Rockwell International

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Wescom 7306-06 DX1/DX2 4/2-4 Terminal Repeater

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1. GENERAL

1.01 The Wescom 7306-06 DX1/DX2 4/2-4 Terminal Repeater is a 400-type plug-in Combined Function Module that combines the functions of a 4-wire to 4-wire or 2-wire terminal repeater and a DX to E&M signaling unit. The 7306-06 is shown in Figure 1. (Excerpts from this Practice, covering installation and testing only, is available in Section 730-606-303.)

1.02 Whenever this Practice is reissued, the reason for reissue will be stated in this paragraph.

1.03 The 7306-06 provides the following features:

Transmission

- Switch-selectable SIDE B terminating impedance of 150, 600 or 1200 ohms
- 4W SIDE A terminating impedance of 600 ohms
- 2W SIDE A terminating impedance of 600 ohms in series with 2.15μF
- Front-panel-mounted prescription gain or attenuation in both transmission paths
- Western Electric type 309B prescription adjustable post (receive) equalizer in the B to A amplifier

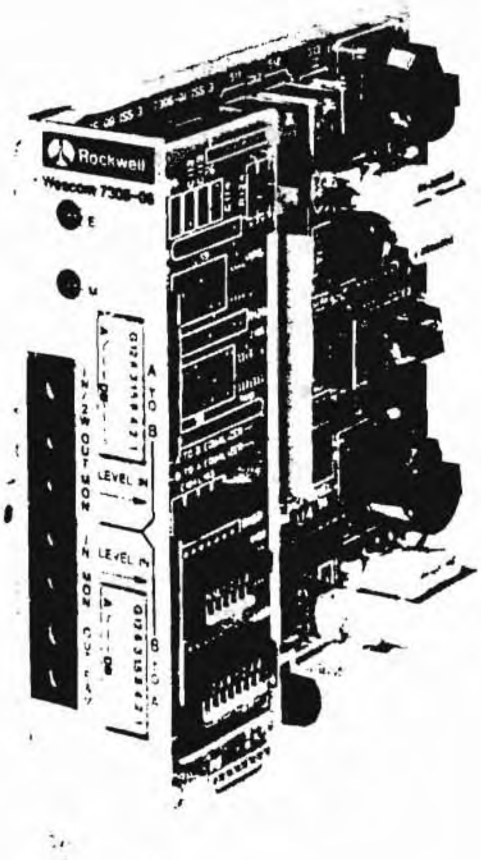


Figure 1. 7306-06 DX1/DX2 4/2-4 Terminal Repeater

- Equalizer bypass option for flat frequency response applications
- Switch-selectable 4W-4W, or 2W-4W operation
- B to A (receive) IN, MON (monitor), and OUT bantam test jacks
- A to B (transmit) IN/2W, OUT and MON bantam test jacks

- Surge protection on SIDE B

Signaling

- Switch-selectable DX1 or DX2 operation
- Switch-selectable TYPE I, TYPE II or TYPE III E&M interface
- Simplex NORM/SXRV switch
- E&M bantam test jack
- M-lead current limiting
- DX resistive line balance adjustable via DIP switches; fixed midpoint and balance capacitors
- Red LEDs that indicate the status of the E&M leads
- Five-year warranty

2. APPLICATION GUIDELINES

2.01 The 7306-06 can be applied as Network Channel Terminating Equipment (NCTE) on special service circuits described by any one of the following FCC Facility Interface Codes: TL31M, TL31E, TC31M, TC31E, TL32M, TL32E, TC32M, TC32E, TL11M, TL11E, TL12M, and TL12E

2.02 The 7306-06 is typically used in station applications. Figure 2 illustrates a typical application using a 7306-06 module to interface a 4-wire PBX trunk to a 4-wire E&M channel unit via cable facilities.

3. CIRCUIT DESCRIPTION

3.01 Refer to Figure 3, the 7306-06 (Issue 3) Block Diagram while reading the following circuit description. Also refer to Figures 4, 5, and 6, 7306-06 DX1/DX2 Connecting Circuits With Type I, Type II, And Type III E&M Signaling.

Transmission

Receive Voice Path

3.02 VF transmission from the 4W facility appears at the RCV SIDE B T and R pins 7 and 13 of the 7306-06. The signal is then routed through the IN and MON jacks to the impedance matching transformer (T1). Transformer T1 provides a switch selectable (S1-A) impedance of 150, 600, or 1200 ohms for the RCV SIDE B input port. The VF signals are then passed to the FRONT-PANEL-MOUNTED B TO A GAIN/ATTENUATION CIRCUIT which provides prescription settable gain or attenuation (switch S4) of up to 24dB in 0.1dB increments. The prescription B TO A EQUALIZER provides Height (HT) and Bandwidth (BW) (switch S2), and SLOPE (switch S3) equalization for non-loaded and/or H88 loaded cable. For 4W operation the B TO A OUTPUT DRIVER provides the required output power for transformer T3 at a fixed 600 ohm impedance. The output is routed through the OUT jack to the RCV SIDE A T1 and R1 pins 5 and 15. For 2W operation the B TO A OUTPUT DRIVER provides the required output power for the 2-WIRE HYBRID (T3 and T4) which provides a fixed input impedance of 600 ohms in series with 2.15µF. The signal is then applied to the IN/2W jack to the XMT SIDE A T and R pins 55 and 49.

