NO. 400 DATA PACKAGE
TELETYPEWRITER STATION
4-WIRE INTERFACE CIRCUIT
FOR USE WITH NO. 101C DATA SETS

Contents Page

1. GENERAL

1.01 The 4-wire interface circuit arranges a 2-wire TWX-type teletypewriter station equipped with a 101C data set to be used on a 4-wire transmission facility arranged for single-frequency signaling.

1.02 The circuit is primarily intended to be used in private service systems served by a No. 400 Data Package.

1.03 The 4-wire interface circuit does not affect the standard operating features of the TWX-type station except that incoming calls are indicated by a steady buzzer instead of the station bell.

1.04 The transmission design flexibility provided by the interface circuit is equivalent to that provided by 24V4 telephone repeaters.

2. OPERATION

Outgoing Call

2.01 With the station in the idle mode, 2600 Hz tone is transmitted to, and received from, the No. 400 Data Package via the 4-wire transmission facility.

2.02 A call originated by the station removes the 2600 Hz tone from the transmit pair.

2.03 The line circuit of the No. 400 Data Package recognizes the absence of the 2600 Hz signal from the station as an off-hook signal and attaches a register, removes 2600 Hz tone from its transmit pair and sends dial tone to the station. Dialing and data transmission may then take place from the station.

Incoming Call

2.04 The removal of 2600 Hz tone from the receive pair is recognized by the interface circuit as an incoming call to the station. Circuit action within the interface circuit then causes the station to respond to the call in the answering mode.

Disconnect

2.05 The station going on-hook causes the interface circuit to send 2600 Hz tone toward the No. 400 Data Package.

2.06 The line circuit in the No. 400 Data Package recognizes the 2600 Hz tone as the station on-hook condition, releases the switching linkage and then returns 2600 Hz tone to the station.

2.07 The interface circuit at the station restores to the idle state upon receiving the 2600 Hz tone from the No. 400 Data Package. In the on-hook (idle line condition) the interface circuit and the line circuit of the No. 400 Data Package exchange 2600 Hz tones.

Single Frequency Signaling Unit Functions

2.08 To transform DC supervisory signals from a 101C data set into AC tone signals for transmission into a 4-wire facility.

2.09 To recognize the presence or absence of incoming AC tone, and convert this to D.C. supervisory signals to the 101 data set.

2.10 To generate 2600 Hz at a -12 dBm for the AC tone signal to be applied to the facility.

2.11 The circuit provides for adjustable components to set transmission levels into a 4-wire facility.

3. WORKING LIMITS

3.01 This circuit is designed to function with circuits:

(a) That send ground on an E lead to this equipment as on off-hook signal and an open circuit on an on-hook signal.

(b) That require + battery on an M lead from this equipment as an off-hook signal and an open circuit as on-hook signal.

3.02 Signal power from the 2600 Hz supply portion shall be within ± 5 Hz.

3.03 This circuit will function with off-hook on-hook loop start supervisory signals only, and will not transmit or receive dial pulse signals.

3.04 This circuit is designed to function over voice paths of 4-wire broadband facilities for Private Line Data use. These facilities shall meet the requirements in BSP Section 314-410-500.

3.05 Voltage limits are +20 and -20 ±3V and 10VAC ±1V

3.06 Ambient operating temperature shall not exceed +32 to +120 F.

4. INSTALLATION AND MAINTENANCE TEST

Operational Station Test

4.01 This test is to be performed before connecting the station to the transmission facility.

STEP	ACTION	VERIFICATION
1	Connect TMS (unterminated) to MON AMP IN 1 jack and adjust the P1 potentiometer on the control card for -12 dBm	TMS reads -12 dB
2	Connect TMS to the MON AMP OUT 1 jack	TMS reads -20 dBm
3	Connect TMS to the MON AMP OUT 2 jack and swing the REC AMP control through its range and back to read -20 dBm NOTE: The amplifier will be reset when the facility is lined up at 1000 Hz.	TMS follows increase and decrease in gain and reads -20 dB
4	Operate the ORIG key on the TTY	TTY runs closed. ORIG lamp lights. TMS reads approx. -40 dB.
5	Operate the CLEAR key on the TTY	ORIG lamp goes out TMS reads -20 dB
6	Connect TMS to AMP OUT 1 jack	Buzzer and BUZ RLS lamp operate briefly then ANS lamp lights TTY runs closed for approx. 7 seconds then disconnects. TMS reads zero dBm briefly then -7 ±2dB until disconnect.
7	Remove test equipment	

