

16-AI EXPANSION BOARD

**FOR
Part Nos.
537-3010
810-1020
810-2020**

DOCUMENT No. 025-3010

December, 1988

Data, drawings and other material contained herein are proprietary to Computer Process Controls, Inc. and may not be reproduced without the prior approval of Computer Process Controls.

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

The logo consists of the letters 'CPC' in a bold, stylized, sans-serif font. The 'C' and 'P' are connected, and the 'C' is slightly larger than the 'P'. The letters are black and set against a light blue background.

COMPUTER PROCESS CONTROLS, INC.
16AI EXPANSION BOARD

The CPC 16AI Expansion Board is an optional add-on board available for the CPC 1602 Monitor and Control Unit (MCU). The 16AI Expansion Board provides the 1602 with an additional 16 inputs which may be programmed as analog or dry contact digital. Two 16AI boards may be added to a 1602 MCU, bringing the total number of inputs up to 64.

The 16AI is connected to the 1602 by way of the "Expansion Communication Bus", which means the 16AI boards can be mounted where the devices being monitored are located. This "remote location" feature will decrease the installation time and cost since only a shielded 2-conductor communication cable is required to connect the 16AI to a 1602 MCU.

SPECIFICATIONS

Microprocessor	8751 Microcontroller
Communications	RS-485 Interface operationg at 1200, 2400, 4800, or 9600 baud.
Field Inputs	1 to 16 analog (-1 to +7VDC) OR 1 to 16 DRY CONTACT digital inputs
Power Requirement	10VAC, 7.5 volt-amps (0.75A) from a 20 volt center-tap transformer
Features	Switch selectable network ID Switch selectable baud rate LED for power/communication 4-5VDC connectors and 4- 12VDC connectors (100 mA maximum load for any one connector with 320 mA maximum combined load)
Failure Protection	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. 1 lb.

HARDWARE SETUP

1. 16AI Board Hardware Setup (See FIG. 3)

a. S1-S2 Temperature Switches determine whether an input is to be used to monitor temperature.

If the input is to be used to read temperature or as a DRY CONTACT digital, the corresponding switch on S1 or S2 should be ON. For any other type input, linear, pressure, etc., the switch should be OFF.

b. S3 Network Switches set the Expansion Bus Device ID and baud rate.

Switches 1-5 define the board device number (1-16). Each 16AI on the Expansion Communication Bus must have a different device number, but these device numbers are group independent so a 16AI 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	1	0	0	0	0
2	0	1	0	0	0

1 = ON
0 = OFF

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

BAUD	POSITION	
	6	7
1200	0	0
2400	1	0
*4800	0	1
9600	1	1

1 = ON
0 = OFF

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

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

These jumpers are located on the 16AI 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, FIG. 2 and the configurations below to construct a 2-conductor shielded wire cable. The cable should be 20 gauge Belden #9154 or equivalent.

The 1602 is used below as an example. Other devices communicating on the Expansion Bus will follow the same general rule.

16AI----1602----16AI

16AI----1602----16AI----16AI

1602----16AI

1602----16AI----16AI

1602----16AI----16AI----16AI

* marked devices require terminating resistors

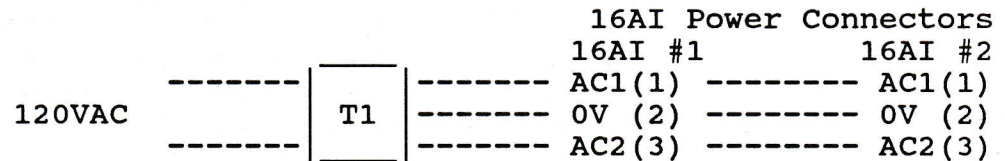
1. 16AI Board set up as an END device (* marked) requires jumpers, JU1, JU2, JU3 to all be in their positions CLOSEST to the RS-485 communication terminal block.

2. 16AI 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 (marked/unmarked) requires no changes since terminating resistors are not needed.

d. 16AI Power Requirements.

Each 16AI requires 10VAC and draws a maximum of 0.75A. CPC, Inc. recommends a 20VAC, 2.0A, center tap transformer (T1 below) to power 2 16AI'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 16AI Power Connector.



e. Connecting the Inputs.

The input connections are numbered 1 to 32. Grouped in pairs, the odd numbered inputs are common and even numbered inputs are signal. The terminal block on the end of the board with 4-5VDC and 4-12VDC connections can be used to power sensing devices such as pressure transducers. The total load available from this terminal block is 320 milliamps. The maximum load from any one connection on the terminal block is 100 mA. For example, 5 pressure transducers requiring 5 volt references could be connected to a single 5 volt connector on the terminal block as long as each transducer's load does not exceed 20 mA.

