

**2C VIDEO TELEPHONE STATION  
TESTS AND MAINTENANCE  
USING 136A TEST SET**

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**1. GENERAL**

**1.01** This section describes test and maintenance procedures to be followed at the time of installation and on subsequent maintenance visits. The 2C video telephone station tests should be performed before any calls are attempted.

**1.02** 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.

**1.03** The 136A test set (Fig. 1) provides for the following tests:

- (1) Measurement of all supply voltages from service unit under both dummy loads and normal display unit and control unit loads.
- (2) Operational checks of the video station using normal calling procedures or simulated turn-on.
- (3) Substitution tests of control unit and display unit loudspeaker and tone ringer.

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

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

- 1A display unit
  - D50AF cord
- 1A service unit
  - FW1 circuit pack
  - FW2 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

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24C fuse (2 amp)

24D fuse (3/4 amp)

877A network

877B network

● 55D control unit

● 72A control unit

● Telephone set

KS-20673 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.*

1.06 Refer to Section 518-800-505 for 1P2 Key Telephone System test and maintenance information.

1.07 Return replaced units or 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 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—Selects 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.

(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 of 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 answered 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 pushbutton key—Provides attenuation of the received video signal (Fig. 2) to verify that signal is not below acceptable limits.

(i) SP-SND key—In TEST position, a loudspeaker and sounder in the test set is substituted into the circuit.

(j) CONTROL UNIT controls—Provides substitution test for 72A control unit.

