

CLC Multi-Axis Coordinated Motion Control

End User Manual

DOK-VISMOT-VM*-05VRS**-WAR1-AE-P



278099

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Purpose of this document	<p>This document supports trained operating and maintenance personnel</p> <ul style="list-style-type: none"> • in the rapid identification of faults • outlining steps for the elimination of faults • to effectively contact either the manufacturer of the machine or INDRAMAT customer service. <p>This document should be placed in the control cabinet where it can be easily accessed by operating or maintenance personnel.</p>

Record of revisions

Revision	Date	Remarks
Initial release	1/98	GPS - 05

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1 Introduction and Overview

1.1 Purpose of Manual

This document is a user manual for the CLC motion control card. For information pertaining to other system components, refer to the following documentation:

- DIAX03 Drive with Electronic Transmission Function
DOK-DIAX03-ELS-04VRS**-50M1-EN-P, Part No. 273438
- DDS 2.1 W/ Analog Interface Application Manual
(Pub No. 209-0069-4315-03, Part No. 257182)
- DDS 2.1/3.1 W/ SERCOS Interface Application Manual
(Pub No. 209-0069-4321-04, Part No. 262156)
- DKS Intelligent Digital Servo Drive Project Planning Manual
(Pub No. 209-0069-4355-00, Part No. 259310)
- DKS and MDD Intelligent Digital AC Servo Drives Application Manual
(Pub No. 209-0069-4351-01, Part No. 261809)

This document is meant to be a user manual for operators who are running or troubleshooting systems that use the CLC card. The information contained in this manual is intended for trained operating and maintenance personal. It is assumed that the controller and drives are installed properly and that all the hard wiring has already been done. For more information refer to the following CLC Manuals:

- CLC Start Up Guide, IAE 68010 Rev. B, 02/97 (Part No. 274661)
- CLC Reference Manual,
- CLC Product Information Guide,

1.2 Manual Overview

Chapter 1 - Introduction	Describes the CLC's general theory of operation and its motion capabilities.
Chapter 2 - CLC Monitoring and Diagnostics	Provides a description of Status, Warning and Shutdown messages and how to troubleshoot errors and faults.
Chapter 3 - CLC DDE Server	Describes the usage and functionality of the DDE Server: a program that allows communication to take place between the CLC card and other applications.
Chapter 4 - Teach Pendant	Describes the usage and functionality of the CLC Teach Pendant.

1.3 CLC Overview

The CLC card is part of an extensive motion control system which also includes digital servo drives and SERCOS, a fiber-optic communication system. The CLC can provide multi-axis coordinated and non-coordinated motion control with tightly integrated I/O logic control functions. The flexibility of the CLC allows it to be used for a wide variety of applications, from general motion control to sophisticated multi-axis electronic line shafting (ELS) to robotics.

Three versions of the CLC card are currently available:

CLC-V for VME bus architecture.

CLC-P for IBM PC-AT bus architecture.

CLC-D which plugs into Indramat digital drives, providing an exceptional cost-effective motion control solution.

The CLC motion control card combines an integrated multi-tasking environment with a unique graphical Windows based programming interface - Visual Motion™ (VM). VM provides simplified point-and-click programming, operation and management. With this software, system builders have a flexible and comprehensive environment, including easy DDE integration with applications such as Wonderware, InTouch or Visual Basic programs.

A CLC card can simultaneously control up to four independent user tasks (A, B, C & D). Each task can control a coordinated group of two or three axes and any number of independent motion axes. Depending on the application, a single CLC may control up to 40 axes.

CLC-D Overview

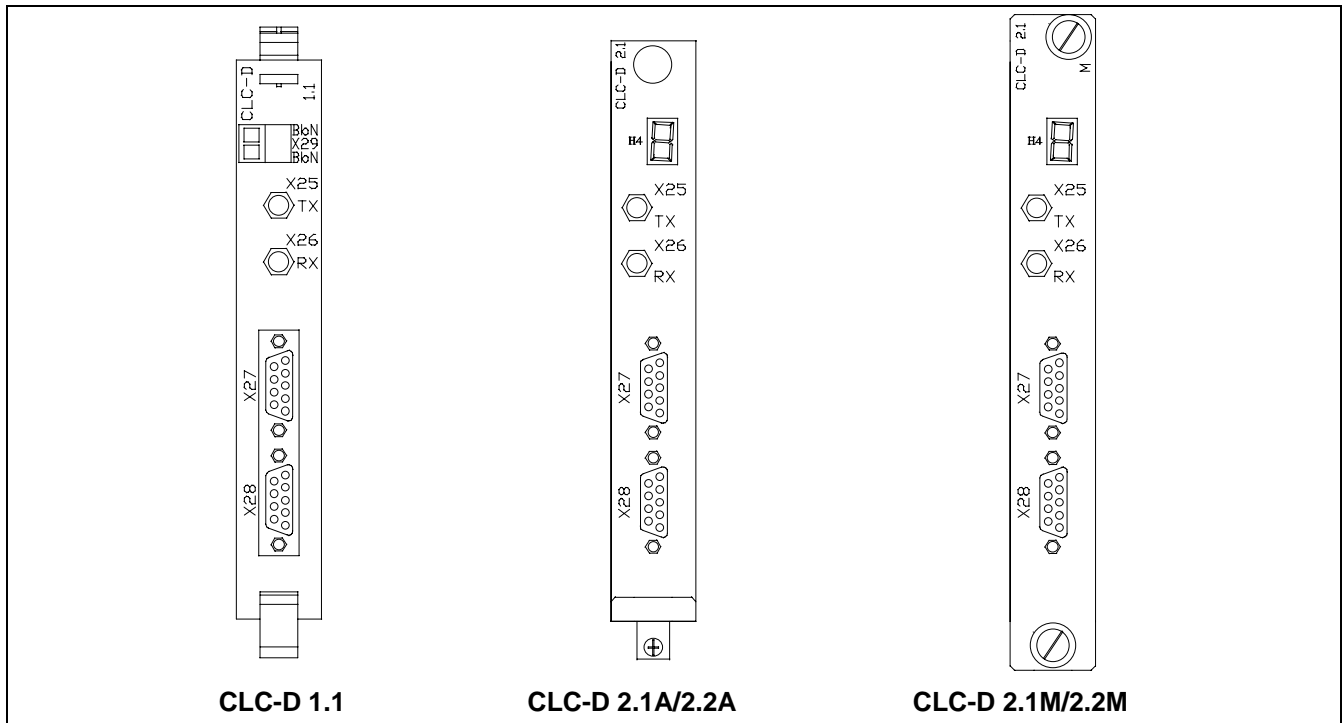


Figure 1-1: CLC-D Hardware Comparison

CLC-D Serial Communication

Port A (X27) is configured to respond to the CLC ASCII Host Protocol. Port B (X28) can be configured to respond to Host Protocol, Teach Pendant or another interface. Both ports always operate with:

- 8 bits per character
- 1 stop bit
- no parity.

The configurable communication settings are shown in the following table.

Serial Com Options	Baud Rate	Checksum	Port Mode	Protocol
Port A (X27) default	9600	enabled	RS-232	Host Protocol
Port A (X27) valid settings	300, 1200, 2400, 4800, 9600, 19200, 38400	enabled or disabled	RS-232,422,485	Host Protocol
Port B (X28) default	9600	enabled	RS-232	Host Protocol
Port B (X28) valid settings	300, 1200, 2400, 4800, 9600	enabled or disabled	RS-232,422,485	Off, Host Protocol, Teach Pendant

CLC-D Jumper Configuration

Jumpers S1 and S2 set the default configuration for serial ports X27 and X28 respectively. If the jumper is installed, the port is configured for the default settings of RS-232 and 9600 baud.

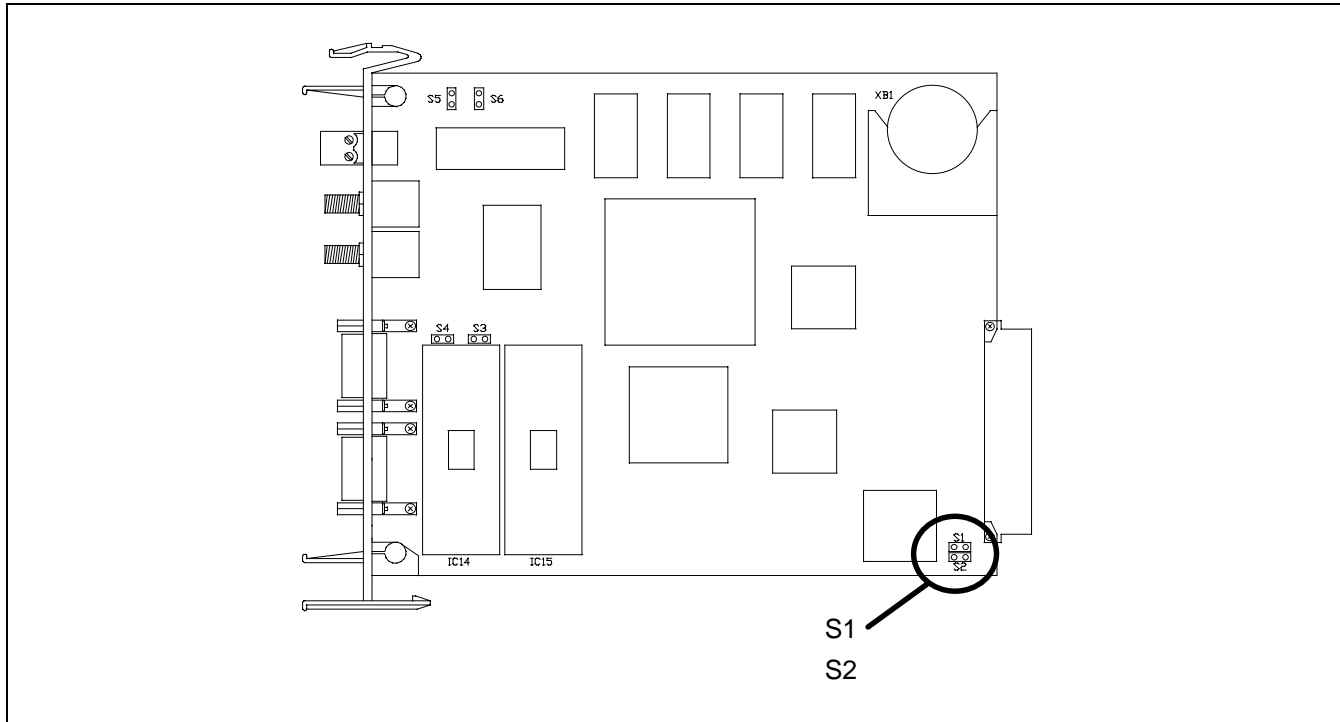


Figure 1-2: CLC-D Jumper Configuration

CLC-D SERCOS

The SERCOS port is used for loop-through, daisy-chained installation into a SERCOS fiber-optic ring. The output port, Tx, is connected to the SERCOS input port of the next SERCOS device in the ring. Each SERCOS device is interconnected, output to input, with the output of the last device returned to the SERCOS input, Rx, of the CLC-D.

On-Board Battery

Non-volatile memory backup is provided by a 3 volt, CR2477N (MnO₂/Li) type battery. The battery has a capacity of 0.9 Amp-hours. The battery is field replaceable, see Section 8.6 for ordering and installation information.

CLC-D 2.1/2.2 Front Panel Diagnostic Display

Normal operations

The CLC-D 2.1/2.2 has a one digit 7-segment LED display. In normal operating conditions, a static display shows the mode that the CLC is currently in.

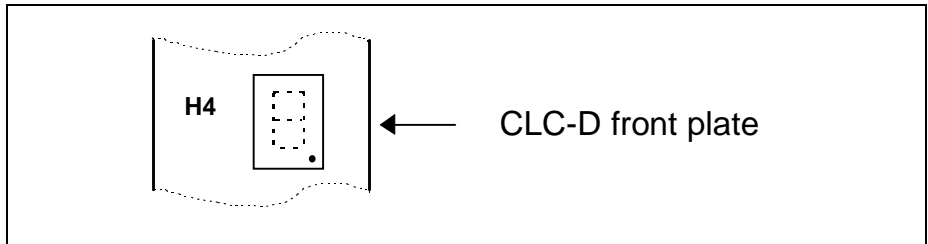


Figure 1-3: 7 segment display on the CLC-D

Display	Status
0	Initial display
1-4	Initialization Mode, SERCOS phases 1-4
P	Parameter mode
H	No user tasks are running (Halt)
A	Task A is running
b	Task B is running
C	Task C is running
d	Task D is running

Error codes

When an error exists, the CLC displays the three digit diagnostic code from Parameter C1.123 and Register 6. "E", indicating error, is displayed for one second, and each digit of the code is displayed for one-half second. The display continues to scroll in this manner until the error is cleared.

Code	Error Type
E200 - E399	Warning
E400 - E999	Shutdown Error

For individual error code descriptions see Chapter 2. Monitoring and Diagnostics.

CLC Watchdog

The decimal point on the display is connected to a hardware watchdog circuit that is refreshed by the CLC every 100ms. If the microprocessor fails or if the CLC drops into the pROBE monitor, the display is blanked and the decimal point turns on. While the CLC is running, the decimal point is off.

CLC-P Overview

CLC-P SERCOS and Serial Communication

The CLC-P card has the same serial communication and SERCOS settings as the CLC-D card. See *CLC-D Serial Communication*.

CLC-P Jumper Configuration

Jumpers S1 and S2 set the default configuration for serial ports X27 and X28 respectively. If the jumper is installed, the port is configured for the default settings of RS-232 and 9600 baud.

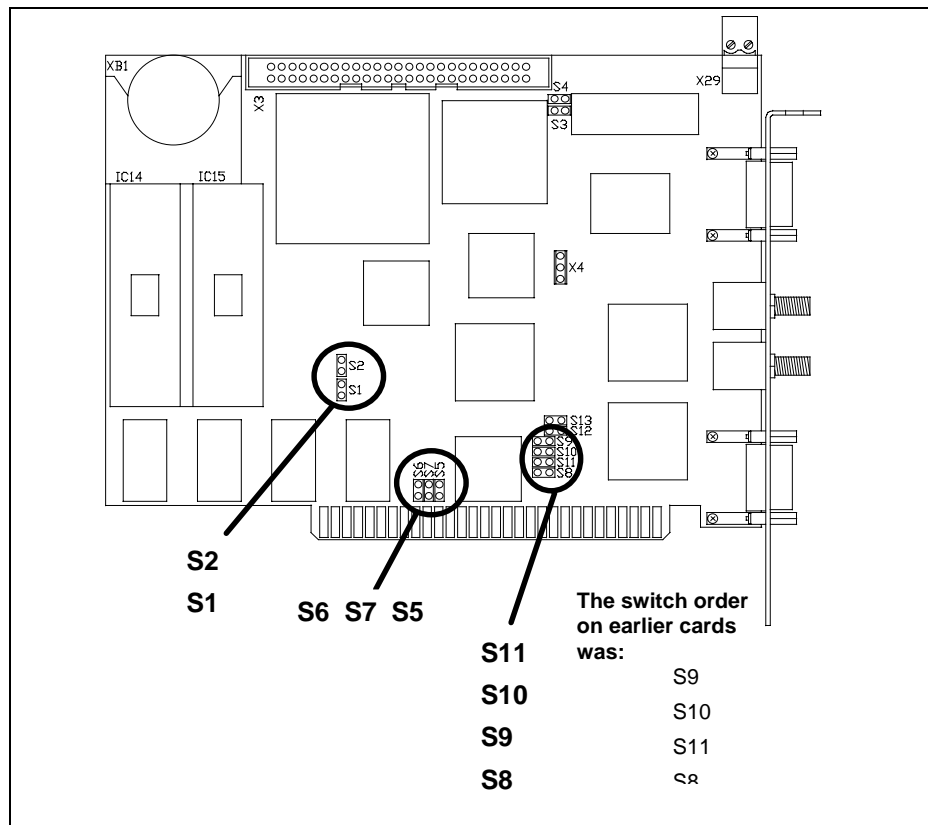


Figure 1-4: CLC-P jumper locations

Jumpers S5 through S7 set the PC interrupt. Only IRQ2 (default) can be used.

PC Interrupt	S5	S6	S7
IRQ2 (IRQ9)	In	Out	Out
IRQ3	Out	In	Out
IRQ5	Out	Out	In

Jumpers S8 through S11 set the base address of a 16K memory segment in the Host's RAM. This memory space is used to exchange information between the CLC and the Host.

Card Number	Base Address	S11	S10	S9	S8
0	C000	In	In	In	In
1	C400	In	In	In	Out
2	C800	In	In	Out	In
3	CC00	In	In	Out	Out
4	D000	In	Out	In	In
5	D400	In	Out	In	Out
6	D800	In	Out	Out	In
7	DC00	In	Out	Out	Out
8	E000	Out	In	In	In
9	E400	Out	In	In	Out
10	E800	Out	In	Out	In
11	EC00	Out	In	Out	Out
12	F000	Out	Out	In	In
13	F400	Out	Out	In	Out
14	F800	Out	Out	Out	In
15	FC00	Out	Out	Out	Out

On-Board Battery

Non-volatile memory backup is provided by a 3 volt, CR2477N (MnO₂/Li) type battery. The battery has a capacity of 0.9 Amp-hours.

