ControlMaster CM50
Universal process controller, 1/2 DIN

Using a CM50 controller as a back up to Freelance PLC/DCS

Measurement made easy

Introduction

Recording and Control products can now be found via both the Measurement Products sales channels and the Control Systems essential automation product suite. This provides a whole new world of products that Recorders and Controllers can interact with.

For example, a plant using a plant-wide distributed control system (DCS) might have a requirement for a back up system in the event that something happens to the main control system.

This document details how to configure a ControlMaster CM50 and a Freelance AC700F controller to enable the CM50 to take over and maintain control of a process in the event the AC700F fails.

Communication method

The ControlMaster range of universal controllers can connect and communicate with a Modbus system using either an Ethernet (Modbus TCP) or serial (Modbus RS485) connection. In this example, Modbus RS485 is used to communicate with the AC700F.
Overview

Key features

- A cost-effective solution using a well integrated engineering tool and operator interface (Control Builder F and DigiVis, respectively).
- With little engineering effort and no additional wiring, the setpoint and auto/manual status can be synchronized using Modbus RS485 communications (only *.prt and *.hwm files are imported).
- Transfer of control from the DCS to the CM50 is initiated by either a Modbus* Communication Failure or a DCS loop error.
- It is possible to enable and disable local setpoint changes on the CM50 using the DCS control panel:
  - Enabled – setpoint cannot be changed locally
  - Disabled – local setpoint adjustment can be performed
- It is possible to change the control status of the CM50 (acting as Master or Backup) from the DCS control panel using Modbus Communications.
  - \( M = \text{manual (Backup)} \)
  - \( A = \text{auto (Master)} \)
- All information shown on the CM50’s display can be viewed on the DCS control panel (for example, process variable and setpoint).
- In the event of the CM50 assuming control, the auto/manual and setpoint switch-over is performed to provide a bumpless transfer.
- The CM50’s customizable display can show up to 6 variables, enabling display of 2 separate loops.

*Modbus is a registered trademark of of the Modbus-IDA organization.
Hardware setup, connections and configuration

To configure the AC700F, the function blocks shown in Figure 3 are programmed.

![Diagram of AC700F function blocks](image)

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Figure 2  MODM_DEV (CM50_MOD) configuration details

Figure 3  AC700F function blocks
...Hardware setup, connections and configuration

Figure 4 shows the CM50 connected to the AC783F demo box.

![Diagram of CM50 and AC783F connections](image)

Figure 4  AC783F/CM50 Modbus connections

Figure 5 shows the connections between the demo box AC700F (DC-RB-AC 700F-V9) and CM50, as well as an example process.

![Diagram of CM50 and AC700F connections](image)

Figure 5  CM50/AC700F demo box (DC-RB-AC 700F-V9) example process connections

Note.
- References to a, b and c in Figure 5 refer to the relay poles in the application overview diagram – see Figure 1 on page 2.
- To use the AC700F demo box to generate the PV to the CM50, see example process connections in Figure 5.
- The application requirement is for single pole, dual throw (SPDT) relays; but the CM50 is equipped with single pole, single throw (SPST) relays.
- To create an SPDT relay, the CM50’s terminals 14 and 16 are linked. This represents relay pole c in the application overview diagram (Figure 1 on page 2) where the control output is directed to the process.
- The CM50’s terminals 11 and 13 are also linked; this is represented by relay pole a on the application overview diagram (Figure 1 on page 2).
The CM50 function block configuration is as follows:

<table>
<thead>
<tr>
<th>Loop</th>
<th>AM1</th>
<th>CM50_LOOPS</th>
<th>PV1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM2</td>
<td>PV2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WS1</td>
<td>SP1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WS2</td>
<td>SP2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MLE</td>
<td>OP1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RSE</td>
<td>OP2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MCE</td>
<td>3</td>
</tr>
</tbody>
</table>

