

"PICTUREPHONE®" SERVICE (PHASE 0)
2C VIDEO TELEPHONE STATION
OPERATIONAL TESTS—
TROUBLE LOCATING PROCEDURES
USING 136A TEST SET

CONTENTS	PAGE	CONTENTS	PAGE
1. GENERAL	1	Testing with Buzzer or Oscillator Signals	21
2. TEST SET CONTROLS	2	Testing with Video Signals	21
3. TEST SET CONNECTIONS	4	Single Line Installation	21
4. VOLTAGE TESTS	5	2C Video Telephone Station Behind 1 P2 Key Telephone System with CO or PBX Video Line Service	22
1A Service Unit	5	2C Video Telephone Station Behind 1P2 Key Telephone System (Intercom Only)	24
1A Display Unit	6		
5. TELEPHONE SET TESTS	6		
6. SPEAKERPHONE TESTS	6		
55D Control Unit	8	1. GENERAL	
7. 1A DISPLAY UNIT AND 72A CONTROL UNIT TESTS	9	1.01 This section describes operational test and trouble locating procedures to be followed at the time of installation and on subsequent maintenance visits. The 2C Video Telephone Station tests (Parts 4 through 7) should be performed before any calls are attempted.	
8. PROPERTIES OF THE VIDEO SIGNAL	9	1.02 This section is reissued to:	
9. CHECK OF PICTURE QUALITY	11	● Expand test procedures using the 136A test set	
Picture Impairment and Corrections	11	● Provide additional video signal properties	
10. OPERATIONAL TESTS	14	● Add photos to associate picture quality with video circuit impairment	
Key Telephone System (Intercom Only)	15	● Separate operational tests between line service and intercom service	
Line Services (Video Test Line Call)	18		
11. LOCATING TROUBLE in VIDEO PAIRS	19		
Continuity Tests for Video Pairs	19		

SECTION 518-800-501

- Expand video pair trouble locating information to show probable troubles and method of correction.
- Provide a video test pattern

Changes or additions in the body of tables are indicated by shaded areas.

1.03 These tests are used to determine if trouble exists in the major apparatus units of the 2C Video Telephone Station (including the 1A service unit, 1A display unit, and 72A control unit) and to locate troubles in the video pairs.

1.04 The 136A test set (Fig. 1) provides for:

- (a) Measurement of all supply voltages from service unit under both dummy loads and normal operational loads.
- (b) Operational checks of the video station using normal calling procedures or simulated turn-on.
- (c) Testing of control unit and display unit loudspeaker and tone ringer.

1.05 The test set derives its power from the circuits under test, eliminating the need for additional power sources.

1.06 Replacement of 2C video station components should be limited to:

- 1A display unit
- D50AF cord
- 1A service unit

FW1 circuit pack

FW2 circuit pack

FW3 circuit pack

P-40J326 power cord, 1-1/2 feet

P-40J327 power cord, 2 feet

P-40J328 power cord, 4 feet

P-40J329 power cord, 6 feet

P-40J099 power cord, 12 feet

939A cable equalizer

939B cable equalizer

24C fuse (2-amp)

24D fuse (3/4-amp)

877A network

877B network

- 55D control unit
- 72A control unit
- Telephone set

KS-20673, L1 lamp

Warning: *Dangerous voltages appear in the display unit. Disconnect power before removing display unit housing. No attempt should be made to operate the display unit with the housing removed.*

Caution: *On new installations, do not connect D50AF cord between display unit and service unit until service unit voltages have been checked as outlined in Part 4.*

1.07 Refer to Section 518-800-505 for maintenance and test procedures for single group, multigroup, and single link intercom and to Section 518-800-507 for trouble locating information for 2-or 3-link intercom.

1.08 Throughout the following tests, when replacing components, if the trouble is not cleared by a replacement, restore the original component. Return replaced components according to local instructions.

2. TEST SET CONTROLS

2.01 The following controls and indicators are provided on the 136A test set (Fig. 1).

(a) PWR lamp indicator—Indicates 1A service unit is powered when lamp is lighted.

(b) METER—Two scales provide for ABS (absolute) or NOR (normalized) voltage readings. The absolute scale is calibrated 0-30



TPA 550536

Fig. 1—136A Test Set

volts and the normalized scale is calibrated for ratios of 0.8 to 1.2 of nominal voltage. The normalized scale has a green field which encloses the normal range of acceptable deviation.

- (c) **METER key**—Select meter scale (ABS or NOR) to be used.
 - (d) **VOLTAGE TEST**—16-position rotary switch for selecting the voltage to be measured.
 - (e) **MODE key**—Provides selection of the following test conditions:
 - (1) **SU TEST**—Nonlocking position of key—places dummy loads on the service unit while voltage measurements are made.
- ◆**Note:** The SU TEST position of the MODE key is designed for *momentary* operation while meter readings are being taken. Continuous operation in the SU TEST position results in substantial heat in the dummy loads located below the DU connector. If this connector becomes warm to the touch, prolonged operation of the MODE key in the SU TEST position should be avoided until the test set has cooled.◆
- (2) **DU TEST**—Locking position of key—turns on service unit power supply for display and control unit tests.
 - (3) **DU-CU OPR**—Normal position key connects display and control units to the service unit through the test set to permit overall operational check, including associated telephone set, speakerphone and key telephone system equipment. Calls can be originated and answer in this mode.
 - (f) **T-R REV key**—When operated to the COM (common) position this switch reverses the outgoing video pair (VOT and VOR) to permit checking the effect of polarity reversal of the pair (Fig. 2). When operated to the CONT (control) position the incoming video pair (VIT and VIR) is reversed and the effect of polarity reversal can be checked. In the NOR position the video pairs are connected straight through the test set.
 - (g) **LOOPBACK key**—Opens the video pairs between the display unit and service unit and loops them back in both directions simultaneously

(Fig. 2). This permits testing of the display unit and its interconnecting cord and (with a call established) serves as an aid for loop transmission testing from the CO.

- (h) **VIDEO ATTEN position key**—Provides attenuation of the received video signal (Fig. 2) to verify that the signal is not below acceptable limits.
- (i) **SP-SND key**—In TEST position, a loudspeaker and sounder in the test set are substituted into the circuit.
- (j) **CONTROL UNIT controls**—Provides substitution test for 72A control unit.
- (k) **SPEAKERPHONE switch**—The TEST position switches speakerphone controls from 72A control unit to the test set to allow checking of speakerphone operation without display or control unit connected or operating.

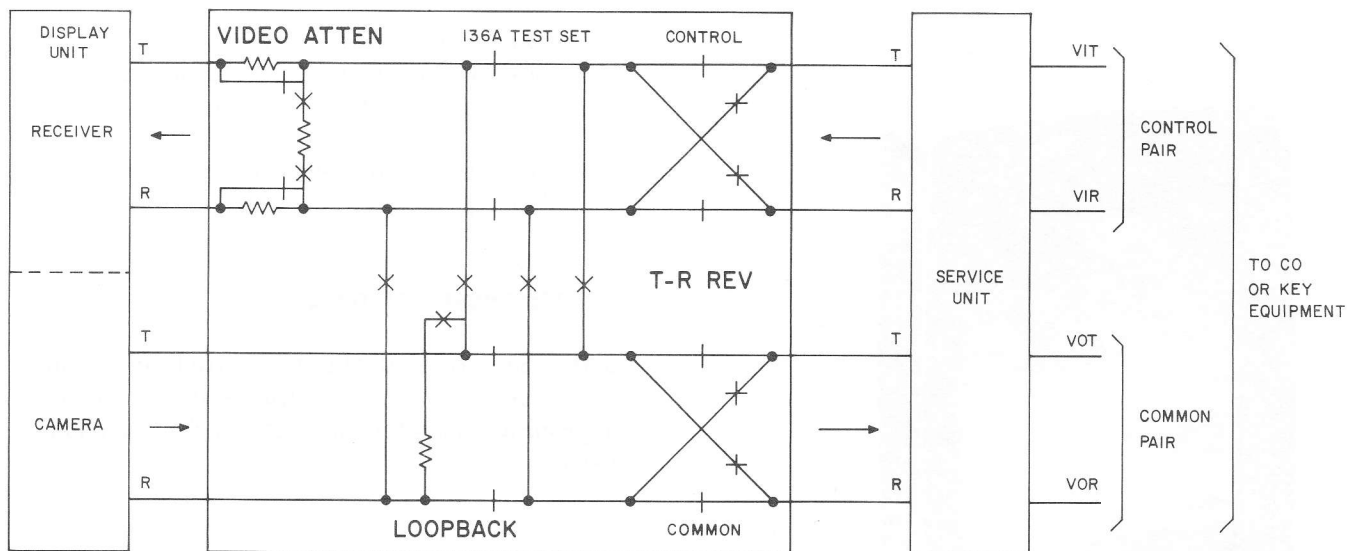
3. TEST SET CONNECTIONS

3.01 Connectors (DU and SU) on the test set (Fig. 1) permit placing the test set between the service unit and the display and control units (Fig. 3). If a connector cable has been used to extend the interconnecting cord from the display unit to the service unit, open the connection and insert the test set. In installations where the display unit is plugged directly into the service unit, use the B25A cable supplied with the test set to connect to the service unit.

