



Raven Electronics Corporation

Raven 40710-640

Switched Network Interface



Users Manual

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General Information

Thank you for purchasing the 40710-640 Switched Network Interface (SNI) Shelf from Raven Electronics Corporation. Please contact us if you have any questions, concerns, product ideas, or ideas to improve this manual. We can be contacted at:

Raven Electronics Corporation

400 Edison Way
Reno, Nevada 89502
(775) 858-2400 Phone
(775) 858-2410 Fax
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**Safety Warning**

Please be Electro-Static Discharge (ESD) protected before starting any procedures contained in this manual.

Raven Electronics' Warranty

This warranty expressly precludes any liability by Raven for consequential damages however arising after delivery to the purchaser of the affected equipment, and is limited to the expressed warranty, excluding all implied warranties including merchantability. All equipment manufactured by Raven is warranted against defective materials and workmanship for a period of two (2) years from the date of delivery to the original purchaser or end-user. Liability under this warranty is limited to servicing, adjusting, repairing or replacing, as necessary, any equipment returned to the factory, transportation prepaid for that purpose. Factory examination must disclose a manufacturing defect. Repaired or replaced items will be returned to the purchaser surface freight prepaid within the continental U.S.A.

This warranty does not extend to any equipment which has been subjected to transportation damage, misuse, neglect, accident, improper installation, or any other circumstances reasonably beyond the control of Raven. Beyond the warranty period, repairs will be billed to the purchaser at cost. In such cases, an estimate will be submitted for approval before repair is initiated. Repaired equipment will be returned to the purchaser with transportation charges collect, unless agreed to between the purchaser and Raven.

System Description

The 40710-640 Switched Network Interface System includes a 41675 Switched Network Interface module, which provides the interface between a 4-wire service channel and a 2-wire subscriber line or a loop start PABX. A 41632 DTMF Address Decoder monitors the 4-wire input of the 41675 module for DTMF and sets the 41675 module to the off-hook condition when the correct DTMF code is detected. The 2-wire public switched network can access the 4-wire service channel by dialing the number of the 2-wire line connected to the 40710-640 system. A 4-way conference bridge provides three "Repeater" ports for the 4-wire service channel. LEG 1 of the 41685 4W/4W Bridge connects to the 41675 Switched Network Interface. LEG 2, LEG 3, and LEG 4 of the Bridge are wired out to the rear panel terminal strips for a 600 ohms balanced "repeater" interface.

41675 Switched Network Interface

The Raven 41675 Switched Network Interface provides ring detection and loop current sink to interface to a 2-wire subscriber line or PBX system. The 41675 module has a 4-wire to 2-wire hybrid circuit as well as amplifiers to provide isolation and level matching. Line Build Out (LBO) is available on the rear panel to assist in hybrid balance adjustment, if required.

In normal operation, the 41675 module is reset by a momentary loss of loop or by a DTMF "#" (All Clear Code). Should these fail to reset the 41675 module, a VOX controlled time-out circuit will prevent the module from holding the 2-wire line in the off-hook condition indefinitely. The VOX circuit monitors the 4 Wire (4W) Receive (RCV) port, and if no Voice Frequency (VF) energy is detected for the user-programmed time period, the module is reset to the on-hook condition.

FCC Part 68 Information

This equipment complies with Part 68 of the FCC Rules. The FCC Part 68 Label is located on the component side of the module printed circuit board and the rear panel. This label contains the FCC Registration Number and Ringer Equivalence Number (REN) for this equipment. If requested, this information must be provided to your telephone company.

The REN is useful to determine the quantity of devices you may connect to your telephone line and still have all of those devices ring when your telephone number is called. In most, but not all areas, the sum of the RENs of all devices connected to one line should not exceed five (5.0).

FCC Part 68 Information (cont.)

If this module causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify you as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the proper functioning of this equipment. If they do, you will be notified in advance in order that necessary modifications can be made to maintain uninterrupted service.

If trouble is experienced with this module, please contact Raven Electronics Corporation at the address on page 1. If the equipment is causing harm to the telephone network, the telephone company may request that the equipment be disconnected until the problem is resolved. Do not attempt to service this module. It does not contain any user serviceable components.

41632 DTMF Address Decoder

The Raven 41632 DTMF Address Decoder monitors the 4-wire input of the 41675 Switched Network Interface and provides detection and address decoding of DTMF signals. Upon detection of the correct DTMF address code assigned to the model 40710-640 SNI Shelf, the unit is set to the off-hook state and dial-tone is provided from the 2-wire line.

41620-01 Power Supply

The Raven 41620-01 Power Supply provides regulated -20 VDC output from an unregulated input voltage source (-24 VDC to -56 VDC). Foldback circuitry and reverse polarity protection are included to protect the 41620 circuitry as well as its load. The maximum current output is approximately 1.2 amperes, which is the point that foldback begins. An On/Off power switch and a fuse in series with the input are also provided.

41685 4-Way/4-Wire Bridge

The Raven 41685 4-Way/4-Wire Active Bridge provides a multipath interface between four ports on a 4-wire basis. An input at one of the ports is routed through to the output of all other ports, with a minimum of interchannel crosstalk. All inputs and outputs are transformer coupled and are balanced. Potentiometer adjustments on all inputs and outputs allow input level coordination and through-path gain adjustments.

Equipment Needed for Installation

Rackmount Equipment (to install unit in a rack):

- Screws
- Washers (optional)

Audio Connections:

- 24-Gauge Twisted Pair Wire

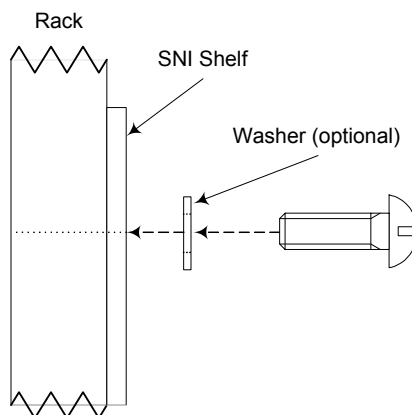
Power Connections:

- 18-Gauge Wire

Mounting Unit in Rack

Please note, Raven supplies the hardware for the mounting on the chassis, but not on the rack. The flanges included with your Switched Network Interface (SNI) Shelf are not interchangeable between 19" and 23". Please specify the flange size needed when ordering.

1. Hold unit in place in the rack.
2. Place a washer and screw in one of the four holes and tighten it to the rack. *(Please refer to the picture below.)*
3. Repeat Step 2 until all four screws are in place.



