

TCAM 5240 USER GUIDE

CTI Part # 62-34-1.2

WP4.2-5240.12-052588

\$25.00

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Warning: This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. Operation of this equipment in a residential area is likely to cause interference, in which case the user at the user's own expense will be required to take whatever measures may be required to correct the interference.

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USAGE CONVENTIONS

NOTE:

Notes alert the user to special features or procedures.

CAUTION:

Cautions alert the user to procedures which could damage equipment.

WARNING:

Warnings alert the user to procedures which could damage equipment and endanger the user.

1. INTRODUCTION

1.1. Description

The TCAM-5240 Timer Counter Access Module is an operator interface unit that is compatible with the Texas Instruments Series 500 and Series 505 programmable controllers (PLC). The TCAM-5240 allows you to display and adjust values in drums, event drums, variable (V) memory, and unprotected timers and counters in the following PLC models:

- 510 (with VIM interface)
- 520, 520C
- 530, 530C
- 560/65
- 525 (Series 505)

You can also display the status of I/O points, I/O force states, and the contents of words WX and WY. With the TCAM-5240 a separate programming device such as the Video Programming Unit (VPU) is unnecessary for routine operator interface functions.

Enclosed within a rugged heavy-duty case, the TCAM-5240 is suitable for panel or rack mounting in harsh industrial environments. It is ideal for operations that require quick access to data within the PLC. Its light weight and small size facilitate PLC setup operations. Ease of use makes it appropriate for monitoring processes, changing recipe variables, tuning parameters, and maintaining equipment.

1.2. Features

Features of the TCAM-5240 include the following:

- Fast and easy installation
- Access to timers, counters, drums, event drums, and V memory
- Keylock protection prohibits unauthorized changes
- Easily accessible front panel controls and displays
- Splash-proof front panel

2. INSTALLATION

2.1. Mounting the TCAM-5240

The TCAM-5240 conforms to NEMA 12 standards and will fit in an enclosure with the cutout dimensions shown in Figure 1. No other special drilling or machining is required. When the TCAM-5240 is inserted into the enclosure, the TCAM's foam rubber gasket seals out dust, falling dirt, and dripping noncorrosive liquids.

To mount the TCAM-5240, insert the unit into the recommended cutout. Using a flat-blade screwdriver, turn the top mounting screw clockwise until you encounter resistance then turn the bottom mounting screw clockwise until you encounter resistance. The unit is removed by reversing this procedure.

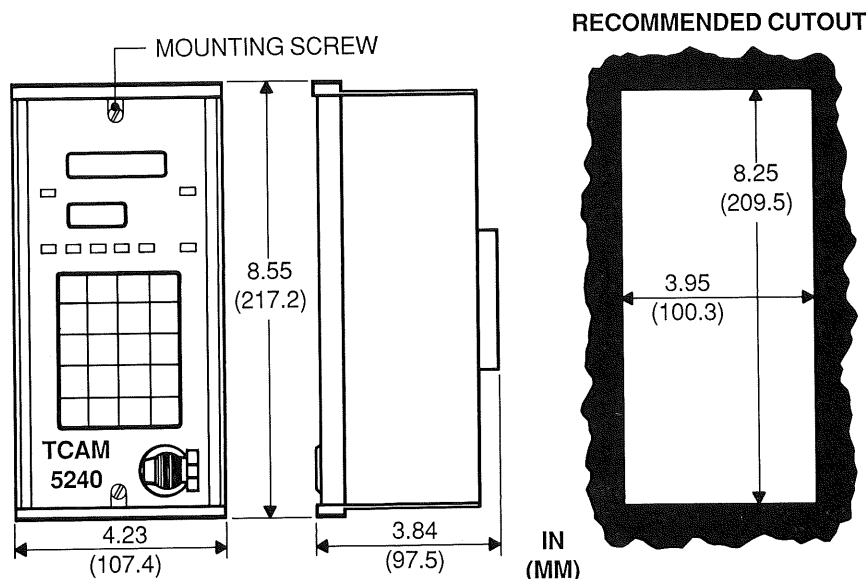


Figure 1. TCAM-5240 Dimensions

2.2. Connecting Line Power to the TCAM-5240

Line power is supplied to the TCAM-5240 by connecting the appropriate lines to the screw terminals of the power connector. The top two screw terminals on the power connector are the line terminals. The next two terminals are the neutral terminals. The bottom terminal is the ground terminal. Single phase power is applied by connecting the line wire to either line terminal, the neutral wire to either neutral terminal, and the ground wire to the ground terminal.