◆**Note:** No connection is made to connector CU at this time. Connector CU is used only when specifically mentioned.

3.02 When the test set has been connected, the PWR lamp should light, indicating the rectifier circuits in the service unit are operating. If lamp does not light and no meter reading is obtained place VOLTAGE TEST switch in position 16 and proceed as follows:◆

- (1) Ensure that all plugs and connectors are properly installed.
- (2) Ensure that service unit power cord is plugged into wall receptacle and commercial power is present.



◆ Fig. 2—Video Attenuation, Video Loopback and Tip-Ring Reversing Through 136A Test Set ◆

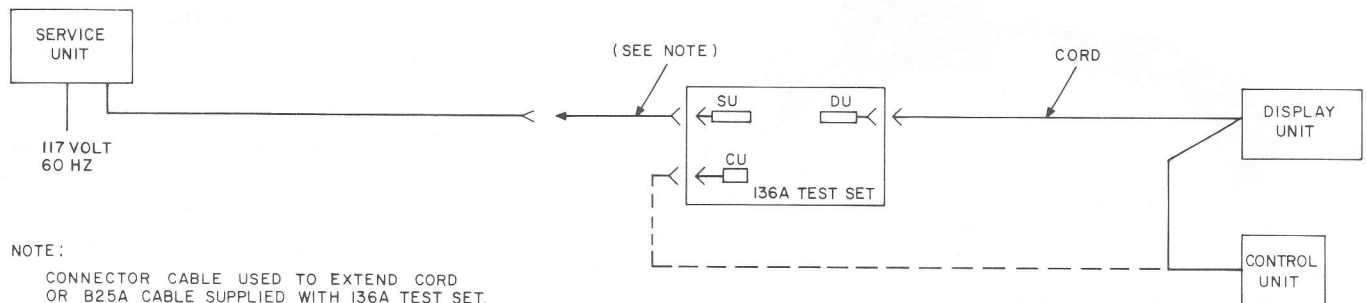


Fig. 3—Block Diagram of Test Set Connections

- (3) Check fuses in service unit.
- (4) If test set lamp still does not light and no meter reading is obtained, replace service unit.

3.03 ◆ If meter reading is obtained in position 16 and the lamp does not light, replace lamp in test set.

4. VOLTAGE TESTS

Note: Perform following 1A service unit tests before testing 1A display unit.

1A Service Unit

4.01 Verify that proper FW-type circuit packs and 877-type networks or 939-type cable equalizers are installed and correctly adjusted in the service unit. See Tables A, B, and C for selection and proper screw switch settings.

4.02 Connect test set to service unit (*only*) as outlined in 3.01.◆

4.03 Check voltages as follows:

- (1) Set METER key to NOR and VOLTAGE TEST switch to position 1.
- (2) Operate and hold MODE key to SU TEST position. The voltage should be within the limits of the *green field* of the NOR scale.
- (3) Release the MODE key and advance VOLTAGE TEST switch to next position.
- (4) Repeat steps (2) and (3) until tests are made at all VOLTAGE TEST switch positions. At position 11 the meter will read zero indicating that the speakerphone is off or not connected.
- (5) ◆ If the voltage reading in position 1 is correct and the voltage reading is not within the limits of the green field of the NOR scale in



◆ Fig. 4—Horizontal Bar Image on Display ◆

any position from 5 through 10 or 12 through 14, replace the FW-type circuit pack. If any other voltage does not test satisfactorily, replace the service unit.◆

1A Display Unit

4.04 ◆Connect test set to service unit and display unit as outlined in 3.01.

4.05 Check voltages as follows:

- (1) Set METER key to NOR and VOLTAGE TEST switch to position 1.◆
- (2) Operate MODE key to DU TEST. the voltage should be within the limits of the *green field* of the NOR scale.
- (3) Rotate VOLTAGE TEST switch to positions 2 through 10 and 12 through 16 making certain that measurements fall within limits of

the *green field* of the NOR scale. The voltage at position 11 will read zero indicating that the speakerphone is off or not connected.

- (4) ◆If any voltage tests fail, replace the display unit.◆

5. TELEPHONE SET TESTS

5.01 Ensure that the associated telephone set meets its own requirements. Refer to appropriate maintenance section for telephone set used.

6. SPEAKERPHONE TESTS

6.01 The 2C Video Telephone Station includes a speakerphone system with the controls and transmitter integrated into the 72A control unit, the loudspeaker integrated into the display unit, and the 2012B transformer into the service unit transformer. The loudspeaker assembly contains an auxiliary amplifier, powered by +23V from the service unit, to drive the loudspeaker. The transmitter amplifier is powered by +23V and -23V from the service unit.

6.02 Refer to Section 512-620-100 for complete information on speakerphone operation and Section 512-620-200 for installation and maintenance. The 136A test set supplements the normal test procedure by permitting substitution (using transfer switches and keys) of test set components for components integrated into 72A control unit and the display unit.

6.03 ◆If the speakerphone cannot be turned on (lamp remains off) by operating the ON button on the 72A control unit, connect the test set as outlined in 3.01.

6.04 Turn test set SPEAKERPHONE switch to TEST with MODE key in the DU CU OPR position. If speakerphone can be turned on by operating the ON button on the test set control unit, return SPEAKERPHONE switch to NOR and proceed as follows:

- (1) Remove cord from 72A control unit and connect to connector CU (Fig. 1) on test set.

TABLE A
939A CABLE EQUALIZER SCREW SWITCH SETTINGS
FOR STATION NOT ASSOCIATED WITH 1P2 KTS
(USING FW2 CIRCUIT PACK)

SCREW SWITCH SETTINGS * CABLE GAUGE AND TYPE	CABLE LENGTH (FEET) FROM PRECEDING CABLE EQUALIZER TO 1A DISPLAY UNIT		
	S	M	M and L
22 Pulp	Up to 2700	2701 to 5400	5401 to 8100
24 Pulp	Up to 2200	2201 to 4400	4401 to 6700
26 Pulp	Up to 1800	1801 to 3600	3601 to 5800

* Close screw switch (S, M, or L) associated with length and gauge of cable used and make certain remaining screw switch(es) (S, M, L are open).

TABLE B
1A SERVICE UNIT NETWORK SELECTION FOR STATION ASSOCIATED WITH 1P2 KTS
(USING FW1 CIRCUIT PACK)

NETWORK CABLE GAUGE & TYPE	CABLE LENGTH (FEET) KTS TO 1A DISPLAY UNIT*			
	877A NETWORK A	877B NETWORK B	877A NETWORK C	877B NETWORK D
22 Pulp	Up to 130	131-230	231-330	331-430
24 Pulp	Up to 120	121-220	221-320	321-420
26 Pulp	Up to 140	141-250	251-350	351-440
22 PIC	Up to 180	181-320	321-460	461-600
24 PIC	Up to 180	181-310	311-450	451-580
26 PIC	Up to 190	191-330	331-460	461-580
24 252A Swbd Cable	Up to 140	141-260	261-380	381-500
24 D-Type Inside Wire	Up to 125	126-225	226-325	326-425
22 D-Type Station Wire	Up to 165	166-315	316-465	466-615
22 ABAM	Up to 190	191-340	341-490	491-620
24 CA 3217	Up to 220	221-390	391-540	541-670
24 DL Wire	Up to 160	161-280	281-410	411-530
24 ABMM	Up to 190	191-340	341-480	481-610

* When cable length exceeds those shown in this table use 939B cable equalizer and externally mounted 607A KTU on station side of KTS in common pair as close as is practical to KTS equipment in place of network and refer to Table C for Screw Switch Settings. Length should include cable between 1A Service Unit and 1A Display Unit.

