

Basic Network Control of the MC1000/3000 Series Drive using ModBus™ Communications

Follow these Quick Start instructions to use ModBus Communications for basic network control of an MC1000/3000 series drive. For more information refer to the MC ModBus Reference Guide (RG-MCMOD) and "Getting Started with ModBus RTU" (AN0025). To download this product manual or application note visit the AC Tech Technical Library at <http://www.lenze-actech.com>.

For Further Reference

Modbus-IDA:	http://www.modbus-IDA.org
AC Tech Library:	http://www.lenze-actech.com

Quick Start Instructions:

1. Set the Modbus Master to 9600 bps with 8 data bits, no parity and 2 stop bits. The MC1000/3000 series drives do NOT support any other baud rates or data formats.
2. Set Parameter 58 (ADDRESS) to the desired network address that the Modbus master will poll. Valid Modbus addresses are 1-247.
TIP - Avoid using address 1. Most Modbus devices ship with a default address of 1. As duplicate addressing on a Modbus network is not allowed, this can lead to conflicts when replacing and commissioning nodes. To avoid this it is recommended that you do not set the slave address to 1.
3. The MC1000/3000 series drive has the provision for a watchdog timer to monitor network communications to the drive. The timer is fixed at a value of 10 seconds. If the drive is under network control and the master does not communicate with the MC1000/3000 drive for longer than the 10 second timeout period, the drive will STOP. The timer can either be enabled or disabled as outlined in the next step.
4. Set Parameter 57 (SERIAL) to either W/TIMER or W/O TIMR as desired in order for serial communication to function.

Drive Control:

1. Start/Stop Control: Please be advised that while the drive is under network control the local STOP circuit is always enabled. The drive's control registers (i.e. start, auto/manual, direction) cannot be written to unless the drive is operating in LOCAL control mode. If Parameter 29 (CONTROL) is set to REMOTE or if it is set to BOTH and no LOC SEL terminal is asserted, the network cannot control the drive. Drive parameters can still be written.

Also, if Parameter 29 (CONTROL) is set to BOTH and a LOC SEL terminal is asserted the drive can only be started over the network if the TB1 input is also asserted. If TB1 is not to be used as an external stop contact, simply jumper the TB1 input to TB2.

If Parameter 29 (CONTROL) is set LOCAL, the TB1 input does not need to be asserted for the drive to be started over the network.

2. Use either Modbus function code 16 with a length of 1 or Modbus function code 06 to perform any writes to the drive.

Unlocking the Drive:

1. The first write necessary to the drive to perform any function (start, change speed, change a parameter, etc) needs to be an unlock command.

To control the drive over the network but not modify any of the drive's programming parameters, you can write a value of 0 to the drive's Modbus register 40049 (AC Tech register 48).

To both control the drive and alter any programming parameters then write the drive's programming password to Modbus register 40049. The default password for the MC1000/3000 series drive is 0019.

2. You should only need to send the unlock command once after power up. As long as the communications do not timeout you should not need to write another unlock to the drive before writing any other function.

NOTE: The drive's control registers cannot be written to when the drive is in REMOTE control (i.e. When Parameter 30 – CONTROL is set to REMOTE or when it is set to BOTH with no LOC SEL terminal asserted).

Setting the Drive to Manual Mode:

In order for the drive to respond to speed commands written to the keypad speed register, Parameter 29 (MANUAL) must be set to KEYPAD and the drive must be put into manual mode. To do this write a value of 200H to Modbus register 40002 (the drive's control register). This step is not necessary if there are no other speed references setup on any TB-13x terminal.

Basic Drive Commands:

The following are the basic drive commands. ONLY ONE OF THESE CAN BE DONE AT A TIME:

1. To STOP the drive using the stop method programmed in Parameter 26 (STOP), write a value of 0004hex to Modbus register 40002 (AC Tech register 1).
2. To Start the drive write a value of 0008hex to Modbus register 40002.
3. To Set Reverse direction write a value of 0040hex to Modbus register 40002. On MC1000 drives, this command will not be accepted if Parameter 27 (ROTATION) is not set to REVERSE or FWD&REV.
4. To Set Forward direction write a value of 0080hex to Modbus register 40002. On MC1000 drives, this command will not be accepted if Parameter 27 (ROTATION) is set to REVERSE.
5. If you want the network to control the speed of the drive, set Parameter 29 (MANUAL) to KEYPAD and write the speed to the Keypad Speed Command Register, Modbus register 40041 (AC Tech register 40). Speed is written in 0.01Hz (so 4120 would be 41.20 Hz). In this mode the drive's initial speed reference on power up will be the last speed written to the drive.

Basic Drive Status:

AC Tech register 24 is a 6 word entity containing the drive's status information. To retrieve the entire status block (Modbus registers 24-29) send a read command to Modbus register 40025 using Modbus function code 03 with a register count of 6. The low byte of the third word in this block of data contains the operational status.

The value of that low byte of data corresponds to the following operational states:

Operational Status (byte D3L or Register #26 DL)

VALUE*	OPERATIONAL STATE
0	FAULT LOCKOUT
1	FAULT
2	START PENDING
3	STOP
4	DC BRAKE
5	RUN AT 0Hz
6	RUN
7	ACCEL
8	DECEL
9	CURRENT LIMIT
10	DECEL OVERRIDE
16	SLEEP MODE

* This is the decimal equivalent value of the binary number of the bits in that byte.

Basic Drive Network Programming:

The programming parameters of the MC1000/3000 drive may be altered by a Modbus master. To do so simply write the desired value to the appropriate Modbus register. The translation is as follows:

$$\text{Modbus register number} = \text{MC parameter number} + 52$$

As an example if you wanted to change the acceleration time (Parameter 8) of the MC drive, write the time desired into Modbus register 40060. Note that time is written in 0.1 seconds (so 200 would be 20.0 sec).

For a complete listing of parameters, refer to the *MC Series Drives Modbus Communications Reference Guide*, document RG-MCMOD.