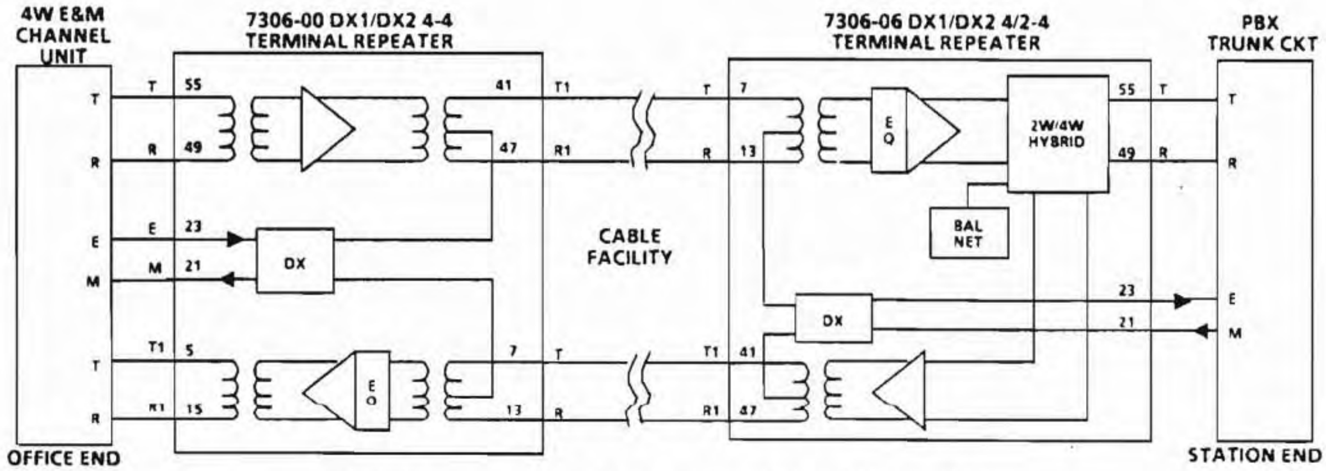


Figure 2. Typical 4W To 2W Application For 7306-06

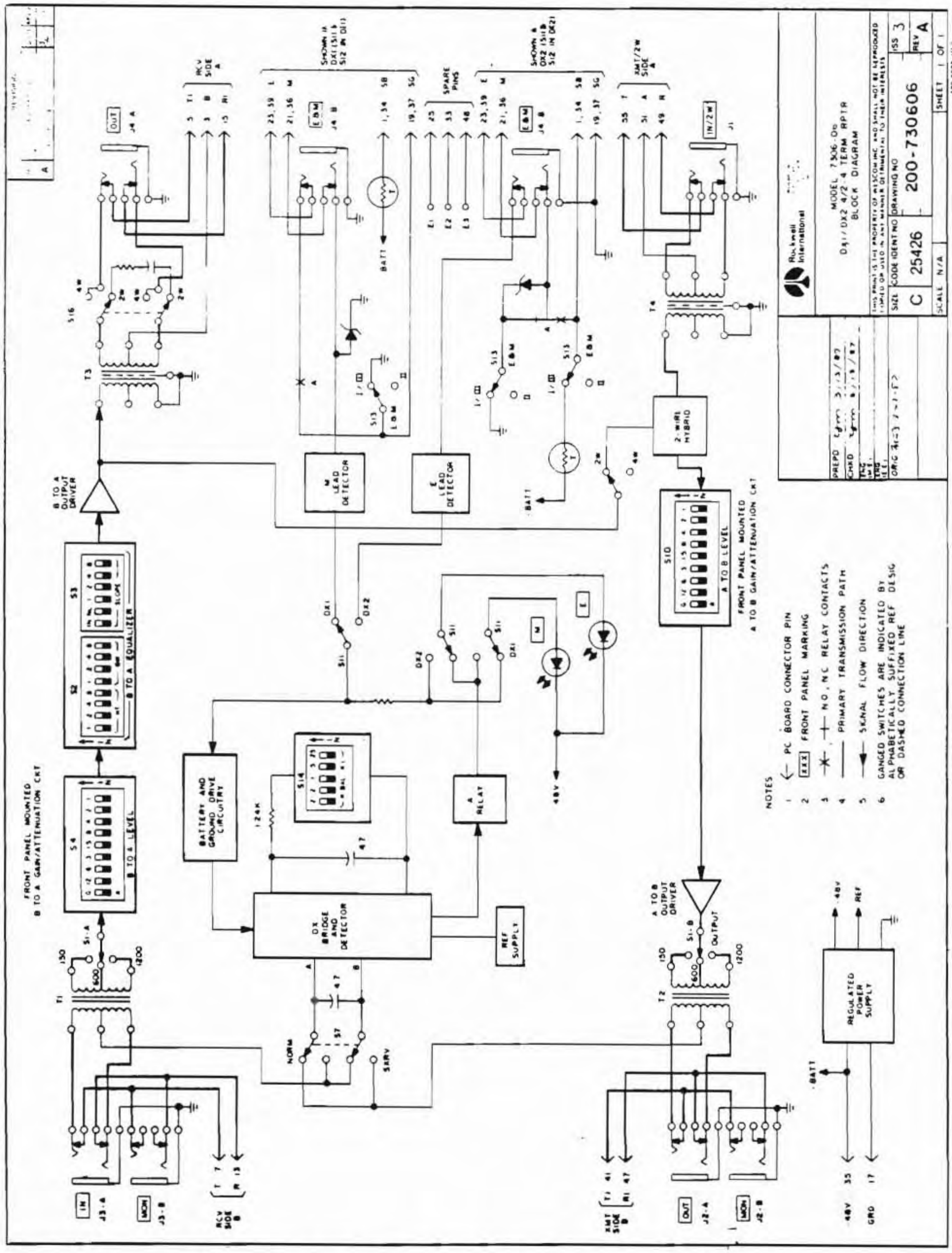
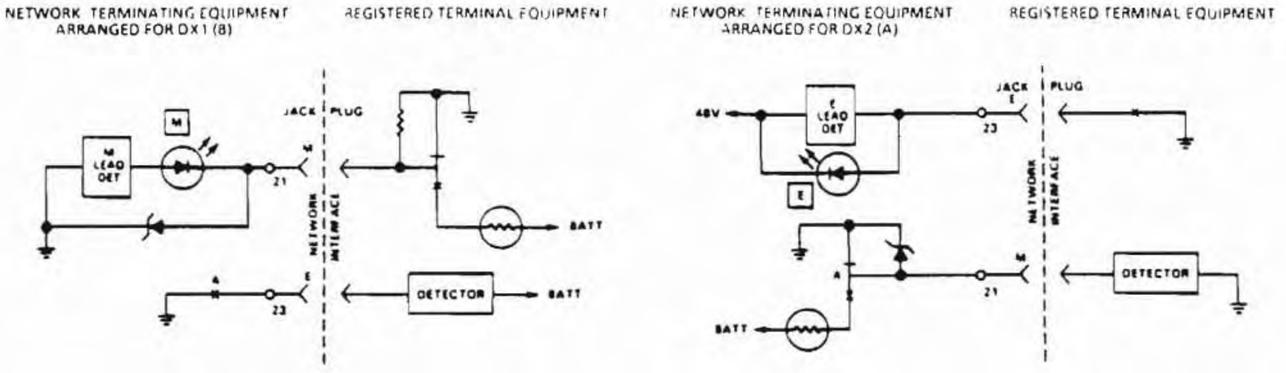


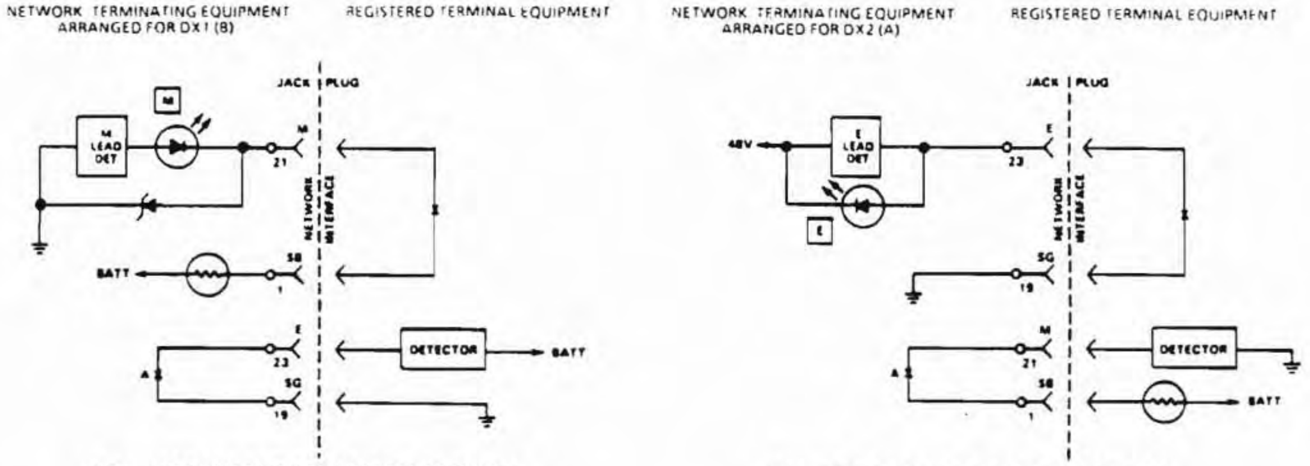
Figure 3. 7306-06 DX1/DX2 4/2-4 Terminal Repeater (Issue 3) Block Diagram



