TERMINATING TROUBLE INDICATOR ALARM ROUTINE NO. 1 CROSSBAR OFFICES

1. GENERAL

1.01 This section covers the method of reading the information displayed by the indicating lamps on the terminating trouble indicator frame.

1.02 The purpose of the terminating trouble indicator is to point as nearly as is practicable, to the source of trouble that interfered with the completion of a connection. The terminating trouble indicator is used in case the marker cannot complete its normal function of setting up a connection between an incoming frame and called line. It is also used in case of false grounds on certain leads. When the terminating trouble indicator is used to make manual tests of the terminating marker, the lamp indications provide a means of checking the operation of the marker.

1.03 The indicator lamp panel is arranged to display the following:

(a) Number dialed.

(b) The first or second trial by the sender.

(c) The number of the particular marker from which a record has been taken.

(d) The marker connector frame, the marker connector position on the frame and the sender position in the connector.

(e) The incoming link frames, the trunk level and the trunk group (switch number) on the frames.

(f) The number group connector frames.

(g) The line choice connector frames.

(h) The line link frames.

(i) The progress lamps.

(j) Various cross detecting lamps.

(k) Class lamps.

1.04 The progress lamps as shown in tables 1, 2 and 3, are arranged so as to follow the natural sequence of operative functions of the various features involved when setting up a call. While it is possible for two troubles to occur simultaneously, this condition is unlikely, therefore but one trouble is considered when analyzing the record taken by the indicator, otherwise the information received would not point to the source of trouble with any degree of accuracy.

2. METHOD

2.01 If, in response to a minor intermittent or major alarm, a lighted TI lamp on the terminating trouble indicator frame is found, operate the LP key and obtain a record of the trouble being indicated by the lamps listed in 2.03.

Note: An accurate record of the trouble should be obtained since in some cases it may be necessary to have records of repeated indications in order to locate the trouble.

2.02 Restore the LP key and momentarily operate the RL key to restore the trouble indicator to normal.

Caution: Release the trouble indicator as soon as possible, since a second trouble indicator record cannot be obtained as long as the trouble indicator is busy. If a marker attempts to seize the trouble indicator while it is busy, the major alarm is sounded.

2.03 The various lamps associated with the trouble indicator circuit appearing on the terminating trouble indicator frame are listed below with the general information to be obtained from each lamp. There are other lamps such as those associated with the connector alarms appearing on this frame, which are described in other B.S.P. Sections. It should be noted that the progress lamps do not necessarily remain lighted beyond the stage the particular lamp indicates, so that a lamp being extinguished may also indicate still further progress especially in conjunction with simultaneously lighted lamps, or the following progress lamps. Certain of these lamps light on a satisfactory condition, hence a failure would result in the failure of the particular lamp to light. These lamp designations are listed below and on tables 1, 2 and 3 in the order as determined by the location on the frame starting at the top and going from left to right on each row. This arrangement of lamps is also intended to correspond with the progress of the call-through the marker. It is necessary in general to analyze these lamp indications collectively in order to obtain a trouble indication.

DR 0-9	Indicates the marker circuit from which the record was taken.
DL 0-9	Indicates the markers that failed and were released without a trouble indicator

record being taken, because the trouble indicator was busy. There is one of these lamps for each marker served by the trouble indicator.

CF 0-4 — Indicate the marker connector frame on which the marker connector circuit is located.

CN 0-3 — Indicate the particular marker connector on the connector frame. There is one of these lamps for each marker connector circuit on any one frame.

SN 0-4 — Indicate the sender in a marker connector group. There is one of these lamps for each sender associated with any one marker connector circuit.

TH, 0, 1, 2, 4, 8)
H, 0, 1, 2, 4, 5)
T, 0, 1, 2, 4, 5)
U, 0, 1, 2, 4, 5) — These lamps indicate digits of the called number received by the marker circuit from the sender. Where there are more than one of these lamps lighted for any one digit, the numbers are added to determine the digit number.

