Diagnostics

Diagnostics

Your DL205 system performs many pre-defined diagnostic routines with every CPU scan. The diagnostics have been designed to detect various types of failures for the CPU and I/O modules. There are two primary error classes, fatal and non-fatal.

Fatal Errors

Fatal errors are errors the CPU has detected that offer a risk of the system not functioning safely or properly. If the CPU is in Run Mode when the fatal error occurs, the CPU will switch to Program Mode. (Remember, in Program Mode all outputs are turned off.) If the fatal error is detected while the CPU is in Program Mode, the CPU will not enter Run Mode until the error has been corrected.

Here are some examples of fatal errors.

- Base power supply failure
- Parity error or CPU malfunction
- I/O configuration errors
- Certain programming errors

Non-fatal Errors

Non-fatal errors are errors that are flagged by the CPU as requiring attention. They can neither cause the CPU to change from Run Mode to Program Mode, nor do they prevent the CPU from entering Run Mode. There are special relays the application program can use to detect if a non-fatal error has occurred. The application program can then be used to take the system to an orderly shutdown or to switch the CPU to Program Mode if necessary.

Some examples of non-fatal errors are:

- Backup battery voltage low
- All I/O module errors
- Certain programming errors

Finding Diagnostic Information

Diagnostic information can be found in several places with varying levels of message detail.

- The CPU automatically logs error codes and any FAULT messages into two separate tables which can be viewed with the Handheld or *Direct*SOFT32.
- The handheld programmer displays error numbers and short descriptions of the error.
- *Direct*SOFT32 provides the error number and an error message.
- Appendix B in this manual has a complete list of error messages sorted by error number.

Many of these messages point to supplemental memory locations which can be referenced for additional related information. These memory references are in the form of V-memory and SPs (special relays).

The following two tables name the specific memory locations that correspond to certain types of error messages. The special relay table also includes status indicators which can be used in programming. For a more detailed description of each of these special relays refer to Appendix D.

**V-memory
Locations
Corresponding to
Error Codes**

Error Class	Error Category	Diagnostic V-memory
Battery Voltage (DL240 only)	Shows battery voltage to tenths (32 is 3.2V)	V7746
User-Defined	Error code used with FAULT instruction	V7751
I/O Configuration	Correct module ID code	V7752
	Incorrect module ID code	V7753
	Base and Slot number where error occurs	V7754
System Error	Fatal Error code	V7755
	Major Error code	V7756
	Minor Error code	V7757
Module Diagnostic	Base and slot number where error occurs	V7760
	Always holds a "0"	V7761
	Error code	V7762
Grammatical	Address where syntax error occurs	V7763
	Error Code found during syntax check	V7764
CPU Scan	Number of scans since last Program to Run Mode transition	V7765
	Current scan time (ms)	V7775
	Minimum scan time (ms)	V7776
	Maximum scan time (ms)	V7777

Special Relays (SP)
Corresponding to
Error Codes

Startup and Real-time Relays	
SP0	On first scan only
SP1	Always ON
SP2	Always OFF
SP3	1 minute clock
SP4	1 second clock
SP5	100 millisecond clock
SP6	50 millisecond clock
SP7	On alternate scans
CPU Status Relays	
SP11	Forced run mode (DL240 only)
SP12	Terminal run mode
SP13	Test run mode (DL240 only)
SP15	Test program mode (DL240 only)
SP16	Terminal program mode
SP20	STOP instruction was executed
SP22	Interrupt enabled
System Monitoring Relays	
SP40	Critical error
SP41	Non-critical error
SP43	Battery low
SP44	Program memory error
SP45	I/O error
SP46	Communications error
SP47	I/O configuration error
SP50	Fault instruction was executed
SP51	Watchdog timeout
SP52	Syntax error
SP53	Cannot solve the logic
SP54	Intelligent module communication error

Accumulator Status Relays	
SP60	Acc. is less than value
SP61	Acc. is equal to value
SP62	Acc. is greater than value
SP63	Acc. result is zero
SP64	Half borrow occurred
SP65	Borrow occurred
SP66	Half carry occurred
SP67	Carry occurred
SP70	Result is negative (sign)
SP71	Pointer reference error
SP73	Overflow
SP75	Data is not in BCD
SP76	Load zero
Communication Monitoring Relays	
SP116 DL230/DL240	CPU is communicating with another device
SP116 DL250–1 / DL260	Port 2 is communicating with another device
SP117	Communication error on Port 2 (DL250–1 / DL260 only)
SP120	Module busy, Slot 0
SP121	Communication error Slot 0
SP122	Module busy, Slot 1
SP123	Communication error Slot 1
SP124	Module busy, Slot 2
SP125	Communication error Slot 2
SP126	Module busy, Slot 3
SP127	Communication error Slot 3
SP130	Module busy, Slot 4
SP131	Communication error Slot 4
SP132	Module busy, Slot 5
SP133	Communication error Slot 5
SP134	Module busy, Slot 6
SP135	Communication error Slot 6
SP136	Module busy, Slot 7
SP137	Communication error Slot 7