4A. FCC CODES TL31M, TC31M OR TL11M

4B. FCC CODES TL31E, TC31E OR TL11E

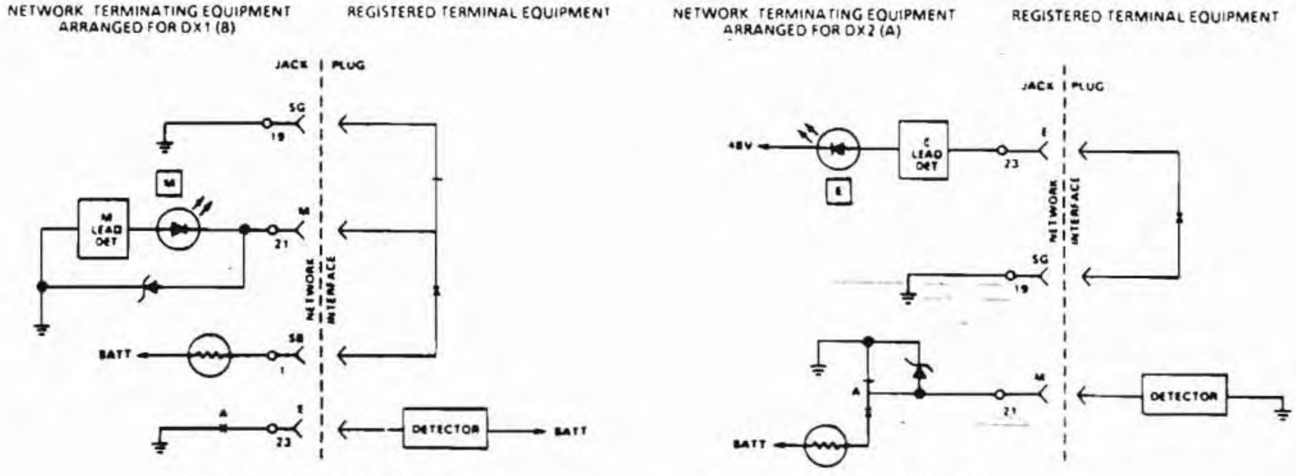
Figure 4. 7306-06 DX1/DX2 Connecting Circuits With Type I E&M Signaling



5A. FCC CODES TL32M, TC32M OR TL12M

5B. FCC CODES TL32E, TC32E OR TL12E

Figure 5. 7306-06 DX1/DX2 Connecting Circuits With Type II E&M Signaling



6A. DX1 TYPE III INTERFACE

6B. DX2 TYPE III INTERFACE

Figure 6. 7306-06 DX1/DX2 Connecting Circuits With Type III E&M Signaling

Transmit Voice Path

3.03 VF transmission appears at the XMT SIDE A T and R pins 55 and 49 of the 7306-06 and is routed through the IN/2W jack to the impedance matching transformer T4. For 4-wire operation T4 provides a fixed impedance of 600 ohms for the XMT SIDE A input port. For 2-wire operation T4 provides impedance of 600 ohms + 2.16µF for the XMT SIDE A input port. The signal is then passed to the FRONT-PANEL-MOUNTED A TO B GAIN/ATTENUATION CIRCUIT which provides prescription settable gain or attenuation (switch S10) of up to 24dB in 0.1dB increments. The A TO B OUTPUT DRIVER provides the required output power to the impedance matching transformer T2. Transformer T2 provides a switch selectable (S1-B) impedance of 150, 600, or 1200 ohms for the XMT SIDE B output port. The signal is then routed through the OUT and MON jacks to the XMT SIDE B T1 and R1 pins 41 and 47.

Signaling

3.04 The 7306-06 provides Duplex (DX) to E&M signaling capability. The electronic DX circuitry contained on the 7306-06 converts M lead (DX1) battery and ground or E lead (DX2) ground and open, supervisory and dial pulse signals to DX signals which are simplexed onto cable pairs used for voice transmission. The terminating end of the cable pairs is connected to a similar DX unit that converts the incoming DX signals to M lead (DX2) or E lead (DX1) signaling.

3.05 The 7306-06 DX signaling unit consists of a DX BRIDGE AND DETECTOR and an A RELAY that function together as the polar relay in older DX units. A variable R BAL network (S14) and a fixed capacitor are provided to balance the external loop resistance and shunt capacitance. The simplexed B lead conductor path in conjunction with the REF (reference) SUPPLY compensate for earth and battery potential differences. DX signaling originating from the M lead (DX1) or E lead (DX2) controlled BATTERY AND GROUND DRIVE CIRCUITRY takes place over the simplexed A lead conductor. A NORM/SXRV switch (S7) is provided to maintain proper signaling and balancing lead continuity between adjacent DX signaling units.

Power Supply

3.06 The on-board REGULATED POWER SUPPLY derives the necessary voltages to operate the 7306-06 from a −42.5 to −53.5Vdc source and power return ground applied at pins 35 and 17 respectively.

4. INSPECTION

4.01 Inspect the equipment thoroughly upon delivery. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company.

4.02 Wescom equipment is identified by a model and issue number imprinted on the front panel or located elsewhere on the equipment. Each time a major engineering design change is made on the equipment, the issue number is advanced by one number on any following models that are manufactured. Therefore, be sure to include both the model number and its issue number when making inquiries about the equipment.

5. MOUNTING

5.01 The 7306-06 is a 400-type plug-in Combined Function Module designed to mount in TL40XX or TL42XX NCTE Mounting Assemblies. The 7306-06 can also be mounted in one position of unwired 400-type mounting assemblies.

CAUTION

Installation and removal of modules should be done with care. Do not force a module into place. If excessive resistance is encountered while installing a module, remove the module and check the card guides and connector to verify proper alignment and the absence of foreign material.

6. INSTALLER CONNECTIONS

6.01 When a 7306-06 is installed in a 400-type mounting assembly, it makes electrical connections to associated equipment through a 56-pin, wire-wrap, card-edge connector, provided as part of the mounting assembly. Make all installer connections to this connector in accordance with Table 1.

Table 1. 7306-06 Installer Connections

	LEAD DESIGNATION	PIN
T1 R1	RCV SIDE A (4W)	5 15
T R	XMT/2W SIDE A	55 49
A B	SIDE A SIMPLEX (4W)	51 3
T R	RCV SIDE B	7 13
T1 R1	XMT SIDE B	41 47
E SG M SB	DX1/DX2 LEADS	23, 39 19, 37 21, 36 1, 34
−48V GRD		35 17
E1 E2 E3	SPARE PINS	25 33 48

7. OPTIONS

7.01 The 7306-06 is equipped with DIP switches and slide switches that are used to condition the modules for proper application and operation. Refer to Figure 7 for the locations of these options while reading the following optioning instructions.

OUTPUT Switch S1 (Side B Impedance Matching)

7.02 Switch S1 is used to select 150, 600, or 1200 ohms for receive and transmit Side B impedance matching. Option per Table 2.

