

LINE TERMINATION

| <u>Module</u> | <u>Description</u> |
|---------------|-------------------------------|
| 19D427353 G21 | Transmit only |
| 19D427353 G24 | Receive only, 3360Hz low-pass |

A. DESCRIPTION

The Line Termination module provides balanced isolated interfaces between the NS40 Audio Tone transmitter equipment and the transmission medium and between the transmission medium and NS40 receiver equipment. Each balanced interface contains a high pass filter that attenuates power frequency noise at 60 Hz.

Group 21 contains only the transmit circuit. The input to the module from transmitter equipment is on pin 5, a bridging input which will accept signals from one or more transmitters. A 15-turn variable resistor mounted on the front of the module is used to adjust the composite transmit line level. The signal then passes through the isolation transformer and the 60 Hz filter.

Group 24 contains only the receive side circuit. The balanced input to the receive side of the unit is through the 60 Hz high pass filter components and through an active lowpass filter. The receive output level adjustment is a 15-turn variable resistor mounted on the front of the module.

B. OPERATION

Refer to Fig.3 - Schematic Diagram - and Fig.2 - Outline Diagram - which are included at the end of this instruction.

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The input at pin 5 is designed to be driven from a 10 kilohm source. Any number of inputs can be paralleled at pin 5. Variable gain stage AR1-1 amplifies the single or composite signal level

which is measured across a 600 ohm load across pins 6 and 7. R2 sets the gain of the transmit circuit. Strappable jumper A adds 20 dB attenuation in the transmit path in the Low Output position (2-3). This strap should be used when composite signals below -20 dBm are desired. The 1-2 position is normal.

T1 is an isolation and unbalance-to-balance audio hybrid transformer at the input of the highpass filter. This highpass filter attenuates 60 Hz signals by at least 40 dB, passes 600 Hz and higher frequencies and is composed of components C2 through C8 and inductor L1. AR1-2 and associated components provide a termination for one side of the hybrid transformer T1.

RV1 and RV3 are secondary surge protection devices.

The 600 ohm balanced output is on pins 6 and 7.

Receive only, 19D427353G24

Refer to Schematic Diagram 0145D8465, Sheet 2 and Pictorial Diagram 0215B8762, which are included in this instruction.

The Receive input is a balanced 600 ohms at pins 11 and 12 formed by the balanced highpass filter which is identical to the filter in the Transmit side. The highpass filter is composed of components C9 through C15 and inductor L2. Isolation transformer T2 provides the balance-to-unbalance function. Zeners Z1 and Z2 serve as fast surge protection devices while MOV- RV2 performs secondary protection.

Amplifier AR2-1 is an isolation stage at the input of the active FDNR lowpass filter composed of resistors R38 through R56; capacitors C40 through C46; and op-amps AR2-2 through AR3-3. Amplifier AR3-4 is an isolation and gain stage at the output of the active lowpass filter.

The filter response is a seventh order Cauer lowpass with three finite poles. The filter has been adjusted at the factory and requires no user adjustments. The filter passes frequencies up to 3360 Hz and attenuates frequencies from 3900 Hz to 8 kHz by at least 40 dB.

The composite level at the receive output is adjusted by R14. Strappable jumper B gives an additional 10 dB of fixed attenuation in the 2-3 position. The 1-2 position is normal.

C. NOMINAL OPERATING CHARACTERISTICS

19D427353G21 (TRANSMIT ONLY)

| | |
|--------------------|---|
| Transmitter Input | -10 dBsr per channel through a 10 Kiloohm resistance |
| Line A Transmit | -45 to +8 dBm (composite) (normal is 0 dBm composite) |
| “60Hz filter” loss | Typically 1dB |