(2) If speakerphone can be operated with test set control unit, replace the 72A control unit.

(3) If speakerphone cannot be operated with test set control unit, replace the D5OAF cord.⚡

6.05 If the speakerphone can be turned on (lamp lights) by operating the ON button on the 72A control unit, but the display unit loudspeaker is inoperative (no sidetone), turn test set SP-SND key to TEST.⚡

Note: Speakerphone volume on the test set loudspeaker will be lower than that of a standard 3-type speakerphone. When using test set loudspeaker, it may be necessary to turn control unit VOLUME control to the maximum position.

(a) If test set loudspeaker does not operate, see 6.07.

(b) If test set loudspeaker operates, return SP-SND key to NOR and make the following checks:

(1) Check that display unit connector is properly connected to test set.

(2) Check that SP1 and SP2 leads are not reversed in the service unit or 55D control unit.

Note: SP1 and SP2 leads should be paired and polarity must be correct. See Section 518-800-401 for 2C Video Telephone Station connections.

(c) If loudspeaker in display unit is still inoperative, replace display unit cord and/or display unit.

(d) If speakerphone still does not work, see 6.07.

6.06 If loudspeaker operates but microphone does not, turn test set SPEAKERPHONE switch to TEST.

(a) If test set permits audio transmission, proceed as in 6.04.

(b) If speakerphone still does not work, see 6.07.

6.07 Check *all wiring* to 55D control unit and associated telephone set. Replace 55D control unit or telephone set if necessary.

55D Control Unit

6.08 Operation of 55D control unit and its connections may be checked *without* the display unit and 72A control unit by connecting the test set to the service unit as outlined in 3.01 and proceeding as follows:

(1) Ensure that power is applied to service unit and 55D control unit.

(2) Set controls on test set as follows:

- SP-SND key to TEST (provides loudspeaker)

- SPEAKERPHONE switch to TEST (provides speakerphone controls and transmitter)

- MODE key to SU TEST (use as a push-to talk key.)

⚡**Note:** The SU TEST position of the MODE key is designed for *momentary* operation while meter readings are being taken. Continuous operation in SU TEST position results in substantial heat in the dummy loads located below the DU connector. If this connector becomes warm to the touch, prolonged operation of the MODE key in the SU TEST position should be avoided until the test set has cooled.

(3) Operate ON button on test set control unit to turn speakerphone on.⚡

(4) Originate a speakerphone call and verify normal operation. When talking, operate MODE key to SU TEST position.

Note: Speakerphone volume on the test set loudspeaker will be lower than that of a standard 3-type speakerphone. When using test set loudspeaker, it may be necessary to turn test set VOLUME control to maximum position.

(5) Request distant party to call back on termination of call.

(6) Answer incoming call by operating ON button on test set control unit and verify normal

operation. When talking, operate MODE key to SU TEST position.

- (7) Change from speakerphone to handset mode and verify normal operation.
- (8) Terminate call.

7. 1A DISPLAY UNIT AND 72A CONTROL UNIT TESTS

7.01 ♦ Check operation of display unit and video controls as follows:

- (1) Connect test set to service unit and display unit as outlined in 3.01.
- (2) Set MODE key to DU TEST position and LOOPBACK key to NOR.
 - (a) In *key telephone system installations* horizontal lines (gray raster) should appear on the screen.
 - (b) In *single line installations* the local image should appear because of loopback in the 939A cable equalizer.
- (3) Open graphic visor. Turn to Fig. 11 and remove video test pattern from section by cutting along line marked **CUT HERE**. Place video test pattern on a flat surface in front of the display unit with the top edge of the test pattern touching the front of the display unit ring stand (slide margin between edge of page and edge of test pattern under ring stand). Operate LOOPBACK key on 136A test set. Rotate display unit as required to line up side markers of test pattern with edges of display unit viewing area. All lines of the resolution strip should be distinguishable.
- (4) Depress PRIVACY button on 72A control unit. Fixed horizontal bar (Fig. 4) should appear on display unit.
- (5) Restore PRIVACY button on 72A control unit to normal position. Local image should return on display unit.
- (6) Test the following controls on the 72A control unit.
 - (a) Rotate BRIGHT. The degree of brightness should vary from very dark to bright.

(b) Rotate ZOOM. As the control is moved slowly from one extreme to the other, the area of the image transmitted should increase or decrease smoothly.

(c) Rotate HEIGHT with ZOOM in extreme "close-up" position. As the HEIGHT control is moved slowly from one extreme to the other, the image transmitted should move smoothly up or down approximately 3 inches on the face of the display unit. Move ZOOM to extreme "wide angle" position. As HEIGHT control is moved, there should be *no* movement of the image transmitted. The range of HEIGHT control should decrease gradually as ZOOM control is changed from "close up" to "wide angle".

(7) Depress VU SELF button on 72A control unit. Return LOOPBACK key to NOR while observing local image on display unit. Local image should remain on display unit. If image breaks up or distorts, ensure that 939-type cable equalizers or 877-type networks are properly seated in their connectors and that S2 screw switches on the 1A service unit terminal board are tightened down.

(8) If any of steps (4) through (6) fail, disconnect cord from 72A control unit and plug into CU connector on the test set. Repeat Steps (4) through (6) using the video controls on the face of the test set. If tests prove satisfactory using the test set, replace the 72A control unit. If tests are still unsatisfactory, replace the control unit cord and/or the display unit.♦

8. PROPERTIES OF THE VIDEO SIGNAL

8.01 In addition to the regular telephone pair (T and R) used to carry the voice (audio) signal, a video telephone station requires two video pairs to transmit and receive picture (video) signals. Video pairs are balanced and twisted pairs of the same type used for the audio tip and ring, but are preselected for balanced, minimum bridge taps, etc.♦

8.02 ♦ Although the pairs are unshielded, their precise balance with respect to ground protects the video signal against interference from other signals. If this balance is upset, the video pair is susceptible to 60 Hz hum (broad horizontal lines moving up the picture), single frequency

TABLE C

**939B AND EXTERNALLY MOUNTED 607A CABLE EQUALIZER SCREW SWITCH
SETTINGS FOR STATION ASSOCIATED WITH 1P2 KTS
(USING FW1 CIRCUIT PACK NOTE 1)**

CABLE GAUGE AND TYPE \ SCREW SWITCH SETTING (NOTE 3)	CABLE LENGTH (FEET) KTS TO 1A SERVICE UNIT (NOTE 2)		
	S	M	M and L
22 Pulp	430-3100	3101-5800	5801-8000
24 Pulp	420-2600	2601-4800	4801-6700
26 Pulp	440-2200	2201-4000	4001-5800
22 PIC	600-3800	3801-7300	7301-8000
24 PIC	580-3200	3201-6000	6001-6700
26 PIC	580-2600	2601-4700	4701-5800
24 252A Swbd Cable	500-2800	2801-5200	5201-6700
24 D-Type Inside Wire	420-2400	2401-4500	4501-6300
22 D-Type Station Wire	610-3400	3401-6500	6501-8000
22 ABAM	620-4300	4301-8000	8001-11,500
24 CA 3217	670-3600	3601-6500	6501-6700
24 DL Wire	530-3000	3001-5600	5601-6700
24 ABMM	610-3300	3301-6000	6001-6700

Notes:

1. This table applies to the 607A KTU *only* when used on the station side of the KTS. In this application, the SS switch on the 607A KTU should be closed.
2. Use this table only when distance from 1P2 KTS exceeds limits of 877B network used in D position (Table B).
3. Close screw switch (S, M or L) associated with length and gauge of cable used and make certain remaining screw switch (es) (S, M, L) are open.

interference (diagonal or vertical bars moving across the picture) and noise (snow as on conventional television screen). To avoid unbalance in the video pairs, make sure the following precautions are taken:¶

- Twisted pairs, not single wires are used as tip and ring leads
- No accidental ground connections appear on either side of line
- Wires make good contact at all connecting points (no broken or loose wires at terminals).

Fig. 5 shows image on display unit with one side of line (VIT or VIR) open.

8.03 Pairs used for video signals must be free from excessive bridge taps. Multiple images (ghosts) are usually an indication of excessive bridge taps on the video pairs. ¶No single bridge tap in excess of 100 feet is permissible, and the sum of all bridge taps should not exceed 200 feet. Excessive bridge taps, load coils, and build-out capacitors must be removed or other pairs without bridge taps must be selected before proceeding.¶

8.04 The common video pair, VOT and VOR, transmits the video output of the video telephone station towards the central office. The control video pair, VIT and VIR, carries the signal from the central office to the video telephone station. Since video signals are transmitted in only one direction on either pair, a transposition of the common and control pairs has the same effect on transmission as both pairs being open or disconnected which results in no picture.