F, 0, 1, 2, 4, 5, 10) — Indicate the incoming link and connector frame number received by the marker from the sender. The number of the lamps lighted are added to obtain the incoming link and connector frame number, but if lamps (F) 1 and 4 are both lighted, this indicates connection with a local Number Checking Trunk Circuit.

TR2 — Indicates that a failure occurred when the marker was making a second trial.

RO — Indicates that a reorder call was requested by the sender.

NGC 0-24 — Indicates the number group connector circuit.

HB 0-24 — Indicate the hundreds block lead grounded by the marker.

HP 0-8 — Indicate the hunt-progress relays operated in the marker circuit. From this indication the twenty block relay lead that was grounded by the marker can be obtained. The 0, 2, 4, 6 and 8 lamps indicate the 0, 1, 2, 3, and 4 twenty block leads, respectively.

L 0-19 — Indicate the individual line relay that was operated in the marker circuit.

JF 0-4 — Indicate the twenty block to which hunting was jumped.

JC 0, 2, 4 6, 8, 10, 12, 14, 16, 18 — Indicate the operation of similarly designated relays in the marker which determine the terminal in a twenty block at which hunting will start in the twenty block to which hunting is jumped.

AL1)
AL2) — Indicate the position of allotter relays in the marker

LCF 0-19 — Indicate the line choice connector frame number. There is one of these lamps for each line choice connector frame.

LLG A-D — Indicate the line link group in the line choice.

LOG — Indicates that originating traffic was locked out of the line link group in which the called line is located.

HF, TF, RF — Indicate whether the line is a P.B.X., tip party or a ring party line.

CA 0-9)
CB 0-9) — Indicate the line link subgroup relay operated in the marker. From this indication the half choice and the line link horizontal group is obtained.

IF 0-19 — Indicate the incoming link and connector frame to which the marker is connected. There is one of these lamps for each incoming link and connector frame. There will be no IF lamp indication when connection is made to the local number checking trunk circuit. This circuit is indicated only by the F1 and F4 lamps being both lighted.

LC 0-9
M 0-9 — The LC lamp that is lighted indicates the LC relay operated in the incoming link and connector circuit and, therefore, the incoming primary switch. The M lamp that is lighted indicates the select magnet operated on the incoming link primary switch and, therefore, the primary switch level. Together these lamps indicate the number of the incoming trunk circuit. The M lamp indicates the units digit of the incoming trunk circuit number and the LC lamp indicates the tens digit. For example, if the M5 and LC8 lamps are lighted it would indicate:

Incoming primary switch level - 5.
Incoming primary switch - 8
Incoming trunk circuit - 85

These indications are taken directly from the incoming link and connector circuit that was connected to the marker at the time the record was taken.

CH 0-9 — Indicate the channel selection relay operated in the marker, and from this indication the incoming secondary switch, or the line link secondary switch can be obtained.

LJ 0-9 — Indicate the line junctor relay operated in the connector circuit. The vertical on the line link secondary switch is also indicated by these lamps.

JPN) JP 0-8) — Indicate the junctor pattern relays operated in the marker circuit.

JG A-E — Indicate the line junctor group relay operated in the marker circuit.

MK0 and MK1 — Indicate the operation of similarly designated relays in the marker circuit. These relays in the marker circuit are controlled by the incoming secondary switch select magnet lockout and throw-over circuit when mate frames are used.

RC — Ringing control.)
RV — Ringing reverse.)
RP — Ringing polarity.) Indicating the ringing combination set up in the incoming trunks.
TC — Tone control.)

LIN — Local intercept.)
LTI — Local trouble intercept.)
TIN — Toll intercept.) Indicates that the call was re-routed to intercept.
TTI — Toll trouble intercept.)

OF — Overflow - All channels busy
BB — Busy back - Subscribers line busy

SPL — Special)
NC — Number check.)
NT — No test.)
NH — No hunt.) Class lamps indicating information given to marker by the incoming trunks.
NTT — No test train.)
FS — Full selector.)
MAN — Manual.)
TOL — Toll.)