Hooking Up Connections

With the source power turned off, use the following instructions to hook up your SNI Shelf. A flathead screwdriver is needed to loosen and tighten the screw lugs. You may also refer to the chart below (also found in Table B):

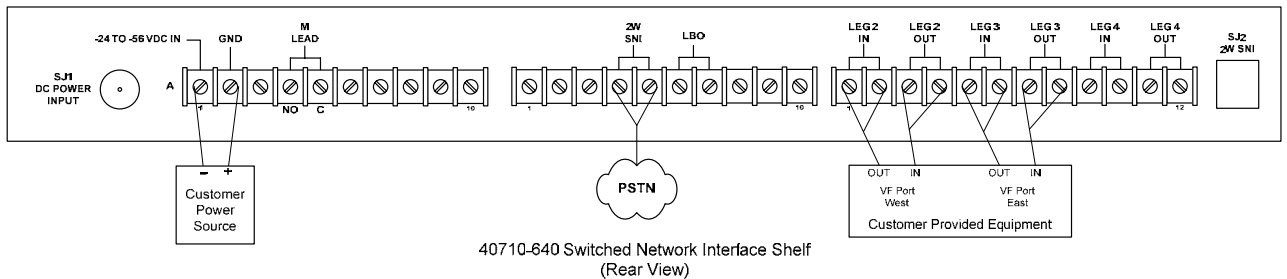
Be sure Power is turned OFF.

2-Wire Connection

- Connect a twisted pair of wire from the 2W SNI (B4, B5) to the PSTN phone line or to a PABX or plug an RJ11 into the SJ2 2W SNI jack.

FUNCTION	REAR TERMINAL CONNECTIONS	SUGGESTED WIRE
Power (PWR)	A1 or SJ1 SLEEVE, -24 TO -56 VDC A2 or SJ1 CENTER, GROUND	18 GA
LEG 2 IN LEG 2 OUT	C1, C2 C3, C4	24 GA
LEG 3 IN LEG 3 OUT	C5, C6 C7, C8	24 GA
LEG 4 IN LEG 4 OUT	C9, C10 C11, C12	24 GA
2-Wire SNI (2W SNI)	B4, B5 or MODULAR JACK (SJ2)	24 GA
Line Build Out (LBO SNI) *	B6, B7	24 GA
XMT RELAY (M-LEAD) *	A4, A5	24 GA

* These connections are not necessary for communication.



Not drawn to scale.

Programming the DTMF Address Decoder

To program the 41632 DTMF Address Decoder, perform the following steps. A unique DTMF code must be assigned to the SNI Shelf so only that shelf responds to the call.

1. Switch, SW-5, should be set for the number of digits in your code (i.e., 1, 2, 3, or 4 digits). Be sure you have only one setting selected.
2. Switches SW1 through SW4 correspond to digits 1-4 of your code. SW1 through SW4 are found on the module from right to left, when viewing the board from the front. Digit 1 – 4 on the switch are labeled from left to right, corresponding to switch positions 1 – 4. You will need to refer to the chart below to program the correct codes.

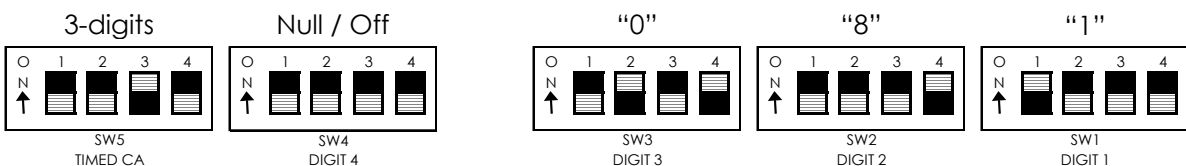
Desired DTMF Digit	Switch Positions 1 = on, 0 = off			
	1	2	3	4
0	0	1	0	1
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1
All Call (*)	1	1	0	1
All Clear (#)	0	0	1	1
A	1	0	1	1
B	0	1	1	1
C	1	1	1	1
D	0	0	0	0

Example:

The code chosen for this unit is 180.

1. Set SW1 to "1" (on-off-off-off)
2. Set SW2 to "8" (off-off-off-on)
3. Set SW3 to "0" (off-on-off-on)

Example Drawing:



Powering Up the SNI Shelf

Reinstall the 41632 card, if previously removed, before performing the following steps. Also, make sure the source power supply is still turned off.

1. With the front panel removed, verify the toggle switch is in the "off" position (to the right).
2. Turn on the external power source.
3. Flip the toggle switch to the "on" position (to the left).
4. The green light on the 41620 card (Power Supply) should be illuminated. If not, please refer to Chapter 5, Troubleshooting and Alignment.
5. Reattach the front panel.

Accessing the Public Switched Telephone Network (PSTN) or PABX

Terminals within the service network channel can access the 2-wire equipment by dialing the DTMF code assigned to the 41675 Switched Network Interface as programmed on the Address Decoder. This will activate the 41675 module to the off-hook state. When dial-tone is returned to the user by the 2-wire equipment, the desired number may be dialed using DTMF digits.

Accessing the Service Channel Network from the PSTN or PABX

A user may call into the service channel network from the public switched network by dialing the number of the 2-wire line connected to the 40710-640 system. The 41675 Switched Network Interface module will detect ring voltage on the 2-wire line and automatically activate (go off-hook). The user will hear at least one cycle of ringback before the 41675 module activates. When ringback ceases, the 41675 module has answered the call and the user will hear a brief confirmation tone. The user can then dial the DTMF code of the desired terminal within the service channel.

Ending a Call

When a call is terminated, one of the users should send the DTMF “#” digit (All Clear), which will return the 41675 SNI module to the idle (on-hook) condition. A loop detect circuit is included on the 41675 module which resets the module to idle when the momentary loss of loop occurs (typically within 30 seconds after the distant end hangs up). A VOX time-out circuit (programmable for 1 to 15 minutes) is included on the 41675 module to prevent holding the 2-wire line off-hook indefinitely, in the event the “#” key is not entered or the distant end fails to reset their 41675 to the on-hook state. Factory default is set to 1 minute. If no voice energy is detected from the Service Channel network during the programmed time period, the 41675 module will automatically reset to the idle condition.

