

1968 16

SIZE	A	E- 850665-A	
		SHEET 1	TOTAL 15
AUTOMATIC ELECTRIC CO.		NORTH LAKE, ILLINOIS U.S.A.	

CIRCUIT EXPLANATION

M

COMMON EQPT. FOR
LINE FINDERS
H-850665-A

(Written specifically for circuit issue 4
but may also apply to later issues. Refer
to H print for appropriate E issue number.)

Rewritten
Issue 2
11/67:kiv

GENERAL

This circuit is designed to operate as a single Common Equipment Circuit to seize idle Finders on a sequential basis. This Common Equipment For Line Finders Ckt. (group relays) provides the pulsing, and controls the vertical stepping until the desired level is reached. The Group Relays then transfer the Finder to rotary stepping enabling it to find one of 200 lines that desires to place a call. The arrangement of circuits associated with Common Eqpt. for Linefinders is shown in FIG BD, sheet 3 of E-850665-A.

There are a maximum of 20 Finders per shelf divided into group A and group B Finders with one set of group relays per Finder group. When all the Finders in a group become busy the group relays transfer a calling line desiring to place a call into the other group relays.

Traffic Grading is provided but requires a modified Start And Level Transfer Circuit (FIG 1A) and a Start Lead Transfer Circuit (FIG 10A). These figures will transfer a call from the Finder unit used for traffic grading (when all Finders are busy on that shelf), back to the original Finder group relays.

For traffic grading an additional Finder shelf is provided with its own group relays.

A specific group of line relay circuits have their line and control leads appearing on the banks of two Finder shelves. Served from a common group of line relays, each is connected to one of 10 Start and Level Marking leads shown in FIG 1A. Each start lead is common to 20 lines as follows:

Lines	11	to	10	and	111	to	110	are	connected	to	start	lead	1.
"	21	"	20	"	121	"	120	"	"	"	"	"	2.
"	31	"	30	"	131	"	130	"	"	"	"	"	3.
"	41	"	40	"	141	"	140	"	"	"	"	"	4.

WRITTEN BY

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APPROVED

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Lines 51 to 50 and 151 to 150 are connected to start lead 5.
 " 61 " 60 " 161 " 160 " " " " 6.
 " 71 " 70 " 171 " 170 " " " " " 7.
 " 81 " 80 " 181 " 180 " " " " " 8.
 " 91 " 90 " 191 " 190 " " " " " 9.
 " 01 " 00 " 101 " 100 " " " " " 10.

The group relays will alert a Testman if one of the Finders fails to release. If a line desiring a trunk cannot be provided with a Finder, the group relays will alert a Testman. The group relays will also alert the Testman if a Finder is blocked or can't complete its stepping.

The Distributor switch is normally associated with each set of Group Relays and serves as a call Allotter.

In the following explanation, group A is considered entirely; the operation of group B is similar

FEATURES

- a) Start and Level marking with 2000 ohm ground.
- b) Vertical stepping relay and interrupter relay controlled over separate circuits to prevent feed back.
- c) Two level Distributor switch with spark-killer network.
- d) Fault timing and automatic transfer to associated Group Relays
- e) Message Register Test Jack
- f) Release relay
- g) Traffic grading with start lead transfer circuit.

