46112 *SynchMaster*
DATA CONTROLLER MODULE

46113 *SynchMaster*
DATA PORT MODULE

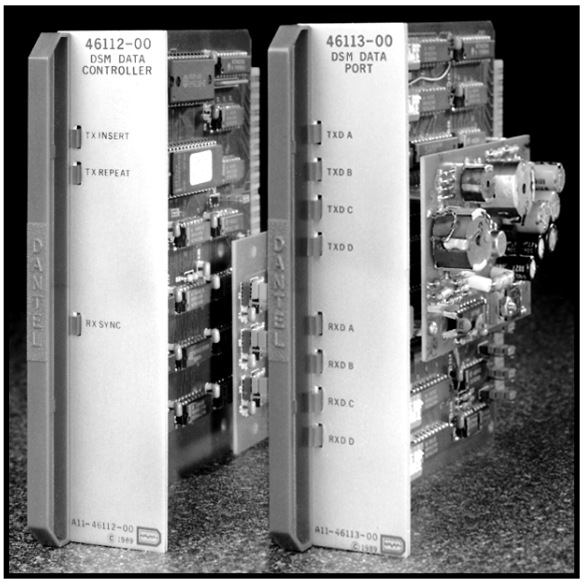


Table of Contents

About this Practice:

This practice has been reissued to:

- Update the 46113 strapping options in the ***Installation*** section.

Reissued Practices: Updated and new content can be identified by a banner in the right margin.

UPDATED

Issue date: February 1999

CAUTION

- Install or remove modules from the shelf only when the power is off. If you install a module in the shelf with the power on, the internal circuitry may suffer damage and the product warranty will be void.
- Remove and install circuit boards only in a static-safe environment (use antistatic wrist straps, smocks, footwear, etc.).
- Keep circuit boards in their antistatic bags when they are not in use.
- Do not ship or store circuit boards near strong electrostatic, electromagnetic, magnetic, or radioactive fields.
- For more complete information on electrostatic discharge safety precautions, refer to Bellcore™ Technical Reference # TR-NWT-000870.

ORDERING INFORMATION

NOTE: This section lists the different options available for this product. To order any of the available options, contact Dantel Inside Sales through our toll-free number, **1-800-432-6835.**

OPTION NUMBER	FEATURES
B11-46112-00	***SynchMaster*** **Data Controller Module**
B11-46113-00	***SynchMaster*** **Data Port Module**

GENERAL DESCRIPTION

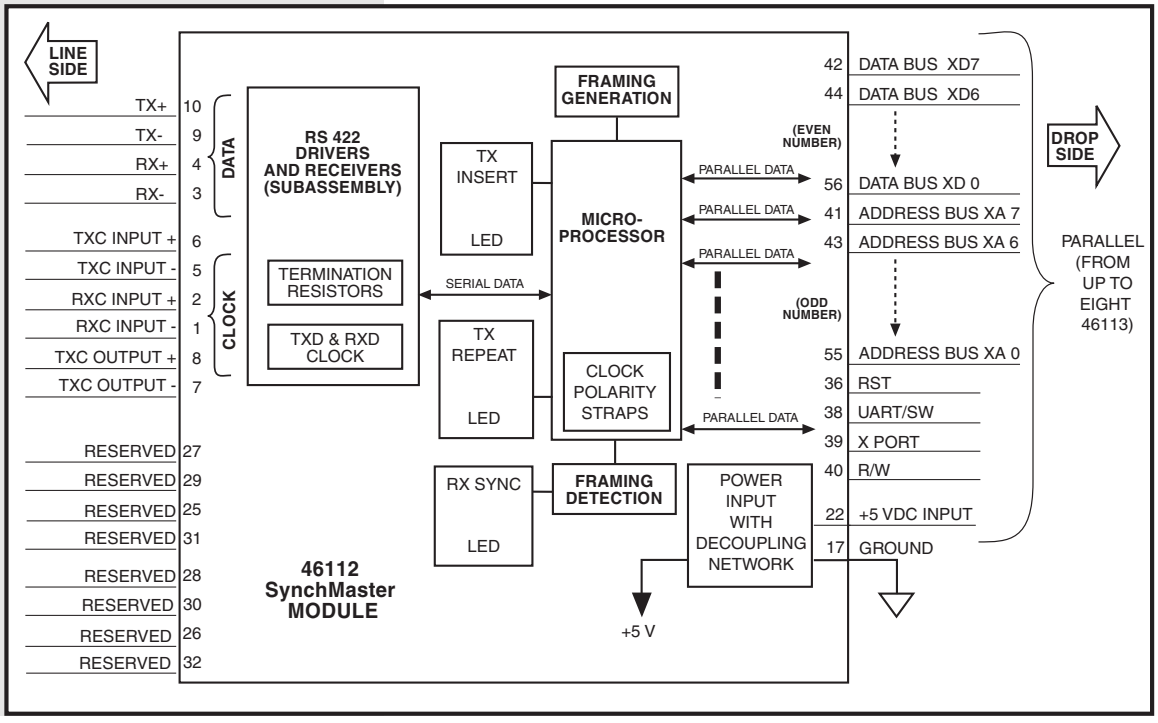
The 46112 ***SynchMaster*** Data Controller Module and 46113 ***SynchMaster*** Data Port Module (46112 and 46113 ***SynchMaster*** modules) are companion modules that work together and provide an interface between 64kb synchronous DTE (Digital Transmission Equipment, such as fiber-optic terminals and microwave equipment) and low speed asynchronous transmission equipment (such as Dantel's 460 Alarm and Control System).

The 46112 and 46113 ***SynchMaster*** modules are plug-in boards that fit into any 400-type or similar equipment housing.

CIRCUIT DESCRIPTION

Figures 1 and 2 show the functional schematics for the 46112 ***SynchMaster*** Data Controller Module and the 46113 ***SynchMaster*** Data Port Module respectively.

FIG. 1 - FUNCTIONAL SCHEMATIC, 46112



CIRCUIT DESCRIPTION

46112 *SynchMaster* DATA CONTROLLER MODULE

The 46112 ***SynchMaster*** Module consists of:

RS-422 Drivers and Receivers

The RS-422 drivers and receivers are on a subassembly board that mounts on the main PC board. The RS-422 drivers and receivers provide data signal transformation from the module's internal TTL data bus to the specific parameters of the RS-422 interface.

A Clock

The RS-422 transmit and receive paths are clocked through the main PC board because the line side data transmission equipment is synchronous.

Terminating Resistors

Three subassembly board straps, designated X1, X2 and X3 provide for termination resistors. When you place the straps in the "T" position a terminating resistor connects across the RS-422 differential inputs. When you place the straps in the "O" position you do not connect the terminating resistor.

Framing Generator and Detector

The framing generator inserts framing information into the transmitted data. The framing detector reads the incoming data and properly sequences the data to and from the microprocessor. Proper sequencing prevents the data from individual ports becoming intermixed.

Microprocessor

The microprocessor is resident for completing asynchronous/ synchronous conversion of the data as well as multiplexing the data.

Status Indicating LEDs

The 46112 ***SynchMaster*** module's green status indicating LEDs are designated as follows:

- **TX INSERT** When data is transmitted to a port configured for the 46112 ***SynchMaster*** module, the TX INSERT LED will light.
- **TX REPEAT** When lit, the TX REPEAT LED indicates that data is not being transmitted at the site. Either the TX REPEAT or the TX INSERT will be on alternatively.
- **RX SYNCH** Refer to the margin note to the left.

NOTE:

In the event of a failure, as well as during installation, the RX SYNC LED is an important indication of the soundness of the 64KB side of the ***SynchMaster*** system. This LED appears as either on or off if there is no synchronization signal detected.

When the 46112 ***SynchMaster*** receives a good synchronization signal the RX SYNC LED appears to turn on solid.

A closer examination however, reveals that the LED is actually alternating on and off at a very high rate. The LED appears to "flicker" slightly.