CLC-V Overview

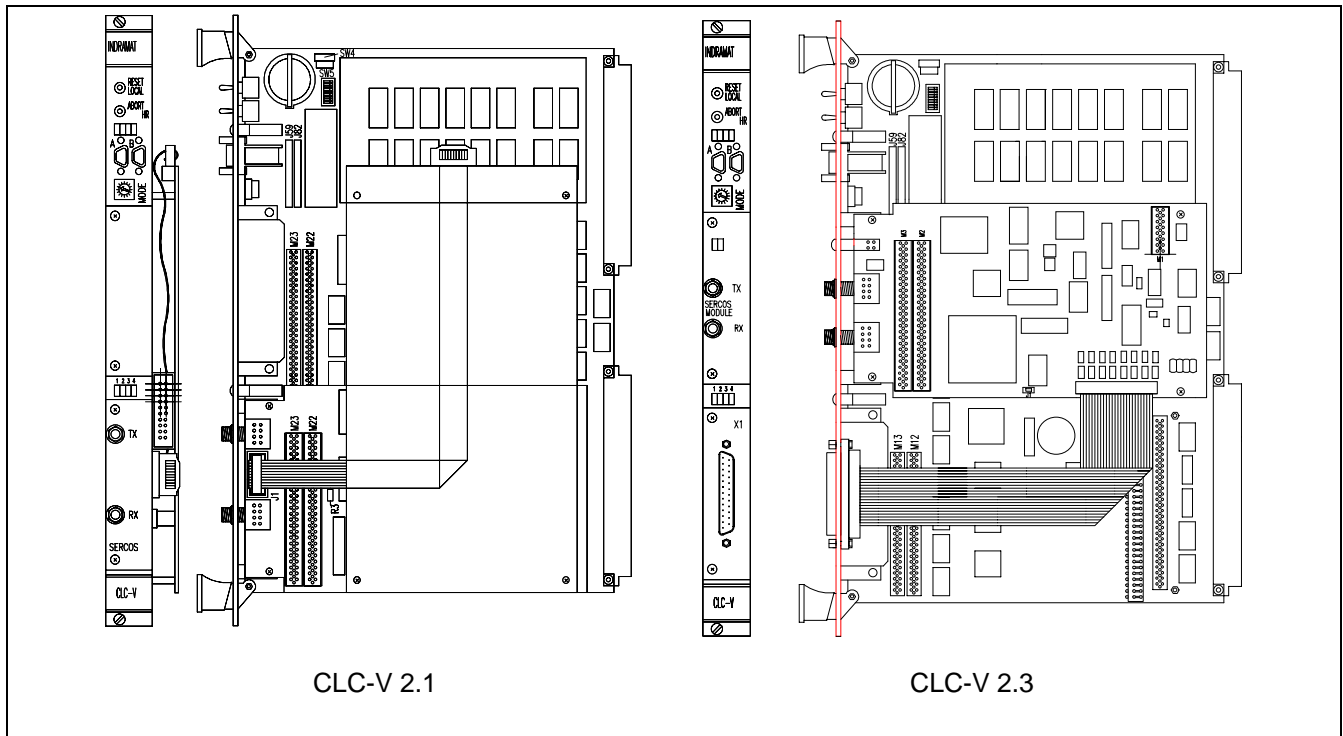


Figure 1-5: CLC-V Hardware Comparison

CLC-V Serial Communication

Port A is configured to respond to the CLC ASCII Host Protocol. Port B can be configured to respond to Host Protocol, Teach Pendant or another interface. The serial interface is compatible with EIA RS-232C and supports signals for both AT and XT type Host PCs.

The CLC's default parameters are:

- 9600 baud
- 8 bits per character
- 1 stop bit
- no parity

The configurable communication settings are shown in the following table.

Serial Com Options	Baud Rate	Checksum
Port A (X27) default	9600	enabled
Port A (X27) valid settings	300, 1200, 2400, 4800, 9600, 19200, 38400	enabled or disabled
Port B (X28) default	9600	enabled
Port B (X28) valid settings	300, 1200, 2400, 4800, 9600	enabled or disabled

CLC-V SERCOS

The SERCOS port is used for loop-through, daisy-chained installation into a SERCOS fiber-optic ring. The output port, Tx, is connected to the SERCOS input port of the next SERCOS device in the ring. Each SERCOS device is interconnected, output to input, with the output of the last device returned to the SERCOS input, Rx, of the CLC-V.

CLC-V Configuration Switches

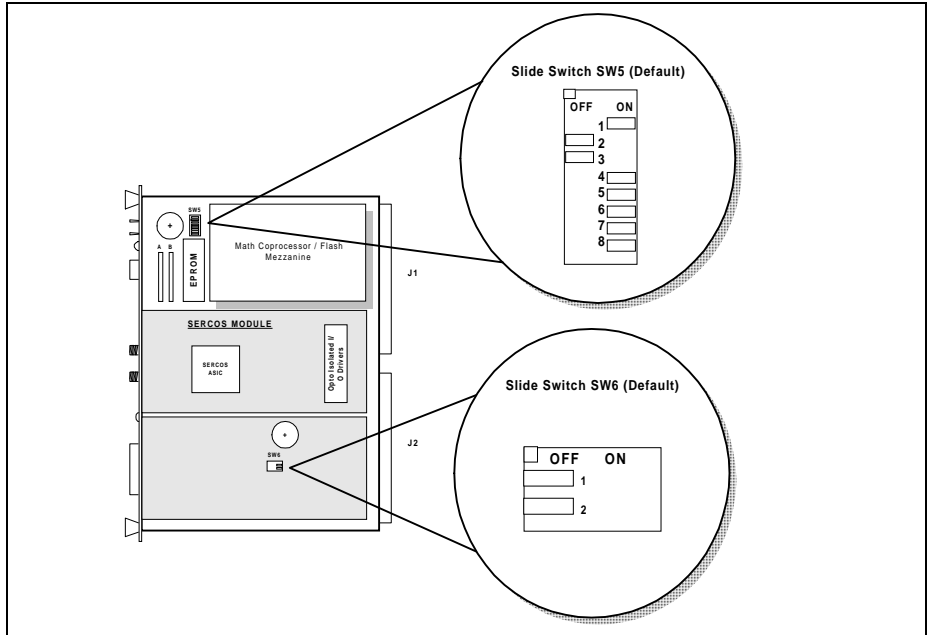


Figure 1-6: CLC-V Configuration Switches

Configuration Switch - SW5

SW5 Position	Default	Function
1	ON	ON - Programming of the local Flash EPROM enabled OFF - Local Flash EPROM write protected
2	OFF	ON - CLC-V Drives VME SYSRESET OFF - SYSRESET not driven
3	OFF	ON - CLC-V Accepts SYSRESET from VME OFF - SYSRESET not received
4	ON	ON - Power-fail reset voltage set to 4.8V OFF - Power-fail reset voltage set to 4.2V
5	ON	ON - Programming of Flash EPROM enabled OFF - Flash EPROM write protected
		6 & 7 Select the CLC's VME Bus request level: BR0 BR1 BR2 BR3
6	ON	OFF OFF ON ON
7	ON	OFF ON OFF ON
8	ON	ON - VME Slot 1 functions enabled OFF - VME Slot 1 functions disabled

Configuration Switch - SW6

Both switches SW6-1 and SW6-2 are functionally used as one switch. Both must have the same setting, ON or OFF.

SW6 Position	Setting	Function
1 2	OFF (default) OFF (default)	Disables the CLC-V's on-board secondary battery. Backup battery is provided through the VME bus STDBY line.
1 2	ON ON	Enables the CLC-V's on-board secondary battery and disconnects the CLC-V from the VME bus STDBY line. Both positions of SW6 must be ON to enable the on-board secondary battery and disconnect the CLC-V from the VME bus STDBY line.

CAUTION: Leave both switch positions OFF, as set by the factory. The VME card cage is the required source of battery back-up. Damage to the CLC-V's on-board secondary battery may occur if a VME card cage supplies battery backup and either position of SW6 is set ON.

On-Board Primary Battery

SRAM parameters and real-time clock (RTC) backup is provided by a 3 volt, CR2032 lithium button-style battery. The battery has a capacity of 0.18 Amp-hours.

2 Monitoring and Diagnostics

2.1 System Diagnostics - Codes and Messages

The CLC provides three types of diagnostic messages: Status Messages, Warnings, and Shutdowns. Diagnostic messages are preceded by an identifying code number. Indramat assigns these code numbers using the following groups:

Status Messages (001-199)

Warning Messages (201-399)

Shutdown Messages (400 - 599)

A second error code is often included within the primary error message.

"X" indicates a hexadecimal error code

"D" indicates a decimal error code

The Host can request the currently active diagnostic message for the CLC system and for each user task. In addition, any parameters pertaining to Drive Diagnostics can be accessed through drive service channel (Dx.x) parameters. Refer to the Drive manual for descriptions of drive diagnostics.

See the **Parameters** section for more detailed descriptions of the CLC System and Task parameters. For example:

Parameter **C-0-0122**: Diagnostic Message

Parameter **C-0-0123**: Diagnostic Code.

Parameter **C-0-0124**: Extended Diagnostics.

Parameter **T-0-0122**: Task Diagnostic Message

(where s= A, B, C or D for Task A - D)

Parameter S-x-0095: Drive Diagnostic Message

(where x= 1 - 8 for Drive 1 - 8)

2.2 Status Messages (001-199)

A Status Message indicates the normal operating status of an axis, task, or the system when there are no errors. A change in status that generates a new status message overwrites the previous message. No user acknowledgment is required for a change in a status message.

001 Initializing System

The CLC is initializing the executive firmware, the SERCOS ring, and other devices at power-up or exit from parameter mode.

002 Parameter Mode

The CLC is in parameter mode, and the drives are in Phase 2.

003 Initializing Drives

SERCOS has been reconfigured and the ring is being initialized.

004 System is Ready

The system has been initialized and is ready for operation.

005 Manual Mode

All four user program tasks are in manual mode.

006 Automatic Mode: ABCD

The user program tasks indicated at the end of the message are in automatic mode, and the rest are in manual mode. For example, "Automatic Mode: B" indicates that only Task B is in automatic mode.

007 Program Running: ABCD

The user program tasks indicated at the end of the message are running, and the rest are not running or are single-stepping.

008 Single-Stepping: ABCD

The user program tasks indicated at the end of the message are in single-step mode. The other tasks are not running.

009 Select Parameter Mode to Continue

An error during system initialization occurred and was cleared, but the error condition was not corrected. Switch into Parameter Mode to continue.

010 Breakpoint Reached: ABCD

The user tasks indicated at the end of the message have reached a user program breakpoint, and the rest of the tasks are not running.

2.3 Warning Messages (201-399)

Warning messages are issued when an improper system condition exists. The condition is important enough to be brought to an operator's immediate attention, but not critical enough to shut down the system. However, a warning may be a notification of an impending shutdown condition. Warnings typically allow normal system operation to continue.

A warning sets the error bit associated with the affected task or the system and displays the warning message. Once issued, the error condition must be corrected and acknowledged to the system. The user acknowledges and clears a warning with a low-to-high transition of the Clear All Errors bit of the CLC's System Control Register.

After a warning condition has been corrected and acknowledged, the user program can be resumed at the point where the error occurred. In SERCOS, warnings are Class 2 Diagnostics.

Warning messages can be cleared by correcting the warning condition, or by setting the CLC's clear error input.

201 Invalid jog type or axis selected

This message is issued before a coordinated I/O jog when an invalid type or axis is selected.

202 Drive D is not ready

This message is issued before a coordinated I/O jog when a drive is not enabled.

203 Power lost during program

This function is not currently implemented.

204 SERCOS Ring was disconnected

The SERCOS ring was disconnected before a shutdown error was cleared. The ring is now initialized. To continue, activate the clear input. This message allows detection of an intermittent break in the fiber optic ring.

205 Parameter transfer warning in Task A

There is an error in the parameter transfer instruction. This indicates a warning condition that does not shut down the task. The parameter format, parameter number, or stored value may be invalid. A communication error message is displayed in the diagnostic message for the task (A-D) in which the error occurred (T-0-0122). Information on the actual parameter number that caused the error is provided in extended diagnostics (C-0-0124).

206 Battery is low: replace it soon

A low voltage on the RAM backup battery has been detected at power-up or initialization from parameter mode. Replace the battery to prevent any loss of data.

207 Axis D position limit reached

The negative or positive travel limit of axis D was reached, preventing a jog from occurring.

2.4 Shutdown Messages (400 - 599)

A Shutdown is issued in an emergency situation or when the system or drives cannot operate correctly. During a shutdown, the CLC switches the user program tasks into manual mode, decelerates all motion to zero velocity, and sets the error bit in the status register.

If the shutdown condition results from an E-stop or DDS-2 drive shutdown condition, the CLC also disables the drives, disabling motor torque and engaging the brake.

A low to high transition on the Clear All Errors bit in the System Control Register will clear a shutdown. The CLC automatically sends a 'Reset Class 1 Diagnostics' command to each drive that has an error.

400 Emergency Stop

The Emergency Stop input is active (low). The E-Stop circuit has been opened due to activation of the E-Stop push button or external logic. All drives on the ring are disabled. Release the E-Stop button or correct the error condition.

401 SERCOS Controller Error: DD

The SERCOS communications controller has indicated an error on the SERCOS ring. Check the fiber optic connections, the addresses set on the drives, and the drive configuration.

402 SERCOS Config. Error: see ext. diag. or

402 SERCOS Interface Error: XXXX (versions before 01.20)

An error in the SERCOS service channel has occurred when the CLC was initializing the timing and scaling parameters. The extended diagnostics (C1.124) gives a description of the error.

If the extended diagnostic indicates a timing error or data limit error, check the amount of data or drives on the ring and the minimum cycle time parameter. Otherwise, check the fiber optic connections, the addresses set on the drives, and drive firmware versions.

403 System Error

This error is not issued in current CLC versions and is reserved for future use.

404 Invalid Switch into Phase D

The SERCOS communications controller did not allow a phase switch. Check if power is applied to the drives and if the fiber optic connections and the drive addresses are correct. If drive parameters were just downloaded, switch back into parameter mode to reinitialize the interface. If the above conditions are O.K., the SERCOS interface board may be faulty.

NOTE: *This error is issued only in versions that do not use the SERCOS ASIC (firmware versions less than 01.20).*

405 Phase D: Drive did not respond

A time-out in the SERCOS ring has occurred when the CLC was initializing timing and scaling parameters. Check the fiber optic connections, the addresses set on the drives, and the drive firmware versions. This distinguishes a communication error from an actual phase switch error.

406 System Error

This error is not issued in current CLC versions and is reserved for future use.

407 Drive D Phase 3 Switch Error

The SERCOS phase 3 switch command failed for the drive indicated. This usually indicates that configuration parameters for the drive are invalid or have not been saved. Check the Drive Status message (parameter Dx.95) for drive 'D' for a description of the error.

If the Drive Status indicates that parameters are invalid or lost, display the Phase 2 error parameter list for Drive 'D'. Switch into parameter mode and change the invalid parameters or download a valid parameter file to the drive.

If the drive is not communicating, check the connections and the addresses. If drive parameters were just downloaded, switch back into parameter mode to reinitialize the interface.

408 SERCOS Controller is in test mode

The Indramat DAS2 SERCOS Controller is in test mode. Set the mode switch on the front of the board to a position where this error does not occur. *Note:* This error is not issued in versions that use the SERCOS ASIC.

409 SERCOS Disconnect Error

The SERCOS fiber optic ring was disconnected or the drives were powered down while in Phase 3 or 4. A more descriptive message will be displayed in the extended diagnostics (C1.124 - *Indicates the first drive in which the drive data failed*).

410 System Error

This error is not issued in current CLC versions and is reserved for future use.

411 Drive D Phase 4 Switch Error

The SERCOS phase 4 switch command failed for the drive indicated. This usually indicates that configuration parameters for the drive are invalid or have not been saved. Check the Drive Status message (parameter Dx.95) for drive 'D' for a description of the error.

If the Drive Status indicates that parameters are invalid or lost, display the Phase 3 error parameter list for Drive 'D'. Switch into parameter mode and change the invalid parameters or download a valid parameter file to the drive.

If the Drive Status indicates that there is a feedback error, voltage error, or other hardware error; correct the problem and switch into and out of parameter mode to reinitialize the interface.

412 No drives were found on ring

No drives were found when the CLC initialized the SERCOS ring to Phase 1. Check the addresses set on the drives, in the CLC program, and in the CLC parameters. Also, check that power is applied to the drives and the fiber optic connections are correct.

413 I-O board was not found

The selected I-O board was not found on the VME bus. The correct I-O device must be enabled and the address selected on the device must match the CLC parameter. A VME arbiter must be present in the rack (on CLC/V, switch SW5-8 must be on). See the I-O device descriptions for more information.

414 Parameters were lost

CLC System, Task, and Axis parameters were lost, and defaults have been loaded. The RAM backup battery has failed or was not connected, or an internal system error or new software version has corrupted the memory.

415 Drive D was not found

A drive (D) that is used in a program or selected in the system parameters was not found on the SERCOS ring. Check the fiber optic connections, the address switches on the drives, and the user program and parameters.

416 Invalid Instruction at XXXX

An invalid user program instruction was found by the CLC during compilation. Recompile the program from the PC and download it again. If the error still occurs, check the source program for an instruction that may not be supported in this firmware version.

417 SYSTEM ERROR: pSOS #XXXX

An internal CLC operating system error has occurred. Call Indramat Service for assistance.

418 No program is active

No active user program was found on the CLC during initialization. Download and activate a program from the user interface, then clear the error.

419 Invalid Program File

A checksum or file format error was found in the active program file. Recompile the program from the PC and download it again. If the error still occurs, call Indramat Service for assistance.

420 Drive D Shutdown Error

The drive has issued a shutdown error, which disables motion. Check the SERCOS Drive Status message (parameter Dx.95) for a description of this error. Refer to the drive manual for more information.

421 User Program Stack Overflow

The subroutine call stack for a user program task has overflowed. Check the program for the following conditions:

- there is not a return for every subroutine call
- a subroutine is calling itself
- program flow has caused multiple returns
- more than 256 subroutines are nested.

See the diagnostic message (***Error! Reference source not found.***) or ***task error bit*** for each task to find out which task has this error.

422 Parameter transfer error in Task A

There is an error in the parameter transfer instruction. The parameter format, parameter number, or stored value may be invalid. A communication error message is displayed in the diagnostic message for the task (A-D) in which the error occurred (T-0-0122). Information on the actual parameter number that caused the error is provided in extended diagnostics (C-0-0124).

423 Unimplemented Instruction

The instruction is not implemented in this version. Recompile the program without this instruction indicated by the current instruction pointer or update the CLC firmware or PC software.

424 System Error

This error is not issued in current CLC versions and is reserved for future use.

425 Instruction Error: see Task A diag.

An error has occurred in a user program instruction. A more specific message is displayed in the diagnostic message for the task (A-D) in which the error occurred (T-0-0122). This error usually applies to coordinated motion instructions.

426 Drive D is not ready

Drives must be enabled before motion commands are issued to them in a user program. Check the Axis Disable bit in Axis D's Control Register, Axis D's status bits, the fiber-optic ring, and the power circuit.

427 Calc: invalid table index D

In a user program calculation expression, the index to a point or event table is invalid. See the diagnostic message for each task to find out which task has this error, then check the variable that is used to index the table.

428 Calc: division by zero

In a user program calculation instruction, an attempt was made to divide a number by zero. See the diagnostic message for each task to find the task and the instruction, then check the variables used in the expression.

429 Calc: too many operands

In a user program calculation instruction, more than 1000 operands and operators were in the string. See the diagnostic message for each task to find the task and the instruction.

