

**E2 STATUS REPORTING AND CONTROL SYSTEM
TROUBLESHOOTING PROCEDURES
MULTIDIRECTIONAL DATA REGENERATOR**

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1.03 Before any tests of the data regenerator are initiated, the VF IN and VF OUT ports associated with each CP 151 (receive and transmit control) must be terminated with 262B plugs to prevent transmission into the data network.

Caution: The tests and alignment procedure outlined here are all out-of-service tests, and all portions of the network served by the regenerator are out of service for the duration of the tests.

1. GENERAL

1.01 This section contains step-by-step procedures for the alignment and testing of the multidirectional data regenerator.

1.02 Before any tests are performed on an in-service regenerator, the individual subnetworks on each side of the regenerator should be tested to ensure that they meet 3002 specifications.

2. ALIGNMENT AND TESTS

2.01 Chart 1 is used for the alignment and testing of the multidirectional data regenerator.

CHART 1

ALIGNMENT AND TEST OF THE DATA REGENERATOR

APPARATUS:

- 21A Transmission measuring set (TMS), or equivalent*
- Vacuum tube voltmeter (VTVM) HP 400D, or equivalent*
- Oscilloscope, Tektronix 547, or equivalent*

STEP	PROCEDURE
1	Apply a mark-frequency tone (1300 Hz) at a level of -6 dBm to the input (REG IN) of the first receive and transmit control circuit pack (CP 151), using the 21A TMS.
2	Monitor TP9 of the same CP 151 by using an HP 400D VTVM or equivalent.
3	Adjust R4 for a meter reading of -16 ±0.5 dBm. If this level cannot be met, replace CP 151.

CHART 1 (Cont)

STEP	PROCEDURE
4	Adjust the 21A TMS to -18 dBm.
5	Monitor TP12 of the same CP 151 using an oscilloscope. Requirement: The voltage shall be greater than $+12$ Vdc. If this requirement is not met, go to Step 8; if otherwise, continue.
6	Adjust the 21A TMS to -20 dBm. Requirement: The voltage at TP12 shall be less than 0.5 Vdc. If this requirement is not met, continue with Step 8; if otherwise, go to Step 11.
8	Adjust the 21A TMS to -19 dBm.
9	Turn potentiometer R9 to its maximum counterclockwise position. Requirement: The voltage at TP12 shall be greater than $+12$ Vdc. If this requirement is not met, replace CP 151.
10	Turn potentiometer R9 clockwise until the voltage on TP12 drops to less than 0.5 Vdc. If this level cannot be obtained, replace CP 151.
11	Adjust the 21A TMS to -6 dBm.
12	Monitor TP13 of the same CP 151 by using an oscilloscope. Requirement: The voltage shall be greater than 1.0 Vac peak-to-peak. If this requirement is not met, replace CP 151.
13	Repeat Steps 1 through 11 for all other CP 151s in the circuit.
14	Apply a mark-frequency tone (1300 Hz) at a level of -6 dBm to the input (REG IN) of the first CP 151.
15	Monitor TP2 of CP 152 (data receiver and transmitter), using an oscilloscope. Requirement: The voltage shall be less than 0.5 Vdc. If this requirement is not met, replace CP 152.
16	Change the oscillator frequency to a space tone (2100 Hz). Requirement: The voltage at TP2 shall be greater than $+12$ Vdc. If the requirement is not met, replace CP 152.

CHART 1 (Cont)