CIRCUIT DESCRIPTION

NOTE:

When the unit initially powers up, the TX REPEAT LED blinks on and off at a one second interval if you set any 46113 ***SynchMaster*** port switches incorrectly. If this happens, recheck the 46113 ***SynchMaster*** module switch settings.

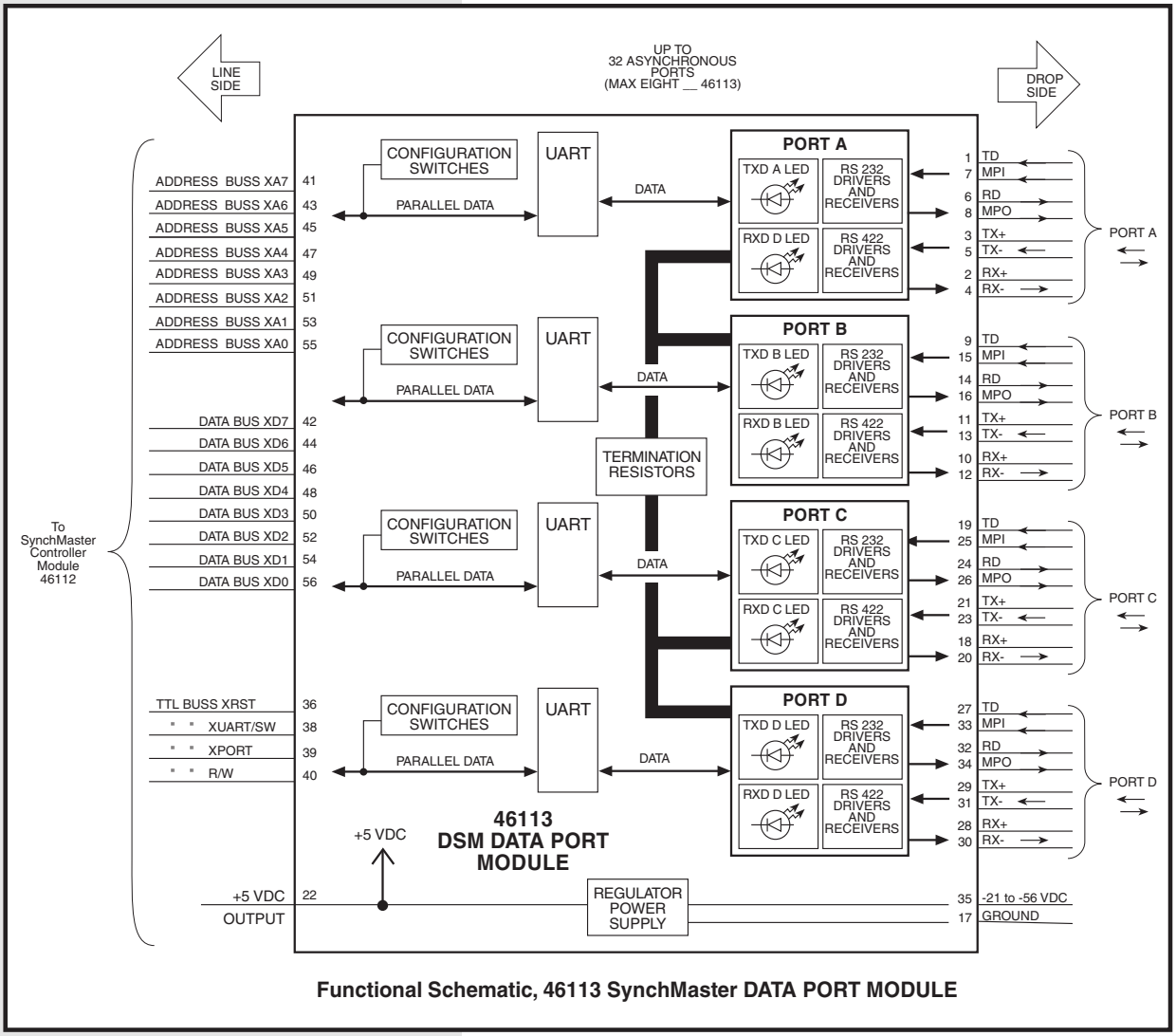
Configuration Straps

The configuration straps set the line clock polarity. When you set the straps in the POS position, data changes at the rising edge of the clock pulse signals. When you set the straps in the NEG position, data changes at the falling edge of the clock pulse signals. Straps are set for POS edge trigger from factory and should not be changed in the field.

A Power Input Decoupling Network

The power input decoupling network is a capacitor array that filters and isolates noise from the +5 VDC operating power. The 46113 ***SynchMaster*** module power supply supplies operating power to the 46112 and 46113 ***SynchMaster*** modules. If more than one 46113 ***SynchMaster*** module is at a location only one 46113 ***SynchMaster*** module supplies power to its associated 46112 ***SynchMaster*** module.

FIG. 1 - FUNCTIONAL SCHEMATIC, 46112



Functional Schematic, 46113 SynchMaster DATA PORT MODULE

46113 *SynchMaster* DATA PORT MODULE

The 46113 ***SynchMaster*** Data Port Module consists of:

RS-232 and RS-422 Drivers and Receivers

The RS-232 and RS-422 drivers and receivers transmit and receive drop side data in their respective formats. The receivers transform the data to the TTL levels for use by the UARTs.

Terminating Resistors

The RS-422 inputs have strap enabled terminating resistors that operate the same as the 46112 ***SynchMaster*** module terminating resistors. T = terminate; O = open.

UARTs

The UARTs (Universal Asynchronous Receiver/Transmitters) convert the drop side serial data to a parallel data format and send and receive data to and from the 46112 ***SynchMaster*** module.

The UARTs also control the serial data format (including baud, number of data and stop bits, and so on). DIP switches set the serial data format. The serial data format controls 46112 ***SynchMaster*** module programming (at initial power-up) for each UART which determines each port's data format.

NOTE:

To leave a port unused (inactive), place all configuration switches for that port in the ON position and set the port to an unused channel number. Failure to do so will result in all ports operating sporadically.

Configuration Switches

The 46112 ***SynchMaster*** module's microprocessor reads configuration switches which programs the 46113 ***SynchMaster*** module's UARTs. The switches determine the operating mode, the number of data and stop bits, the parity and the baud (data transmission) rate and set the channel number.

Status Indicating LEDs

There are two sets of four green front panel LEDs.

The top four LEDs are labeled TXD (ports A to D) and light up when the port (A, B, C or D) drop side equipment transmits data through the 46113 ***SynchMaster*** module.

The bottom four LEDs are labeled RXD (ports A to D) and light up when the port (A, B, C or D) receives data from a remote 46113 ***SynchMaster*** module and transmits the data to the drop equipment

A Power Regulator

The regulated power supply operates on -21 to -56 VDC and supplies operating power for the 46113 ***SynchMaster*** module's circuits. The power supply also supplies regulated +5 VDC output power (through edge connector pin 22) for operating the 46112 ***SynchMaster*** module's circuits.

APPLICATION INFORMATION

You can use the 46112 ***SynchMaster*** Data Controller Module and 46113 ***SynchMaster*** Data Port Module for interfacing digital transmission equipment (such as fiber optic terminals, microwave equipment, and so on) and asynchronous transmission equipment (such as Dantel's 460 Alarm and Control System).

Fig. 3 shows a terminal mode application. Fig. 4 shows pin-for-pin wiring of the terminal mode application. A single 46112 ***SynchMaster*** Module controls data I/O (Input/Output) from up to 32 asynchronous ports. Up to eight 46113 ***SynchMaster*** Modules provide the 32 asynchronous ports (4 ports per 46113 ***SynchMaster*** Module).

Fig. 5 shows a simple repeater mode application. Each line side port requires two 46112 ***SynchMaster*** Modules and from two to sixteen 46113 ***SynchMaster*** Modules. With interconnected 46112 ***SynchMaster*** Modules one repeater setup is the same as two terminal setups.