430 Calc instruction: invalid operator

An invalid arithmetic operator was found in a user program calculation instruction. Check the compiler and firmware version numbers, and call Indramat service for assistance.

431 Calc error: see Task A diag.

An error has occurred in a user program calculation instruction. See the task diagnostic message for a communication error message.

432 Calc: too many nested expressions

In a user program calculation instruction, more than 16 operations were pending. See the diagnostic message for each task to find the task and the instruction. Then check the number of operands in the expression, looking for unbalanced parentheses.

433 Setup instruction outside of a task

The following commands must be placed in a task's main program: TASK/AXES, KINEMATIC, and DATA/SIZE. This error is issued if any of

these commands are found in a subroutine. Move the instructions to Task A, B, C, or D, following the TASK/START instruction or Axis Setup icon.

434 Axis D configured more than once

Axis D was selected more than once in a TASK/AXES command (axis setup icon). Modify the program so that the axis is selected once.

435 Axis D not associated with a task

Axis D was not associated with a task using the TASK/AXES command but was used in another command. Modify the program so that the axis is selected.

436 General Compiler Error: XXXX

An error was found in a compile-time instruction (TASK/AXES, KINEMATIC) after program activation. See the task diagnostic message for a description. If there is no task diagnostic message, call Indramat for assistance.

437 Axis D not controlled by this task

Single-axis motion was started from a task not associated with an axis. Motion can only be started from a task with axes selected in the TASK/AXES command.

438 Invalid Axis Selected: D

Axis D was not found on the SERCOS ring or is an invalid axis number. This error is issued during single-axis or ELS motion commands. Check the constant or variable that contains the axis number.

439 Invalid Motion Type: D

The axis type does not match the type of motion used by the instruction. This error is issued when a single-axis command is given to a coordinated motion axis, for example.

440 I-O Transfer Error: see task diag.

An error occurred while reading or writing an I-O register. See the task diagnostic message for a description.

441 DMA error while reading from local RAM

442 DMA error while reading from VME address

443 DMA error while writing to local RAM

444 DMA error while writing to VME address**445 DMA Access Time-out Error****446 DMA Time-out Error****447 VME SYSFAIL Detected****448 VME Communication Handshake Error (D)****449 VME Bus Error**

A VME bus error occurred while communicating to another card in pass-through mode through the serial port or during a VME transfer instruction. Check the extended diagnostics for the type of error and the address at which it occurred. If VME transfers were not being performed or if the address does not match that in the program, an internal CLC system error has occurred. Notify Indramat Service of this system error.

450 Event D: invalid event type

The event type selected in the event table is not valid or does not match the type of motion or event. This error is also issued if an event/trigger (event arm) is executed for a motion-based event.

451 Invalid event number D

The event number is not within the bounds selected with the data/size command for this task.

452 More than D event timers armed

Only 'D' repeating timer events can be armed at one time. Check the program flow to make sure that triggered events are being disabled.

453 Homing param. transfer error: D

A SERCOS communication error occurred during a drive-controlled homing command. 'D' indicates the communication error code returned by the drive. Try to home the axis again. If this error still occurs, call Indramat for assistance.

454 Axis D homing not complete

The drive did not successfully complete the homing sequence. See the drive diagnostics for a status or error message.

455 Invalid VME Data Transfer Class

During a VME/READ or VME/WRITE instruction, the transfer class (e.g. I16, F32, etc.) is invalid.

456 Invalid VME Address

During a VME/READ or VME/WRITE instruction, the VME address does not lie within the valid VME address range.

457 Table Bounds Error During VME Read

The variable or point table index exceeds the size of the table configured in the DATA/SIZE instructions.

458 Table Bounds Error During VME Write

The variable or point table index exceeds the size of the table configured in the DATA/SIZE instructions.

459 Axis D target position out of bounds

The programmed position in an axis/move command exceeds the drive's travel limits. Adjust the travel limits or check the variable or constant containing the position.

460 Invalid program D from binary inputs

The program selected from the Binary Program Select bits does not exist on the card or is greater than the maximum number of programs.

461 System Error

This error is not issued in current CLC versions and is reserved for future use.

462 System Error

This error is not issued in current CLC versions and is reserved for future use.

463 Ratio command: invalid ratio

In the RATIO command, one of the factors is too large or the master factor is zero.

464 Can't activate while program running

A new program cannot be selected through the Binary Program Select inputs unless the program is stopped.

465 Drive D config. error, see ext. diag, or**465 Drive D: telegram type not supported (versions before 01.20)**

Drive D does not support a product-specific option or a drive configuration calculation has failed. Product-specific options include ELS, single-axis motion, or I-O cards.

The extended diagnostic message (C1.124, or in Status-System menu) describes the error in more detail. It often shows the parameter that failed along with a short message describing the error. If it indicates that a parameter is invalid or a configuration is not supported, check the axis configuration with the drive hardware or software.

If the extended diagnostic indicates an error such as 'Handshake time-out' or 'Drive is not responding', the SERCOS ring may have been disconnected during initialization. Check the fiber optic connections and the addresses of the drives on the ring.

466 Drive D: scaling type not supported

Drive D does not support an option such as ELS or single-axis motion, which are product-specific. Check the axis configuration with the drive hardware or software. *Note:* This error is issued only in versions that do not use the SERCOS ASIC (firmware versions less than 01.20).

467 Invalid ELS Master Option

An option in the ELS/INIT command is invalid, not supported, or inconsistent with the other options.

468 ELS adjustment out of bounds

The phase offset or fine ratio adjustment exceeded the bounds allowed by the drive. The fine adjust must be between -100 and 300%.

469 Axis D accel ≤ 0 or $>$ maximum

The acceleration or deceleration programmed for axis D is negative, zero, or exceeds the maximum acceleration or deceleration parameter (Ax.21 or Ax.22).

470 Axis D velocity $>$ maximum

The velocity programmed for axis D is exceeds the maximum velocity parameter (Ax.20).

471 Invalid VME Base Address Page: 0xXXXX

The base address page selected in the VME parameter is invalid. See the VME descriptions.

472 VME Event Trigger Rejected

A CLC did not respond to the VME broadcast event message. See the VME event description.

473 VME Event Trigger For Unit D Failed

Unit D did not respond to the VME mailbox event message. See the VME event description.

474 Drive D cyclic data size too large

Too much data is configured in the SERCOS cyclic telegram. The drives currently support up to 16 bytes of configurable data. Remove I-O or registration options from the parameter or program configuration.

475 Axis D capture already configured

An axis has been configured for the feedback capture function in a previous user program command. Only one capture/setup command is allowed for each axis.

476 Axis D: Real Time Bit Setup Error

A SERCOS error occurred while the CLC was configuring the drive's real time bits for the feedback capture function. Clear the error, enter parameter mode to reinitialize SERCOS, and then exit parameter mode.

477 Axis D: probe edge not configured

This error, issued in the capture/enable instruction, indicates that the selected probe edge for the event has not been configured with the capture/setup instruction.

478 Calc: operand out of range

The operand of a calculation function is out of the range of valid arguments, as when a square root or a logarithmic of a negative number is attempted.

479 Drive D: too many cyclic data elements

The DDS 2.1 currently allows 4 cyclic data elements for the AT and MDT. Remove options such as I-O cards and probing. Refer to the [SERCOS Cyclic Telegram Configuration](#)

480 SERCOS Error: MDT is too large

The DDS 2.1 currently allows 104 bytes in the MDT. Remove options such as I-O cards and probing, or reduce the number of drives on the ring. Refer to the [SERCOS Cyclic Telegram Configuration](#)

481 Event D is already armed

An event that is currently armed has been armed again using event/trigger (event arm) or the VME event instructions.

482 Checksum Error in Program

The currently active program's checksum doesn't match the checksum that is stored in memory. This indicates that a system error has caused the CLC to overwrite memory. Call Indramat service for assistance.

483 Parameter Init. Error: see Task A diag

There is an error in the parameter initialization or bit initialization instruction; which is executed when exiting parameter mode. The parameter format, parameter number, or stored value may be invalid.

A communication error message is displayed in the diagnostic message for the task (A-D) in which the error occurred ([T-0-0122](#)). Information on the actual parameter number that caused the error is provided in extended diagnostics ([C-0-0124](#)).

In many cases, this error is issued when a drive is not on the ring or the drive parameter is not found for a type of drive.

484 CLC SYSTEM ERROR

This error indicates a problem in the CLC executive firmware. See the extended diagnostics parameter ([C-0-0124](#)) for more information, and call the Indramat service department for assistance.

485 SERCOS I-O: too many registers configured

More than 50 SERCOS I-O registers were configured in the CLC, which exceeds the system limit. This includes both drive-resident I-O and SERCOS I-O slaves.

486 SERCOS Device D is not a drive

The SERCOS device with address D was enabled in the user program or parameters as an axis, but an I-O slave or other type of slave was detected.

487 Cam D is invalid or not stored

In the cam/activate command, the selected cam ('D') is not stored on the card or does not contain valid data. Check the variable or constant that selects the cam. Check that there is a valid cam with index 'D' stored on the CLC.

488 Cam Error: See Task A diag.

An error was issued during a cam command in task (A-D). See the task diagnostic message ([T-0-0122](#)) for a description.

489 More than D cam axes selected

The CLC limits the number of axes configured as CLC Cam Axes to 'D'.

490 System Memory Allocation Error

The dynamic memory space on the CLC has been exhausted. Call Indramat Service for assistance.

491 PC Communication Handshake Error

The CLC/P did not respond to an ASCII message. Check the address configuration on both the PC (config.sys and system.ini) and the CLC/P (address jumper switches).

492 Programs were lost

User programs and data were lost. The RAM backup battery has failed or was not connected, or an internal system error has corrupted the memory. For the CLC/V, the card may have been removed from the VME rack.

493 Data was restored from Flash

User programs and parameters have been restored from Flash EPROM. If the card has just been installed in the VME rack and a valid program is active, clear this error and proceed. If the card has not just been installed, this indicates that the VME standby battery has failed and the previous program and data has been replaced with that stored in Flash.

494 Sequencer init. error: see task T diag

An error has occurred in a sequencer/initialize instruction in task 'T'. The task diagnostic ([T-0-0122](#)) and the extended diagnostic ([C-0-0124](#)) give a more detailed description of the error.

495 Sequencer error: see task T diag.

An error has occurred in a sequencer/execute instruction in task 'T'. The task diagnostic ([T-0-0122](#)) and the extended diagnostic ([C-0-0124](#)) give a more detailed description of the error.

496 Can't Execute this Instruction from an Event

This user program instruction cannot be executed from within an event. See the task error descriptions and the current program instruction. Some operations, such as sequencer initialization, cannot take place during an event. Move the instruction into a main user task or subroutine.

497 Limit switch config. error, see ext. diag

This error is issued at activation of a program when one of the PLS parameters defined in the program is invalid. It is also issued when the ELS setup is incorrect for PLS operation. Parameter [C-0-0124](#) provides a detailed description of the error as an extended diagnostic message.

498 Drive D Shutdown Warning

This error is issued when any drive has a Class 2 shutdown warning. The tasks that stop for errors switch into manual mode and perform a controlled stop of all axes. A drive warning indicates a condition that will later cause a shutdown, but is serious enough to require immediate attention. Since the warning may have already been cleared on the drive, the extended diagnostic (**C-0-0124**) latches the class 2 diagnostic bits (drive parameter S-0-0012) from the drive so that this condition can be corrected.

Note: Class 2 warnings may not be detected by the CLC if drive parameter S-0-0012 is being continuously read by the user interface or user program, since the diagnostic change bit is reset whenever this parameter is read.

499 Axis number D not supported in this version

This version of CLC software is limited to less than D axes. The axis number is limited to the number of axes allowed. Currently, the standard version of CLC allows 4 axes, and the enhanced version 40 axes.

500 Axis D is not referenced

Axis D has not been homed, the reference position has not been set, or the reference position has been lost. The reference position bit in drive parameter S-0-0403 is zero. To enable or disable this error, use parameter A-0-0006.

501 Drive D communications error

An error in drive communications has occurred while the CLC was reading or writing a service channel parameter for an internal operation. Parameter C1.124, extended diagnostics, has a detailed description of the error.

502 ELS and cams not supported in this version

The ELS and cam features are not supported in this version of the CLC. GPS and GPE are the only firmware versions that include these features.

503 Executing empty block #D

This error is reserved for use by the TRANS01-D control. See the documentation for this version.

504 Communication Timeout

During a timed serial port transmission, the serial port has not responded within the time set in parameter C-0-0016. Timed transmissions used for jogging through Visual Motion. If this error occurs, increase the timeout value in C-0-0016.

505 Axis D is not configured

A user program command was issued to Axis D, but axis D is not configured in the program. Modify the user program so that the correct axis is addressed, or exclude the axis from the system using parameter A-0-0007.

506 I-O Mapper initialization error

The I-O mapper was invalid at initialization, due to loss of memory or an incompatibility in the mapper version.

507 Option Card Power Supply Error

There is an external power supply or output driver error on a DEA-08.1C, DEA-09.1C, or DEA-10.1C expansion cards connected to the CLC-D. This error is issued only in Run Mode (phase 4). All inputs are read as 0, and all outputs are turned off.

Power Supply Error on DEA/C:

The +24V signal voltage on each CLC/D must fall in the following range:

	<u>Min.</u>	<u>Typical</u>	<u>Max.</u>
External Supply Voltage	+18V	+24V	+32V

Output Driver Error on DEA/C:

An output driver error turns the 'ERR' LED on the DEA/C card on. This indicates that the current drawn by the outputs has caused the output drivers to shut down. There is a protection circuit that prevents damage to the card in this condition. This error is issued if the current is greater than 300mA for more than 1 microsecond.

Troubleshooting

When a 507 error occurs, check parameter C-0-0031 to find the cards that have the error condition. Check the ERR LED on the DEA/C. If it is on, check the current draw of the devices connected to the outputs. If the ERR LED is off, check the +24V external power supply signal to see if it is connected and if it falls in the range above.

2.5 Fatal System Errors

When a microprocessor exception or an unrecoverable system error occurs, the CLC may stop communicating with Visual Motion and teach pendant interfaces. If possible, control is passed to a CLC-resident monitor routine that can provide debugging information to an ASCII terminal connected to the Host serial port. If a fatal error repeatedly occurs and cannot be recovered, call Indramat Service for assistance in debugging.

2.6 Communication Error Codes and Messages

Error Code	Description
!01 SERCOS Error Code#xxxx (xxxx=Error code)	This is the code set in the data status word of the DDS-2 drive if SERCOS communication is invalid. Call Indramat Service if this error occurs.
!02 Invalid Parameter Number	The requested or sent parameter does not exist on the CLC / TRANS 01-D or the drive, or the format of the parameter is incorrect.
!03 Data is Read Only	The data in this parameter may not be modified.
!04 Write Protected in this mode/phase	The data in this parameter can not be written in this mode or communication phase. Switch into parameter mode (phase 2) to enter the parameter.
!05 Greater than maximum value	The parameter exceeds the maximum allowed value.
!06 Less than minimum value	The parameter is less than the minimum allowed value.
!07 Data is Invalid	Parameter data is invalid, or the format of the parameter is invalid. See the DDS or CLC / TRANS 01-D Parameter Descriptions.
!08 Drive was not found	The requested drive was not found on the SERCOS ring.
!09 Drive not ready for communication	The requested drive or the SERCOS ring has not been initialized.
!10 Drive is not responding	The drive did not respond to a service channel request. Check system diagnostics for the state of the SERCOS ring.
!11 Service channel is not open.	When switching between initialization phases, data from the drive is momentarily invalid, and this message is sent instead of the requested data.
!12 Invalid Command Class	A serial port command is invalid or not supported at this time.
!13 Checksum Error: xx (xx=checksum that CLC / TRANS 01-D calculated)	The CLC / TRANS 01-D detected an invalid or missing checksum in data that was sent to it. As a debugging aid, the checksum that the CLC / TRANS 01-D calculated on the incoming data is also sent with this message.
!14 Invalid Command Subclass	A serial port command option is invalid or not supported.
!15 Invalid Parameter Set	The parameter set number (task or axis) is invalid.
!16 List already in progress	An attempt has been made to start a parameter or program list that is already in progress.
!17 Invalid Sequence Number	The sequence number of a parameter or program list is invalid or has been sent out of order.
!18 List has not started	A parameter or program list has not been initiated (i.e. sequence number was sent before list was started).
!19 List is finished	This is an acknowledgment that a parameter or program list is complete. It does not indicate an error.
!20 Parameter is a List	This parameter is a variable-length list, and its data cannot be displayed as a normal parameter.
!21 Parameter is not a List	Only Variable-Length List parameters can use the Parameter List sequence.
!22 Invalid Variable Number	The variable mnemonic was not 'I' or 'F', or the variable number is greater than the maximum number of variables allocated.
!23 Insufficient program space	This message is sent after the CLC / TRANS 01-D receives a "P W" program header if not enough contiguous memory is left on the CLC / TRANS 01-D to store the program. Other programs may need to be deleted or their order rearranged. Check system parameters C1.91, C1.92 and C1.93 for CLC / TRANS 01-D memory status.
!24 Maximum number of files exceeded	The CLC / TRANS 01-D allows up to 10 programs resident in the CLC / TRANS 01-D. This error message is sent when the CLC / TRANS 01-D receives a "PW" program header and there are already 10 programs stored on the CLC / TRANS 01-D. One of the CLC / TRANS 01-D resident program files must be deleted to make room to download the program.