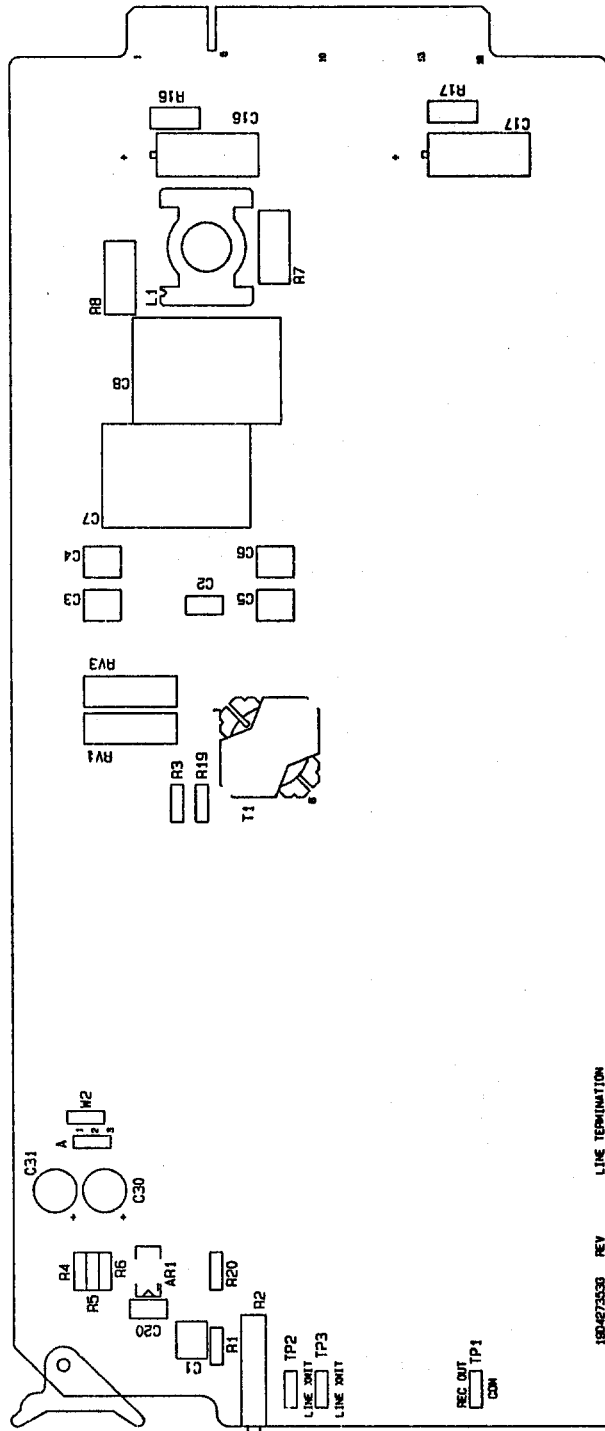
19D427353G24 (RECEIVE ONLY)

| | |
|--------------------|------------------------------------|
| Line B Receive | -30 to +10 dBm (composite) |
| Receive Output | -30 dBsr per channel |
| Low-pass roll-off | Typically 1dB at cut-off frequency |
| “60Hz filter” loss | Typically 1dB |

