MICROMASTER (MM4): What are the possible causes of F0070 on MICROMASTER 4, and how do I avoid them?

FAQ • November 2013

Siemens Industry Online Support

Answers for industry.

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1 Conditions of LED

On MICROMASTER 4 there is only one fault code, F0070, for PROFIBUS communications failure. If the fault is due to failure of communication with the PROFIBUS Master, the LED on the PROFIBUS module goes orange, if it is due to MM to PROFIBUS module comes failure, it goes red.

1.1 Problems that could cause the LED to go orange

1.1.1 Poor PROFIBUS signal

Possible causes are electrical interference (EMC), signal attenuation due to excessive cable lengths, reflections due to cable joints or incorrectly installed connectors, incorrect bus termination, or inadmissible spurs on the bus (T-offs). Check the PROFIBUS with an oscilloscope, an example of a good waveform is shown below (1.5 Mbaud). The BT200 PROFIBUS Tester (6ES7181-0AA01-0AA0) is also useful for checking PROFIBUS hardware.

Figure 1-1

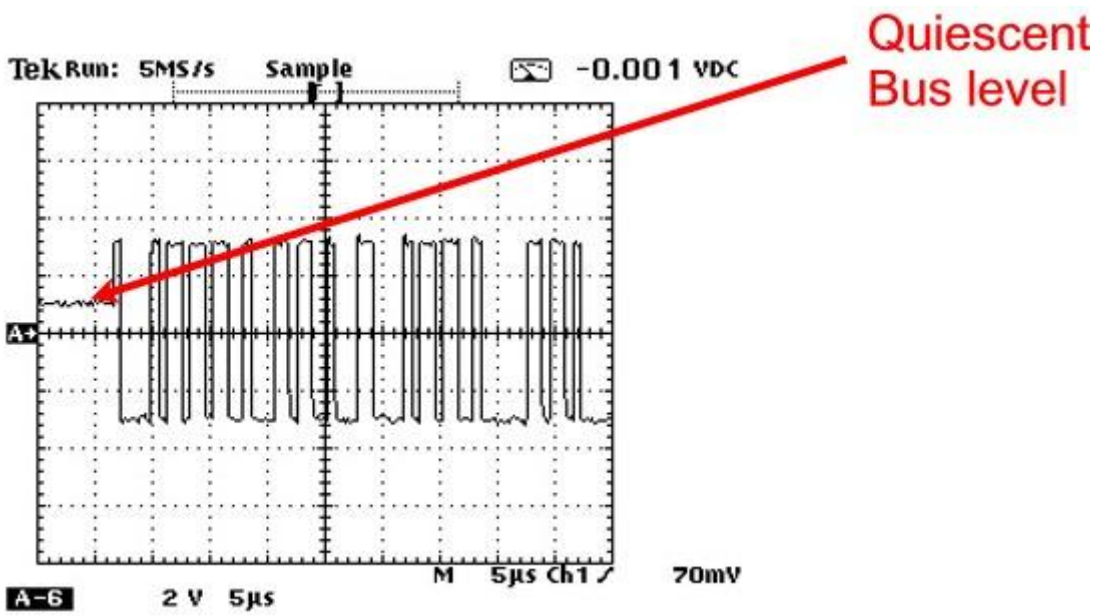
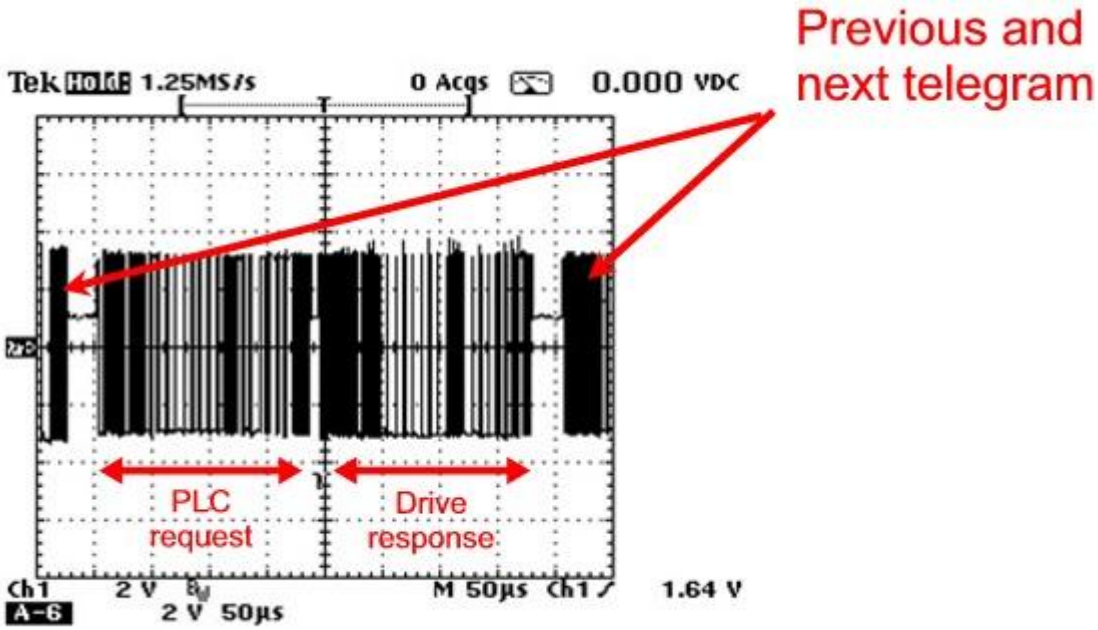