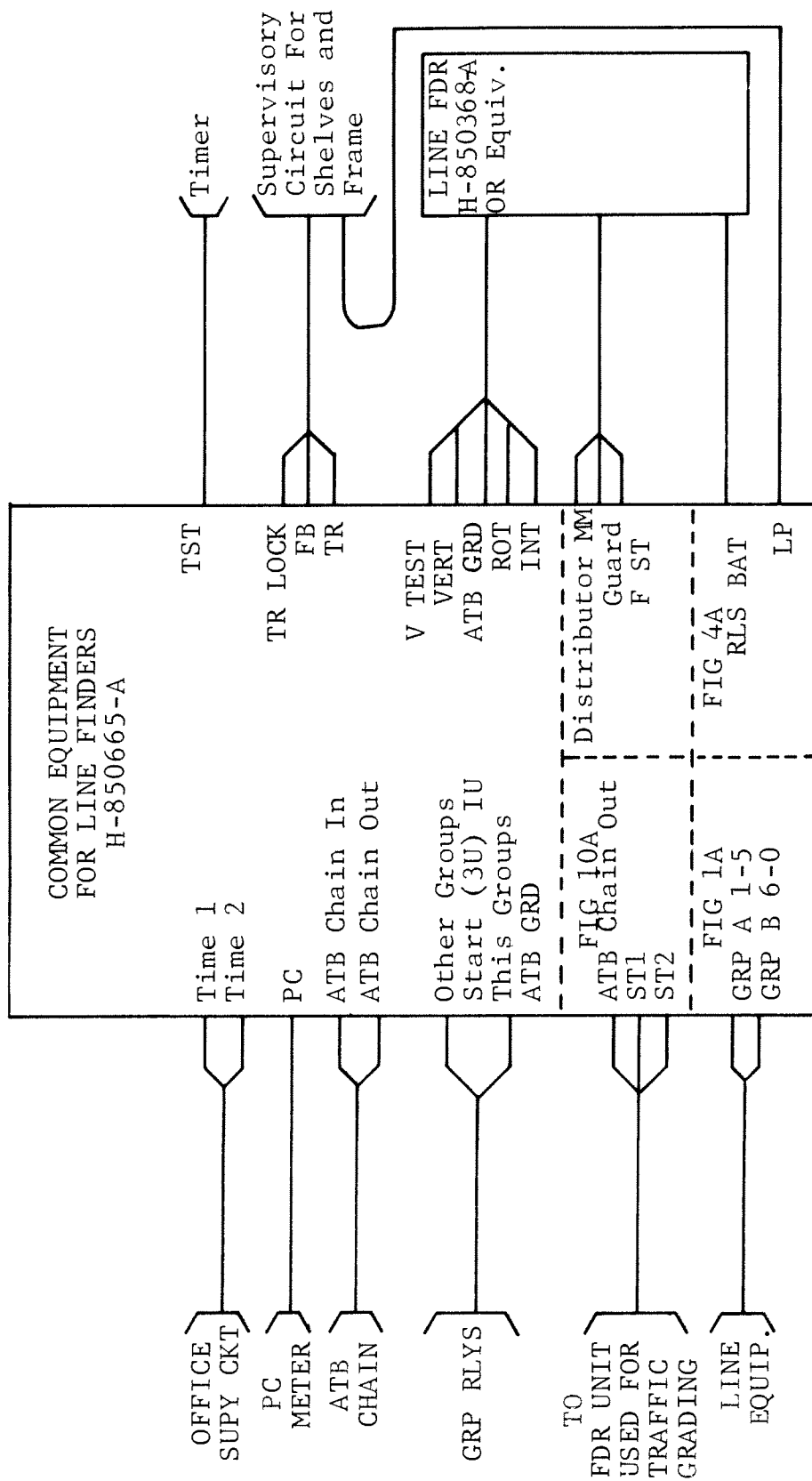
CIRCUIT OPERATION

1.00 Regular Finder Unit

1.01 Start of Group Relays (Operated: Relay ATB)

Ground received via lead STA closes relay ST. Relay ST operates, closes relay TST, and connects ground to lead SS. Relay TST operates, closes relay SW in series with magnet MM (FIG 12A) (magnet MM does not operate in series with SW), connects resistance (#1TMT) battery to lead TIME 1, connects ground to lead TEST 1 via #1TO, connects ground to lead TEST 2 via #1TT, and grounds lead TST and terminal 14L or (16L). Relay SW operates, locks, closes #2TO and #2TT in series via

FIG BD
A TYPICAL ARRANGEMENT OF EQUIPMENT



LETTER IN BLOCKS REFER TO LEAD DESIGNATIONS

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resistor B, connects lead GUARD to the Distributor magnet MM, connects #2FB and #2INT in multiple to lead INT, and grounds leads ATB GRD and F ST, causing ground to be returned via lead INT.

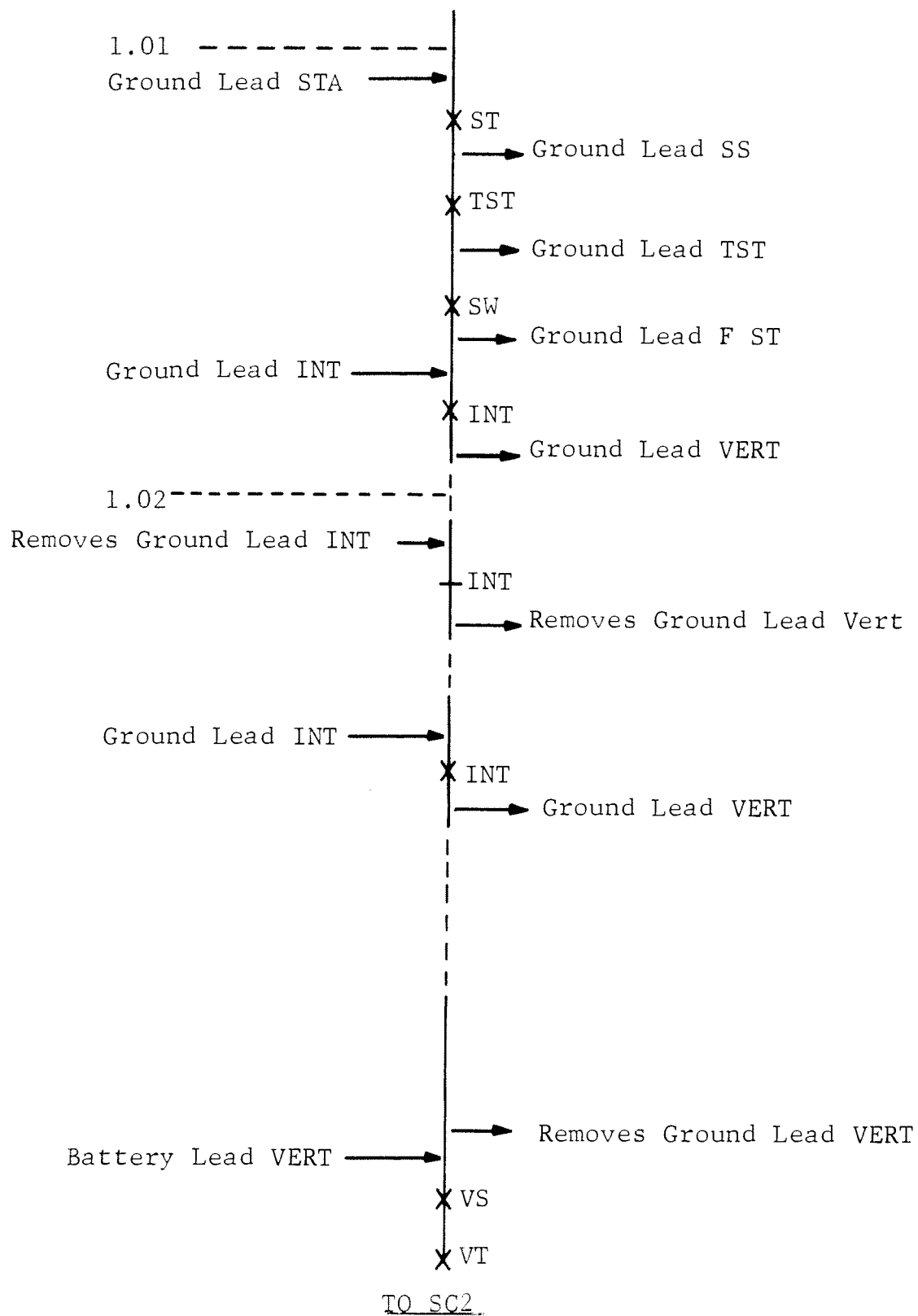
Ground returned via lead INT closes #2INT. Relay INT operates, grounds lead VERT and connects resistance (#2VS) ground to lead V TEST.