8.05 Video signals are unsymmetrical: On the tip lead, the negative part of the signal consists of synchronizing pulses which control the start of the scanning lines displayed in the picture tube. The positive part of the signal represents the picture information which varies with the scene viewed by the camera.

8.06 When the tip and ring leads of a video pair are interchanged, the polarity of the signal is reversed and the sync information is not recognized by the video telephone station. Depending on picture content and signal level, only a flickering, narrow, horizontal strip may be seen in the center of the image area. If any picture is recognizable,

it is negative with whites appearing black, and blacks appearing white. See Fig. 6,7, and 8 for examples of tip-ring reversals. Refer to 11.08, 11.12, or 11.16 for methods of clearing tip-ring reversals at single line installations, KTS installations (line service), and KTS installations (intercom) respectively.

9. ¶CHECK OF PICTURE QUALITY

9.01 Fig. 9a shows an undistorted picture of good quality. When checking picture quality look for the following impairments:

Picture Impairment and Corrections

(a) **Crosstalk** (Fig. 9b): Vertical lines or bars moving slowly across the picture caused by portions of other video signals appearing in the signal displayed. Sometimes crosstalk is noticed only when the call is made to another station and not when calling a test number. To correct:

- (1) If crosstalk is observed on distant party display unit and operation of the VU SELF button at your station eliminates it (crosstalk on distant party display unit), the crosstalk is caused by your display unit.
- (2) If impairment is objectionable, replace the display unit.
- (3) If operation of the VU SELF button at your station does not affect crosstalk observed at the distant station, and if your station shows crosstalk, connect the 136A test set as outlined in 3.01 and refer to 11.08 (single line installation) or 11.12 or 11.16 (key telephone system installation) for repair procedures.

(b) **Random Noise** (Fig. 9c): Picture appears grainy or fuzzy with "snow" in severe cases.

(c) **Impulse Noise** (Fig. 9d): Light and dark spots appear on the scanning lines.

(d) **Power Line Interference (60Hz, 120Hz, and 180Hz)** (Fig. 9e): Broad waves of light and dark areas moving up the picture.



◆ Fig. 5—Image on Display Unit With One Side of Line (VIT or VIR) Open ◆

(e) **Single Frequency Interference** (Fig. 9f):

Uniformly spaced wavy patterns moving across picture in any direction:

- (1) To correct impairments (b, c, d, or e), connect the 136A test set as outlined in 3.01 and refer to 11.09 (single line installation) or 11.13 (key telephone system installation) for repair procedure.

(f) **Echo Impairments** (Fig. 9g): One or more images horizontally displaced from the main image (ghosts). This may be caused by bridge taps on the video pairs. Check for excessive bridge taps.◆

- (g) **Resolution:** (Sharpness of picture) In the picture of a person's face, look for detail in the eyes, or lines between the teeth. When using video test pattern (Fig. 11), the individual lines should be discernible in both resolution strips.



The 2C Video Telephone Station is not designed for readable reproduction of typewritten material or similar size printing.

- (h) **Overloading:** With the BRIGHT control on the 72A control unit properly set, there should be detail in the dark as well as in the light image areas. Presence of washed out white