Figure 1-2



1.1.2 Poor PROFIBUS connection

This may be due to the PROFIBUS connector not being correctly inserted, or the contacts on quick connect connectors (e.g. 6GK1 500-0FC00) not being pushed fully onto the cable. Ensure the connection knives are pushed firmly home. Checking with a standard multimeter may identify such problems.

1.1.3 External problems

Also consider external problems, such as disturbances caused by other nodes on the PROFIBUS, and PLC programming errors.

If you look at the PROFIBUS traffic (with a data analysis tool such as Amprolyzer) when there is an EMC or PROFIBUS signal quality problem causing the LED to go orange, you're likely to see occasional error frames and the PLC sending repeat messages (retries).

1.2 Problems that can cause the LED to go read are

1.2.1 EMC problems

On MM420/430/440, the most likely sources are voltage spikes coming in on the analogue I/O, and for MM430/440 on the motor PTC/KTY input, which are not isolated. As motor PTC/KTY cables are often installed close to motor cables

without proper screening or segregation, excessive noise coming in on the MM430/440 motor PTC/KTY input is a common cause of problems.

On MM411 the digital inputs are not fully isolated, and voltage spikes coming in via these can have the same effect as the analogue I/O and motor PTC/KTY inputs on MM420/430/440

1.2.2 Incorrect fitting of the PROFIBUS module

Check the PROFIBUS module is firmly engaged on the MICROMASTER, and that the connectors on the rear of the module and the front of the MICROMASTER (or encoder module) are not damaged.

2 Measures to avoid problems

2.1 EMC correct installation

EMC correct installation is the key to reliable operation.

Ensure the bus cables are separated by at least 20cm from all cables, and power cables in particular, and that they cross these cables at right angles.

Maintain equipotential bonding between different PROFIBUS stations by connecting the stations' PE together using heavy copper conductors or wide flat braid. If there is a poor earth, current will flow in the PROFIBUS cable screen, which is likely to lead to data corruption. If the bonding is uncertain (e.g. if nodes are different buildings) consider the use of optical links. To give a good EMC earth to the PROFIBUS cable screen, it should be grounded use screen clamps making 360 degree contact. Brass or copper P clips are often a convenient way of doing this.

Where there are short cables connecting within a group of MICROMASTERS (e.g. a row in a cubicle), one ground connection per 2 MICROMASTERS is usually adequate. For cables of several metres or more there should be one ground connection at each of the cable.

Figure 2-1

Particular attention should be given to motor cables. These should be screened with steel braid (type SY), or preferably copper braid (CY). If the equipment has to meet Class A radiated emissions limits CY cable is normally required. If possible run the cable without joints direct from the MICROMASTER to the motor. At the motor use an EMC gland that makes 360 degree contact with the cable screen. Examples of EMC glands are shown below. At the MICROMASTER a good EMC ground connection is needed to the backplate on which the MICROMASTER is

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mounted. On smaller drives this can be done using a copper or brass P clip similar to those used for the Profibus cable. On larger drives a cable clamping rail or suitable EMC gland will probably be needed. If joints cannot be avoided, the EMC integrity of the cable screen must be ensured. For example, if a local isolator is mounted near the motor, it should be mounted in a metal box with EMC glands.

