1A DATA STATION
MULTICHANNEL ARRANGEMENTS
MAINTENANCE

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1. GENERAL

A. Scope

1.01 This section describes the trouble analysis procedures to be followed when handling service complaints of the 1A Data Station, Multichannel Arrangements (MCA), hereafter referred to as the 1A Data Station.

1.02 This section has been reissued to add the following:

(a) Data Auxiliary Set (DAS) 811J-L1

(b) Station Balanced Interface (DP63 circuit pack)($\pm$3 mA, 2-wire, HDX or FDX)

(c) Station Current Interface (DP68 circuit pack)(62.5- or 20-mA, 2-wire, HDX, binary only).

1.03 This section should be used as a guideline in conjunction with the description, installation, and test practices, 591-813-100, 591-813-200, and 591-813-500, respectively, to locate troubles at the 1A Data Station.

B. Maintenance Policy

1.04 No routine maintenance is required for the 1A Data Station.

1.05 The 1A Data Station should require maintenance only when a channel or system fails or as a result of a customer report.

1.06 The 1A Data Station or components of the station (circuit packs, data auxiliary sets, rectifiers, etc) not meeting the test requirements should be replaced to restore customer service as quickly as possible.

Care should be exercised in handling the circuit packs, particularly the transmitter and/or the demodulator circuit packs, to avoid dropping them. It is the property of the ferrite core inductors used on these cards that a physcial shock can alter the inductance sufficiently to change the BIAS by a few percent and also to change the FREQUENCY of the transmitter oscillator. A severe physical shock can crack the ferrite structure.

1.07 The defective circuit pack shall be sent to the nearest Distribution House for repair. Maintenance on the circuit packs other than at the Service Center shall ***not*** be attempted. This does not include operations such as cleaning the contacts of the circuit board or making prescribed adjustments.

1.08 Verify that proper options have been installed on the replacing circuit packs before placing them into their positions.

1.09 If the trouble cannot be isolated to a particular circuit pack within the 1A Data Station, replace all circuit packs as follows:

(1) Replace circuit packs one at a time, until the trouble is corrected.

(2) Reinstall all original circuit packs one at a time, ***except*** the one replaced by the new one which corrected the trouble.

(3) If after replacing an original circuit pack the 1A Data Station does function properly, that circuit pack that was removed is probably defective and should be returned to the Distribution House for repair.

(4) Circuit packs taken from the Distribution House to the station for replacement purposes are assumed to be in good working order.

1.10 If possible, use original cartons to store, transport, or ship the circuit packs or data auxiliary sets.

C. Overall Maintenance Plan

1.11 The plan is divided into the following areas of responsibility for malfunctions in order to provide a systematic approach to the location and clearance of trouble.

- Trouble in customer equipment
- Trouble in transmission facilities
- Trouble at the transmitter end
- Trouble at the receiver end.

1.12 ***Customer Equipment:*** In multiplex use the customer ***must*** operate the test control switches to verify the integrity of a channel by using built-in test circuits and data loop capabilities, and thus identify the trouble as being in his (the customer) equipment or in the equipment or facilities of the telephone company. This will aid in determining the circuit location to which a Telco maintenance employee should be dispatched. In private line data (telegraph) use, the Telco employee should operate the test control switches. The responsibility for repair will be referred to the designated trouble reporting center.

1.13 ***Transmission Facility:*** The troubleshooting and repair of the transmission facilities are not within the scope of this practice. When it has been found through preliminary test procedures that the line circuit circuit pack of the 1A Data Station at the transmit end has the specified output, and the specified signal is not received at the input to the line circuit of the 1A Data Station at the receive end, the responsibility of repair will be referred to the designated trouble reporting center.

1.14 ***Transmit End and Receive End Trouble:*** This section is confined to the investigation and repair of trouble at the transmit end or at the receive end at the 1A Data Station.

1.15 A sequence of activities, while following the flowcharts, is entered from a decision point only when the analysis of the trouble indicates the need to investigate that portion of the data circuit. A sequence may progress through several decision points before reaching one of the following points: (1) restoral of service, (2) reference to another trouble area, (3) referral of the trouble to Telco personnel, or (4) referral of the trouble to the customer. The activities required to reach the respective end points for some of the sequences are similar in part.

1.16 The 1A Data Station is equipped with a data loop test feature which permits a test, with the assistance of the customer, to the interface (demarcation) between the Telco 1A Data Station and the customer equipment. This provides a means for testing the operational capabilities of the 1A Data Station without dispatching a Telco employee. Telco-owned terminals such as the 1A Data Station can be remotely tested with the assistance of the customer, which permits sectionalizing trouble between the 1A Data Station and the customer equipment or Telco teletypewriter. No means are provided for the testing of the customer equipment or Telco TTY.

Caution: Operation of the TEST MODE switch to the DA LP (data loop) position causes disruption of transmission in all other channels of the 1A Data Station.

2. MAINTENANCE AIDS

2.01 The following documents may be of assistance during a maintenance visit:

SECTION	TITLE
SD-1D148-01	1A Data Station, Multichannel Arrangements
CD-1D148-01	1A Data Station, Multichannel Arrangements
591-813-100	1A Data Station, Multichannel Arrangements—Description and Operation
591-813-200	1A Data Station, Multichannel Arrangements—Installation
591-813-500	1A Data Station, Multichannel Arrangements—Tests
591-813-180	Data System—1A Data Station, Multichannel Arrangements—Summarizing Specification
598-073-100	Data Auxiliary Set 811G—Identification
598-074-100	Data Auxiliary Set 811H—Identification
598-078-100	Data Auxiliary Set 811J—Identification
590-102-125	29-Type Data Mounting—Identification
SD-70958-01	43B1 Voice Frequency Carrier Data System
CD-70958-01	43B1 Voice Frequency Carrier Data System
312-710-100	43B1 Voice Frequency Carrier Data System—General Description
312-710-200	43B1 Voice Frequency Carrier Data System—Out-of-Service Tests
312-710-201	43B1 Voice Frequency Carrier Data System—2- and 4-Wire

SECTION	TITLE
	Connections—Description and Installation
312-710-500	43B1 Voice Frequency Carrier Data System—Trouble Locating Tests
332-852-107	4066G Network—Description
314-410-500	Private Line Data Circuits—Voice Bandwidth Circuits for Miscellaneous Data—Overall Tests and Requirements
AB27.350.	Voice Bandwidth Circuits for Private Line Data Use—2000 Series and 3002 Channels—General Information
AB83.048.01	43B1 Voice Frequency Carrier Data System—General Engineering Considerations
SD-81978	KS-20575 Rectifier
CD-81978	KS-20575 Rectifier

2.02 The apparatus required to perform the maintenance and tests is listed in (a) through (d).

(a) KS-20538-L1 volt-ohm-milliammeter (VOM), or equivalent

(b) J79901B-L3 Data Test Set (cover only of the 901B Data Test Set; also called interface test adapter)

(c) Small duck-bill pliers (KS-6015) for inserting jumper wires into quick-clip 216A terminals (strapping)

(d) KS-19935-L7 telegraph carrier test set (Stelma).

3. MAINTENANCE PROCEDURES

A. General

3.01 While investigating troubles in the 1A Data Station, references will be made to a ***primary*** (ternary mode only) end, a ***near*** end (binary mode only), and a ***far*** end (both modes) while discussing the ***ternary*** mode and the ***binary*** mode (see Fig. 1).

Ternary Mode

3.02 The ***primary*** end is that end which has been previously designated on the CLR or by the Circuit Design Engineer to have the capability of initiating the transmission of an ON supervisory signal upon the operation of the CHANNEL MODE switch to the TEST position. ▶For the station EIA interface (DP65* circuit pack), this capability is made possible by strapping E12 to E13, which also inhibits the loop-around of a supervisory signal at the ***primary*** end. For the station balanced interface (DP63 circuit pack), this capability is made possible by strapping E1 to E13. In addition, the ***far*** end must have E17 strapped to E18 in order to loop back the supervisory signal.◀

* Early stations may have circuit pack DP55 (MD) installed. If so, E12 must be strapped to E13 on circuit pack DP65 at the primary end. DP65 is standard.

3.03 The ***far*** end is that end which has the capability of looping back a signal transmitted from the ***primary*** end.

3.04 When it has been determined that the 1A Data Station at the ***primary*** end is in trouble, Telco personnel will be dispatched to the ***primary*** end to perform tests while the customer personnel will assist by looping the signals at the ***far*** end.

3.05 When it has been determined that the 1A Data Station at the ***far*** end is in trouble, Telco personnel will be dispatched to the far end, and the customer at the primary end will assist in the test procedures.

3.06 ***Receiver:*** If the receiver suspected of being in trouble is at the ***far*** end, transmit the signal from the ***primary*** end. If the receiver suspected of being in trouble is at the ***primary*** end, the signal shall be transmitted from the ***primary*** end and looped back at the ***far*** end.

3.07 ***Transmitter:*** If the transmitter suspected of being in trouble is at the ***far*** end, transmit the signal from the ***primary*** end and loop the signal at the ***far*** end to key the ***far*** end transmitter. If the transmitter suspected of being in trouble is

at the ***primary*** end, key the transmitter at the ***primary*** end.

Binary Mode

3.08 The ***near*** end is the end at which maintenance is being performed. The ***far*** end, with respect to the binary mode, is the end opposite the ***near*** end.

3.09 If the 1A Data Station operating in the ***binary*** mode is in trouble, the end to which the Telco personnel has been dispatched becomes the ***near*** end.

3.10 ***Receiver:*** The receiver may receive its signal as a result of any of the following:

(a) Key the ***far*** end transmitter either steady mark or steady space by means of the channel check circuit.

(b) Operate the ***far*** end in DA LOOP and either send steady mark or steady space by means of the channel check circuit.

3.11 ***Transmitter:*** The transmitter may be keyed by either of the following:

(a) Send steady mark or steady space, by means of the channel check circuit.

(b) Transmit from the ***far*** end and loop back at the ***near*** end in order to key the ***near*** end transmitter.