WARNING:

Make sure that line power is off when connecting the supply wires to the screw terminals to prevent personal injury.

The supply line wires should be 14-18 AWG and rated at 300V for 110V applications or 600V for 220V applications. Select the operating line voltage by inserting a flat-blade screwdriver into the slot in the voltage selector, shown in Figure 2, then turn the screwdriver clockwise to select 110V operation or counter-clockwise to select 220V operation.

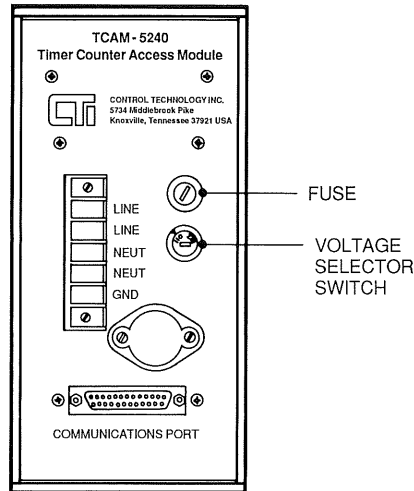


Figure 2. Rear View of TCAM-5240

Check the fuse located directly above the line voltage selector. To remove the fuse, insert a flat-blade screwdriver and turn counter-clockwise. Replacement fuses should be rated at 3/4 amp/250V. To replace the fuse, insert a new fuse in the holder, then insert the new fuse and holder into the fuse hole and turn clockwise using the flat-blade screwdriver.

2.3. Connecting the TCAM-5240 to a PLC

The TCAM-5240 uses a single 25-pin subminiature Type "D" female connector wired as DTE equipment for communicating with either an RS-232-C/RS-423-A or an RS-422-A PLC port. Two nominal length cables are supplied with the TCAM; one for connection to an RS-232-C/RS-423-A PLC port and the other for connection to an RS-422-A PLC port.

The RS-232-C/RS-423-A cable has a 25-pin subminiature male connector on both ends. As shown in Figure 3, the end with pins 2, 3, and 7 connects to the TCAM. The TCAM connector uses a right angle hood for easier installation and identification. The other end uses pins 2-8 and 20, and connects to the PLC's RS-232-C port.

If you need a longer cable than the one supplied, use the diagram in Figure 3 to make your own cable. However, you should limit the cable length to 50 feet or less. You should use cable with specifications similar to Belden 8771. Make sure that you attach a drain wire to the cable shield on the TCAM side only.

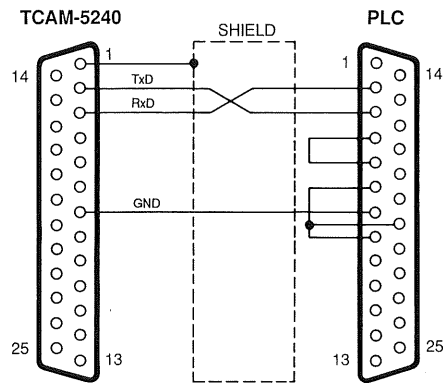


Figure 3. RS-232-C/RS-423-A Cable Diagram

The RS-422-A cable has a 25-pin subminiature male connector on one end and a 9-pin subminiature male connector on the other end. As shown in Figure 4, the 25-pin connector mates with the TCAM connector and the 9-pin connector mates with the PLC's RS-422-A port.

If you need a longer cable than the one supplied, use the diagram in Figure 4 to make your own cable. The RS-422-A interface will operate reliably with cables up to 4,000 feet in length. You should use cable with specifications similar to Belden 8723. Make sure that you attach a drain wire to the cable shield on the TCAM side only.

