TRANSMISSION MAINTENANCE OF FOUR-WIRE FACILITIES EQUIPPED WITH DATA AUXILIARY SET 806A-TYPE

1. GENERAL

1.01 This section describes the procedures to be followed when testing four-wire facilities equipped with a Data Auxiliary Set 806A-type. Data Auxiliary Set 806A-type will be referred to in this section as DAS. Although designed primarily for use in data services, DAS may be used on any service using four-wire facilities.

1.02 This section is reissued to add information not available for the previous issue. A bandwidth and guard band test have been added. Change arrows indicate additions.

1.03 DAS 806A-type (Fig. 1) is designed to assist in the overall transmission maintenance of four-wire line facilities serving the customer's station equipment. This is accomplished by installing the DAS on the customer's premises where it is connected between the customer's station equipment and the four-wire line facility. DAS is activated remotely under control of the Serving Test Center (STC), Plant Service Center (PSC), or Data Test Center (DTC). It may also be operated locally under control of the station attendant or telephone employee.

1.04 When an operate signal (from the test center) is received by the DAS, it functions to loop the receive path to the transmit path to permit loop-back transmission testing of the customer's four-wire line facility from the test center. Simultaneously, when under the control of the test center, options are provided to either terminate the transmit and receive paths from the customer equipment in 600 ohms or connect them through an appropriate pad (AT2) for loop-back testing of the station equipment.

1.05 Options are also provided which permit customer control of the DAS for making loop-back tests of this equipment. When under the customer's control, the send and receive paths from the test center are terminated in 600 ohms.

1.06 Three types of DAS 806A are available and the operate signal required is different for each. DAS 806A1 requires a continuous 48-volt dc signal applied in accordance with Table A. A current of 20 ma is required to hold DAS 806A1 operated. Removal of the dc signal will release the DAS 806A1. DAS 806A2 requires a 2800 ±30 Hz tone applied for five to ten seconds to the transmit (from testboard) pair as an operate signal. When option A is provided, a second 2800 ±30 Hz tone is required to release the data auxiliary set. When option A is ***not*** provided, the DAS 806A2 releases upon the removal of the first 2800 ±30 Hz tone. DAS 806A3 is identical to DAS 806A2 except that the operate signal is 2400 ±30 Hz.

> ***Note:*** The 806A3 is designed specifically for use on the Federal Aviation Agency (FAA) remote control air ground circuits. It must not be used on any facilities equipped with 2400 Hz single-frequency signaling.

1.07 DAS 806A1, due to its operate signal of 48 volts dc, may only be used where facilities provide a dc path from the test center to the customer's location. DAS 806A2 or DAS 806A3 may be used on any type of facility (cable or carrier).

1.08 Option N permits the customer or telephone employee to test the equipment by depressing the LOC key. This lights the LOC lamp and operates the DAS to permit testing of the station equipment, on a loop-back basis, through pad AT2 (Fig. 2). Operation of the OFF key on the DAS releases the test connection and returns the facility to normal. During the time the customer or telephone employee is performing tests, the four-wire facility is terminated in 600 ohms towards the test center. Option M supplements but does not remove features of option N; it provides for remote control by the customer or telephone employee.

1.09 ▶In the event that DAS is in the local test mode, the test center may transmit an