3.12 Maintenance of the 1A Data Station should be in accordance with the flowcharts shown in Fig. 2 through Fig. 9. The flowcharts are recommended for an organized trouble investigation with a minimum amount of time spent in locating the cause of the trouble reported by the customer.

The numbers in brackets [ ] refer to the numbered blocks in the flowcharts.

3.13 Maintenance of the 1A Data Station may conveniently be divided into two main categories: preliminary tests to determine if a trouble exists in the station or in an associated feature, such as the transmission facility; and the procedure to isolate a station trouble to a particular component.

3.14 The first category is largely a matter of testroom procedure, and varies in detail with use of customer-provided terminal equipment, such as business machines or computer-operated switching equipment. Refer to appropriate sections in the 660-YYY-ZZZ series for detailed procedure and for the customer responsibility when he furnishes terminal equipment.

3.15 Tariff considerations may dictate the amount of trouble isolation performed by the customer before referring a difficulty to the serving test center (STC). The 1A Data Station also contains indicators which may be observed by the customer, and assistance given to the STC to determine whether a maintenance employee should be dispatched to the station. These indicators are as follows:

(a) The 18B-49 indicator associated with the cabinet contains three beehive lenses. These lenses and their indications when illuminated are as follows:

WHITE—illuminated when power is ON in data set

GREEN—illuminated when a TEST key is operated

RUBY—illuminated during a channel or system fail condition (alarm indication).

(b) Channel and system fail alarm lamps located in the DAS 811G or 811H.

(c) Testing functions available to the customer in the DAS 811G or 811H.

(d) ◗Testing functions and sytem alarm lamp available to the customer in DAS 811J-L1.◖

3.16 The amount of preliminary testing which may be done at the STC is limited by the amount of test equipment available. Once again, reference should be made to sections in the 660-YYY-ZZZ series for detailed instructions on procedures for testing.

3.17 The detailed procedure for performing tests (eg, voltage measurements, limits, etc) when

indicated in the flowcharts is covered in the test practice (591-813-500).

B. Trouble Isolation Prior to Dispatching Personnel (Fig. 2)

3.18 The following procedure will ***not*** be performed by the Telco personnel at the 1A Data Station. The procedure is presented to help the Telco employee be aware of steps taken prior to his being dispatched to the 1A Data Station at the customer location.

3.19 The first sign of trouble will usually be evident at the receiving end of the circuit and will result in a customer report of nonreceipt of data or of garbled copy, etc. The Telco employee who receives the trouble report must then make an attempt to determine if the trouble is in (a) the customer equipment at either end, (b) the voice facilities between the 1A Data Stations, (c) the transmitter at one end of the circuit, or (d) in the receiver at the other end of the circuit, in order to determine how many Telco personnel to dispatch and to which end(s).

3.20 After the customer at one end has reported that he is having trouble [1], request that he check the status of the 18B-49 indicator lights [2]. If no lamps are lighted [3], request the customer to check the ac power cord and determine whether it is plugged into the receptacle, to check the fuses supplying the receptacle from which the 1A Data Station receives its power [4]. If the fuses are bad, the trouble is in the customer equipment.

3.21 If the fuses are in good condition, the power cord is plugged in, and the trouble is not found, dispatch a Telco employee to the end reporting the trouble [5].

3.22 Again observe the indicator lights [2]. If the green and white lamps are illuminated [6], request the customer to return the CHANNEL MODE switch to the NOR position and/or the VOICE BAND LOOP AROUND switch to the NORM position [7]. The operation of the test switches to their normal positions should correct the malfunction which caused the green lamp to be lighted. Restore the channel to service [8]. If operation of the test switches does not correct the malfunction, dispatch Telco employee to the end reporting trouble [5].

3.23 Again observe the indicator lights [2]. If the white lamp only is lighted [9], request the customer at the ***far*** end to operate his station in the data loop mode [10]. Request the customer at the end reporting the trouble to send a dotting signal [11]. If the signal is returned properly to the end reporting the trouble, the trouble is in the customer equipment [12]. If the signal is not returned properly to the end reporting the trouble, the trouble is in Telco equipment, and a Telco employee must be dispatched to the end reporting the trouble [5].

3.24 If when observing the indicator lights [2] it was found that the white and ruby lamps were illuminated, check the CF and MAJ ALM lamps. If only one CF lamp is illuminated, check for presence of the channel signal at the central office nearest the receive end [14]. If the signal is present, dispatch a Telco employee to the end reporting the trouble [5]. If the channel signal is not present at the central office nearest the receive end [14], check for the channel signal at the central office nearest the transmit end [15]. If the signal is not present, dispatch a Telco employee to the transmit end [16]. If the signal is present at the central office nearest the transmit end [15], the trouble is in the facility and appropriate action must be taken.

3.25 If it was found that the MAJ ALM light and/or more than one CF lamp was illuminated, check the signal level at the central office nearest the receive end [18]. If the level of the composite signal is good, check the cable loop to the station via the voiceband loop around relay [19]. If the loop is good, the trouble is at the end reporting the trouble and a Telco employee must be dispatched to that end [5]. If the loop is not good, the trouble is in the voiceband facility and appropriate action must be taken [20].

3.26 If at the time the composite signal level at the central office nearest the receive end was checked [18] and the level was found to be incorrect, check the signal level at the central office nearest the transmit end [21]. If the level is not as specified, the trouble is in the facility and corrective action must be taken [17]. If the composite signal level at the central office nearest the transmit end is not as specified, check the cable loop to the station via the voiceband loop around relay [22]. If the loop is good, dispatch Telco employee to the transmit end [16]. If the level is

not as specified, the trouble is in the facility and appropriate action must be taken [20].

C. Preliminary Trouble Investigation at the 1A Data Station (Fig. 3)

3.27 When the Telco employee begins his initial trouble investigation [1], he should check the status of the 18B-49 indicator lights [2], regardless of whether the 1A Data Station is operating in the binary or ternary mode or whether the suspected trouble is in the receive or transmit end.

3.28 If no lamps are lighted [3], check the voltage at the customer receptacle [4]. If the proper voltage is not present, the trouble is in the customer voltage supply [5]. In the event the correct voltages are present at the customer receptacle, check the output of the KS-20575 rectifier [6]. If the proper voltages and polarities are not present, replace the KS-20575 rectifier [7] and return the circuits to normal [9]. Should the correct voltages and polarity be present, replace the alarm indicator (DP59 circuit pack) [8]. If a power failure has caused the failure of the terminal, these procedures should rectify the malfunction. Return the circuits to normal [9], have the customer check the operation of the 1A Data Station, and close the trouble report [10].

3.29 Again observe the 18B-49 indicator lights [2]. If the green and white lamps are illuminated [11], return the test switches to their normal positions as follows:

(a) VOICEBAND switch to NORM

(b) CHANNEL MODE switch to NORM

(c) LOC CONT (local control) switch to MK (mark)

(d) ALM switch to ON [12].

The trouble should be cleared at this point. Return all circuits to normal [9], have the customer check the operation of the circuit, and close the trouble report [10].

3.30 In the event that the white lamp or the white and ruby lamps are illuminated [13], proceed to one of the following flowcharts, depending upon the results of previous analysis of the trouble.

- Fig. 4—Supervisory Signal Checks—Ternary Mode—Receive End
- Fig. 5—Data Signal Checks—Ternary Mode—Receive End
- Fig. 6—Supervisory Signal Checks—Ternary Mode—Transmit End
- Fig. 7—Data Signal Checks—Ternary Mode—Transmit End
- Fig. 8—Data Signal Checks—Binary Mode—Receive End
- Fig. 9—Data Signal Checks—Binary Mode—Transmit End.

D. Supervisory Signal Checks—Ternary Mode—Receive End (Fig. 4)

3.31 The following procedure (Fig. 4) is a continuation of the 1A Data Station trouble investigation to be followed after the preliminary checks [2] (Fig. 3) have been completed, and is to be used when tests or reports indicate that the malfunctioning portion of the system may be at the receive end concerning the supervisory signal while operating in the ternary mode.

3.32 Observe the status of the 18B-49 indicator lights [3]. If the white and ruby lamps are illuminated [4], observe the status of the CF lamps.

3.33 If more than one CF lamp is illuminated, check the receive signal level at TS(A) [5]. If the proper level is not present at TS(A), check at the transmit end TS(A) [6] to verify that the correct signal level is being delivered to the facility for transmission to the receive end TS(A) [5].

3.34 If the correct signal level is being delivered to the facility at the transmit end TS(A) [6] and is not being received at the receive end, the trouble is in the facility and should be reported to the designated trouble reporting center [8].

3.35 In the event that the correct signal level is not present at the transmit end TS(A), the trouble is at the transmit end [7], (see Fig. 6 and/or Fig. 7).

3.36 If the receive signal level at TS(A) [5] is found to be as specified, check the signal

level at the RCV test point [9]. If the correct level is present, proceed to [15], and Fig. 5.

3.37 In the event that the receive signal level does not meet specifications at the RCV test point [9], adjust the RCV GAIN potentiometer to correct the signal at the RCV test point [10]. If the correct level is now present, proceed to [15], and Fig. 5.

3.38 If the level cannot be adjusted and corrected by the RCV GAIN potentiometer, replace the line circuit (DP52 circuit pack) [11] and adjust the RCV GAIN potentiometer for the correct level at the RCV test point. Proceed to [15], and Fig. 5.

3.39 In the event that the correct signal level cannot be obtained after replacing the line circuit [11], replace the alarm indicator [12]. Again, check for the correct signal level at the RCV test point [9]. If the correct level can now be obtained, proceed to [15], and Fig. 5.

3.40 In the event that the receive signal level cannot be obtained, check and repair the wiring between the line circuit, alarm indicator and TS(A) [13]. It should now be possible to adjust for the correct signal level [14]. Proceed to [15], and Fig. 5.