5. STATION LINEUP

5.01 This test is performed after the station is connected to a prealigned facility.

STEP	ACTION	VERIFICATION
1	At the station set oscillator for +8 dBm and connect to AMP IN 1 jack	Station may go off-hook
2	If the station went off-hook operate the CLR key	Station goes on-hook
3	Connect TMS to MON AMP OUT 1 jack	TMS reads zero dBm
4	If TMS does not read zero dBm check the 849 Type network in the T AMP socket (J3) for the proper resistance (89AN 8dB)	
5	At the No. 400 Data Package connect a TMS to the MON AMP 1 IN jack of the line circuit associated with the station under test. Read the TLP (Transmission Level Point) according to the circuit layout record.	
6	At the No. 400 Data Package move the TMS from the MON AMP 1 IN jack to the MON AMP 1 OUT jack and adjust AMPL 1 for a reading of +2 dBm	TMS reads +2 dBm
7	Remove all equipment at the station and the No. 400 Data Package	
8	At the No. 400 Data Package set the oscillator for +2 dBm and connect to AMP IN 2 jack	Station may go off-hook
9	If the station went off-hook operate the CLR key	Station goes on-hook
10	At the No. 400 Data Package connect the TMS to MON AMP OUT 2 jack	TMS reads zero dBm
11	If the TMS does not read zero dBm check the 849 type network in the AMPL 2 socket for the proper resistance (89J 2dB)	TMS reads zero dBm
12	At the station connect the TMS to the MON AMP IN 2 jack and read the TLP according to the circuit layout record	TMS reads prescribed level

STEP	ACTION	VERIFICATION
13	At the station move the TMS from the MON AMP IN 2 jack to the MON AMP OUT 2 jack. And adjust the REC AMP for a reading of zero dBm	TMS reads zero dBm
14	At the No. 400 Data Package remove the oscillator from the MP IN 2 jack	TMS at the No. 400 Data Package reads -20 dBm. TMS at the station reads between -17.5 dBm and -27.5 dBm
15	If the TMS at the No. 400 Data Package does not read -20 dBm check the Data Packages 2600 Hz supply. If the TMS reading at the station is not between -17.5 and 27.5 dBm check the facility lineup.	
16	At the No. 400 Data Package and the station move both TMS's from the MON AMP OUT 2 jacks to the MON AMP OUT 1 jacks	TMS at the station reads -20 dBm. TMS at the No. 400 Data Package reads between -17.5 dBm and -27.5 dBm
17	If the TMS at the station does not read -20 dBm check the stations 2600 Hz supply. (A fine adjustment of the P1 potentiometer on the control card will compensate for a deviation of ± 2 dB). If the TMS reading at the No. 400 Data Package is not between -17.5 and -27.5 dBm check the facility lineup	
18	Remove the equipment at the station and the No. 400 Data Package	

6. SINGLE FREQUENCY TESTING

6.01 Basic lineup for single frequency (2600 cycles) signaling applique units.

6.02 The single frequency signaling system provides for supervision only. That is, on or off hook. It is not used for dialing. It is, therefore, a relatively simple arrangement. Once adjusted at a particular location, very little if any trouble should be experienced with the equipment.

6.03 The following steps may be used for either lineup or trouble location. A high impedance transmission measuring set, such as the Northeast Electronics TTS-28 should be used for all measurements. Facility lineup measurements will be set with 1000 Hz.

7. SINGLE FREQUENCY LINEUP (STA. END)

7.01 Testing jacks are located at one end of the signaling applique mounting strip. The designations will be similar to the diagram on the following page (Figure 1). Jack numbers are added to help in making tests.

7.02 The cable pairs going to the distant office will appear on the jacks at the right (line) side of the diagram. The signaling equipment is connected to the jacks on the left (equip.) side of the diagram. The row of jacks on the top, associated with amp-1, are the transmitting jacks. Bottom row, receiving from the distant station.

7.03 Before starting lineup of the signaling unit, the transmission lineup with the distant end must be completed and recorded. Tone from the distant end may be measured at Mon. Jack (5).