Maintenance
and Troubleshooting

I/O Module Codes   Each system component has a code identifier. This code identifier is used in some of the error messages related to the I/O modules. The following table shows these codes.

Code (Hex)	Component Type
04	CPU
03	I/O Base
20	8 pt. Output
21	8 pt. Input
24	4input/output combination
28	12 pt. Output, 16 pt. Output
3F	32 pt. Input
30	32 pt. Output
52	H2–ERM
51	H2–CTRIO

Code (Hex)	Component Type
36	Analog Input
2B	16 pt. Input
37	Analog Output
3D	Analog I/O Combo
4A	Counter Interface
7F	Abnormal
FF	No module detected
EE	D2–DCM H2–ECOM F2–CP128
BE	D2–RMSM

The following diagram shows an example of how the I/O module codes are used:
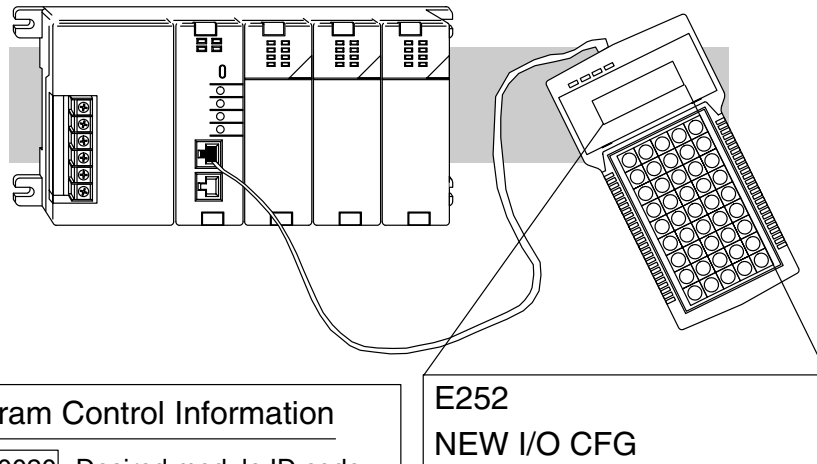
Program Control Information

V7752	0020	Desired module ID code
V7753	0026	Current module ID code
V7754	0002	Location of conflict
V7755	0252	Fatal error code
SP47	⊣⊢	I/O Configuration Error

E252
NEW I/O CFG

Error Message Tables

×	✓	✓	✓
230	**240**	**250–1**	**260**
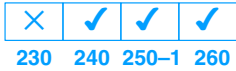
The DL240 CPU will automatically log any system error codes and any custom messages you have created in your application program with the FAULT instructions. The CPU logs the error code, the date, and the time the error occurred. There are two separate tables that store this information.

- Error Code Table – the system logs up to 32 errors in the table. When an error occurs, the errors already in the table are pushed down and the most recent error is loaded into the top position. If the table is full when an error occurs, the oldest error is pushed (erased) from 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 position. If the table is full when an error occurs, the oldest message is pushed (erased) from the table.

The following diagram shows an example of an error table for messages.

Date	Time	Message
1993–05–26	08:41:51:11	*Conveyor–2 stopped
1993–04–30	17:01:11:56	* Conveyor–1 stopped
1993–04–30	17:01:11:12	* Limit SW1 failed
1993–04–28	03:25:14:31	* Saw Jam Detect

You can access the error code table and the message table through **Direct**SOFT32's PLC Diagnostic sub-menus or from the Handheld Programmer. Details on how to access these logs are provided in the DL205 **Direct**SOFT32 manual.