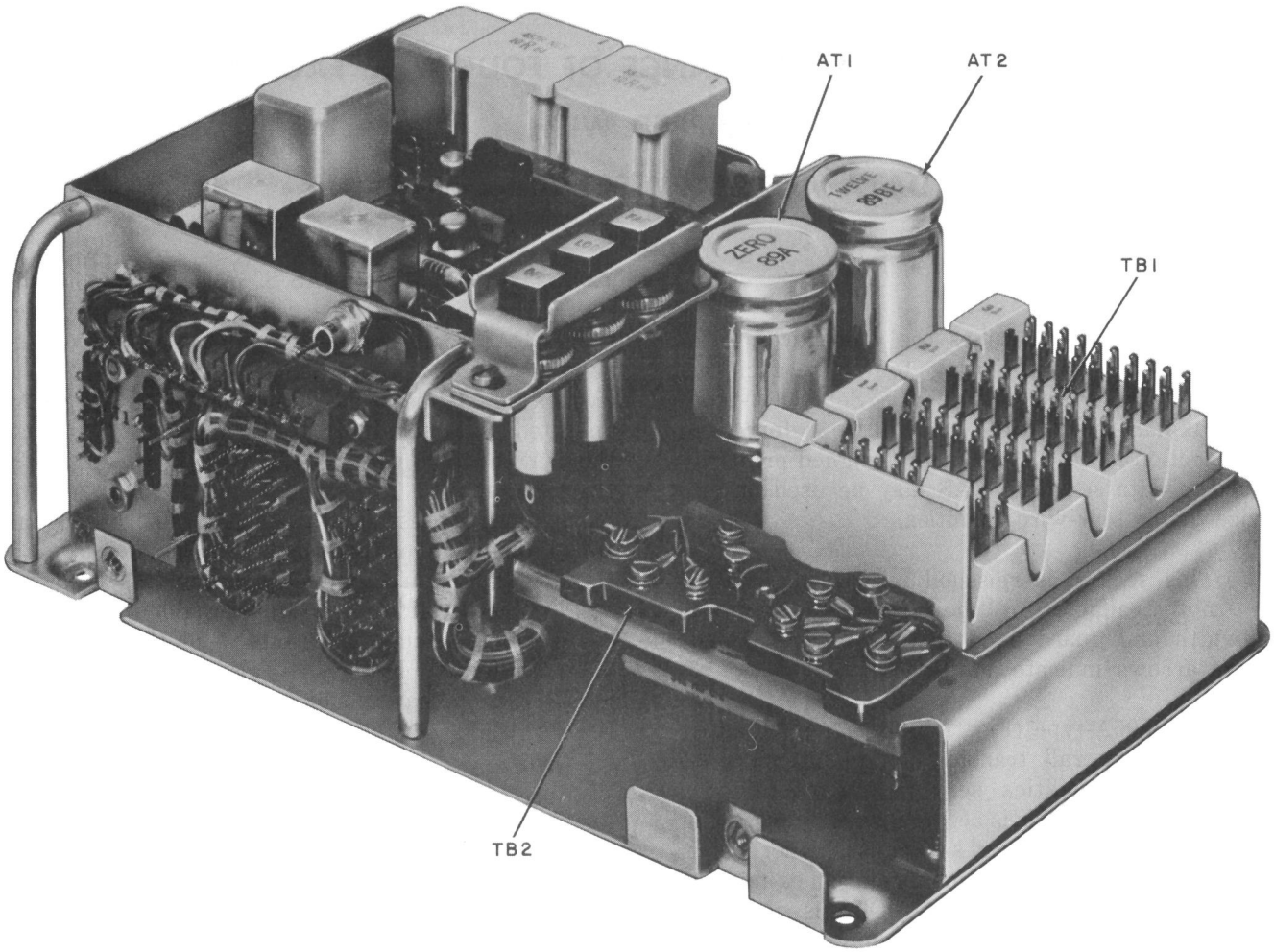

Fig. 1—Data Auxiliary Set 806A-Type—Cover Removed

operate signal to the DAS and cause the facility terminations to be removed and the four-wire facility to be looped back to the test center. This test center operation will override the customer's test and take control of the DAS. The customer's station loop-back may be momentarily affected by the test center operation if the R option is used, or terminated if the S option is used. The FAC lamp will light and the LOC lamp will extinguish to indicate the transfer of control. The release of the DAS by the test center will also release the customer's station loop-back and restore the facility to normal.◀

2. INSTALLATION TESTS

2.01 At the time a circuit is equipped with a DAS 806A-type, the test center should perform the tests in the following paragraphs.

2.02 Make all circuit order tests with the circuit in the normal condition (DAS not looped back).

- Make an operational test of DAS 806A1 per 2.03 or DAS 806A2 (DAS 806A3) per 2.04.