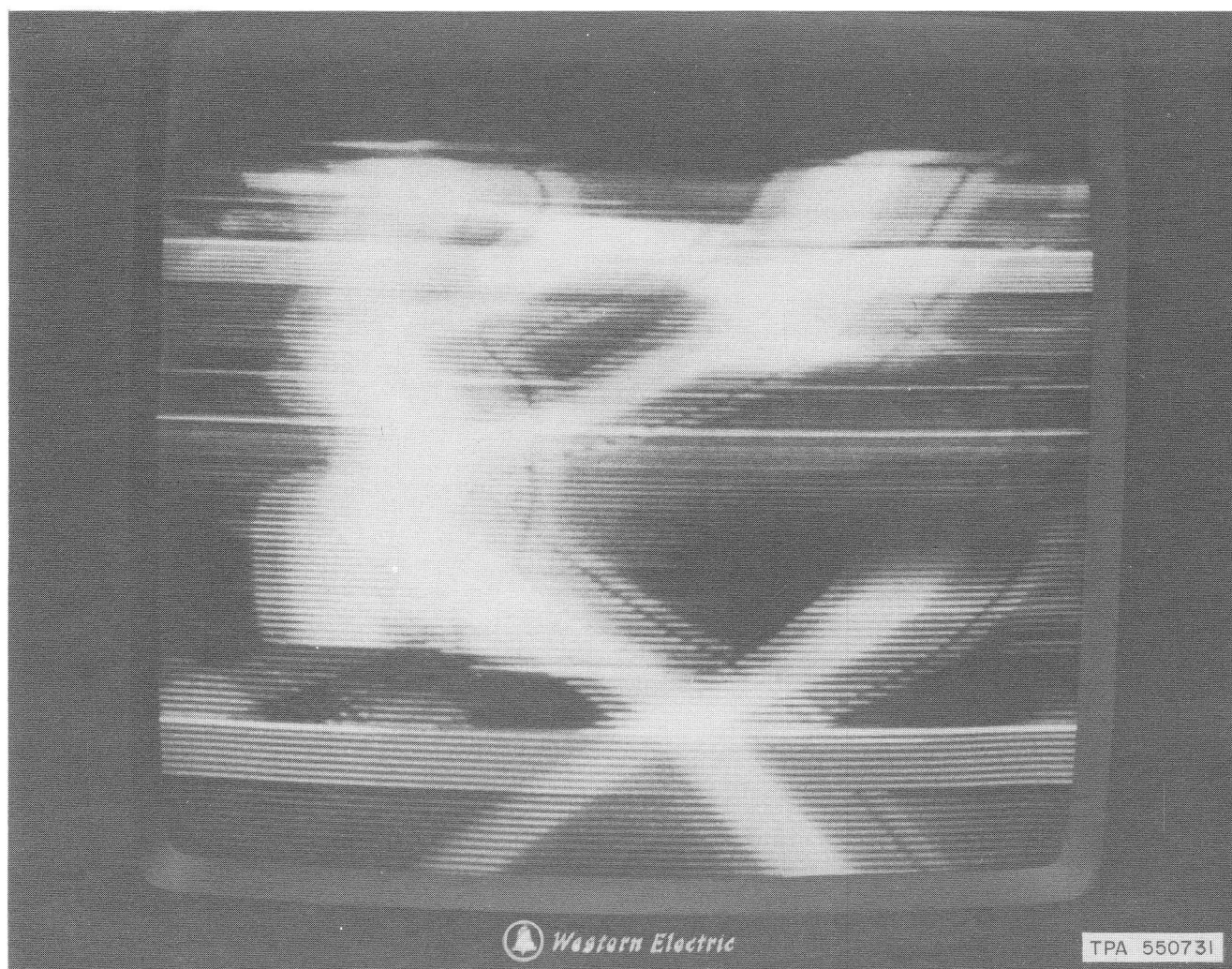


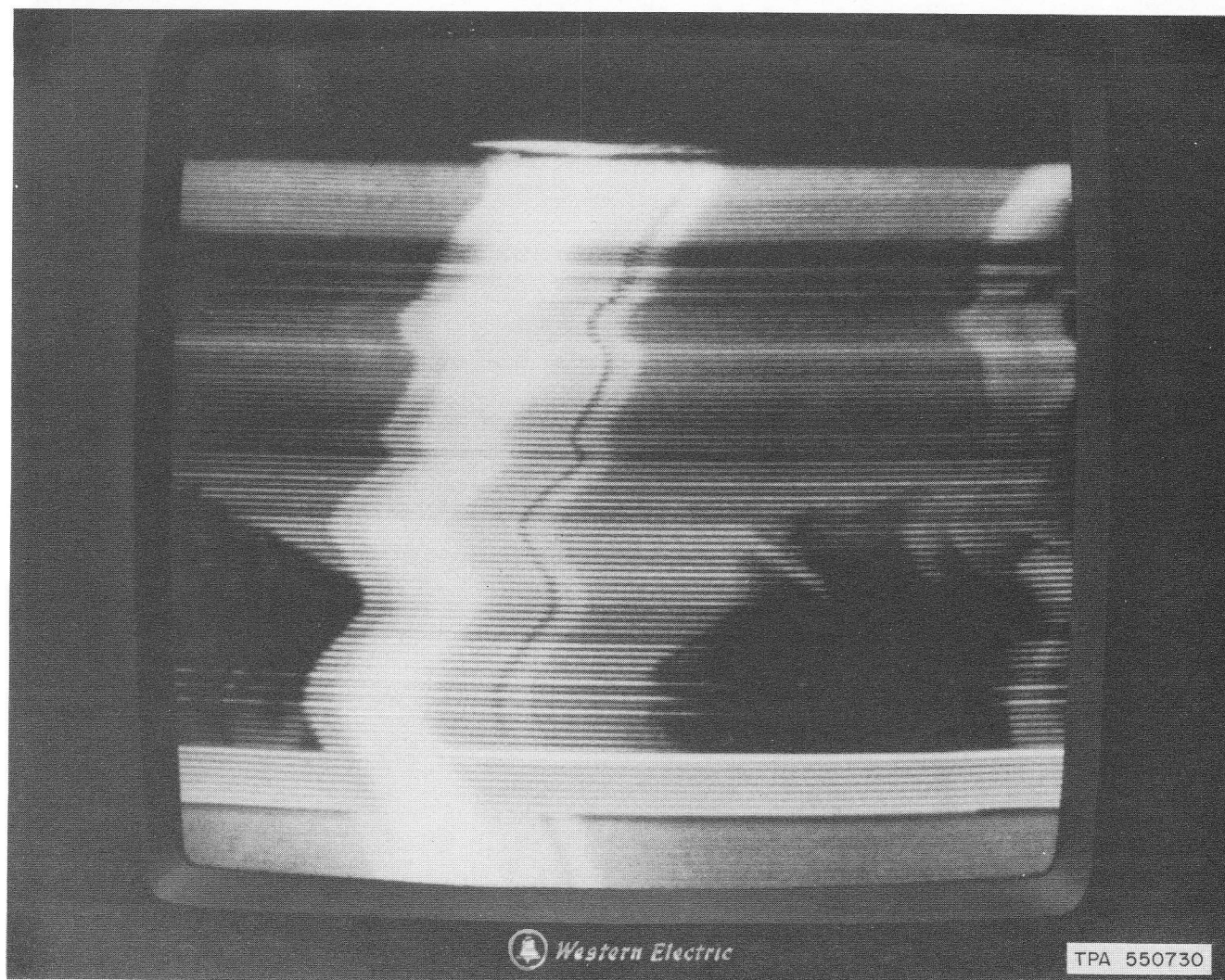
Fig. 6—Tip-Ring Reversal Image on Display Unit

areas in the middle of the picture indicate overloading. However, overloading on windows and other light sources especially near the top or bottom of the image area should be disregarded. When a video test pattern with a gray scale chart or stairstep signal is used, each bar of gray should be clearly discernible (adjustment of BRIGHT control may be necessary). To correct impairments (g or h):

- (1) ♦Connect 136A test set as outlined in 3.01, place test set MODE key in DU CU OPR position, and operate LOOPBACK key. If impairment persists while LOOPBACK key is operated, replace display unit. However, *no* display unit should be rejected unless it has had a 30-minute warmup (display unit turned on) prior to test.♦

- (i) **Receiver Size and Centering:** Verify that essential parts of the received pictures are not hidden by the bezel. Edge markers on a test pattern from the central office or a computer produced display, if available, are aids for this check. ♦If a CO test pattern or computerized display unit is not available, a video test pattern (Fig. 11) may be transmitted from a distant set to check receiver size and centering on your display unit.♦ *Since size and centering adjustments are not accessible, the display unit must be replaced if it does not meet this requirement.*

- 9.02 ♦Conditions which persist after the actions described have been taken and conditions



◆ Fig. 7—Tip-Ring Reversal Image on Display Unit ◆

for which no specific action is recommended should be referred to the local test desk or engineering department according to local instructions.◆

10. OPERATIONAL TESTS

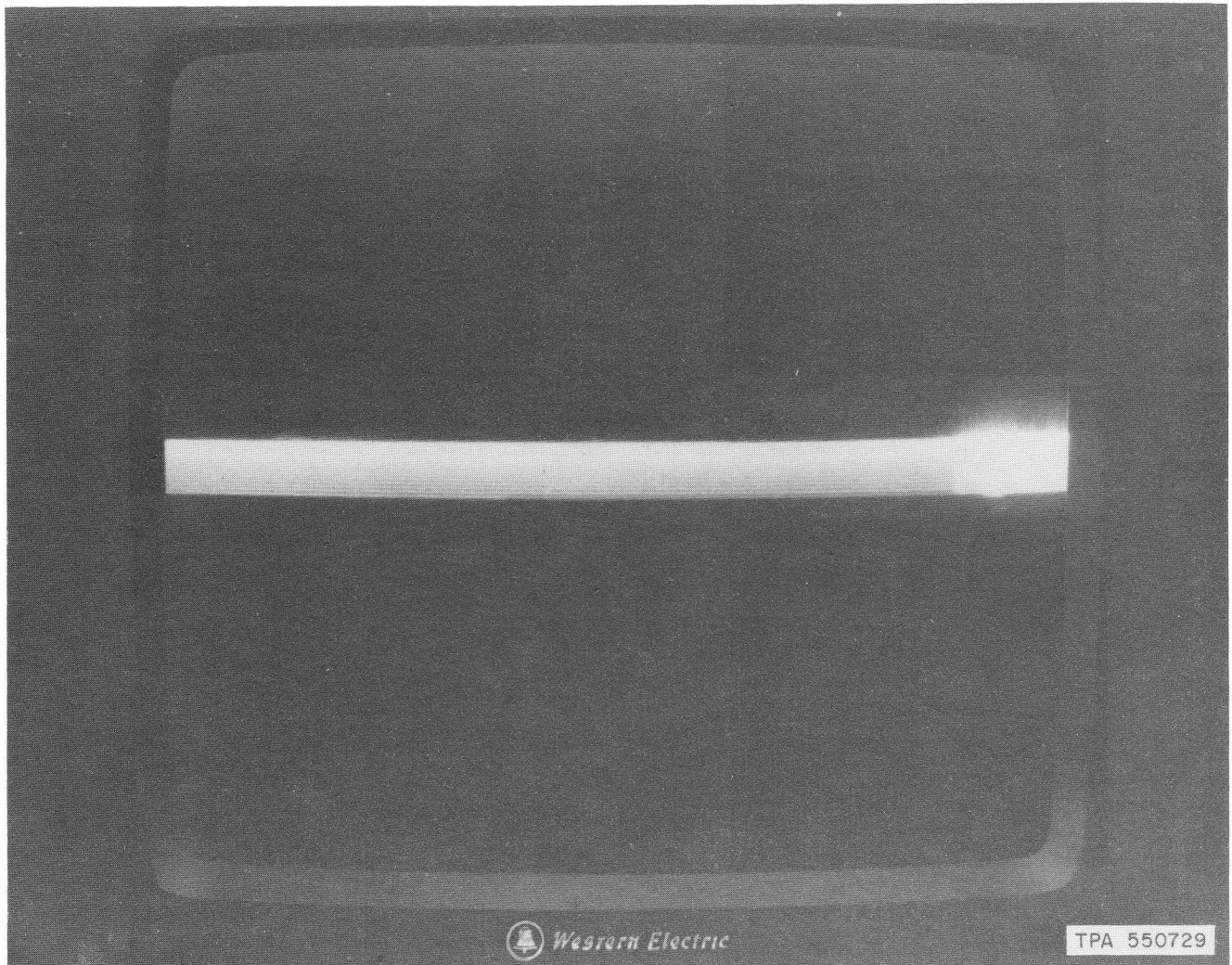
10.01 The purpose of these tests is to originate and receive video calls to verify that the system works satisfactorily before it is turned over to the customer and to check out customer complaints.

10.02 To make these tests, the video switch (remote or central office) serving the station must be in operation and the video loops must have been aligned. See Section 518-800-510. The station set should be tested before calls are

attempted (see 7.01). Operational tests involve the observation of:

- A video reference signal received by the station under test
- A video signal originated at the station and returned to the station from a video switching point.

If a station video test line with a video test pattern is available, this may be accomplished by the installer without assistance. In some cases, such as stations behind PBXs, more than one call must be made or the assistance of the test desk may



◆ Fig. 8—Tip-Ring Reversal Image With Privacy Button Depressed ◆

be required. In such cases, local instructions should be followed.