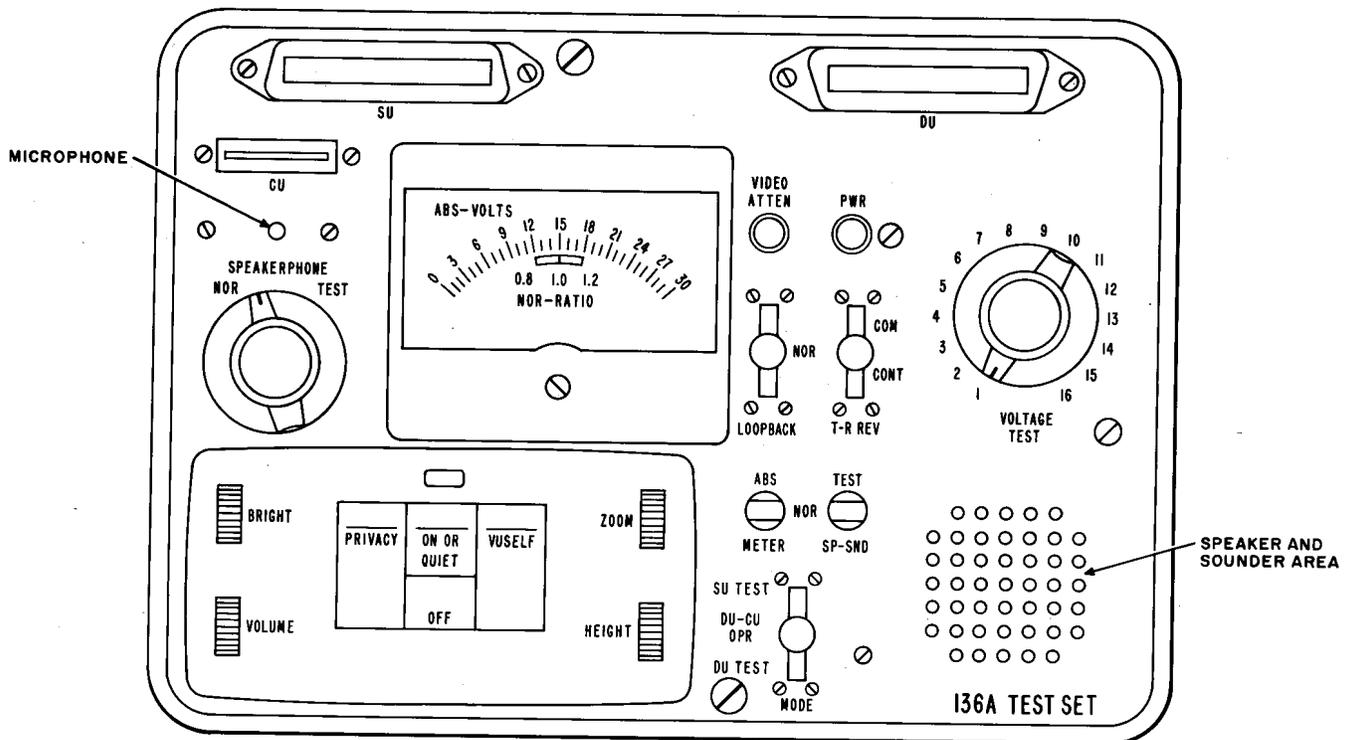


Fig. 1—136A Test Set

(k) **SPEAKERPHONE** switch—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 display unit, control unit, and service unit (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.

### 4. 1A SERVICE UNIT VOLTAGE TESTS

**4.01** When the test set has been connected to the service unit, the PWR lamp should light, indicating the rectifier circuits in the service unit are operating. If the lamp does not light and no meter reading is obtained (VOLTAGE TEST switch in position 1), 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.
- (3) Check fuses in service unit.
- (4) If test set lamp will not light and no meter reading is obtained, replace service unit.

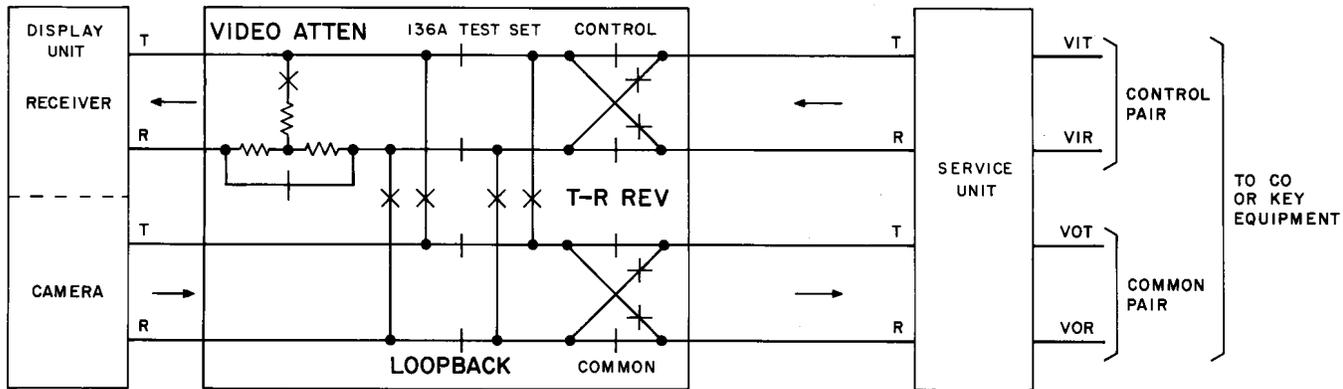


Fig. 2—Video Attenuation, Video Loopback, and Tip-Ring Reversing Through 136A Test Set