3.41 If at the time the CF lamps are observed it is found that only one CF lamp is illuminated, proceed to 3.42.

> ***Note:*** It is possible for the ruby lamp not to be lighted and yet have a CF lamp lighted ***only*** when the alarm switch on the alarm indicator circuit pack is in the OFF position.

3.42 If at the time the 18B-49 indicator lamps are observed [3] only the white lamp is illuminated, request the customer at the far end to send data [17]. Request the customer at the far end to operate the CHANNEL MODE switch alternately between NORM and OFF positions [18]. The RS test point should give a positive voltage indication for an ON signal (far-end CHANNEL MODE switch in NORM position) and a negative voltage indication for an OFF signal (far-end CHANNEL MODE switch in OFF position). Should the RS test point provide the above indications, proceed to [15], and Fig. 5.

3.43 In the event that the RS test point does not alternate between positive and negative voltage [18], check the SU adjustment as to whether the level varies at the LIM IN test point [20]. If the level does vary at the LIM IN test point but does not change from positive to negative at the RS test point, the receive interface ▶(DP57 circuit pack)◀ must be replaced [21]. After replacing the receive interface ▶(DP57 circuit pack)◀ and adjusting it per Section 591-813-200, the RS test point should now change from positive to negative voltage [22]. Proceed to [15], and Fig. 5.

3.44 If the LIM IN test point level does not vary [20] when the far-end CHANNEL MODE switch is operated between NORM and OFF, replace the demodulator (DP26-DP50 circuit packs) [23]. If the level at the LIM IN test point now changes when the far-end CHANNEL MODE switch is operated between NORM and OFF, proceed to [15], and Fig. 5. If the LIM IN test point level does not vary after replacing the demodulator, check and repair the wiring between the plug-ins [24], then proceed to Fig. 5.

3.45 The above procedures should have made it possible for the Telco employee to rectify malfunctions which might have caused the failure of the supervisory signal (center frequency) to pass through the channel from the transmit end to the receive end. Proceed to [15], and Fig. 5.

E. Data Signal Checks—Ternary Mode—Receive End (Fig. 5)

3.46 Prior to starting the checks of the data signal it is necessary that the supervisory signal, both ON and OFF, be received properly. See Fig. 4 [10].

3.47 After having established that the supervisory signal is received properly [1], send a steady space signal from the primary end [2]. At the receive end, check the voltage at the receive end RD test point [3]. If the voltage is good, the space signal is good to this point [9].

3.48 If the voltage is not as specified at the receive end RD test point [3], check the frequency at the LIM IN test point [4]. If the level is not as specified at the receive end LIM IN test point, the trouble is at the transmit end [5] (see Fig. 6 [1]).

3.49 Should the frequency at the LIM IN test point be as specified [6], replace the ternary receive interface (DP57 circuit pack) and check the SU ADJ [6]. If the voltage at the receive end RD test point is correct, both the mark and space signals are good to this point [9].

3.50 Should the voltage level not be as specified at the receive end RD test point when the ternary receive interface was replaced [6], replace the station interface (DP63 or DP65 circuit pack) [7]. If the voltage at the receive end RD test point is now correct, both the mark and space signals are good to this point [9].

3.51 If the voltage is not as specified at the receive end RD test point after the station interface has been replaced, check and repair the wiring between the plug-ins [8]. Both the mark and space signals should now be evident at the receive end RD test point [9].

3.52 When both the mark and space signals are evident at the receive end RD test point, request the customer to send data from the transmit end [10]. If the customer has no further complaint, return all circuits to normal and close the trouble report [16].

3.53 If after the customer at the transmit end sends data and the customer at the receive end still has a complaint (with respect to the original trouble report), terminate the customer EIA connector in a 901B interface test adapter [11]. Observe a multimeter for keyed signals on the receive circuit [12]. If the meter indicates that the signals are keyed, the trouble is in the customer equipment [13].

3.54 Should the meter in [12] indicate that the signals are not keyed, replace the station interface (DP63 or DP65 circuit pack) [14]. The meter at the 901B interface test adapter will now indicate keyed signals [15]. If the customer still has a complaint, the trouble is in the customer equipment [13].

3.55 Should the customer have no complaint after the station interface is replaced [14], return all circuits to normal and close the trouble report [16].

F. Supervisory Signal Checks—Ternary Mode—Transmit End (Fig. 6)

3.56 The following (Fig. 6) is a continuation of the 1A Data Station trouble investigation to be followed after the preliminary checks [2] (Fig. 3) have been completed, and is to be used when tests or reports indicate that the malfunctioning portion of the system may be at the transmit end concerning the supervisory signal while operating in the ternary mode [1] and [2].

3.57 If more than one channel has been reported as failed, check for the presence of the signal at TS(A) at the transmit end [3]. If the signal is present at the transmit end, check for presence of the signal at TS(A) at the receive end [4]. If the received signal is present, the trouble is at the receive end [5]. If the received signal is not present, the trouble is in the facility [6]; refer it to the proper STC.

3.58 Should the transmitted signal not be present at TS(A) [3], replace the line circuit (DP52 circuit pack) [7]. If the signal now appears at TS(A), proceed to 3.62. If the signal does not appear at TS(A) after replacing the line circuit [7], replace the alarm indicator (DP59 circuit pack) [8]. If the signal now appears at TS(A), proceed to 3.62. Should the signal not be evident at TS(A) after replacing the line circuit and the alarm indicator, check and repair the wiring between the plug-ins [9] and proceed to 3.62.

3.59 After performing the preliminary power checks [2] and it has been determined that only one channel has been reported as failed, operate the ***far***-end station in the data loop (DA LP) mode [13]. At the ***primary*** end, operate the station in the test mode [14]. At the primary transmit end, alternately ground and unground the TS test point [15]. (With the TS test point grounded, the supervisory signal transmitted corresponds to the OFF position; conversely, if the TS test point is ungrounded, the supervisory signal transmitted corresponds to the ON condition.) At the primary transmit end, check the level at the TRMTR OUT test point [16].

3.60 If the level at the TRMTR OUT test point changes when the TS test point is grounded [16], proceed to 3.62.

3.61 Should the level at the TRMTR OUT test point not change when the TS test point is grounded, replace the transmitter (DP1-DP25 circuit packs) [17]. If after replacing the transmitter the level at the TRMTR OUT test point does change, proceed to 3.62. However, if the level does not change, replace the station interface (◗DP63 or DP65◖ circuit pack) [18]. If the level at the TRMTR OUT test point now changes, proceed to 3.62. If the level does not change, check and repair the wiring between the plug-ins, and proceed to 3.62.

3.62 If the level changes at the TRMTR OUT test point [16] when the TS test point is grounded [15], verify that the level also changes at the transmit end LIM IN test point [10]. If the level does change at the LIM IN test point, the supervisory signal is operating and the craft employee may proceed with the data checks [12]. Should the level not change at the LIM IN test point, the trouble would be in the far-end receiver or transmitter [11]. It is not likely that the trouble will be in the facility because only one channel is reported as failed. Also, it is unlikely that the far-end receiver or transmitter will be faulty. The fault being investigated was first evident at the far-end receiver and has been localized to the primary-end transmitter (Fig. 6). The far-end transmitter would not be faulty, since the primary-end receiver did not experience a failure of data reception.

G. Data Signal Checks—Ternary Mode—Transmit End (Fig. 7)

3.63 Prior to starting the checks on the transmitter ternary data signal, it is necessary that the supervisory signals, both ON and OFF, be transmitted properly (see Fig. 6 [15]).

3.64 After having established that the supervisory signal is transmitted [1], remove the ground connection from the TS test point if it is present [2]. At the primary end send a steady space [3]. If the space signal is observed at the TRMTR OUT test point, proceed to 3.66.

3.65 Should the space signal not arrive at the TRMTR OUT test point, check for the space voltage at the EIA IN test point [4]. If the space voltage is not present at the transmit end EIA IN test point, replace the station EIA interface (DP65 or DP63 circuit pack) [5]. If space voltage is present at the EIA IN test point and the space signal is not present at the TRMTR OUT test point, replace the transmitter (DP1-DP25 circuit packs) [6]. If the space signal is still not present at the TRMTR OUT test point, check and repair the wiring between the plug-ins [7] and proceed to 3.66.

3.66 At this stage of testing, with the space, mark, and supervision signal appearing at the TRMTR OUT test point, the transmit portion of the 1A Data Station is operating correctly [8].

3.67 Perform channel realignment per Section 591-813-200, if it is needed [10]. Return all circuits to normal. Request the customer to send data from the transmit end [11]. If the customer at the receive end has no further complaint (with respect to the original trouble report), return all circuits to normal and close the trouble report [17].

3.68 Should the customer at the receive end still have a complaint, terminate the EIA connector at the transmit end in a 901B interface test adapter [12]. Alternately key the transmitter through the captive shorting clips on the interface test adapter [13]. If the mark and space signals are now observed at the TRMTR OUT test point, the trouble is in the customer equipment [14]. If the mark and space signals are not observed at the TRMTR OUT test point, replace the station interface (◗DP63 or DP65◖ circuit pack) [15]. If the customer still has a complaint after the station interface is replaced [15] or after the wiring between the plug-ins has been checked and corrected, the trouble is in the customer equipment [14].

3.69 Should the customer have no further complaint after the station interface has been replaced and/or the wiring between the plug-ins has been checked and corrected, return all circuits to normal and close the trouble report [17].

H. Data Signal Checks—Binary Mode—Receive End (Fig. 8)

3.70 The following procedure (Fig. 8) is a continuation of the 1A Data Station trouble investigation to be followed after the preliminary checks [2] (Fig. 3) have been completed and is to be used when tests or reports indicate that the malfunctioning portion of the system may be at the receive end.

3.71 Observe the status of the 18B-49 indicator lights for the status of the ruby lamp. If the white and ruby lamps are lighted [3], observe the status of the CF lamps.

3.72 If more than one CF lamp is illuminated, check the received signal level at TS(A) [4]. If the specified signal level is no present at TS(A), check at the transmit end TS(A) [5] to verify that the correct signal level is being delivered to the facility for transmission to the receive end TS(A) [4].