Figure 2-2

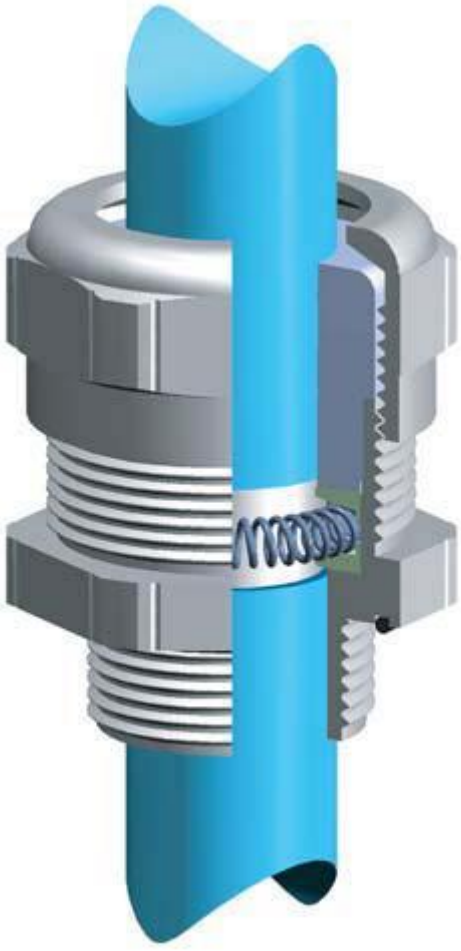

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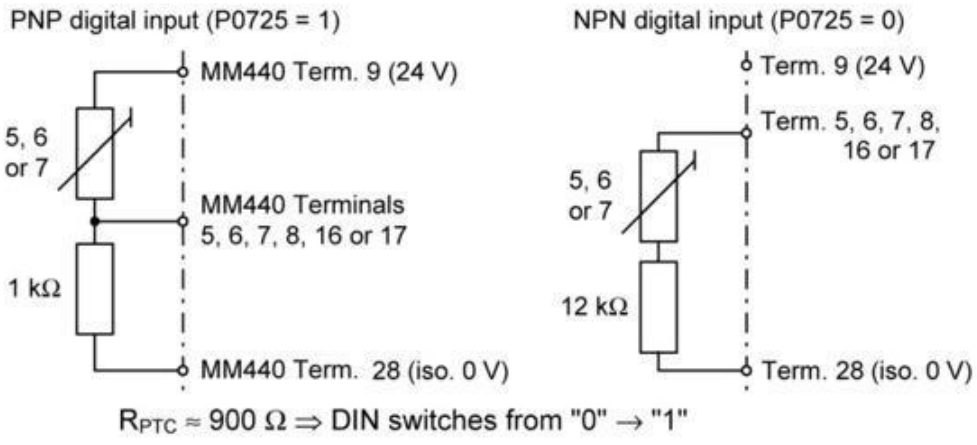
Figure 2-3

Particular care should be taken with the motor PTC/KTY input on MM430/440. The cable to this should be screened and effectively separated from the motor power cable. You can do this either by running it separately from the power cable, or ensuring the power cable is well screened. If a motor PTC is used, a better immunity is obtained by connecting it to a digital input (which is fully isolated). The parameter P70x for the input is set to 29, an external fault F0085 occurs when motor overtemperature is detected. To get the better immunity, the analogue 0V (terminal 2) must not be connected to the isolated 0V (terminal 28).

Figure 2-4



Further information on EMC correct installation can be found in the SD Engineering info No. 6:

http://support.automation.siemens.com/WW/view/en/18162267

2.2 Correct lay of PROFIBUS cable

Ensure the bus is correctly terminated at both ends. The nodes where the bus is terminated must always have power available to provide the 5V supply for pull up/ down. For MM4 this can be achieved by connecting a permanent 24V supply to the Profibus module. Observe the maximum and minimum cable lengths, and use the recommended cable and connectors. Use repeaters when needed. For details see the Simatic Net publication:

http://support.automation.siemens.com/WW/view/en/1971286

This is a summary of some of the important points from this document:

- Maximum total cable lengths for a Profibus segment are:

Up to 187.5 kbaud 1000m
Up to 500 kbaud 400m
Up to 1.5 Mbaud 200m
Up to 12 Mbaud 100m

- Minimum lengths for the cable between 2 nodes are specified in section 3.1.2 of the Simatic Net publication. As long as the connectors recommended for MM4 are used (6GK1500-0FC00 or 6GK1500-0EA02), then the minimum cable length between 2 MICROMASTERS is 200mm for up to 1.5 Mbaud. For higher transmission rates a minimum cable length between nodes of up to 600mm should be considered. For other connector types or configurations refer to the Simatic Net publication.