Troubleshooting and Alignment Procedures

Equipment Needed for Troubleshooting and Alignment:

- 42067 Extender Card (optional, but easier to align with)
- AC Voltmeter
- DC Ammeter
- Alignment Tool
- Signal Generator

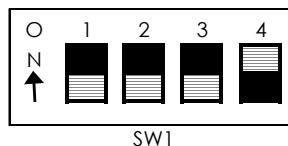
Alignment of the system has been performed at the factory. Please try the unit first before attempting the alignment procedures. No adjustment should be necessary since levels are set at the factory per customer's specifications at time of order. If the unit is not working, it may need to be aligned. Attachment A (shipped inside the chassis) lists all levels and impedances for the system. The 2-Wire line that will be used with the system should be connected to the system during the alignment process.

When a signal generator is inserted into a signal path, that port may be double terminated. To insure correct test tone levels, bridge the signal generator with a high impedance AC voltmeter. When the signal generator is connected to the input port, set the level to that specified by Attachment A as read on the AC voltmeter.

When taking output level readings, the AC voltmeter will be either terminated or bridged. If it is unknown whether an output reading should be a terminated or bridged measurement, compare the two readings. If a 3.5 dBm difference is noted, the bridged measurement is correct. If a 6 dBm difference is noted, the terminated measurement is correct.

41675 Switched Network Interface Alignment Procedure

1. Remove front panel.
2. Turn power OFF (flip the toggle switch to the right).
3. Remove 41675 Switched Network Interface module and insert the 42067 Extender Card in its place.
4. Set Switch SW1 so that only Position 4 is closed for the time-out period of 8 minutes.



Troubleshooting and Alignment Procedures (cont.)

5. Insert the 41675 SNI module into the Extender Card.
6. Turn power ON (flip the toggle switch to the left).
7. Connect a DC ammeter in series with the 2-wire SNI line (B4 or B5 on the terminal blocks) on the rear panel.
8. Establish a call over the 2-wire line to eliminate dial-tone.
9. With a call established on the line, verify a loop current of 20 to 30mA.
10. Connect a signal generator to pins P and R on the 42067 Extender Card.
11. Set the signal generator frequency to 1KHz at the level specified by Attachment A.
12. Connect a "floating" AC voltmeter (earth ground isolated at the AC supply) to pins 'M' and 'N' (2-wire SNI) on the 42067 Extender Card. *The signal ground side of the AC voltmeter must be isolated from loop current through a 2 μ f capacitor.*
13. Read the level specified by Attachment A for the 2-wire SNI (OUT). Adjust R63 on the 41675 SNI module, if required.
14. With the AC voltmeter still connected, connect a "floating" signal generator (earth ground isolated at the AC supply) to pins 'M' and 'N' (2-wire SNI) on the 42067 Extender Card.
15. The signal ground side of the signal generator must be isolated from loop current through a 2 μ f capacitor. Adjust the signal generator frequency to 1KHz at the level specified by Attachment A for 2-wire SNI (IN) as read on the AC voltmeter.
16. Connect the AC voltmeter (terminate, if required, and not "floating") to pins 'U' and 'V' on the 42067 Extender Card. Read the level specified by Attachment A. Adjust R35 on the 41675 SNI module, if required.
17. Connect the signal generator (not "floating") to pins 'P' and 'R' on the 42067 Extender Card. Set the frequency to 1KHz at the level specified by Attachment A. Adjust R24 and switch in various capacitance values with SW2 on the 41675 SNI module for a minimum reading on the AC voltmeter.

NOTE: It may become necessary to utilize the Line Build Out (LBO) if a satisfactory hybrid null cannot be obtained (a reading of -25 dBm0 or less on pins 'U' and 'V'). Adjust R24 and SW2 on the 41675 SNI module for the lowest possible reading, then add capacitance to the LBO and readjust R24 until a satisfactory null is obtained.

Troubleshooting and Alignment Procedures (cont.)

18. Turn power OFF (flip the toggle switch to the right).
19. Remove the 41675 Switched Network Interface module and the 42067 Extender Card.
20. Set Switch SW1 for the desired VOX time-out period. The factory default is "1".

SW1 SWITCH ON	TIME-OUT PERIOD
1	1 minute
2	2 minutes
3	4 minutes
4	8 minutes

21. Reinstall the 41675 SNI module in its position.
22. Turn power ON (flip the toggle switch to the left).

41632 DTMF Address Decoder Alignment Procedure

The DTMF Address Decoder does not require alignment. If the 41632 DTMF Address Decoder does not appear to function, double check strapping and switch settings as detailed in Attachment A (shipped inside the chassis).

41620 Power Supply Alignment Procedure *(Only if installed.)*

1. Turn power ON and verify LED CR7 illuminates.
2. Connect a DC voltmeter to test points TP1 and GND on the 41620 Power Supply and read -20.0 VDC.
3. Adjust R15 on the 41620 module, if required.
4. Replace front panel.

Troubleshooting and Alignment Procedures (cont.)**41685 4W/4W Bridge Level**

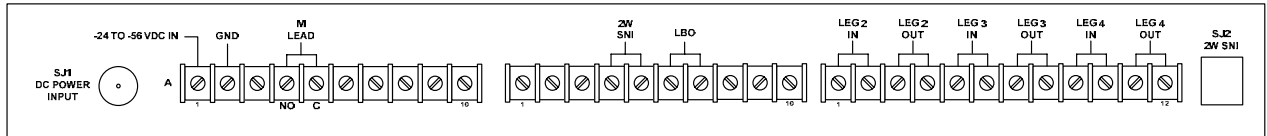
1. Turn power off. Remove the 41685 4W/4W Bridge module and insert a 42067 Extender Card into the module position. Insert the 41685 4W/4W Bridge into the Extender Card. Turn power on.
2. Connect the signal generator to terminals 21 and 22 on the Extender Card. Set the signal generator frequency to 1 KHz at the level specified by Attachment A.
3. Connect the AC voltmeter (terminate, if required) to pins F and H (LEG 2 OUT). Read the level specified by Attachment A. Adjust R2 on the 41685 4W/4W Active Bridge, if required.
4. Connect the AC voltmeter (terminate, if required) to pins K and L (LEG 3 OUT). Read the level specified by Attachment A. Adjust R3 on the 41685 4W/4W Active Bridge, if required.
5. Connect the AC voltmeter (terminate, if required) to pins M and N (LEG 4 OUT). Read the level specified by Attachment A. Adjust R4 on the 41685 4W/4W Active Bridge, if required.
6. Connect the signal generator to pins 19 and 20 (LEG 2 IN). Set the signal generator frequency to 1 KHz at the level specified by Attachment A for LEG 2 IN.
7. With the AC voltmeter still connected to pins M and N, read the same level as in step 3. Adjust R8 on the 41685 4W/4W Active Bridge, if required.
8. Connect the AC voltmeter (bridging) to pins D and E (LEG 1 OUT). Read the level specified by Attachment A. Adjust R1 on the 41685 4W/4W Active Bridge, if required.
9. Connect the signal generator to pins 16 and 17 (LEG 3 IN). Set the signal generator level as specified by Attachment A. Read the same level on the AC voltmeter as in step 8. Adjust R9 on the 41685 4W/4W Active Bridge, if required.
10. Connect the signal generator to pins 14 and 15 (LEG 4 IN). Set the signal generator level as specified by Attachment A. Read the same level on the AC voltmeter as in step 8. Adjust R10 on the 41685 4W/4W Active Bridge, if required.
11. Disconnect all test equipment and turn power off. Remove the Extender Card and install the 41685 Bridge in its position.