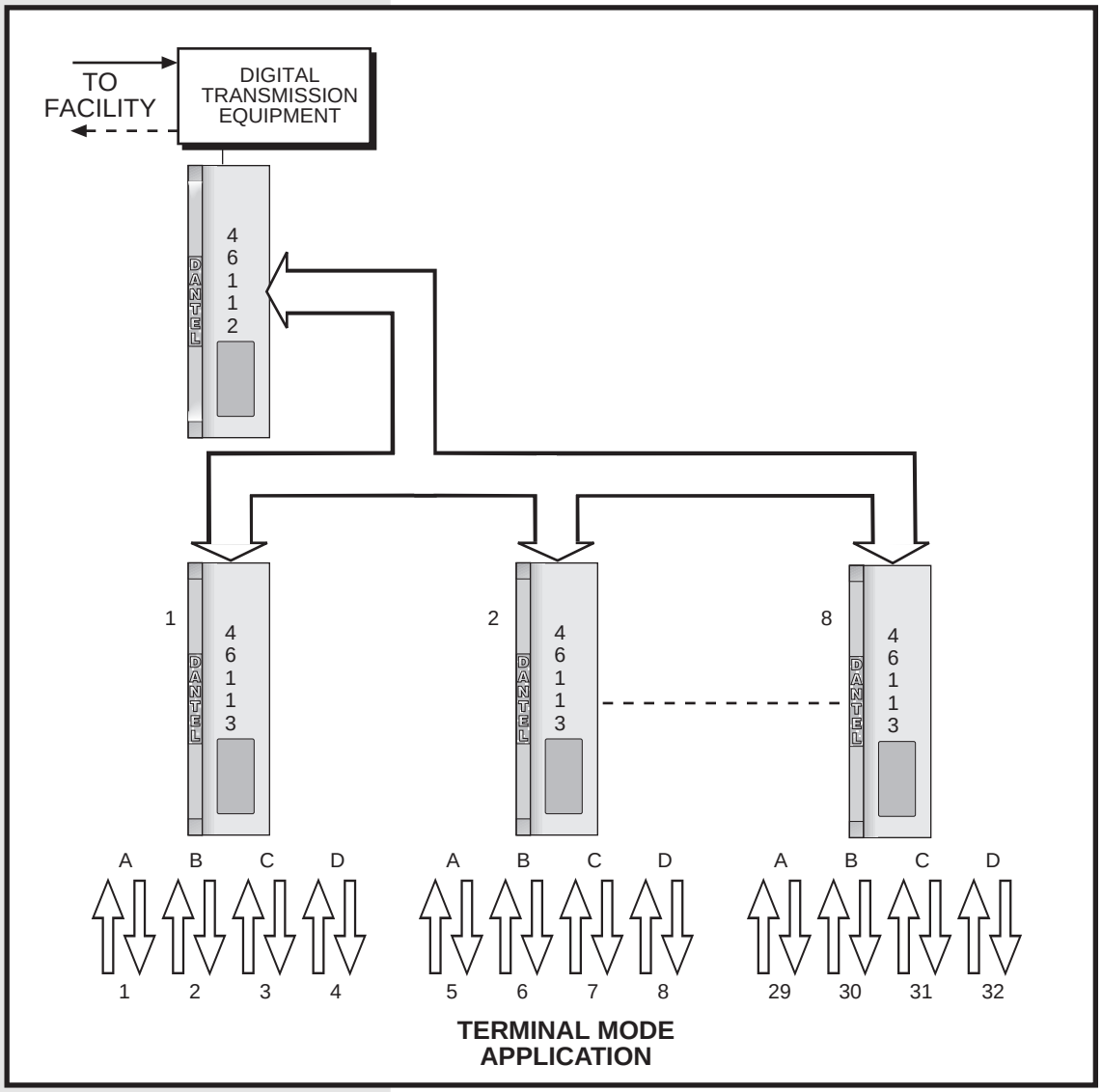
NOTE:

Any combination of the repeater modes can be used together in a system with a maximum of 32 asynchronous ports. The system must not exceed the drop side bandwidth, for all ports, of 38.4 kbs, or 19.2 kbs on any one port.

In this mode, you can transmit and receive data from two different directions. You can drop data received from the west direction of the 46112 ***SynchMaster*** Module to the 46113 ***SynchMaster*** Module. You can also repeat (transmit) through the east direction line side through the other 46112 ***SynchMaster*** Module. You can also transmit data from east to west.

Fig. 6 shows a repeater terminal application. Port A switches are in terminal mode for address 1 on both the west and east 46113 ***SynchMaster*** Modules (drop side). Data received from that port's west direction is always dropped at the west 46113 ***SynchMaster*** Module port A. The west 46112 ***SynchMaster*** Module transmits west data to the east direction if the channels are in repeat mode. The data traveling from east to west transmits the same way.