2. 1602 Expansion Bus Device Hardware Setup.

Any device communicating on the Expansion Bus with the 16AI board(s) will have to have a matching baud rate. The 1602 MCU's baud is set using switches 3 and 4 on the 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 16AI on the Expansion Bus must have a different device number, but since the device numbers are group independent, the 1602 MCU and the 16AI'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 16AI Input Boards. Make sure that the 16AI device number corresponds to the 16AI switches 1-5 set on S1 (see 16AI 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 (turns Network ON). This completes the Network programming.

2. Programming the 1602 Input (32-64) Setpoints

The expansion of the inputs from 32 up to 64 does not change the "Input Menu" except to reflect the increased number of inputs. If the 16AI should fail due to a hardware or communication problem, the 1602 has several built in safeguards. If failure should occur, the 1602's 16AI Analog inputs will automatically go into the OPEN state. Outputs controlled by these sensors can be programmed to OPEN or CLOSE if the sensor fails (called "Sensor Fail Override"). The 1602's 16AI digital inputs can be programmed to OPEN or CLOSE (called "Default State") should the 16AI fail.

MONITORING

1. 1602 Network Monitoring

To see if the Network is operating after 'Programming the Network Setpoints' and 'Programming the 1602 Inputs', select "Inputs" from the 1602's "Main Menu". Now select "Present Analog" or "Present Digital" and notice the headings. The headings displays an ONLINE or OFFLINE status for each 16AI board. If a 16AI 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 Acknowledged 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 to either 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