Error Code	Description
!25 Invalid program header	The format of the program header sent to the CLC / TRANS 01-D is invalid, or this command is not available for reading or writing.
!26 Checksum Error in Program	This message is sent at the end of a download if the checksum of the data does not match the checksums sent in the program or program header.
!27 Invalid Program Handle	The format of the handle is incorrect, or this command is not available for reading or writing.
!28 Function not Implemented	The function is not implemented in this version of the CLC / TRANS 01-D.
!29 Program not found on CLC	A program corresponding to the requested program handle was not found (e.g., the program is not resident in the CLC / TRANS 01-D).
!30 Invalid I/O Register or Bit Number	The I/O register mnemonic is invalid or a register number greater than the maximum number of registers was sent.
!31 Invalid Table Index	The ABS, REL, or EVT table name was incorrect, or the index number was greater than the maximum number of points or events.
!32 Communication Port Error	The serial port receive buffer has overflowed. Make sure communications is set to half-duplex.
!33 Invalid Data Format	The format of the data received by the CLC / TRANS 01-D is invalid (e.g., non-digits are sent in a decimal number).
!34 Active program can't be deleted	The active program cannot be deleted at any time.
!35 Parameter mode is required	The action requested can only be performed in Parameter Mode.
!36 Invalid Event Number	The event number selected in the ABS or REL point table is out of the range of the total number of events.
!37 Invalid Event Function	The function name selected in the event table does not exist on the CLC / TRANS 01-D card or is not defined as an event function.
!38 Program file version mismatch	The version of the file system on the card does not match that of the downloaded file. Upgrade to the latest versions of the Visual Motion compiler and CLC / TRANS 01-D executive.
!39 Can't activate while program running	A new program cannot be activated unless all user tasks are stopped.
!40 No programs are active	No programs are active on the CLC / TRANS 01-D card. Download a program to the card.
!41 System Error: pSOS #XXXX	This is an internal CLC / TRANS 01-D system error. Call Indramat Service for assistance.
!42 Mapper: invalid operator	An invalid Boolean operator was found in I/O Mapper when it was sent to the CLC / TRANS 01-D.
!43 Mapper: too many operations	The maximum number of Boolean operations allowed by the CLC / TRANS 01-D I/O mapper has been exceeded.
!44 Mapper: invalid register	A register exceeds the maximum number of registers or is 0.
!45 Mapper: invalid bit or mask	The bit number or mask sent exceeds 16 bits.
!46 Mapper: register is read-only	An assignment to a read-only register or bit was made (e.g., attempting to write to a CLC / TRANS 01-D status register).
!47 Invalid Unit Number	The unit number (second character in string) is not a number between '1' and 'F' or an ASCII space character.
!48 VME Bus Error	A VME bus error occurred while communicating to another card in pass-through mode through the serial port.
!49 VME Communication Handshake Error (D)	The card addressed by the unit number in pass-through mode does not exist or its parameters are not configured properly. Change the unit number to correspond to a card in the rack or set it to a space. (No longer issued on CLC / TRANS 01-D-D.)
!50 Invalid Download Block	The block sent during a program download is incorrect in length or is not in hexadecimal format.

Error Code	Description
151 Unit D: Invalid VME Base Address Page	The VME base address page parameter is set to an invalid address for the indicated VME unit number.
152 Invalid Axis	The parameter set for the requested axis does not exist. Either this axis is disabled or the CLC / TRANS 01-D does not support this number of axes.
153 Waiting for service channel	When switching between drive initialization phases, data from the drive is momentarily invalid. This message is sent instead of the requested data. This message will also be issued whenever a service channel transaction cannot be completed. Continue to retry the message until a valid response is returned.
154 List or String is too short	The text string or parameter list is smaller than the minimum length allowed by the CLC / TRANS 01-D or the drive, or the size of a value does not match the attributes sent from the drive.
155 List or String is too long	The text string or parameter list exceeds the maximum length allowed by the CLC / TRANS 01-D or the drive, or the size of a value does not match the attributes sent from the drive.
156 PC Communication Handshake Error	The CLC / TRANS 01-D/P is not responding to an ASCII message. Check the address configuration on both the PC (config.sys and system.ini) and the CLC / TRANS 01-D/P (address jumper switches).
157 I/O Mapper: Max file size on CLC Exceeded	The CLC / TRANS 01-D's memory that was allocated for I-O mapper strings (8KBytes) has been exhausted. Optimize the mapping program so that it fits into memory.
158 Cannot store cam: already active for axis D	Cam data cannot be changed unless no axes are currently using it. Deactivate the cam for axis 'D', then send the cam again.
159 SERCOS handshake/busy timeout	This is an internal error generated by the SERCOS ASIC. Change modes or reset the card. If it happens again, call Indramat Service.
160 Executable program is too large (ddK)	The executable portion of the user program downloaded to the CLC / TRANS 01-D exceeds the maximum limit, which is indicated in the message ('dd') in kilobytes. Optimize the program and download it again, or update the firmware to a version that has a larger program limit.
161 System Memory Allocation Error	The dynamic memory space on the CLC / TRANS 01-D has been exhausted. Call Indramat Service for assistance.
162 Cam X data is < 0 or greater than 360	All values in the x-column (right hand column) of the cam file sent to the CLC / TRANS 01-D must be between zero and the modulo value of the master.
163 X-Column does not start at 0 or end at 360	In the cam file sent to the CLC / TRANS 01-D, the first point must be zero and the last point must be the modulo value of the master. Check the beginning and end of the cam file.
164 Not supported in user prog file version 1.1	The requested feature is not present in the file version of the user program from which the data was requested or sent. To use this feature, a compiler upgrade is necessary.
165 Sequencer: invalid sequence (D)	The sequence number (D) is zero or is greater than the allocated maximum number of sequencers for this program.
166 Sequencer: invalid step (D)	The sequencer step number (D) is zero or is greater than the allocated maximum number of steps for this program.
167 Invalid function number (D)	The function number (D) selected for a sequencer step is invalid or refers to a function that does not exist on the card.
168 Function D not accessible in a step	The function referred to with the number (D) cannot be entered in a sequencer step. It needs to be declared accessible by the sequencer in the user program.
169 Too many functions are used (D)	The total number of functions used by all steps exceeds the number (D) allocated for the program in the data sizing instruction, or the number of functions used in a step exceeds the number of functions remaining. Reduce the number of functions used or allocate more function slots in the data sizing instruction.
170 Maximum steps per sequence exceeded (D)	The number of steps in a sequence exceeds the number (D) allocated for the program in the data sizing instruction.

Error Code	Description
!71 Maximum functions per step exceeded (D)	Up to (D) functions can be used in one sequencer step. This is a CLC / TRANS 01-D system limit, which in version GPS-02.00 is 100.
!72 Program does not include a PLS	PLS data was requested from a program that does not support the Programmable Limit Switch function or does not have any PLS's configured.
!73 Invalid ABS or REL point index (D)	Point D is zero or is greater than the allocated maximum number of points for the selected point table
!74 Error in command execution	A procedure command set in the CLC / TRANS 01-D or drive parameter has not been successfully completed.
!75 Comm. port buffer overflow	The serial port receive buffer has overflowed. In current versions of the CLC / TRANS 01-D, this buffer is 512 bytes. To avoid this error, the host must communicate in half duplex or use XON-XOFF handshaking correctly.
!76 Invalid Block	This message is reserved for the TRANS01-D version of the CLC / TRANS 01-D. See the documentation for this version.
!77 Can't save sequencer while it is running	Sequencer data can only be save while the program is not running, or while no user tasks are running a sequencer.
!78 Service channel in use	The SERCOS service channel is being used by a user program task or by a CLC / TRANS 01-D internal process, and has suspended the transmission of a list or text string. See the description of parameter C-0-0010, bit 12.
!79 PID block number does not exist	This error is issued when the selected PID block is not initialized in the user program.

3 CLC DDE Server

3.1 Dynamic Data Exchange

The Microsoft Windows operating system specifies a method for transferring data between applications which is called dynamic data exchange (DDE). DDE is a message protocol that developers can use for exchanging data between Windows-based applications. The CLC communication server uses the dynamic data exchange management library (DDEML) which is built on top of the DDE protocol. The DDEML provides services that the message-based DDE protocol does not support. Under the DDEML a client application requests information from a server application, or it sends unsolicited data to the server. The client does this by passing predefined ASCII strings to the server through the DDEML.

Before a client and server can exchange data, they must first agree upon what they are going to talk about. This is done by establishing a conversation. Conversations are defined by a service name and a topic name. The CLC server application uses this information to specify how and who to communicate with. After having established a conversation, the client application can now pass data. This is done by specifying an item name. The item name identifies the specific data to be passed.

There are three basic types of data transactions which can be initiated by the client application. A **request** transaction is used to obtain data from the server. The server application knows how to obtain the requested information. The second type of transaction is an **advise link**. After a client application establishes an advise link with a server, it is up to the server to poll the data for changes. If the server finds that the data has changed it will notify the client application. The third type of transaction is a **poke**. A poke transaction is used to send data for a specific item to the server.

The Dynamic Data Exchange Server

CLC_DDE is a Windows based Dynamic Data Exchange (DDE) Server application which is used to communicate with Indramat's CLC motion control cards. It has been implemented using windows dynamic data exchange management library (DDEML).

- Key Features**
- Serial connection to a CLC card with support for an RS485 auto switching adapter.
 - Support for a modem connection to a CLC card (AT protocol).
 - VME back plane communications from a XYCOM PC (Requires *XVME984.DLL*).
 - VME back plane communications from a GE FANUC Plug & Play PC (Requires *VPCMTK.DLL*).
 - Direct PC AT bus communication to a CLC-P card (Requires *CLC_P.DLL*).
 - Connection for editing a CLC compiled program file off line (Requires *CLC_FILE.DLL*).
 - Demonstration connection for testing client applications off line (Requires *DEMO.INI*).
 - Access to server parameters and status through DDE.
 - Supports *Request*, *Advise* and *Poke* transactions.

Dynamic Data Exchange Interface

A windows application, known as a *client*, can pass information between other applications known as *servers* using Dynamic Data Exchange (*DDE*). A client establishes a conversation with a server specifying a *Service* and a *Topic*. Once a conversation has been started, a client may request or send information by specifying an *item*.

Service Name

The CLC communication server supports two DDE service names. The standard service name is **CLC_DDE**. This should be used for all connections except when connecting to a CLC compiled program file. For this case use **CLC_FILE**.

Topic Name

When the standard service name is used to exchange CLC data, the topic name identifies the method of connection to the CLC card and the card unit number. Valid strings consist of a communication device name and a unit number. Valid device names are **SERIAL_**, **AT_MODEM_**, **XYCOM_**, **GE_P&P_**, **DEMO_** or **ISA_** and valid card unit numbers are '0' to 'F'. Connections which use the CLC_FILE service should specify the CLC program file as the topic name. If the file is not located in the same directory as clc_dde.exe then the complete path should be included. To exchange server data the service name should be CLC_DDE and the topic name should be **SERVER**. This is the only topic which will not support an advise link. See section *SERVER Topic Name*.

Example:	"SERIAL_0"	Serial connection to a CLC card designated as unit '0'.
	"XYCOM_B"	Xycom PC in VME rack talking to a CLC_V card designated as unit 'B'.
	"ISA_1"	PC talking over the ISA bus to a CLC_P card designated as unit 1.
	"SERVER"	Exchange CLC_DDE server information.

Item Name

The item name identifies the specific data to exchange. When exchanging CLC data the item name consists of a string which contains the class, subclass and data identifiers of the information for the CLC card. The strings follow the ASCII serial protocol. **Refer to Appendix B. Direct ASCII Communications for an explanation of these codes.** When exchanging server data the item name should consist of the section and entry name from the INI file (clc_dde.ini). The two names must be divided by a pipe (|) character. Not all server data has read/write capabilities.

Example:	"RX 0.10"	Specifies register 10 in hexadecimal format.
	"TP 2.20"	Specifies task B parameter 20.
	"CP 1.122"	Specifies card parameter 122.
	"SERIAL Baudrate"	Specifies the baud rate to use for serial connections.

Note: Serial connections directed at different units will be passed through the VME backplane to the proper unit (CLC-V only). This allows communications with any CLC_V card in the VME rack with only one serial connection.

3.2 The Communication Servers Main Window

CLC_DDE displays the unit number and current status for the selected CLC control card. To display the status for a different CLC card or to disable this feature, open the server configuration dialog box under the settings menu item. Select the desired connection/unit from the CLC status display combo box.

When CLC_DDE is in an icon state the tip of the arrow will change colors depending on the communication state. A green tip means that the server is actively communicating, and a red tip indicates that the server is in an error state. If the monitored CLC card's status indicates an error state while the application is an icon, the server window will be restored to the normal state.

When the CLC DDE Server is running, either the icon or the dialog box below is displayed. If the icon is displayed, double-clicking the icon restores the dialog box.

The CLC DDE Server dialog box contains three selections on the main menu bar: File, Settings and DDE.

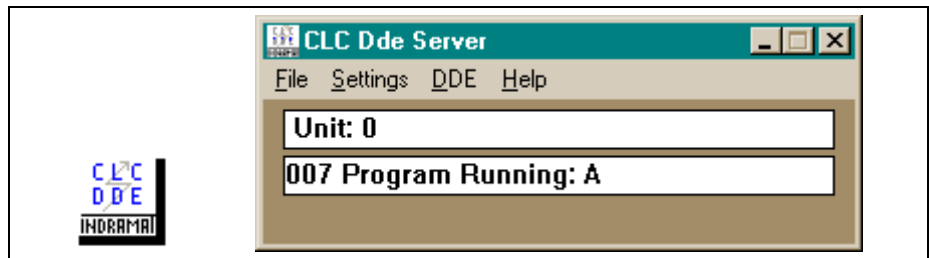


Figure 3.1: CLC DDE Server

Settings Menu - CLC Server Configuration

The CLC Server Configuration allows setting of various system parameters as well as providing performance status information.

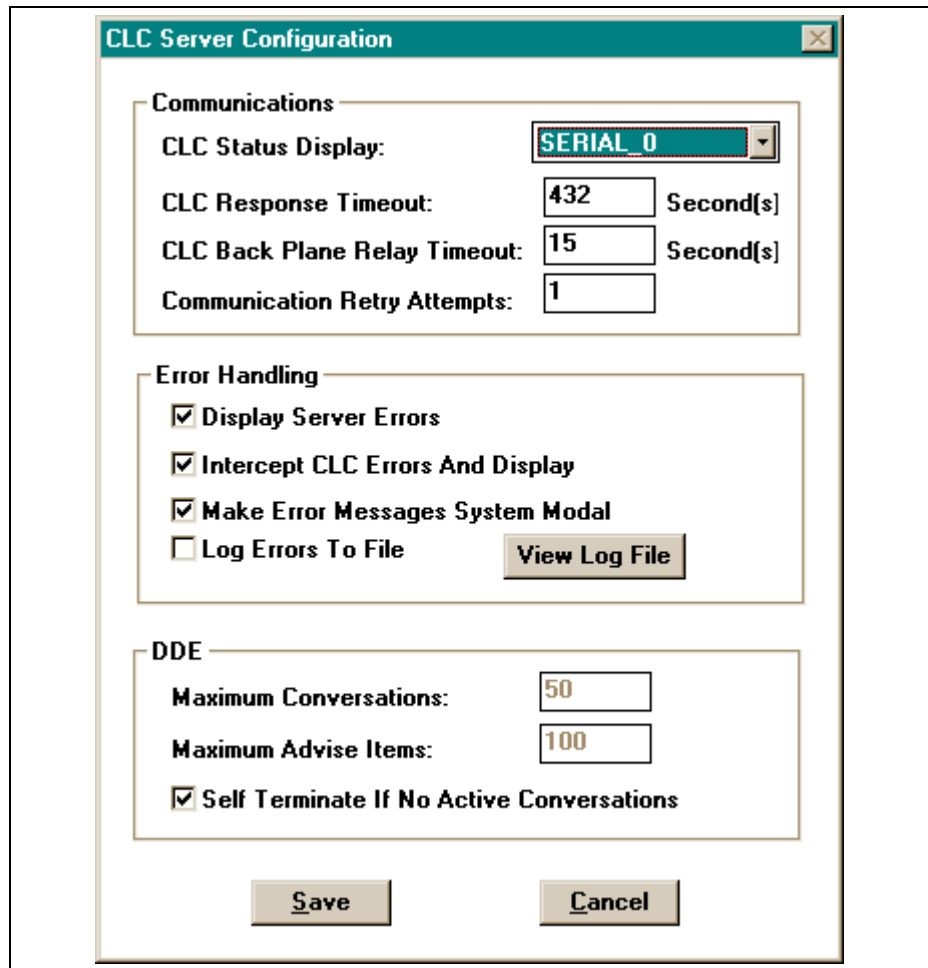


Figure 3-2: CLC Server Configuration

Communications

CLC Status Display	Selects the CLC device/unit (i.e. serial_0) combination to be displayed in the status window of the server . The request will be inserted into the standard client advise loop queue. This feature can be turned off by selecting "Disable Status".
CLC Response Time-out	The amount of time in seconds that the server will wait for a completed response from the CLC control card before diagnosing a disconnect. The valid range of values is 1-900 seconds.
CLC Back Plane Relay Time-out	CLC-V control cards have the ability to redirect incoming serial messages over the VME back plane to other CLC-V cards in the same rack. This allows a host to address multiple control cards with one serial connection. These transmissions may require more time than a direct serial link. The relay time-out value is used for these transactions. The valid range of values is 1-900 seconds.
Communication Retry Attempts	The number of times the server will re-send a message before it issues an error. The valid range of values is 0-255.

Error Handling

Intercept CLC Errors And Display	Checking this box will cause the server to intercept CLC error responses and displayed them in a message box. Request and poke transactions will return failure to the client application. Advise links will remain active, however they will return nothing until the error is resolved. The error response will be written to the error log file if that feature is enabled. If this box is not checked the error string will be returned to the client.
Make Error Messages System Modal	Checking this box will cause all server generated message boxes to have system modal attributes. This means that all applications will be suspended until the user responds to the message box. The window can not be forced to the background.
Log Errors To File	Checking this box will cause the server to log all server errors to a file. The current system date and time will be associated with each log entry. As a default this feature is not enabled.
View Log File	Pressing this button will cause the current error log file to be displayed in notepad.

DDE

Maximum Conversations	This is a static display of the maximum number of allowed DDE conversations as specified in the INI file. The server will refuse any DDE connection requests in excess of this value.
Maximum Advise Items	This is a static display of the maximum number of allowed DDE advise links as specified in the INI file. The server will refuse any requests for advise links in excess of this value.
Self Terminate If No Active Conversations	Checking this box will cause the server to close itself when the last DDE conversation with it has terminated. This is the default state.

Settings Menu - Serial Communications

The Serial Communications dialog box allows the user to select the serial communication parameters the server will use. When this dialog box is open all communications are suspended. If changes are made to the configuration they will take affect when the “Save” button is pressed.