CN — Class lamp indicating that a call is being set-up to coin line.

GS — Ground sleeve test used on a number check test call.

CKG, K1,) K2, K3) — These lamps indicate that numerical registration check leads are satisfactory.

TBK — Indicates that path to TB relay in Number Group Connector is closed.

LE — When lighted, indicates that LO-19 relay in Marker has not yet operated.

FC — Indicates closure of path to operate F relay in incoming trunk.

AK — Indicates operation of LC relay in incoming link and connector.

TK — Indicates closure of check lead through TB, LJ and HG relays of connector frames.

L1L, R1L — Indicate that correspondingly designated relays in the marker have operated.

TE — When operated, indicates that CH0-9 relay in marker has not yet operated for channel selection.

BC — Indicates that channel linkages have been tested and are available.

GJ — Indicates that an attempt was made to operate secondary line link and secondary incoming link hold magnets.

SL — Indicates that primary and secondary incoming hold magnets are operated.

GC — Indicates that secondary line link hold magnet is operated.

GLH — Indicates that an attempt was made to operate a primary line link hold magnet.

CON — Indicates that satisfactory check was made that primary line link hold magnet was operated.

GTZ — No false ground on tip or ring and ringing control relays operated OK.

RL — Indicates that release signal was given to sender.

PG — Indicates an attempt to advance from one junctor retest group to the next junctor retest group.

FL — Free line.
NFL — No free line.
AL — Allotter.
NAL — No allotter.

LTR) HTR) — Indicate that the corresponding relays in the terminating marker circuit are operated. LTR for light traffic and HTR for heavy traffic.

SDT — Indicates that the sender test class relay was operated in the marker circuit.

TCT — Indicates that the current flow test of the CON relay is not yet completed.

TRL — Indicates that the TRL lead is grounded.

FCG — Indicates a grounded tip, battery on the ring or a cross between tip and ring.

X	Indicates operation of marker X relay usually in combination with other cross detecting relays.
XFC	Indicates a false ground on FC lead.
XC	Indicates a false ground or cross to ground on HGA-D or NC leads.
XHG	Indicates that more than one HG relay in the line link was operated.
XIN	Indicates false ground on winding of LIN, TIN, LTI or TTI relays in marker.
XOB	Indicates a false ground on winding of BB or OF relays.
XR	Indicates a false ground on TC or RC ringing control leads.
XRL	Indicates a crossed or grounded release or trouble release lead.
XS	Indicates a crossed or grounded subscribers line sleeve lead.
XSM	Indicates crossed or grounded primary line link select magnet lead.
XTI	Indicates false ground on leads tested by manual test feature.
XTB	Indicates that more than one TB relay was operated.
XTL	Indicates a false ground or cross on a TB lead.
XL	Indicates a false ground on a winding of a marker L relay.
XP	Indicates that more than one JP relay was operated.
XF	Indicates more than one marker LC relay winding is energized.

2.04 Of the above listed lamps the progress lamps shown in Tables 1, 2 and 3 should be considered of primary importance since they indicate points at which the call was blocked. Table 3 is supplementary to Table 2 because it includes indicating lamps which give valuable information concerning the progress of the call between the stages indicated by the lamps of Table 2.

2.05 After the progress lamps have been referred to, information regarding the sender, marker connector, connector frames and important relays in the marker including cross detecting relays should be obtained from the other lamps on the indicator panel.

2.06 The descriptions accompanying indications 1 to 29 in Tables 1, 2 and 3 give general information which illustrate the method of determining the probable causes of trouble. No attempt is made to cover all possible causes of trouble but merely to give representative cases.

2.07 In those cases where more than one indicating lamp is lighted it must first be determined which is true and which false since the false indication generally points directly to the trouble. The true indication may be determined by reference to the records which give the location and cross connection information for the called line identified by the number registered.

