8-RO EXPANSION BOARD

For
Part No.'s
537-3000
810-1010
810-1015
810-2010
810-2015
810-2035

DOCUMENT No. 025-3000

December, 1988

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Computer Process Controls, Inc.
1275 Kennestone Circle, Suite 100
Marietta, GA 30066 (404) 425-2724

CPC

COMPUTER PROCESS CONTROLS, INC.
8RO EXPANSION BOARD

The CPC 8RO Expansion Board is an optional add-on board available for the CPC 1602 Monitor and Control Unit (MCU). The 8RO Expansion Board provides the 1602 with an additional 8 Relayed Outputs (RO) and at present 3 boards may be added to the 1602 MCU. Whether local to the 1602 or on an 8RO board, the 1602 outputs are all programmed and operate in the same way as described in the "1602 Monitor and Control System" manual.

The 8RO is connected to the 1602 by way of the "Expansion Communication Bus" which means the 8RO boards can be mounted where the devices being controlled are located. This "remote location" feature will decrease the installation time and cost since only a communication cable is required to connect the 8RO to a 1602 MCU.

SPECIFICATIONS

Microprocessor	8751 Microcontroller
Communications	RS-485 Interface operationg at 1200, 2400, 4800, or 9600 baud
Power Requirement	10VAC, 8 volt-amps (0.8A) from a 20 volt center-tap transformer
Field Outputs	8 Outputs, 240V maximum, 2A per output When multiple outputs are used, the output currents must be derated so that the total volt-amps of the input power (7.5 VA) and outputs does not exceed 2000 VA. For example, when using all 8 outputs at 208 volts, 1992 VA is available for the outputs, which is 1.2 amps maximum per output.
Features	Switch selectable network ID Switch selectable baud rate Jumper selectable N.O./N.C.outputs 8 LED output state indicators LED power/communication indicator

Failure Protection	outputs go to jumper selectable N.O. or N.C. state if:
	- power fails
	- communication fails
	- 1602 fails to update 8RO once a minute
	Automatic reinsertion into network
Dimensions	10" x 4" x 2" (LxWxH)
Mounting Dimensions	6 - 6/32 screws (3/side) (see FIG. 3 dimensions)
Weight	approx. 2 lb.

HARDWARE SETUP

1. 8RO Board Hardware Setup (See FIG. 3)

a. S1 Network Switches set the Expansion Bus Device ID and baud rate.

Switches 1-5 define the board device number (1-16). Each 8RO on the Expansion Bus must have a different device number, but these device numbers are group independent so an 8RO and a 1602 MCU may both be assigned device number 1. Set the device number using the table below.

ID	POSITION 1 2 3 4 5	
0	0 0 0 0 0	1 = ON
1	1 0 0 0 0	0 = OFF
2	0 1 0 0 0	
3	1 1 0 0 0	

Switches 6-7 set the RS-485 baud rate. Set the baud using the table below.

BAUD	POSITION 6 7	
1200	0 0	1 = ON
2400	1 0	0 = OFF
*4800	0 1	
9600	1 1	

b. S2 Failsafe Switches set the default output state.

If the power or network communication fails, these switches along with jumpers JU4-JU11 determine the the Normally Open, Normally Closed Position of the relays. Each of the 8 switch positions on S2 must be set for proper operation of the jumpers, JU4-JU11 (next to the 8 fuses). For example, if jumper JU4 is in the "Normally Open" position, switch 1 of S2 should be OFF. If JU4 is in the "Normally Closed" position, switch 1 of S2 should be ON.

c. Jumpers JU1,JU2,JU3 set terminating resistance for the RS-485 communication bus.

DEVICES AT THE ENDS OF THE EXPANSION COMMUNICATION BUS REQUIRE TERMINATING RESISTORS FOR PROPER OPERATION OF THE RS-485 LINE.

These jumpers are located on the 8RO board right next to the RS-485 communication terminal block. The jumper positions depend on how the Expansion Communication Bus is wired. Use FIG.1 and the configurations below to constuct a cable with 2-conductor shielded wire. The cable should be 20 gauge Belden #9154 or equivilant. The 1602 is used below as an example. Other devices communicating with the 8RO will follow the same general rule.