3.73 If at the time the CF lamps are observed it is found that only one lamp is illuminated, proceed to 3.80.

3.74 If the correct signal level is being delivered to the facility at the transmit end TS(A) [5] and is not being received at the receive end, the trouble is in the facility and should be reported to the designated trouble reporting center [6].

3.75 In the event that the correct signal level is not present at the transmit end TS(A), the trouble is at the transmit end [7] (see Fig. 9).

3.76 If the received signal level at TS(A) is found to be as specified on the CLR, check the signal level at the RCV test point [8]. If the correct level is present, proceed to 3.83.

3.77 In the event that the receive signal level does not meet specifications at the RCV test point [8], replace the line circuit (DP52 circuit pack) [9], and adjust the RCV GAIN potentiometer for the correct level at the RCV test point. If the correct signal level is now attained, proceed to 3.83.

3.78 In the event that the correct signal level cannot be obtained after replacing the line circuit [9], replace the alarm indicator [10]. Again, check for the correct signal level at the RCV test point. If the correct level can now be obtained, proceed to 3.83.

3.79 In the event that the receive signal level cannot be obtained, check and repair the wiring between the line circuit, alarm indicator and the TS(A) [11].. It should now be possible to adjust for the correct signal level [12]. Proceed to 3.83.

3.80 If at the time the 18B-49 indicator lights were observed it was found that the white lamp only was lighted [13], request the customer or Telco personnel to operate the far end station in the data loop mode (DA LP) [14]. Send undistorted data from the near end [15]. If the looped around signal is received at the LIM IN test point, proceed to 3.83.

3.81 In the event that the looped around signal is not received at the LIM IN test point check for the receive channel signal at TS(A). If the channel signal is not present at TS(A), the trouble is at the transmit end [16] (see Fig. 9).

3.82 If the looped around signal is received at TS(A) and not at the LIM IN test point, replace the demodulator (DP26-DP50 circuit pack) [17]. If the received signal is now at the LIM IN test point, proceed to 3.83. If the receive channel signal is not evident at the LIM IN test point, check and repair the wiring between the plug-ins [18].

3.83 Once a signal has been received at the LIM IN test point, the specified level must be established. If the level is not correct, check the levels of the other channels at their respective LIM IN test points. If all of the channels have low signals, realign the channels per Section 591-813-200 [19]. If only the channel in question is low, adjust the CF ADJ potentiometer [20]. If the CF lamp is extinguished, proceed to 3.84. If it is not possible to extinguish the CF lamp with an adjustment on the CF ADJ potentiometer, replace the receive interface (DP51 circuit pack) [21] and proceed to 3.84.

3.84 If the level of the channel signal is as specified at the LIM IN test point, alternately send steady mark and steady space from the near end [22]. If the voltages are as specified at the EIA OUT test point, proceed to 3.86.

3.85 Should the voltage not be as specified at the EIA OUT test point, replace the receive interface (DP51 circuit pack) [23]. The voltage levels should now be as specified at the EIA OUT test point [24]. Proceed to 3.86.

3.86 If the voltage levels are as specified at the EIA OUT test point when steady mark and steady space are received, check and adjust the channel alignment [25].

3.87 Return all circuits to normal [26] and request the far-end customer to send data [27]. If the customer has no further complaint, proceed to 3.90.

3.88 Should the near-end customer still have a complaint when the far-end customer sends data, terminate the EIA connector in a 901B interface test adapter [28]. Observe a meter for keyed signals [29]. If the levels are as specified, the trouble is in the customer equipment [33].

3.89 If the levels of the keyed receive signals on the meter at the 901B interface test adapter are not as specified, replace the station interface (DP56, ▸DP63, DP65, or DP68◂ circuit pack) [30]. The meter at the 901B interface test adapter should now indicate the correct level of the keyed signals [31]. Check the channel alignment [32]. If the customer still has a complaint, the trouble is in the customer equipment [33].

3.90 If after all of the preceding tests the customer has no further complaints regarding the original trouble report, return all circuits to r ,rmal and close the trouble report [34].

I. Data Signal Checks—Binary Mode—Transmit End (Fig. 9)

3.91 The following is a continuation of the 1A Data Station trouble investigation to be followed after the preliminary checks [2] (Fig. 3) have been completed and is to be used when tests or reports indicate that the malfunctioning portion of the system may be at the transmit end.

3.92 If at the far end the ruby and white alarm lamps are illuminated, check for the number of channels that are reported failed. If only one channel has been reported as failed, proceed to 3.95. If more than one channel has failed, check at the transmit end for presence of the signal at TS(A) [4]. If the signal is present at the correct level at the transmit end TS(A), check for the presence and correct level of the signal at the receive end TS(A) [5]. If the signal is received at the receive end TS(A), the trouble is at the receive end [6] (see Fig. 8). However, should the signal not be present at the receive end TS(A), the trouble is in the facility and should be reported to the designated trouble reporting center [7].

3.93 When the correct level of signal is not present at the transmit end TS(A) [4], replace the line circuit (DP52 circuit pack) [8]. If the correct level of signal is now present at the transmit end TS(A), proceed to 3.100.

3.94 If the correct level of signal is not present at the transmit end TS(A) after replacing the line circuit, replace the alarm indicator (DP59 circuit pack) [9]. If the correct level of signal is now present at the transmit end TS(A), proceed to 3.100. If not, check and repair wiring between the plug-ins [10] and proceed to 3.100.

3.95 When the far-end 18B-49 indicator light is observed and it is found that the white lamp only is lighted, operate the far end in the data loop (DA LP) mode [12]. At the near end, operate the station in the test mode and send an undistorted dotting signal [13]. If at the near end the received signal is not distorted, proceed to 3.100.

3.96 If the looped back signal of 3.95 is distorted, send a steady mark signal from the near end [14]. If the level at the TRMTR OUT test point is as specified on the CLR, proceed to 3.98. Should be level at the TRMTR OUT test point not be as specified, check for the proper voltage at the EIA IN test point. If it is not correct, proceed to 3.97. If the voltage is correct at the EIA IN test point, replace the transmitter (DP1-DP25 circuit pack) [15]. If replacement of the transmitter corrects the level at the TRMTR OUT test point, proceed to 3.98.

3.97 If the voltage is not correct at the EIA IN test point when the steady mark is sent from the near end [14], replace the station interface (▸DP56, DP63, DP65, or DP68◂ circuit pack) [16]. Should the level now be correct at the TRMTR OUT test point, proceed to 3.98. If the level at the TRMTR OUT test point is not correct, check and repair the wiring between the plug-ins [17].

3.98 After the above connections and replacements, the steady mark signal will appear at the TRMTR OUT test point [18]. At the near end, send a steady space signal [19]. If the level at the TRMTR OUT test point is as specified, proceed to 3.100. Should the level at the TRMTR OUT test point not be as specified, check for the proper voltage at the EIA IN test point. If it is not correct, proceed to 3.99. If the voltage is correct

at the EIA IN test point, replace the transmitter (DP1-DP25 circuit packs) [20]. If replacement of the transmitter corrects the level at the TRMTR OUT test point, proceed to 3.100.

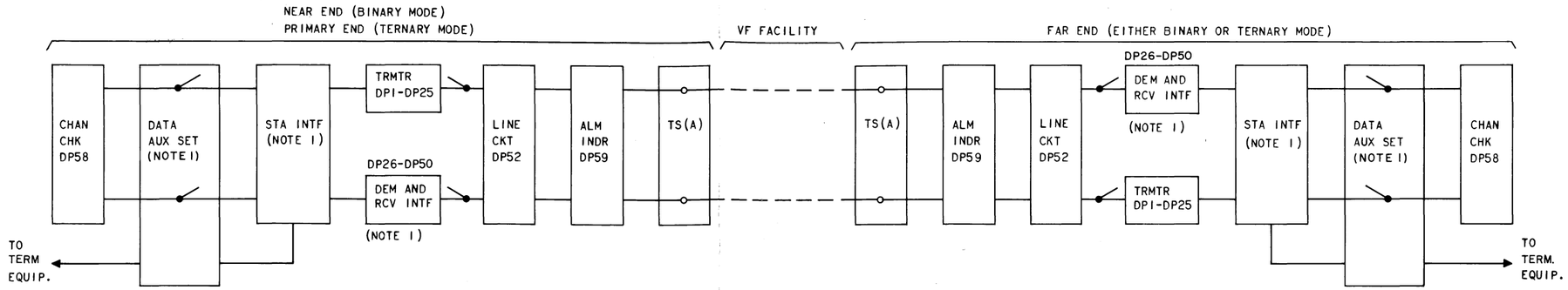
3.99 If the voltage is not correct at the EIA IN test point when the steady space is sent from the near end [19], replace the station interface (▶DP56, DP63, DP65, or DP68◀ circuit pack) [21]. Should the level now be correct at the TRMTR OUT test point, proceed to 3.100. If the level at the TRMTR OUT test point is not correct, check and repair the wiring between the plug-ins [22].

3.100 After the above corrections and replacements, the steady mark and steady space signals will be evident at the TRMTR OUT test point [23]. Request the customer to send data from the near transmit end [24]. If the customer at the far end has no further complaint with respect to the initial trouble report, proceed to 3.103.

3.101 Should the customer at the far end still have a complaint after the signal is evident at the TRMTR OUT test point, terminate the EIA connector at the near end in a 901B interface test adapter [25] and alternately key the transmitter (by means of the 901B) mark and space [26]. If the mark and space are observed at the TRMTR OUT test point, the trouble is in the customer equipment [27]. Should the mark and space signal not be observed at the TRMTR OUT test point, replace the station interface (▶DP56, DP63, DP65, or DP68◀ circuit pack) [28]. If the signals are still not evident at the TRMTR OUT test point, check and repair the wiring between the plug-ins [29].

3.102 If after replacing the station interface [28] the mark and space signals appear at the TRMTR OUT test point, check the alignment of the channel in both directions [30]. If after the alignment procedure has been accomplished [30] and the wiring has been checked [29] the customer still has a complaint, the trouble is in the customer equipment [27].

