Auxiliary Functions

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Introduction

What are Auxiliary Functions?

Many CPU set-up tasks involve the use of Auxiliary (AUX) Functions. The AUX Functions perform many different operations, ranging from clearing ladder memory, displaying the scan time, copying programs to EEPROM in the Handheld Programmer, etc. They are divided into categories that affect different system parameters. You can access the AUX Functions from DirectSOFT or from the DL205 Handheld Programmer. The manuals for those products provide step-by-step procedures for accessing the AUX Functions. Some of these AUX Functions are designed specifically for the Handheld Programmer setup, so they will not be needed (or available) with the DirectSOFT package. Even though this Appendix provides many examples of how the AUX functions operate, you should supplement this information with the documentation for your choice of programming device.

NOTE, *the Handheld Programmer may have additional AUX functions that are not supported with the DL205 CPUs.*

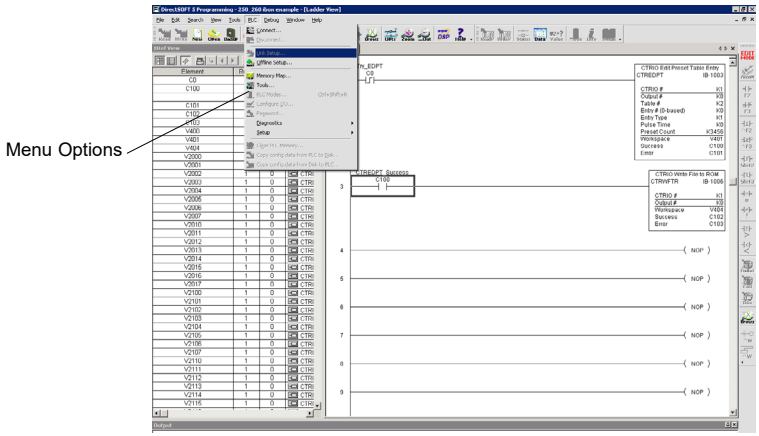
AUX Function and Description		230	240	250-1 260 & 262
AUX 2* — RLL Operations				
21	Check Program	3	3	3
22	Change Reference	3	3	3
23	Clear Ladder Range	3	3	3
24	Clear All Ladders	3	3	3
AUX 3* — V-Memory Operations				
31	Clear V Memory	3	3	3
AUX 4* — I/O Configuration				
41	Show I/O Configuration	3	3	3
42	I/O Diagnostics	3	3	3
44	Power-up I/O Configuration Check	3	3	3
45	Select Configuration	3	3	3
46	Configure I/O	7	7	3
AUX 5* — CPU Configuration				
51	Modify Program Name	3	3	3
52	Display/Change Calendar	7	3	3
53	Display Scan Time	3	3	3
54	Initialize Scratchpad	3	3	3
55	Set Watchdog Timer	3	3	3
56	Set CPU Network Address	7	3	3
57	Set Retentive Ranges	3	3	3
58	Test Operations	3	3	3
59	Bit Override	7	3	3
5B	Counter Interface Config.	3	3	3
5C	Display Error History	7	3	3

AUX Function and Description		230	240	250-1 260 & 262	HPP
AUX 6* — Handheld Programmer Configuration					
61	Show Revision Numbers	3	3	3	-
62	Beeper On / Off	7	7	7	3
65	Run Self Diagnostics	7	7	7	3
AUX 7* — EEPROM Operations					
71	Copy CPU memory to HPP EEPROM	7	7	7	3
72	Write HPP EEPROM to CPU	7	7	7	3
73	Compare CPU to HPP EEPROM	7	7	7	3
74	Blank Check (HPP EEPROM)	7	7	7	3
75	Erase HPP EEPROM	7	7	7	3
76	Show EEPROM Type (CPU and HPP)	7	7	7	3
AUX 8* — Password Operations					
81	Modify Password	3	3	3	-
82	Unlock CPU	3	3	3	-
83	Lock CPU	3	3	3	-

3 supported
7 not supported
- not applicable

Accessing AUX Functions via DirectSOFT

DirectSOFT provides various menu options during both online and offline programming. Some of the AUX functions are only available during online programming, some only during offline programming, and some during both online and offline programming. The following diagram shows an example of the PLC operations menu available within DirectSOFT.