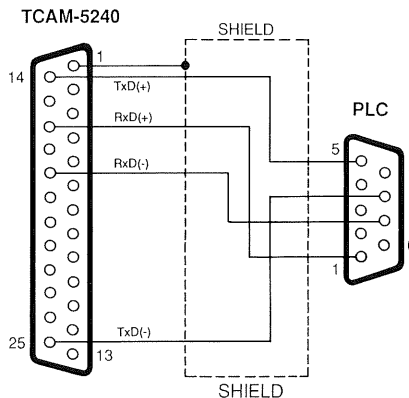


Figure 4. RS-422-A Cable Diagram

3. OPERATION

3.1. Display Windows

The TCAM-5240 has two windows for displaying data and memory locations. Refer to Figure 5.

- DATA Window - The DATA window consists of five digits and can display an integer up to 65,535.

NOTE:

If a data value greater than 65,535 is entered, the TCAM displays 65,535.

- LOCATION Window - The LOCATION window consists of four digits and displays memory addresses ranging from 0 to 9999.

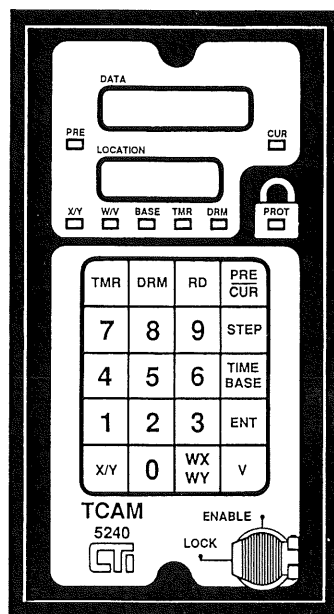


Figure 5. Front Panel Diagram

3.2. LEDs

The TCAM-5240 has eight LEDs, shown in Figure 5, that indicate the status of the current operation being executed.

- PRESET (PRE) LED - The "PRE" LED lights when a preset value for the timer, counter, drum, or event drum is displayed.
- CURRENT (CUR) LED - The "CUR" LED lights when a current value for a timer, counter, drum, or event drum is displayed.
- DISCRETE I/O (X/Y) LED - The "X/Y" LED lights when the status of a discrete input/output (I/O point) is displayed. The "X/Y" LED also lights in conjunction with the "W/V" LED when the contents of a word input/output are displayed.
- WORD I/O/VARIABLE MEMORY (W/V) LED - The "W/V" LED lights in conjunction with the "X/Y" LED when the contents of a word input/output are displayed. The "W/V" LED also lights if the contents of a V memory location are displayed.
- TIME BASE (BASE) LED - The "BASE" LED lights when the drum or event drum time base is displayed.
- TIMER/COUNTER (TMR) LED - The "TMR" LED lights in conjunction with either the "CUR" or "PRE" LED's when preset or current values in a timer or counter are displayed.
- DRUM/EVENT DRUM (DRM) LED - The "DRM" LED lights when preset, current, time base, or step values in a drum or event drum are displayed.
- PROTECT (PROT) LED - The "PROT" LED lights (red) when a protected timer or counter is accessed.

3.3. Keypad Controls

The operation of the ten keypad controls, shown in Figure 5, of the TCAM-5240 is described below.

- X/Y - Use the X/Y key whenever you need to read the status of a discrete I/O point. It is used with the read (RD) key to access both inputs (X) and outputs (Y).
- WX/WY - With the WX/WY key you can read the contents of word inputs (WX) and word outputs (WY). Use it in conjunction with the RD key.
- V - You may access variable (V) memory locations with the V key. Use it with the RD key to read V memory, and with the ENT key to write data to V memory.
- RD - Use the RD key to read data in V memory, word I/O locations, and the status of discrete I/O points.
- TMR - Use the TMR key to access a timer/counter variable.
- DRM - With the DRM key you may access variables associated with either drums or event drums.
- PRE/CUR - You access preset or current values of variables with the PRE/CUR key. Used with timers, counters, drums, and event drums, this key toggles between preset and current values.
- STEP - Use the STEP key to display a particular step for a drum or event drum.
- TIME BASE - You may read or alter the time base of a drum or event drum with the TIME BASE key.
- ENT - New values are entered into a variable for a timer, counter, drum, or event drum with the ENT key.

3.4. Keylock

You may always monitor data values in variables with the TCAM-5240. However, you must **enable** the keylock to alter the contents of a variable.