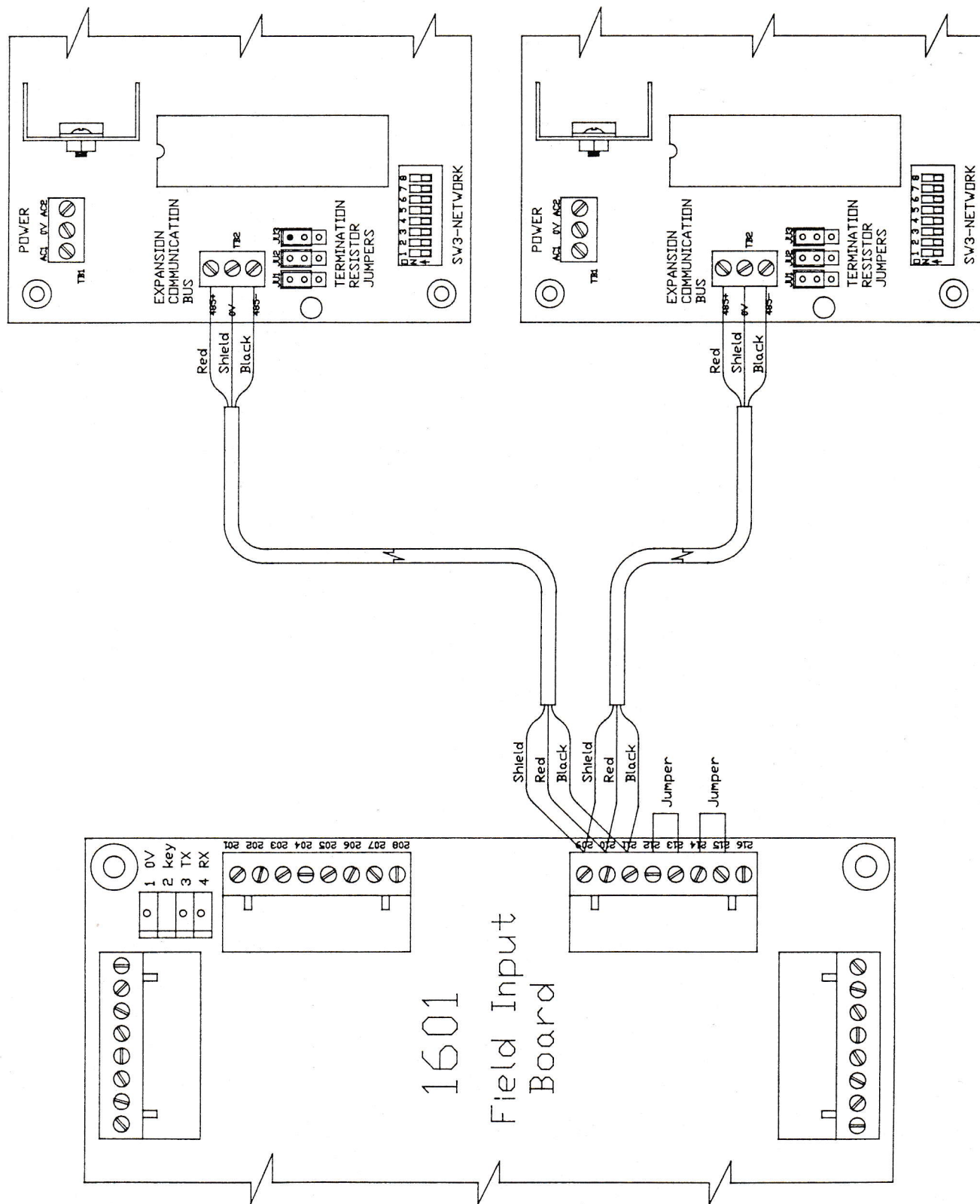
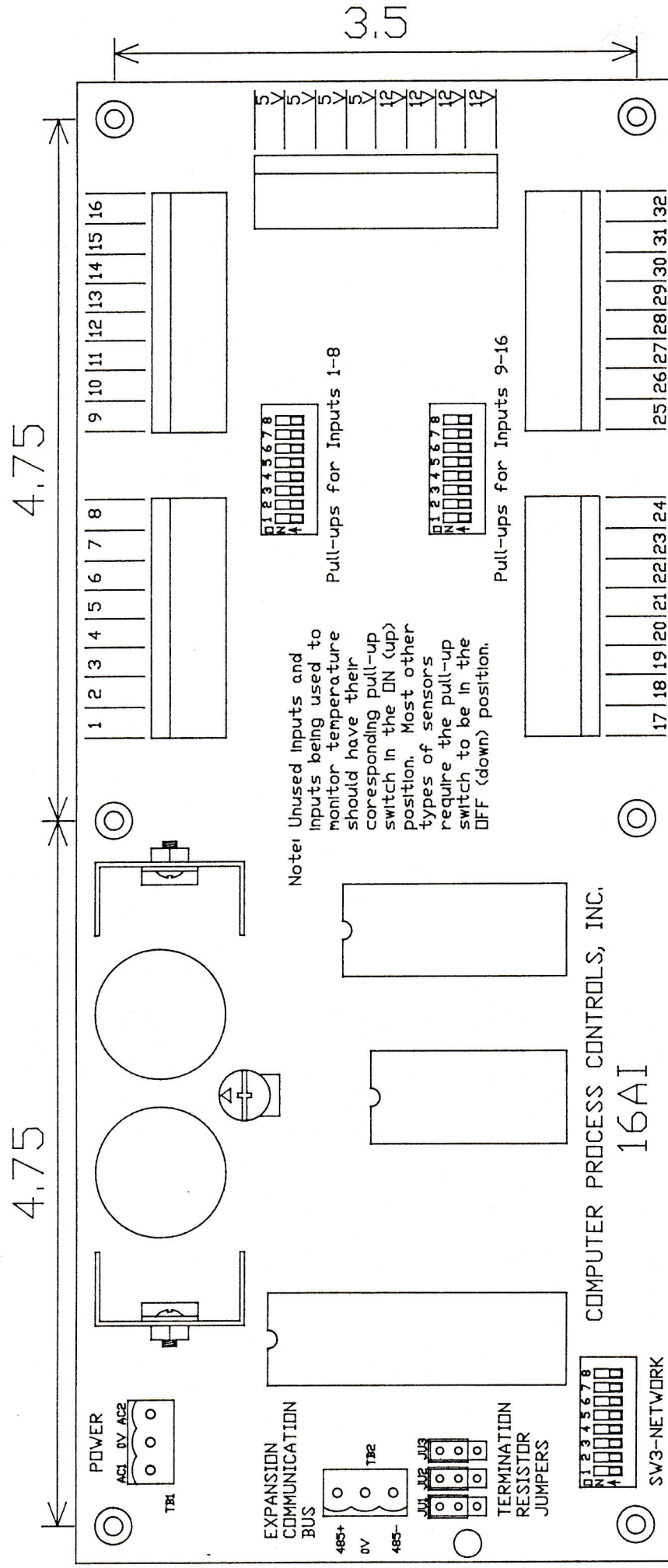


Figure 3



16-AI EXPANSION BOARD (Shown Actual Size)