1.02 Group Relays Cause Vertical Hunting (Operated: Relays ATB, ST, SW, INT and TST)

When the associated switch removes ground from lead INT, #2INT is opened. Relay INT restores, disconnects resistance (#2VS) ground from lead V TEST, and removes ground from lead VERT, causing ground to be returned via lead INT. Ground returned via lead INT closes #2INT. Relay INT operates, grounds lead VERT and connects resistance (#2VS) ground to lead V TEST. Relay INT follows the ground pulses via lead INT and continues to pulse in this manner until a vert. bank level marked by ground is reached. Ground is removed from lead INT, and #2INT is opened. Relay INT restores. Battery via lead VERT and ground via lead V TEST closes #2VS. Relay VS operates, locks via its #1 winding in series with #2VT, and opens the pulsing circuit. Relay VT operates to its "X" contacts, locks via its #1 winding, operates fully, opens relay VS and #2INT, closes #1 and #2INT in series, transfers the pulsing leads from VERT to ROT, and grounds lead PC for peg count registration. Ground returned via lead INT closes relay INT. Relay INT operates. Relay VS restores and grounds lead ROT.

1.03 Group Relays Cause Rotary Hunting (Operated: Relays ATB, ST, SW, INT, VT, and TST)

When the associated switch removes ground from lead INT, #1 and #2INT are opened. Relay INT restores and removes ground from lead ROT, causing ground to be returned via lead INT. Ground returned via lead INT closes #1 and #2INT. Relay INT operates and grounds lead ROT. Relay INT follows the ground pulses via lead INT and continues to pulse in this manner until the associated circuit finds the subscribers line (upper or lower bank) marked by resistance battery or the eleventh rotary step is taken. The resistance battery returned via leads TEST 1 or TEST 2 closes #1TO or #1TT. Relay TO or TT operates and transfers ground from lead ROT (causing the associated switch to end its rotary hunting) to lead RLY UB or RLY LB. Ground is removed from lead INT opening relay INT. Relay INT restores. At this time the Subscriber hears DIAL TONE.

Sequence ChartsSC 1

1.04 Distributor Selects Next Idle Finder [Operated: Relays ATB, ST, SW, INT, VT, TST and TO (or TT)]

When ground is removed from lead ST A, ST is opened. Relay ST restores (if no other call has been originated in the group) and removes ground from lead SS, extinguishing a lamp.

Ground on lead GUARD via LEV A (P), closes motor magnet MM, and short-circuits relay SW. Motor magnet MM operates, and disconnects lead MM from lead DI. Relay SW restores, opens relays INT and TST, removes ground from leads F ST and ATB GRD, and transfers lead GUARD from lead MM to lead DI opening motor magnet MM. Motor magnet MM restores, advancing the wipers of the DISTRIBUTOR switch one step to another set of bank contacts associated with the next Finder. If the next Finder is busy, ground on lead GUARD closes motor magnet MM, which operates, interrupts its own circuit, and advances the wipers to the next Linefinder. This stepping action continues as long as busy Finders (ground on lead GUARD) are encountered.