FIG. 3 - TERMINAL MODE APPLICATION



APPLICATION INFORMATION

FIG. 4 - TERMINAL MODE APPLICATION WIRING

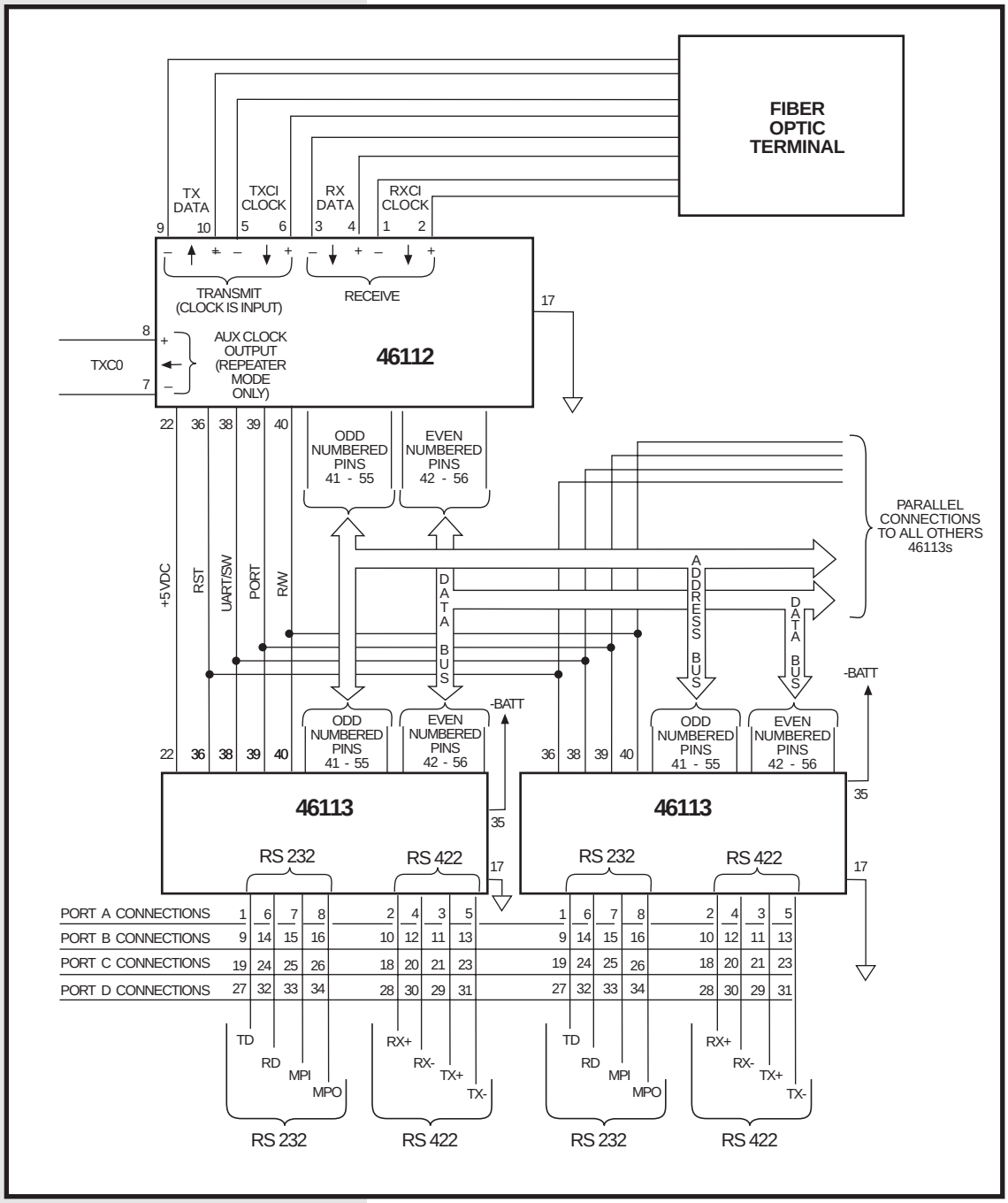


FIG. 5 - SIMPLE REPEATER MODE APPLICATION

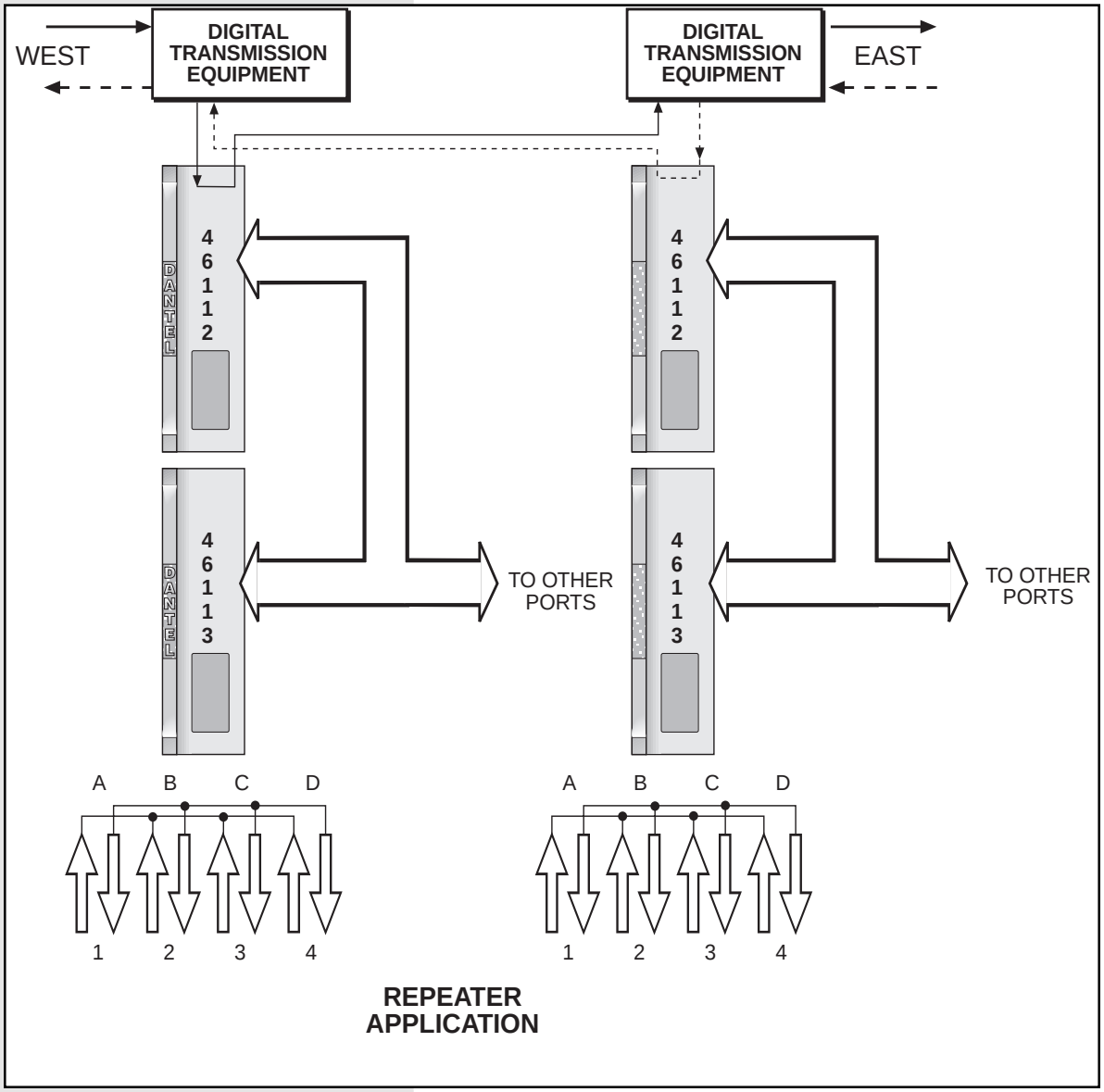
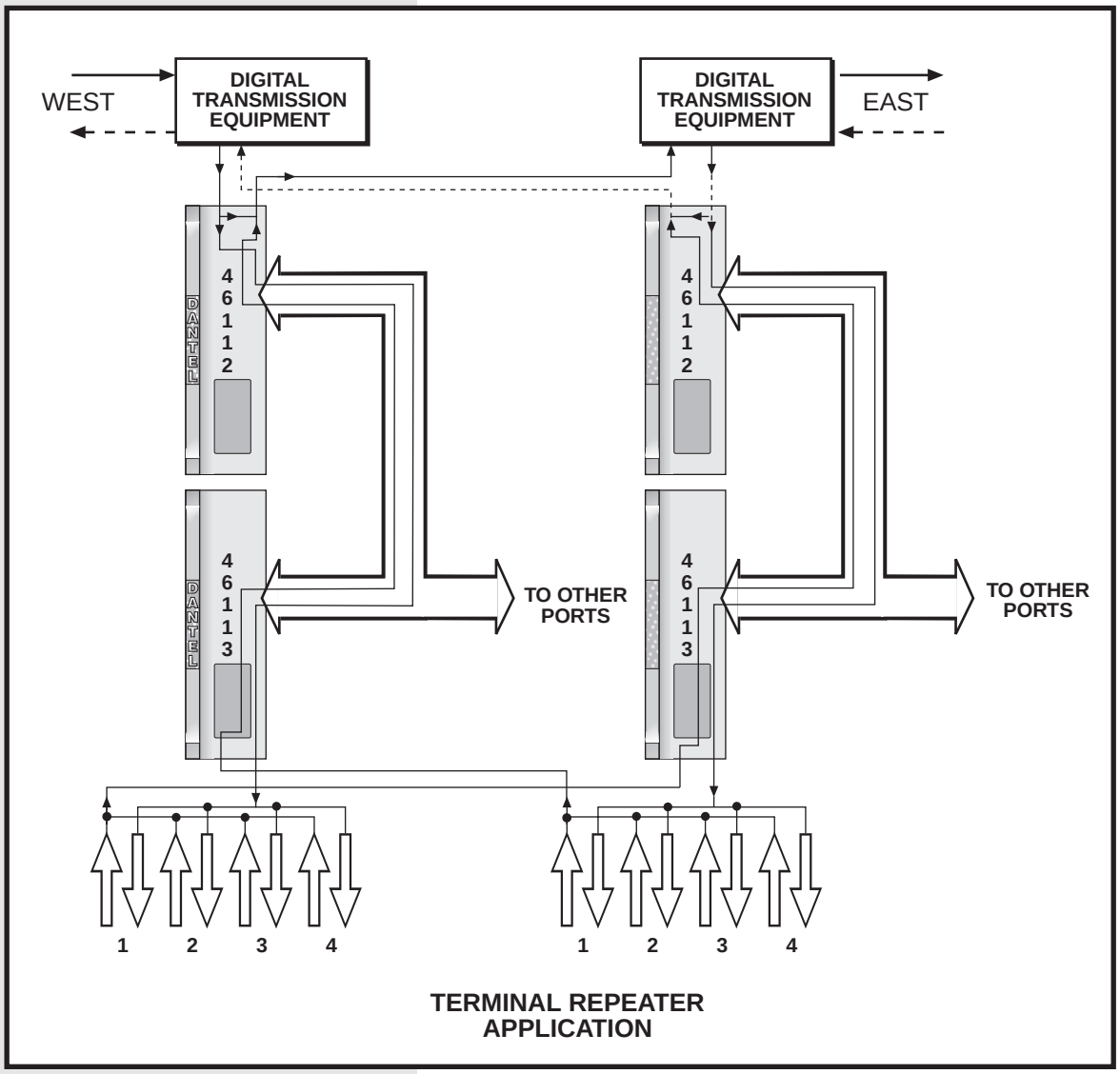


FIG. 6 - REPEATER/TERMINAL MODE APPLICATION



NOTE:
Use factory-set strapping options. Change the strapping options only for special applications.