Key Telephone System (Intercom Only)

10.03 ◆ In key telephone system intercom installations, no test lines are available and any test calling for a test signal or pattern is performed by using another intercom station as the reference signal generator; therefore, special care must be exercised during the wiring of the intercom station that will serve as the reference signal generator. Each video pair should be checked to positively identify *tip* and *ring* (see 11.04).

10.04 At the intercom station being used as a reference signal generator, proceed as follows:

- (1) Originate call to station being tested.
- (2) Open graphic visor.
- (3) Place video test pattern (Fig. 11) on a flat surface in front of the display unit with the top edge touching the ring stand.
- (4) Depress VU SELF button and rotate display unit on stand as required to line up side markers of test pattern with vertical edges of



(a) UNDISTORTED PICTURE



(d) IMPULSE NOISE



(b) CROSSTALK



(c) RANDOM NOISE

TPA 550726-1

◆ Fig. 9—Video Impairments That May Appear on Display Unit (Sheet 1 of 2) ◆



60 Hz



32 kHz



120 Hz



431 kHz

(f) SINGLE FREQUENCY INTERFERENCE



180 Hz

(e) POWER LINE INTERFERENCE



(g) ECHO IMPAIRMENT

TPA 550726-2

▶Fig. 9—Video Impairments That May Appear on Display Unit (Sheet 2 of 2)◀

display area. All lines of the resolution strip should be distinguishable.

- (5) If the video test pattern picture is not satisfactory at the station under test and a good picture can be obtained by operating the VU SELF button on the 72A control unit, then, a pair defect has occurred and must be corrected (See 11.04).

10.05 Any requirements for central office loopback are simulated at the station under test by placing jumpers on the 66-type connecting blocks at the key equipment. The tip and ring of the common and control pairs of the station under test are jumpered VOT-to-VIT and VOR-to-VIR. This condition loops back the video pairs for a comparison between the VU SELF picture, and the loopback picture over the entire transmission path. Connect the 136A test set as outlined in 3.01. It is important that no call be placed and that the 136A test set be used to turn on the PICTUREPHONE station. With MODE key in DU-CU OPR position and all other controls in normal position, depress ON button on test set to eliminate the possibility of a bridge tap at the key equipment. Observe your image on the display unit screen; then, operate the VU SELF button on the 72A control unit and compare the images. They should be of the same video quality.

10.06 Remove jumpers from the 66-type connecting block and disconnect 136A test set.

Line Services (Video Test Line Call)

10.07 To make a video test call via a test line proceed as follows:

- (1) Connect 136A test set as outlined in 3.01.
- (2) Set MODE key to DU-CU OPR and all other controls to normal position.
- (3) Remove handset from associated telephone set.
- (4) Dial prefix "#", followed by station video test line code and the last four digits of the telephone number of the calling station.
- (5) An audio signal and a video image (station video test signal, Fig. 10) should be received.

- (6) Depress VU SELF button on 72A control unit. If local image is distorted or broken up, ensure that cable equalizer or 877-type network is properly installed in 1A service unit.

- (7) If symptoms of tip-ring reversal (see 8.06) are noted, operate test set T-R REV key to CONT position. If this corrects the display there is a VIT-VIR reversal. Terminate test call, locate the error (see 11.08 or 11.12) and correct the wiring. Repeat tests (1) through (6) to verify trouble is cleared. Do not continue unless test signal is displayed properly.

- (8) Flash switchhook, then replace handset. Station video test line equipment will originate a video test call. Upon receiving the incoming video call:

1. Tone ringer should be heard (if connected)
2. Flashing red light should appear on line button of associated telephone set (if key telephone set is used)
3. Before answering call, verify that display unit has not yet turned on.
4. Answer call by operating ON button on 72A control unit associated with video telephone station. Display unit should turn on showing local image returned from video switch.
5. If symptoms of tip-ring reversal (see 8.06) are noted, operate test set T-R REV key to COM position. If this corrects the display, VOT-VOR are reversed. Terminate test call, locate error (see 11.08 or 11.12) and correct the wiring. Repeat tests (1) through (8) to verify trouble is cleared.

6. Check picture quality as outlined in Part 9. Use VU SELF image as a standard for comparison.

7. Disconnect 136A test set.

10.08 Repeat tests in 10.07 for each video line associated with the station.

10.09 A video call to an attended station (local test desk or other locally designated station) is recommended as a final check of picture quality.

The person at the distant station should be familiar with judging picture quality as described in Part 9.

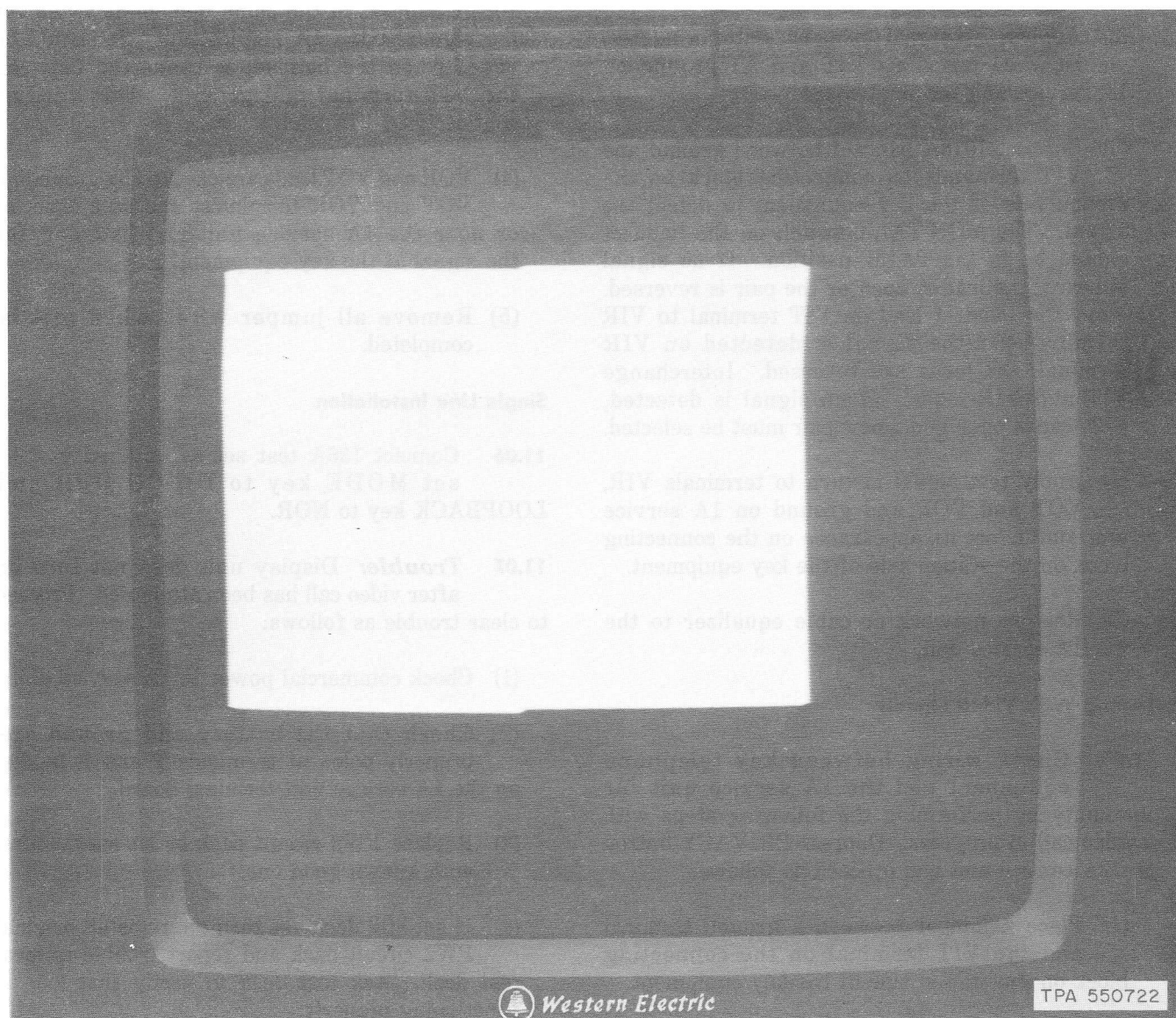
11. LOCATING TROUBLE IN VIDEO PAIRS

11.01 Before attempting to locate trouble in the video pairs, verify that the video telephone station has been tested as indicated in Parts 4 through 7 and is working satisfactorily.