Accessing AUX Functions via the Handheld Programmer

You can also access the AUX functions by using a Handheld Programmer. Plus, remember some of the AUX functions are only available from the Handheld Programmer. Sometimes the AUX name or description cannot fit on one display. If you want to see the complete description, press the arrow keys to scroll left and right. Also, depending on the current display, you may have to press CLR more than once.

CLR AUX

```
AUX FUNCTION SELECTION
AUX 2* RLL OPERATIONS
```

Use NEXT or PREV to cycle through the menus

NEXT

```
AUX FUNCTION SELECTION
AUX 3* V OPERATIONS
```

Press ENT to select sub-menus

ENT

```
AUX 3* V OPERATIONS
AUX 31 CLR V-MEMORY
```

You can also enter the exact AUX number to go straight to the sub-menu.

Enter the AUX number directly

CLR D 3 B 1 AUX

```
AUX 3* V OPERATIONS
AUX 31 CLR V-MEMORY
```

AUX 2* — RLL Operations

AUX 21-24

Four AUX functions are available to perform various operations on the control program.

- AUX 21 - Check Program
- AUX 22 - Change Reference
- AUX 23 - Clear Ladder Range
- AUX 24 - Clear Ladders

AUX 21 Check Program

Both the Handheld Programmer and DirectSOFT automatically check for errors during program entry. However, there may be occasions when you want to check a program that has already been in the CPU. Two types of checks are available:

- Syntax
- Duplicate References

The Syntax check will find a wide variety of programming errors, such as missing END statements, incomplete FOR/NEXT loops, etc. If you perform this check and get an error, see Appendix B for a complete listing of programming error codes. Correct the problem and then continue running the Syntax check until the message "NO SYNTAX ERROR" appears.

Use the Duplicate Reference check to verify you have not used the same output coil reference more than once. Note, this AUX function will also find the same outputs even if they have been used with the OROUT instruction, which is perfectly acceptable.

This AUX function is available on the PLC Diagnostics sub-menu from within DirectSOFT.

AUX 22 Change Reference

There will be times when you need to change an I/O address reference or control relay reference. AUX 22 allows you to quickly and easily change all occurrences, (within an address range), of a specific instruction. For example, you can replace every instance of X5 with X10.

AUX 23 Clear Ladder Range

There have been many times when you take existing programs and add or remove certain portions to solve new application problems. By using AUX 23 you can select and delete a portion of the program. DirectSOFT does not have a menu option for this AUX function, but you can select the appropriate portion of the program and cut it with the editing tools.

AUX 24 Clear Ladders

AUX 24 clears the entire program from CPU memory. Before you enter a new program, you should always clear ladder memory. This AUX function is available on the PLC > Clear PLC sub-menu within DirectSOFT.

AUX 3* — V-memory Operations

AUX 31

- AUX 31 - Clear V-memory

AUX 31 Clear V-Memory

AUX 31 clears all the information from the V-memory locations available for general use. This AUX function is available on the PLC > Clear PLC sub-menu within DirectSOFT.

AUX 4* — I/O Configuration

AUX 41-46

Several AUX functions are available to set up, view, or change the I/O configuration.

- AUX 41 — Show I/O Configuration
- AUX 42 — I/O Diagnostics
- AUX 44 — Power-up Configuration Check
- AUX 45 — Select Configuration
- AUX 46 — Configure I/O

AUX 41 Show I/O Configuration

This AUX function allows you to display the current I/O configuration. With the Handheld Programmer, you can scroll through each base and I/O slot to view the complete configuration. The configuration shows the type of module installed in each slot. DirectSOFT provides the same information, but it is much easier to view because you can view a complete base on one screen.

AUX 42 I/O Diagnostics

This is one of the most useful AUX functions available in the DL205 system. This AUX function will show you the exact base and slot location of any I/O module error that has occurred. This feature is also available within DirectSOFT under the PLC > Diagnostics sub-menu.

AUX 44 Power-up Configuration Check

Select this feature to quickly detect any changes that may have occurred while the power was disconnected. For example, if someone placed an output module in a slot that previously held an input module, the configuration check would detect the change.

If the system detects a change in the I/O configuration at power-up, an error code E252 NEW I/O CONFIGURATION will be generated. You can use AUX 42 to determine the exact base and slot location where the change occurred. This feature is also available within DirectSOFT under the PLC > Setup sub-menu.

WARNING: You should always correct any I/O configuration errors before you place the CPU into RUN mode. Uncorrected errors can cause unpredictable machine operation that can result in a risk of personal injury or damage to equipment.

