt of a static relay equipment, it should be unpacked and examined for any damage sustained in transit. If injury or damage resulting from rough handling is evident, file a damage claim at once with the transportation company and promptly notify the nearest General Electric Sales Office.

Reasonable care should be exercised in unpacking the equipment. If the equipment is not to be installed immediately, it should be stored indoors in a location that is free from moisture, dust, metallic chips, and severe atmospheric contaminants.

Just prior to final installation the shipping support bolt should be removed from each side of all relay units, to facilitate possible future unit removal for maintenance. These shipping support bolts are approximately eight inches back from the relay front panel. WARNING: STATIC RELAY EQUIPMENT, WHEN SUPPLIED IN SWING RACK CABINETS, SHOULD BE SECURELY ANCHORED TO THE FLOOR OR TO THE SHIPPING PALLET TO PREVENT THE EQUIPMENT FROM TIPPING OVER WHEN THE SWING RACK IS OPENED.

*Indicates revision

TEST INSTRUCTIONS

CAUTION

THE LOGIC SYSTEM SIDE OF THE DC POWER SUPPLY USED WITH MOD III STATIC RELAY EQUIPMENT IS ISOLATED FROM GROUND. IT IS A DESIGN CHARACTERISTIC OF MOST ELECTRONIC INSTRUMENTS THAT ONE OF THE SIGNAL INPUT TERMINALS IS CONNECTED TO THE INSTRUMENT CHASSIS. IF THE INSTRUMENT USED TO TEST THE RELAY EQUIPMENT IS ISOLATED FROM GROUND, ITS CHASSIS MAY HAVE AN ELECTRICAL POTENTIAL WITH RESPECT TO GROUND. THE USE OF A TEST INSTRUMENT WITH A GROUND CHASSIS WILL NOT AFFECT THE TESTING OF THE EQUIPMENT. HOWEVER, A SECOND GROUND CONNECTION TO THE EQUIPMENT, SUCH AS A TEST LEAD INADVERTENTLY DROPPING AGAINST THE RELAY CASE, MAY CAUSE DAMAGE TO THE LOGIC CIRCUITRY. NO EXTERNAL TEST EQUIPMENT SHOULD BE LEFT CONNECTED TO THE STATIC RELAYS WHEN THEY ARE IN PROTECTIVE SERVICE, SINCE TEST EQUIPMENT GROUNDING REDUCES THE EFFECTIVENESS OF THE ISOLATION PROVIDED.

IF THE SMF51A RELAY THAT IS TO BE TESTED IS INSTALLED IN AN EQUIPMENT WHICH HAS ALREADY BEEN CONNECTED TO THE POWER SYSTEM, DISCONNECT THE OUTPUTS IN THE ASSOCIATED TYPE SMAT RELAY FROM THE SYSTEM DURING TEST.

GENERAL

The SMF51A relay is supplied from the factory either as a separate unit, or mounted in a static relay equipment. All relay units for a given terminal of static relaying equipment are tested together at the factory, and each unit will have the same summary number stamped on its nameplate.

OPERATIONAL CHECKS

Operation of the SMF51A unit can be checked by observing the signals at the forty test points (TP1 to TP40), or by observing the output functions in the associated Type SMAT tripping relay. The test points are located on four test cards in positions S, T, AS and AT, and are numbered 1 to 40. TP1 is the reference bus for the logic circuit; TP10 is at +15 VDC, and TP2 is at -15 VDC. The remaining points are located at various strategic points throughout the logic as shown on the internal connection diagram Fig. 1. Test point voltages can be monitored with a portable high impedance voltmeter, the test lamps in the SMAT51B, or an oscilloscope.

TEST CARD ADAPTER

The test card adapter provides a convenient means of gaining access to any pin of a particular card. Detailed information on the use of the test adapter card is included in the instruction book GEK-34158.

SETTING LEVEL DETECTORS

Two methods can be employed to set the level detectors. The first method requires a signal of the correct amplitude and frequency be injected into the demodulator. The signal level is measured at the * SMF51A input test points TP3 thru TP8** and adjusted to the correct level. The associated level detector is then adjusted for pickup. The other method uses a signal injected directly into the SMF51A. This method requires that the gain-phase cards in the filter equipment be removed. The signal is set to the proper level and the associated level detector adjusted for pickup. A test lamp in the SMAT51B can be connected to the output of the level detector under test to determine the point at which it picks up.

Table I lists all the level detectors and the associated test points.**

*Indicates revision

**In some applications, several level detectors may be omitted. Refer to card omission chart for the particular scheme and the overall logic diagram.