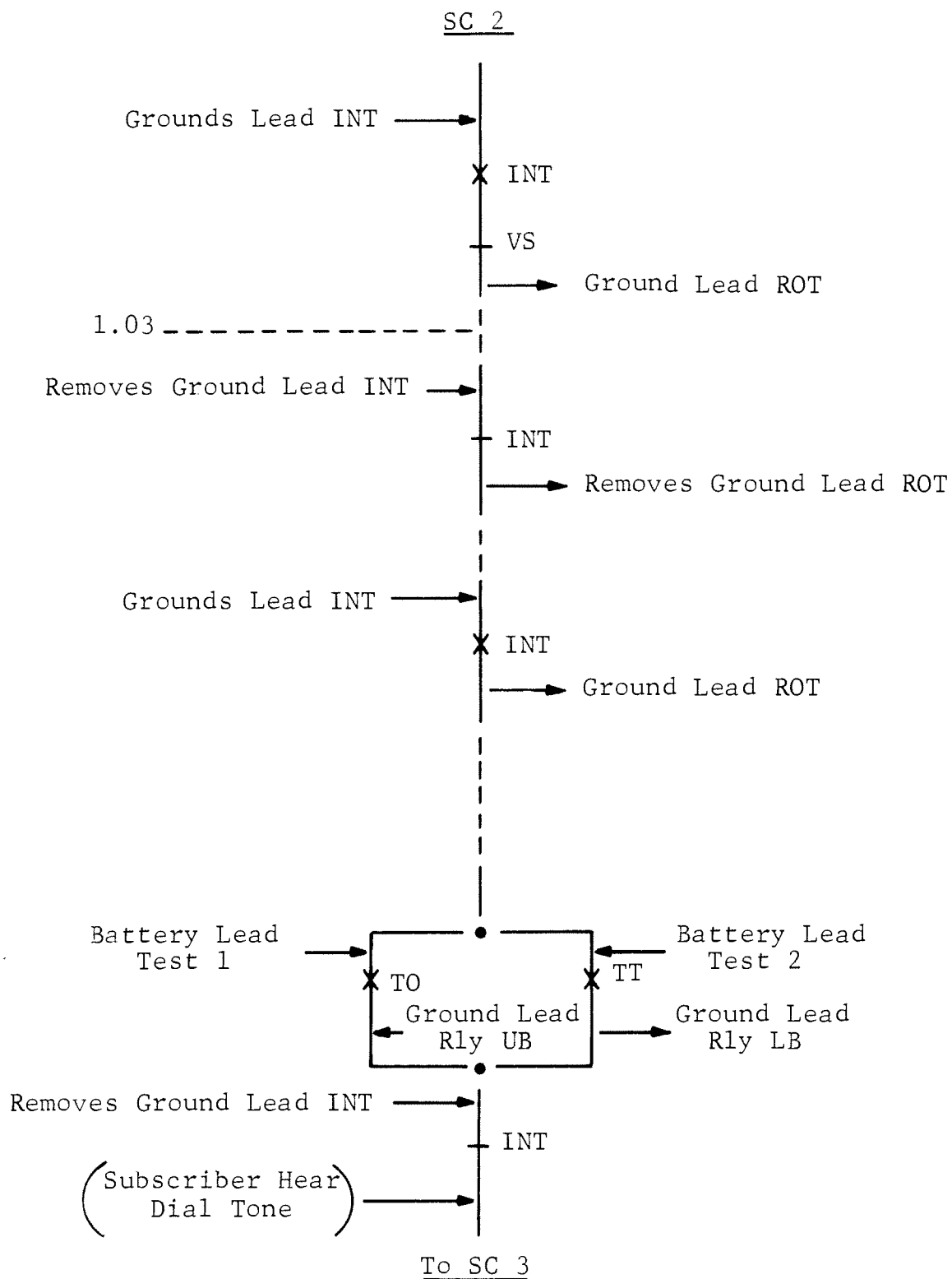
Relay INT restores, disconnects ground from lead RLY UB or lead RLY LB. Relay TST restores, opens #1VT, #2TO and #2TT, opens #1TO (or #1TT), disconnects ground from lead TST, disconnects ground from terminal 14L or (16L) and disconnects resistance (#1TMT) battery from lead TIME 1. Relay VT restores, disconnects ground from lead PC. Relay TO (or TT) restores.

When there is more than one call originating in the group, the preceding circuit (line circuit) holds ground on lead ST A holding relay ST operated. The following sequence of operations is the same as previously described.

Relay ATB is normally held operated from one or several idle Finders. When the last idle Finder of a group is seized, ground is removed from lead ATB GRD (15L). Relay ATB remains operated by ground from relay SW until the Group Relays have released the last Finder in a group leaving all the Finders busy. The following operation is the same as that described in Section 1.04 except that after relay SW restores it opens relay ATB.

1.05 All Finders Busy

When relay SW restores, relay ATB is opened. Relay ATB restores and disconnects DISTRIBUTOR Motor Magnet from remaining busy Finders (via lead GUARD). Relay ATB restores, transfers lead ST A from relay ST to lead START 3U or (1U) and ST B. Therefore, all further calls from lines in group A (as long as all Finders in group A are busy), will cause the operation of group relays B and a Finder in group B.