DAS 806A1 (DC)

2.03 Steps 1 through 14 cover procedure to be followed when testing four-wire facilities equipped with DAS 806A1.

Note: In order to apply the proper operate signal, it will be necessary to provide a simplex arrangement to the station. Fig. 3 illustrates one method of applying the operate signal. If an alternate arrangement has been provided at the central office test center, this circuit

should be used instead. Circuitry shown in Fig. 3 must be made up locally. Although a 2552B Transformer is illustrated, any 600 to 600 ohm impedance ratio transformer may be used.

(1) ▸Connect an oscillator (21A or equivalent), set at 1000 Hz, to the transmit leg towards DAS (receive leg at DAS).

(2) Connect a transmission measuring set (21A TMS or equivalent) to the receive leg towards DAS (transmit leg at DAS).

Note: When working with a telephone employee at the station, transmit a signal (not the operate signal) on the facilities which terminate the receive path of the DAS to verify through connection.

(3) Connect operate signal (–48 volts) to the facilities assigned to control the DAS in accordance with Table A.◂

Requirement: TMS reads approximately calculated 1000 Hz loop-back loss ***plus*** any AT1 pad loss in DAS 806A1 (Fig. 2).

(4) Remove and reconnect the –48 volt operate signal several times to verify that the DAS operates and releases properly.

Requirement: TMS measures tone when operate signal is applied. Either no tone or a test signal will be measured after operate signal is removed.

(5) Reconnect –48 volt operate signal.

TABLE A

DAS	OPERATE SIGNAL	OPTIONS PROVIDED	*APPLY TO
806A1 (See Note)	48V @ 20 ma	X, G	Ring of Receive
		X, K	Tip of Receive
		X, T	Both Tip and Ring of Receive
		Y, G	Ring of Transmit
		Y, K	Tip of Transmit
		Y, T	Both Tip and Ring of Transmit
	48V @ 20 ma and Central Office Ground	X, H	Bat. to Ring Grd to Tip of Receive
		Y, H	Bat. to Ring Grd to Tip of Transmit
806A2	2800 ±30	A†‡	Transmit Pair
		Without A‡	
806A3	2400 ±30	A†‡	Transmit Pair
		Without A‡	

*From testboard (towards station) in all cases

†Option A requires five to ten seconds of tone to operate DAS 806A-type and another five to ten seconds of tone to release DAS 806A-type. (See 1.06.)

Note: 20 ma will be required to operate the HA relay which monitors the line in each case. The resistance of the HA relay is 950 ohms.

‡Option X, Y, or Z may be used with this type of DAS. Because G, K, and T are ground return options, these are not recommended unless loop impedance amounts to 1500 ohms or more. ◂