3.5. Start-Up

When you power up the TCAM-5240, the DATA window displays "HELLO," and a handshaking routine with the PLC is initiated. Communication is attempted, first at 9600 and, if that fails, at 1200 baud. This sequence is continually repeated until communications is established with the PLC. Then the TCAM polls the PLC for its configuration of timer/counters, drum/event drums, V memory and I/O points.

When communication is established, the DATA window goes blank, and the TMR LED is illuminated. At this point you may read or enter data to the PLC.

3.6. Keypad Entry

After power-up press one of the function keys (X/Y, WX/WY, V, TMR, or DRM) to initiate a function with the TCAM.

NOTE:

Pressing any other key is an error and an E0 error code is displayed.

Following the function key, enter an address or reference number. Locations up to 9,999 may be accessed. If you intend to enter data into the PLC, you must first **enable** the TCAM keylock.

The TCAM 5240 automatically limits the maximum address of the function selected. During start-up the TCAM polls the PLC and builds tables of all available memory locations accessible to the TCAM. The maximum number of drum timers or EDRUM supported is 99.

The TCAM-5240 is capable of displaying signed integers between -32,767 and +32,767. To display a negative integer, the TCAM alternately flashes a negative sign and the absolute value of the negative integer. When you enter a negative integer, first subtract the absolute value of the integer from 65,536 and then enter this value into the TCAM. For example, to enter -45, subtract 45 from 65,536, giving 65,491. Enter 65,491 into the TCAM.

The procedures for reading and writing data to the PLC are described in the paragraphs below.

3.6.1. Discrete I/O (X/Y Key)

The PLC monitors the status of discrete I/O inputs (Xs) and outputs (Ys) by updating the discrete image register (IR). Each bit in the IR corresponds to an X or Y I/O point. When there is power to an I/O point, its corresponding bit in the IR is set to 1. No power is indicated by a 0. The discrete image register is one bit wide, and its length varies with the PLC model.

Because the discrete I/O points are represented by one IR, the same address should not be assigned to both an input and an output. That is, if an input is configured as X4, there should be no Y4.

With the TCAM-5240 you can read the status of the discrete I/O points by following the steps below.

Reading Discrete I/O

Action	Result
1. Press X/Y key	X/Y LED lights
2. Enter the I/O address	Address is displayed
3. Press the RD key	Status is displayed by 1 (ON) or 0 (OFF)

The X/Y key reads both Xs and Ys since they each have a unique address or location. This location determines whether you are reading an input or an output. The I/O point status may change since the PLC is continually updating the IR. You cannot force an I/O point to a given state with the TCAM. If a point has been forced with another programming device, the TCAM denotes this forced action by displaying an L in the most significant digit (MSD) of the data window.

If you receive errors during this operation, see Paragraph 3.10.

3.6.2. Word I/O (WX/WY Key)

The PLC monitors the status of word I/O (WX and WY) by updating the word image register. The process is the same as for discrete I/O, described in Paragraph 3.6.1. The word IR is 16 bits wide, and its length varies with the PLC model.

Use the TCAM to display the contents of word inputs and outputs by taking the steps below.

Reading Word I/O

Action	Result
1. Press WX/WY key	W/V and X/Y LEDs light
2. Enter the I/O address	Address is displayed
3. Press the RD key	Word contents are displayed

Both WXs and WYs are read with the WX/WY key because the address determines whether you are reading an input or an output. The I/O word may change since the PLC is continually updating the IR. You cannot force an I/O word to a given value with the TCAM. If you receive errors during this operation, see Paragraph 3.10.

3.6.3. Variable Memory (V Key)

Each PLC has a block of memory called variable (V) memory that is reserved essentially for "scratchpad" operations. The result of a math operation, for example, may be stored temporarily in V memory. V memory data is 16 bits wide. The number of locations varies with each PLC.

You may use the TCAM to read or write to a V memory location. Follow the steps below.

Reading V Memory

Action	Result
1. Press the V key	W/V LED lights
2. Enter V memory address	Address is displayed
3. Press the RD key	V memory is displayed

The display may change if the PLC writes new data into the V location.