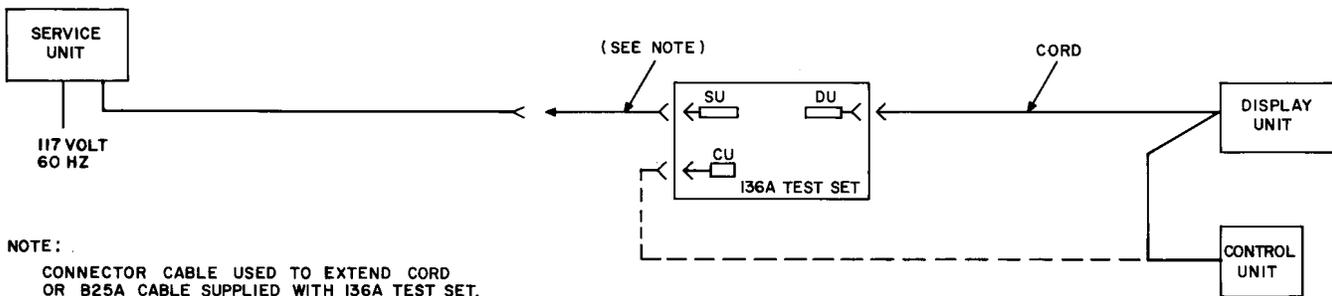


Fig. 3—Block Diagram of Test Set Connections

4.02 Connect test set to service unit as outlined in 3.01.

4.03 Check the service unit 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 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.
- (5) If any voltage does not test satisfactorily, replace the service unit.

4.04 If all voltages test satisfactory in SU TEST position, connect display unit cord to test set as outlined in 3.01.

4.05 Check the display unit voltages as follows:

- (1) With VOLTAGE TEST switch in position 1, Operate MODE key to DU TEST. The voltage should be within the limit of the green field of the NOR scale.
- (2) Rotate VOLTAGE TEST switch to positions 2 through 10 and 12 through 16 making certain that measurements fall within limits of the green scale. The voltage at position 11 will read full scale indicating that the speakerphone is off.

## 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 to drive the loudspeaker.

**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 the 72A control unit and the display unit.

**6.03** If the speakerphone cannot be turned on with the ON button on the 72A control unit, turn SPEAKERPHONE switch to TEST. If speakerphone controls can be tuned on with test set controls, return SPEAKERPHONE switch to NOR and proceed as follows:

- (1) Remove cord from 72A control unit and connect to CU connector on test set.
- (2) If speakerphone can be operated with test set controls, replace the 72A control unit.
- (3) If speakerphone cannot be operated with test set controls, replace cord.

**6.04** If the speakerphone can be turned on (lamp on) with the ON button on the 72A control unit, but the loudspeaker is inoperative, turn 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, VOLUME control at maximum position may be required.

- (a) If test set loudspeaker does not operate, see 6.06.

(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.

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

(d) If speakerphone still does not work, see 6.06.

**6.05** If speakerphone receives, but does not transmit, turn speakerphone switch to TEST.

(a) If test set permits audio transmission, proceed as in 6.03.

(b) If speakerphone still does not work, see 6.06.

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

**6.07** 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 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)

(3) Originate a speakerphone call and verify normal operation.

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

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- (5) Answer incoming call and verify normal operation.
- (6) Change from speakerphone to handset mode and verify normal operation.
- (7) Terminate speakerphone call.

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

**7.01** If all voltage tests covered in Part 4 prove satisfactory, check operation of video controls as follows:

- (1) Connect test set, service unit and display unit as outlined in 3.01.
- (2) Set MODE key to DU TEST and depress VU SELF button on 72A control unit. The local image should appear on the display unit.
- (3) Depress PRIVACY button on 72A control unit. Fixed horizontal bar should appear on display unit.
- (4) Restore PRIVACY button on control unit to normal position. Local image should return on display unit.
- (5) 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. The area of the image transmitted should increase or decrease approximately 50 percent.
  - (c) Rotate HEIGHT with ZOOM in close-up position. The image should vary in vertical position  $\pm 25$  percent. Rotate ZOOM in opposite direction and this range should diminish, until it is ineffective for the "wide angle" position.
- (6) If any of tests (2) through (5) fail, disconnect cord from 72A control unit and plug into CU connector on the test set.
- (7) Repeat Steps (2) through (5) using the controls (72A control unit) 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 T and R and are carried in the same cable. 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 pair will still carry the signal, but objectionable irregularities, such as moving lines or spots may appear in the image area. To avoid unbalance in 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 tip or ring side of line
- Wires make good contact at all connecting points (no broken or loose wires at terminals).