3.103 Should the customer have no further complaint regarding the original trouble report, return all circuits to normal and close the trouble report [31].



1A DATA STATION
MULTICHANNEL ARRANGEMENT

1A DATA STATION
MULTICHANNEL ARRANGEMENT

NOTES:

1. THE INTERFACE CP'S USED IN THE BINARY AND TERNARY MODES ARE TABULATED IN THE FOLLOWING TABLE:

MODE \ CIRCUIT PACK	RCV INTF	STA INTF	DATA AUX SET 81IG OR H	DATA AUX SET 81IJ
BINARY	DP51	DP56, 20-mA, 3-WIRE, FDX	X	—
		DP63, ± 3-mA, 2-WIRE, FDX	X	X
		DP65, * EIA 3-WIRE, FDX	X	—
		DP68, 62.5-/20-mA, 2-WIRE, HDX	X	X
TERNARY	DP57	DP63, ±3-mA, 2-WIRE, FDX	X	X
		DP65, * EIA 3-WIRE, FDX	X	—

* EARLY STATIONS MAY HAVE CIRCUIT PACK DP55 (MD) INSTALLED. DP65 IS STANDARD.

2. THE DESIGNATION "NEAR END" IS ALWAYS USED IN A BINARY MODE.
3. THE DESIGNATION "PRIMARY END" IS ALWAYS USED IN A TERNARY MODE.
4. THE PRIMARY END IS THAT END WHICH HAS BEEN PREVIOUSLY DESIGNATED (AND STRAPPED) TO HAVE THE CAPABILITY OF FORCING THE STATION TO TRANSMIT AN ON SIGNAL WHEN THE CHANNEL MODE SWITCH IS OPERATED TO TEST. (THERE WILL NEVER BE MORE THAN ONE PRIMARY END IN A SYSTEM).
5. THE FAR END IS THAT END WHICH WILL LOOP BACK THE SUPERVISORY (IF TERNARY) AND DATA SIGNAL TRANSMITTED FROM THE OPPOSITE END (THERE MAY BE MORE THAN ONE FAR END IN A SYSTEM).
6. IF THE 1A DATA STATION AT THE PRIMARY OR NEAR END IS IN TROUBLE, TELCO PERSONNEL WILL BE DISPATCHED TO THE PRIMARY OR NEAR END TO PERFORM TESTS WHILE CUSTOMER PERSONNEL WILL ASSIST BY LOOPING THE SIGNAL BACK AT THE FAR END.
7. IN THE BINARY MODE, THE END AT WHICH THE TELCO PERSONNEL IS TROUBLE SHOOTING WILL ALWAYS BE REFERRED TO AS THE "NEAR END".

TPA 553647

Fig. 1—Orientation and Definitions

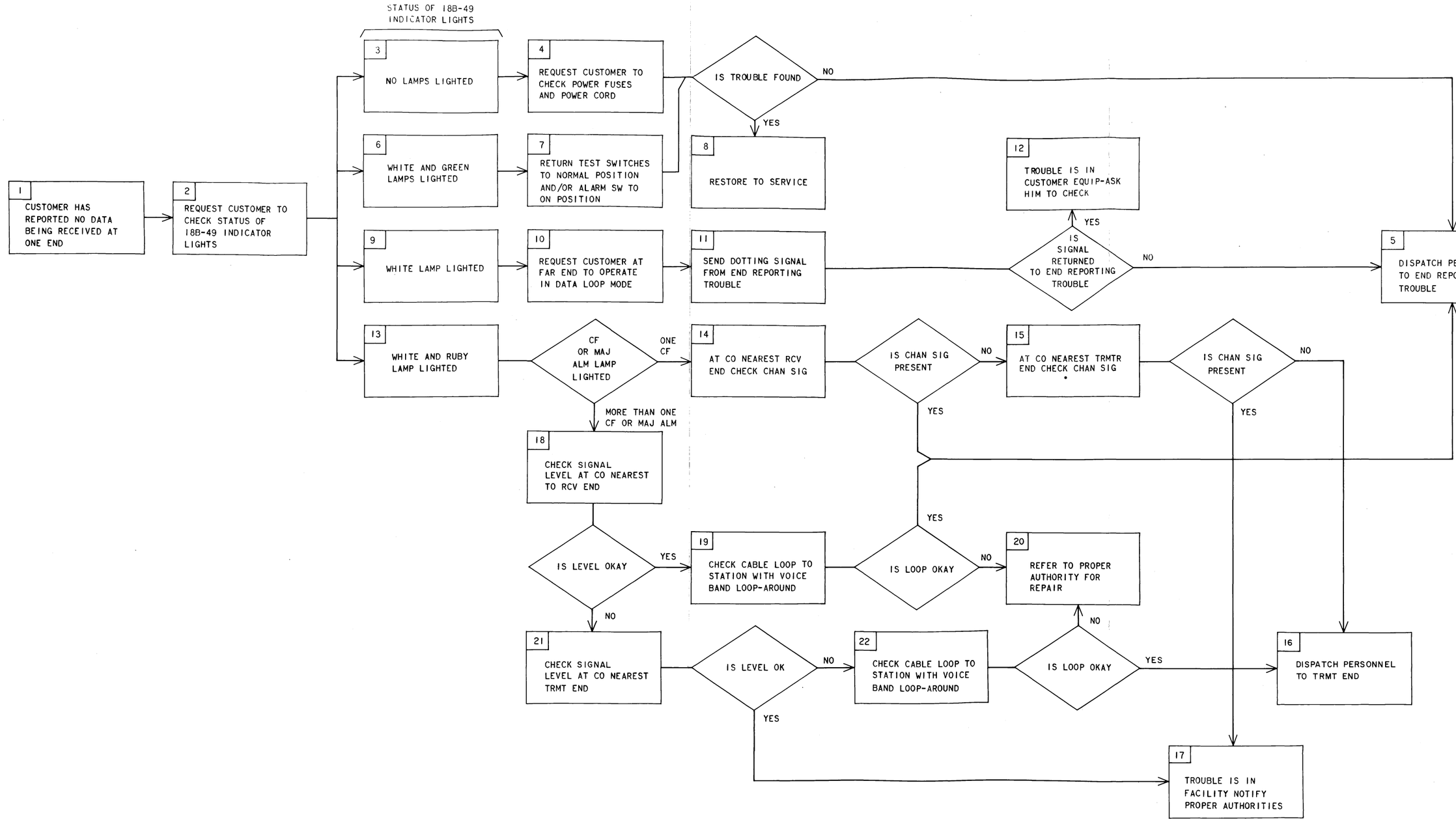
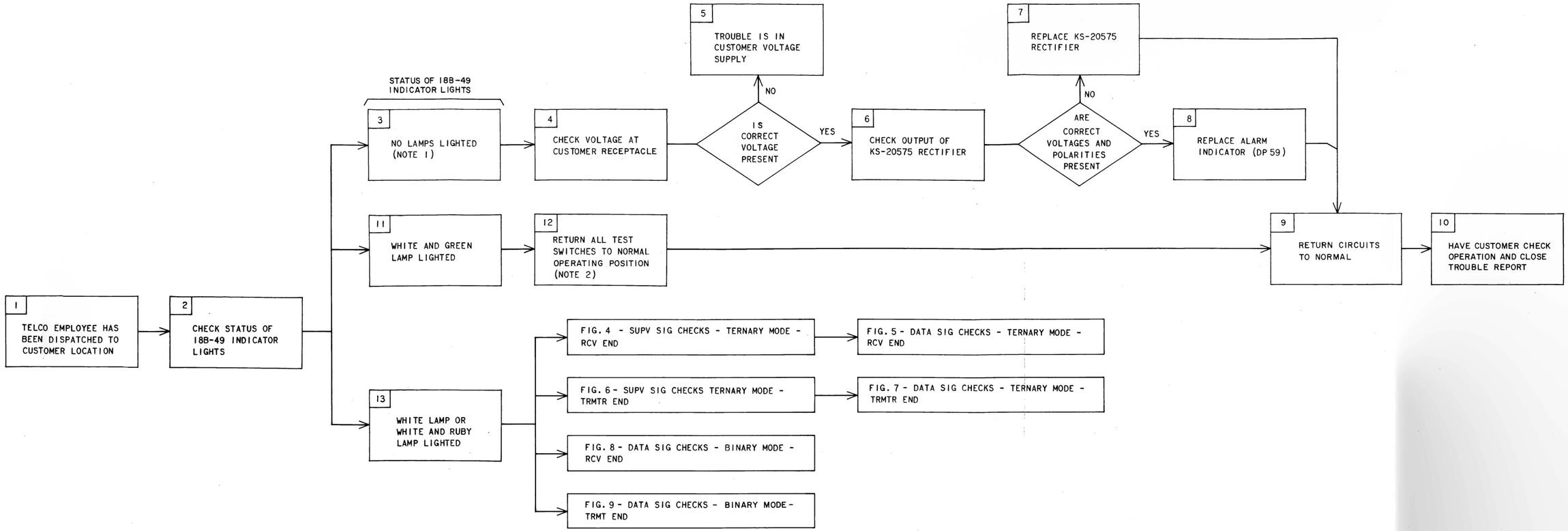


Fig. 2—Trouble Isolation Prior to Dispatching Personnel



NOTES:
1. TO CHECK WHITE LAMP FILAMENT OPERATE CHANNEL MODE SWITCH TO TEST POSITION. IF POWER IS APPLIED TO IA DATA STATION THE GREEN LAMP WILL LIGHT - REPLACE WHITE LAMP AND RESTORE THE CHANNEL MODE SWITCH TO NOR (NORMAL) POSITION. IF GREEN LAMP DOES NOT LIGHT PROCEED AS DIRECTED AFTER "NO LAMPS LIGHTED"[3].
2. RETURN VOICEBAND LOOP SWITCH TO NORM POSITION
RETURN CHANNEL MODE SWITCH TO NOR POSITION
RETURN LOC CONT (LOCAL CONTROL) SWITCH TO MK(MARK) POSITION
RETURN ALM(ALARM) SWITCH TO ON POSITION.