You should be aware that some math functions utilize two adjacent 16-bit registers in their operation. These include the following functions:

- Multiplication
- Division
- Square Root
- Convert Binary to BCD

For example, the multiplication function places the 16 most significant bits of a product into a V location and the 16 least significant bits into V+1. If a product is less than 32,767 you must read V+1 to obtain the correct value since V contains zeros. You should understand the operation of these functions before attempting to interpret the results of their execution.

Writing to V Memory

Action	Result
1. Set the keylock to the ENABLE position	Enables the TCAM to write data
2. Press the V key	W/V LED lights
3. Enter V memory address	Address is displayed
4. Press the RD key	V memory is displayed
5. Enter the new data	New data is displayed
6. Press the ENT key	New data is stored

The display may change if the PLC writes new data into the V location. You may enter only integer numbers. If you receive error messages during this operation, see Paragraph 3.10.

3.7. Timer/Counter (TMR Key)

The number of timers and counters that may be used varies with each PLC. Consult your PLC manual to determine the actual number supported.

NOTE:

Because timers and counters use the same memory registers, they cannot be assigned the same reference numbers. That is, if a TMR1 has been programmed, there can be no CTR1.

These variables are set when the TMR/CTR function is programmed:

- Preset (TCP) - The function of TCP is to set the amount of time that a timer counts down, or the number of events that a counter counts.
- Protect - When you protect a timer/counter during programming, unauthorized changes cannot be made to the timer/counter function.

After a timer/counter has been enabled during program execution, another variable (TCC) holds the current value of the timer/counter. If the timer/counter has been protected, you may read the values of TCP and TCC with the TCAM, but you cannot change them. If the timer/counter is not protected, you may modify TCP and TCC.

Use the TCAM to read the values in TCP and TCC as follows:

Reading Current (TCC) or TMR/CTR Preset (TCP)

Action	Result
1. Press TMR key	TMR LED lights
2. Enter TMR/CTR reference number	Reference number is displayed
3. Press PRE/CUR key	As key is toggled, TCP and TCC are alternately displayed, and PRE and CUR LEDs light alternately

Use the TCAM to write values into TCP and TCC as follows:

Changing TMR/CTR Preset (TCP) or Current (TCC)

Action	Result
1. Set the keylock to the ENABLE position	Enables the TCAM to write data
2. Press TMR key	TMR LED lights
3. Enter TMR/CTR reference number	Reference number is display
4. Press PRE/CUR key	As key is toggled, TCP and TCC are alternately displayed and PRE and CUR LEDs light alternately
5. Enter new TCP or TCC	New TCC or TCP is displayed
6. Press the ENT key	New TCC or TCP is stored

NOTE:

Changes to preset values with the TCAM-5240 are only retained if the PLC is configured to "retain presets" and battery back-up is enabled. Otherwise, when the power is cycled on the PLC, the original presets from L memory are downloaded.

If you receive error messages, refer to Paragraph 3.10.

3.8. Drum/Event Drum (DRM Key)

The PLC drum simulates an electromechanical drum. Outputs or control relays are switched on or off according to a pre-mapped mask in each of 16 steps. You set the timing for each step to determine when the drum advances to the next step.

The event drum operates similarly to the drum. However, advancement to the next step is determined by timing, the status of a discrete I/O point or a control relay, (the event) or a combination of these.

The number of drums and event drums that may be used varies with each PLC. Consult your PLC manual to determine the actual number supported. Because drums and event drums share the same memory registers, they cannot be assigned the same reference numbers. That is, if a DRUM1 has been programmed, there can be no EDRUM1.

These time/step variables are set when a drum/event drum is programmed:

- Drum Step Preset (DSP) - the step to which a drum returns when reset
- CNT/STP (DCP) - the number of counts that a drum remains at a step
- SEC/CNT (Time base) - the number of seconds assigned to a count

After a drum/event drum is enabled during program execution, a variable (DSC) holds the current step, and another variable (DCC) keeps track of the current count of the current step.

With the TCAM you can read and write to these drum/event drum variables:

- DSP
- DCP (EDRUM only)
- DSC
- Timebase

You may monitor, but not alter, the drum/event drum DCC with the TCAM.