TABLE I

Amplifier		Level Detector		Test Point		Note
Position	Pot	Number	Position	Input	Output	
F	Upper	421	B	5	13	1
		422	C	5	14	2
F	Lower	423	D	5	15	1
		424	E	5	16	2
AF	Upper	425	AB	6	17	1
		426	AC	6	18	2
AF	Lower	427	AD	6	19	1
		428	AE	6	20	2
G	Upper	429	H	7	21	1
		430	J	7	22	2
G	Lower	431	K	7	23	1
		432	L	7	24	2
AG	Upper	433	AH	8	25	1
		434	AJ	8	26	2
AG	Lower	435	AK	8	27	1
		436	AL	8	28	2
-	-	437	A	3	11	3
-	-	438	AA	4	12	3

NOTES

1) Set the pot on the level detector card to mid-range and adjust the associated amplifier gain pot on the F145 card to obtain pickup.

2) Adjust the pot on the level detector card for pickup. If the desired pickup cannot be obtained adjust the associated amplifier gain pot on the F145 card to obtain pickup. Then readjust the previous level detector.

3) Adjust the pot on the level detector card for pickup.

OVERALL EQUIPMENT TESTS

After the SMF51A relay and the associated static relay units have been individually calibrated and tested for the desired settings, a series of overall operating checks is advisable.

The elementary, overall logic, and logic description for the specific job will be useful determining the overall operation of the scheme.

MAINTENANCE

PERIODIC TESTS

The pickup level of the various functions may be checked at periodic intervals using procedures described in the TESTING section.

TROUBLE SHOOTING

In any trouble shooting of equipment, it should first be established which unit is functioning incorrectly. The overall logic diagram supplied with the equipment shows the combined logic of the complete

equipment and the various test points in each unit. By signal tracing, using the overall logic diagram and the various test points, it should be possible to quickly isolate the trouble.

A test adapter card is supplied with each static relay equipment to supplement the prewired test points on the test cards. Use of the adapter card is described in the card instruction book GEK-34158.

A dual-trace oscilloscope is a valuable aid to detailed trouble shooting, since it can be used to determine phase shift, operate and reset times as well as input and output levels. A portable dual-trace oscilloscope with a calibrated sweep and trigger facility is recommended.

SPARE PARTS

To minimize possible outage time, it is recommended that a complete maintenance program should include the stocking of at least one spare card of each type. It is possible to replace damaged or defective components on the printed circuit cards, but great care should be taken in soldering so as not to damage or bridge-over the printed circuit busses, or overheat the semiconductor components. The repaired area should be recovered with a suitable high-dielectric plastic coating to prevent possible breakdowns across the printed busses due to moisture and dust. The wiring diagrams for the cards in the SMF51A relay are included in the card instruction book GEK-34158.