Continuity Tests For Video Pairs

11.02 Continuity tests of video pairs require a signal source such as a KS-16690 oscillator, 81A test set (buzzer), or equivalent, connected at one end of the video pair and a 1013A handset or equivalent, to listen for the signal at the distant end of the video pairs or at intermediate points.

Warning: *Disconnect video pairs from PICTUREPHONE equipment before connecting buzzer.*



◆ Fig. 10—Station Video Test Signal ◆

11.03 A 1013A handset can also be used to distinguish a video signal, especially the privacy signal which produces a buzz.

Testing With Buzzer or Oscillator Signals

11.04 Video wiring between key telephone equipment and the 1A service unit may be checked for continuity and tip-ring reversals by performing the following steps. With the equipment inactive (no call in progress):

- (1) Remove network or cable equalizer from 1A service unit.
- (2) Apply a test signal (using oscillator or buzzer) between terminals VIT and A1 ground on 1A service unit terminal board.
- (3) Connect 1013A handset between ground and VIT terminals on connecting block on the station side of the key equipment to detect the signal. The MON-TALK switch on the handset should be in the TALK position. If no signal is heard, the lead is open or the pair is reversed. Move the handset lead on VIT terminal to VIR terminal. If the signal is detected on VIR terminal, the leads are reversed. Interchange VIT and VIR leads. If no signal is detected, VIT lead is open and a new pair must be selected.
- (4) Apply test signal in turn to terminals VIR, VOT and VOR and ground on 1A service unit and detect its appearance on the connecting block on the station side of the key equipment.
- (5) Restore network or cable equalizer to the 1A service unit.

Testing With Video Signals

11.05 Check wiring between key telephone equipment and the 1A service unit for continuity by performing the following steps with a video call in progress. Depress PRIVACY button on 72A control unit and proceed as follows:

- (1) Place a jumper between a ground terminal and the VIT terminal on the connecting block on the station side of the key equipment.

Warning: *Never ground the video pairs on CO, Centrex, or PBX side of the key equipment as this could interfere with*

the operation of the loop cable equalizers and create a safety hazard for personnel.

- (2) Connect 1013A handset between ground terminal and VIT terminal at 1A service unit. No signal should be heard. If signal is heard, reversal exists. Move the handset lead on VIT terminal to VIR terminal. A signal (steady buzz) should be heard. This verifies continuity of VIR lead. If no signal is heard, VIR lead is open and a new pair must be selected.

- (3) Move jumper at key equipment from VIT terminal, and ground VIR terminal. Use 1013A handset in the same manner to listen for the signal at the 1A service unit. It should be heard when the handset is connected between the VIT terminal and ground. This verifies continuity of VIT lead.

- (4) VOR and VOT leads are checked by grounding VOT and VOR terminals, one at a time, at or near the 1A service unit and listening for the signal at the key equipment.

- (5) Remove all jumper wires when test is completed.

Single Line Installation

11.06 Connect 136A test set as outlined in 3.01. set MODE key to DU-CU OPR and LOOPBACK key to NOR.

11.07 **Trouble:** Display unit does not turn on after video call has been attempted. Proceed to clear trouble as follows:

- (1) Check commercial power to 1A service unit.
- (2) Check that CO battery and ground are properly poled at terminals T and R (audio) on the 1A service unit terminal board.
- (3) Replace FW2 circuit pack in 1A service unit with known good one.
- (4) If set still does not turn on, reinstall original FW2 circuit pack and report trouble to local test desk. Ask test desk to verify that loop is functioning properly.
- (5) If display unit still does not turn on, replace 1A service unit.

11.08 Trouble: Symptoms of tip-ring reversals on video pairs (see 8.06) are observed.

(a) **VIT-VIR reversal:** Symptoms are observed in the picture received by the station under test when an established reference signal (eg test signal from CO, Fig. 10) is received. Connect test set as outlined in 3.01. Operate test set T-R REV key to CONT position. If this corrects the trouble, interchange wires connected to terminals VIT and VIR at the 1A service unit.

(b) **VOT-VOR reversal:** Symptoms appear in the signal transmitted by the station under test and may be observed at the local test desk. (After any VIT-VIR reversal has been corrected according to step(a), and the reference signal is now received without reversals, the station under test may itself be used to check its transmitted signal when it is returned from a video switching point.) Operate test set T-R REV key to COM position. If this corrects the trouble, interchange wires connected to terminals VOT and VOR at the 1A service unit.

11.09 Trouble: Horizontal bars moving slowly up and down in the picture (power line interference Fig. 9e), snow or streaking in the picture (noise Fig. 9c and d) dark picture (noticeable difference between received picture and local image with VU SELF button on 72A control unit operated). If symptoms are on the customer display unit they are caused by trouble in the control pair (VIT-VIR). If symptoms are on the local test desk receiver, they are caused by trouble in the common pair (VOT-VOR).

(a) Connect test set as outlined in 3.01. Operate test set LOOPBACK key. If impairment persists:

(1) Replace B25A cable, if used, between 136A test set and display unit.

(2) Replace D50AF cord.

(3) Replace display unit.

(b) If impairment disappears on your set while LOOPBACK key is operated, request local test desk to measure 1000 Hz loss through

loopback in 939A cable equalizer (station on-hook). If not within limits:

(1) Check that S2 screw switches on 1A service unit terminal board are tightened down.

(2) Refer to Section 518-800-512 for clearing video loop troubles.

(c) If measurement is within limits, request local test desk to complete a call to the station and measure 1000 Hz loss through loopback in 136A test set (operate LOOPBACK key). If this loss exceeds by more than 10db the loss measured in (b):

(1) Check that S1 screw switches on 1A service unit terminal board are tightened down.

(2) Replace 939A cable equalizer and/or 1A service unit.

(3) If cable equalizer is replaced, loop must be equalized again. Refer to Section 518-800-512.

(d) Consult Telephone Company Engineer about possibility of using A25M shielded cable.

2C Video Telephone Station Behind 1P2 Key Telephone System With CO or PBX Video Line Service

11.10 Trouble: Video call cannot be established (line lamp in key telephone set does not turn red, and display unit is not turned on).

(a) Check that the station is ready to accept video calls. There should be -12 to -23 volts (with respect to circuit ground) on the PF lead at the key equipment associated with the station. If this voltage is not present proceed as follows:

(1) Ensure that service unit is receiving ac power.

(2) Check service unit fuses:

(3) Check connections between service unit and display unit.

(4) Replace FW1 circuit pack in 1A service unit.

- (5) Remove power and disconnect PF lead at service unit. Check continuity of PF lead between service unit and associated key equipment at the connecting block using a buzzer or oscillator and a 1013A handset. Connect the buzzer or oscillator to the PF lead and A1 ground at the service unit, then go to the key telephone equipment and connect the 1013A handset to the PF lead and the common ground terminal.
- (b) If the voltages are present and a video call still cannot be established:
 - (1) Check key telephone equipment as outlined in Section 518-800-505.
 - (2) Report failure to clear trouble to local test desk.

11.11 Trouble: Video call has been established (red line lamp on) but display unit has not turned on.

- (a) With video call established:
 - (1) Measure negative dc voltage between TOS terminal and A1 ground terminal at the service unit and at the station side of the key equipment.
 - (2) If voltage measurement at the service unit is approximately 0 volts, replace FW1 circuit pack.
 - (3) If voltage measurement is 12V at the service unit and there is no voltage reading on the TOS lead at the key equipment, the TOS lead is open between the service unit and the key equipment.
 - (4) If voltage measurement is 12V on TOS lead at key equipment, check for malfunctions in key equipment. (See Section 518-800-505.)

11.12 Trouble: Symptoms of tip-ring reversal on video pairs (see 8.06) are observed.

- (a) **VIT-VIR reversal:** Symptoms are observed in the picture received by the station under test when an established reference signal (eg, test signal from CO or PBX) is received. Connect test set as in 3.01 and operate test set T-R REV key to CONT position. If this corrects

the trouble, a tip-ring reversal is indicated. Proceed to clear trouble as follows:

- (1) Check wiring between key equipment and service unit for tip-ring reversal and correct any reversals found.
- (2) If a tip-ring reversal does not exist in the wiring between the service unit and key telephone equipment, interchange wires to terminals VIT and VIR on CO, Centrex, or PBX side of key equipment.
- (b) **VOT-VOR reversal:** Symptoms appear in the signal transmitted by the station under test and may be observed at the local test desk. (After any VIT-VIR reversal has been corrected according to step(a), and the reference signal is now received without reversals, the station under test may itself be used to check its transmitted signal when it is returned from a video switching point.)
 - (1) Operate test set T-R REV key to COM position. If this corrects the trouble, a VOT-VOR reversal is indicated.
 - (2) Check wiring between key equipment and service unit for VOT-VOR reversals and correct any reversals found.
 - (3) If a VOT-VOR reversal does not exist in the wiring between the service unit and key telephone equipment, interchange wires to terminals VOT and VOR on CO, Centrex or PBX side of key equipment.