NOTE:

The PLC does not support changes made with the TCAM to the drum timer DCP. This drum variable executes from L memory. Only changes made to DCP in EDRUM are supported.

Use the TCAM to read the drum/event drum variables as follows:

Reading DRUM/EDRUM DSP or DSC

Action	Result
1. Press DRM key	DRM LED lights
2. Enter drum/event drum reference number	Reference number is displayed
3. Press PRE/CUR key	As key is toggled, DSP and DSC are alternately displayed and PRE and CUR LEDs light alternately

Reading DRUM/EDRUM Time Base

Action	Result
1. Press DRM key	DRM LED lights
2. Enter drum/event drum reference number	Reference number is displayed
3. Press TIME BASE key	BASE LED lights and time base is displayed

Reading DRUM / EDRUM DCC

Action	Result
1. Press DRM key	DRM LED lights
2. Enter drum/event drum reference number	Reference number is displayed
3. Press PRE/CUR key	DSP is displayed
4. Press STEP key	CUR LED lights and DCC is displayed as it counts down to 0. Then DSC is displayed.

Repeat step 4 to have DCC displayed for subsequent drum/event drum steps.

Reading EDRUM DCP

Action	Result
1. Press DRM key	DRM LED lights
2. Enter event drum reference number	Reference number is displayed
3. Press STEP key	Reference number is shifted to the left
4. Enter step number	Reference and step numbers are displayed
5. Press PRE/CUR key	DCP displayed

NOTE:

Because drum variables execute from L memory, a 0 will always be displayed when attempting to read DRUM DCP.

Use the TCAM to write data to the drum/event drum variables as follows:

Changing DRUM/EDRUM DSP or DSC

Action	Result
1. Set the keylock to the ENABLE position	Enables the TCAM to write data
2. Press DRM key	DRM LED lights
3. Enter drum/event drum reference number	Reference number is displayed
4. Press PRE/CUR key	As key is toggled, DSP and DSC are alternately displayed
5. Enter new value for DSP or DSC	New DSP or DSC is displayed
6. Press the ENT key	New DSP or DSC value is stored

Changing DRUM/EDRUM Time Base

Action	Result
1. Set the keylock to the ENABLE position	Enables the TCAM to write data
2. Press DRM key	DRM LED lights
3. Enter drum/event drum reference number	Reference number is displayed
4. Press TIME BASE key	BASE LED lights and time base is displayed
5. Enter new value for time base	New time base is displayed
6. Press the ENT key	New time base is stored

Changing EDRUM DCP

Action	Result
1. Set the keylock to the ENABLE position	Enables TCAM to write data
2. Press DRM key	DRM LED lights
3. Enter event drum reference number	Reference number is displayed
4. Press STEP key	Reference number is shifted to the left
5. Enter step number	Reference and step numbers are displayed
6. Press PRE/CUR key	DCP is displayed
7. Enter new value for DCP	New value for DCP is displayed
8. Press ENT key	New value for DCP is stored

After executing a time base function, you must clear the TCAM before beginning an operation with the STEP key. Do this either by pressing the DRM key, and re-entering the reference number; or by pressing the PRE/CUR key. Then press the STEP key.

3.9. Diagnostics

The TCAM-5240 is equipped with continuous runtime diagnostics that perform an EPROM checksum calculation. If a failure is detected, error code E90 is displayed.

3.10. Error Codes and Troubleshooting

When an operational error is detected, the TCAM-5240 displays a code in the DATA window. Each code and the appropriate troubleshooting steps is described below. Each error code is displayed for two seconds before the display is cleared unless otherwise indicated.

E0 - An incorrect key was pressed when the TCAM-5240 was initially powered up. A function key (TMR, DRM, X/Y, WX-WY, or V) must be the first key pressed.

To correct error E0, press one of the function keys.

E1 - A numeric entry was not made before the action request key (RD, PRE/CUR, STEP, TIME BASE, or ENT) was pressed.

To correct error E1, press the function key, enter a numeric value for the location, and press the action request key.

E2 - Invalid action request key was pressed for the function selected. Review paragraphs 3.3, 3.6, 3.7, and 3.8 for details on the appropriate key sequence.