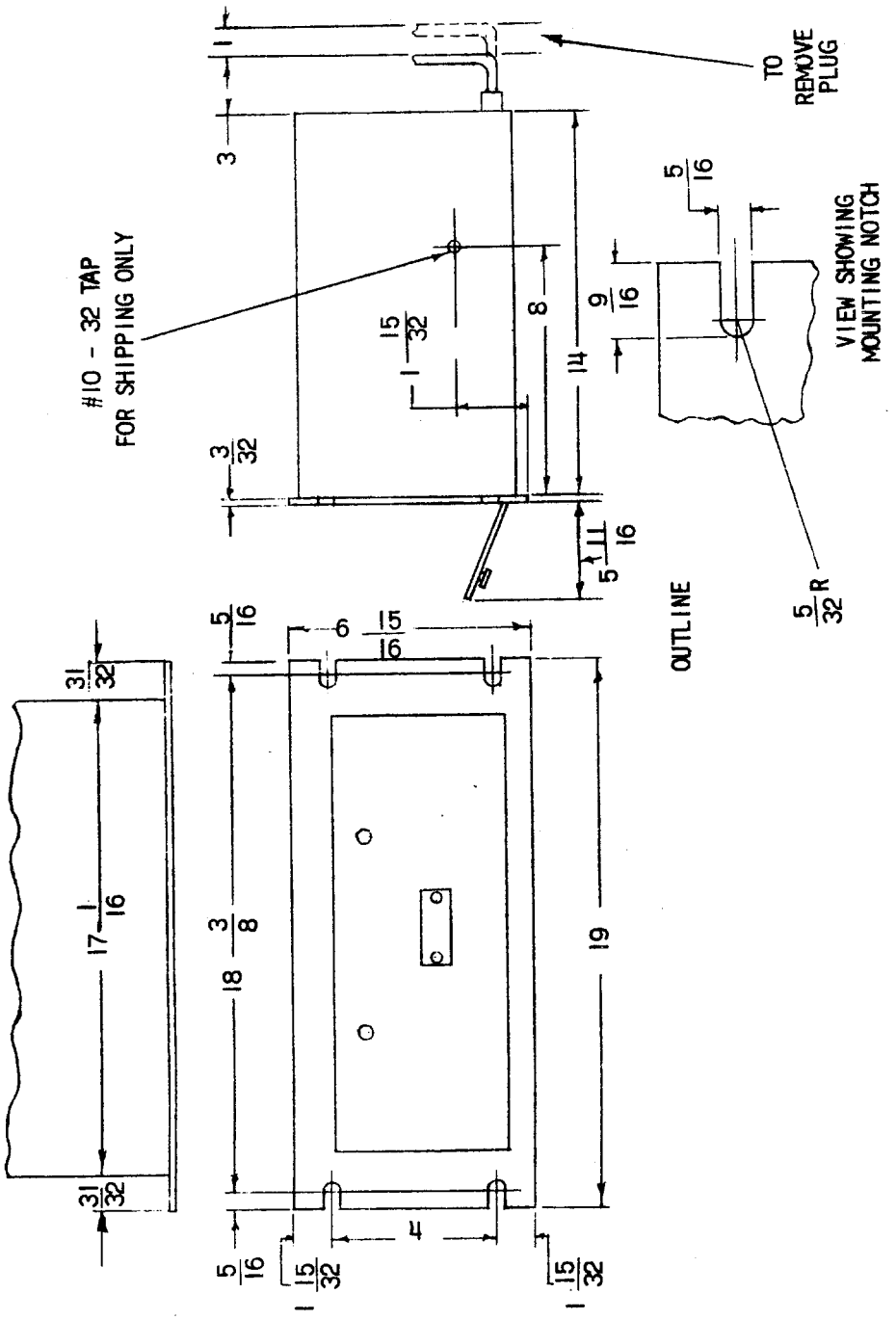

Fig. 1 (0227A2037-0) Outline and Mounting Dimensions

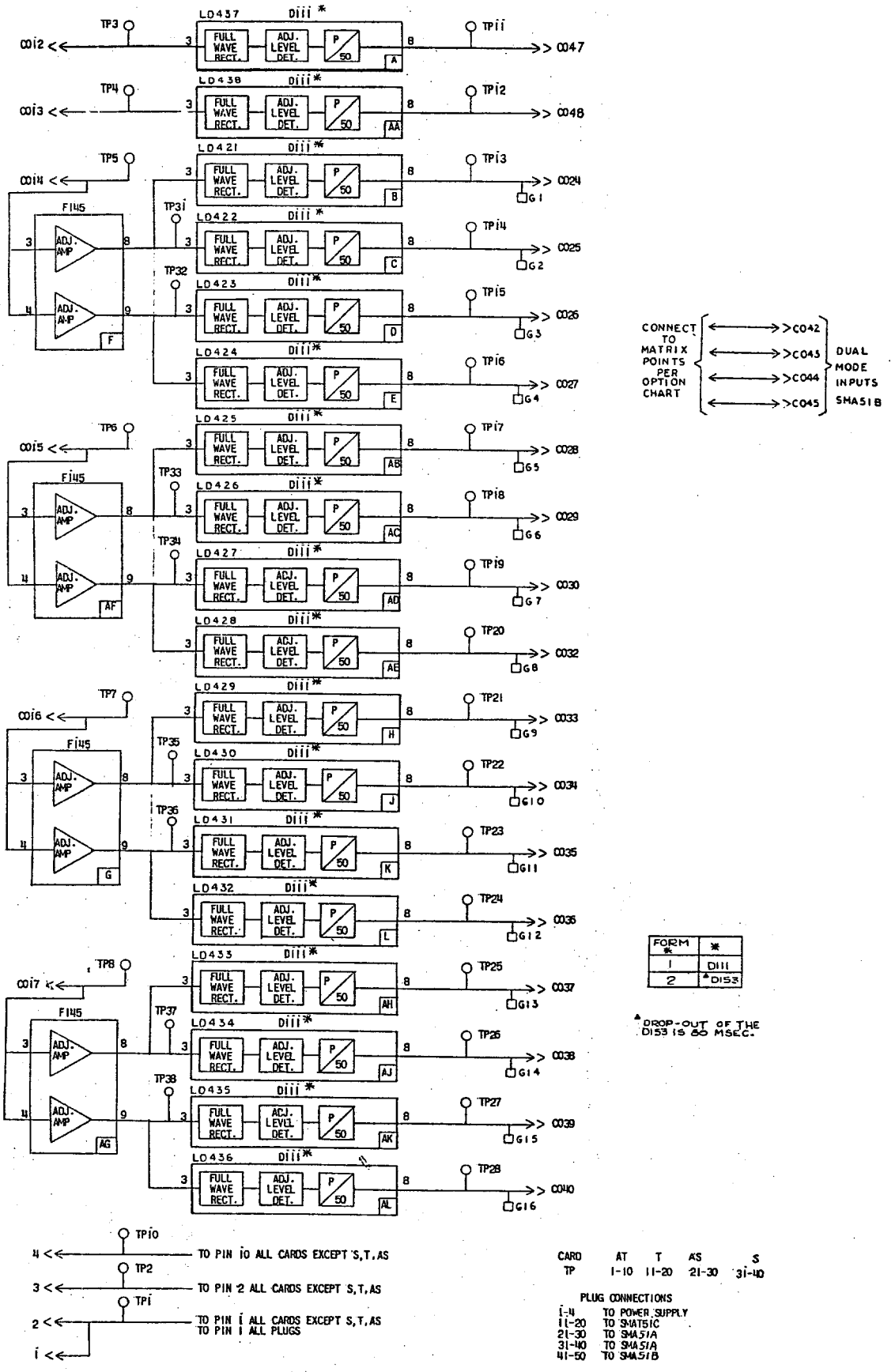

Fig. 2 (0167C8714-4) Internal Connections