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Fig. 3—Trouble Isolation—Preliminary Investigation at Customer Location

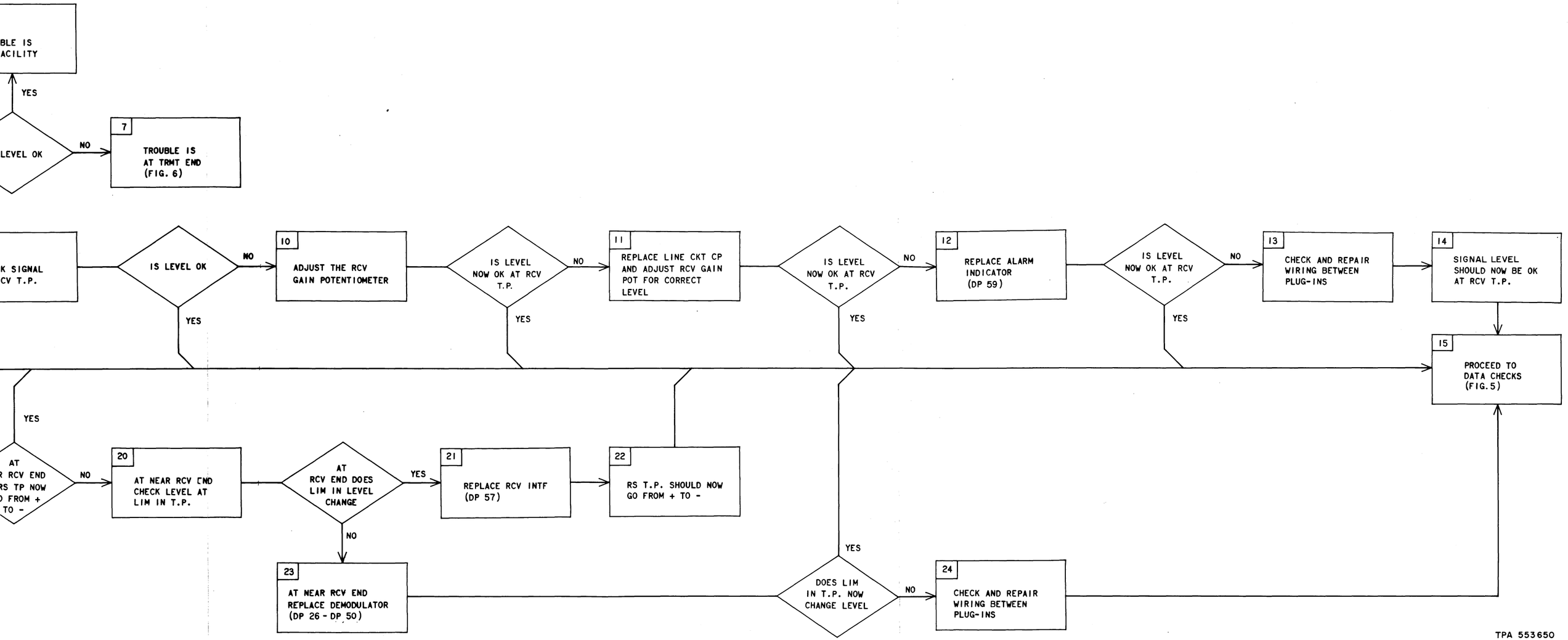
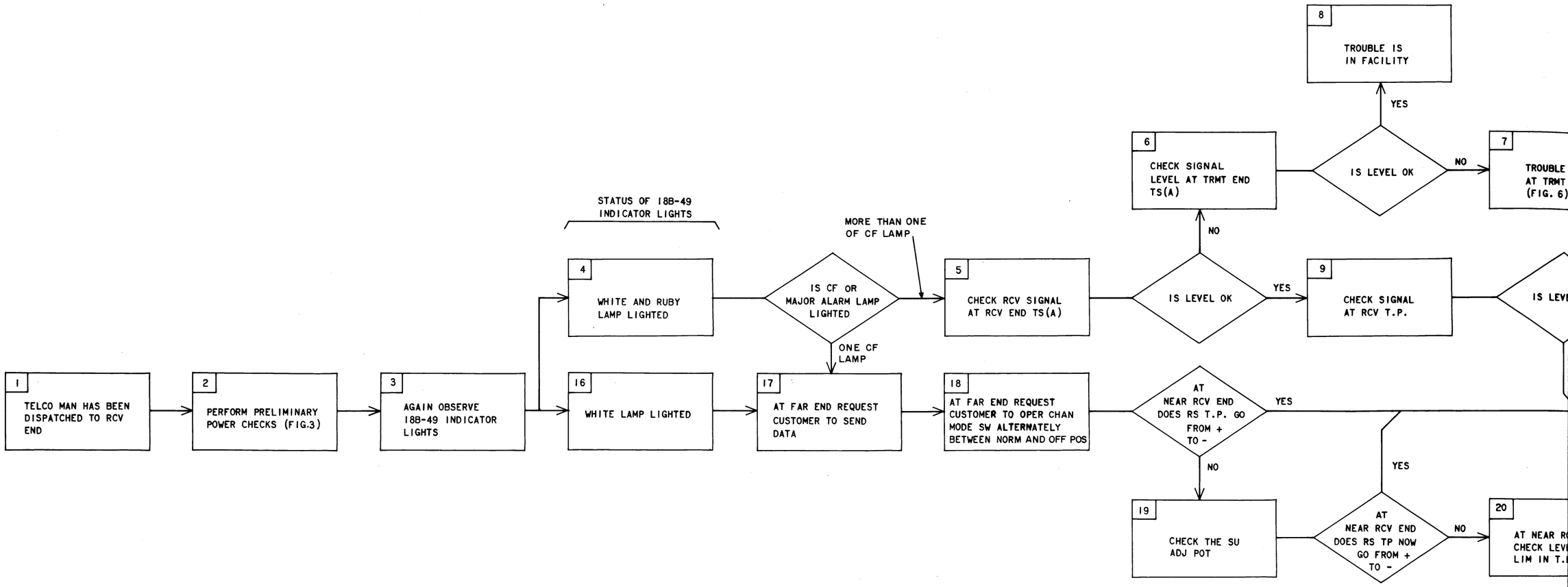
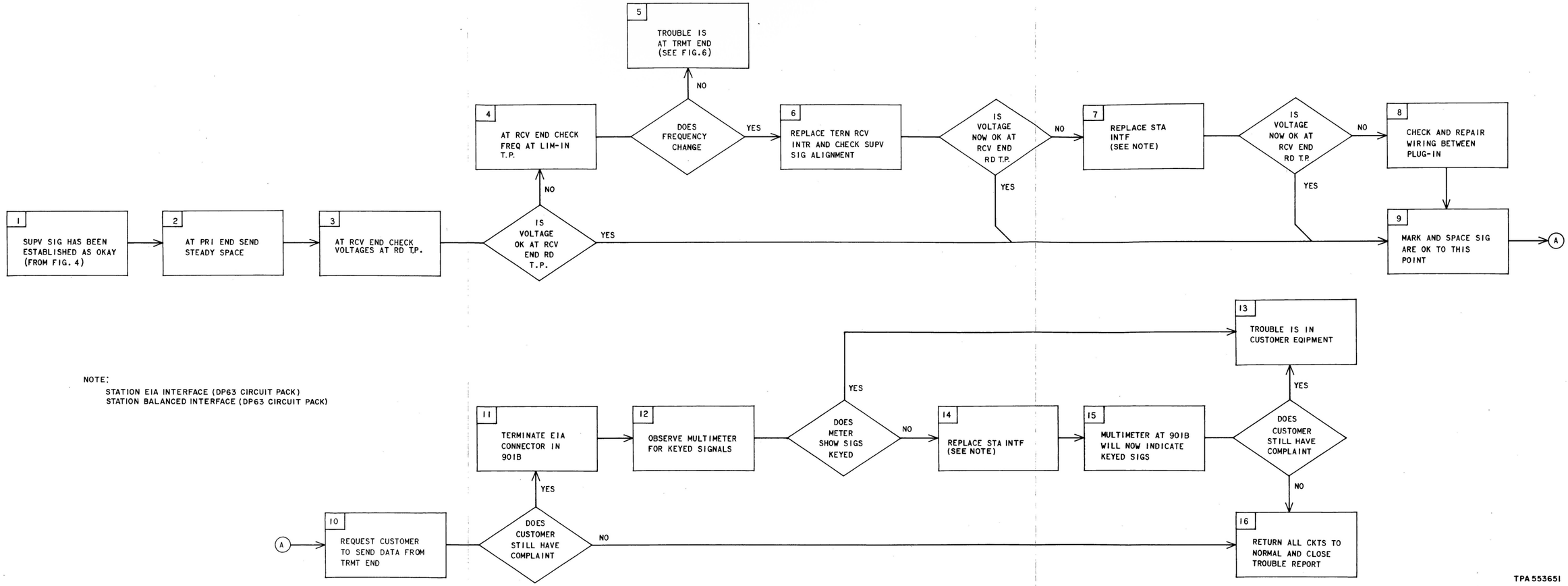


Fig. 4—Supervisory Signal Checks (Ternary)—Receive End


1
TELCO MAN HAS BEEN DISPATCHED TO RCV END
2
PERFORM PRELIMINARY POWER CHECKS (FIG.3)
3
AGAIN OBSERVE 18B-49 INDICATOR LIGHTS
STATUS OF 18B-49 INDICATOR LIGHTS
4
WHITE AND RUBY LAMP LIGHTED
16
WHITE LAMP LIGHTED
IS CF OR MAJOR ALARM LAMP LIGHTED
MORE THAN ONE OF CF LAMP
ONE CF LAMP
17
AT FAR END REQUEST CUSTOMER TO SEND DATA
5
CHECK RCV SIGNAL AT RCV END TS(A)
18
AT FAR END REQUEST CUSTOMER TO OPER CHAN MODE SW ALTERNATELY BETWEEN NORM AND OFF POS
IS LEVEL OK
NO
YES
6
CHECK SIGNAL LEVEL AT TRMT END TS(A)
IS LEVEL OK
YES
NO
8
TROUBLE IS IN FACILITY
7
TROUBLE AT TRMT (FIG. 6)
9
CHECK SIGNAL AT RCV T.P.
IS LEVE
AT NEAR RCV END DOES RS T.P. GO FROM + TO -
YES
NO
19
CHECK THE SU ADJ POT
AT NEAR RCV END DOES RS TP NOW GO FROM + TO -
YES
NO
20
AT NEAR RC
CHECK LEV
LIM IN T.