Table 2. 4W Line Impedance Selection

4W CABLE	IMPEDANCE SELECTION OHMS, S1 POSITION (NOTE)
Nonloaded	600
H88 Loaded	1200
Mix Loaded And Nonloaded	600 if distance between the 7306-06 and the first load coil is greater than 9kft
	1200 if distance between the 7306-06 and the first load coil is less than 9kft

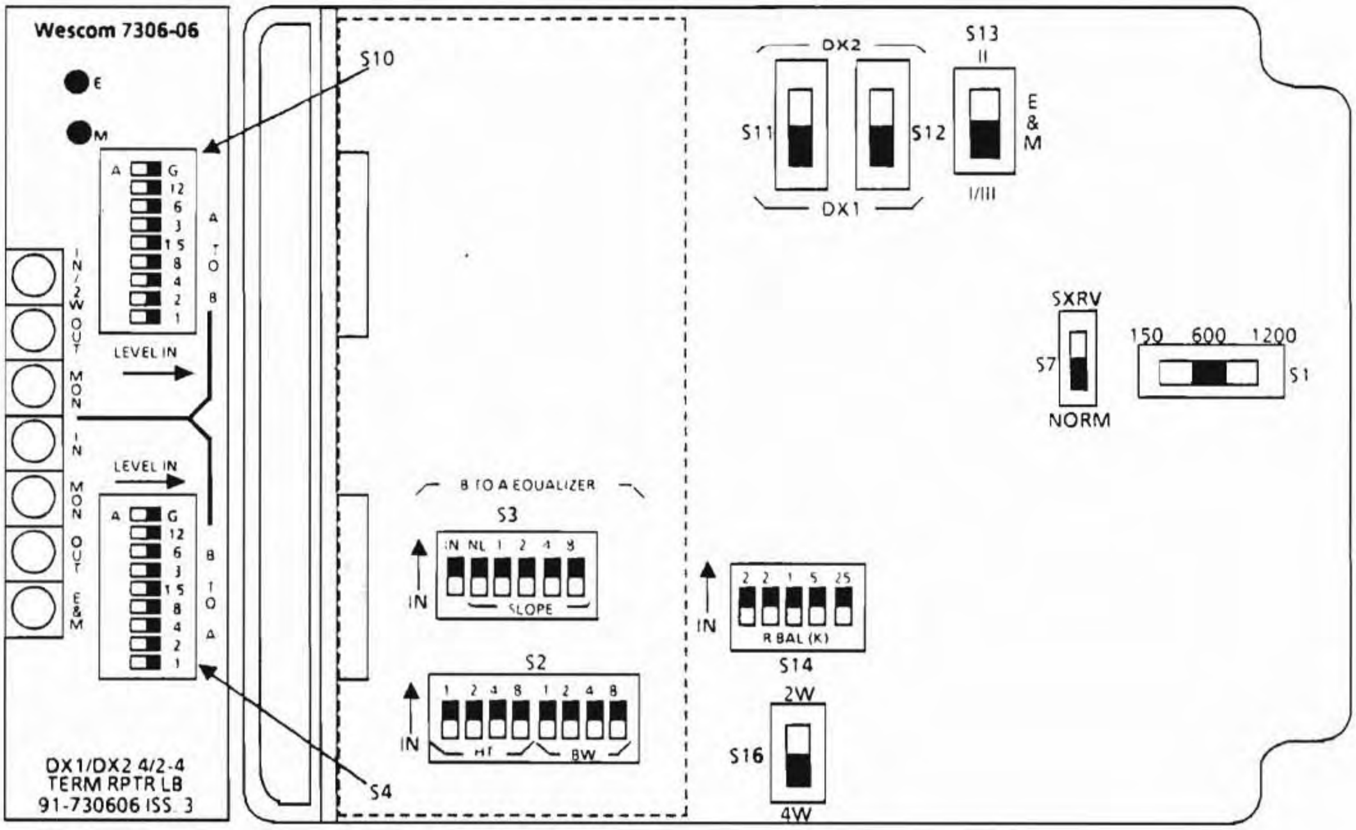
NOTE: The 150 (ohm) position on switch S1 is provided for long nonloaded loops where on board equalization is not required.

B To A Equalizer Switches S2 And S3 (Post Equalization Adjustment)

7.03 The B TO A EQUALIZER consists of switches S2 and S3. Switch S2 controls the Height (HT) and Bandwidth (BW), and switch S3 controls the SLOPE equalization and the equalizer bypass function. Except for the IN position on S3, these switches are functionally identical to the 309B equalizer found on many Western Electric transmission modules. When B to A equalization is required, place the left most switch on S3 to the IN position. The prescription settings for the 309B-type equalizer are contained in BSP 332-912-222; the manual set-up procedure is covered in BSP 332-912-221 or refer to Tables 4, 5, 6, and 7 of this Practice.

NOTE

The 309B-type equalizer introduces low frequency rolloff. When no equalization is required or a flat frequency response of the B to A (receive) amplifier is desired, place the left most switch of S3 away from the IN position, bypassing the equalizer.



SWITCH DESIG	SWITCH FUNCTION	SWITCH POSITION
S1 OUTPUT	150/600/1200 Ohm Line Impedance See Table 2	150/600/1200
S2 HT/BW and S3 SLOPE B TO A Equalizer S3 IN	Western Electric 309B type receive (post) equalization for 19, 22, 24, 25 (MAT), and 26 gauge loaded and nonloaded cable or combination of loaded and nonloaded cable Enable Equalizer	Prescription setting for the Western Electric type 309B equalizer are contained in BSP 332-912-222; manual set-up procedure is covered in BSP 332-912-221 or refer to Tables 4, 5, 6, and 7 of this Practice. IN
S4 B to A LEVEL and G/A(front-panel)	LEVEL provides up to 24dB (additive) in 0.1dB increments, for the B to A (receive) channel; G/A provides gain or attenuation.	See Table 3 Level Adjustment
S7 NORM/SXRV	Normal B Side SX to DX Reverse B Side SX to DX	NORM SXRV
S10 A to B LEVEL and G/A (front-panel)	LEVEL provides up to 24dB (additive) in 0.1dB increments, for the A to B (transmit) channel; G/A provides gain or attenuation.	See Table 3 Level Adjustment
S11 and S12	DX1/DX2 signaling interface	DX1/DX2
S13 Type I/III, II E&M	Type I/II/III signaling interface	I/III (Type I), II (Type II), I/III (Type III)
S14 R BAL (K)	DX resistive line balance up to 5000 ohms in 250 ohm increments. Do not add 1250 ohms (see NOTE in Part 7).	2, 2, 1, .5, .25 R BAL (K)
S16 4W/2W	4-wire or 2-wire operation	4W//2W

Figure 7. 7306-06 Option Locations

B To A G/A Front Panel Switch S4 (Transmission Level Adjustment)

7.04 The B TO A G (Gain) or A (Attenuation) and the B TO A LEVEL prescription gain DIP switches are used to provide up to 24dB of gain or attenuation in 0.1dB increments. Condition the B TO A level according to Table 3 and the following:

(a) Determine the total 1000Hz gain or attenuation required by subtracting the RCV SIDE B TLP (Transmission Level Point) from the RCV SIDE A (4W) or the XMT/2W SIDE A (2W) TLP.

NOTE

RCV SIDE B TLP equals the facility's transmitted TLP minus the 1000Hz loss of the cable facility (loss is expressed as a positive number).

(b) If enabled, the active equalizer introduces 1000Hz gain as a result of the HT and BW (S2) and/or SLOPE (S3) switch settings. To determine the correct settings for the B to A amplifier, subtract the additional 1000Hz gain in dB as a result of HT and BW and/or SLOPE settings from the total required 1000Hz gain or attenuation derived in Step (a).