In addition, ATB in restoring, disconnects terminal 16L or (14L) from terminal 18L, allowing Finders of group B to step above the fifth level (as required for finding lines of group A on the banks of group B Finders), opens magnet MM of Distributor A to prevent it from searching for an idle Finder, and connects lead ATB CHAIN IN to lead ATB CHAIN OUT. As soon as a Finder in the busy group is released, ATB re-operates, and this group is automatically restored to service.

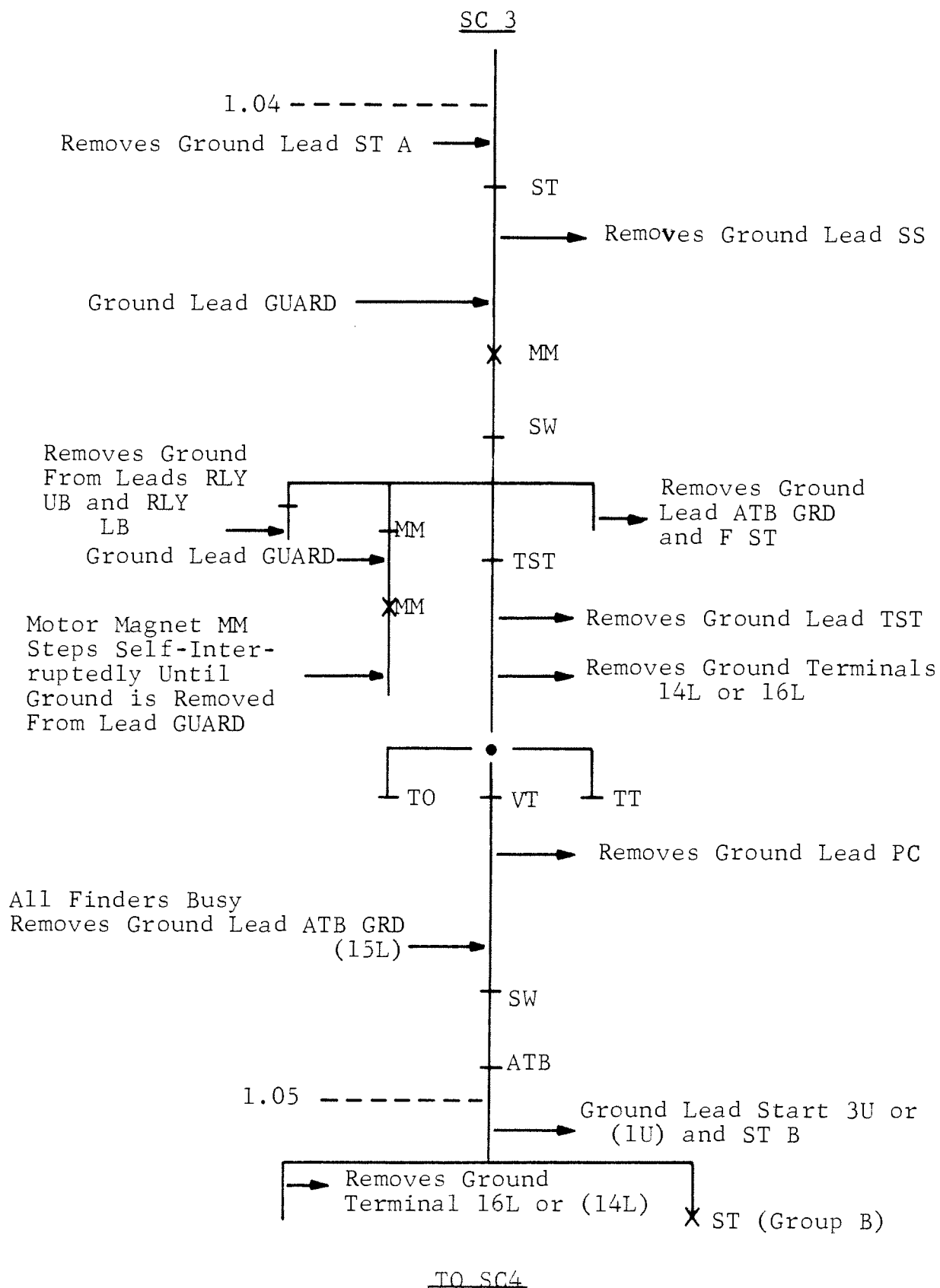
Lines in group B are transferred in the same manner to group A when all Finders in group B are busy.

When all Finders in both groups A and B are busy, both ATB relays are restored. The circuits to both ST relays are opened so that any further calls can not operate relay ST. Any call originated during this period must wait for a Finder to become idle. As soon as the Finder (in either group A or B) becomes idle, this Finder causes its associated group relays to be restored to service and immediately search for any waiting call.