(*): 0 dBsr = 778mVrms

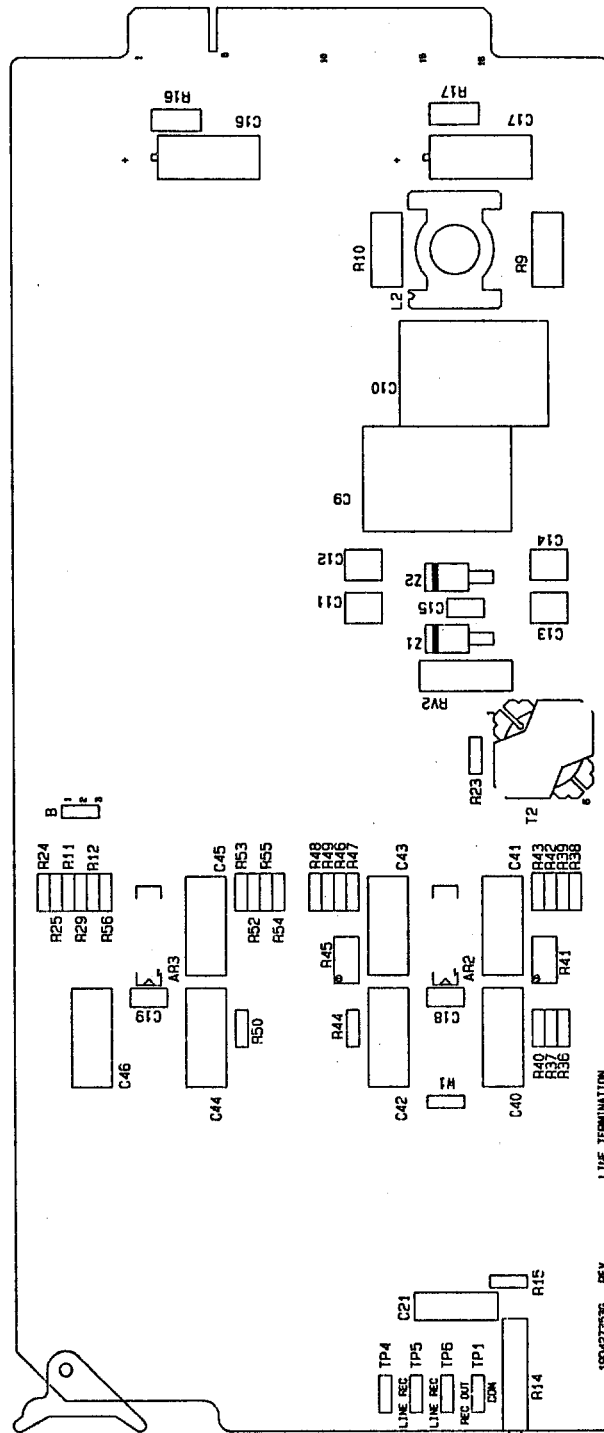
| ITEM NO. | IDENTIFICATION NUMBER | DESCRIPTION | GROUP NUMBER & QUANTITY | | | | | | |
|----------|-----------------------|---------------------------|-------------------------|----|----|----|----|----|--|
| | | | 21 | 22 | 23 | 24 | 25 | 26 | |
| | 19D427353G021 REV#01 | LINE TERM. TRANSMIT ONLY | | | | | | | |
| | 19D427353G024 REV#02 | LINE TERM. REC ONLY (STD) | | | | | | | |
| AR1 | 0246A9387P258 | ULTRA-LOW NOISE | 1 | | | | | | |
| AR2 | 0246A9367P003 | J-FET OP AMP | | | | | 1 | | |
| AR3 | 0246A9367P003 | J-FET OP AMP | | | | | 1 | | |
| C1 | 0246A9036P684 | CAP .68UF 50V 5% POLY | 1 | | | | | | |
| C2 | 0246A9036P103 | CAP .01UF 50V 5% POLY | 1 | | | | | | |
| C3 | 0246A9036P684 | CAP .68UF 50V 5% POLY | 1 | | | | | | |
| C4 | 0246A9036P684 | CAP .68UF 50V 5% POLY | 1 | | | | | | |
| C5 | 0246A9036P684 | CAP .68UF 50V 5% POLY | 1 | | | | | | |
| C6 | 0246A9036P684 | CAP .68UF 50V 5% POLY | 1 | | | | | | |
| C7 | 0246A9037P105B | CAP 1MFD 400VDC 20% | 1 | | | | | | |
| C8 | 0246A9037P105B | CAP 1MFD 400VDC 20% | 1 | | | | | | |
| C9 | 0246A9037P105B | CAP 1MFD 400VDC 20% | | | | | 1 | | |
| C10 | 0246A9037P105B | CAP 1MFD 400VDC 20% | | | | | 1 | | |
| C11 | 0246A9036P684 | CAP .68UF 50V 5% POLY | | | | | 1 | | |
| C12 | 0246A9036P684 | CAP .68UF 50V 5% POLY | | | | | 1 | | |
| C13 | 0246A9036P684 | CAP .68UF 50V 5% POLY | | | | | 1 | | |
| C14 | 0246A9036P684 | CAP .68UF 50V 5% POLY | | | | | 1 | | |
| C15 | 0246A9036P103 | CAP .01UF 50V 5% POLY | | | | | 1 | | |
| C16 | 0246A9009P151BM | CAP 150UF 20V 10% TANTX | 1 | | | | 1 | | |
| C17 | 0246A9009P151BM | CAP 150UF 20V 10% TANTX | 1 | | | | 1 | | |
| C18 | 0246A9036P103 | CAP .01UF 50V 5% POLY | | | | | 1 | | |
| C19 | 0246A9036P103 | CAP .01UF 50V 5% POLY | | | | | 1 | | |
| C20 | 0246A9036P103 | CAP .01UF 50V 5% POLY | 1 | | | | | | |
| C21 | 0246A9006P102 | CAP 1000PF 500V MICA | | | | | 1 | | |