NOTE:
STATION EIA INTERFACE (DP63 CIRCUIT PACK)
STATION BALANCED INTERFACE (DP63 CIRCUIT PACK)

TPA 553651

Fig. 5—Data Signal Checks (Ternary)—Receive End

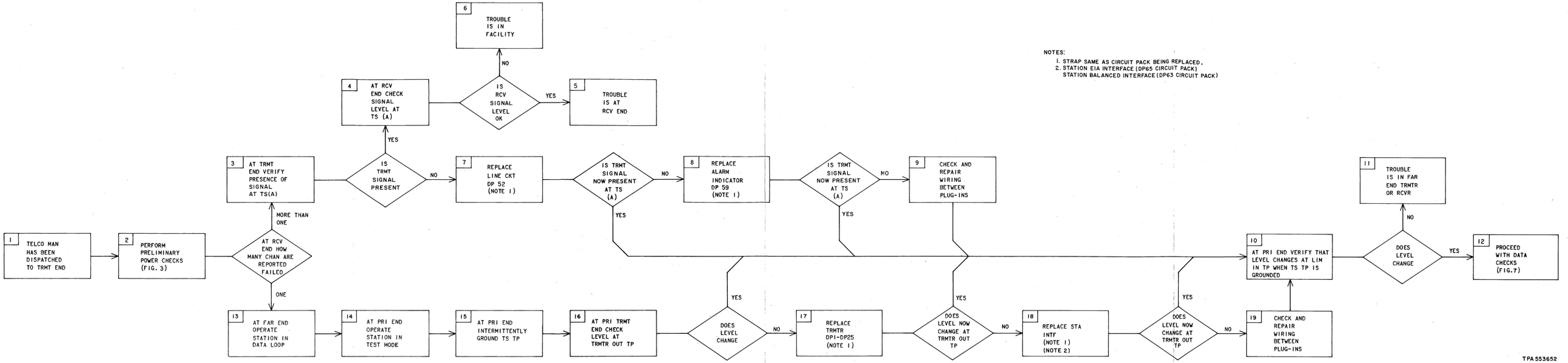


Fig. 6—Supervisory Signal Checks (Ternary)—Transmit End

NOTE:
STRAP SAME AS CIRCUIT PACK BEING REPLACED.
STATION EIA INTERFACE (DP65 CIRCUIT PACK)
STATION BALANCED INTERFACE (DP63 CIRCUIT PACK)

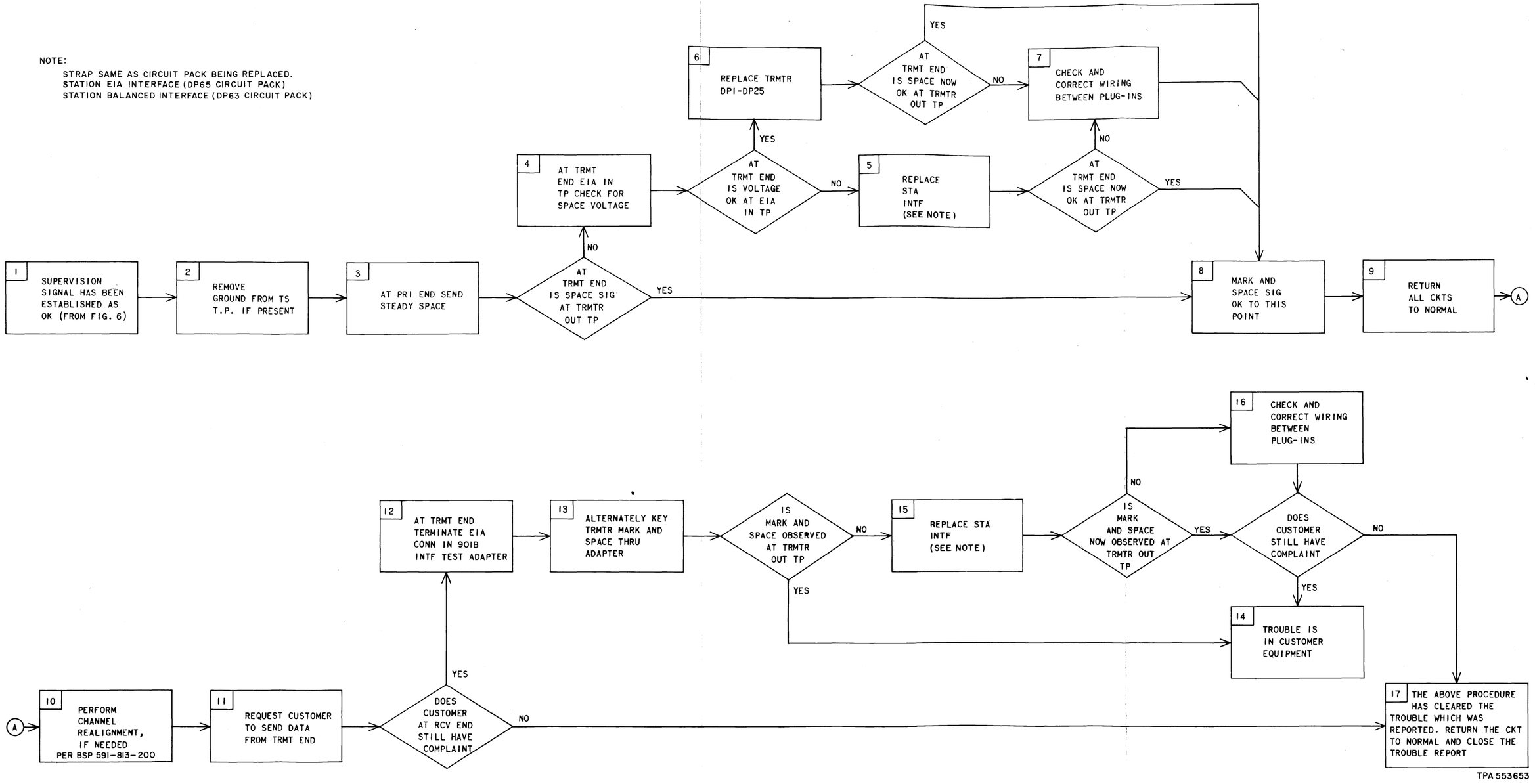


Fig. 7—Data Signal Checks (Ternary)—Transmit End

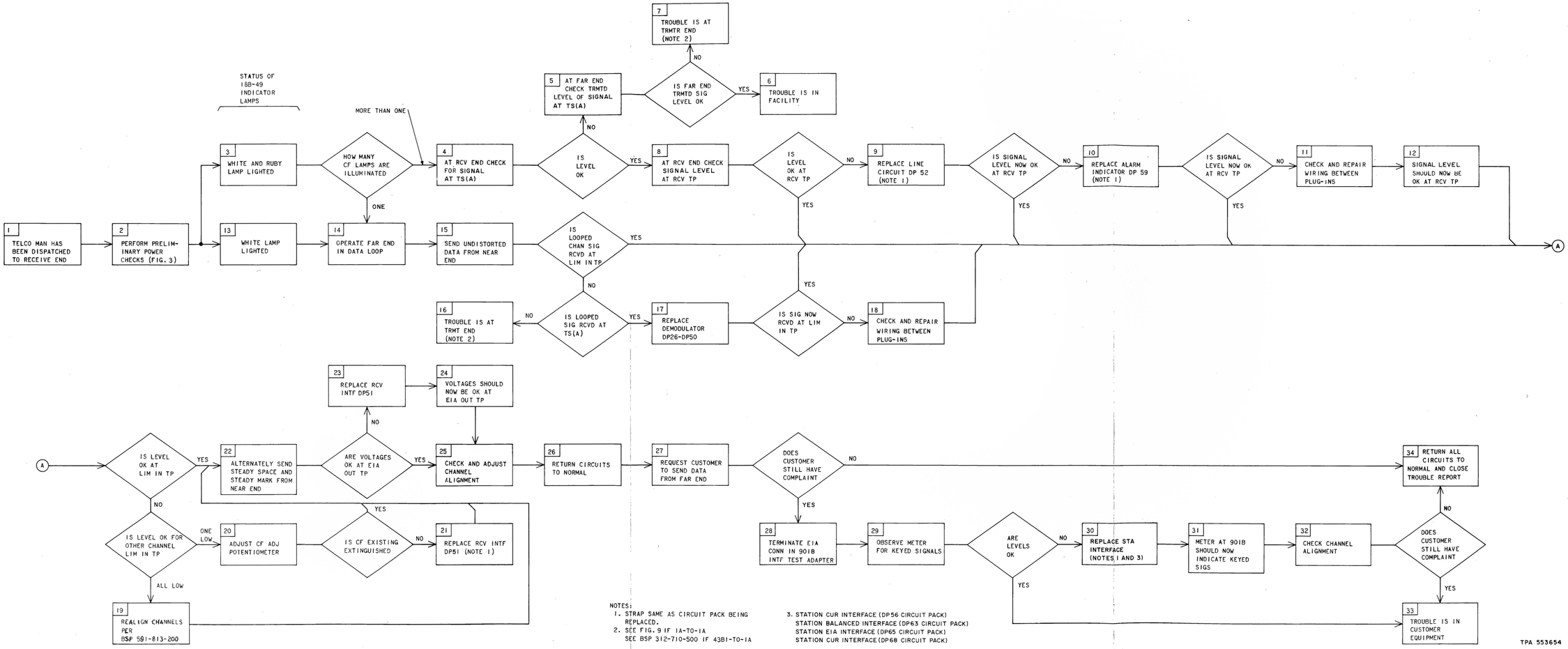


Fig. 8—Data Signal Checks (Binary)—Receive End

NOTES:

1. STRAP SAME AS CIRCUIT PACK BEING REPLACED.
2. STATION CUR INTERFACE (DP56 CIRCUIT PACK)
   STATION BALANCED INTERFACE (DP63 CIRCUIT PACK)
   STATION EIA INTERFACE (DP65 CIRCUIT PACK)
   STATION CUR INTERFACE (DP68 CIRCUIT PACK)
3. REPORT FACILITY TROUBLE TO THE DESIGNATED TROUBLE REPORTING CENTER.

