# COMBINED AND COMPLETING MARKER CIRCUITS—PART 31

## TESTS USING MASTER TEST FRAME

## NO. 5 CROSSBAR OFFICES

### 1. GENERAL

**1.01** This section is Part 31 in a series of sections for testing combined and completing markers.

**1.02** The reasons for reissuing this section are listed below. Revision arrows are used to emphasize the more significant changes. Equipment Test Lists are affected.

(a) To revise test procedures to include offices arranged with Electronic Translation System (ETS).

(b) To make minor changes as required.

**1.03** The tests covered are:

PAGE

**1.04** *Lettered Steps:* A letter, a, b, c, etc, added to a step number in Part 3 of this section indicates an action which may or may not be required depending on local conditions. The condition under which a lettered step or a series of lettered steps should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

**1.05** The manner of selecting some circuits and test conditions at the master test frame (MTF) and its associated circuits varies depending on the apparatus options furnished with these circuits. Therefore, where variable means of selection are provided, precise instructions for the selection of circuits and test conditions are not given. Precise instructions for the use of these variable means are given in Section 218-106-301.

**1.06** The location statement, At MTF—, is used to refer to all apparatus located on the four basic bays of the MTF.

**1.07** A statement between asterisks (*____*) is added after action or verification statements

to clarify the function being simulated in the test procedures of Part 3.

**1.08** ◆When the office is arranged for LAMA-C or ETS, the distributors and scanners associated with the marker and trunk used in the test call must be in service or in a *maintenance-busy* condition—not in an *out-of-service* condition. To change a scanner or distributor from an *out-of-service* to a *maintenance-busy* condition, use the procedure given in the following sections for the office arrangement.

> 218-798-308—Taking LAMA-C Equipment Out-of-Service.

> 218-799-701—Taking ETS Equipment Out-of-Service.

**1.09** When making tests in No. 5 crossbar offices arranged with Electronic Translation System and test verification requires a completing marker trace output (teletype printout or data dump) to determine the data used to process a call, operate the TCPO key at the master test frame (MTF).

The data dump received at the maintenance teletypewriters (TTY) may be in a raw form (binary or hexadecimal numbering system), formatted into decimal and written text, or a combination of both. For additional information on data dumps and formats used, refer to Section 218-799-102.◆

## 2. APPARATUS

**All Tests**

**2.01** Blocking and insulating tools as required. Use tools and apply as covered in Section 069-020-801.

**Test DD**

**2.02** Testing cord, 893 cord, 3 feet long, equipped with two 360A tools (1W13A cord), and two 624B (terminal connector) tools or two 419A (test connector) tools.

**Test DF**

**2.03** ITE5282 logic test probe or equivalent.

## 3. METHOD

| STEP | ACTION | VERIFICATION |
|---|---|---|

◆*Note:* Refer to paragraphs 1.04 through 1.09.◆

**DD. Route Transfer—◆ETS Not Provided◆**

| | | |
|---|---|---|
| 1 | At MTF— Restore all keys and switches. | |
| 2 | Momentarily operate RL key. | All lamps extinguished. |
| 3 | Select A_ through K_ digits as required to direct call to selected route. | |
| 4a | If subscriber access route is to be tested— Select ORIG class of test. | |
| 5a | Select line location of any line having access to selected route. | |
| 6a | Select class of service and rate treatment as required for access to selected route. | |
| 7a | Select orginating class of call with translator indication as required for selected route. | |

| STEP | ACTION | VERIFICATION |
|------|--------|--------------|
| 8b | If routes not accessable to subscribers are to be tested.— Select OGT class of test. | |
| 9b | Select originating class of call with translator indication for access to selected route. | |
| 10 | Select route advance as required for access to selected route. | |
| 11 | Select marker. | |
| 12 | Operate REC key. | |
| 13c | If route transfer relays RT0 through RT9 are to be tested— At MTF jack, lamp, and key circuit— Insulate contacts of RT_ relay selected for all markers except marker under test. | |
| 14c | Connect ground to upper winding of selected RT_ relay. | RT_ lamp lighted. |
| 15d | If route transfer relays RT20 through RT39 are to be tested— At MTF— Operate RT switch to select route transfer units. | |
| 16d | Operate RTF1/2 key to select route transfer tens. | |
| 17d | Operate DOC key. | |
| 18 | Make busy marker under test. | |
| 19 | Operate ST key. | Trouble record taken. TB_, TG_, FS_ designations perforated indicating the transfer route. If route transfer relays RT20 through RT39 are being tested— At MTF jack, lamp, and key circuit— RCTA_ lamp momentarily lighted. |
| 20 | At MTF— Operate RL key. | All lamps extinguished. If route transfer relays RT0 through RT9 are being tested— RT_ lamp remains lighted. |
| 21c | If route transfer relays RT0 through RT9 are being tested and more than one route is associated with the selected RT_ relay— | |