NOTE

Total 1000Hz gain as a result of equalizer switch settings is determined from Paragraph 7.03 and Tables 8 and 9.

(c) Program the required level by setting the B TO A LEVEL switches on S4 equal to the 1000Hz gain calculated in Step (b) ±0.05dB. Place the G/A switch of S4 to the G position if the result of Step (b) is positive; place the G/A switch of S4 to the A position if the result is negative.

A To B G/A Front Panel Switch S10 (Transmission Level Adjustment)

7.05 The A TO B G (Gain) or A (Attenuation) and the A TO B LEVEL prescription gain DIP switches are used to provide up to 24dB of gain or attenuation in 0.1dB increments. Condition the A TO B level according to Table 3 and the following:

Table 3. Transmission Level Adjustment

LEVEL	GAIN (dB)	
SWITCH ON	G (Gain)	A (Attn)
12	+12	−12
6	+6	−6
3	+3	−3
1.5	+1.5	−1.5
.8	+0.8	−0.8
.4	+0.4	−0.4
.2	+0.2	−0.2
.1	+0.1	−0.1

NOTE: Switch settings are additive up to ±24dB

(a) Determine the total 1000Hz gain or attenuation required by subtracting the XMT SIDE A TLP (Transmission Level Point) from the XMT SIDE B TLP.

(b) Program the required level by setting the A TO B LEVEL switches on S10 equal to the 1000Hz gain calculated in Step (a) ±0.05dB. Place the G/A switch of S10 to the G position if the result of Step (a) is positive; place the G/A switch of S10 to the A position if the result is negative.

NORM/SXRV Switch S7 (Simplex Lead Reversal)

7.06 The normal simplex-lead-to-DX configuration is provided by placing switch S7 in the NORM position. A reversed simplex-lead-to-DX configuration is provided by placing switch S7 in the SXRV position. To provide proper DX operation, signaling and balancing lead continuity between the local and distant DX units must be maintained. Therefore, the DX units at the local and distant locations must be optioned with one unit in the normal position and the other in the reverse position.

DX1/DX2 Switches S11 And S12 And Type I/III And Type II Switch S13

7.07 Switches S11 and S12 (DX1/DX2) and switch S13 are used to condition the 7306-06 for DX1/DX2 and Type I/Type II/Type III operation according to Table 10.

Table 4. Manual Alignment Of 309B-Type Equalizer

STEP	INSTRUCTIONS
1	Attach transmission measurement set to the equipment side of the module being aligned and arrange for test tones of 404Hz, 1004Hz, 2504Hz, and 3204Hz from the distant end at the level and impedance specified on the Circuit Layout Record (CLR).
2	Determine if the cable facility is loaded or nonloaded and set the Loaded/Nonloaded (L/NL) switch to the proper position.
3	Set all SLOPE, HT, and BW switches to OUT
4	**Slope Setting** Measure and record the signal level at 1004Hz and 404Hz. Calculate and record the difference between the two readings.
5	From Table 5, find the column that contains the calculated difference from Step 4. If the difference is greater than 3dB, set the L/NL switch to NL (even if facility is loaded) and use the NONLOADED FACILITIES row in Table 5. Set SLOPE switches to the value displayed at the top of that column. Example (Loaded Cable): 404Hz = −10.0dBm −1004Hz = −10.9dBm Difference = +0.9dBm (a) Set L/NL switch to L. (b) From Table 5 (Loaded Facilities): 0.9dBm is in the 0.85 to 1.34 range. (c) SLOPE setting is 2 (1 OUT; 2 IN; 4 OUT; 8 OUT).
6	**HT (Height) Setting** After setting the SLOPE switches as specified in Step 5, measure and record the signal level at 3204Hz and remeasure and record the new 1004Hz level. (Slope adjustment will change 1004Hz reading.) Calculate and record the difference between the two readings.
7	From Table 6, find the column that contains the calculated difference (1004Hz - 3204Hz) from Step 6. Set the HT switches to the value displayed at the top of that column. Example: 1004Hz = −8.40dBm −3204Hz = −13.09dBm Difference = +4.60dBm (a) From Table 6: 4.60dBm is in the 4.55 to 5.24 range. (b) HT setting is 7 (1 IN; 2 IN; 4 IN; 8 OUT).
8	**BW (Bandwidth) Setting** After setting the HT switches as specified in Step 7, measure and record the signal level at 2504Hz and remeasure and record the new 1004Hz level. (HT adjustment may or may not affect 1004Hz reading.) Calculate and record the difference between the two readings.
9	Find the previously-determined HT setting in the left column of Table 7. In that row, find the number that is closest to the calculated difference (1004Hz - 2504Hz). Set the BW switches to the value shown at the top of that column. Example: 1004Hz = −8.4dBm −2504Hz = −12.0dBm Difference = +3.6dBm (a) From Table 7, Row HT-7: Closest number is 3.08. (b) BW setting is 15 (1 IN; 2 IN; 4 IN; 8 IN).
10	**Optimization** Make full frequency run, if desired.
11	To reduce loss above 1800Hz, adjust HT to higher number.
12	To reduce loss below 1800Hz, adjust SLOPE to higher number.
13	Remeasure 1004Hz loss and adjust gain/loss setting to value indicated on the CLR.

Table 5. Slope Setting (Calculated Difference 404Hz - 1004Hz)

SLOPE SETTING	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LOADED FACILITIES (404Hz – 1004Hz)	0 to 0.34	0.35 to 0.84	0.85 to 1.34	1.35 to 1.64	1.65 to 1.89	1.90 to 2.04	2.05 to 2.19	2.20 to 2.34	2.35 to 2.49	2.50 to 2.59	2.60 to 2.64	2.65 to 2.69	2.70 to 2.74	2.75 to 2.79	2.80 to 2.84	2.85 to 3.00
NON – LOADED FACILITIES (404Hz – 1004Hz)	0 to 0.49	0.50 to 0.99	1.00 to 1.34	1.35 to 1.79	1.80 to 2.09	2.10 to 2.59	2.60 to 2.89	2.90 to 3.09	3.10 to 3.24	3.25 to 3.59	3.60 to 3.99	4.00 to 4.14	4.15 to 4.29	4.30 to 4.44	4.45 to 4.59	4.60 and up

Table 6. Height Setting (Calculated Difference 1004Hz - 3204Hz)

HEIGHT SETTING	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1004Hz – 3204Hz	0 to 0.34	0.35 to 1.04	1.05 to 1.74	1.75 to 2.44	2.45 to 3.14	3.15 to 3.84	3.85 to 4.54	4.55 to 5.24	5.25 to 5.94	5.95 to 6.64	6.65 to 7.34	7.35 to 8.04	8.05 to 8.74	8.75 to 9.44	9.45 to 10.14	10.15 and up

Table 7. Bandwidth Setting (Calculated Difference 1004Hz - 2504Hz)