AUX 45 Select Configuration

Even though the CPU can automatically detect configuration changes, you may actually want the new I/O configuration to be used. For example, you may have intentionally changed a module to use with a new program. You can use AUX 45 to select the new configuration, or, keep the existing configuration that is stored in memory. This feature is also available within DirectSOFT from the PLC > Setup sub-menu.

WARNING: Make sure the I/O configuration being selected will work properly with the CPU program. You should always correct any I/O configuration errors before you place the CPU into RUN mode. Uncorrected errors can cause unpredictable machine operation that can result in a risk of personal injury or damage to equipment.

AUX 46 Configure I/O

The D2-250–1, D2-260 and D2-262 CPUs allow you to use AUX 46 to manually assign I/O addresses for any or all I/O slots on the local or expansion bases. It is generally much easier to do the I/O configuration operations from within DirectSOFT. The software package provides a really nice screen that is available from the PLC > Configure I/O sub-menu.

This feature is useful if you have a standard configuration you must sometimes change slightly to accommodate special requests. For example, you may require two adjacent input modules to have addresses starting at X10 and X200 respectively.

In automatic configuration, the addresses were assigned on 8-point boundaries. Manual configuration assumes that all modules are at least 16 points, so you can only assign addresses that are a multiple of 20 (octal). For example, X30 and Y50 would not be valid starting addresses for a module. X20 and Y40 are valid examples of starting addresses in a manual configuration. This does not mean you can only use 16- or 32-point modules with manual configuration. You can use 8-point modules, but 16 addresses will be assigned and 8 of them are unused.

WARNING: If you manually configure an I/O slot, the I/O addressing for the other modules will change. This is because the DL205 products do not allow you to assign duplicate I/O addresses. You should always correct any I/O configuration errors before you place the CPU into RUN mode. Uncorrected errors can cause unpredictable machine operation that can result in a risk of personal injury or damage to equipment.

Once you have manually configured the addresses for an I/O slot, the system will automatically retain these values even after a power cycle. You can remove any manual configuration changes by simply performing an automatic configuration.

NOTE: As of 07/2021 CPU D2-260 has been retired.
Please consider CPU D2-262 as a replacement.

AUX 5* — CPU Configuration

AUX 51-5C

Several AUX functions are available to set up, view, or change the CPU configuration.

- AUX 51 — Modify Program Name
- AUX 52 — Display / Change Calendar
- AUX 53 — Display Scan Time
- AUX 54 — Initialize Scratchpad
- AUX 55 — Set Watchdog Timer
- AUX 56 — CPU Network Address
- AUX 57 — Set Retentive Ranges
- AUX 58 — Test Operations
- AUX 59 — Bit Override
- AUX 5B — Counter Interface Configuration
- AUX 5C — Display Error / Message History

AUX 51 Modify Program Name

The DL205 products can use a program name for the CPU program or a program stored on EEPROM in the Handheld Programmer. Note, you cannot have multiple programs stored on the EEPROM. The program name can be up to 8 characters in length and can use any of the available characters (A–Z, 0–9). AUX 51 allows you to enter a program name. You can also perform this operation from within DirectSOFT by using the PLC > Setup sub-menu. Once you've entered a program name, you can only clear the name by using AUX 54 to reset the system memory. Make sure you understand the possible ramifications of AUX 54 before you use it!

AUX 52 Display/Change Calendar

The D2-240, D2-250–1, D2-260 and D2-262 CPUs have a clock and calendar feature. If you are using this, you can use the Handheld Programmer and AUX 52 to set the time and date. The following format is used.

- Date — Year, Month, Date, Day of week (0 – 6, Sunday through Saturday)
- Time — 24-hour format, Hours, Minutes, Seconds

You can use the AUX function to change any component of the date or time. However, the CPU will not automatically correct any discrepancy between the date and the day of the week. For example, if you change the date to the 15th of the month and the 15th is on a Thursday, you will also have to change the day of the week (unless the CPU already shows the date as Thursday).

You can also perform this operation from within DirectSOFT by using the PLC > Setup sub-menu.

AUX 53 Display Scan Time

AUX 53 displays the current, minimum, and maximum scan times. The minimum and maximum times are the ones that have occurred since the last Program Mode to Run Mode transition. You can also perform this operation from within DirectSOFT by using the PLC > Diagnostics sub-menu.