8RO----1602----8RO

8RO----1602----8RO----8RO

1602----8RO

1602----8RO----8RO

1602----8RO----8RO----8RO

* marked devices require terminating resistors

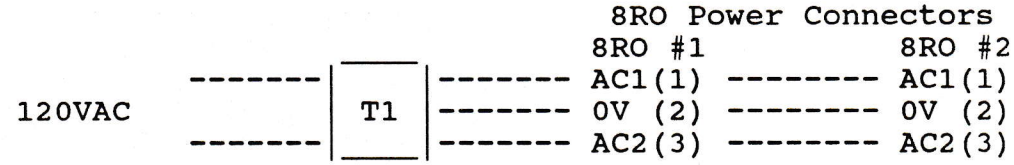
1. 8RO Board set up as an END device (* marked) requires jumpers, JU1, JU2, JU3 to all be in their positions CLOSEST to the RS-485 communication terminal block.

2. 8RO Board set up as a MIDDLE device (unmarked) requires jumpers, JU1, JU2, JU3 to all be in their positions AWAY from the RS-485 communication terminal block.

3. 1602 set up as a MIDDLE or END device (unmarked/marked) requires no changes since terminating resistors are not needed.

d. 8RO Power Requirements.

Each 8RO requires 10VAC and draws a maximum of 0.8A. CPC, Inc. recommends a 20VAC, 2.0A, center tap transformer (T1 below) to power 2 8RO's. A 2-conductor shielded wire (20 gauge Belden #9154 or 16 gauge Belden #8719 for long runs) should be used to connect the transformer, T1, to the 8RO Power Connectors.



e. Connecting the Outputs.

Each of the 8 outputs is provided with a 2 pole terminal block used to connect the relays. Even numbered terminal positions (8-22) should be connected to LOAD, and odd numbered terminal positions (7-21) should be connected to LINE.

2. 1602 Expansion Bus Device Hardware Setup.

Any device communicating on the Expansion Bus with the 8RO board(s) will have to have a matching baud rate. The 1602 MCU's baud is set using switches 3 and 4 on the 1602 Digital I\O Board. See the "1602 Monitor and Control System" Manual, FIG.2-2).

BAUD	POSITION 3 4	
1200	0 0	1 = ON
2400	1 0	0 = OFF
*4800	0 1	
9600	1 1	

SOFTWARE SETUP

1. Programming the 1602 Expansion Bus Network Setpoints.

    a. Network Device Numbers.

    Each 8RO on the Expansion Bus must have a different device number, but since the device numbers are group independent, the 1602 MCU and the 8RO's can both start with device number 1. From the 1602 "Main Menu", select 10, the "System Info" Menu. Select "Device" to define the device numbers. Enter the Expansion Device number for the 1602, and likewise for the 8RO Output Boards. Make sure that the device number corresponds to the 8RO switches 1-5 set on S1 (8RO Board Hardware Setup). If the board does not exist, enter a 0 for "undefined".

    b. Network ON/OFF Feature.

    Select 13 from the "Main Menu" to display the "Network Menu." The "Reset" option allows the Expansion Bus Network communication to be turned OFF or reset (turn Network ON). This completes the Network programming.

2. Programming the 1602 Output (17-40) Setpoints.

    The expansion of the outputs from 16 up to 40 does not change the "Output Menu" Monitoring or Programming except to reflect the increased number of outputs.

MONITORING

1. 1602 Network Monitoring.

To see if the Network is operating after "Programming the Network Setpoints" and "Programming the 1602 Outputs", select "Outputs" from the 1602's "Main Menu". Now select "List Output Status" and notice the heading for Outputs 17-40. The heading displays an ONLINE or OFFLINE status for each 8RO board. If an 8RO board is OFFLINE, check the 1602's "Unacknowledged Alarms Log" and see "Network Errors" in this manual for the problem cause/solution.

2. Network Errors.

Although every precaution has been taken to make the Expansion Bus Network "maintenance free", occasionally the need for operator intervention may be needed. Network errors appear in the "Logging Menu" under Unacknowledged or Aknowledged Alarms.

Message	Notice/Alarm
No Expansion Devices	Alarm
Node ONLINE 8RO ID = 1	Notice
Token Pass Missed 8RO ID = 1	Notice
No Response - Node OFFLINE 8RO ID = 1	Alarm
Bad Msg. - Node OFFLINE 8RO ID = 1	Alarm
Bad CKSum - Node OFFLINE 8RO ID = 1	Alarm

The "No Expansion Devices" Alarm means the Network is down due together a hardware or programming problem. This Alarm should be followed by one or more "Node ONLINE..." Notice(s) within 7-8 minutes. If no "Node ONLINE..." Notice occurs, Check the RS-485 communication line and step back through "Programming the 1602 Network Setpoints".