Specifications

40710-640 Switched Network Interface System

POWER REQUIREMENT	-24 to -56 VDC input power or 95 to 240 VAC input power with external converter
AC POWER SAFETY APPROVALS	UL1950, CSA950, TUV/IEC950, Approved for Australia, MITI (<i>when the external AC-DC adapter is used</i>)
SIGNALING FORMAT	DTMF and 20Hz ringing for off-hook condition DTMF for Dial Through DTMF "#", momentary loss of loop, or VOX timeout for on-hook condition.
LINE IMPEDANCE	600Ω balanced ± 5%
INPUT/OUTPUT LEVELS	
4-Wire Port	-16 to +7 dBm (continuously adjustable)
2-Wire Port	0 dBm nominal
ENVIRONMENTAL	
Operating Temperature	0°C to +50°C
Storage Temperature	-40°C to +80°C
Relative Humidity	0 to 95% non-condensing
DIMENSIONS	
Width	19.00 inches rackmount
Depth	12.00 inches (30.48 cm)
Height	1.75 inches (4.45 cm) (1 ru)
WEIGHT (max)	16 pounds (7.26 kg)

40710-640 Back Panel Diagram

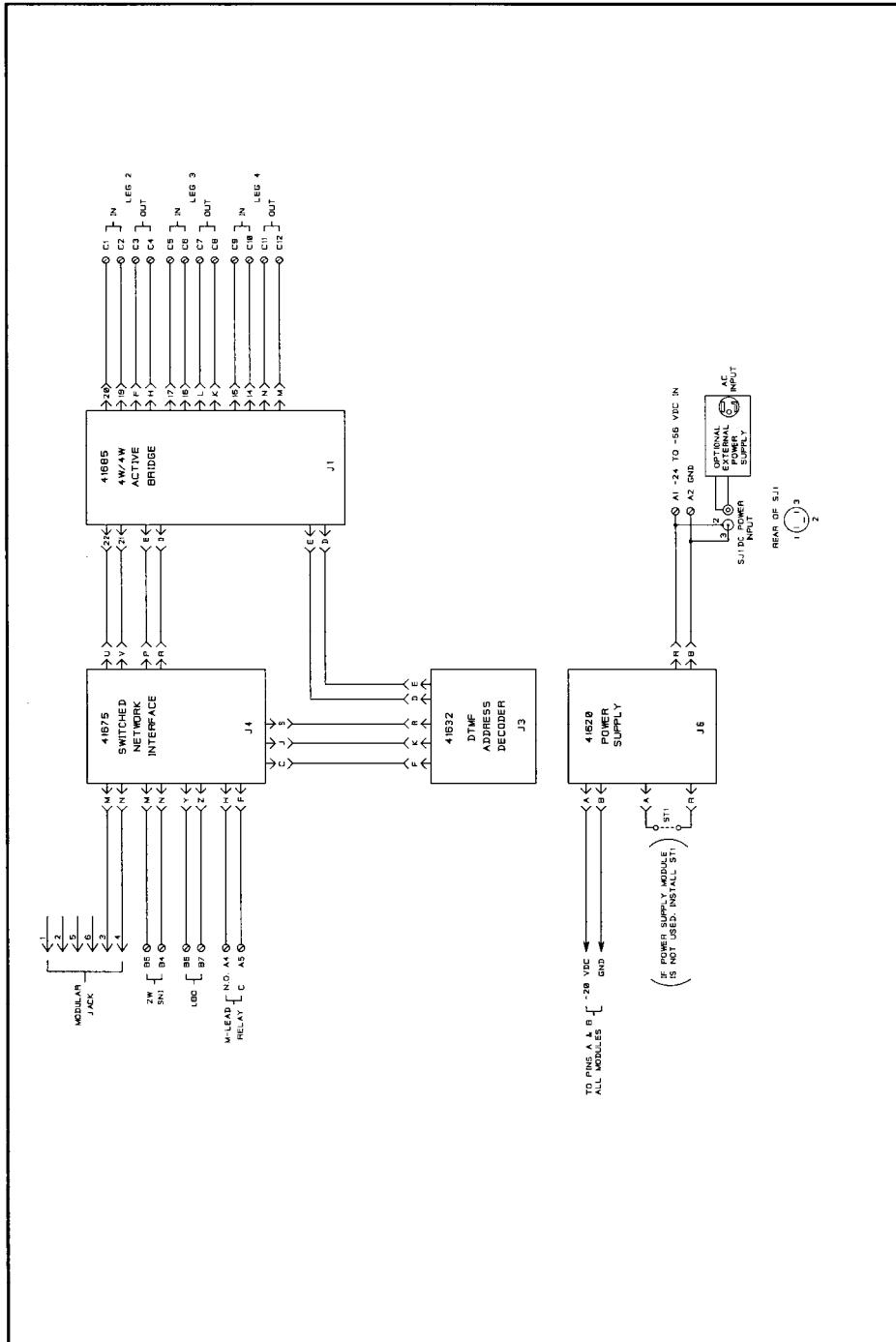


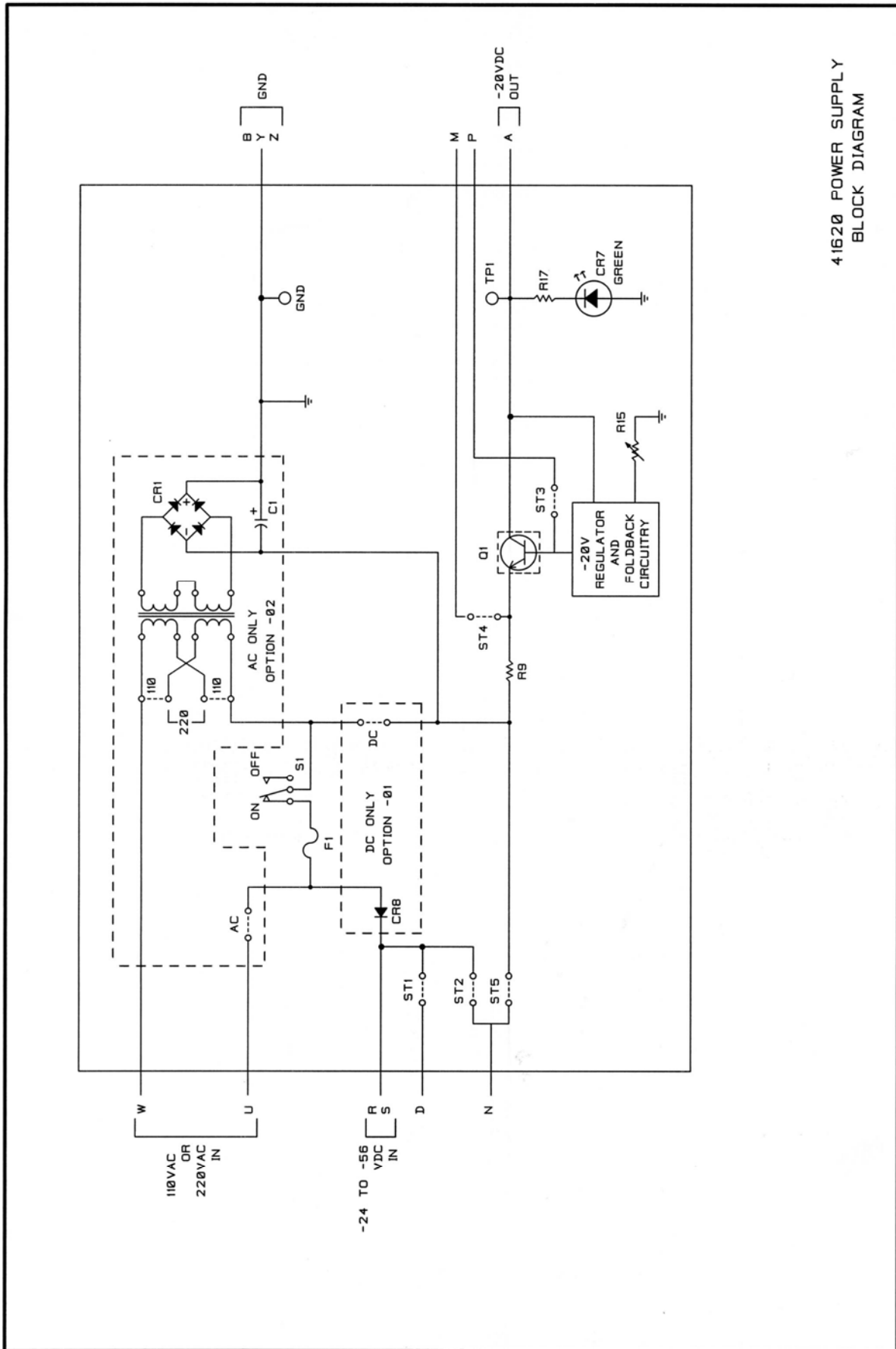
40710-640 Switched Network Interface Shelf
(Rear View)

Not drawn to scale.

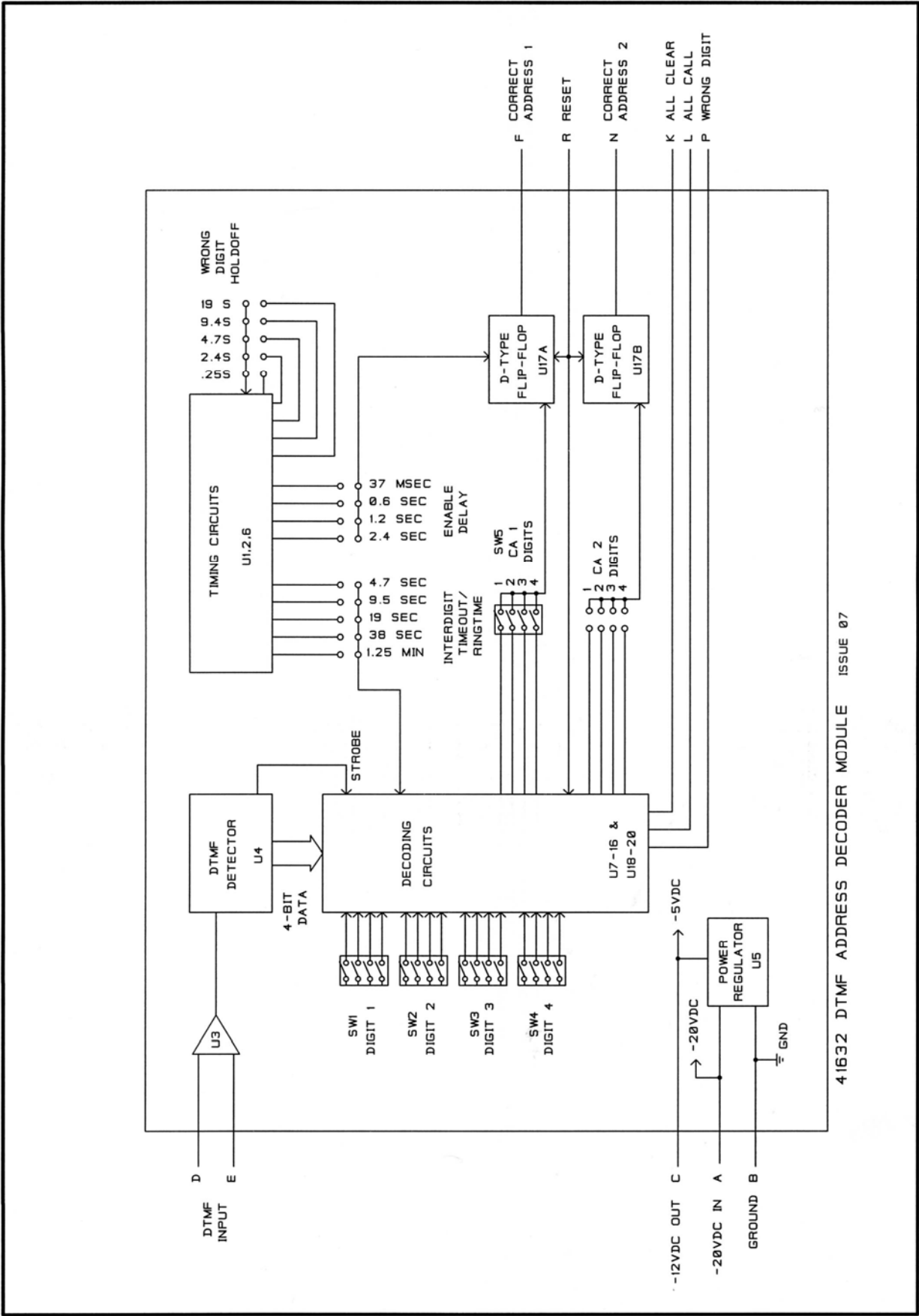
Curtis Screw Lug Terminal Blocks Do Not Require
Lugs on Wire Ends