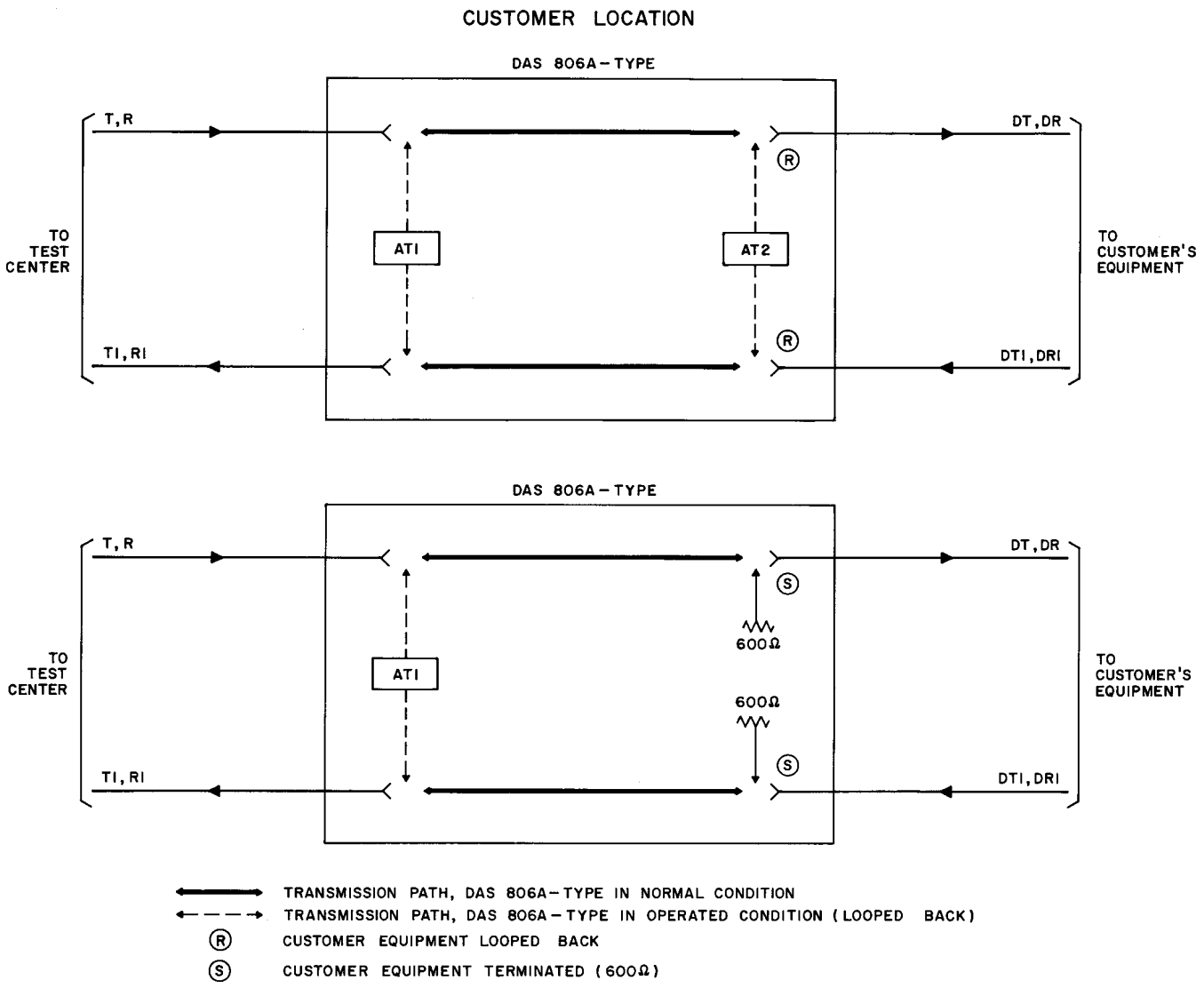

Fig. 2—Data Auxiliary Set 806A-Type—Transmission Options Under Control of Test Center

(6) Make a loop-back frequency run using frequencies normally included in circuit order tests and any other necessary frequencies.

(7) Measure the circuit noise using a 3A Noise Measuring Set (J94003A) or equivalent.

(8) Where available, a PAR reading should be made. Use the J94027A and B meter and the section entitled J94027A and B PAR Meter, Generator and Receiver, Description, Operation, and Maintenance (103-110-110).

Note: For data channels such as types 3004 and 3005, it would be desirable to make an envelope delay test.

Record all test results in the Circuit Layout Record (CLR) file for future reference when sectionalizing trouble reports.

(9) Verify that the telephone employee at the customer location has tested the ***customer equipment side*** of the DAS for loop-back loss (option R) or for 600 ohm transmit and receive path terminations (option S) while the DAS is in the loop-back mode under control of the test center.

(10) Remove the -48 volt operate signal.

Note: The following steps are required when the DAS is provided with option M or option N.

(11) Have the telephone employee at the customer location operate LOC key (option N) or auxiliary ON key (option M), and verify that the customer side is looped back through AT2 pad.

(12) While the DAS is under local control, connect -48 volt operate signal. Verify that the operate signal from test center overrides local control and loops back the facility to the test center.

Requirement: LOC lamp extinguishes. FAC lamp lights on the DAS.

(13) Remove -48 volt operate signal and verify that DAS restores to normal condition.

(14) This ends the test; remove all cords.