The last 3 alarms the result in "...Node OFFLINE..." and should also be followed by a "Node ONLINE..." notice. If no "Node ONLINE..." Notice occurs, check the hardware and programming as described above.

The "Token Pass Missed..." error is self correcting and requires no action.

Most of the above errors tend to be "self correcting". If an expansion board is disconnected from the Expansion Communication Bus, powered down, or goes OFFLINE for any reason, the 1602 will check on the board once a minute until it responds or is removed from the device definitions ("System Info" Menu).

Figure 1

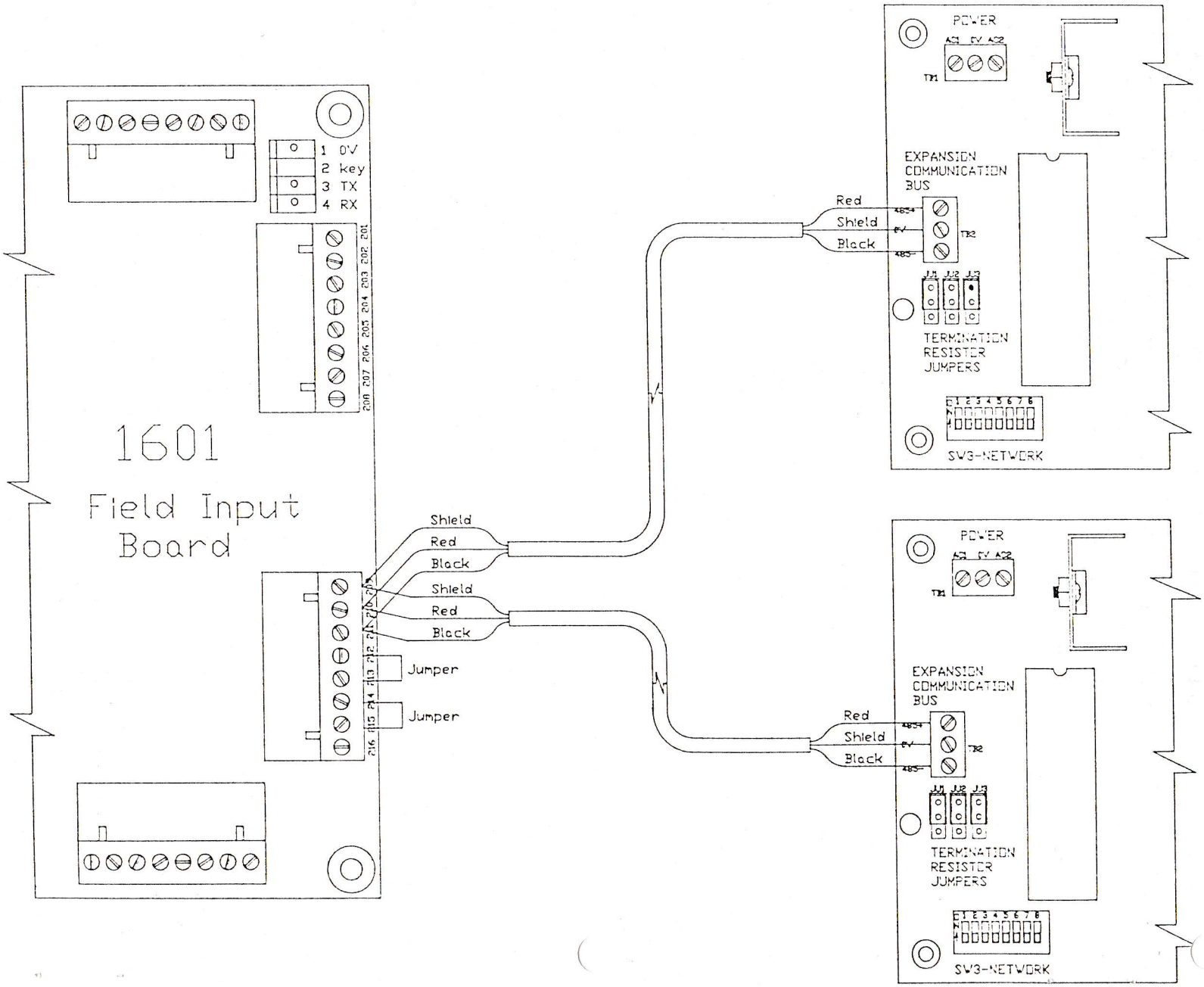
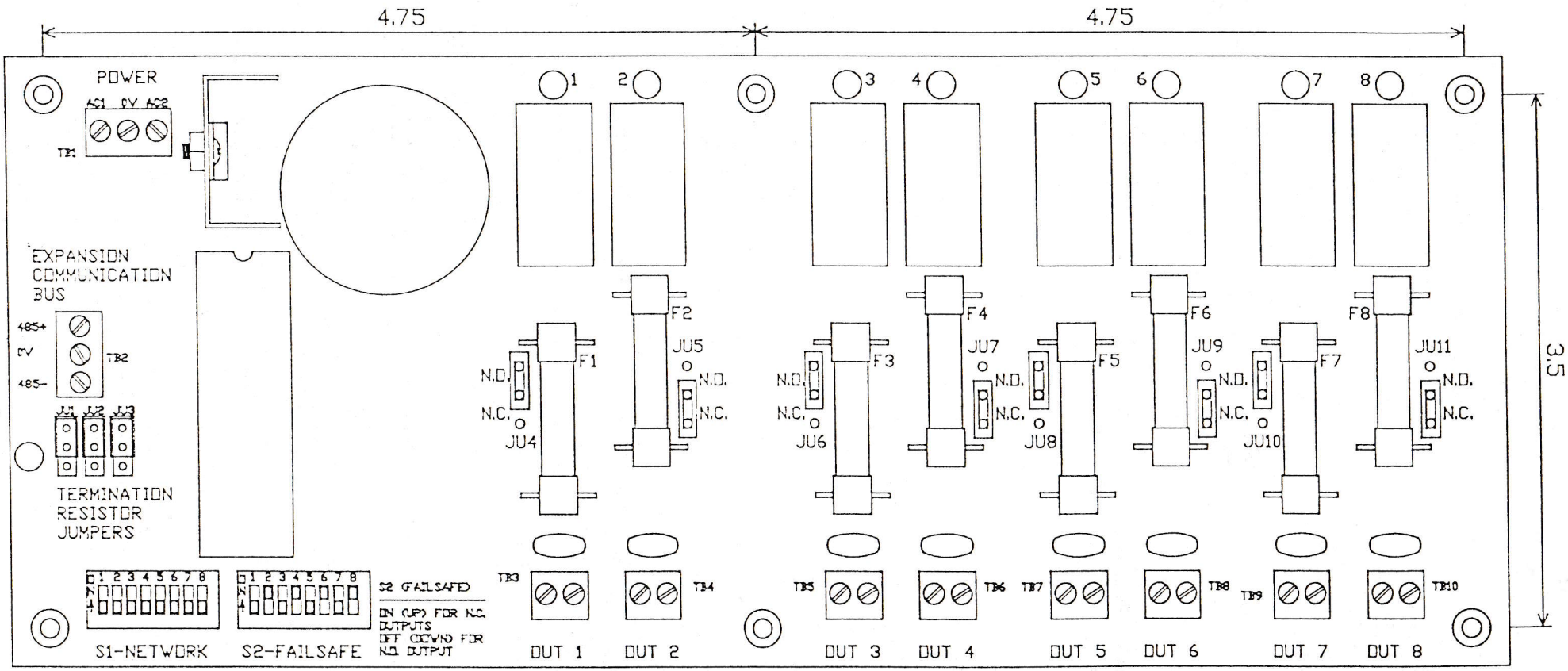
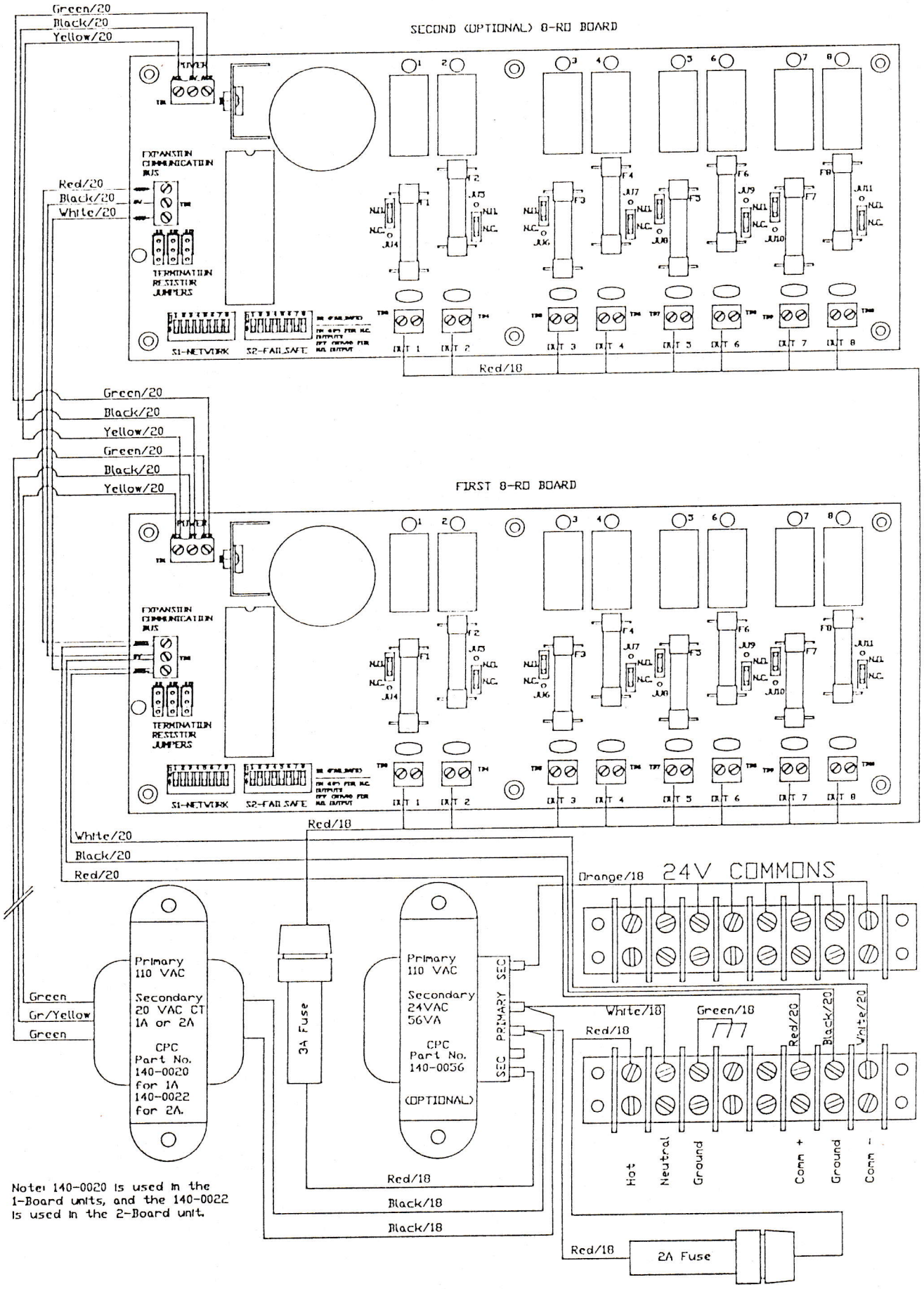