**8.02** 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. Excessive bridge taps (a 200-foot bridge tap with no single bridge over 100 feet is permissible) must be removed or other pairs (without bridge taps) selected before proceeding.

**8.03** 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, a transposition of the common and control video pairs has the same effect on transmission as both pairs being open or disconnected.

**8.04** Video signals are unsymmetrical: One side of the signal consists of synchronizing pulses which control the start of the scanning lines displayed in the picture tube. The other side of the signal represents the picture information which varies with the scene viewed by the camera.

8.05 When the tip and ring lead 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.

## 9. CHECK OF PICTURE QUALITY

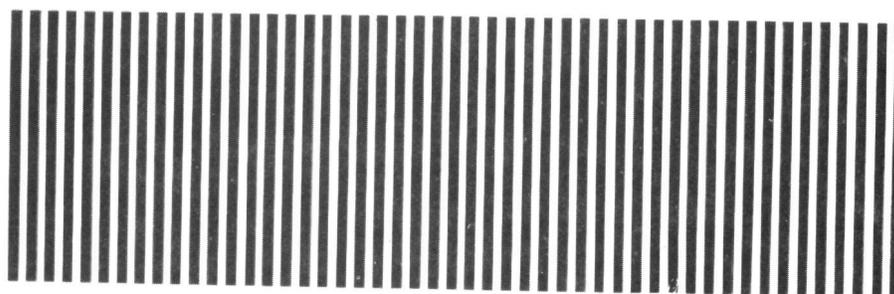
9.01 When checking picture quality, observe the following:

- (a) **Crosstalk:** Dark lines or bars moving slowly over the picture are caused by portions of the other video signals appearing in the signal displayed. They sometimes are noticed only when the call is made to another station.
- (b) **Random and Impulse Noise:** Check for excessive graininess of the picture, or light and dark spots appearing on the scanning lines (snow).
- (c) **Resolution:** (Sharpness of picture) In the picture of a person's face, look for detail in

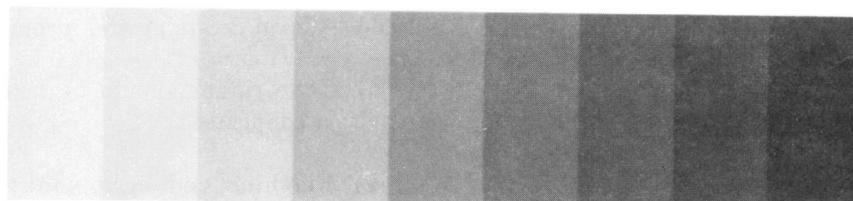
the eyes, or lines between the teeth. When using a resolution chart (Fig. 4), the individual lines should be discernible.

**Note:** The 2C video telephone station is not designed for readable reproduction of typewritten material or similar size printing.

- (d) **Overloading:** With the BRIGHT control properly set, there should be detail in the dark as well as in the light image areas. Presence of washed out white 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 test pattern with a gray scale chart or staircase (Fig. 4) signal is used, each bar of gray should be clearly discernible (adjustment of BRIGHT control may be necessary).
- (e) **Receiver Size and Centering:** Verify that essential parts of the received pictures are not hidden by the bezel. Edge markers on the test pattern from the central office or a computer produced display, if available, are aids for this check. **Since size and centering adjustments are not accessible, the display unit must be replaced if it does not meet this requirement.**



RESOLUTION CHART



GRAY SCALE OR STAIRSTEP CHART

Fig. 4—Resolution and Gray Scale or Stairstep Chart

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**9.02** To correct impairments observed in 9.01 the following actions are recommended.