1.06 Group Relay Transfer Timing Circuit (Operated: Relays TST, ATB and ST)

Relay TST operated, closes a circuit to a transfer timer by grounding lead T ST and connecting #1TMT to lead TIME 1. A ground pulse on lead TIME 1 closes #1TMT. Relay TMT operates, locks via its #2 winding, and closes #1TR to lead TIME 2. Relay TR operates, locks on its #2 winding via lead -MB and lead TR LOCK, closes #1FB, opens #1TMT and relay ATB, closes motor magnet MM and short-circuits relay SW. Motor magnet MM operates, disconnects lead D1 from the motor magnet MM and lead MM. Relay FB operates, locks, and connects lead FB to lead F BL, (lighting a lamp). Relay ATB restores, transfers lead ST A from relay ST and lead START (3U) or 1U to leads STB and START (1U) or 3U, opens relay ST, disconnects terminal 18L from terminal 16L or (14L), connects lead ATB CHAIN IN to lead ATB CHAIN OUT and removes ground from terminal 14L or (16L). Relay ST restore, opens relay TST and #2TMT, disconnects lead GUARD from lead D1, removes ground from lead SS, extinguishing a lamp and opens motor magnet MM. Motor magnet MM restores, advancing the wipers of the DISTRIBUTOR switch one step to another set of bank contacts associated with the next Finder and connects lead D1 to the motor magnet MM and lead MM. Relay TST restores, disconnects resistance (#1TO) ground from lead TEST 1, disconnects resistance (#1TT) ground from lead TEST 2 and disconnects ground from lead T ST. Relay TMT restores and disconnects lead TIME 2 from #1TR.

The waiting call that has caused the timed transfer is now found by the other group.



Relay TR is held operated until all the Finders in the other group become busy or until manually released by momentarily operating the BSY KEY or a reset key. Relay FB remains operated until released by the manual operation of a reset key, disconnecting ground from lead TR which would cause the release of relay TR via lead TR LOCK, if it is still operated. Relay TR restores and closes relay ATB. Relay ATB operates, transfers lead STA from leads START 3U or (1U) and STB to relay ST and lead START (3U) or 1U and disconnects lead ATB CHAIN IN from lead ATB CHAIN OUT.

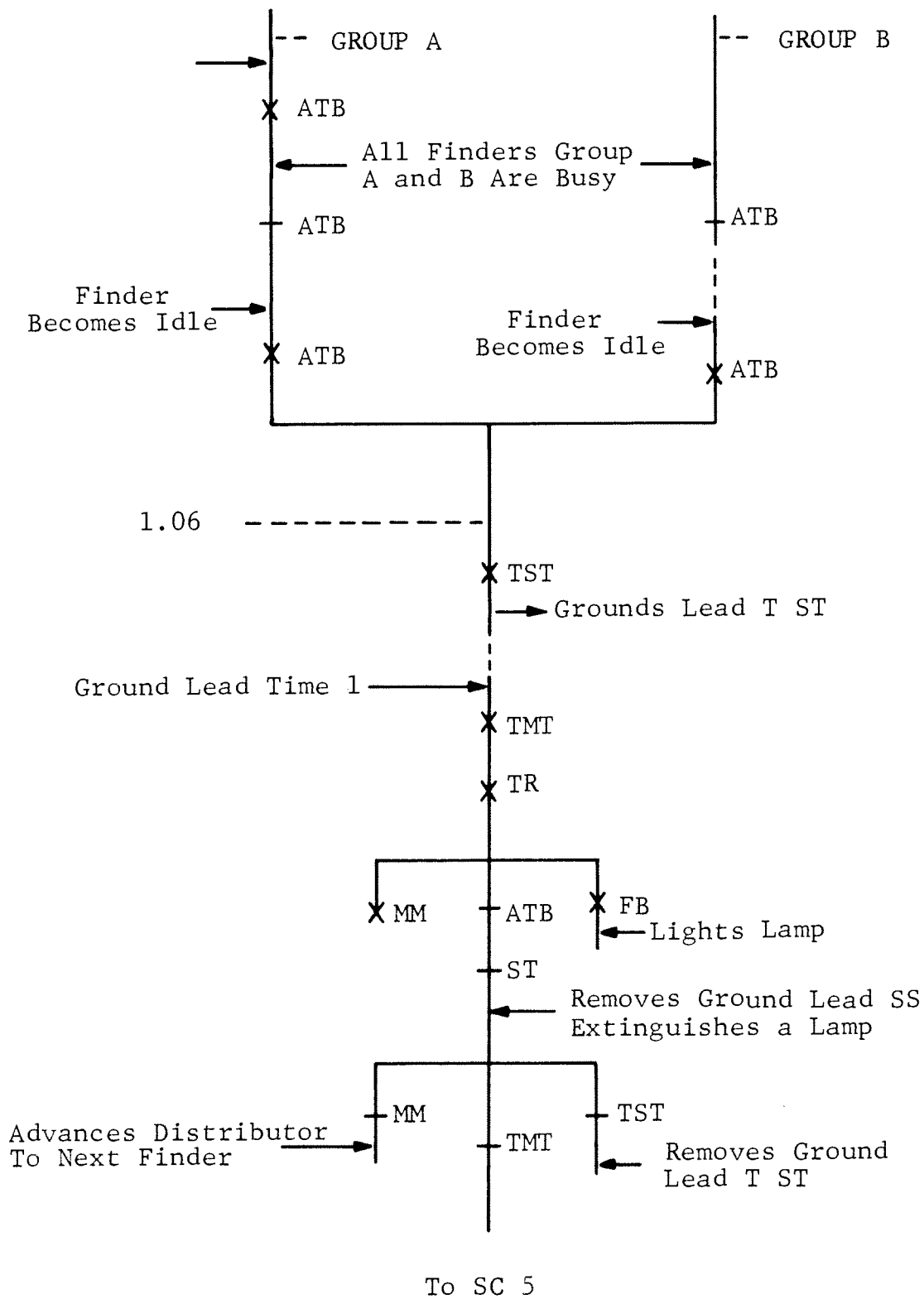
If all Finders of the other group should be busy at the moment relay TR is operated, closes motor magnet MM and closes relay FB, relay TR cannot lock itself as there is no ATB ground (lead TR LOCK) at its locking circuit. Therefore, it remains operated only as long as ground is connected to lead TIME 2. Motor magnet MM operates and disconnects lead D1 from the motor magnet MM and lead MM. Relay FB operates, locks and connects lead FB to lead F BL, (lighting a lamp). At the end of the TIME 2 pulse #1TR is opened. Relay TR restores, opens motor magnet MM and connects lead TIME 1 to #1TMT. Motor magnet MM restores, advancing the wipers of the DISTRIBUTOR switch one step to another set of bank contacts. When one Finder becomes idle in either group, ground via lead ATB GRD closes relay ATB in that set of GROUP RELAYS. Relay ATB operates, transfers lead STA from leads START (1U) or 3U and ST B to relay ST and lead START (3U) or 1U connects terminal 18L to terminal 16L or (14L), disconnects lead ATB CHAIN IN from lead ATB CHAIN OUT. A waiting call will now ground lead ST A closing relay ST. Relay ST operates and the following operation is the same as that described in Section 1.01.