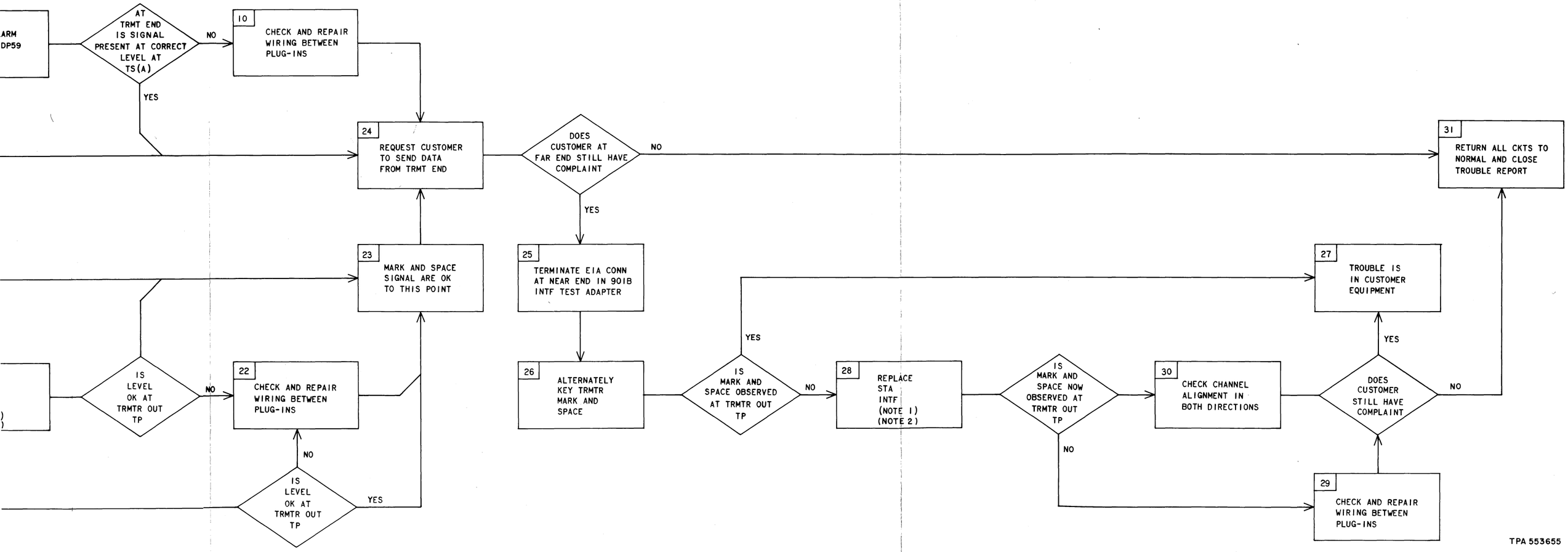
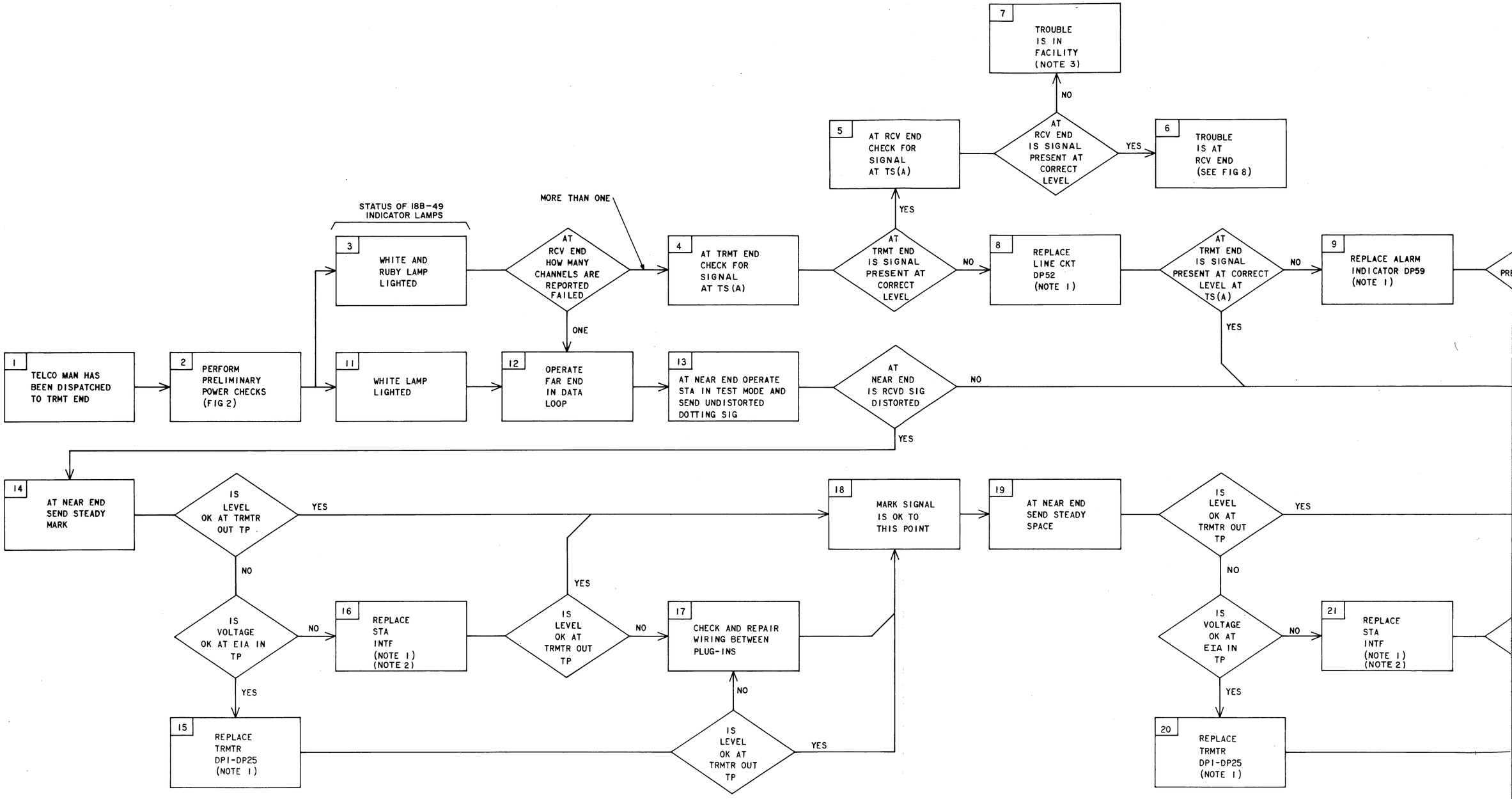


Fig. 9—Data Signal Checks (Binary)—Transmit End


1
TELCO MAN HAS BEEN DISPATCHED TO TRMT END
2
PERFORM PRELIMINARY POWER CHECKS (FIG 2)
3
WHITE AND RUBY LAMP LIGHTED
STATUS OF 188-49 INDICATOR LAMPS
AT RCV END HOW MANY CHANNELS ARE REPORTED FAILED
MORE THAN ONE
ONE
4
AT TRMT END CHECK FOR SIGNAL AT TS(A)
AT TRMT END IS SIGNAL PRESENT AT CORRECT LEVEL
NO
YES
5
AT RCV END CHECK FOR SIGNAL AT TS(A)
AT RCV END IS SIGNAL PRESENT AT CORRECT LEVEL
NO
YES
6
TROUBLE IS AT RCV END (SEE FIG 8)
7
TROUBLE IS IN FACILITY (NOTE 3)
8
REPLACE LINE CKT DP52 (NOTE 1)
AT TRMT END IS SIGNAL PRESENT AT CORRECT LEVEL AT TS(A)
NO
YES
9
REPLACE ALARM INDICATOR DP59 (NOTE 1)
11
WHITE LAMP LIGHTED
12
OPERATE FAR END IN DATA LOOP
13
AT NEAR END OPERATE STA IN TEST MODE AND SEND UNDISTORTED DOTTING SIG
AT NEAR END IS RCVD SIG DISTORTED
NO
YES
14
AT NEAR END SEND STEADY MARK
IS LEVEL OK AT TRMTR OUT TP
YES
NO
IS VOLTAGE OK AT EIA IN TP
NO
YES
16
REPLACE STA INTF (NOTE 1) (NOTE 2)
15
REPLACE TRMTR DPI-DP25 (NOTE 1)
IS LEVEL OK AT TRMTR OUT TP
YES
NO
17
CHECK AND REPAIR WIRING BETWEEN PLUG-INS
IS LEVEL OK AT TRMTR OUT TP
NO
YES
18
MARK SIGNAL IS OK TO THIS POINT
19
AT NEAR END SEND STEADY SPACE
IS LEVEL OK AT TRMTR OUT TP
YES
NO
IS VOLTAGE OK AT EIA IN TP
NO
YES
21
REPLACE STA INTF (NOTE 1) (NOTE 2)
20
REPLACE TRMTR DPI-DP25 (NOTE 1)