To correct error E2, press the function key, enter a numeric value for the location, and press the action request key.

E3 - A communications error occurred between the TCAM-5240 and the PLC. This is caused by data link errors such as parity or baud rate mismatches, framing errors, and overrun errors.

To correct error E3, re-enter the last request. If this error continues, request technical assistance from CTI.

E4 - This error indicates a communications error occurring between the TCAM-5240 and the PLC. This error is usually caused by a disconnected cable, a broken wire in the connecting cable, or line driver failure.

To correct error E4, check the connecting cables. The TCAM-5240 continuously retries to establish communications with the PLC. When corrected, the E4 error will no longer be displayed. If this error continues, request technical assistance from CTI.

E5 - Invalid data was received from the PLC. The TCAM-5240 will display the E5 error for approximately two seconds then clear the display.

To correct error E5, re-enter the last request. If this error continues, request technical assistance from CTI.

E6 - This error is displayed when the PLC returns an address out-of-range message. You should consult the PLC user's manual and verify the number of memory locations supported.

E7 - An error message was received from the PLC indicating that it could not respond to the request. This usually indicates that the PLC contains an old firmware release.

To correct error E7, make sure that the PLC contains the latest release of the operating firmware.

E8 - An error message was received from the PLC indicating that it has detected a fatal error.

To correct error E8, consult the PLC's user's manual for the procedures to clear the PLC's error condition.

E9 - The PLC could not respond to the request in its current operational mode--run, program, or fatal.

To correct error E9, consult the PLC's user's manual and set the PLC to the appropriate mode.

E10 - This error code is displayed when the TCAM-5240 receives a PLC error message that it does not currently support.

To correct error E10, retry the request. If this error continues, request technical assistance from CTI.

E90 - The TCAM-5240 has detected an internal ROM checksum error. You can perform the ROM diagnostic test described in Paragraph 3.11. If both tests indicate an error, you should return the unit for repairs.

E91 - The TCAM-5240 has detected an internal microprocessor RAM error during the power up cycle.

To correct error E91, cycle the power again. If this error continues, you should return the unit for repairs.

E92 - The TCAM-5240 has detected an internal RAM error during the power up cycle.

To correct error E92, cycle the power again. If this error continues, you should return the unit for repairs.

E93 - This error code is displayed when a failure is detected while performing the serial port/display diagnostic test described in Paragraph 3.11.

To correct error E93, try the test again. If this error continues, you should return the unit for repairs.

3.11. Hardware Diagnostics

The TCAM-5240 has several built-in diagnostic tests to help troubleshoot certain problems. An internal ROM checksum diagnostic test is performed continuously when the TCAM is operating. This same test is performed when the TCAM is powered up along with tests of the microprocessor's internal RAM and the TCAM's internal RAM. In addition to the checksum tests, you can perform the following tests:

- Keypad Test - checks the operation of the individual keys.
- Keylock Test - checks the operation of the keylock.
- Serial Port/Display Test - checks the operation of the serial communications port and the displays.
- ROM Test - performs a checksum test on internal ROM.

Keypad Test

Action	Result
1. Cycle the power	Displays HELLO
2. Wait until E4 is displayed	Displays E4
3. Press ENT key then RD key	Displays HELP
4. Enter 1	Display clears
5. Press any key (repeat as necessary)	Column/Row reference is displayed (See Figure 6)
6. To exit this test, toggle the keylock	Displays HELP

Refer to Figure 6. Pressing the TIME BASE key displays 43, while the X/Y key displays 15.

Figure 6. Keypad Column/Row Matrix

Keylock Test

Action	Result
1. Enter 2	
2. Set keylock to ENABLE position	Displays 1
3. Set keylock to LOCK position	Displays 0
4. Press any key to exit this test	Displays HELP

For the following Serial Port/Display test, pins 2 and 3 of the PC PORT must be tied together. To accomplish this easily, make up a DB-25 connector as shown in the diagram below:

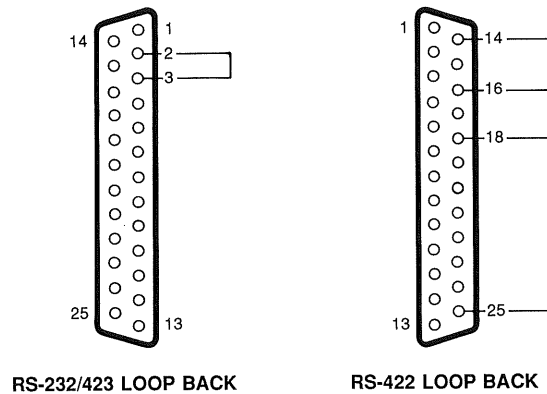


Figure 7. Loop-back Connector

Serial Port/Display Test

Action	Result
1. Disconnect the communications cable and attach the loopback connector	Displays HELP
2. Enter 3	Display counts to 100. Each display digit is lit; error E93 is displayed for any failure
3. Press any key to exit this test	Displays HELP

ROM Test

Action	Result
1. Enter 4	Displays the ROM checksum (should always be 55)
2. Press any key to exit this test	Displays HELP

To exit hardware diagnostics, enter 9 while HELP is displayed.

4. SPECIFICATIONS

4.1. Communications

EIA RS-232-C/RS-423-A Serial Data (Auto Baud rate selection)	1200, 9600 Baud
Maximum cable length	50 feet
EIA RS-422-A Serial Data Transfer Data Rate	1200, 9600 Baud
Maximum cable length	4,000 feet

4.2. Power Requirements

Voltage	110 VAC @ 60 HZ or 220 VAC @ 50 HZ (European) Switch Selectable
Power	5 Watts
Designed to meet these agency ap- provals	UL, CSA, FCC Class A

4.3. Environment

Temperature	
Storage	-40° to 70° C (-40° to 158° F)
Normal Operation	0° to 60° C (32° to 140° F)
Humidity	5% to 95% noncondensing
Front panel and keylock seal	NEMA 12

4.4. Physical Dimensions

Size	4.23 x 8.55 x 3.84 inches
Weight	4 pounds

Specifications subject to change without notice.

5. LIMITED PRODUCT WARRANTY (EXCLUDING SOFTWARE)

CTI warrants that this CTI Industrial Product shall be free from defects in material and workmanship for a period of one (1) year after purchase from CTI or from a authorized CTI Industrial Distributer. This CTI Industrial Product will be newly manufactured from new and/or serviceable used parts which are equal to new in the Product.

Should this CTI Industrial Product fail to be free from defects in material and workmanship at any time during this one (1) year warranty period, CTI will repair or replace (at its option) parts or Products found to be defective and shipped prepaid by the customer to a designated CTI service location along with proof of purchase date and associated serial number. Repair parts and replacement Product furnished under this warranty will be on an exchange basis and will be either reconditioned or new. All exchanged parts or Products become the property of CTI. Should any Product or part returned to CTI hereunder be found by CTI to be without defect, CTI will return such Product or part to the customer.

This warranty does not include repair of damage to a part or the Product resulting from: failure to provide a suitable environment as specified in applicable Product specifications, or damage caused by an accident, disaster, neglect, abuse, misuse, transportation, alterations, attachments, accessories, supplies, non-CTI parts, non-CTI repairs or activities, or to any damage whose proximate cause was faulty installation done by someone other than CTI.

Control Technology Inc. reserves the right to make changes to the Product in order to improve reliability, function, or design in the pursuit of providing the best possible Product. Since CTI does not possess full access to data concerning all of the uses and applications of the product by the customer, CTI assumes no responsibility for indirect or consequential damages resulting from the use or application of this equipment. (Warranty continued on following page)

Warranty, cont'd.

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THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY FROM STATE TO STATE.

6. REPAIR POLICY

In the event that the Product should fail during or after the warranty period, a Return Material Authorization number (RMA) can be requested verbally or in writing from CTI main offices. Whether this equipment is in or out of warranty, a Purchase Order number provided to CTI when requesting the RMA number will aid in expediting the repair process. The RMA number that is issued and your Purchase Order number should be referenced on the returning equipment's shipping documentation. Additionally, if under warranty, proof of purchase date and serial number must accompany the returned equipment.

Emergency product exchanges can be accomplished within 24 hours contingent on availability. The current repair and/or exchange rates can be obtained by contacting CTI main office.