Installation consists of setting the straps and switches, wiring the pin connectors, and mounting the module in the shelf.

1. Set the 46112 *SynchMaster* Module straps.

Refer to Fig. 7. Each 46112 ***SynchMaster*** Module has two 2-position strapping points that configure the line clock polarity. The first two points are TXCPOL and RXCPOL. When in the POS position, data changes at the rising edge of the clock pulse. When in the NEG position, data changes at the falling edge of the clock pulse.

Set the RS-422 Interface Subassembly straps. Refer to Fig. 7. When you place the straps in the "T" position a terminating resistor connects across the RS-422 differential inputs. When you place the straps in the "O" position you do not connect the terminating resistor.

2. Set the 46113 *SynchMaster* Module straps.

Refer to Fig. 8. The 46113 ***SynchMaster*** Module has four 3-position strapping points that allow terminating resistors for use on the receiver circuits. The resistors are labeled TRMA, TRMB, TRMC and TRMD.

- When placed in the "T" position, the terminating resistor connects across the RS-422 differential inputs.
- When placed in the "O" position, the terminating resistors do not connect.
- To prevent a misleading front panel indicator, place in the "G" position for all applications **except** those using RS-422.

UPDATED

3. Set the 46113 *SynchMaster* Module switches.

The 46113 ***SynchMaster*** Module is the only module with switches. Refer to Fig. 8, Table A, and Table B.

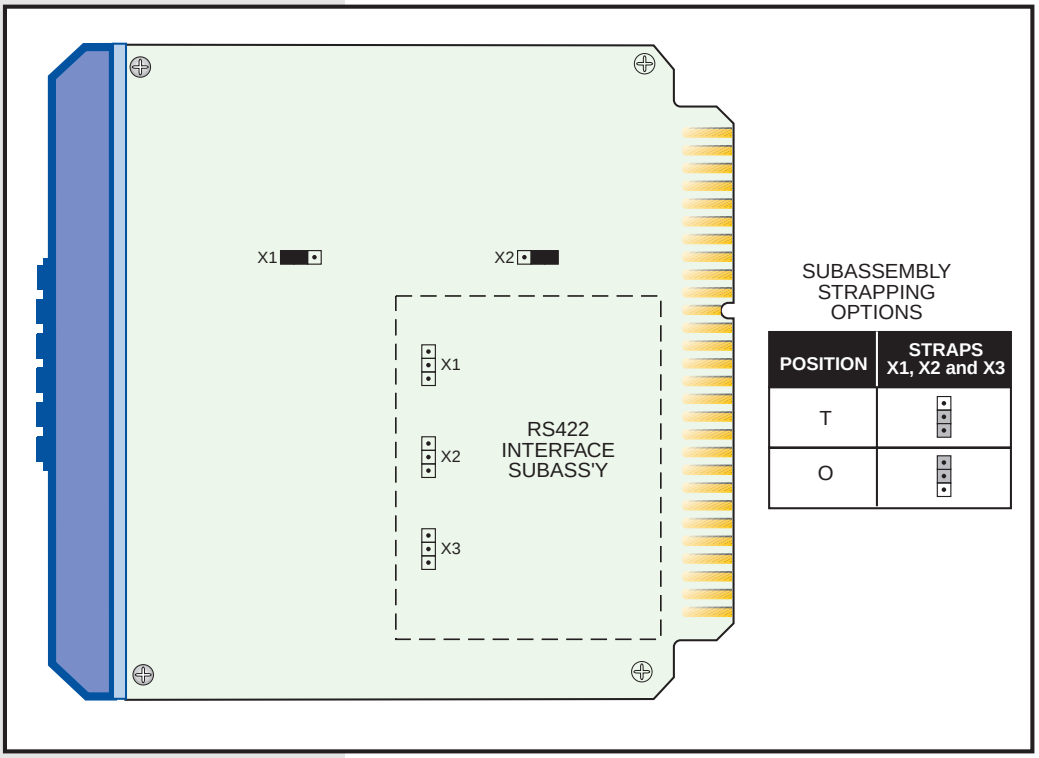
There is a maximum of 32 time slots available in a ***SynchMaster*** system. The baud rate of the equipment utilizing any one port determines how many time slots that port requires. The higher the baud rate, the more time slots it will need. Table C shows the relationship between baud rate and time slots (addresses).

Table D depicts a sample system and shows the relationship between addresses used and baud rates.

Table E is included for your use.

CONTINUED . . .