| C30 | 0246A9040P226 | CAP 22UF 35V 10% TANT | 1 | | | | | | |
| C31 | 0246A9040P226 | CAP 22UF 35V 10% TANT | 1 | | | | | | |
| C40 | 5491871P3300G | CAP 3300PF 300V 2% MICA | | | | | 1 | | |
| C41 | 5491871P3300G | CAP 3300PF 300V 2% MICA | | | | | 1 | | |
| C42 | 5491871P3300G | CAP 3300PF 300V 2% MICA | | | | | 1 | | |
| C43 | 5491871P3300G | CAP 3300PF 300V 2% MICA | | | | | 1 | | |
| C44 | 5491871P3300G | CAP 3300PF 300V 2% MICA | | | | | 1 | | |
| C45 | 5491871P3300G | CAP 3300PF 300V 2% MICA | | | | | 1 | | |
| C46 | 5491871P3300G | CAP 3300PF 300V 2% MICA | | | | | 1 | | |
| L1 | 19B218975G004 | COIL | 1 | | | | | | |
| L2 | 19B218975G004 | COIL | | | | | 1 | | |
| R1 | 0246A9134P1002 | RES 10K OHM 1/4W 1% MTL | 1 | | | | | | |
| R2 | 0246A9104P104 | POT 100K .5W 10% | 1 | | | | | | |
| R3 | 0246A9134P1620 | RES 162 OHM 1/4W 1% | 1 | | | | | | |
| R4 | 0246A9134P2430 | RES 243 OHM 1/4W 1% MTL | 1 | | | | | | |
| R5 | 0246A9134P2371 | RES 2.37KOHM 1/4W 1% MTL | 1 | | | | | | |
| R6 | 0246A9134P2490 | RES 249 OHM 1/4W 1% MTL | 1 | | | | | | |
| R7 | 0246A9103P240 | RESISTOR | 1 | | | | | | |
| R8 | 0246A9103P240 | RESISTOR | 1 | | | | | | |
| R9 | 0246A9103P240 | RESISTOR | | | | | 1 | | |
| R10 | 0246A9103P240 | RESISTOR | | | | | 1 | | |
| R11 | 0246A9134P1501 | RES 1.5K OHM 1/4W 1% MTL | | | | | 1 | | |
| R12 | 0246A9134P1501 | RES 1.5K OHM 1/4W 1% MTL | | | | | 1 | | |
| R14 | 0246A9104P102 | POT 1K .5W 10% | | | | | 1 | | |
| R15 | 0246A9134P22R1 | RES | | | | | 1 | | |
| R16 | 0246A9102P100 | RES 10 OHM .5W 5% | 1 | | | | | | |
| R17 | 0246A9102P100 | RES 10 OHM .5W 5% | 1 | | | | | | |
| R19 | 0246A9134P2430 | RES 243 OHM 1/4W 1% MTL | 1 | | | | | | |
| R20 | 0246A9134P9090 | RES 909 OHM 1/4W 1% MTL | 1 | | | | | | |
| R23 | 0246A9134P6040 | RES 604 OHM 1/4W 1% MTL | | | | | 1 | | |
| R24 | 0246A9134P2211 | RES 2.21KOHM 1/4W 1% MTL | | | | | 1 | | |