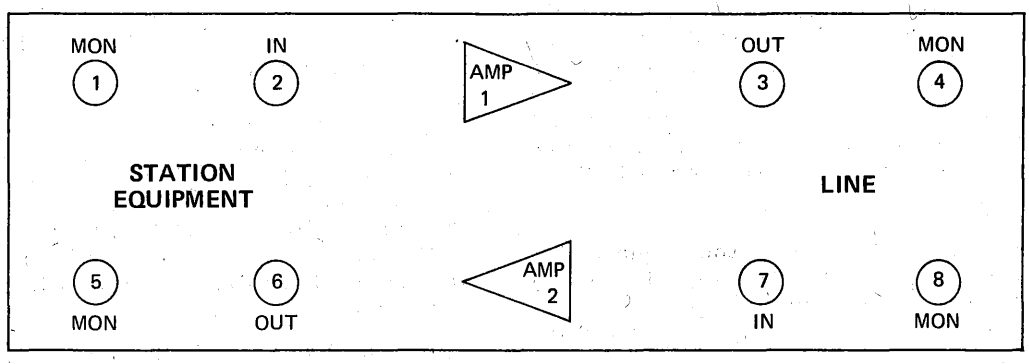

FIGURE 1

7.04 Tone may be sent to the distant end by use of amp in Jack No. 2. Loss in both directions should be checked against circuit layout record. Remove all cords and plugs.

7.05 With the power supplied to the signaling applique (PJ-1D028), measure the 2600 tone at Mon. Jack (1). You should read a -12+1 dB. Adjust P1 potentiometer in CONT CCT plug-in unit (PED-92093) to obtain correct reading. (If the proper level cannot be obtained, replace the plug-in unit.) Remove all cords and dummy plug.

7.06 Measure the incoming 2600 hertz at the Mon. Jack 5. You should read a -20.0 dB. (If you do not read the above, check your facility lineup.)

7.07 Output and detector test. Use a patch cord equipped with a 310 plug on either end.

(a) Plug one end of patch cord into IN Jack 7. Teletype should go off hook.

(b) Plug other end of patch cord into OUT Jack 3, looping your own 2600 cycle tone back into your own receiver. Operate the clear key, teletype should go on hook.

(c) If S.F. Unit fails, recheck 7.05 and 7.06. If S.F. Unit still fails, remove and replace.

8. SINGLE FREQUENCY LINEUP (400 DATA PACKAGE)

8.01 Testing jacks are located at one end of the signaling applique mounting strip. The designations will be similar to the diagram below. Jack numbers are added to help in making tests.

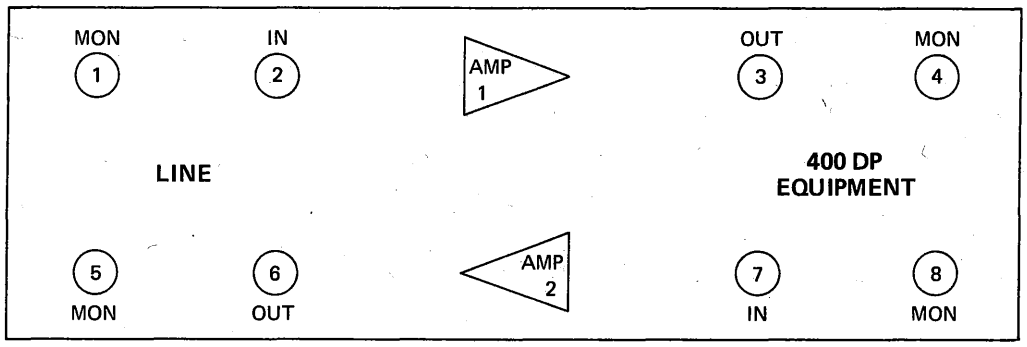

FIGURE 2

8.02 The cable pairs going to the distant office will appear on the jacks at the left (line) side of the diagram. The signaling equipment is connected to the jacks on the right (equip.) side of the diagram. The row of jacks on the top, associated with amp-1, are the receiving jacks. Bottom row, transmitting toward the distant station.

8.03 Before starting lineup of the signaling unit, the transmission lineup with the distant end must be completed and recorded. Tone from the distant end may be measured at Mon. Jack (4).

8.04 Tone may be sent to the distant end by the use of amp in Jack No. 7. Loss in both directions should be checked against circuit layout record. Remove all cords and plugs.

8.05 Refer to BSP 580-000-952 for proper strapping of pads and amplifier adjustment, of 2600 Hertz tone.

8.06 A quick check of any or all ports may be made by measuring the 2600 tone at Mon. Jack (8). You should read -18+1 dB. If All ports do not meet this value, recheck alignment per BSP 580-000-952. If only one port does not meet the -18+1 dB value, check wiring of this port. Remove all cords and dummy plugs.

8.07 The incoming 2600 hertz tone may be measured at the Mon. Jack (4). You should read a -17.7 dB. (If you do not read the above, check your facility lineup.)

8.08 The monitor and Test Circuit should be used for Output and detector tests. Refer to PED-2G031 for operation of Monitor and Test Circuit.