40710-640 Wiring Diagram

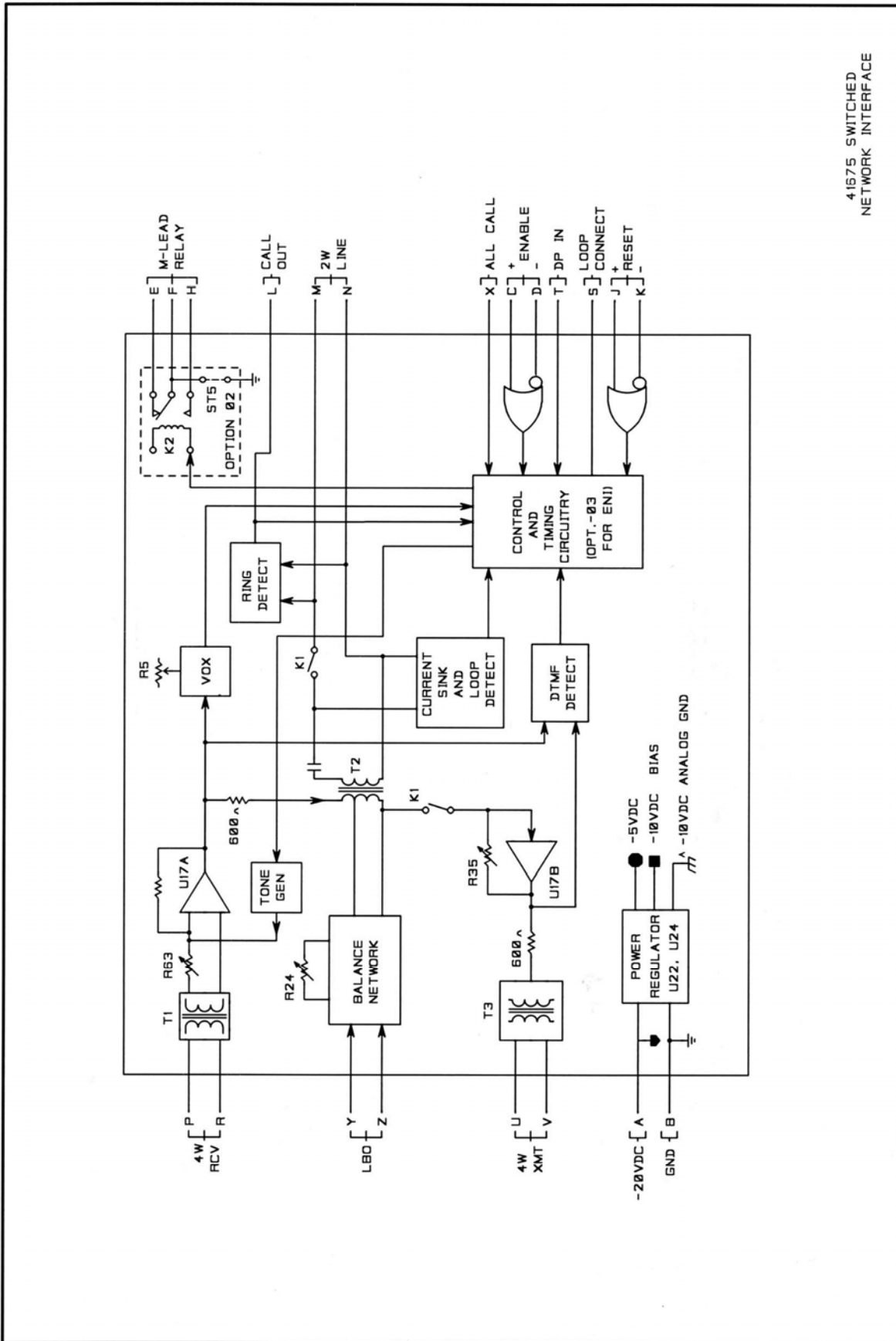




41620 POWER SUPPLY
BLOCK DIAGRAM



41632 DTMF ADDRESS DECODER MODULE ISSUE 07



41675 SWITCHED NETWORK INTERFACE

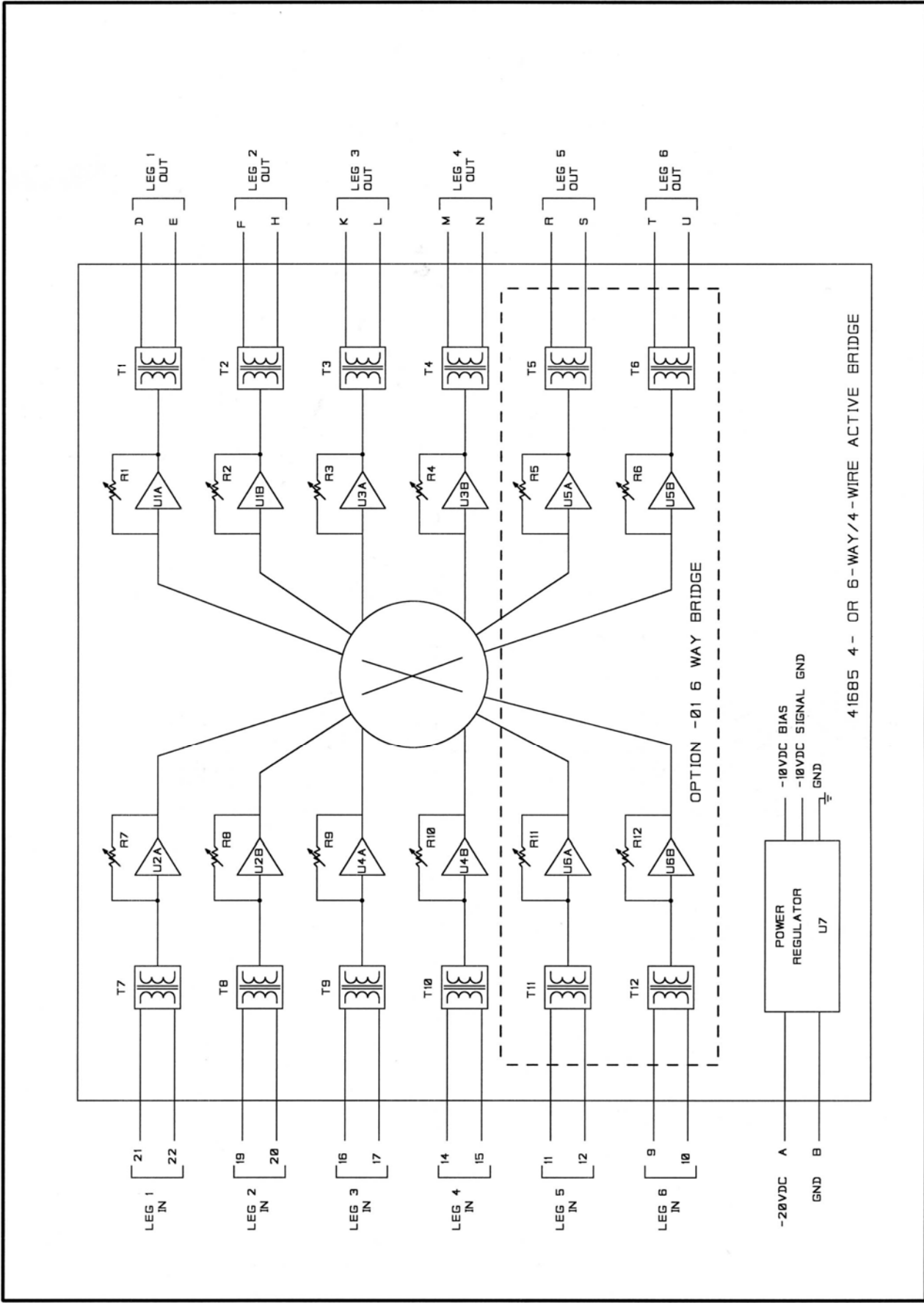


TABLE B**INSTALLER CONNECTIONS****40710-640 Installer Connections**

FUNCTION	REAR TERMINAL CONNECTIONS	SUGGESTED WIRE
Power (PWR)	A1 or SJ1 SLEEVE, -24 TO -56 VDC A2 or SJ1 CENTER, GROUND	18 GA
LEG 2 IN LEG 2 OUT	C1, C2 C3, C4	24 GA
LEG 3 IN LEG 3 OUT	C5, C6 C7, C8	24 GA
LEG 4 IN LEG 4 OUT	C9, C10 C11, C12	24 GA
2-Wire SNI (2W SNI)	B4, B5 or MODULAR JACK (SJ2)	24 GA
Line Build Out (LBO SNI) *	B6, B7	24 GA
XMT RELAY (M-LEAD) *	A4, A5	24 GA

* These connections are not necessary for communication.

Switched Network Interface System

<u>Model #</u>	<u>Description</u>
40710D-600	Switched Network Interface Shelf <i>Includes 3 modules:</i> 41632 Address Decoder, 41675 Switched Network Interface, 41620-01 DC Power Supply (-20 to -56 VDC input power)
40710A-600	Switched Network Interface Shelf <i>Same as above, however the power supply is:</i> V420-2403 AC External Power Pack (110/250 VAC input power)
40710D-640	Switched Network Interface Shelf with 4-Way Bridge <i>Includes 4 modules:</i> 41632 Address Decoder, 41675 Switched Network Interface, 41685 4-Wire, 4-Way Bridge, 41620-01 DC Power Supply (-20 to -56 VDC input power) <i>One Bridge leg is internally wired; this allows 3 external VF ports</i>
40710A-640	Switched Network Interface Shelf with 4-Way Bridge <i>Same as above, however, the power supply is:</i> V420-2403 AC External Power Pack (110/250 VAC input power)

Spares:

41620-01	DC Power Supply
41632	Address Decoder
41675	Switched Network Interface
41685	4-Way Bridge

General Conditions of Sales
RAVEN ELECTRONICS CORPORATION
400 EDISON WAY, RENO, NEVADA 89502
TELEPHONE 775-858-2400 FAX: 775-858-2410