BW	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HT-1	0	0.04	0.05	0.07	0.08	0.11	0.15	0.23	0.27	0.30	0.33	0.35	0.39	0.41	0.43	0.44
HT-2	0	0.08	0.10	0.13	0.16	0.22	0.30	0.46	0.55	0.60	0.67	0.70	0.77	0.83	0.87	0.88
HT-3	0	0.12	0.16	0.20	0.25	0.33	0.46	0.69	0.82	0.90	1.00	1.06	1.16	1.24	1.30	1.32
HT-4	0	0.16	0.21	0.27	0.33	0.44	0.61	0.92	1.09	1.20	1.33	1.41	1.55	1.65	1.73	1.76
HT-5	0	0.20	0.26	0.33	0.41	0.55	0.76	1.15	1.37	1.50	1.67	1.76	1.93	2.06	2.17	2.20
HT-6	0	0.24	0.31	0.40	0.49	0.66	0.91	1.38	1.64	1.80	2.00	2.11	2.32	2.48	2.60	2.64
HT-7	0	0.28	0.36	0.47	0.57	0.77	1.06	1.61	1.91	2.10	2.33	2.46	2.71	2.90	3.03	3.08
HT-8	0	0.32	0.42	0.53	0.66	0.89	1.22	1.84	2.19	2.40	2.67	2.82	3.09	3.30	3.47	3.52
HT-9	0	0.36	0.47	0.60	0.74	1.00	1.37	2.07	2.46	2.70	3.00	3.17	3.48	3.72	3.90	3.96
HT-10	0	0.40	0.52	0.67	0.82	1.11	1.52	2.30	2.73	3.00	3.33	3.52	3.87	4.13	4.33	4.40
HT-11	0	0.44	0.57	0.73	0.90	1.22	1.67	2.53	3.01	3.30	3.67	3.87	4.25	4.55	4.77	4.84
HT-12	0	0.48	0.62	0.80	0.98	1.33	1.82	2.76	3.28	3.60	4.00	4.22	4.64	4.96	5.20	5.28
HT-13	0	0.52	0.68	0.87	1.07	1.44	1.98	2.99	3.55	3.90	4.33	4.58	5.03	5.37	5.63	5.72
HT-14	0	0.56	0.73	0.93	1.15	1.55	2.13	3.22	3.83	4.20	4.67	4.93	5.41	5.79	6.07	6.16
HT-15	0	0.60	0.78	1.00	1.23	1.66	2.28	3.45	4.10	4.50	5.00	5.28	5.80	6.20	6.50	6.60

Table 8. Additional 1kHz Gain In dB As A Result Of HT And BW Settings

BW SETTING	HT SETTING															
	0*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1
5	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0.1
6	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.2
7	0	0	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3
8	0	0	0	0	0	0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3
9	0	0	0	0	0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.5
10	0	0	0	0	0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.5	0.7
11	0	0	0	0	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.6	0.7	0.9
12	0	0	0	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.4	0.5	0.6	0.8	0.9	1.2
13	0	0	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.9	1.1	1.3	1.7
14	0	0	0.1	0.1	0.2	0.3	0.4	0.5	0.7	0.8	1.0	1.2	1.4	1.7	2.0	2.5
15	0	0.1	0.2	0.3	0.4	0.5	0.7	0.9	1.2	1.5	1.7	2.0	2.4	2.8	3.3	3.9

*HT setting 0 disables the bump unit for all BW settings

Table 9. Additional 1000Hz Gain In dB As A Result Of Slope Settings

SLOPE SETTING	NL/L SWITCH	
	NL	L
0*	0	0
1	0.4	1.4
2	0.9	2.6
3	1.4	3.7
4	1.8	4.7
5	2.3	5.5
6	2.8	6.3
7	3.4	7.2
8	3.7	7.8
9	4.2	8.4
10	4.7	9.0
11	5.0	9.5
12	5.4	10.0
13	5.8	10.5
14	6.2	11.0
15	6.6	11.4

*SLOPE setting 0 disables the slope unit

R BAL (K) Switch S14 (DX Resistive Line Balance Network)

7.08 The R BAL (K) switches on S14 are used to provide resistive line balance. The balance network of the DX signaling circuit is conditioned as follows:

(a) Calculate the loop resistance of the 4-wire facility. The 4-wire loop resistance is equal to the loop resistance of either the transmit or receive pair divided by two.

NOTE

Some DX signaling units require that 1250 ohms be added when calculating loop resistance. The 7306-06 has a balance network which compensates for this 1250 ohms. Therefore, do not add 1250 ohms to the calculated resistance.

(b) Select resistors with the total value equal to the calculated loop resistance ± 125 ohms. Place the required resistors into the balance network by placing the DIP switches of S14, that correspond to the resistors needed, to the IN position. The DIP switches are self-reading switches. EXAMPLE; DIP switches 2 and .25 places 2000 ohms (2kohms) and 250 ohms (.25kohms) respectively into the network.

Table 10. DX1/DX2 And Type I/Type II/ Type III Conditioning With FCC Facility Code Cross Reference*

FCC CODES	INTERFACE	MODE	SWITCH POSITION		
			S11 AND S12	S13	S16
TL31M OR TC31M	TYPE I (NONLOOPED)	DX1	DX1	TYPE I/III	4W
TL11M	TYPE I (NONLOOPED)	DX1	DX1	TYPE I/III	2W
TL31E OR TC31E	TYPE I (NONLOOPED)	DX2	DX2	TYPE I/III	4W
TL11E	TYPE I (NONLOOPED)	DX2	DX2	TYPE I/III	2W
TL32M OR TC32M	TYPE II (LOOPED)	DX1	DX1	TYPE II	4W
TL12M	TYPE II (LOOPED)	DX1	DX1	TYPE II	2W
TL32E OR TC32E	TYPE II (LOOPED)	DX2	DX2	TYPE II	4W
TL12E	TYPE II (LOOPED)	DX2	DX2	TYPE II	2W

*For Type III operation, place switch S13 in Type I/III position.

4W/2W Switch S16 (4-Wire Or 2-Wire Operation)

7.09 Place switch S16 in the 4W position for 4-wire operation. Place switch S16 in the 2W position for 2-wire operation

8. ALIGNMENT

8.01 The 7306-06 contains gain controls which must be adjusted to set the SIDE A and SIDE B TLPs (Transmission Level Points). They also contain controls for receive (post) amplitude equalization. The alignment procedure for the 7306-06 is provided in Tables 11 and 12. Table 11 provides the alignment procedure for the B TO A (receive) voice path. Also, refer to Paragraph 7.04. Table 12 provides the alignment procedure for the A TO B (transmit) voice path. Also, refer to Paragraph 7.05. Be certain that all options have been properly conditioned for the application in accordance with Part 7 before beginning the alignment procedure.

8.02 The following test equipment is required to properly align the 7306-06.

(a) Transmission Measuring Set (TMS): WECO 23A, Hewlett-Packard 3550, or equivalent with self-contained Variable Frequency Oscillator (VFO)

(b) Three-conductor test cords having one end terminated in bantam plugs and the other end suitable for connecting to the TMS and VFO.

NOTE

If TMS or VFO-connecting cords are terminated in Type 310 plugs, they can be adapted for connecting into bantam jacks by attaching a Wescom Part No. 003-210367 Type 310 to Bantam Jack Adapter (14 inch).

(c) One open bantam plug.

9. TESTING

9.01 If trouble is encountered with the operation of the 7306-06, verify that all installer connections have been made in accordance with Part 6, that all options have been arranged as required in Part 7, and that the alignment procedure in Part 8 have been properly performed. Make certain that the module is making good connection with the mounting assembly card-edge connector; remove and re-insert the module. If trouble persists, refer to Paragraphs 9.02 and 9.03; Table 13, Signaling Test Procedure.