| STEP | ACTION | VERIFICATION |
|------|--------|--------------|
| | Repeat Steps 3 through 19 as required for other route. | |
| 22c | At MTF jack, lamp, and key circuit—<br>Remove ground from upper winding of selected RT_ relay. | RT_ lamp extinguished. |
| 23c | Remove insulators from contacts of RT_ relay. | |
| 24 | Restore marker under test to service. | |
| 25 | At MTF—<br>Restore all keys and switches. | |

**DE. Trunk Guard Feature**

| STEP | ACTION | VERIFICATION |
|------|--------|--------------|
| 1 | At MTF—<br>Restore all keys and switches. | |
| 2 | Operate RL key. | All lamps extinguished. |
| 3 | Select A_ through K_ digits as required to direct call to selected route. | |
| 4 | Select OGT class of test. | |
| 5 | Select originating class of call with translator indication for access to selected route. | |
| 6 | Select route advance as required for access to selected route. | |
| 7a | ◆If ETS provided—<br>Operate PTS key.◀ | |
| 8b | If 4-wire switching route is selected—<br>Operate 4W key. | |
| 9c | If office is arranged for multilevel preemption—<br>Select CDP, CD control digits as required to select P-4 priority. | |
| 10 | Select marker under test. | |
| 11 | Operate TLK, KY keys. | |
| 12d | If test is to be made using a particular trunk—<br>Select trunk. | |
| 13e | If test is to be made using a particular sender—<br>Select sender. | |

| STEP | ACTION | VERIFICATION |
|------|--------|--------------|
| 14f | ◆If option ZQV (TG key) provided—<br>Operate TG key. | |
| 15g | If option ZQU provided—<br>(TG key not provided)—<br>Insulate contacts 2, 3T of REC, 1, 2B of OGT, and 5, 6B of TKT1 relays.◀ | |
| 16h | If option to guarantee light traffic operation on marker test calls is not provided—<br>At marker—<br>Block operated HTT relay. | |
| 17 | At MTF—<br>Operate ST key. | Trouble record taken.<br>SDT, TGT designations perforated.<br>FS⌐, TB⌐, TS⌐, OSG⌐, OS_ designations perforated indicating the trunk and out sender used. |
| 18 | Operate RL key. | All lamps extinguished. |
| 19h | If option to guarantee light traffic operation on marker test calls is not provided—<br>At marker—<br>Remove blocking tool from HTT relay. | |
| 20g | ◆If option ZQU provided—<br>(TG key not provided)—<br>At MTF_<br>Remove insulators from REC, OGT, and TKT1 relays.◀ | |
| 21 | Restore all keys and switches. | |

**DF. Marker to Distributor and Scanner (DAS) Lead Verification—Marker Progress Leads—LAMA-C Provided**

> *Note:* The following leads are used by the processor to follow the sequence of each call through the completing marker. (Fig. 1) The integrity of each lead is checked by the processor, however, since the progress is not shown on the marker test output message, this test provides a means for verifying these leads (a service or test call must progress through HMS1 before a marker test output message will be received at the MTF terminal or TTY). The leads verified are: CKG, HMS1, ITR, LRA, MB, MT, OSK, RK3, TK, TOG.

| STEP | ACTION | VERIFICATION |
|------|--------|--------------|

*Caution: Use only logic probes when checking scan point terminals for the presence or absence of ground. DO NOT USE TEST PICKS OR 67C TEST SET.*

1   At MTF—
Restore all keys and switches.

2   Momentarily operate RL key.      All lamps extinguished.

3   Select marker to be tested.

4   Select ORIG class of test.

5   Select OR originating class of call and LT translator indication.

6   Insert make-busy plug into MMB_ jack of marker under test.

## CKG, RK3, TK, HMS1, ITR, MB, MT Leads

7   Select A_ through G_ digits as required for an IAO route.

8   Select class of service and rate treatement as required for access to selected route.

9   At DAS frame—      Ground not present.
Connect logic probe to terminal punching for the CKG lead (Table A—Test 1) for the marker scanner associated with the selected marker.