Normally, a timed transfer causes a supervisory alarm over the circuit closed by relay FB and to restore that circuit back to service, the Attendant operates a key, opening relay FB. Relay FB restores and disconnects lead FB from lead F BL, extinguishing a supervisory lamp.

2.00 Traffic Grading Finder Unit

2.01 Start of Group Relays (Operated: Relay ATB)

When Traffic Grading is provided another set of Group Relays with associated Finders is located on another shelf with line and control leads multiplied to that Finder shelf (see NOTE 57, H-850665-A). In the following explanation, FIG 1A lead 4 (line relays 41-40 and 141-140 lower and upper banks, respectively) in group A and discussed; lead 7 (line relays 71-70 and 171-170 lower and upper banks, respectively) in group B is similar. The ATB CHAIN OUT lead in FIG 10A is under the control of Group Relays that are located on the other shelf (has no line relays).

SC 4

Ground is received on lead STO (FIG 10A see NOTE 9, H-850665-A) via lead 4 (FROM LINE EQPT. H-75318-A or EQUIV.) grounding a Start lead in the other group relays. The following operation will be similar to that described in Section 1.01 if H-850665-A is used.

2.02 All Finders Busy (Other Group Relays)

The following operation is the same as that described in Section 1.05 except that ground is connected to lead ATB CHAIN OUT (FIG 10A), closing relay TC. Relay TC operates, and disconnects ground from relays T1-T5. Relays T1-T5 restore. The operation of each relay is basically the same and this circuit explanation will describe operation of relay T1.

Relay T1 restores and transfers leads STO (GRP A) and STO (GRP B) from leads ST1 and ST2 to leads STI (GRP A) and STI (GRP B), respectively. The lines effected by the traffic grading are now transferred back into their regular Finder units, and further operation is the same as described in Section 1.01.

As soon as a Finder (Group Relays graded) becomes idle, this Finder causes ground to be removed from lead ATB CHAIN OUT opening relay TC. Relay TC restores and closes relays T1-T5. Relays T1-T5 operate and transfer the start and level marking ground (if a subscriber wishes to place a call) back to the Group Relays used for Traffic grading. The following operation is the same as that described in Section 2.01.