1 0V
2 key
3 TX
4 RX
200 207 206 205 204 203 202 201
1601
Field Input
Board
Shield
Red
Black
Shield
Red
Black
Jumper
Jumper
216 215 214 213 212 211 210 209
POWER
EXPANSION
COMMUNICATION
BUS
Red
Shield
Black
TERMINATION
RESISTOR
JUMPERS
SW3-NETWORK
POWER
EXPANSION
COMMUNICATION
BUS
Red
Shield
Black
TERMINATION
RESISTOR
JUMPERS
SW3-NETWORK

Figure 3



Note: As shown, Outputs 1, 3, 5, and 7 are setup to fail in the OPEN position. Outputs 2, 4, 6, and 8 are setup to fail in the CLOSED position.

8-RO EXPANSION BOARD
(Shown Actual Size)


SECOND (OPTIONAL) 8-RO BOARD
FIRST 8-RO BOARD
Green/20
Black/20
Yellow/20
Red/20
White/20
Red/18
EXPANSION COMMUNICATION BUS
TERMINATION RESISTOR JUMPERS
S1-NETWORK
S2-FAILSAFE
OUT 1
OUT 2
OUT 3
OUT 4
OUT 5
OUT 6
OUT 7
OUT 8
24V COMMONS
Orange/18
Primary 110 VAC
Secondary 20 VAC CT 1A or 2A
CPC Part No. 140-0020 for 1A 140-0022 for 2A.
Green
Gr/Yellow
3A Fuse
Primary 110 VAC
Secondary 24VAC 56VA
CPC Part No. 140-0056
(OPTIONAL)
SEC
PRIMARY
SEC
White/18
Green/18
Red/20
Black/20
White/20
Hot
Neutral
Ground
Comm +
Ground
Comm -
Black/18
2A Fuse
Note: 140-0020 is used in the 1-Board units, and the 140-0022 is used in the 2-Board unit.