AUX 54 Initialize Scratchpad

The DL205 CPUs maintain system parameters in a memory area often referred to as the "scratchpad." In some cases, you may make changes to the system setup that will be stored in system memory. For example, if you specify a range of Control Relays (CR) as retentive, these changes are stored.

NOTE: *You may never have to use this feature unless you have made changes that affect system memory. Usually, you'll only need to initialize the system memory if you are changing programs and the old program required a special system setup. You can usually change from program to program without ever initializing system memory.*

AUX 54 resets the system memory to the default values. You can also perform this operation from within DirectSOFT by using the PLC > Setup sub-menu.

AUX 55 Set Watchdog Timer

The DL205 CPUs have a "watchdog" timer that is used to monitor the scan time. The default value set from the factory is 200ms. If the scan time exceeds the watchdog time limit, the CPU automatically leaves RUN mode and enters PGM mode. When the scan overrun occurs, the Handheld Programmer displays the following message: E003 S/W TIMEOUT.

Use AUX 55 to increase or decrease the watchdog timer value. You can also perform this operation from within DirectSOFT by using the PLC > Setup sub-menu.

AUX 56 CPU Network Address

Since the D2-240, D2-250–1, D2-260 and D2-262 CPUs have an additional communication port, you can use the Handheld Programmer to set the network address for the port and the port communication parameters. The default settings are:

- Station address 1
- HEX mode
- Odd parity

You can use this port with either the Handheld Programmer, DirectSOFT, or, as a DirectNET communication port. The DirectNET Manual provides additional information about communication settings required for network operation.

NOTE: *You will only need to use this procedure if you have the bottom port connected to a network. Otherwise, the default settings will work fine.*

Use AUX 56 to set the network address and communication parameters. You can also perform this operation from within DirectSOFT by using the PLC > Setup sub-menu.

AUX 57 Set Retentive Ranges

The DL205 CPUs provide certain ranges of retentive memory by default. The default ranges are suitable for many applications, but you can change them if your application requires additional retentive ranges or no retentive ranges at all. The default settings are:

Memory Area	D2-230		D2-240		D2-250-1		D2-260/D2-262	
	Default Range	Available Range	Default Range	Available Range	Default Range	Available Range	Default Range	Available Range
Control Relays	C300-C377	C0-C377	C300-C377	C0-C377	C1000-C1777	C0-C1777	C1000-C1777	C0-C3777
V-Memory	V2000-V7777	V0-V7777	V2000-V7777	V0-V7777	V1400-V3777	V0-V17777	V1400-V3777	V0-V37777
Timers	None by default	T0-T77	None by default	T0-T177	None by default	T0-T377	None by default	T0-T377
Counters	CT0-CT77	CT0-CT77	CT0-CT177	CT0-CT177	CT0-CT177	CT0-CT177	CT0-CT177	CT0-CT377
Stages	None by default	S0-S377	None by default	S0-S777	None by default	S0-S1777	None by default	S0-S1777

Use AUX 57 to change the retentive ranges. You can also perform this operation from within DirectSOFT by using the PLC > Setup sub-menu.

WARNING: The DL205 CPUs do not come with a battery. They have a super capacitor which will help in retaining values in the event of a power loss. The retention time varies depending on environmental conditions but could possibly last as long as 1 week (retention in the D2-262 is 1.9 hours, maximum). If the retentive ranges are important for your application the optional battery must be used.

AUX 58 Test Operations

In normal Run Mode, the outputs are turned off when you return to Program Mode. In TEST-RUN mode you can set each individual output to either turn off, or, hold its last output state on the transition to TEST-PGM mode. The ability to hold the output states is especially useful, since it allows you to maintain key system I/O points for examination. See Chapter 9 for a description of the Test Modes.

You can use AUX 58 to configure each individual output. You can also perform this operation from within DirectSOFT by using the PLC > Setup sub-menu.