- (a) If crosstalk is observed at the far end of a video call and operation of the VU SELF button on the near station (set under test) eliminates it, the crosstalk occurs in the display unit of the near station. If the impairment is objectionable, the display unit must be replaced. If operation of the VU SELF button on the near station does not affect crosstalk observed at the far end, or if crosstalk is observed at the near end, follow the procedure for noise in the following paragraph.
- (b) If the picture is noisy, use the 136A test set connected as outlined in 3.01, with MODE key in DU-CU OPR position and LOOPBACK key in NOR position. Observe picture while momentarily depressing VIDEO ATTN key. If the picture loses contrast or breaks up while the key is operated, check video pairs for shorts or open wires.
- (c) When noise, poor resolution, or overloading are observed, operate LOOPBACK key on 136A test set. If impairment persists while switch is operated, replace display unit.

## 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 wideband 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. These 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 wideband 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, two different numbers may have to be called, or the assistance of the

test desk may be required. In such cases local instructions should be followed.

### Video Test Call

**10.03** To make a video test call, 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 should be received.
- (6) While observing received image, depress VIDEO ATTN key on test set. The image should remain the same except for a momentary change. If image loses contrast or breaks up, check incoming (CONTROL) video pair.
- (7) If symptoms of tip-ring reversal (see 8.05) are noted, operate T-R REV key to CONT position. If this corrects the reversal, terminate test call, locate the error [see 11.01 (2)] and correct the wiring. Repeat previous tests in 10.03.
- (8) Check picture quality as outlined in Part 9.
- (9) Flash switch hook, then replace handset. Station video test line equipment will originate a video test call to the video telephone station.

**10.04** Upon receiving the incoming video call:

- (1) Tone ringer should be heard (if tone ringer is connected).
- (2) Flashing red light should appear on line button of associated telephone set (if set is key telephone set).
- (3) Depress VU SELF button before answering call. Verify that set has not been yet turned on. Return VU SELF to normal position.

(4) Answer call by operating ON button on 72A control unit. Display unit should turn on. If image does not appear, operate VU SELF button. If local image appears, it indicates display unit has been turned on, but trouble exists in the loop or local wiring.

(5) While observing local image returned by the central office, operate VIDEO ATTEN key on test set. The image should remain unchanged except for a momentary change. If image loses contrast or breaks up, check outgoing (COMMON) video pair.

(6) If symptoms of tip-ring reversal (see 8.05) are noted, operate T-R REV key to COM position. If this corrects the reversal; terminate test call, locate the error [see 11.01 (2)] and correct the wiring. Repeat previous tests in 10.04.

**10.05** Repeat tests in 10.03 and 10.04 for each video line associated with the station.

**11. LOCATING TROUBLE IN VIDEO PAIRS**

**11.01** Before proceeding verify that:

(1) The video telephone station has been tested as indicated in 4.02 through 7.01 and is working satisfactorily.

(2) The equipment recognizes a video call as indicated by the line button lamp (in key system installations) changing to red, the distinctive tone of the tone ringer sounder and the station set turning on.

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

**11.03** Make regular telephone call to test desk and request:

(1) A loop back measurement for the station under test and, if it is satisfactory

(2) Completion of the video call to the station.

**11.04** With video call from test desk to customer location established, observation of picture impairments at either station set may be used as a guide to fault location:

IMPAIRMENT OBSERVED	FAULTY PAIR
At customer location	CONTROL (VIT-VOR)
At test desk	COMMON (VOT-VOR)

(1) At key system installations, an approximate location of the fault can be made by having test desk place successive video calls to all video lines picked up by the station. If the same impairments are observed on all lines, the trouble is probably on the station side of the key equipment and should be corrected there. If impairments occur only on some lines, the troubles must be corrected on the loop side of the key equipment.

**11.05** In cooperation with the test desk the T-R REV key, the LOOPBACK key, and the VIDEO ATTEN key on the 136A test set may be used to aid identification and location of troubles. Refer to Part 2 and Fig. 2.

**11.06** After any wiring changes have been made, test calls should be made over all video lines.