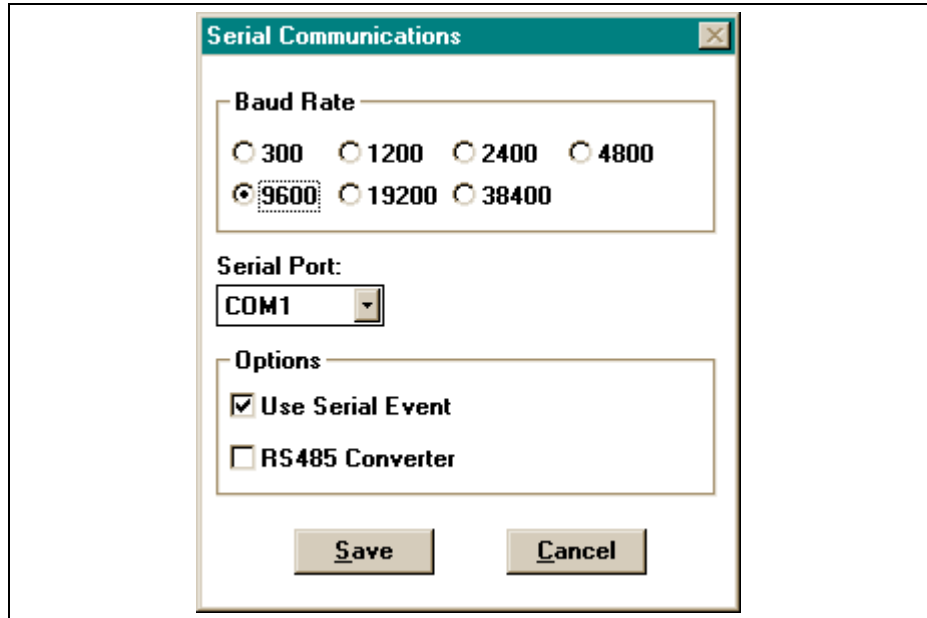


Figure 3-3: Serial Communications

Baud Rate	Check the proper baud rate to use when communicating serially with a CLC card.
Serial Port	Select the serial communications port to use on the PC.
Use Serial Event	Checking this box causes Windows to notify the server when a completed message is in the receive queue. This will increase the number of serial messages sent over polling for a response. Slower computers may not be able to utilize this feature.
RS485 Converter (not available with TRANS 01-D)	This option should be used when an RS232 to RS485 converter is present. A delay will be inserted between messages which is equal to at least one character transmission at the selected baud rate. This is necessary to ensure that the CLC card has had sufficient time in which to turn the RS485 transmitter off and enable the receiver. Please note that the converter must toggle the transmitter and receiver automatically, and also that echo back must be disabled.

Settings Menu - VME Communications

The VME Communications dialog box allows the user to edit parameters which the server uses when talking over the VME bus using a XYCOM embedded PC. When this dialog box is open all communications are suspended. If changes are made to the configuration they will take affect when the "Save" button is pressed. The dynamic link library "XVME984.DLL" must be in the CLC directory or the windows path.

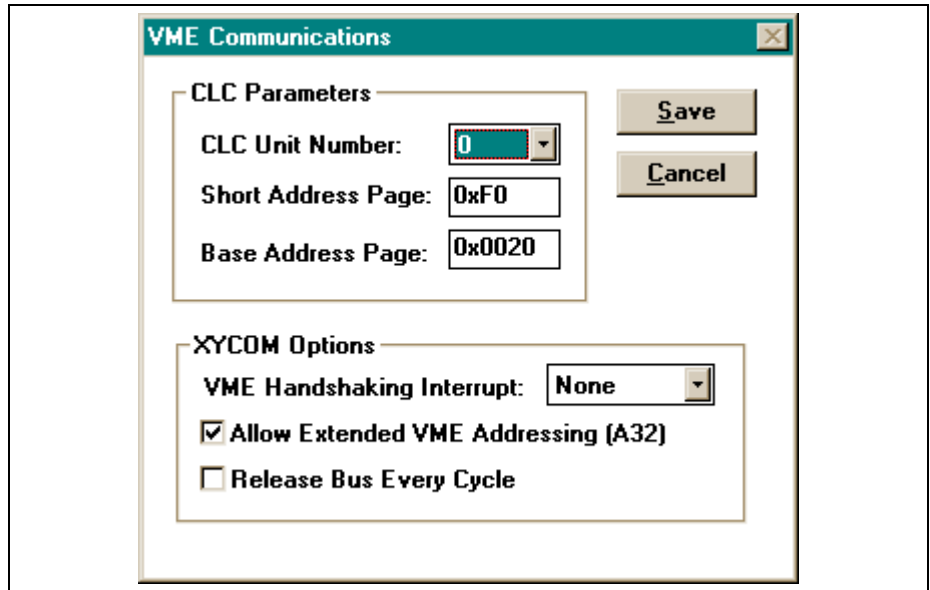


Figure 3.4: VME Communications

CLC Parameters

CLC Unit Number	The CLC unit number for the currently displayed data.
Short Address Page	The address page in short VME memory space where the selected CLC card resides.
Base Address Page	The address page in Standard or Extended memory space where the CLC's shared RAM is located.

Note: The default server settings correspond to the default CLC control card settings and should not need to be altered.

XYCOM Options

VME Handshaking Interrupt	Select the VME interrupt which all CLC-V control cards should use to terminate a communication response. If this option is not used, the server will poll for a communication response every 55 milliseconds. Refer to your XYCOM owners manual to configure the computers BIOS to acknowledge the selected VME interrupt.
Allow Extended VME Addressing (A32)	Check this box if the XYCOM PC can support A32 addressing.
Release Bus Every Cycle	Check this box if the PC should release the VME bus after every cycle. This will increase communication overhead due to the additional bus arbitration cycles

Settings Menu - PC Bus Communications

The PC Communications dialog box allows the user to view CLC status indicators and set communication parameters. When this dialog box is open all communications are suspended. If changes are made to the configuration they will take affect when the "Save" button is pressed. The dynamic link library "CLC_P.DLL" must be in the CLC directory or the windows path.

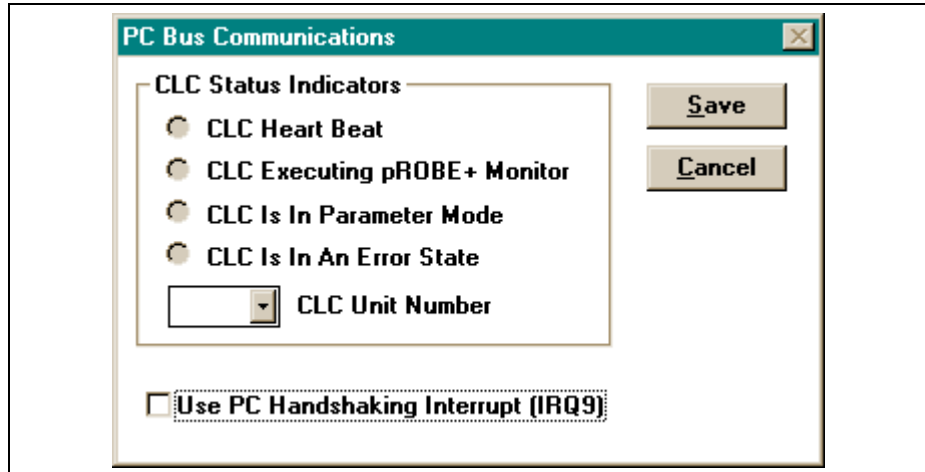


Figure 3-5: PC Bus Communications

CLC Status Indicators

CLC Heart Beat	This indicator will blink indicating that the selected CLC control card is running.
CLC Executing pROBE+Monitor	This indicator will be marked if the selected CLC control card has faulted and is running the pROBE+ monitor.
CLC Is In Parameter Mode	This indicator will be marked when the selected CLC control card is in parameter mode.
CLC Is In An Error State	This indicator will be marked when the selected CLC control card is in an error state. Card parameter 122 will contain the specific error message.
CLC Unit Number	Use this pull down list to select the unit number to display the status indicators for.
Use PC Handshaking Interrupt (IRQ 9)	When selected, this option will force all CLC-P control cards to terminate communication responses with a PC interrupt (<i>IRQ 9</i>). Hardware jumper S5 must be inserted on the CLC-P card for this option to work properly. If this option is not used, the server will poll for a communication response every 55 milliseconds. Note: When using the interrupt option on the CLC-P control card, no other hardware devices may use IRQ 9.DDE Menu.

DDE Conversations

The DDE Conversations dialog box displays the **Conversation, Service and Topic Handles** for all of the current DDE conversations. The **Item Count** column shows the total number of active advise links, request transactions and poke transactions. Double click on a specific conversation entry in order to view the item transaction list. A second method is to select the conversation and then use the “expand” button. This dialog box is useful when creating client applications which talk to the CLC communications server.

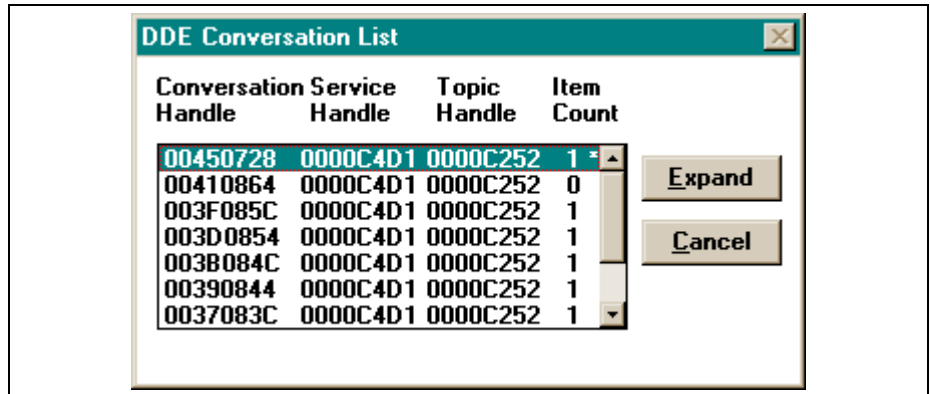


Figure 3.6: DDE Conversations

DDE Conversation Item Dialog

The DDE Conversation Item dialog box can be used to view the item transaction list for a conversation. The Service name, Topic string, Item string, clipboard Format and Transaction Type are displayed in text format. Use the “Next” and “Previous” buttons to cycle through the current list.



Figure 3.7: DDE Conversation Item

Communication Monitor

The DDE Communication Monitor displays all of the current DDE conversations. The monitor can display DDE requests and/ or responses depending the selection made under the *Settings* menu.

The active window builds a communications log of all DDE conversations that occur while the monitor is running. Selecting *Clear* will empty the log. Selecting *Stop* will stop the conversation monitoring and allow users to scroll through the log. The Monitor window can be resized to enlarge the active viewing area.

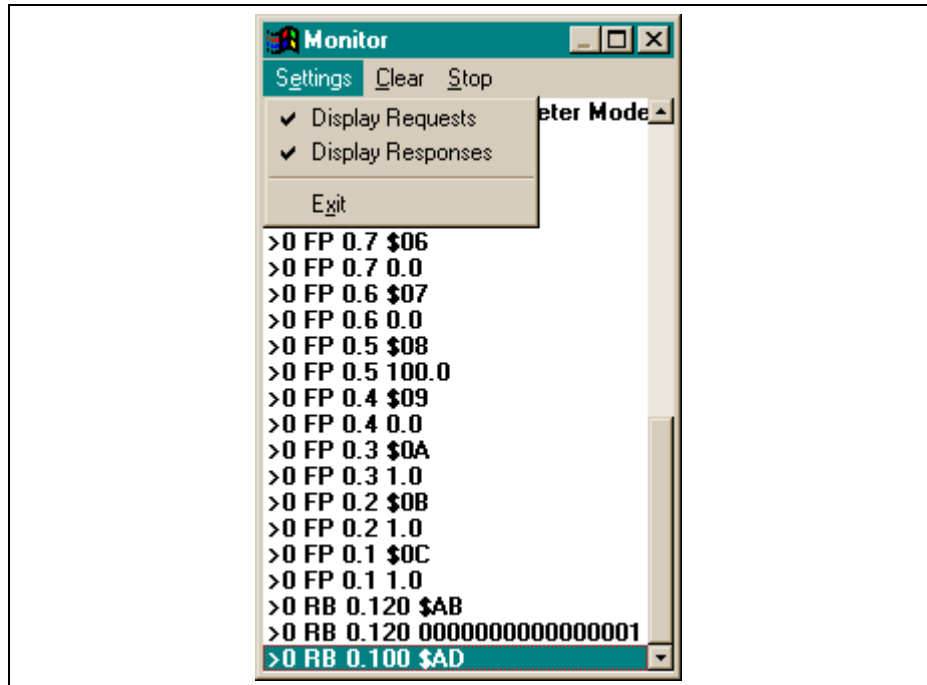


Figure 3.8: DDE Communication Monitor

3.3 AT Modem Configuration Dialog

CLC_DDE supports communications with a telephone modem which uses the AT protocol. The server will initiate the modem link and instruct it to dial the desired number by sending standard AT commands. The AT Modem Configuration dialog box is automatically displayed when a DDE conversation which specifies the "AT_MODEM_x" topic is started. The box will again appear when the conversation is terminated. The dialog contains setup data and connection status. To initiate the modem connection first enter the baud rate, serial port and phone number. The next step is to select the "Connect" button and watch the status box. After the sending and receiving modems have connected press the "Cancel" button to close the dialog box.

The modems used for communication must respond to the AT protocol. CLC_DDE will initialize the sending modem and establish a connection with the receiving modem. The receiving modem should be configured in auto answer mode. The CLC card must be configured to the same baud rate as the receiving modem.

Baud Rate	Select the baud rate to use to talk to the sending modem.
Serial Port	Select the serial port to use to talk to the sending modem.
Telephone	Enter the complete phone number to dial including any numbers required to get an outside line. Placing a comma in the number will insert a delay.
Attempt To Connect On Start Up	Check this box if you wish CLC_DDE to automatically attempt a connection when a conversation is started. The telephone number is saved in the INI file. If this box is not checked the user will need to select the "Connect" button.

3.4 SERVER Topic Name

The “SERVER” topic name allows a DDE client application access to CLC_DDE’s parameter set and status. The server will accept request and poke transactions. When accessing a parameter the client application should specify the section and entry names from the INI file. The two names must be separated by a pipe character (‘|’). When requesting status information the client should use “STATUS” as the section name (i.e. “STATUS|ErrorState”). RW = Read/Write RO = Read Only

Section: GENERAL	Response_Timeout	RW	1-900 Seconds	Message response time out.
	Relay_Timeout	RW	1-900 Seconds	Message time out when using VME pass-through.
	Communication_Retry	RW	0-255	Number of times to re-send a message.
	Suspend_Polling	RO	0 or 1	If 1 CLC_DDE status polling will be disabled.
	Display_CLC_Errors	RW	0 or 1	If 1 CLC_DDE will intercept & display CLC Errors.
	Log_Errors	RW	0 or 1	If 1 all server errors will be logged to the error file.
	Modal_Errors	RW	0 or 1	Displayed errors with the system modal attribute.
	Self_Terminate	RW	0 or 1	Close CLC_DDE when last conversation terminates.
	Monitor_List_Size	RW	1-500	# of entries in communication monitor window.
	Editor	RW	256 Characters	Name & path of text editor to use to display error log.
Section: SERIAL	Baudrate	RO	38400..300	Baud rate for serial connection to CLC card.
	Port	RO	1-4	COM port number to use for serial connection.
	Serial_Event	RW	0 or 1	Use serial event option to increase performance.
	RS485_Converter	RW	0 or 1	Activate RS485 adapter code.
Section: VME	Sustain_Bus	RW	0 or 1	Release every cycle option for XYCOM PC.
	A32_Addresssing	RW	0 or 1	Use A32 addressing for XYCOM PC.
	VME_IRQ	RO	0-7	Number of VME IRQ to use (0 = disabled).

Section: AT_MODEM	Baudrate	RO	9600..300	Baud rate to use to communicate with the modem.
	Port	RO	1-4	COM port number the modem is on.
	Auto_Connect	RW	0 or 1	Initialize & connect on conversation connection.
	Phone	RW	50 Characters	Phone number to dial.
	Initialize_Script	RW	100 Characters	Script to initialize modem.
	Disconnect_Script	RW	100 Characters	Script to disconnect modem.
	Dial_Prefix	RW	50 Characters	Script to send to modem before phone number.
	Escape_Sequence	RW	50 Characters	Script to send modem to return to command mode.
Section: PC	PC_IRQ	RO	0 or 1	if 1 use PC interrupt for communications.
Section: DDE	Status	RO	200 Characters	CLC_DDE's status request item.
	Max_Conversations	RO	1-3274	Maximum allowed conversations.
	Max_Advise_Items	RO	1-3500	Maximum allowed advise items.
Section: STATUS	ErrorState	RO	0 or 1	If 1 CLC_DDE is issuing an error.
	ErrorText	RO	256 Characters	Error text message CLC_DDE is displaying.
	RequestState	RO	0 or 1	If 1 CLC_DDE is actively communicating.

4 Teach Pendant

4.1 Overview

This chapter explains how to use the GT/2000 - CLC Teach Pendant.

The Teach Pendant is a hand-held instrument with 16 x 42 character display and a 40-key sealed membrane keypad. The pendant provides a convenient operation and position programming interface for Indramat CLC Motion Control.

The Teach Pendant gives users a hand held operating interface which allows them to:

- Select operating modes and axis jogging.
- Access multi-level menus for functions.
- Teach and edit motion control points, events and variables; edit parameters.
- Select and activate CLC resident programs.

Each category of functions has its own set of menus. The following function categories are available through the pendant TPT 2.0 Main Menu:

Note: While in the Main Menu the B+ and B- keys can be used to respectively turn on and off the display backlighting.

This line can be set by parameter C-0810 to display Task Status Messages.

```
CLC MAIN MENU
TASK: A
CLC*DP-GPS-05T24

F1    PROGRAM MENU
F2    TABLE EDIT MENU
F3    JOG MENU
F4    CONTROL MENU
F5    REGISTER I/O MENU
F6    PARAMETER MENU
F7    SECURITY MENU
F8    DIAGNOSTIC MENU
```

Note: The first screen that is displayed on the Teach Pendant is the Control Menu. See section 4.3 Task Control.

Menu Map

The following chart maps the submenus and menu links that are found within the main menu. Some menus have direct links to diagnostics, parameters and I/O registers.

Note: Pressing the ESC key will backtrack the Teach Pendant and display the previously viewed screen until it reaches the main menu.