| R25 | 0246A9134P1001 | RES 1K OHM 1/4W 1% MTL | | | | | 1 | | |
| R29 | 0246A9134P1002 | RES 10K OHM 1/4W 1% MTL | | | | | 1 | | |
| R36 | 0246A9134P1002 | RES 10K OHM 1/4W 1% MTL | | | | | 1 | | |
| R37 | 0246A9134P1000 | RES 100 OHM 1/4W 1% MTL | | | | | 1 | | |
| R38 | 0246A9134P1542 | RES 15.4KOHM 1/4W 1% MTL | | | | | 1 | | |
| R39 | 0246A9134P9091 | RES 9.09KOHM 1/4W 1% MTL | | | | | 1 | | |
| R40 | 0246A9134P1402 | RES 14K OHM 1/4W 1% MTL | | | | | 1 | | |
| R41 | 0246A9128P502 | POT 5K 1/2W 10% | | | | | 1 | | |
| R42 | 0246A9134P1212 | RES 12.1KOHM 1/4W 1% MTL | | | | | 1 | | |
| R43 | 0246A9134P1402 | RES 14K OHM 1/4W 1% MTL | | | | | 1 | | |
| R44 | 0246A9134P1402 | RES 14K OHM 1/4W 1% MTL | | | | | 1 | | |
| R45 | 0246A9128P502 | POT 5K 1/2W 10% | | | | | 1 | | |
| R46 | 0246A9134P2152 | RES 21.5KOHM 1/4W 1% MTL | | | | | 1 | | |
| R47 | 0246A9134P1402 | RES 14K OHM 1/4W 1% MTL | | | | | 1 | | |
| R48 | 0246A9134P1272 | RES 12.7KOHM 1/4W 1% MTL | | | | | 1 | | |
| R49 | 0246A9134P1822 | RES 18.2KOHM 1/4W 1% MTL | | | | | 1 | | |
| R50 | 0246A9134P1402 | RES 14K OHM 1/4W 1% MTL | | | | | 1 | | |
| R52 | 0246A9134P1372 | RES 13.7KOHM 1/4W 1% MTL | | | | | 1 | | |
| R53 | 0246A9134P1402 | RES 14K OHM 1/4W 1% MTL | | | | | 1 | | |
| R54 | 0246A9134P1332 | RES 13.3KOHM 1/4W 1% MTL | | | | | 1 | | |
| R55 | 0246A9134P3831 | RES 3.83KOHM 1/4W 1% MTL | | | | | 1 | | |
| R56 | 0246A9134P6191 | RES 6.19KOHM 1/4W 1% MTL | | | | | 1 | | |
| RV1 | 0246A9433P002 | DIODE | 1 | | | | | | |
| RV2 | 0246A9433P002 | DIODE | 1 | | | | | | |
| RV3 | 0246A9433P002 | DIODE | 1 | | | | | | |
| T1 | 19B218976G003 | XFMR | 1 | | | | | | |
| T2 | 19B218976G003 | XFMR | | | | | 1 | | |
| W1 | 0246A9141P001 | JUMPER .00 OHM RES | | | | | 1 | | |
| W2 | 0246A9141P001 | JUMPER .00 OHM RES | 1 | | | | | | |
| Z1 | 0246A9427P6R8A | TRANSIENT SUPPRESSOR | | | | | | 1 | |
| Z2 | 0246A9427P6R8A | TRANSIENT SUPPRESSOR | | | | | | 1 | |