- a maximum of 32 nodes is permitted on a Profibus segment. If more nodes are to be connected, repeaters have to be used. Note each side of a repeater counts as 1 node.

Limitation of use in safety critical applications

Do remember that MICROMASTER 4 is a single channel electronic control system, and is not specified to meet the machine safety standards such as EN 954 and IEC61508. External safety systems are required to comply with such standards. Typically these take actions such as monitoring machine speed, isolating the AC input power to the MICROMASTER, and applying mechanical brakes.

2.3 Telegram off time

In general, for problems that lead to short term MICROMASTER to Profibus module comms failure, F0070 can be avoided if P2040 is set to c. 3000ms. The MICROMASTER will continue running at the speed reference in the last received telegram, so the reliability and safety of the machine or system must be

considered. The setting P2040 = 3000ms is based on experience (temporary communications breakdowns last 1 to 2 seconds). The LED can be seen changing from green to red for 1 to 2 seconds. If you look at the Profibus traffic when this happens (with a data analysis tool such as Amprolyzer), you'll see the PLC repeatedly sends diagnostic requests because the MICROMASTER is unable to reply correctly.

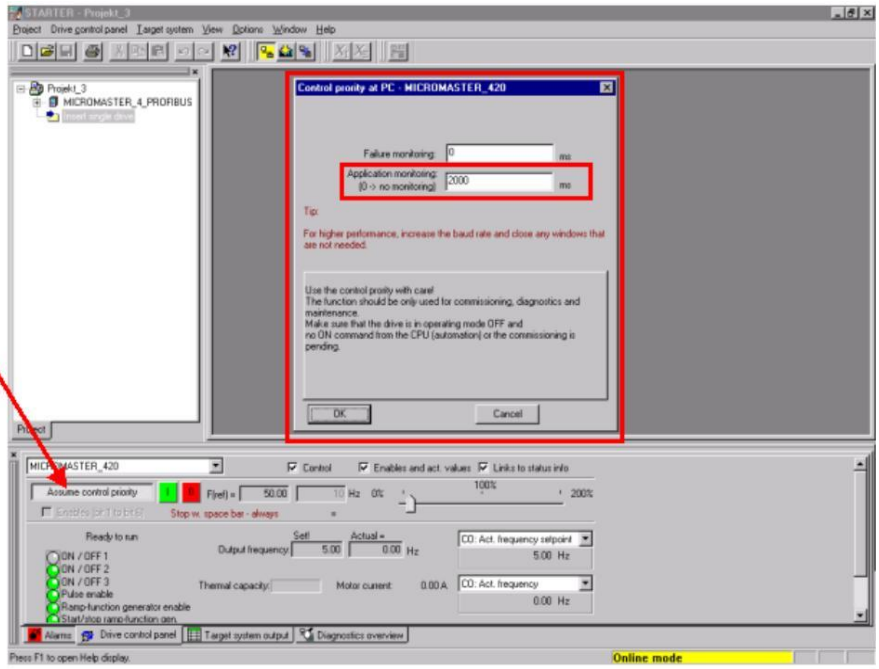
3 Fault F0070 in conjunction with control panel

This description is only valid for firmware <3.0!

When STARTER takes control, two windows will appear. The second window is shown below. Please change the application monitoring time to a value greater than 2 seconds (e.g. 5000ms). Then fault F0070 should not appear again.

This change should also improve the response time for STARTER to take control.

Figure 3-1



4 When fieldbus communication fails, how can fault F0070 be detected by the drive inverter and further processed?

In many applications, when fieldbus (PROFIBUS, PROFINET) communication fails with fault F0070, it is desired to have a bit that signals that fieldbus has failed, and that can then also be freely interconnected. This means that the user can specifically evaluate this fault and himself decide which response is to be made.

The bit can be generated using free blocks (FFB). This is the reason that the recommended method can only be implemented at the MM430 / MM440 and G120 / G120D with CU240S/D DP/DP-F / CU240S/D PN/PN-F.

Parameterization:

P2800 = 1 // Activate FFB

P2801.0 = 1 // Enable AND 1 (level 1)

P2802.12 = 2 // Enable comparator 1 (level 2)

P2802.13 = 2 // Enable comparator 2 (level 2)

P2810.0 = r2886.0 // 1st input of AND 1 = output of comparator 1

P2810.1 = r2888.0 // 2nd input of AND 1 = output of comparator 2

P2885.0 = r0947.0 // 1st input of comparator 1 = last fault code

P2885.1 = P2889 // 2nd input of comparator 1 = fixed setpoint 1

P2887.0 = P2889 // 1st input of comparator 2 = fixed setpoint 1

P2887.1 = r0947.0 // 2nd input of comparator 2 = last fault code

P2889 = 0.43 // Fixed setpoint 1 = 0.43% (the value is only valid for F0070)

r2811 = 1 for fault F0070

Bit r2811 can be used for further BiCo interconnections.