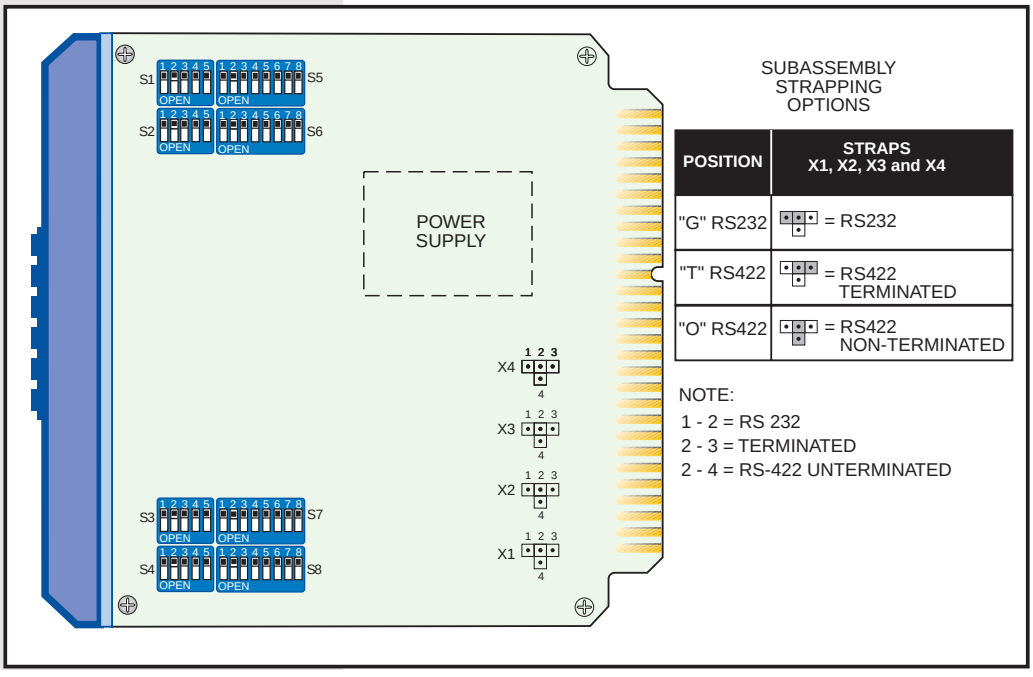
FIG. 7 - STRAP LOCATIONS, 46112



SUBASSEMBLY
STRAPPING
OPTIONS

POSITION	STRAPS X1, X2 and X3
T	
O	

FIG. 8 - SWITCH AND STRAP LOCATIONS, 46113



SUBASSEMBLY
STRAPPING
OPTIONS

POSITION	STRAPS X1, X2, X3 and X4
"G" RS232	= RS232
"T" RS422	= RS422 TERMINATED
"O" RS422	= RS422 NON-TERMINATED

NOTE:
1 - 2 = RS 232
2 - 3 = TERMINATED
2 - 4 = RS-422 UNTERMINATED

TABLE A - 46113 SWITCH SETTINGS FOR SWITCHES 1-4

ADDRESS	SWITCH SETTING				
NOTE: DIP switch 1 for Port A, DIP switch 2 for Port B, DIP switch 3 for Port C and DIP switch 4 for Port D.					
Number	**-1**	**-2**	**-3**	**-4**	**-5**
0	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	ON	ON
4	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	ON	OFF	ON
6	OFF	OFF	ON	ON	OFF
7	OFF	OFF	ON	ON	ON
8	OFF	ON	OFF	OFF	OFF
9	OFF	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON	OFF
11	OFF	ON	OFF	ON	ON
12	OFF	ON	ON	OFF	OFF
13	OFF	ON	ON	OFF	ON
14	OFF	ON	ON	ON	OFF
15	OFF	ON	ON	ON	ON
16	ON	OFF	OFF	OFF	OFF
17	ON	OFF	OFF	OFF	ON
18	ON	OFF	OFF	ON	OFF
19	ON	OFF	OFF	ON	ON
20	ON	OFF	ON	OFF	OFF
21	ON	OFF	ON	OFF	ON
22	ON	OFF	ON	ON	OFF
23	ON	OFF	ON	ON	ON
24	ON	ON	OFF	OFF	OFF
25	ON	ON	OFF	OFF	ON
26	ON	ON	OFF	ON	OFF
27	ON	ON	OFF	ON	ON
28	ON	ON	ON	OFF	OFF
29	ON	ON	ON	OFF	ON
30	ON	ON	ON	ON	OFF
31	ON	ON	ON	ON	ON
CAUTION: Always set each port's address differently. Giving two ports the same address will result in sporadic operation.					

TABLE B - 46113 SWITCH SETTINGS FOR SWITCHES 5-8

SWITCH FUNCTIONS (S5-1 to -8 = A, S6-1 to -8 = B, S7-1 to -8 = C, S8-1 to -8 = D)									
DESCRIPTION		**SWITCH SETTING**							
		-1	**-2**	**-3**	**-4**	**-5**	**-6**	**-7**	**-8**
MODE	Terminal	ON	-	-	-	-	-	-	-
	Repeater	OFF	-	-	-	-	-	-	-
STOP BITS	1 Bit	-	ON	-	-	-	-	-	-
	2 Bits	-	OFF	-	-	-	-	-	-
Data Bits	7 Bits	-	-	ON	-	-	-	-	-
	8 Bits	-	-	OFF	-	-	-	-	-
Parity	None	-	-	-	OFF	ON	-	-	-
	Even	-	-	-	ON	OFF	-	-	-
	Odd	-	-	-	OFF	OFF	-	-	-
Data Rate (Baud)	Reserved	-	-	-	-	-	ON	ON	ON
	110	-	-	-	-	-	OFF	ON	ON
	300	-	-	-	-	-	ON	OFF	ON
	1200	-	-	-	-	-	OFF	OFF	ON
	2400	-	-	-	-	-	ON	ON	OFF
	4800	-	-	-	-	-	OFF	ON	OFF
	9600	-	-	-	-	-	ON	OFF	OFF
	19.2 K	-	-	-	-	-	OFF	OFF	OFF
Port Deactivated		ON	ON	ON	ON	ON	ON	ON	ON

NOTES:

1. Make a list of all of the ports to be used along with their specified baud. Add all of the baud rates together and verify that the total does not exceed 38.4 kbits. (An example port baud/address list as well as blank list forms follow the switch settings table below.

2. Assign port addresses to the highest baud rates first, followed by progressively lower rates. Each time an address is assigned, note which addresses become unavailable, then go on to assign the next port to be used to the next available address.

3. Allowable address switch settings for specific data rates are listed below. Note that not all 32 addresses are available to ports with data rates higher than 1200 baud.

4. All switch numbers listed are for individual switches on a port's DIP (i.e. - to set the address of Port B, DIP switch 2, switches 1 through 5 would be used). The switches are assigned as follows; DIP switch 1 for Port A, DIP switch 2 for Port B, DIP switch 3 for Port C and DIP switch 4 for Port D.

TABLE C - ALLOWABLE PORT ADDRESSES VERSUS PORT DATA RATE

BAUD (b/s)	ALLOWED PORT ADDRESS	PORT ADDRESSES NO LONGER AVAILABLE	SWITCH SETTINGS				
			-1	-2	-3	-4	-5
19.2K	0	2 thru 30, even numbered	OFF	OFF	OFF	OFF	OFF
19.2K	1	3 thru 31, odd numbered	OFF	OFF	OFF	OFF	ON
9600	0	4, 8, 12, 16, 20, 24, 28	OFF	OFF	OFF	OFF	OFF
9600	1	5, 9, 13, 17, 21, 25, 29	OFF	OFF	OFF	OFF	ON
9600	2	6, 10, 14, 18, 22, 26, 30	OFF	OFF	OFF	ON	OFF
9600	3	7, 11, 15, 19, 23, 27, 31	OFF	OFF	OFF	ON	ON
4800	0	8,16, 24	OFF	OFF	OFF	OFF	OFF
4800	1	9, 17, 25	OFF	OFF	OFF	OFF	ON
4800	2	10, 18, 26	OFF	OFF	OFF	ON	OFF
4800	3	11, 19, 27	OFF	OFF	OFF	ON	ON
4800	4	12, 20, 28	OFF	OFF	ON	OFF	OFF
4800	5	13, 21, 29	OFF	OFF	ON	OFF	ON
4800	6	14, 22, 30	OFF	OFF	ON	ON	OFF
4800	7	15, 23, 31	OFF	OFF	ON	ON	ON
2400	0	16	OFF	OFF	OFF	OFF	OFF
2400	1	17	OFF	OFF	OFF	OFF	ON
2400	2	18	OFF	OFF	OFF	ON	OFF
2400	3	19	OFF	OFF	OFF	ON	ON
2400	4	20	OFF	OFF	ON	OFF	OFF
2400	5	21	OFF	OFF	ON	OFF	ON
2400	6	22	OFF	OFF	ON	ON	OFF
2400	7	23	OFF	OFF	ON	ON	ON
2400	8	24	OFF	ON	OFF	OFF	OFF
2400	9	25	OFF	ON	OFF	OFF	ON
2400	10	26	OFF	ON	OFF	ON	OFF
2400	11	27	OFF	ON	OFF	ON	ON
2400	12	28	OFF	ON	ON	OFF	OFF
2400	13	29	OFF	ON	ON	OFF	ON
2400	14	30	OFF	ON	ON	ON	OFF
2400	15	31	OFF	ON	ON	ON	ON
1200 or lower		0 - 31					

TABLE D - EXAMPLE PORT ADDRESS ALLOCATION TABLE

SWITCH SETTINGS							
ADDRESS	-1	-2	-3	-4	-5	PORT	DESCRIPTION
0	OFF	OFF	OFF	OFF	OFF	1A	Port 1, 9600 Baud
1	OFF	OFF	OFF	OFF	ON	1B	Port 2, 4800 Baud
2	OFF	OFF	OFF	ON	OFF	1C	Port 3, 4800 Baud
3	OFF	OFF	OFF	ON	ON	1D	Port 4, 2400 Baud
4	OFF	OFF	ON	OFF	OFF		<Port 1>
5	OFF	OFF	ON	OFF	ON	2A	Port 5, 2400 Baud
6	OFF	OFF	ON	ON	OFF	2B	Port 6, 2400 Baud
7	OFF	OFF	ON	ON	ON	2C	Port 7, 1200 Baud
8	OFF	ON	OFF	OFF	OFF		<Port 1>
9	OFF	ON	OFF	OFF	ON		<Port 2>
10	OFF	ON	OFF	ON	OFF		<Port 3>
11	OFF	ON	OFF	ON	ON	2D	Port 8, 1200 Baud
12	OFF	ON	ON	OFF	OFF		<Port 1>
13	OFF	ON	ON	OFF	ON	3A	Port 9, 1200 Baud
14	OFF	ON	ON	ON	OFF		Not Used
15	OFF	ON	ON	ON	ON		Not Used
16	ON	OFF	OFF	OFF	OFF		<Port 1>
17	ON	OFF	OFF	OFF	ON		<Port 2>
18	ON	OFF	OFF	ON	OFF		<Port 3>
19	ON	OFF	OFF	ON	ON		<Port 4>
20	ON	OFF	ON	OFF	OFF		<Port 1>
21	ON	OFF	ON	OFF	ON		<Port 5>
22	ON	OFF	ON	ON	OFF		<Port 6>
23	ON	OFF	ON	ON	ON		Not Used
24	ON	ON	OFF	OFF	OFF		<Port 1>
25	ON	ON	OFF	OFF	ON		<Port 2>
26	ON	ON	OFF	ON	OFF		<Port 3>
27	ON	ON	OFF	ON	ON		Not Used
28	ON	ON	ON	OFF	OFF		<Port 1>
29	ON	ON	ON	OFF	ON		Not Used
30	ON	ON	ON	ON	OFF		Not Used
31	ON	ON	ON	ON	ON	3B, C, D	Not Used