10   At MTF—      DIS1, LK2, MRL lamps lighted.
Momentarily operate ST key.      At DAS Frame—
Logic probe indicates ground momentarily present.
*Verifies lead from marker to marker scanner terminal.*

11   At MTF—      All lamps extinguished.
Momentarily operate RL key.

12   Repeat Steps 9 through 11, connecting the logic probe to the terminal punchings for each of the leads, as indicated in Table A, Tests 2 through 7.

| STEP | ACTION | VERIFICATION |
|------|--------|--------------|

**OSK Lead**

| | | |
|------|--------|--------------|
| 13 | Select A_ through K_ digits as required for an outgoing route that requires the use of a sender. | |
| 14 | Select class of service and rate treatment as required for access to selected route. | |
| 15 | At DAS frame—<br>Connect logic probe to the terminal punching for the OSK lead (Row 0, terminal 14) on the marker scanner associated with selected marker. | Ground not present. |
| 16 | At MTF—<br>Momentarily operate ST key. | DIS1, LK2, MRL lamps lighted.<br>At DAS frame—<br>Logic probe indicates ground momentarily present. |
| 17 | At MTF—<br>Momentarily operate RL key. | All lamps extinguished. |

**LRA Lead (Line Link Pulsing Provided)**

| | | |
|------|--------|--------------|
| 18 | Select A_ through K_ digits as required to route call to an LLP trunk or route. | |
| 19 | Select class of service and rate treatment as required for access to selected route. | |
| 20 | At DAS frame—<br>Connect logic probe to the terminal punching for the LRA lead (row 0 terminal 8) on the marker scanner associated with selected marker. | Ground not present. |
| 21 | At MTF—<br>Momentarily operate ST key. | DIS1, LK2, MRL lamps lighted.<br>At DAS frame—<br>Logic probe indicates ground momentarily present. |
| 22 | At MTF—<br>Momentarily operate RL key. | All lamps extinguished. |

**TOG Lead (Through-Switched Call)**

| | | |
|------|--------|--------------|
| 23 | At MTF—<br>Restore all keys and switches. | |
| 24 | Select INC class of test. | |

| STEP | ACTION | VERIFICATION |
|------|--------|--------------|
| 25 | Select A_ through K_ digits as required to direct call to toll tandem outgoing route. | |
| 26 | Select TOL incoming class of call and translator indication required for toll-tandem outgoing route. | |
| 27 | Select any trunk link frame. | |
| 28 | Select trunk number required for incoming trunk having access to tandem routing. | |
| 29 | Operate GPA/GPB when trunk is in an allotted group. | |
| 30 | Select route advance, as required. | |
| 31 | Select completing marker to be tested. | |
| 32 | At DAS frame— Connect logic probe to terminal punching for the TOG lead (row 0, terminal 9) on the marker scanner associated with selected marker. | Ground not present. |
| 33 | At MTF— Momentarily operate ST key. | DIS1, LK2, MRL lamps lighted. At DAS frame— Logic probe indicates ground momentarily present. |
| 34 | Remove probe from terminal punching. | |
| 35 | At MTF— Momentarily operate RL key. | All lamps extinguished. |
| 36 | Restore all keys and switches not required in next test. | |
| 37 | ◆Remove make-busy plug from MMB_ jack of marker under test.◀ | |

**DG. Marker to Distributor and Scanner (DAS) Lead Verification—Marker Data Leads—LAMA-C Provided**

*Note:* A series of test calls must be made to verify all the information leads between the markers and their associated marker scanners on the distributor and scanner (DAS) frame. Due to the flexibility for marker cross-connections and the options and features provided, it is not practical to provide a complete test chart for verifying the leads.

| STEP | ACTION | VERIFICATION |
|------|--------|--------------|

Instead, the leads and types of information necessary to make the test calls will be provided. Local office records *must* be used to determine the options provided, the class of service (and rate treatment) and the routing that will cause the marker to select sufficient trunks to verify existing TB_, FS_, and TS_ leads. The verification of leads require the use of the Marker Test Call Output (Fig. 3) which will be printed at the MTF TTY or terminal (as provided). The print-out contains a header message and the bit positions as received by the scan points in the marker scanner. To interpret the message, Fig. 2 is provided. Figure 1 is a simplified drawing for a typical marker scanner.