Figure 1 (19D427353) Parts List Line Termination, G21 and G24



1904273536021

Figure 2A (0215B8761 Sh. 1 [0]) Outline Diagram Line Termination, G21



19D4273536024

Figure 2B (0215B8762 Sh. 1 [0]) Outline Diagram Line Termination, G24

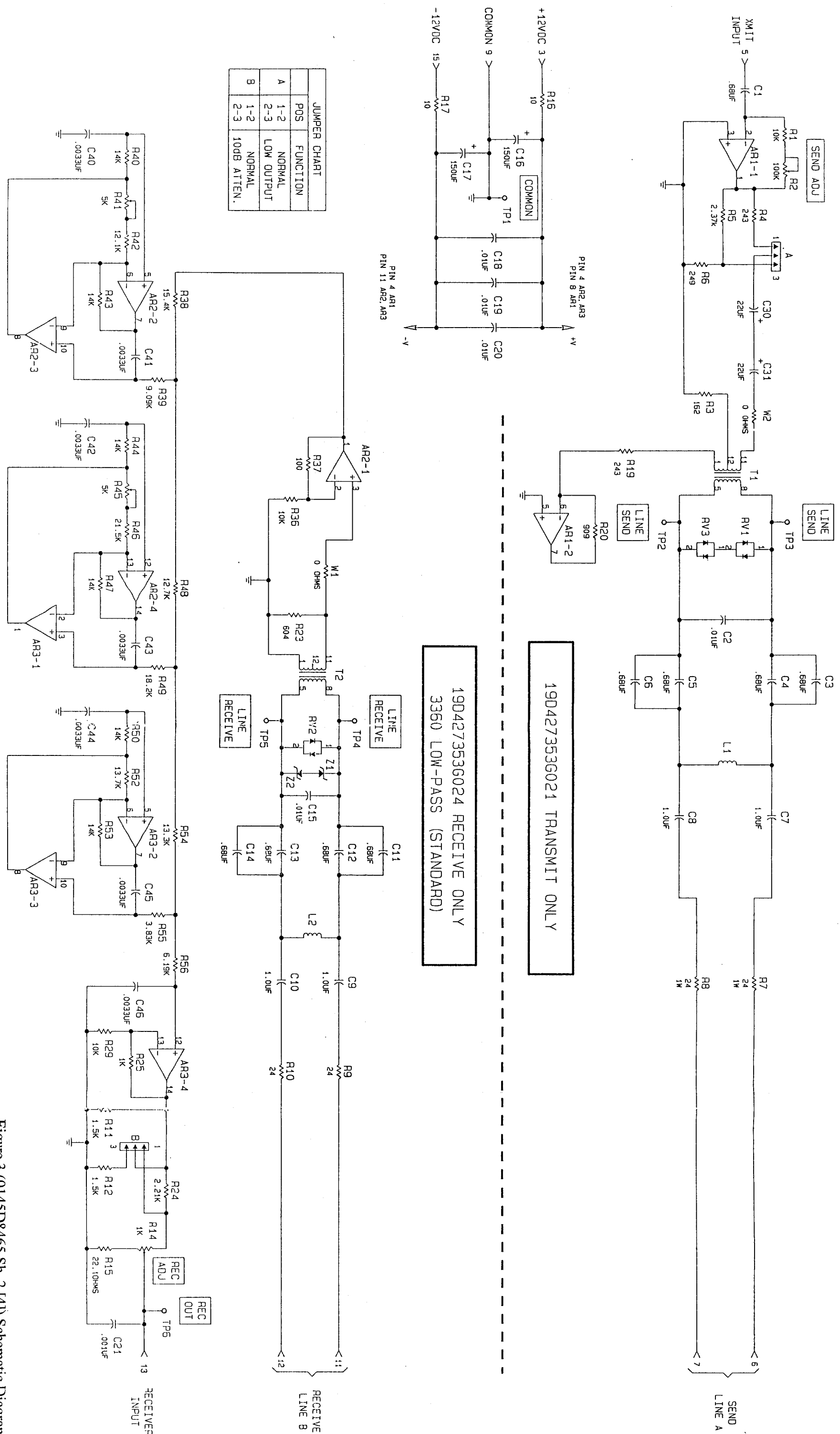


Figure 3 (0145D8465 Sh. 2 [4]) Schematic Diagram
Line Termination. G21 and G24