Example (± indicates lighted lamp)

		LLG				CA	CB	TH	H	T	U
X	XC	A	B	C	D	4	7	1	2	3	4
±	±		±	±		±	±	±	±	±	±

This lamp display indicates a falsely grounded NC lead. It is assumed that number 1234 is assigned to horizontal group 7 of a line link group D of a line choice otherwise identified. Hence LLGD and CB7 are the true indications of the number called and LLGB and CA4 are false indications. Hence the trouble is probably introduced at the HGB field, #4 multiple strip or some NC punching connected to that strip on the same Block Relay frame as the registered number.

2.08 The above example was given because troubles of that type have a very serious effect on terminating traffic.

2.09 Whenever a cross detecting lamp is lighted it indicates a cross on the leads associated with the lamp as described in the list above. The various frames which are responsible for the trouble indication may also be obtained from lighted lamps. If the cross is between two contacts on a connector relay so that a lead going to one marker is permanently connected to a lead within one of the connector circuits, the trouble indication may give misleading information pointing to a wrong relay. It may also occur very infrequently since to bring in a trouble indication it may be necessary to have the marker in trouble serving a call thru a connector not associated with the trouble and at the same time another marker must be serving a call thru the connector in trouble. Under this condition both markers may attempt to seize the trouble indicator. However, only one would seize it and regardless of which marker left a trouble indication it would not indicate the connector relay in trouble. The indicator may show either the wrong marker or the wrong connector, hence from analysis the wrong connector relay. The second marker in attempting to seize the trouble indicator would light a DL - lamp. Repeated records showing two markers and one connector and the one cross indication, would show one particular marker in each indication but possibly several connectors. Hence it may be necessary to inspect all connector relays associated with the marker reported on each trouble indication on all connector frames for crosses to the leads indicated.

3. REPORTS

3.01 The required record for these alarms should be entered on the proper form.

TABLE I

Progress Lamps

	TH					H					T					U					F					TR2	RO	CKG	K1	K2	K3
	0	1	2	4	8	0	1	2	4	5	0	1	2	4	5	0	1	2	4	5	0	1	2	4	5						
1.			±					±					±					±					±					-	-	-	-
2.		-	±	±	±		±	±	±	±		±	±	±	±		±	±	±	±		±	±	±	±	±	±	+	-	-	-
3.		±	±	±	±		-	±	±	±		±	±	±	±		±	±	±	±		±	±	±	±	±	±	+	-	-	-
4.		±	±	±	±		±	±	±	±		-	±	±	±		±	±	±	±		±	±	±	±	±	±	+	-	-	-
5.		±	±	±	±		±	±	±	±		±	±	±	±		-	±	±	±		±	±	±	±	±	±	+	-	-	-
6.		±	±	±	±		±	±	±	±		±	±	±	±		±	±	±	±		-	±	±	±	±	±	+	-	-	-
7.		-	±	±	±		±	±	±	±		±	±	±	±		-	±	-	-		±	±	±	±	±	±	+	-	-	-
8.		±	±	-	-		±	±	±	±		-	±	-	-		±	±	±	±		±	±	±	±	±	±	+	-	-	-
9.		±	±	±	±		-	±	-	-		±	±	±	±		±	±	±	±		±	±	±	±	±	±	+	-	-	-
10.		±	+					+					+				±	+	±	±			+					+	-	+	+
11.			+	±	±			+				±	+	±	±			+					+				+		+	+	-	+
12.			+				±	+	±	±			+					+				+	+	+				+	+	+	-
13.			+					+					+					+					+				+		+	+	+	+
14.			+					+					+					+					+					+	+	+	+	+

Assume that number 2222 and frame 2 was registered.

\+ Indicates Lighted Lamp.
± Indicates Lighted Lamp Associated with Trouble.
\- Indicates Non-Lighted Lamp Associated with Trouble.