**Table 1** Pin details

<table>
<thead>
<tr>
<th>Name</th>
<th>Data type</th>
<th>Conf.</th>
<th>Acc.</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM1</td>
<td>Boolean</td>
<td>No</td>
<td>RW</td>
<td>Input from SMA pin of continuous controller output for loop 1 – write loop 1 AM mode</td>
</tr>
<tr>
<td>AM2</td>
<td>Boolean</td>
<td>No</td>
<td>RW</td>
<td>Input from SMA pin of continuous controller output for loop 2 – write loop 2 AM mode</td>
</tr>
<tr>
<td>WS1</td>
<td>Real</td>
<td>No</td>
<td>RW</td>
<td>Input from ASP pin of continuous controller output for loop 1 – write loop 1 SP</td>
</tr>
<tr>
<td>WS2</td>
<td>Real</td>
<td>No</td>
<td>RW</td>
<td>Input from ASP pin of continuous controller output for loop 2 – write loop 2 SP</td>
</tr>
<tr>
<td>MLE</td>
<td>Boolean</td>
<td>No</td>
<td>RW</td>
<td>Input from Err pin of continuous controller output for loop 1 – master loop error</td>
</tr>
<tr>
<td>RSE</td>
<td>Boolean</td>
<td>No</td>
<td>RW</td>
<td>Resource state error – system variable</td>
</tr>
<tr>
<td>PV1</td>
<td>Real</td>
<td>No</td>
<td>RO</td>
<td>CM50 loop 1 PV value</td>
</tr>
<tr>
<td>PV2</td>
<td>Real</td>
<td>No</td>
<td>RO</td>
<td>CM50 loop 2 PV value</td>
</tr>
<tr>
<td>SP1</td>
<td>Real</td>
<td>No</td>
<td>RO</td>
<td>CM50 loop 1 active setpoint</td>
</tr>
<tr>
<td>SP2</td>
<td>Real</td>
<td>No</td>
<td>RO</td>
<td>CM50 loop 2 active setpoint</td>
</tr>
<tr>
<td>OP1</td>
<td>Real</td>
<td>No</td>
<td>RO</td>
<td>CM50 loop 1 control output</td>
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<tr>
<td>OP2</td>
<td>Real</td>
<td>No</td>
<td>RO</td>
<td>CM50 loop 2 control output</td>
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<tr>
<td>Slave_Add1 to 7</td>
<td>Byte</td>
<td>Yes</td>
<td>RW</td>
<td>CM50 Modbus slave address</td>
</tr>
</tbody>
</table>

**Figure 6** CM50_LOOPS UFB details

**Parameter definition mask**

<table>
<thead>
<tr>
<th>Slave_Add1 to 7</th>
<th>Byte</th>
<th>Yes</th>
<th>RW</th>
</tr>
</thead>
</table>

**Figure 7** Parameter mask
... Hardware setup, connections and configuration

The RANGE parameters on the PARAMETERS1 tab are set to suitable alphanumeric values representing the engineering ranges of the setpoint and process variables. For example, if the process variable is 0 to 1500 °C, the minimum and maximum ranges are entered in the appropriate RANGE parameter to enable those values to display correctly on the CM50 display within the ControlBuilder F software.

The CM50 is configured as follows:

1 Device Setup
2 Input/Outputs
> Initial Setup
> Application Template > Single Loop

3 Communication
> Device Address: 5 (user defined/ as per user)
> Reverse IEEE Data: No
> RS485 Setup
> Mode: 2-Wire
> Baud Rate: 38400
> Parity: Odd Parity
> Tx Delay: 0 ms

The CM50 display is simulated by the ControlBuilder F software and shown on the DCS control panel – see Figure 8 on page 7.
...Hardware setup, connections and configuration

Operation is applicable to both loops.

CM50 status indication
M – master
B – backup

Auto/Manual operating mode control

CM50 control status trigger – toggles CM50 between master and backup from the DCS faceplate

Enable/Disable setpoint changes at the CM50.

Enabled  Active setpoint cannot be changed locally at the CM50. The CM50 follows the setpoint value from the DCS

Disabled  Active setpoint can be changed locally at the CM50. The DCS follows the setpoint value from the CM50

Active local setpoint. A maximum of 4 active local setpoints can be selected

Figure 8  CM50 ControlMaster display simulation on DCS control panel