9.02 The following test equipment is required for testing the signal/trunk operation of the 7306-06.

(a) Pulsing test set, Northeast Electronic TTS 26B, or equivalent.

(b) Miscellaneous test cords and plugs.

9.03 If technical assistance is required, contact the Wescom Technical Services Department by calling:

(312) 985-4240 or 985-9000,
TWX 910-695-4735,
DATAPHONE® (312) 985-1700, or
TELEX 253-656

Canadian Customers:

(416) 877-0191,
TWX 610-492-2646, or
TELEX 06-97777

Table 11. B TO A (Receive) Alignment Procedure

STEP	INSTRUCTIONS
1	**Facility Line Verification** Arrange the TMS for terminated measurement at the impedance specified on the CLR (Circuit Layout Record). Connect the TMS to the B TO A (RCV SIDE B) MON jack on the front panel of the module. Insert an open bantam plug into the B TO A IN jack on the module to disconnect the receive amplifier circuit from the receive pair.
2	Request the distant terminal to send a 1000Hz test tone at the required level and impedance specified on the CLR. Verify that the levels measured on the TMS are those specified on the CLR.
3	Remove the open bantam plug from the B TO A IN jack .
4	If no equalization is required, ensure that the B TO A EQUALIZER switches on S2 and S3 are in the OUT position. Proceed to Step 6.
5	**B TO A Equalization Adjustment** Program the required B TO A equalization by setting the B TO A EQUALIZER switches on S2 and S3 equal to the switch settings specified on the CLR. Refer to Paragraph 7.03 B TO A Receive Equalization Adjustment. Be certain that the left most position of switch S3 is in the IN position.
6	**B TO A Level Adjustment (Front-Panel)** Program the required B TO A level by setting the B TO A LEVEL switches on S4 (located on the front panel) equal to the gain specified on the CLR ±0.05dB. If required gain is positive, place the B TO A G/A switch of S4 to the G position. If negative, place the B TO A G/A switch to the A position. Refer to Paragraph 7.04.
7	**RCV SIDE A Verification** Arrange the TMS for 600-ohm terminated measurement. Connect the TMS to the B TO A OUT (RCV SIDE A) jack for 4-wire operation or to the A TO B IN/2W (XMT SIDE A) jack for 2-wire operation. Request the distant terminal to send a 1000Hz, a 2800Hz, and then a 400Hz test tone at the required level and impedance. Verify that the levels measured on the TMS are those specified on the CLR.
8	Remove all test cords and perform the A TO B Alignment.

Table 12. A TO B (Transmit) Alignment Procedure

STEP	INSTRUCTIONS
1	Condition the local VFO to apply a 1000Hz test tone at the required level and impedance specified on the CLR. Connect the VFO to the A TO B IN/2W (XMT SIDE A) jack on the module.
2	Arrange the TMS for terminated measurement specified on the CLR. Connect the TMS to the A TO B OUT (XMT SIDE B) jack on the module.
3	**A TO B Level Adjustment (Front-Panel)** Program the required A TO B level by setting the A TO B LEVEL switches on S10 (located on the front panel) equal to the gain specified on the CLR ±0.05dB. If required gain is positive, place the A TO B G/A switch of S10 to the G position. If negative, place the A TO B G/A switch to the A position. Refer to Paragraph 7.05.
4	Verify that the level measured on the TMS is that specified on the CLR.
5	Remove the TMS from the A TO B OUT jack of the module and request the distant terminal to measure the 1000Hz test tone.
6	Distant terminal verifies proper level as specified on the CLR.
7	This completes the A TO B Alignment Procedure; remove all test connections.

Table 13. Signaling Test Procedure

STEP	ACTION	VERIFICATION
1	Connect a test cord between the E&M jack of the pulsing test set and the E& M jack of the module (E lead on tip and M lead on ring) or the M lead (pin 21 or 36) and the E lead (pin 39 or 23) of the module (at the backplane).	
2	If the module is arranged for DX1 operation, proceed to Step 3; if arranged for DX2 operation proceed to Step 8.	
3	**DX1*** Key the M lead to the module for an off-hook condition.	Verify that the circuit is seized at the distant terminal and that the local M LED illuminates.
4	Pulse the M lead to the module at 12pps and 58 percent break.	Verify pulsing and pulse quality at the distant terminal. Pulse distortion should not exceed 4 percent. Verify that the E lead at the local terminal remains in the idle condition, and that the local M LED follows dial pulses.
5	Place the M lead at the local terminal in the an off-hook condition and request the distant terminal to seize the circuit toward the local terminal.	Verify that the local M LED lights. When the circuit is seized verify a ground on the E lead and that the E LED lights.
6	Request the distant terminal to pulse the circuit at 12pps and 58 percent break.	Verify pulsing and pulse quality at the local E lead. Pulse distortion should not exceed 4 percent. The local E LED should follows dial pulses.
7	This concludes the DX1 test procedure. Remove all test equipment.	
8	**DX2*** Key the E lead to the module for an off-hook condition.	Verify that the circuit is seized at the distant terminal and that the local E LED illuminates.
9	Pulse the E lead to the module at 12pps and 58 percent break.	Verify pulsing and pulse quality at the distant terminal. Pulse distortion should not exceed 4 percent. Verify that the M lead at the local terminal remains in the idle condition, and that the local E LED follows dial pulses.
10	Place the E lead at the local terminal in the an off-hook condition and request the distant terminal to seize the circuit toward the local terminal.	Verify that the local E LED lights. When the circuit is seized verify that the M LED lights.
11	Request the distant terminal to pulse the circuit at 12pps and 58 percent break.	Verify pulsing and pulse quality at the local terminal. Pulse distortion should not exceed 4 percent. Verify that the local terminal remains in the idle condition, and that the local M LED follows the dial pulses.
12	This concludes the DX2 test procedure. Remove all test equipment.	

*The signaling test procedure assumes that the module is arranged for either DX1 or DX2 operation with Type I signaling. In addition, it assumes that a similar unit is at each location.

10. WARRANTY

10.01 WARRANTY: Wescom offers an industry leading five (5) year warranty on products of Wescom's manufacture. Contact your local Wescom Sales Engineer for details of Wescom's warranty. The warranty provisions are subject to change without notice. The terms and conditions applicable to any specific sale of product shall be defined in the resulting sales contract.

10.02 Field repairs involving the replacement of components within a unit are not recommended. If a unit is in need of repair, contact Wescom by telephone, letter, or TWX for instructions regarding replacement or repair.

10.03 If a replacement unit is required, it will be shipped in the fastest manner consistent with the urgency of the situation. Upon receipt of the replacement unit, return the out-of-service unit in the carton in which the replacement was shipped, using the shipping label provided, to:

Rockwell Telecommunications, Inc.
Wescom Telephone Products Division
8245 South Lemont Road
Downers Grove, Illinois 60516

Canadian Customers:
Rockwell International of Canada Ltd.
Wescom Canada Division
45 Sinclair Ave.
Halton Hills (Georgetown)
Ontario L7G 4X4

Repair Or Exchange Services

10.04 In addition to the standard Wescom Warranty, Wescom offers a repair or exchange service for those units out of warranty. Under this arrangement, out-of-service units may be shipped to Wescom and either completely repaired and quality tested or exchanged for a replacement unit. To obtain details of this service and a schedule of prices, contact your local Wescom Sales Engineer.