AUX 59 Bit Override

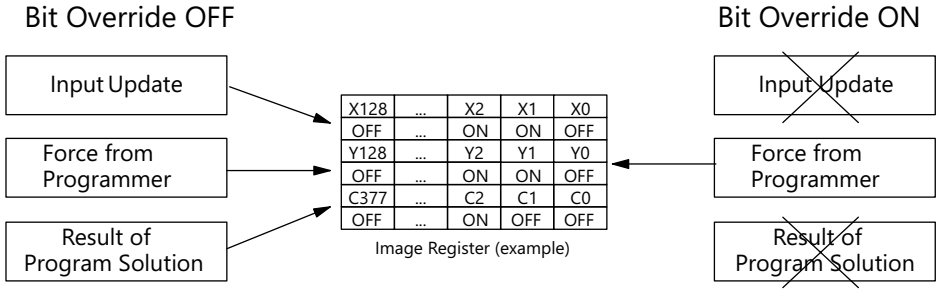
Bit override can be enabled on a point-by-point basis by using AUX 59 from the Handheld Programmer or, by a menu option from within DirectSOFT. Bit override basically disables any changes to the discrete point by the CPU. For example, if you enable bit override for X1, and X1 is off at the time, then the CPU will not change the state of X1. This means that even if X1 comes on, the CPU will not acknowledge the change. So, if you used X1 in the program, it would always be evaluated as "off" in this case. Of course, if X1 was on when the bit override was enabled, then X1 would always be evaluated as "on."

NOTE: *DirectNet protocol does not support single-bit write operations.*

There is an advantage available when you use the bit override feature. The regular forcing is not disabled because the bit override is enabled. For example, if you enabled the Bit Override for Y0 and it was off at the time, then the CPU would not change the state of Y0. However, you can still use a programming device to change the status. Now, if you use the programming device to force Y0 on, it will remain on and the CPU will not change the state of Y0. If you then force Y0 off, the CPU will maintain Y0 as off. The CPU will never update the point with the results from the application program or from the I/O update until the bit override is removed from the point.

The following diagram shows a brief overview of the bit override feature. Notice the CPU does not update the Image Register when bit override is enabled.

AUX 5B Counter Interface Configuration



AUX 5B is used with the DL205 Counter Interface module D2-CTRINT to select the module configuration. You can choose the type of counter, set the counter parameters, etc. See the DL205 Counter Interface Module manual for a complete description of how to select the various counter features.

AUX 5C Display Error History

The D2-240, D2-250–1, D2-260 and D2-262 CPUs will automatically log any system error codes and custom messages created with the FAULT instructions. The CPU logs the error code, date, and time the error occurred. There are two separate tables that store this information.

- Error Code Table – the system logs up to 32 errors in the table. When an error occurs, the errors already on the table are pushed down and the most recent error is loaded into the top slot. If the table is full when an error occurs, the oldest error is pushed out (erased) of the table.
- Message Table – the system logs up to 16 messages in this table. When a message is triggered, the messages already stored in the table are pushed down and the most recent message is loaded into the top slot. If the table is full when an error occurs, the oldest message is pushed out (erased) of the table.

The following is an example of an error table for messages.

Date	Time	Message
2008-05-26	08:41:51:11	*Conveyor - 2 stopped
2008-04-30	17:01:11:56	*Conveyor - 1 stopped
2008-04-30	17:01:11:12	*Limit SW1 failed
2008-04-28	03:25:14:31	*Saw Jam Detect

You can use AUX Function 5C to show the error codes or messages. You can also view the errors and messages from within DirectSOFT by using the PLC > Diagnostics sub-menu.

AUX 6* — Handheld Programmer Configuration

AUX 61, 62 and 65

Several AUX functions are available that you can use to set up, view, or change the Handheld Programmer configuration.

- AUX 61 — Show Revision Numbers
- AUX 62 — Beeper On/Off
- AUX 65 — Run Self Diagnostics

AUX 61 Show Revision Numbers

As with most industrial control products, there are cases when additional features and enhancements are made. Sometimes these new features only work with certain releases of firmware. By using AUX 61, you can quickly view the CPU and Handheld Programmer firmware revision numbers. This information (for the CPU) is also available from within DirectSOFT from the PLC > Diagnostics sub-menu.

AUX 62 Beeper On/Off

The Handheld Programmer has a beeper that provides confirmation of keystrokes. You can use Auxiliary (AUX) Function 62 to turn the beeper OFF or ON.

AUX 65 Run Self Diagnostics

If you think the Handheld Programmer is not operating correctly, you can use AUX 65 to run a self-diagnostics program. You can check the following items.

- Keypad
- Display
- LEDs and Backlight
- Handheld Programmer EEPROM check

AUX 7* — EEPROM Operations

AUX 71 – 76

Several AUX functions are available to move programs between the CPU memory and an optional EEPROM installed in the Handheld Programmer.