11.13 Trouble: Horizontal bars moving slowly up and down in the picture (power line interference Fig. 9e), snow or streaking in the picture (noise Fig. 9c and d) dark picture (noticeable difference between received picture and local image with VU SELF button on 72A control unit operated). If symptoms are on the customer display unit they are caused by trouble in the control pair (VIT-VIR). If symptoms are on the local test desk receiver, they are caused by trouble in the common pair (VOT-VOR). To clear trouble, proceed as follows:

- (a) Connect test set as outlined in 3.01. Operate test set LOOPBACK key. If impairment persists:
 - (1) Replace B25A cable, if used, between 136A test set and display unit.

- (2) Replace D50AF cord.
- (3) Replace display unit.
- (b) If impairment disappears on your set while LOOPBACK key is operated, request local test desk to measure 1000 Hz through loopback in the key equipment. If not within limits, refer to Section 518-800-512 for trouble clearing procedures.
 - (1) If measurement is within limits, request local test desk to complete a call to the station and measure 1000 Hz loss through loopback in 136A test set. (Operate LOOPBACK key.)
 - (2) If the loss exceeds by more than 10db the loss measured in (1), verify continuity of tip and ring (see 11.05) and check for unwanted grounds between key equipment and the test set. Also check that screw switches on the 1A service unit terminal board and on 877-type network are tightened down.
- (c) Consult Telephone Company Engineer about possibility of using A25M shielded cable.

11.14 Trouble: Raster present, but no picture received by station even though test of display unit (Part 7) using 136A test set was satisfactory. If symptoms are on the customer display unit, they are caused by trouble in the control pair (VIT-VIR) and if symptoms are on the local test desk receiver, they are caused by trouble in the common pair (VOT-VOR). To clear trouble proceed as follows:

- (1) Identify tip and ring leads of both common and control pairs and test for continuity between the service unit and the key equipment (11.04 or 11.05).
- (2) If wiring is correct and trouble persists, refer to Section 518-800-505 for trouble clearing procedures.

2C Video Telephone Station Behind 1P2 Key Telephone System (Intercom Only)

11.15 Trouble: Video call has been established (red line lamp lit) but display unit has not turned on.

(a) With video call established:

- (1) Measure negative dc voltage between TOS terminal and A1 ground terminal at the service unit and at the station side of the key equipment.
- (2) If voltage measured at the service unit is approximately 0 volts, replace FW1 circuit pack in 1A service unit.
- (3) If voltage measurement is 12V at the service unit and there is no voltage reading on TOS lead at the key equipment, the TOS lead is open between the service unit and the key equipment.
- (4) If voltage measurement is 12V on TOS lead at key equipment, check for open TOS lead in key equipment (see applicable Section 518-800-505 or 518-800-507).

11.16 Trouble: Symptoms of VIT-VIR reversal (see 8.06) are observed on the station under test when an established reference signal (see 10.03) is received. To clear trouble, proceed as follows:

- (1) Connect 136A test set per 3.01 and operate test set T-R REV key to CONT position. If this corrects the trouble, a VIT-VIR reversal is indicated.
- (2) Check wiring between key equipment and service unit for VIT-VIR reversals and correct any reversals found.

11.17 Trouble: Symptoms of VOT-VOR reversal are observed on the signal transmitted by the station under test and displayed on the station used as the reference signal generator (see 8.06). To clear trouble, proceed as follows:

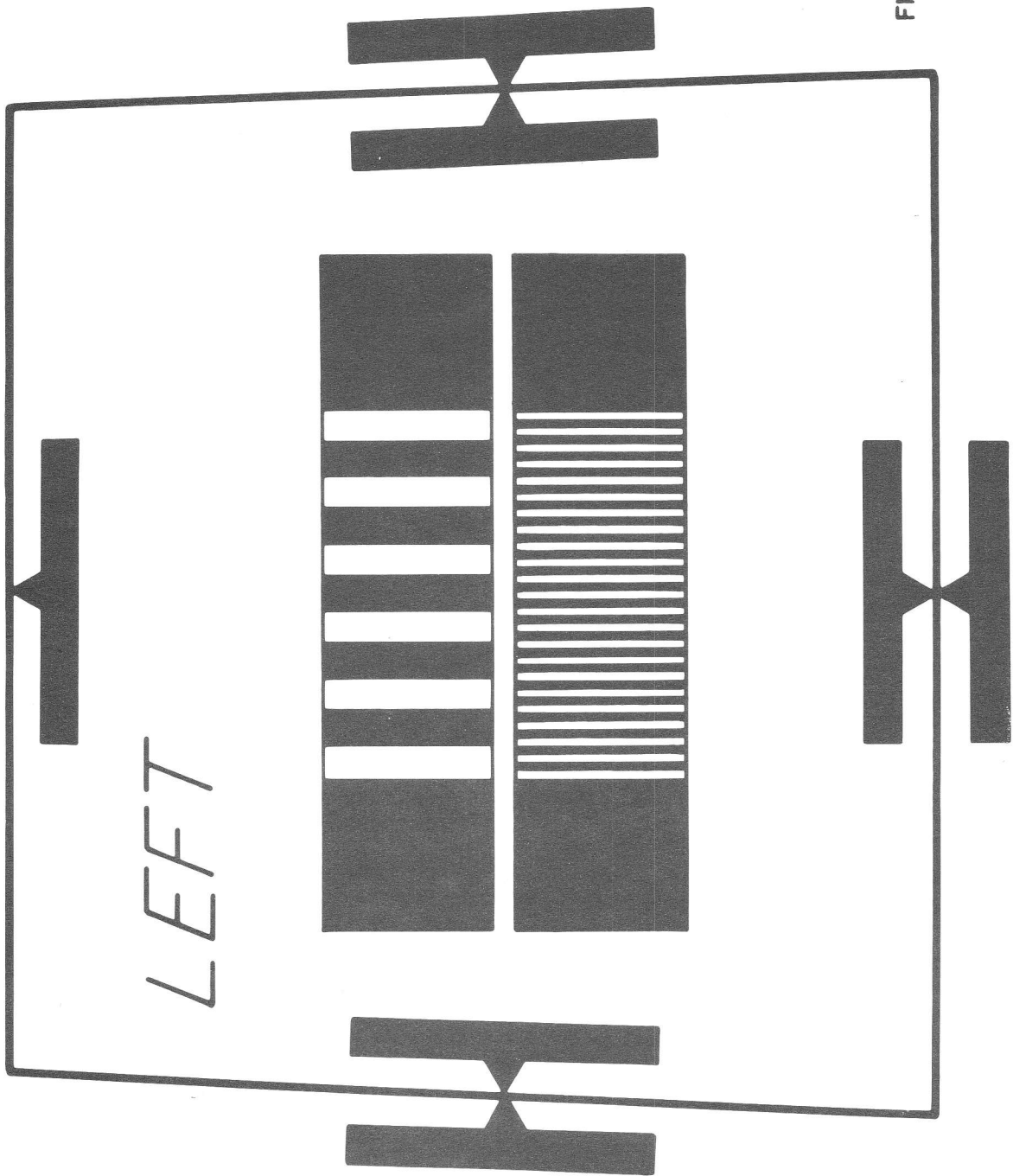
- (1) Operate test set T-R REV key to COM position. If this corrects the trouble, a VOT-VOR reversal is indicated.

- (2) Check wiring between key equipment and service unit for tip and ring reversals and correct any reversals found.

11.18 Trouble: Horizontal bars moving slowly up and down in the picture, snow or

streaking in the picture, dark picture (considerable difference between received picture and local image with VU SELF button on 72A control unit operated) or a raster is present without a picture on the display unit. To clear above troubles, check lead continuity as outlined in 11.04 or 11.05.♦

CUT HERE



VIDEO
TEST
PATTERN

FIGURE 11

◆ Fig. 11—Video Test Pattern ◆

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