11. SPECIFICATIONS

11.01 The electrical and physical characteristics of the 7306-06 are as follows:

Electrical

(a) POWER REQUIREMENTS:

(1) Voltage Range: −42.5 to −53.5Vdc.

(2) Current Requirements:
Idle: 42mA typical, 55mA maximum.
Busy: 68mA typical, 75mA maximum plus M lead current.

<u>Transmission</u>

(b) B TO A AND A TO B REPEATER GAIN RANGE: ±24dB.

(c) GAIN ADJUSTMENT GRANULARITY: ±0.1dB.

(d) B TO A RECEIVE (POST) EQUALIZATION: Western Electric 309B type equalizer for 19, 22, 24, 25 (MAT), and 26 gauge loaded and nonloaded cable or combination of loaded and nonloaded cable.

(e) 4-WIRE B SIDE IMPEDANCES: 150, 600, or 1200 ohms.

(f) 4-WIRE A SIDE IMPEDANCE: 600 ohms.

(g) 2-WIRE A SIDE IMPEDANCE: 600 ohms + 2.15µf.

(h) RETURN LOSS: Greater than 20dB ERL.

(i) LONGITUDINAL BALANCE: Greater than 60dB 200 to 3000Hz.

(j) IDLE CHANNEL NOISE: Less than 13dBrnC.

(k) MAXIMUM INPUT AND OUTPUT: +8dBm.

(l) HARMONIC DISTORTION: Less than 1 percent 200 to 3400Hz.

(m) FREQUENCY RESPONSE: ±0.3dB maximum from 300 to 3400Hz relative to 1000Hz.

(n) CROSSTALK IMMUNITY: Greater than 75dB isolation between channels or adjacent units, 200 to 3000Hz.

(o) PEAK TO AVERAGE RATIO: Greater than 98.

Signaling

(p) OPERATION: DX1 and DX2.

(q) SIGNALING INTERFACE: Type I, Type II, Type III.

(r) PULSING RANGE: 7.5 to 12pps.

(s) PULSE DISTORTION: ±4 percent maximum.

(t) LOOP RESISTANCE: 5000 ohms maximum.

(u) DC EARTH POTENTIAL DIFFERENCE: Greater than ±45 volts.

(v) AC INDUCTION: Greater than 35Vrms.

(w) M-LEAD OUTPUT CURRENT: Short circuit current limited to 30mA nominal.

(x) LEDs: Red E&M front-panel-mounted.

Physical

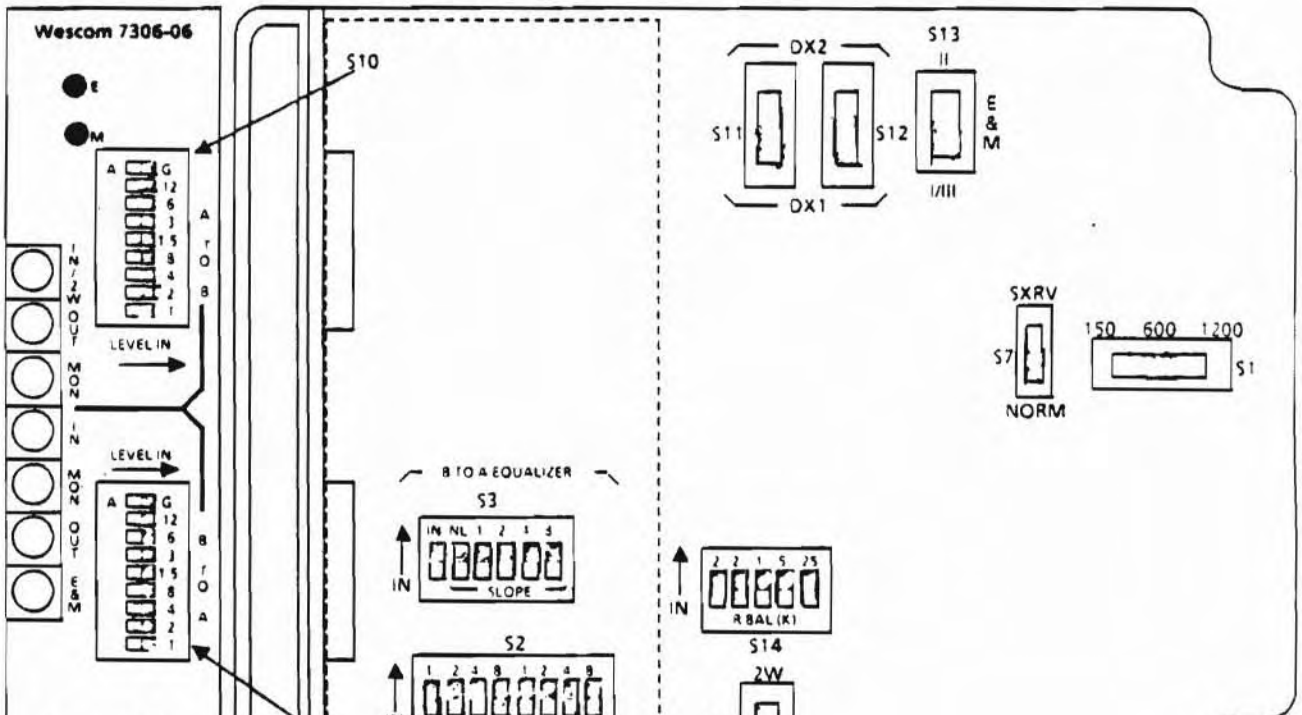
(y) OPERATING ENVIRONMENT: Temperature, 32° to 120° F (0° to 49° C).

(z) SURGE PROTECTION: 1000V on SIDE B.

(aa) WEIGHT: 12 oz (340g).

(bb) DIMENSIONS: Height, 5.6 in. (14.2cm); width, 1.4 in. (3.5cm); depth, 6.0 in. (15.2cm).

(cc) MOUNTING: TL40XX or TL42XX NCTE mounting assemblies or unwired 400-type mounting assemblies.



WESCOM 7306-06 OPTIONS DIAGRAMS

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CKT 7 /LGGS/380041      /LB                   A OKBRILOAF10   - Z NPVLILNA
ORD C-88800011          -001  ACTN A  CAC SUP2CN2            MCO OKBRILOA
N/*LOCN,EQPT AND FAC    FRAME ID   UNIT     SV  Z-A  A-Z MISC
1   EXC46               24H88      103      XT        12.0 R2995 DB05.1
                                                                  3.5
1   EXC46               24H88      104      XR 12.5        R0995 DB05.1
                                                                  3.5
   CUSTIL9S999          R 572 RTE 95 BP 3/4                TERM ADDR
  A 8D29W701            WSCMTG19   5726     X4  8.5 16.0
       WSCM-7306-45
       B TO A/RU1:GN=-8.12DB/
       RU2:GN=-5.80DB:NL=OFF
       SLOPE=1:HT=4:BW=5
       OUTPUT=1200/
       $S5=IN,S6=4,S8=2S5,S9=S
                             CL,S11=SC,S12=SXRV
   CUSTIL9S999
   NCI 04DA2/    /PI                        X4  0.0 16.0
                       T J MAXX
   CUSTIL9S999
    DEMARC4W
       SA  576 S RTE 95, AURORA AVE, FL1
       COND=3002 C
1 /19GA/      /22GA/      /24GA/18.7 /26GA/       /BT/.4
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