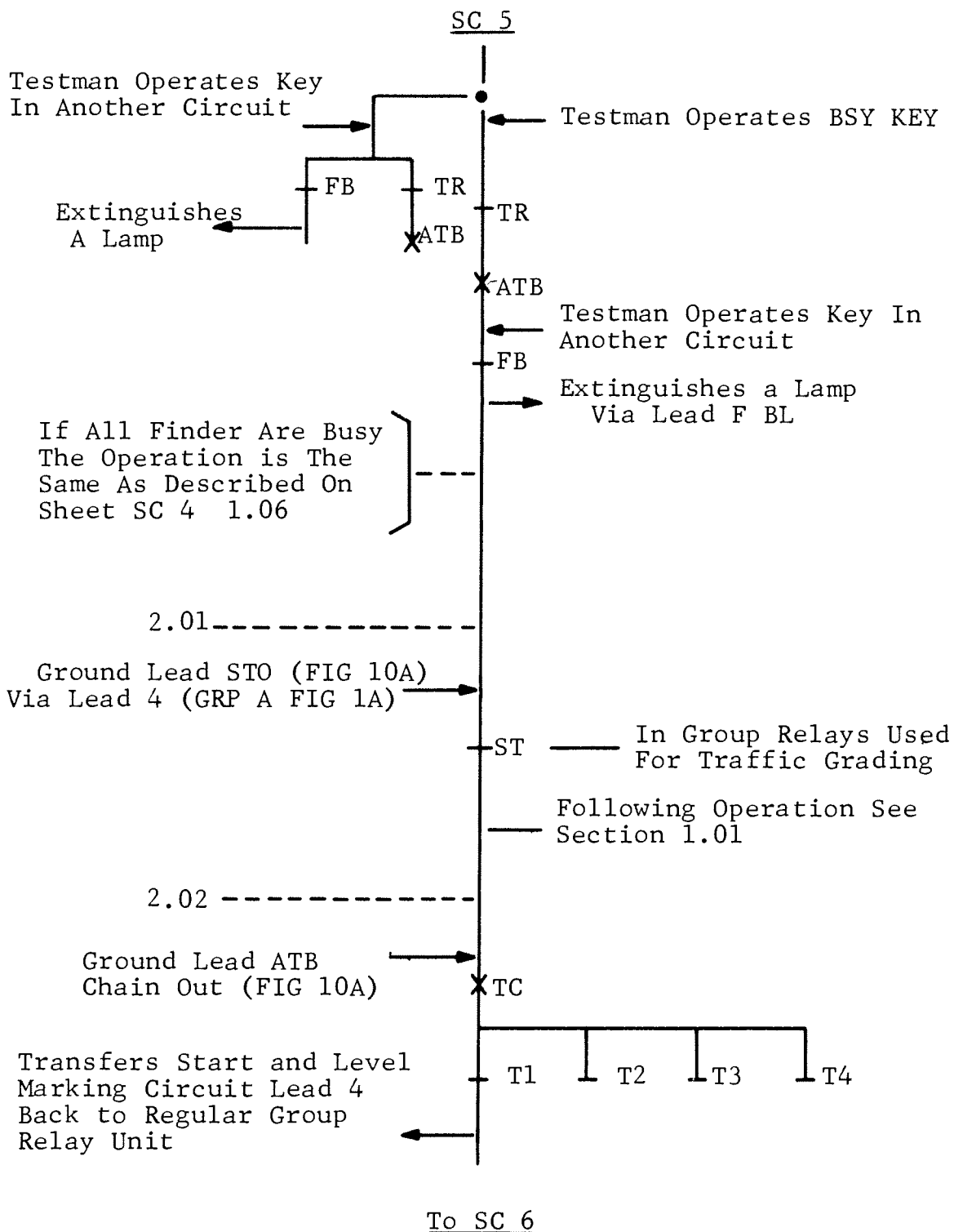
3.00 Test Facilities

3.01 Release and Alarm

When the circuit to a Linefinder's RLS magnet is closed for an excessively long time, indicating that a Finder has failed to release, ground is returned via lead RLS BAT (FIG 4A or RR), closing relay RLS. Relay RLS operates and grounds lead LP, lighting a lamp.

Lead SS is grounded as long as start relay ST is operated. This closes a delayed alarm circuit which causes an alarm and lights a supervisory lamp after some seconds. Normally, relay ST is not operated long enough to bring in such an alarm. This alarm indicates a condition of one or several calls waiting without getting service.

Lead F BL closes an alarm circuit to indicate timed transfer. The alarm lamp remains lighted until a key (FIG SS) is manually operated.



3.02 Busy Key

The BSY KEY when operated, opens relay ATB, which upon restoring, transfers the call to the other group, and opens the locking circuit to relay TR.

3.03 Test Jacks

The test jack of the Group Relays provides several routine test features. A short circuit between springs 1 and 2 (FDR TST) operates relay ST in the same manner as when a call is originated from a line busy without placing a direct marking ground on any vertical bank contact. Relay ST operates as a regular call and starts the operation of an idle Finder. This routine test permits a rapid check of the vertical and rotary operation of each Finder as one Finder after another operates in rapid succession. This operation continues until the short circuit is removed from jack spring 1 and 2.

Springs 5 and 6 (TEST LINE) are normally connected to a line circuit. One line circuit in group A and one line circuit in group B are usually set aside as a test line for the respective group. When springs 5-6 are short-circuited, the line relay operates and a Finder searches for the test line. This permits checking the complete correct operation of each Finder. If a test telephone is connected to springs 5-6, it is also possible to check the associated Selector for dial one or several digits to check the operation of the associated Selector (removal of dial tone) and other succeeding switches.

Springs 3 and 4 (IMPULSE & TRANS TEST JK) are for controlling the impulse and transfer circuits of the switch.

A short circuit placed across the spring energizes relay INT continuously, and thus prevents pulse from occurring. After the necessary time interval, transfer should occur. The pulsing speed and ratio pulses from relay INT can be checked by connecting a suitable speed and ratio meter across springs 3 and 4.

Message Register Test Jack springs 1-2, 3-4, 5-6, (FIG MR) provides access to line circuit (H-85318-A or equiv.) or to a Routiner.