The following examples show you how to use the Handheld and AUX Function 5C to show the error codes. The most recent error or message is always displayed. You can use the PREV and NXT keys to scroll through the messages.
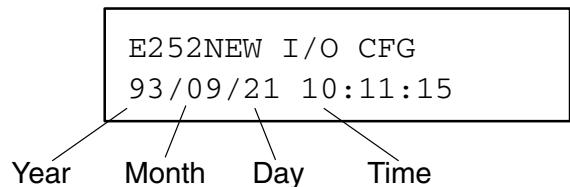
Use AUX 5C to view the tables

| CLR | F 5 | SHFT | C 2 | AUX | ENT |

```
AUX 5C HISTORY D
   ERROR/MESAGE
```

Use the arrow key to select Errors or Messages

| → | ENT |

```
AUX 5C HISTORY D
   ERROR/MESAGE
```

Example of an error display

```
E252NEW I/O CFG
93/09/21 10:11:15
```

Year   Month   Day   Time

System Error Codes

×	✓	✓	✓
230	240	250–1	260
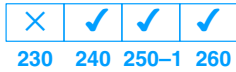
The System error log contains 32 of the most recent errors that have been detected. The errors that are trapped in the error log are a subset of all the error messages which the DL205 systems generate. These errors can be generated by the CPU or by the Handheld Programmer, depending on the actual error. Appendix B provides a more complete description of the error codes.

The errors can be detected at various times. However, most of them are detected at power-up, on entry to Run Mode, or when a Handheld Programmer key sequence results in an error or an illegal request.

Error Code	Description
E003	Software time-out
E004	Invalid instruction (RAM parity error in the CPU)
E041	CPU battery low
E043	Memory cartridge battery low
E099	Program memory exceeded
E101	CPU memory cartridge missing
E104	Write fail
E151	Invalid command
E155	RAM failure
E201	Terminal block missing
E202	Missing I/O module
E203	Blown fuse
E206	User 24V power supply failure
E210	Power fault
E250	Communication failure in the I/O chain
E251	I/O parity error
E252	New I/O configuration
E262	I/O out of range
E312	Communications error 2
E313	Communications error 3
E316	Communications error 6
E320	Time out
E321	Communications error
E499	Invalid Text entry for Print Instruction
E501	Bad entry
E502	Bad address
E503	Bad command
E504	Bad reference / value
E505	Invalid instruction

Error Code	Description
E506	Invalid operation
E520	Bad operation – CPU in Run
E521	Bad operation – CPU in Test Run
E523	Bad operation – CPU in Test Program
E524	Bad operation – CPU in Program
E525	Mode switch not in TERM
E526	Unit is offline
E527	Unit is online
E528	CPU mode
E540	CPU locked
E541	Wrong password
E542	Password reset
E601	Memory full
E602	Instruction missing
E604	Reference missing
E610	Bad I/O type
E611	Bad Communications ID
E620	Out of memory
E621	EEPROM Memory not blank
E622	No Handheld Programmer EEPROM
E624	V memory only
E625	Program only
E627	Bad write operation
E628	Memory type error (should be EEPROM)
E640	Miscompare
E650	Handheld Programmer system error
E651	Handheld Programmer ROM error
E652	Handheld Programmer RAM error

Program Error Codes

The following list shows the errors that can occur when there are problems with the program. These errors will be detected when you try to place the CPU into Run Mode, or, when you use AUX 21 – Check Program. The CPU will also turn on SP52 and store the error code in V7755. Appendix B provides a more complete description of the error codes.

Error Code	Description	Error Code	Description
E4**	No Program in CPU	E461	Stack Overflow
E401	Missing END statement	E462	Stack Underflow
E402	Missing LBL	E463	Logic Error
E403	Missing RET	E464	Missing Circuit
E404	Missing FOR	E471	Duplicate coil reference
E405	Missing NEXT	E472	Duplicate TMR reference
E406	Missing IRT	E473	Duplicate CNT reference
E412	SBR/LBL >64	E480	CV position error
E413	FOR/NEXT >64	E481	CV not connected
E421	Duplicate stage reference	E482	CV exceeded
E422	Duplicate SBR/LBL reference	E483	CVJMP placement error
E423	Nested loops	E484	No CV
E431	Invalid ISG/SG address	E485	No CVJMP
E432	Invalid jump (GOTO) address	E486	BCALL placement error
E433	Invalid SBR address	E487	No Block defined
E434	Invalid RTC address	E488	Block position error
E435	Invalid RT address	E489	Block CR identifier error
E436	Invalid INT address	E490	No Block stage
E437	Invalid IRTC address	E491	ISG position error
E438	Invalid IRT address	E492	BEND position error
E440	Invalid Data Address	E493	BEND I error
E441	ACON/NCON	E494	No BEND
E451	Bad MLS/MLR		
E452	X input used as output coil		
E453	Missing T/C		
E454	Bad TMRA		
E455	Bad CNT		
E456	Bad SR		

Maintenance
and Troubleshooting