STEP	PROCEDURE
17	Remove the tone momentarily. Note that the voltage at TP2 shifts to less than 0.5 Vdc. Reapply the tone and note that the voltage returns to +12 Vdc. If these levels cannot be obtained, replace CP 152.
18	Remove CP 90 from the stand-alone version or CP 154 from the collocated version.
19	Ground pin 7 on CP 152.
20	Monitor pin 3 on CP 152 using an oscilloscope. Requirement: The voltage on pin 3 shall be greater than 1.0 Vac peak-to-peak at a frequency of 1300 ± 20 Hz. If this requirement is not met, replace CP 152.
21	Remove the ground on pin 7 and place +24 Vdc on it. Requirement: The voltage on pin 3 of CP 152 shall be greater than 1.0 Vac peak-to-peak and have a frequency of 2100 ± 20 Hz. If this requirement is not met, replace CP 152.
22	Apply +24 Vdc to pin 1 of the first CP 151.
23	Connect the detector portion of the 21A TMS to the output (REG OUT) of the first CP 151. (Leave transmit portion of TMS intact) Requirement: The level shall be less than -60 dBm. Replace CP 151 if the requirement is not met.
24	Monitor the output (REG OUT) of all other CP 151 cards in the circuit with the detector portion of the 21A TMS. Requirement: The level shall be -29 ± 1 dBm. If the requirement is not met, adjust potentiometer R47 for a meter reading of -29 ± 0.5 dBm; if reading is not obtainable, replace CP 151.
25	Repeat Steps 23 and 24 for all other CP 151s in the circuit.
26	Remove the 24 Vdc supply from pin 7 of CP 152 and from pin 1 of CP 151.
27	Reinsert CP 90 or CP 154, removed in Step 18.
28	If the regenerator is the stand-alone version, proceed with Step 29; if it is the collocated version, go to Step 40.
29	Using an oscilloscope, check for clock pulses at TP1, TP2, TP3, and TP4 of CP 88 (clock).

CHART 1 (Cont)

STEP	PROCEDURE
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Requirement: The pulses shall be positive pulses approximately every 1.6 msec, having a pulse width of approximately 20 μ sec. The pulse height shall be greater than 12 Vdc. If these requirements cannot be met, replace CP 88.

- 30 Using an oscilloscope, check the clock pulses at pins 8, 9, 15, and 19 of CP 153 (logic control).

Requirement: The pulses shall be the complements of the pulses in Step 29.

- 31 Ground pin 27 on CP 92 (word length counter).
- 32 Monitor in order TP10, TP7, TP4, TP6, and TP14 on CP 92.

Requirement: The pulse shall be a square wave with an amplitude of greater than 12 Vdc and a duration as shown below.

TEST POINT	DURATION (msec)
TP10	1.66
TP7	3.32
TP4	6.64
TP6	13.28
TP14	26.56

If any part of the above requirement is not met, replace CP 92.

- 33 Remove the ground from pin 27 of CP 92.
- 34 Using a 21A TMS or equivalent, apply a space frequency tone (2100 Hz) at a level of -6 dBm to the input (REG IN) of the first CP 151.
- 35 Using an oscilloscope, measure the voltage of TP14 of CP 153.

Requirement: The voltage shall be greater than $+12$ Vdc. If the requirement cannot be met, replace CP 153.

- 36 Ground pin 7 on CP 92.
- 37 Remove the tone momentarily and then reapply the tone.

CHART 1 (Cont)

STEP	PROCEDURE
	Requirement: The voltage at TP14 on CP 153 shall shift to less than 0.5 Vdc. If the requirement is not met, replace CP 153.
38	Using an oscilloscope, measure the voltage at TP14 on CP 90 (6-stage shift register). Requirement: The voltage at TP14 on CP 90 shall be less than 0.5 Vdc. If the requirement is not met, replace CP 90.
39	Remove the ground from pin 7 on CP 92. Requirement: The voltage at TP14 on CP 90 shall shift to greater than 12 Vdc. If the requirement cannot be met, replace CP 90. Note: <i>This completes the test for the stand-alone version regenerator.</i>
40	COLLOCATED VERSION: Remove the cable drivers, CP 157 and CP 158, from the circuit.
41	In the E2 Remote Data Transmission Control circuit (SD-1C302-01), strap pin 11 of CP 93 (transmission control) to pin 19 of CP 96 (timing pulse generator).
42	Test the E2 remote as described in Section 201-644-504.
43	Remove the strap from pin 11 of CP 93 and pin 19 of CP 96.
44	Reinsert CP 157 and CP 158. Note: If the regenerator is still not performing properly, replace CP 157, CP 158, and CP 154, one-at-a-time, checking for proper operation after each replacement.