1　At MTF—
Restore all keys and switches.

2　Momentarily operate RL key.

3　Operate LAMC key.

4a　If a trouble record is desired—
Operate REC key.

5　Select ORIG class of test.

6　Select Marker to be tested.

7　Select line locations that will check the following leads at least once:
FT 0-5 (as provided)
FU 0-9 (as provided)
VGT 0-1 (as provided)
VGU 0-9
HG 0-9
VF 0-4

8　Select trunk locations that will check the following leads at least once:
TB 0-9 (as provided)
FS 0-29
TS 0-19

9　Select A_ through M_ digits (as required) that will check or use all of the following at least once if provided:
(a) route to selected trunk
(b) use 3, 5, and 7 if possible for each digit at least once to verify 0 - 9 digit leads.

| STEP | ACTION | VERIFICATION |
|---|---|---|

(c) prefix 1 (DDD call), LT1 translation
(d) prefix 0 (TSPS call), LT2 translation
(e) prefix 8 (CCSA call), LT3 translation
(f) 11X service code or Prefix 011 (IDDD call), 11 translation
(g) X11 service code or 4-digit centrex intercom call, X11 translation
(h) 5-digit centrex intercom call, FVD translation
(i) prefix 01, 1XX centrex tie line, or 7-digit centrex intercom call, 2DT translation

10    When free numbers are provided, for two tests, select A_ through G_ digits as required to direct call to individual or hunting lines assigned free number services to verify FN, FNA and FN, FNB leads respectively.

11    Select originating class of call (OR/FAC) and associated translator indication (LT, LT 1-3, 11, X11, FVD, 2DT) for route selected.

12    Select class of service and rate treatment as required for access to selected route.

13    Select route advance as required for access to selected route.

14    For one test, operate TP key to verify TP lead. RP lead will be verified on all other tests.

15b    If traffic sampling is provided, when a trunk is selected (Step 8) that permits traffic sampling, operate SMP key for one test to verify SMP lead. NSP lead will be verified when other trunks in the same trunk group are selected.

16    For one test, operate OBS key to verify OBS lead. NOB lead will be verified on all other tests.

17    For one test, select PS auxiliary originating translation (permanent signal) to verify PS lead.

18    For one test, select PD auxiliary originating translation (partial dial) to verify PD lead.

19c    If wideband service is provided—
For one test, select PK1 auxiliary originating translation to verify PK1 lead.

| STEP | ACTION | VERIFICATION |
|------|--------|--------------|
| | *Note:* Do not begin test while terminal or TTY is in the process of printing. | |
| 20 | Momentarily operate ST key. | DIS1, LK2, MRL lamps lighted. At MTF terminal or TTY— Marker test output message received. Confirm that the leads being verified by the test call are shown in the marker test output message. (Fig. 2 may be of assistance in interpreting the message). If the REC key is operated— Trouble record taken. PK lead is verified on all calls except permanent signal, partial dial, or wideband. LT (translation) lead will be verified on all calls unless another type of translation has been selected. |
| 21 | Momentarily operate RL key. | All lamps extinguished. |
| 22 | Repeat Steps 7 through 21 as required to verify all leads. | |
| 23 | Restore all keys and switches not required in next test. | |