- AUX 71 — Read from CPU memory to HPP EEPROM
- AUX 72 — Write HPP EEPROM to CPU
- AUX 73 — Compare CPU to HPP EEPROM
- AUX 74 — Blank Check (HPP EEPROM)
- AUX 75 — Erase HPP EEPROM
- AUX 76 — Show EEPROM Type (CPU and HPP)

Transferable Memory Areas

Many of these AUX functions allow you to copy different areas of memory to and from the CPU and Handheld Programmer. The following table shows the areas that may be mentioned.

Option and Memory Type	D2-240 Default Range	D2-230 Default Range
1:PGM — Program	$00000–$02559	$00000–$02047
2:V — V-memory	$00000–$4777	$00000–$04777
3:SYS — System	Non-selectable copies system parameters	
4:etc (All)—Program, System and *non-volatile* V-memory	Non-selectable	Non-selectable

AUX 71 CPU to HPP EEPROM

AUX 71 copies information from the CPU memory to an EEPROM installed in the Handheld Programmer. You can copy different types of information from CPU memory as shown in the previous table.

AUX 72 HPP EEPROM to CPU

AUX 72 copies information from an EEPROM installed in the Handheld Programmer to the CPU. You can copy different portions of EEPROM (HP) memory to the CPU memory as shown in the previous table. The amount of data you can copy depends on the CPU.

AUX 73 Compare HPP EEPROM to CPU

AUX 73 compares the program in the Handheld Programmer (EEPROM) with the CPU program. You can compare different types of information as shown previously. There is also an option called "etc." that allows you to check all of the areas sequentially without re-executing the AUX function every time.

AUX 74 HPP EEPROM Blank Check

AUX 74 allows you to check the EEPROM in the Handheld Programmer to make sure it is blank. It's a good idea to use this function any time you start to copy an entire program to an EEPROM in the Handheld Programmer.

AUX 75 Erase HPP EEPROM

AUX 75 allows you to clear all data in the EEPROM in the Handheld Programmer. You should use this AUX function before you copy a program from the CPU.

AUX 76 Show EEPROM Type

You can use AUX 76 to quickly determine what size EEPROM is installed in the CPU and Handheld Programmer. The D2-230 and D2-240 use different size EEPROMs. See Chapter 3 for additional information.

AUX 8* — Password Operations

AUX 81 - 83

AUX functions are available to modify or enable the CPU password. You can use these features during on-line communications with the CPU, or, you can also use them with an EEPROM installed in the Handheld Programmer during off-line operation. This will allow you to develop a program in the Handheld Programmer and include password protection.

- AUX 81 — Modify Password
- AUX 82 — Unlock CPU
- AUX 83 — Lock CPU

AUX 81 Modify Password

You can use AUX 81 to provide an extra measure of protection by entering a password that prevents unauthorized machine operations. The password must be an eight-character numeric (0–9) code. Once you've entered a password, you can remove it by entering all zeros (00000000). This is the default from the factory.

Once you've entered a password, you can lock the CPU against access. There are two ways to lock the CPU with the Handheld Programmer.

- The CPU is always locked after a power cycle (if a password is present).
- You can use AUX 83 and AUX 82 to lock and unlock the CPU.

You can also enter or modify a password from within DirectSOFT by using the PLC > Password sub-menu. This feature works slightly differently in DirectSOFT. Once you've entered a password, the CPU is automatically locked when you exit the software package. It will also be locked if the CPU is power cycled.

WARNING: Make sure you remember the password before you lock the CPU. Once the CPU is locked you cannot view, change, or erase the password. If you do not remember the password, you have to return the CPU to the factory for password removal (For US customers only).

NOTE: *The D2–240, D2-250–1, D2–260 and D2-262 CPUs support multi-level password protection of the ladder program. This allows password protection while not locking the communication port to an operator interface. The multi-level password can be invoked by creating a password with an upper case "A" followed by seven numeric characters (e.g., A1234567).*

AUX 82 Unlock CPU

AUX 82 can be used to unlock a CPU that has been password protected. DirectSOFT will automatically ask you to enter the password if you attempt to communicate with a CPU that contains a password.

AUX 83 Lock CPU

AUX 83 can be used to lock a CPU that contains a password. Once the CPU is locked, you will have to enter a password to gain access. Remember, this is not necessary with DirectSOFT since the CPU is automatically locked whenever you exit the software package.