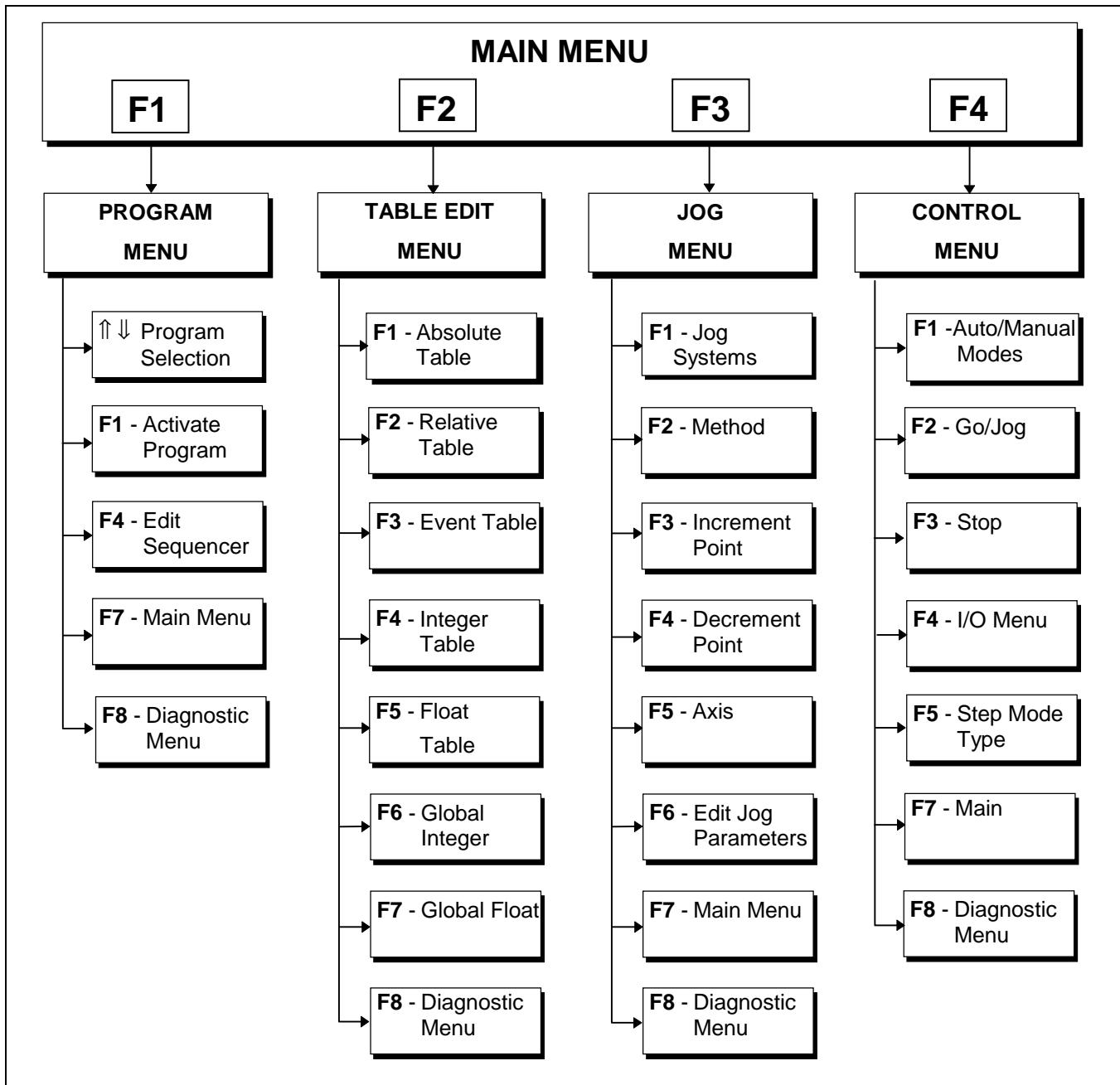


Figure 4-9: Menu Map (F1-F4)

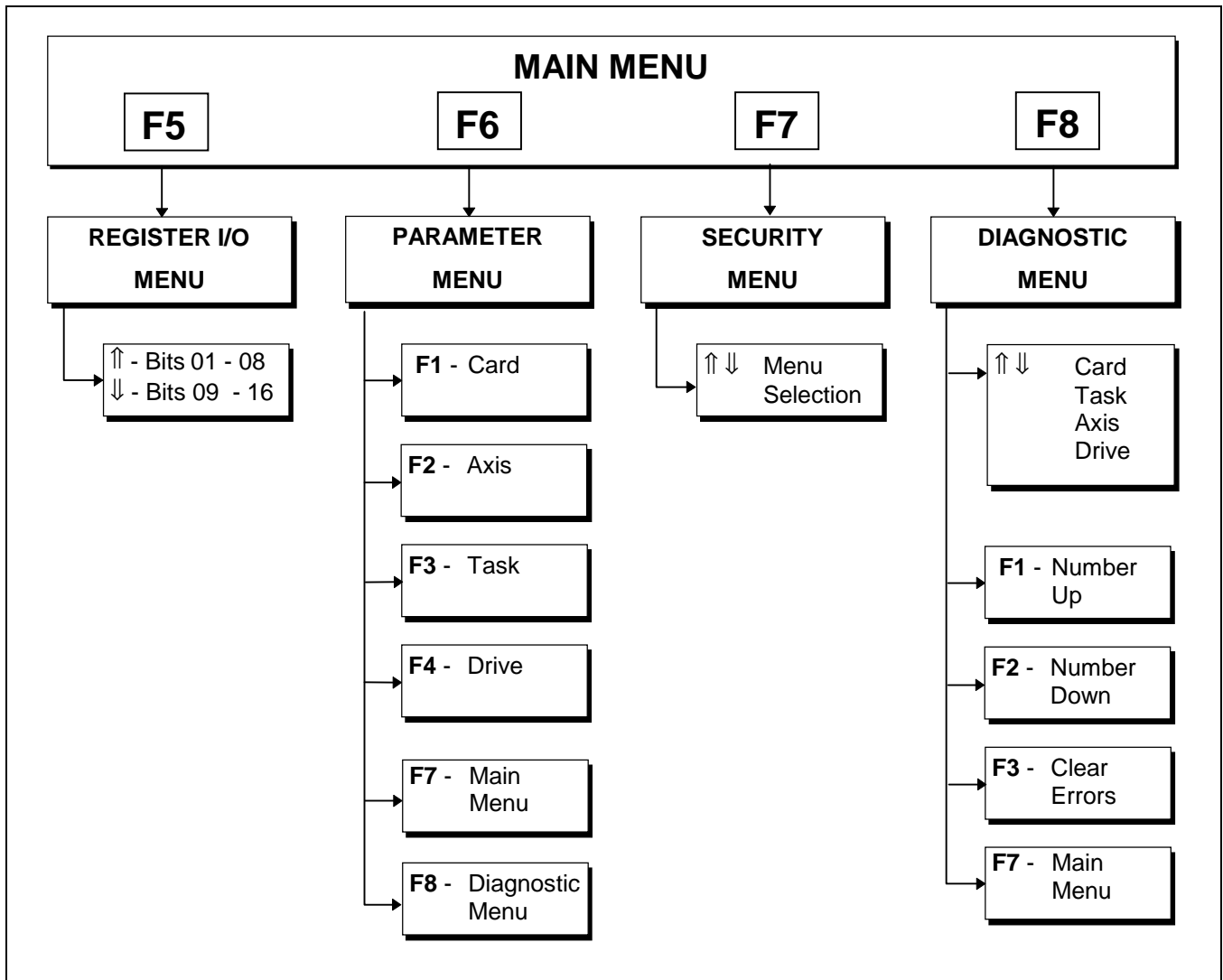


Figure 4-10: Menu Map (F5-F8)

4.2 Teach Pendant Setup

Note: To use the pendant function keys, as well as the pendant edit features, the System Control Register 1, bit 14 (Pendant Enable) must be set to 1.

When the Teach Pendant is enabled, the following registers and bits shall be forced at all times by the TPT. The CLC provides a register forcing capability that allows a Host system to directly change the state of individual I/O register bits overriding both the physical I/O and the CLC I/O Mapper.

Task A Control Register 2:	bit 1	Mode Select
	bit 4	Single Step
	bit 6	Cycle Start
	bit 7	!Task Stop
	bit 12	Step Sequence Step
	bit 13	Step Sequence Function

Task B-D Control Registers 3-5: same as above.

Registers 98 and 99 define blocking bits for task A, B, C and D. The bits in the register can disable Teach Pendant control of the selected function for the corresponding tasks A - B, C-D. The following functions can be blocked:

- Manual Mode
- Auto Mode
- Step Mode
- Jogging
- Teaching Points
- Task Selection

If a block bit is set, its corresponding function is blocked. If a user selects the function an error message is issued by the TPT. **See section 4.15 Teach Pendant Reserved Register Table for bit descriptions**

The pendant parameters are automatically preset to the following specifications:

Menu	Item	Default Setting
Comm:	Baud Rate	9600 (Fixed)
	Parity	None
	Data and Stop Bits	8, 1
	Display Serial Errors	Yes
	Audible Serial Errors	Yes
	Support for XON/OFF	Yes
Dsp:	Display CTL Characters	No
	Display ESC Characters	No
	Cursor Visible	Yes
	Auto Line Wrap	No
	New Line on CR	Yes
	Display Self-Test	No
	Backlight Level	7
	Backlight On	Yes
Kbd:	Local Echo	No
	Key Repeat	Off
	Audible Keys	No
	Simplified KB	Yes

Note: *When the Teach Pendant is initializing, it automatically sets the baud rate to 9600.*

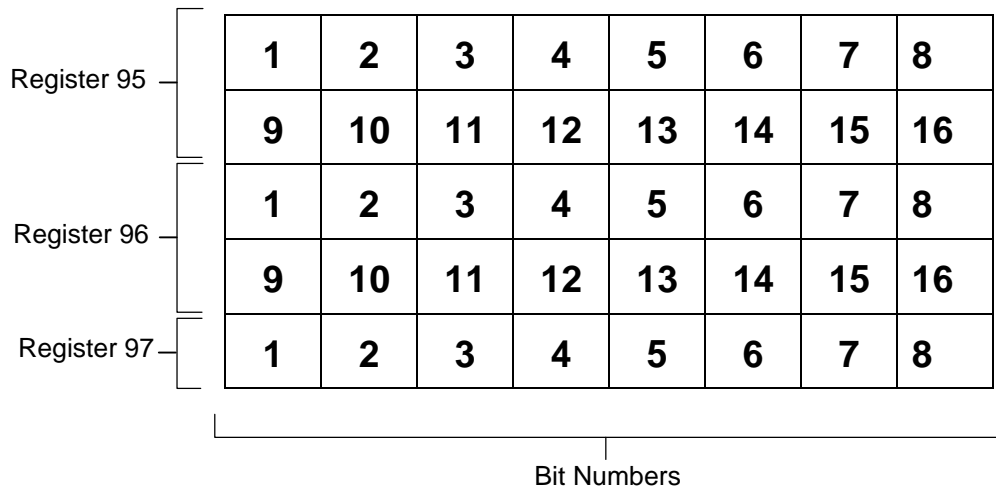
4.3 Keyboard Operation

The following defines the keys for the Teach Pendant:

Key	Action
F1	Soft key defined by active menu
F2	Soft key defined by active menu
F3	Soft key defined by active menu
F4	Soft key defined by active menu
F5	Soft key defined by active menu
F6	Soft key defined by active menu
F7	Soft key defined by active menu
F8	Soft key defined by active menu
HELP	First press function key help, then press item help
ESC	Terminate current operation or return to previous menu
EDIT	Clear field of current item and allow editing
END	Move cursor to last item on current line
ENTER	Carriage Return
0	numeric key
1	numeric key
2	numeric key or UP ARROW
3	numeric key
4	numeric key or LEFT ARROW
5	numeric key
6	numeric key or RIGHT ARROW
7	numeric key
8	numeric key or DOWN ARROW
9	numeric key
.	decimal point
+/-	plus/minus sign
TEACH	Teach current position to absolute point table
TASK	Select a user task
AXIS+	Jog axis positive (used in single axis mode)
AXIS-	Jog axis negative (used in single axis mode)
A+/A-	Jog A coordinate plus/minus
B+/B-	Jog B coordinate plus/minus Main Menu: respectively turns backlighting on and off
C+/C-	Jog C coordinate plus/minus
X+/X-	Jog X coordinate plus/minus
Y+/Y-	Jog Y coordinate plus/minus
Z+/Z-	Jog Z coordinate plus/minus

Keyboard Map

F1	F2	F3	F4	F5	F6	F7	F8
Help	7	↑ 8	9	Teach	Task	Axis+	Axis -
ESC	← 4	5	→ 6	A+	A-	X+	X-
Edit	1	↓ 2	3	B+	B-	Y+	Y-
Enter	.	0	+/-	C+	C-	Z+	Z-



The TPT keyboard is mapped to register 95, 96 and 97. The first row of keys from the top is placed in the low bytes of register 95. The second row of keys is placed in the high byte of register 95, etc. When a key is pressed its corresponding bit turns on and remains on for as long as the key is pressed.

Cursor Control and Editing

The cursor may be moved up or down, left or right by pressing the corresponding arrow key. The arrow keys double as numeric entry keys and generate numeric values when an item on the screen is edited. To edit an item, position the cursor over it and press the EDIT key. Doing so clears the field used by the item allowing a new value to be entered. Pressing ENTER terminates the editor and enters the new value into the system. Sometimes the cursor can be positioned on an item but the EDIT key does nothing when pressed. In this case the item cannot be edited. The cursor may be positioned there for another reason, such as item selection or viewing.

Jogging Control

Press the *coordinated jog keys* (-X, +X, -Y, +Y, -Z, +Z) to jog in world coordinates. The jog keys are active only while in the Jog Menu. If other coordinated axes are defined in other tasks, then that task must be activated in order to jog from the Teach Pendant.

Press the *single axis jog keys* (-AXIS, +AXIS) to jog in axis coordinates.

Task Control

Press the TASK key to display the task menu. Use the arrow keys to position the cursor in the desired task, then press ESC to return to the previous menu.

Teach Control

The Teach key allows the user to store the current position (during a coordinated jog) into the Absolute Point Table. The table point number will flash indicating that point has been recorded in the table.

F1	F2	F3	F4	F5	F6	F7	F8
Help	7	↑ 8	9	Teach	Task	Axis+	Axis -
ESC	← 4	5	→ 6	A+	A-	X+	X-
Edit	1	↓ 2	3	B+	B-	Y+	Y-
Enter	·	0	+/-	C+	C-	Z+	Z-

4.4 Program Menu

The Program menu allows pendant selection and activation of any of the programs that have been downloaded to the CLC card.

Each program consists of one to four user tasks (A, B, C, and D), and the associated Absolute and Relative Point Tables, Event Table, and Variable Tables. Activating a new program replaces the current four motion tasks and tables with the tasks and tables for the new program selection.

Table Includes:

- Program number (CLC card ID, 1-10)
- Program name
- Program size (in decimal bytes)

CLC PROGRAM MENU				
01	SEQ	12/20/96	15:39:27	1572
02	SEQ1	01/03/97	10:20:15	3452
03	AB1	01/03/97	16:20:00	1152
04	AB2	11/20/96	16:20:00	3344
05	PLS1	01/03/97	07:15:00	2888
00				
00				
00				
00				
00				
F1	F4	F7	F8	
Activate	Edit	Main	Diag	

The up and down arrow keys move the cursor to select a program. Pressing **F5** activates the selected program.

Note: The currently active program must not be running when activating another program

Sequencer Editing (F4)

The **F4** key (Edit) only applies to programs which contain Sequencers. Pressing **F4** allows the user to edit the Sequencer list, steps and functions of the selected program. **See the CLC Reference Manual, IAE 74792 Rev. F, 10/96 for more Sequencer information.**

Sequence List Menu

The first screen that appears after pressing **F4** in the *CLC Program Menu* is the *Sequence List Menu*. Use the arrow keys to navigate with the cursor to select the desired *Sequence List*. Press **F4** again to edit the contents of the selected list name within the *Sequence Edit Menu*.

SEQUENCE LIST MENU				
PROGRAM:	SEQ1			
01	INITIALIZE_SYSTEM			
02	PRODUCT_1			
03	PRODUCT_2			
F1 PgUp	F2 PgDn	F4 Edit	F7 Main	F8 Diag

The name of each list can also be edited. Position the cursor at the end of the list name and press the **Edit** key. This activates a special editing mode which allows you to type letters according to the keyboard map illustrated below. Use the **F1** key to delete characters to the left of the cursor. Use the **F2** key to Select **Shift On** and **Off**. This allows you to toggle the keyboard map between numbers and letters.

Note: These letters do not appear on the keypad, however their location (as illustrated) represents the key functions while typing within this editing mode.

F1	F2	F3	F4	F5	F6	F7	F8
Help	A	B	C	D	E	F	G
ESC	H	I	J	K	L	M	N
Edit	O	P	Q	R	S	T	U
Enter	V	W	X	Y	Z	Z+	Z-

This editing mode is functional within all of the following Sequencer menus.

The Sequence Edit Menu

The *Sequence Edit Menu* displays all the steps within the selected Sequence. Use the arrow keys to navigate with the cursor to select the desired Sequence Step. Press **F4** again to edit the contents of that Step within the *Step Table Edit Menu*. Press **F3** to cut the selected Sequence Step. Press **F6** to paste a Sequence Step in the current cursor position

SEQUENCE EDIT MENU							
PROGRAM:		SEQ1					
SEQUENCE:		INITIALIZE_SEQUENCER					
01	HOME_ALL_AXES						
02	SET_MAX_VALUES						
03	PICK_POSITION						
04	END OF LIST						
F1	F2	F3	F4	F5	F6	F7	F8
PgUp	PgDn	Cut	Edit	Ins	Paste	Main	Diag

Table List Menu

Pressing **F5** (Ins) from the *Sequence Edit Menu* will open the *Table List Menu*. This menu contains a list of all the step tables available within the selected Sequence. Use the arrow keys to navigate with the cursor to select the desired *Step Table*. Press ENTER to insert that function into the previous *Sequence*.