## TABLE A

### MARKER SCANNER TERMINALS

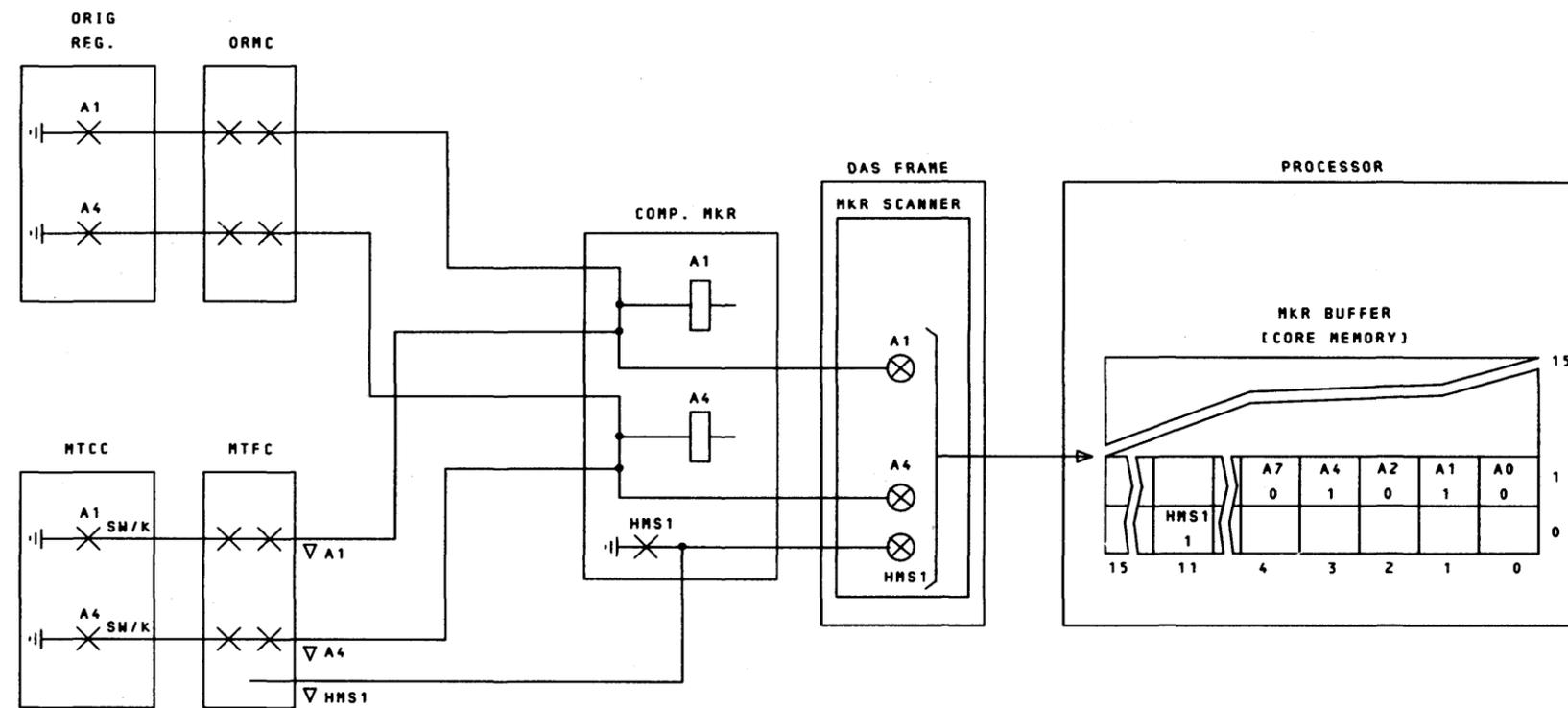| TEST | LEAD TO BE VERIFIED | MARKER SCANNER TERMINAL PUNCHING | |
|------|---------------------|------|----------|
|      |                     | ROW | PUNCHING |
| 1 | CKG  | 0 | 15 |
| 2 | RK3  | 0 | 13 |
| 3 | TK   | 0 | 12 |
| 4 | HMS1 | 0 | 11 |
| 5 | ITR  | 0 | 10 |
| 6 | MB   | 0 | 07 |
| 7 | MT   | 0 | 06 |

Fig. 1—Typical Marker Scanner

(1)  M __ __ (Note 1)   MKR TEST CALL OUTPUT
(2)  MKR NO__        SCAN UNIT NO_____
(3)  TRK SELECTED   TB__ FS__ TS__   (Note 2)
(4)  CALLING LINE LOC   FTT__ FUT__ VGT__ HGT__ VFT__
(5)  CALLED NO.   - - - - - - - - - - - - -!   (Note 3)

(A through M digits)