- 1. CONTRACT** – The following general conditions of sale apply to this contract and all purchases from Raven Electronics Corporation (hereinafter referred to as Raven). No changes, deletions or additions shall be binding on Raven, unless expressly agreed to in writing and signed by an authorized representative of Raven. Any terms or condition of the Purchaser inconsistent herewith, or in addition hereto, shall be of no force and effect, and Purchasers order shall be governed only by terms and conditions appearing herein. A definite and reasonable expression of acceptance or a written confirmation, which is sent within the time specified in the Raven proposal or sales order, operates as an acceptance of the terms specified herein, even though it states terms different from or additional to those specified herein.
- 2. PROPOSALS** – Raven proposals, when accepted, and any subsequent orders placed as a result of such proposals, are not subject to cancellation changes, reduction in amount or suspension of deliveries except with Raven's written consent and upon terms which indemnify Raven against loss. Information contained in Raven's proposal is valid for a period of sixty (60) days from the date of proposal, unless specified to the contrary in the proposal. Stenographic and clerical errors are subject to correction. Verbal quotations expire, unless accepted, the same day they are made.
- 3. PRICES (are in United States dollars)** – All prices and discounts are subject to change without notice. In the event of price change, the price of equipment on order but not shipped will be the price in effect at the time of acceptance of the order. Equipment already shipped is not subject to a price change. In addition to prices specified herein, purchaser shall pay for all extra components, parts, equipment, materials or services (each or all hereafter called "equipment") requested by the purchaser or made necessary by incompleteness of or inaccuracy in plans, specifications, or other information submitted by the purchaser.
- 4. TAXES AND TRANSPORTATION** – Unless otherwise specified, the prices do not include any applicable taxes (sales, use, ad valorem, property, etc.) for the sale, use, licenses, or delivery of the equipment, software, or services supplied. The purchaser agrees to pay all taxes, licenses and transportation charges.
- 5. TERMS OF PAYMENT** – Terms of payment to Purchasers of satisfactory credit is thirty (30) days from the date of shipment. The same terms are applicable to partial shipment. If in the judgment of Raven, the financial conditions of the Purchaser at any time does not justify continuance of production or shipment on the terms of payment specified, the company may require full or partial payment in advance before shipment. Raven may ship the equipment in installments, and pro rata payments of purchase price are due as shipments are made. If shipments are delayed by Purchaser, payments shall be made based on the contract price and percent completed. Delinquent charges of 1½% per month (18% per annum) will be added to all past due invoices.
- 6. DELIVERY** – Raven shall not be liable for any damages or penalty for delays in delivery and/or completion due to acts of God, acts of omissions of the Purchaser, acts of civil or military authorities, government regulations or priorities, fires, floods, epidemics, quarantine, inability to obtain necessary labor, war, riots, strikes, differences with workmen, accidents to machinery, delays in transportation, failure of or delay in furnishing correct or complete information by Purchaser, impossibility or impracticability of performance or any other cause or causes beyond the control of Raven.
- 7. SHIPMENT** – Unless otherwise specified in this or other documents forming a part of this contract, all shipments will be F.O.B. Raven manufacturing facility. Property of and title to the equipment shall pass to the purchaser upon delivery thereof by Raven to the carrier, and risk of loss, damage or deterioration to the equipment shall thereafter be on the purchaser. If the purchaser requests Raven to postpone shipment beyond the time Raven would be required to ship in order to comply with the delivery dates agreed upon between Raven and the purchaser elsewhere in this or other documents forming a part of this contract, (a) the purchaser shall pay Raven for the expense of storing the equipment, (b) the risk of loss, damage or deterioration to the equipment shall be on the purchaser on and from the date Raven receives the purchasers request to postpone shipment.
- 8. SHORTAGES** – Claims for shortages, damaged, or incorrect material must be made within ten (10) days after receipt of goods.
- 9. MINIMUM BILLING CHARGE** – Orders amounting to less than \$50.00 will be billed at \$50.00.
- 10. ACCEPTANCE OF ORDER** – All orders are subject to acceptance and approval by a principle officer of Raven.
- 11. TITLE (Risk of loss)** – The purchaser agrees that Raven shall have a security interest in the equipment purchased until paid in full. The purchaser agrees to perform all acts necessary to protect the interests of Raven in the product until such interests are discharged by payment in full. Risk of loss of the equipment or any part of the same shall pass to the purchaser upon delivery of such equipment or parts, F.O.B. Raven's manufacturing facility.
- 12. CANCELLATIONS** – An order once placed with and accepted by Raven can be canceled only with Raven's consent and upon terms which indemnify Raven against loss.
- 13. WARRANTY** – This warranty expressly precludes any liability by Raven for consequential damages however arising after delivery to the purchaser of the affected equipment, and is limited to the expressed warranty, excluding all implied warranties including merchantability. All equipment manufactured by Raven is warranted against defective materials and workmanship for a period of two (2) years from the date of delivery to the original purchaser. Liability under this warranty is limited to servicing, adjusting, repairing or replacing, as necessary, any equipment returned to the factory, transportation prepaid for that purpose. Factory examination must disclose a manufacturing defect. Repaired or replaced items will be returned to the purchaser surface freight prepaid within the continental U.S.A.

This warranty does not extend to any equipment which has been subjected to transportation damage, misuse, neglect, accident, improper installation, or any other circumstances reasonably beyond the control of Raven. Repairs will be billed to the purchaser at cost. In such cases, an estimate will be submitted for approval before repair is initiated. Repaired equipment will be returned to the purchaser with transportation charges collect, unless otherwise agreed to between the purchaser and Raven.
- 14. RETURN FOR CREDIT** – No equipment may be returned for credit until the company has obtained Raven's written approval for return authorization. Materials accepted for return is subject to a re-stocking charge of 15% of the current list price. All transportation charges will be borne by the purchaser. Orders for special non-stock equipment or items become non-cancelable upon initiation of production and are not returnable for credit.
- 15. RETURNS FOR REPAIR** – Equipment returned for repair should be identified with a tag indicating the problem, and returned to Raven's repair service department. Special instructions, i.e., desired modifications, should be noted on the packing slip. Any equipment returned must be packaged to insure safe arrival at Raven. Items modified and/or programmed by customer for special features will be returned to standard Raven configuration, with time billed accordingly, unless modification and/or program instructions or documentation is provided and repairs have been agreed to by Raven.
- 16. SERVICE** – Engineering assistance will be provided on request for permanently installed equipment, and billed at a nominal fee as agreed upon between Raven and the purchaser.
- 17. APPLICABLE LAW** – The validity, performance, construction and interpretation of these terms and conditions shall be governed by the laws of the state of Nevada, United States of America and any litigation must take place in the state of Nevada.
- 18. PROPRIETARY DATA** – Raven retains ownership and rights in all proprietary data disclosed to the purchaser by Raven in connection with this contract. Proprietary samples, software documents and/or drawings shall not be disclosed, reproduced, manufactured or made available to unauthorized persons in whole or in part or used to prepare the same or similar materials without the expressed written permission from Raven. Proprietary data includes all design, engineering, and technical information (whether patentable or not) and other information concerning Raven trade secrets not disclosed by inspection or analysis of the equipment itself.
- 19. GOVERNMENT REQUIREMENTS** – Raven agrees to comply with all applicable state and federal laws, rules and regulations, and all obligations hereunder are subject to applicable government regulation, including those affecting or limiting prices (except price redetermination), production, purchases, sales, use or inventory of materials. If the equipment to be furnished is to the United States government, Raven agrees to comply with applicable requirements for such contracts, with respect to secrecy, use of convict labor, employment of aliens, non-discrimination, plant protection, espionage, sabotage, fair labor standards act of 1938, as amended, the service contract act of 1965 as amended and other provisions relative to hours and conditions of work, if and when applicable.
- 20. MODIFICATION AND SUBSTITUTION** – Raven reserves the right to modify equipment of Raven design sold hereunder, and/or the drawings and specification related thereto, or to substitute equipment of later design to fulfill this contract, providing the modification or substitution will not materially affect the performance of the equipment or lessen in any way the utility of the equipment to the purchaser.
- 21. DESIGN CHANGES** – Raven reserves the right to make design changes at any time without incurring any obligation to modify equipment previously sold.
- 22. TERMS AND CONDITIONS** – The terms and conditions specified herein shall be in addition to those set out in the Raven proposal.



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