TABLE LIST	
Press ENTER to insert	
01	PICK_POSITION
02	SET_MAX_VALUES
03	HOME_ALL_AXES
04	Z_DROP_PART1
05	CYCLE_EJECTORS
06	Y-DROP_PART1
07	PART_MADE
08	STEP_08
09	STEP_09
F1	F2
PgUp	PgDn

The Step Table Edit Menu

The *Step Table Edit Menu* displays all the functions within the selected Sequence Step. Use the arrow keys to navigate with the cursor to select the desired Sequence *Function*. Press **F4** again to edit the contents of that function within the *Function Edit Menu*. Press **F3** to cut the selected function. Press **F6** to paste a function in the current cursor position

```

STEP TABLE EDIT MENU

PROGRAM:      SEQ1
SEQUENCE:    INITIALIZE_SEQUENCER
STEP:        HOME_ALL_AXES
EMPTY SLOTS: 00011

01  DISABLE_CLAMP_MOTION
02  CHK_MOLD_OPEN
03  PERMIT_EJECT_BACK
04  CHK_EJECTORS_BACK
05  HOME_AXIS

F1  F2  F3  F4  F5  F6  F7  F8
PgUp PgDn Cut Edit Ins Paste Main Diag

```

Function List Menu

Pressing **F5** (Ins) from the *Step Table Edit Menu* will open the *Function List Menu*. This menu contains a list of all the functions available within the selected Sequence. Use the arrow keys to navigate with the cursor to select the desired *Function*. Press ENTER to insert that function into the previous *Step Table*.

```

FUNCTION LIST
Press ENTER to insert

01  HOME_AXIS
02  INIT_POS_VELOCITY
03  CHK_EJECTORS_RETRACT
04  CLEAR_SYSTEM_TIMERS
05  DWELL
06  PERMIT_EJECT_BACK
07  DISABLE_CLAMP_MOTION

F1  F2
PgUp PgDn

```

Function Edit Menu

The *Function Edit Menu* contains a list of all the arguments and their corresponding values. Use the arrow keys to navigate with the cursor and select a *Function*. Press **F4** again to edit the values assigned to the arguments of that function.

FUNCTION EDIT MENU			
PROGRAM:	SEQ1		
SEQUENCE:	INITIALIZE_SEQUENCER		
STEP:	HOME_ALL_AXES		
FUNCTION:	HOME_AXIS		
01	AXIS_NUMBER		2
02	HOME_OFFSET_POSITION		0.0000
03	SET_HOME_POSITION		0.0000
F1	F4	F7	F8
Save	List-Edit	Main	Diag

4.5 Table Edit Menu

The Table Edit menu allows pendant editing of the Absolute and Relative Point Tables, the Event Table, and the Integer and Float variable Tables.

CLC TABLE EDIT MENU	
F1	Absolute Table Menu
F2	Relative Table Menu
F3	Event Table Menu
F4	Integer Table Menu
F5	Float Table Menu
F6	Global Integer Table
F7	Global Float Table
Esc	F8
Main	Diag

Absolute Point Table Edit

The Absolute Point Table Edit menus permit editing taught or programmed points.

ABSOLUTE TABLE MENU							
NUM	NAME						
001	Part_Pickup						
002	Regrip						
003	Leave_Part						
..							
..							
F1	F2	F3	F4	F5	F6	F7	F8
PgUp	PgDn	Home	End	Edit	Jog	Main	Diag

Select a point by moving the cursor up and down with the arrow keys. Pressing edit will bring up the following menu:

ABSOLUTE POINT MENU						
ABS[0002]		Regrip				
	30.000	X		0.000	Roll	00 Elbow
	20.000	Y		0.000	Pitch	
	00.000	Z		0.000	Yaw	
	00.000	BLEND				
		0	Speed	001	Event 1	
		0	Accel	002	Event 2	
		0	Decel	003	Event 3	
		0	Jerk	0	Event 4	
F1	F2	F3	F4	F6	F7	F8
IncPnt	DecPnt	Home	End	Jog	Main	Diag

X X coordinate of the point
 Y Y coordinate of the point
 Z Z coordinate of the point
 Roll Roll angle
 Pitch Pitch angle
 Yaw Yaw angle
 Elbow Elbow state
 Blend Blend Radius

Speed Speed Percentage (of task maximum)
 Accel Acceleration Percentage (of task maximum)
 Decel Deceleration Percentage (of task maximum)
 Jerk Jerk Limiting Percentage
 (0 trapezoid, 100 s-shape, 50 between)

Event 1 First event for the point
 Event 2 Second event for the point
 Event 3 Third event for the point
 Event 4 Fourth event for the point
 (This value represents an event number from the event table

See Event Table Edit.)

Relative Point Table Edit

The Relative Point Table Edit menus permit editing taught or programmed points.

RELATIVE TABLE							
NUM	NAME						
001	REL[1]						
002	REL[2]						
003	REL[3]						
..							
..							
F1	F2	F3	F4	F5	F6	F7	F8
PgUp	PgDn	Home	End	Edit	Jog	Main	Diag

Select a point by moving the cursor up and down with the arrow keys. Pressing edit will bring up the following menu:

RELATIVE TABLE						
REL[0002]	REL[2]					
30.000	X	0.000	Roll	00	Elbow	
20.000	Y	0.000	Pitch			
00.000	Z	0.000	Yaw			
00.000	BLEND					
	0 Speed	001	Event 1			
	0 Accel	002	Event 2			
	0 Decel	003	Event 3			
	0 Jerk	0	Event 4			
F1	F2	F3	F4	F6	F7	F8
IncPnt	DecPnt	Home	End	Jog	Main	Diag

X X coordinate of the point
 Y Y coordinate of the point
 Z Z coordinate of the point
 Blend Blend Radius

Roll Roll angle
 Pitch Pitch angle
 Yaw Yaw angle
 Elbow Elbow state

Speed Speed Percentage
 (of task maximum)
 Accel Acceleration Percentage
 (of task maximum)
 Decel Deceleration Percentage
 (of task maximum)
 Jerk Jerk Limiting Percentage
 (0 trapezoid, 100 s-shape, 50 between)

Event 1 First event for the point
 Event 2 Second event for the point
 Event 3 Third event for the point
 Event 4 Fourth event for the point
 (This value represents an event number from the event table)

See Event Table Edit.)

Event Table Edit

The Event Table Edit menu allows pendant editing of the events associated with each task in the Event Table.

The currently selected task determines the portion of the event table allowed to be viewed through the Teach Pendant.

EVENT TABLE					
NUM	ST	TY	RF	ARG	FUNCTION
001	01	06	00	20.0	Pressure_Switch
002	01	06	00	40.0	Change_Speed
003	01	03	00	60.0	evt_fn_1
004	01	03	00	80.0	evt_fn_2
000	00	00	00	00.0	
000	00	00	00		
000	00	00	00		
000	00	00	00		
000	00	00	00		
000	00	00	00		
F1	F2		F5	F7	F8
PgUp	PgDn		Replace	Main	Diag

St **The Event's status:**

- 0 = inactive
- 1 = pending
- 2 = queued
- 3 = executing
- 4 = done

Ty **Event type:**

- 0 = event inactive
- 1 = repeating timer
- 2 = time on coordinated motion path
- 3 = dist. on coordinated motion path
- 4 = single axis distance
- 5 = repeating axis position
- 6 = task external interrupt input

Ty **Event type: (continued)**

- 7 = VME broadcast interrupt
- 8 = VME short address (mailbox) interrupt
- 9 = axis feedback capture

Rf **Event Reference:**

- 0 = start of segment
- 1 = end of segment

Arg **Argument for the event**

(milliseconds if time based, or percent of path and axis distance)

Function Task ID and Event number

Integer Variable Table Edit

This menu allows for viewing and editing integers. Variables can be changed by any task at any time. It is possible, therefore, for editing to be in conflict with a motion task. In this instance, unexpected results may occur. It is at the discretion of the operator to determine the usefulness of such an operation.

INTEGER TABLE MENU				
00001	Pointer_1			20.0
00002	Pointer_2			40.0
00003	Timer_1			60.0
00004	Timer_2			80.0
00005	Operation Type			00.0
00006	I[6]			0
00007	I[7]			0
..				
F1	F2	F3	F7	F8
PgUp	PgDn	Fmt	Main	Diag

F1 Page Up

F2 Page Down

F3 Display Format

Display Format

Pressing **F3** toggles the display between integer and scientific notation.

Floating Point Variable Table Edit

This menu allows for viewing and editing floating point variables. Variables can be changed by any task at any time. It is possible, therefore, for editing to be in conflict with a motion task. In this instance, unexpected results may occur. It is at the discretion of the operator to determine the usefulness of such an operation.

FLOATING TABLE MENU				
00001		slave_turns		0.2500
00002		master_turns		1.0000
00003		z_position		19.9990
00004		q_position		1.0001
00005		q_axis_home_offset		1.0000
00006		current_q_position		2.0000
F1	F2	F3	F7	F8
PgUp	PgDn	Fmt	Main	Diag

F1 Page Up

F2 Page Down

F3 Display Format

Display Format

Pressing **F3** toggles the display between floating point fixed (100.000) and scientific (1.000E2) notation.

Global Integer Variable Table Edit

This menu allows for viewing and editing global integer variables. Variables can be changed by any task at any time. It is possible, therefore, for editing to be in conflict with a motion task. In this instance, unexpected results may occur. It is at the discretion of the operator to determine the usefulness of such an operation.

GLOBAL INTEGER TABLE				
00001	GI[[]	25		
F1 PgUp	F2 PgDn	F3 Fmt	F7 Main	F8 Diag

F1 Page Up **F2** Page Down **F3** Display Format

Display Format

Pressing **F3** toggles the display between floating point fixed (100.000) and scientific (1.000E2) notation.

Floating Point Variable Table Edit

This menu allows for viewing and editing global floating point variables. Variables can be changed by any task at any time. It is possible, therefore, for editing to be in conflict with a motion task. In this instance, unexpected results may occur. It is at the discretion of the operator to determine the usefulness of such an operation.

GLOBAL FLOATING TABLE				
00001	GF[I]	0.2500		
F1 PgUp	F2 PgDn	F3 Fmt	F7 Main	F8 Diag

F1 Page Up

F2 Page Down

F3 Display Format

Display Format

Pressing **F3** toggles the display between floating point fixed (100.000) and scientific (1.000E2) notation.

4.6 Jog Menu

The Jog menu allows you to jog a stopped system. The following I/O register bits must be on before jogging an axis:

Register 1 - System Control

Bit 6 Pendant Live Man

Register 2, 3, 4, or 5 -Task Control

Bit 1 Mode:! Manual

ROBOT JOG MENU							
Task: A							
System:		Axis					
Method:		Continuous/Slow					
0001:		ABS[1]					
		AXIS		WORLD		TAUGHT	
01	X	12.643		47.5		20.3	
02	Y	95.215		18.3		54.2	
03	Z	63.609		5.5		16.0	
04	A	0.960		36.8		10.0	
00	AXS	857.628		180			
F1	F2	F3	F4	F5	F6	F7	F8
System	Method	IncPnt	DecPnt	Axis	Para	Main	Diag

F1 = System **F2 = Method** **F3 = Increase Point**

F4 = Decrease Point **F5 = Axis** **F6 = Parameters**

F8 = Diagnostics

Press **F1** to select either the Axis, Joint, World or Tool jog system. **F2** selects the jog method which can be continuous or incremental.

F3 and **F4** increases and decreases the current point in the point table which can be taught. **See Teaching Points below.**

F5 selects a single axis to jog. **F6** opens the *Edit Jog Parameters* screen which allows the user to adjust the percent distance and speed parameters, as well as, view the values set for each Task and Axis.

Jog Systems

Axis Jog Menu

The **Single Axis Jog** menu allows jogging a single, non-coordinated axis. Only the selected axis is affected. The pendant display is continuously updated with the current position of the axis.

Press **AXIS-** to jog in the negative direction.

Press **AXIS+** to jog in the positive direction.

(The pendant beeps at the beginning and end of motion.)

Coordinated Jogging

Press **-X** to jog in the negative X direction.

Press **+X** to jog in the positive X direction.

Press **-Y** to jog in the negative Y direction.

Press **+Y** to jog in the positive Y direction.

Press **-Z** to jog in the negative Z direction.

Press **+Z** to jog in the positive Z direction.

Joint Jog Menu

The **Joint Jog** menu allows jogging of individual axes with a joint number.

Robot World Jog Menu

The Robot **World Jog** menu allows jogging a coordinated or single axis for a task in World Cartesian Space. When jogging in world coordinates, motion will be generated parallel to the selected X, Y, or Z coordinate.

The pendant beeps at the beginning and end of motion. The display is continuously updated to display the current position (X, Y, Z) on each of the axes.

Tool Jog Menu

The **Tool Jog** menu allows jogging of the position of the end of a robotic arm.

Jog Method

The following Jog Methods are available with the Teach Pendant:

Continuous Slow	Continues to jog slowly until the button is released
Continuous Fast	Continues to jog quickly until the button is released
Incremental Small	Jogs a predetermined small increment and then stops
Incremental Large	Jogs a predetermined large increment and then stops

Teaching Points

To teach the current position (during a coordinated jog) into the Absolute Point Table press TEACH. (Confirm each point by pressing the enter key.)

The table point number will flash indicating that point has been recorded in the table. The point number will automatically advance to the next point. **F3** and **F4** can also be used to increase or decrease the point number.

Jog Fine Adjustments

The jog speed and distance increment are set as a percentage of the Maximum Jog Increment and Maximum Jog Velocity parameters (T-0-0025 and T-0-0026).

Separate percents are used for FAST/SLOW and LARGE/SMALL jog settings in coordinated jog.

While in the Axis Jog or World Jog Menus, pressing the PAR key displays a screen that permits editing the FAST/SLOW and LARGE/SMALL jog percents.

4.7 Control Menu

The Control menu allows the pendant to control the execution of a task.

When the Teach Pendant powers up, the Control Menu is the first menu displayed.

The Control Menu will provide the following information:

Title	Control Menu Title
Task Status	Current task operating status
Program Name	Name of the currently active program
Sequence	Name of the current sequence executing
Step	Name of the current step executing
Function	Name of the current function executing
N/A	
Position Title	Axis Position Title (Joint, World, & Target)
Axis 1 Label (X)	Axis defined as axis 1
Axis 2 Label (Y)	Axis defined as axis 2
Axis 3 Label (Z)	Axis defined as axis 3
Axis 4 Label (A)	Axis defined as axis 4
Target Name	Point # and label for the current point executing
N/A	
Function Keys	Function keys control machine operation
Operation Labels	Specify the machine operations

The control menu can run in one of three different modes. The following pages describe the operation of each mode and illustrate the different menu layouts.

Control Menu: Auto Run/Hold Mode

CONTROL MENU							
TASK:	A: Auto: Run					SPEED% 100	
NAME:	Two_Liter_Bottles						
SEQN:	Ejectors_Back						
STEP:	Ejectors_fwd						
FUNC:	Move_In_Mold_Position						
		JOINT		WORLD		TARGET	
X:		1200.00		1200.00		2000.00	
Y:		500.00		500.00		500.00	
Z:		90.00		90.00		180.00	
A:							
TARGET		0001		Move_In_Mold_Position			
F1	F2	F3	F4	F5	F7	F8	
Auto	Go	STOP	I/O		Main	Diag	

F1 - Mode Of Operation

If the *Teach Pendant Enabled Bit (Register 1 bit 14)* is high, pressing the **F1** key will change the mode of operation in the order shown below:

Manual: Jog ⇒ Auto: Step ⇒ Auto: Run/Hold ⇒ Auto: Step ⇒

F1 = Auto **F2** = Go, Jog **F3** = Stop **F4** = I/O
F5 = Instruct, Seq/Step, Seq/Func **F8** = Diagnostics

Note: **F2**, **F3** and **F5** are dependent on the selected mode of operation.

When *Automatic Mode* is selected by pressing the **F1** key, **F2** will display Go and **F3** will display Stop. By pressing the **F2** key, the program will start executing instructions. By pressing the **F3** key, program execution will stop. If the **F2** key is pressed again, the program will continue.

To restart at the beginning of the program, the mode of operation must be changed to manual or step and then changed back to auto.

In Auto: Step mode **F5** is used to select the step method which can be one instruction, one Sequence Step, or one Sequence Function at a time.

Control Menu: Auto Step Mode

TASK:		A: Auto:		CONTROL MENU	
NAME:		Two_Liter_Bottles		STEP	
SEQN:		Ejectors_Back		SPEED% 100	
STEP:		Ejectors_Fwd			
FUNC:		Move_In_Mold_Position			
		JOINT		WORLD	
X:		1200.00		1200.00	TARGET
Y:		500.00		500.00	2000.00
Z:		90.00		90.00	500.00
A:					180.00
TARGET 0001		Move_In_Mold_Position			
F1	F2	F3	F4	F5	F8
STEP	GO	STOP	I/O	INST	DIAG

F1 = Step F2 = Go F3 = Stop F4 = I/O
F5 = Instruction/Sequence F8 = Diagnostics

When the Automatic Step Mode is selected by pressing the **F1** key, **F2** will display GO and **F3** will display STOP. Every time the **F2-GO** key is pressed, the program will be sequentially executed one step at a time. The steps can be program instructions, Sequencer steps or Sequencer functions. Pressing the **F5** key selects the step mode that the program will follow:

Instruction	-	INST
Sequence/Steps	-	SEQ/STEP
Sequence/Function	-	SEQ/FUNC

When INST is selected the program will execute only one instruction every time the **F2-GO** key is pressed. When SEQ/STEP is selected the program will execute all the functions within one Sequencer step, one at a time. When SEQ/FUNC is selected the program will execute each Sequencer function, one at a time.

The **F3-STOP** key can be used to immediately halt the execution of the program within a step. If the **F2-GO** key is pressed again the step will continue to run.

Control Menu: Manual Mode

When manual mode is selected by pressing the **F1** key, **F2** will display Jog.

CONTROL MENU			
TASK:	A: Manual:	Jog	SPEED% 100
NAME:	Two_Liter_Bottles		
SEQN:	Ejectors_Back		
STEP:	Ejectors_Fwd		
FUNC:	Move_In_Mold_Position		
	JOINT	WORLD	TARGET
X:	1200.00	1200.00	2000.00
Y:	500.00	500.00	500.00
Z:	90.00	90.00	180.00
A:			
TARGET	0001	Move_In_Mold_Position	
F1	F2	F3	F4
Manu	Jog	I/O	F5
			F8
			DIAG

F1 = Manual **F2 = Jog** **F4 = I/O** **F8 = Diagnostics**

By pressing the **F2** key, the Jog Menu will be displayed, allowing the operator to jog and teach each axis.

4.8 Register I/O Menu

The **F4** I/O key is provided on every operator interface control screen. The operator will have the ability to view and edit the register bits that the machine builder selects. When the **F4** key is pressed, the register menu will be displayed. The first register displayed is set in CLC card parameter C-0-0805 *Start of User Accessible Registers on Pendant*. Parameter C-0806 defines the *End of User Accessible Registers on Pendant*. The operator can only edit registers within the range of these two parameters.