Table E - Blank Port Address Allocation Table

	SWITCH SETTINGS						
ADDRESS	-1	-2	-3	-4	-5	PORT	DESCRIPTION
0							
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

4. Wire the pin connector.

Wire the 46112 and 46113 ***SynchMaster*** Module connectors in the shelf. Refer to Figs. 9 and 10.

5. Install the modules in the shelf.

Install the module in the proper equipment shelf slot by sliding the module along the guide slots, then firmly seating the edge connector.

FIG. 9 - PIN DESIGNATIONS, 46112

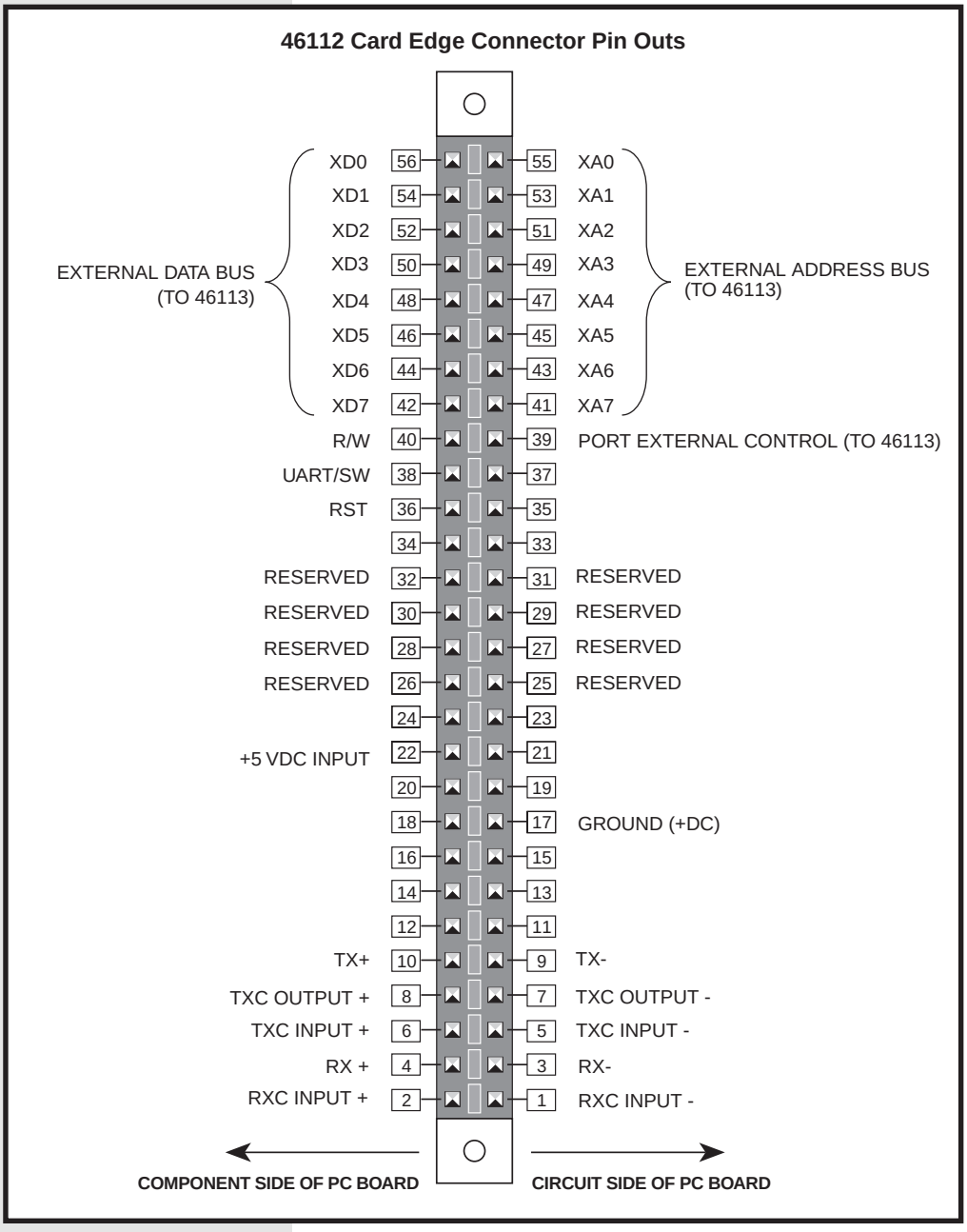
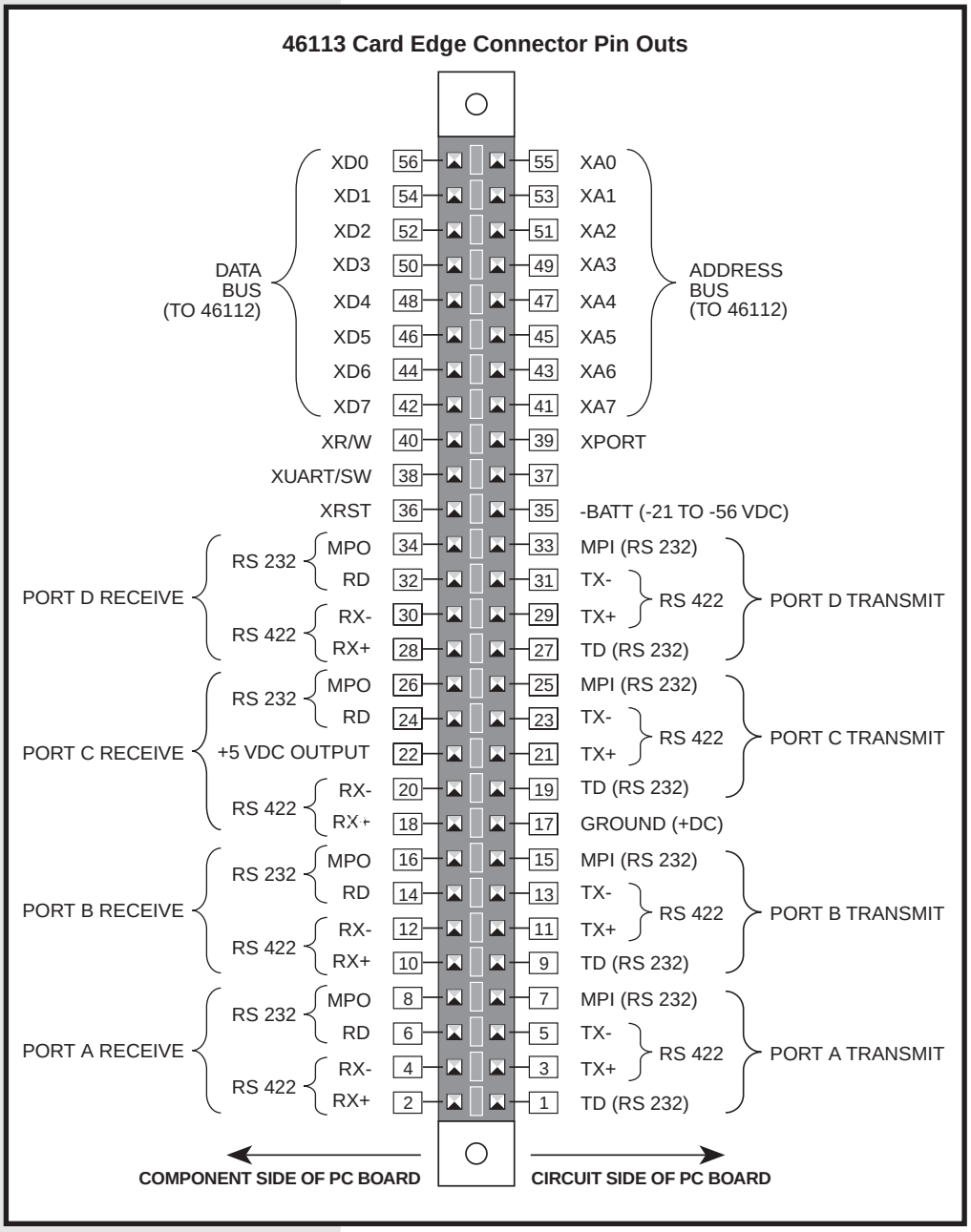