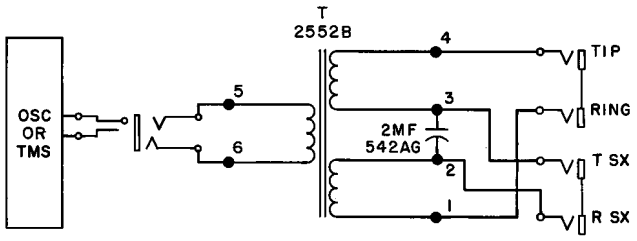

Fig. 3—Transformer Connections For Applying DAS 806A1 Operate Signal

DAS 806A2 (2800 HZ) OR DAS 806A3 (2400 HZ)

2.04 Steps 1 through 33 cover procedure to be followed when testing four-wire facilities equipped with DAS 806A2 or DAS 806A3.

Note: The test procedure is identical when testing DAS 806A2 or DAS 806A3. Requirement values shown in ( ) are applicable to DAS 806A3 (2400 Hz receiver). DAS 806A2 (DAS 806A3) equipped with option A will operate and "lock up" in the loop-back mode upon receipt of 2800 (2400) Hz for five to ten seconds. The unit will remain in the loop-back mode until a second 2800 (2400) Hz tone is received for five to ten seconds. This second tone will restore the DAS to normal. DAS 806A2 (DAS 806A3) ***without option A*** will operate to the loop-back mode on receipt of the 2800 (2400) Hz tone. The unit will remain in the loop-back mode as long as the tone ***remains*** on. Removal of the tone restores the DAS to normal.

Note: ▶When working with a telephone employee at the station, transmit a tone (not the operate signal) on the transmit pair facilities (from testboard towards DAS) to verify through connection.◀

(1) Connect the receive path of the circuit under test to a transmission measuring set (TMS). Use a 21A TMS or equivalent.

(2) Adjust an oscillator (21A or equivalent) to 2800 (2400) Hz. This is the operate frequency of DAS 806A2 (DAS 806A3).

(3) Adjust the output of the oscillator so that the level of signal will be -17 dbm at the DAS.

Note: The transmitted level will depend upon the "reference" (0, -13, -16 dbm) level point in the circuit under test at which the signal will be inserted. This level may be calculated using the CLR. DAS 806A2 (DAS 806A3) will operate and release with a level range from -8 dbm to -26 dbm; therefore, the optimum level is -17 dbm.

(4) Connect the oscillator to the transmit path of the circuit under test.

Requirement: Five to ten seconds after the tone is applied, TMS reads approximately the calculated 2800 (2400) Hz loop-back loss ***plus*** any AT1 pad loss in the DAS. (See Fig. 2.)

(5) Remove and reconnect the oscillator several times at five- to ten-second intervals.

Requirement: The DAS operates and/or releases properly determined by whether or not option A is provided.

Note: Steps (6), (7), and (8) can be performed only when option A is provided.

(6) Make a loop-back frequency run using frequencies normally included in circuit order tests and any other necessary frequencies.

(7) Measure the circuit noise using a 3A Noise Measuring Set (J94003A) or equivalent.

(8) Where available, a PAR reading should be made. Use the J94027A and B meter and the section entitled J94027A and B PAR Meter, Generator and Receiver, Description, Operation, and Maintenance (103-110-110).

Note: For data channels such as types 3004 and 3005, it would be desirable to make an envelope delay test.

Record all test results in the Circuit Layout Record (CLR) file for future reference when sectionalizing trouble reports.

(9) Verify that the telephone employee at the customer location has tested the ***customer equipment side*** of the DAS for loop-back loss (option R) or for 600 ohm transmit and receive path terminations (option S) while the DAS is in the loop-back mode under control of the test center.

(10) Restore the DAS to normal.

(11) ▶Have the telephone employee at the customer location operate the LOC key (option N) or the auxiliary ON key (option M), and verify that customer side is looped back through the AT2 pad.

Note: For DAS 806A3, used on FAA circuits, a test tone should not be heard by the telephone employee if an 89B Resistor is used in the AT2 pad.◀

(12) While DAS 806A2 (DAS 806A3) is under local control, reconnect the 2800 (2400) Hz operate signal. Verify that the operate signal from the test center overrides local control and loops back the facility to the test center.