For example, parameter C-0805 = register 100, which is labeled *End_Of_Arm_Tool_1*. When the **F4** key is pressed, the first screen displayed is register 100, along with the register label. Bits 1 through 8 are displayed, along with the bit labels and current state (ON/OFF). This screen is only updated when any of the bits change states.

REGISTER MENU							
REGISTER: 0100				End_Of_Arm_Tool_1			
BITS:	OAT_Forward		01				OFF
	EOAT_Reverse		02				OFF
	C_Axis_Vertical		03				ON
	C_Axis_Horizontal		04				OFF
	A_Axis_Forward		05				OFF
	A_Axis_Retracted		06				OFF
	Bit_07		07				OFF
	Bit_08		08				OFF
Press Down Arrow For Bits 09 - 16							
F1	F2	F3	F4	F5	F6	F7	F8
01	02	03	04	05	06	07	08

The first page of the register menu will display bits 1 through 8. By pressing the down arrow key, bits 9 through 16 will be displayed. Pressing the up arrow key will return to bits 1 through 8.

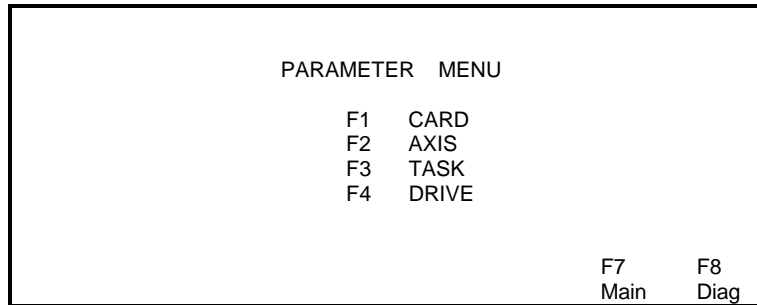
REGISTER MENU							
REGISTER: 0100				End_Of_Arm_Tool_1			
BITS:		Bit_09	09			OFF	
		Bit_10	10			OFF	
		Bit_11	11			ON	
		Bit_12	12			OFF	
		Bit_13	13			OFF	
		Bit_14	14			OFF	
		Bit_15	15			OFF	
		Bit_16	16			OFF	
Press Down Arrow For Bits 01 - 08							
F1	F2	F3	F4	F5	F6	F7	F8
09	10	11	12	13	14	15	16

The function keys **F1** through **F8** will allow the operator to toggle the state (ON/OFF) of bits 1 through 8 (first page displayed) or bits 9 through 16 (second page displayed).

NOTE: *If an operator needs to change a bit in a register outside the range set by parameters C-0-0805 and C-0-0806, a password will have to be entered or the pendant level protection bits will have to be adjusted. See the Security Menu description.*

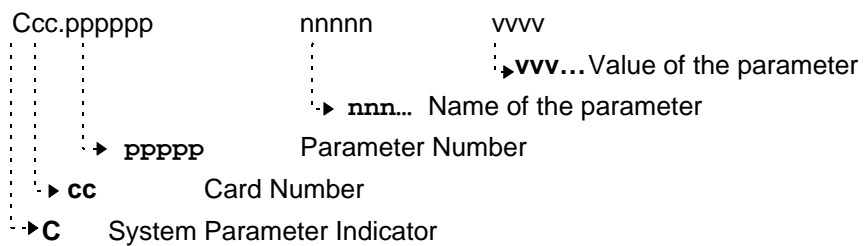
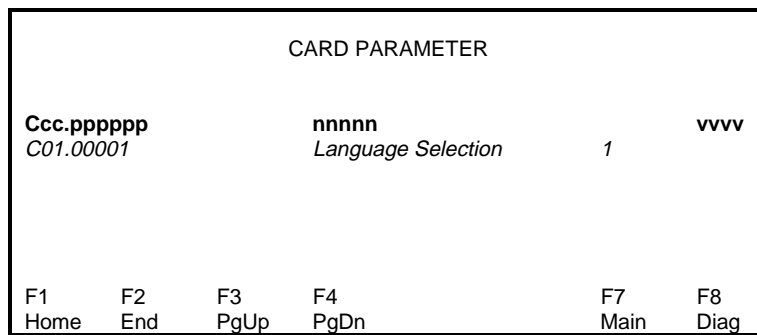
4.9 Parameter Menu

The Parameter menu allows selection of screens for editing the system, task, axis, and drive parameters.

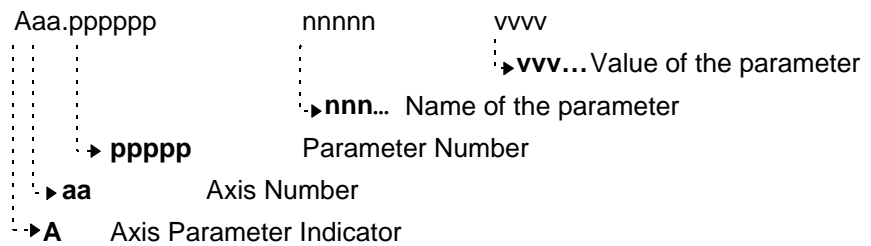
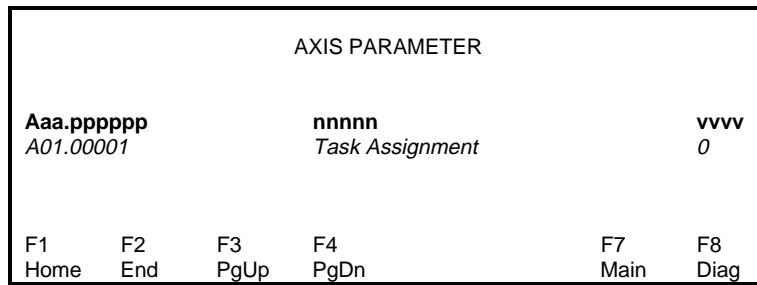


Selecting **F1-F4** will open one of the following Parameter screens. Position the cursor over the parameter number or the parameter value and press the edit key to select a different parameter or change the value of the current one displayed.

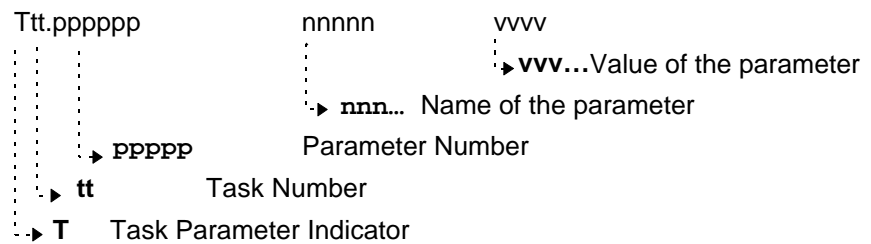
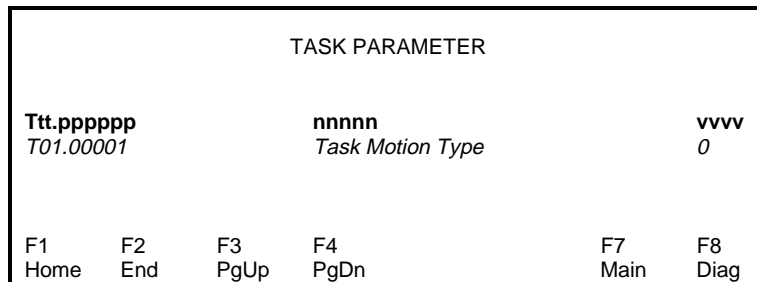
Card Parameter Screen



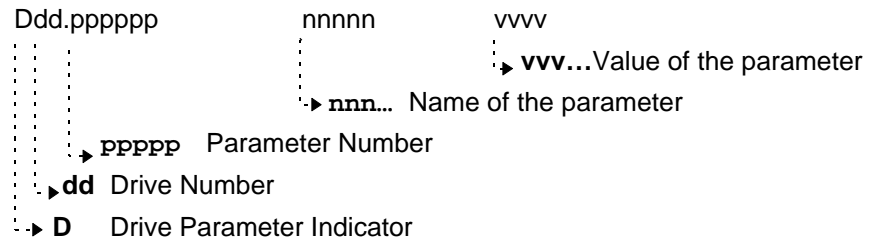
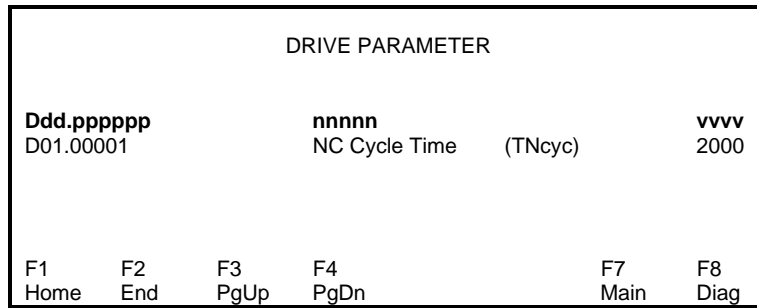
Axis Parameter Screen



Task Parameter Screen



Drive Parameter Screen



4.10 Security Menu

The Security Menu allows the Teach Pendant manager to assign a protection level code between 0 and 2 for each menu. Different access codes can then be set for various users to provide customized security for system data.

SECURITY MENU		
	NAME	LEVEL
000	Program Menu	1
001	Table Edit Menu	1
002	Jog Robot Menu	1
003	Control Menu	0
004	I/O Menu	2
005	Security Level Menu	-1
006	System Parameter Menu	1
007	Axis Parameter Menu	1
008	Task Parameter Menu	1
009	Drive Parameter Menu	1
010	Main Menu	0

F8
Diag

To alter a menu protection level, place the cursor over the protection level field and press the EDIT button. Key-in the appropriate code (0, 1 or 2) and press ENTER. The Security Level Menu has a default of -1 to allow initial access to all users.

The user access status for each menu depends on the menu protection level outlined above and the users access code, which is determined by the System Control Register 1, Bits 15 and 16. The access code has to be greater than the menu protection level to allow the user to view and edit a menu. If the levels are the same the user can only view the menu. A menu with a protection level that is higher than the security level cannot be accessed by a user. The following table lists the level combinations which determine user access privileges.

Bit 15 Status	Bit 16 Status	Access Code (Bit Resultant)	Protection Level (Preset)	Net Access Status
0	0	0	0	View Only
			1,2	No Access
1	0	1	0	View/Edit
			1	View Only
			2	No Access
0	1	2	0,1	View/Edit
			2	View Only
1	1	3	0-2	View/Edit

4.11 Diagnostics Menu

When the **F8** key is pressed from any of the Operator Interface Control Menus, the Diagnostics Menu is displayed. The diagnostics menu displays the current Card, Tasks, Axis, and Drive status. The diagnostics screen updates continuously. When first entering this menu, by default, Axs=1, Drv=1 and the cursor is positioned on the CLC card number.

DIAGNOSTICS MENU			
Crd: 03	007 Program Running: AB <i>Extended Diagnostic Message</i>		
Tsk: AA	TASK RUNNING		
Tsk: BB	TASK RUNNING		
Tsk: CC	MANUAL MODE		
Tsk: DD	MANUAL MODE		
Axs: 01	No Axis Message		
Drv: 01	303 Position Mode Encoder 1 / lag		
F1 NumUp	F2 NumDn	F3 ClrErrors	F7 Main

Positioning The Cursor

The up/down arrow keys will position the cursor on the menu item the user may wish to edit.

NOTE: *The Teach Pendant cannot edit the card number or task.*

Cursor Positioned Axis and Drive Number

By pressing the (**F1** NumUp) or (**F2** NumDn), the Axis number will increment up or down, respectively.

By pressing the Edit key, the operator can enter the desired Axis number and press the Enter key to accept.

4.12 Help Menu

Reserved for future use.

4.13 Error Screen

If an error is detected during operation, the pendant automatically enters the Error screen and displays a message about the error condition.

If the *TPT enable bit (Register 1, bit 14)* is on and an error occurs, the TPT will force all tasks into manual mode.

Pressing escape after an error occurs will display the Diagnostic Menu.

DIAGNOSTICS MENU		
Crd: 03	420 Drive 6 Shutdown Error	
Tsk: AA	MANUAL MODE	
Tsk: BB	MANUAL MODE	
Tsk: CC	MANUAL MODE	
Tsk: DD	MANUAL MODE	
Axs: 01	No Axis Message	
Drv: 04	028 Excessive Deviation	
F1	F2	F3
NumUp	NmDn	CrErrors

F3 - Clear Errors

A basic “Shutdown” error can be cleared by pressing **F3**. If the error is a configuration or hardware error, the source of that error must first be corrected before it can be cleared by the pendant.

4.14 System Parameters (Teach Pendant Related)

C-0-0801

Pendant Protection Level 1 Password

Default: 0
 Limits: 0-9999
 Attributes: Integer, Read/write at any time

This parameter defines a four-digit numeric password that prevents entry into protected menus unless it is entered. If it is 0, the password is disabled.

C-0-0802 Pendant Protection Level 2 Password (Not Currently Used)

Reserved for future use.

C-0-0803 Pendant User Accessible Floats Section

Default: -1
Selections: -1 all are accessible
 0 none are accessible
 1 number of program floats defines range
Attributes: Integer, Read/write at any time

This parameter defines the maximum allowable range for program floats to be user accessible from the Teach Pendant. The operator can view all the program floats, but the operator can only access the program floats, up to number set in this parameter. If the operator needs to change a program float greater than the number in this parameter then the operator can either enter a password or set the pendant level protection bits (System Control Register 1, bits 15 & 16).

Example: User Accessible Program Float Section = 10

When the operator selects Table Edit Menu/Float Table Menu, the operator can only access the first ten floats. The programmer is responsible for structuring the program floats properly.

C-0-0804 Pendant User Accessible Integers Section

Default: -1
 Selections: -1 = all are accessible
 0 = none are accessible
 1 = number of program integers defines range
 Attributes: Integer, Read/write at any time

This parameter defines the maximum allowable range for program integers to be user accessible from the Teach Pendant. The operator can view all the program integers, but the operator can only access the program integers, up to number set in this parameter. If the operator needs to change a program integer greater than the number in this parameter then the operator can either enter a password or set the pendant level protection bits (System Control Register 1, bits 15 & 16).

Example: User Accessible Program Integer Section = 10

When the operator selects Table Edit Menu/Integer Table Menu without a password or the required security level, the operator can only access the first ten integers. The programmer is responsible for structuring the program integers properly.

C-0-0805 Start of User Accessible Registers on Pendant

Default: 1
 Limits: 1 - maximum I-O register number
 (512 on CLC-D/P, 2048 on CLC-V)
 Attributes: Integer, Read/write at any time

C-0-0806 End of User Accessible Registers on Pendant

Default: maximum I-O register number
 (512 on CLC-D/P, 2048 on CLC-V)
 Limits: 1 - maximum I-O register number
 Attributes: Integer, Read/write at any time

These parameters define a range of registers accessible to the operator. The operator can view all the registers, but the operator can only access the registers within this window. If the operator needs to change a bit in a register outside the window of this parameter, the operator can either enter a password or set the pendant level protection bits (System Control Register 1, bits 15 & 16). When the Register I/O Menu is selected on the Teach Pendant, the first register to be displayed is the number stored in the Start of User Accessible Registers parameter.

C-0-0807 Pendant Password Time-out

Units: seconds
Default: 30 seconds
Limits: 0 (disabled) to 3600 (one hour)
Attributes: Integer, Read/write at any time

This parameter sets a time-out on the Teach Pendant password. After the password is entered (parameter C-0-0801), the user can enter any screen requiring the password for the time set in this parameter. When a key is pressed, the timer is reset. After the timer expires, the password is again required. If the time-out is set to 0, the password is always required.

C-0-0810 Task ID Number

Default: 0
Limits: 0-4
Attributes: Integer, Read/write at any time

Gets Task Status (Parameter T-0-0123) and allows for the message to be displayed on the first line of the TPT.

0	Disabled
1	Task A status message to line 1 of TPT
2	Task B status message to line 1 of TPT
3	Task C status message to line 1 of TPT
4	Task D status message to line 1 of TPT

This allows the user program to place customized messages on the top line of the CLC TPT. Every time the message changes, the TPT beeps and flashes the new message three times.

4.15 Teach Pendant Reserved Register Table

Register	Register Label Name	Bit	Bit Label Name
01	System_Control	6	Pendant_Live_Man (switch)
		14	Pendant_Enable
		15	Pendant_Level_LSB
		16	Pendant_Level_MSB
21	System_Status	13	TP_Password_Active
		14	Teach_Pendant
95	Teach Pendant Status	1	F1 Key
		2	F2 Key
		3	F3 Key
		4	F4 Key
		5	F5 Key
		6	F6 Key
		7	F7 Key
		8	F8 Key
		9	Help Key
		10	7 Key
		11	8 Key
		12	9 Key
		13	Teach Key
		14	Task Key
		15	Axis Plus Key
		16	Axis Minus Key
96	Teach Pendant Status	1	Esc Key
		2	4 Key
		3	5 Key
		4	6 Key
		5	A Plus Key
		6	A Minus Key
		7	X Plus Key
		8	X Minus Key
		9	Edit Key
		10	1 Key
		11	2 Key
		12	3 Key
		13	B Plus Key
		14	B Minus Key
		15	Y Plus Key
		16	Y Minus Key

..... Output Bits

Register	Register Label Name	Bit	Bit Label Name
97	Teach Pendant Status	1	Enter Key
		2	Decimal Key
		3	Zero Key
		4	Plus Minus Key
		5	C Plus Key
		6	C Minus Key
		7	Z Plus Key
		8	Z Minus Key
98	Teach Pendant Control	1	Block Task A Manual
		2	Block Task A Auto
		3	Block Task A Step
		4	Block Task A Jog
		5	Block Task A Entry
		6	Block Task A Teach
		7	Bit 7
		8	Bit 8
		9	Block Task B Manual
		10	Block Task B Auto
		11	Block Task B Step
		12	Block Task B Jog
		13	Block Task B Entry
		14	Block Task B Teach
		15	Bit 15
		16	Bit 16
99	Teach Pendant Control	1	Block Task C Manual
		2	Block Task C Auto
		3	Block Task C Step
		4	Block Task C Jog
		5	Block Task C Entry
		6	Block Task C Teach
		7	Bit 7
		8	Bit 8
		9	Block Task D Manual
		10	Block Task D Auto
		11	Block Task D Step
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