Note: The value 0.43% results from the formula:

$$\frac{\text{Fault No.}}{16384} \cdot 100\% = \frac{70}{16384} \cdot 100\% = 0.43\%$$

This method can be used for all faults.

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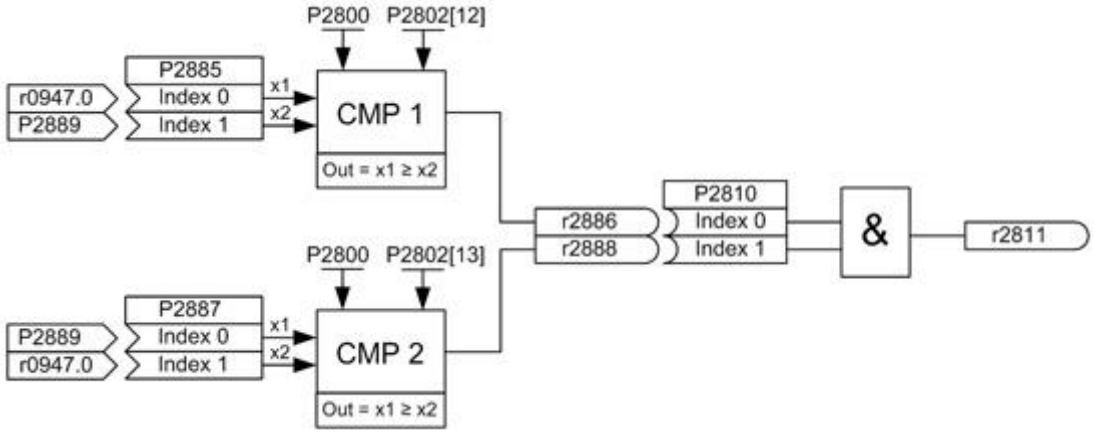
Figure 4-1: Detecting fault F0070



Bit r2811 can be used, e.g. for "remote / local" changeover (P0810 / P0811). To do this, in addition, a flip-flop and a logical OR are parameterized.

Note: Fault F0070 must be acknowledged after changing over between the two command data sets.

Parameterization:

P0704.0 = 99 // Enable BiCo parameterization for digital input 3/4 (DI3/4)

P2801.3 = 1 // Enable OR1 (level 1)

P2801.14 = 1 // Enable RS-FF 1 (level 1)

P2816.0 = r0722.3 // 1st input of OR1 = DI3/4

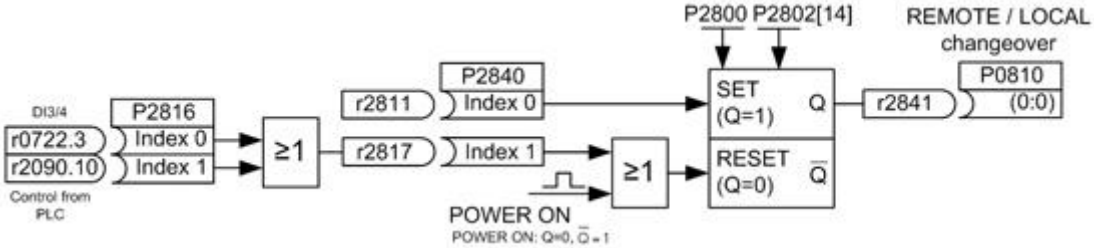
P2816.1 = r2090.10 // 2nd input of OR1 = Bit r2090.10 (control from PLC)

P2840.0 = r2811.0 // Set input of RS-FF 1 = output of the AND 1 (Bit r2811)

P2840.1 = r2817.0 // Reset input of RS-FF 1 = output of the OR1

P0810 = r2841.0 // CDS Bit0 (remote / local) = output of the RS-FF 1

Figure 3-2: REMOTE / LOCAL changeover



Also read the application document on this subject

Entry-ID: 22533468 „Profibus monitoring and “LOCAL / REMOTE” changeover“

5 History

Tabelle 5 History

Version	Date	Changes
V1.0	11/2013	First issue