Requirement: LOC lamp extinguishes. FAC lamp lights on the DAS.

▶***Note:*** FAC lamp will light only when option A exists and the looping signal has been removed.◀

A. DAS 806A2 (DAS 806A3) Without Option A (With Option A, Proceed to Step 19)

(13) Remove 2800 (2400) Hz signal. Verify that DAS restores to normal.

Bandwidth Test

(14) ▶Reconnect the operate signal oscillator. Set the operate signal to 2770 (2370) Hz and adjust the level for -17 dbm at the DAS. Verify that the DAS has looped back.

(15) Slowly decrease the frequency until the DAS releases. Record the lower critical frequency.

Requirement: Lower critical frequency (F_l) 2725(2325)Hz$\leq F_l \leq$2770(2370)Hz

Note: $\leq$ less than or equal to

(16) Set the operate signal to 2830 (2430) Hz. Verify that the DAS has looped back.

(17) Increase the frequency until the DAS releases. Record the upper critical frequency.

Requirement: Upper critical frequency (F_h) 2830(2430)Hz$\leq F_h \leq$2875(2475)Hz

(18) Proceed to the guard band test (before Step 28).◀

B. DAS 806A2 (806A3) With Option A

(19) Remove and reconnect 2800 (2400) Hz signal. Verify that five to ten seconds after the signal is applied, DAS restores to normal.

Bandwidth Test

(20) ▶Set the operate signal oscillator to 2770 (2370) Hz and adjust the level for -17 dbm at the DAS.

(21) Apply the operate signal for ten seconds.

(22) If DAS operates, apply the operate signal again for ten seconds. Decrease the frequency of the operate signal by 10 Hz.

(23) Repeat Steps 21 and 22 until DAS does not operate. Record the lower critical frequency.

Requirement: Lower critical frequency (F_l) 2725(2325)Hz$\leq F_l \leq$2770(2370)Hz

Note: $\leq$ less than or equal to

(24) Set the operate signal to 2830 (2430) Hz and adjust the level for -17 dbm at the DAS.

(25) Apply the operate signal for ten seconds.

(26) If the DAS operates, apply the operate signal again for ten seconds. Increase the frequency of the operate signal by 10 Hz.

(27) Repeat Steps 25 and 26 until DAS does not operate. Record the upper critical frequency.

Requirement: Upper critical frequency (F_h) 2830(2430)Hz$\leq F_h \leq$2875(2475)Hz

Guard Band Test—All DAS 806A2 (806A3)

Note: A multiple arrangement is required for this test to patch two signals to the test center's transmit pair. One signal is the operate signal, and the other is 1000 Hz.

(28) Request telephone employee to terminate data receive pair in 600 ohms.

(29) Adjust an oscillator (21A or equivalent) to 1000 Hz and, by way of multiple arrangement, apply the output to the test center's transmit pair. Adjust the output level for -10 dbm at the DAS.

(30) Adjust the operate signal oscillator (21A or equivalent) to 2800 (2400) Hz and, by way of multiple arrangement, apply the output to the test center's transmit pair. Verify that the output level is still adjusted for -17 dbm at the DAS.

Note: The DAS should ***not*** operate.

(31) ***Slowly*** decrease the level of the 1000 Hz signal until the DAS operates.

Note: A five- to ten-second lag in DAS operation requires ***slow*** level changes. A rate of ten seconds per 2-db step should be sufficient.

Requirement: Level of 1000 Hz should be between -12 and -22 dbm at DAS.

(32) Disconnect the 1000 Hz and operate signal oscillator. If option A is employed, reapply the operate signal for ten seconds.

(33) This ends the test; remove all cords.

3. REFERENCES

3.01 Schematic and circuit description covering the DAS are numbered SD- and CD-1D053.

3.02 Associated BSP's concerning DAS are as follows:

SECTION	TITLE
598-036-100	Identification and Operation
598-036-200	Installation
598-036-300	Maintenance
598-036-400	Connections
598-036-500	Test Procedures
668-108-510	Data Test Center—904A- and C-Types Test Procedure