1. CKG Open
2. TH1 Lead Open
3. H1 Lead Open
4. T1 Lead Open
5. U1 Lead Open
6. F1 Lead Open
7. CK1 Lead Open
8. CK2 Lead Open
9. CK3 Lead Open
10. CK1 Lead Ground or Cross
11. CK2 Lead Ground
12. CK3 Lead Ground
13. Rec. Leads Checked - 2nd Trial
14. Rec. Leads Checked - Reorder

TABLE 2

Progress Lamps

	TBK	LE	FC	AK	TK	LIL RIL	TE	BC	GJ	SL	GC	GLH	CON	GT2	RL
15.	-														
16.	+	±													
17.	+		-												
18.	+		+	-											
19.	+		+	+	-	+	+								
20.	+		+	+	-	-	+								
21.	+		+	+	+	+	±								
22.	+		+	+	+	+		-		+					
23.	+		+	+	+	+		±	-	-					
24.	+		+	+	+	+		+	+	-					
25.	+		+	+	+	+		+	+	+	-				

15. Twenty block relay not operated probably due to open in NGC start lead, HB lead or TB lead. If call is to a number for which a SH relay is used, additional cross connections in the marker may be involved.
16. LE relay not released due to failure of L relay to operate as indicated by no LO-19 lamp in Table 3. This points to wiring trouble in the marker.
17. GT relay not operated.
18. Open AK check lead.
19. Open check lead.
20. Junctor retest circuit not functioning probably due to marker cross connection trouble.
21. CHO-9 relay not operated probably due to failure in Incoming mate frame lock out.
22. Open LLO-9 lead from line link.
23. BA relay not operated probably due to open OL-9L or OR-9R lead from Incoming link.
24. Open SL lead from Incoming link or failure of primary or secondary Incoming link hold magnet to operate.
25. Secondary line link hold magnet failed to operate.

TABLE 2 (Continued)

	TBK	LE	FC	AK	TK	LIL RIL	TE	BC	GJ	SL	GC	GLH	CON	GT2	RL
26.	+		+	+	+	+		+	+	+	+	-			
27.	+		+	+	+	+		+	+	+	+	+	-		
28.	+		+	+	+	+		+	+	+	+	+	+	-	
29.a	+		+	+	+	+		+	+	+	+	+	+	+	-
29.b	+					+		+	+		+	+	+	+	-

26. False ground on the tip, battery on the ring or cross between tip and ring leads as far as the line cross points. Also in case of a failure of the marker to ground the line sleeve lead to operate the line hold magnet.
27. Open subscribers line or primary line link hold magnet not operated.
28. Failure of marker ringing or tone control relays to operate or remain operated.
29.a GT relay not released due to false ground on tip or ring of subscribers line.
29.b Open release lead through marker connector or sender.

TABLE 3

Supplementary Progress Lamps

	L 0-19	LCF 0-19	LLG A-D	LOG	TF HF RF	CA 0-9	CB 0-9	IF 0-19	LC 0-9	M 0-9	CH 0-9	LJ 0-9	JPN	JP 0-8	JG A-E	MKO MK1
16.a	-															
17.a	+							±	-	-						
18.a	+							+	-	-						
18.b	+							-	-	-						
19.a	±	+	+	±	±	±		+	+	+		±				
19.b	±	+	+	-	±	±		+	+	+		±				
19.c	±	-	-	-	-	-		+	+	+		±				
19.d	±	+	+	±	±	±		+	+	+		-				
20.a	+	+	+	+	+	+		+	+	+		+	+		-	
21.a	+	+	+	+	+	+		+	+	+	-	+	+		+	-

16.a LE relay not released due to failure of L relay to operate as indicated by no LO-19 lamp in Table 3. This points to wiring trouble in the marker.
17.a GT relay not operated.
18.a LC relay in Incoming link not operated possibly due to open FC lead or LC lead.
18.b MC relay in Incoming link not operated due to open ST lead.
19.a All junctor cut in relays operated indicating open in AK, CK, BK or TK leads.
19.b Line link not locked out due to open LEA-D or LOA-D lead preventing HG relay in line link from operating.
19.c Twenty block relay not operated.
19.d LJ relay in line choice not operated due to JR lead from incoming link open.
20.a Junctor retest circuit not functioning probably due to marker cross connection trouble.
21.a CHO-9 relay not operated probably due to failure in Incoming mate frame lock out.