ROW                                         - - - BIT POSITION - - -          (Note 4)

| ROW | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | NSP | TS 19 | TS 18 | TS 17 | TS 16 | TS 15 | TS 14 | TS 13 | TS 12 | TS 11 | TS 10 | TB 9 | TB 8 | TB 7 | TB 6 | TB 5 |
| 11 | SMP | TS 9 | TS 8 | TS 7 | TS 6 | TS 5 | TS 4 | TS 3 | TS 2 | TS 1 | TS 0 | TB 4 | TB 3 | TB 2 | TB 1 | TB 0 |
| 10 | NOB | FS 29 | FS 28 | FS 27 | FS 26 | FS 25 | FS 24 | FS 23 | FS 22 | FS 21 | FS 20 | FS 19 | FS 18 | FS 17 | FS 16 | FS 15 |
| 9 | OBS | FS 14 | FS 13 | FS 12 | FS 11 | FS 10 | FS 9 | FS 8 | FS 7 | FS 6 | FS 5 | FS 4 | FS 3 | FS 2 | FS 1 | FS 0 |
| 8 |  | HGT 9 | HGT 8 | HGT 7 | HGT 6 | HGT 5 | HGT 4 | HGT 3 | HGT 2 | HGT 1 | HGT 0 | VFT 4 | VFT 3 | VFT 2 | VFT 1 | VFT 0 |
| 7 |  |  |  |  | VGT 11 | VGT 10 | VGT 9 | VGT 8 | VGT 7 | VGT 6 | VGT 5 | VGT 4 | VGT 3 | VGT 2 | VGT 1 | VGT 0 |
| 6 | FUT 9 | FUT 8 | FUT 7 | FUT 6 | FUT 5 | FUT 4 | FUT 3 | FUT 2 | FUT 1 | FUT 0 | FTT 5 | FTT 4 | FTT 3 | FTT 2 | FTT 1 | FTT 0 |
| 5 | FN | FNA | FNB | PK1 | PK | PD | PS | TT | FVD | 2DT | X11 | 11 | LT3 | LT2 | LT1 | LT |
| 4 |  | M7 | M4 | M2 | M1 | M0 | L7 | L4 | L2 | L1 | L0 | K7 | K4 | K2 | K1 | K0 |
| 3 | RP | J7 | J4 | J2 | J1 | J0 | H7 | H4 | H2 | H1 | H0 | G7 | G4 | G2 | G1 | G0 |
| 2 | TP | F7 | F4 | F2 | F1 | F0 | E7 | E4 | E2 | E1 | E0 | D7 | D4 | D2 | D1 | D0 |
| 1 |  | C7 | C4 | C2 | C1 | C0 | B7 | B4 | B2 | B1 | B0 | A7 | A4 | A2 | A1 | A0 |
| 0 | (Note 5) |  |  |  |  |  | TKT | MKT | TF7 | TF4 | TF2 | TF1 | TF0 | FG2 | FG1 | FG0 |

*Note 1:* Minutes-after-the-hour

*Note 2:* (a) An asterisk in lines 3, 4, or 5 indicates that the processor could not interpret that particular information received from the marker.

(b) A blank in lines 3, 4, or 5 indicates that no digit was registered.

*Note 3:* An exclamation mark (!) indicates a ground on bit 7 of the respective digit (either an end 7 or only the bit 7 grounded).

*Note 4:* Bit position designations are not shown on the print-out. The print-out will show 0/1 for open/ground at the scan point.

*Note 5:* The information in Row 0 is marker information via the line verification scanner, not via the marker scanner.

**Fig. 2—Marker Test Output Message**

```
M 00 MKR  TEST CALL  OUTPUT

MKR  NO 000        SCAN UNIT NO 000

TRK SELECTED         TB0 FS01  TS19

CALLING LINE LOC     FTT0 FUT1 VGT03 HGT2 VFT3

CALLED  NO           2163931357!

ROW    ---BIT  POSITION---
        15----8   7-----0
12--   01000000  00000000
11--   00000000  00000001
10--   10000000  00000000
 9--   00000000  00000010
 8--   00000000  10001000
 7--   00000000  00001000
 6--   00000000  10000001
 5--   00001000  00000001
 4--   00000010  00010001
 3--   00101000  11000011
 2--   10011010  10000110
 1--   00110000  01100101
 0--   00000011  00000000
```

Fig. 3—Sample Marker Test Call Output