for the Type SMF51A Relay

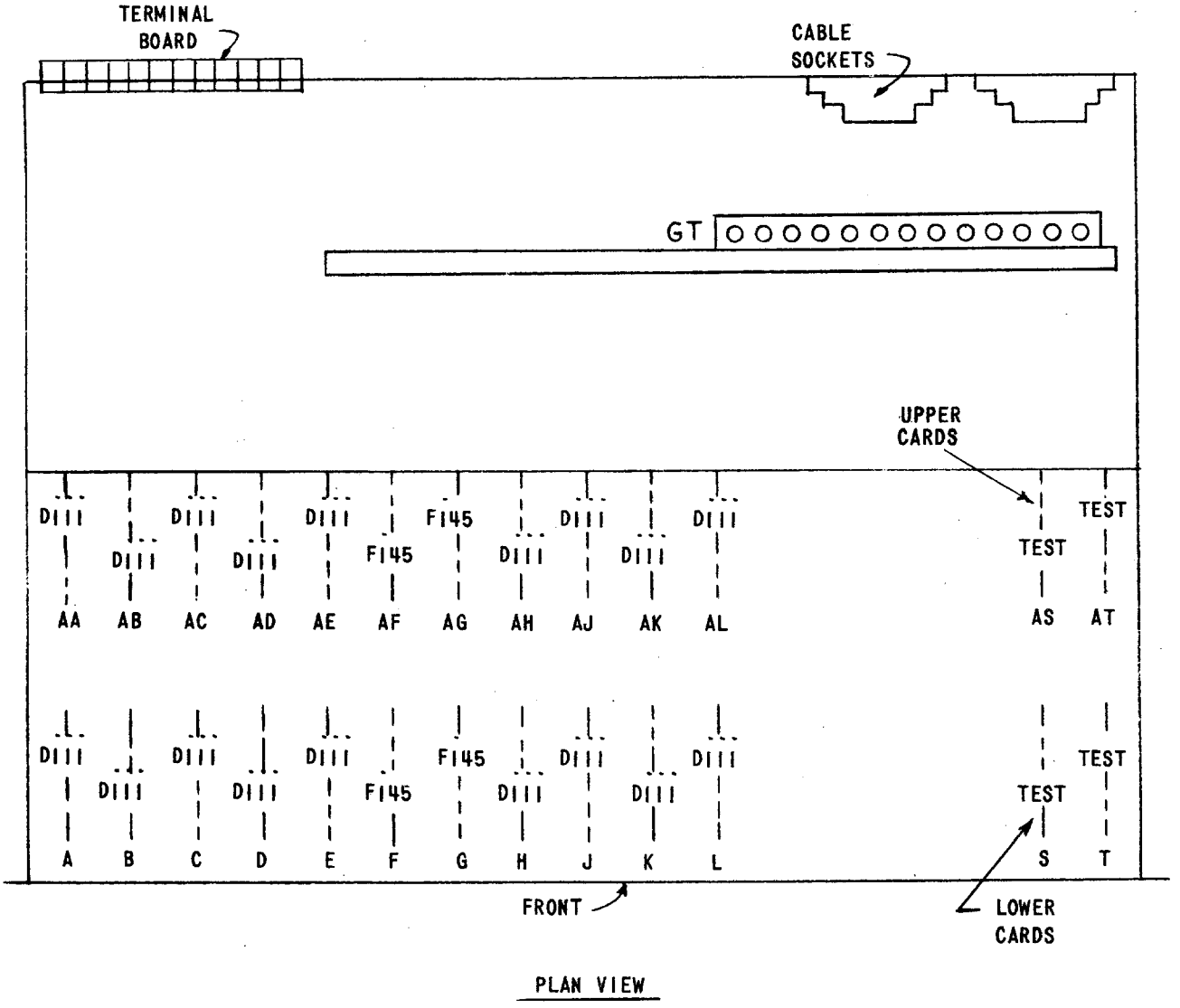

Fig. 3 (0257A6277-1) Component Location Diagram SMF51A

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