FIG. 10 - PIN DESIGNATIONS, 46113



Operation of the 46112 and 46113 ***SynchMaster*** Modules consists of observing the front panel LEDs. Refer to Figs. 11 and 12.

NOTE:

When the unit initially powers up, the TX REPEAT LED blinks on and off at a one second interval if you set any 46113 ***SynchMaster*** Module switches incorrectly. If this happens, recheck the 46113 ***SynchMaster*** Module switch settings.

46112 Status indicating LEDs

The 46112 ***SynchMaster*** Module's green status indicating LEDs are designated as follows:

- **RX SYNC** The RX SYNC LED lights up when the 46112 ***SynchMaster*** Module receives frame information properly.
- **TX INSERT** When data is transmitted to a port configured for the 46112 ***SynchMaster*** Module, the TX INSERT LED will light.
- **TX REPEAT** When lit, the TX REPEAT LED indicates that data is not being transmitted at the site. Either the TX REPEAT or the TX INSERT will be on alternatively.

46113 Status indicating LEDs

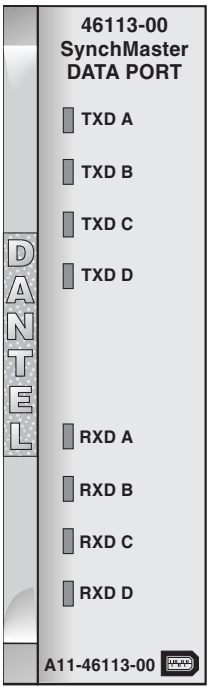
There are two sets of four green front panel LEDs.

The top four LEDs are labeled TXD (ports A to D) and light up when the port (A, B, C or D) drop side equipment transmits data through the 46113 ***SynchMaster*** Module.

The bottom four LEDs are labeled RXD (ports A to D) and light up when the port (A, B, C or D) receives data from a remote 46113 ***SynchMaster*** Module and transmits the data to the drop equipment.

FIG. 11 - FRONT PANEL, 46112

FIG. 12 - FRONT PANEL, 46113



TECHNICAL SPECIFICATIONS

DESCRIPTION	VALUE			
Power Requirements Input Voltage (To 46113 Module Only)	-21 to -56 VDC			
Current (in mA)	-21 VDC	-21 VDC	-21 VDC	-21 VDC
46113 (Alone) RS422 Interface Idle Active RS422 Interface Idle Active	 109 129 86 105	 102 116 79 93	 64 72 55 63	 62 70 52 61
46112 and 46113 Both RS422 Interface Idle Active RS232 Interface Idle Active	 130 217 173 195	 179 198 156 175	 107 198 98 106	 101 107 91 98
NOTE: All current values are nominal. Add 5% to the nominal values to get the maximum allowable.				
RS232 Receivers Input High Voltage Input Low Voltage Drivers Output High Voltage Output Low Voltage Short Circuit Current Output Resistance Maximum Load Resistance	 +3 to 5 V -3 to -5 V 10.5 V Typical 9.0 Minimum w/3K Ohm Load 9.5 V Typical w/No Load 8 V Minimum w/3 K Ohm Load 45 mA Maximum 300 Ohms Minimum 3 K Ohms			
RS422 Receivers Differential Input (Threshold Voltage) Common Mode Input Voltage Drivers Differential Output Voltage Short Circuit Current Maximum Load Resistance	 +/-0.2 V (Referenced to Ground) +/-7.0 V Maximum (Referenced to Ground) +/ 4.0 V Load +/-2.0 Minimum, 100 Ohm Load (Referenced at Inverting Output) 150 Ohms Minimum 100 Ohms			
SynchMaster FAILURE ANALYSIS CONTROLLER MODULE Failure Rate MTBF PORT MODULE (with power supply) Failure Rate MTBF	 1212.6 FITs 824699.4 Hours 5807.9 FITs 172177.9 Hours			
Weight 46112 46113	 6.5 ounces 9.5 ounces			
Physical Dimensions (For Each Module)	1.4 " x 6.0" x 5.6"			
Operating Temperature Range	0 to 55 Degrees C.			

WARRANTY

LIMITED WARRANTY

The Seller warrants that the standard hardware products sold will be free from defects in material and workmanship and perform to the Seller's applicable published specifications for a period of 18 months for hardware, and 3 months for software, from the date of the original invoice. The liability of the Seller hereunder shall be limited to replacing or repairing, at its option, any defective products which are returned F.O.B. to the Seller's plant, (or, at the Seller's option, refunding the purchase price of such products). In no case are products to be returned without first obtaining permission and a customer return authorization number from the Seller. In no event shall the Seller be liable for any consequential or incidental damages.

Equipment or parts which have been subject to abuse, misuse, accident, alteration, neglect, unauthorized repair or installation are not covered by warranty. The Seller shall make the final determination as to the existence and cause of any alleged defect. No warranty is made with respect to custom equipment or products produced to the Buyer's specifications except as specifically stated in writing by the Seller in the contract for such custom equipment.

This warranty is the only warranty made by the Seller with respect to the goods delivered hereunder, and may be modified or amended only by a written instrument signed by a duly authorized officer of the Seller and accepted by the Buyer.

Warranty and remedies on products not manufactured by the Seller are in accordance with warranty of the respective manufacturer. THE SELLER MAKES NO OTHER WARRANTY OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED; AND ALL IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEEDS THE AFORESAID OBLIGATIONS IS HEREBY DISCLAIMED BY THE SELLER.

IN CASE OF DIFFICULTY

If you experience difficulty with this equipment, check the following, as appropriate:

1. **Switch settings**
2. **Signal levels**
3. **Software configuration**
4. **Connections between Dantel's equipment and your equipment.**

If there is still a problem, substitute equipment that is known to be good. For additional assistance, call Dantel's Technical Field Service Department weekdays, 6 A.M. to 5 P.M. pacific time:

1-800-4DANTEL (1-800-432-6835).

If a thorough checkout shows a piece of equipment has malfunctioned, you may return it to the factory. For repairs and emergency replacements, obtain a Return Material Authorization (RMA) number from the Customer Service Representative at **1-800-4DANTEL** (1-800-432-6835).

To ensure expedient processing of your order, provide a purchase order number and shipping and billing information when requesting an RMA number. Also, when the units are returned to Dantel, include a description of the failure symptoms for each unit returned. Send defective equipment to:

Dantel, Inc. • 2991 North Argyle Avenue • Fresno, California 93727-1388

Dantel

P.O. Box 55013 • Fresno, CA 93747-5013 Phone (559) 292-1111 Fax (559) 292-9355 http://www.dantel.com