Using the CM1-T

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> ⚠ This manual covers all Ethernet functionality of the CM1-T. For CML programming see the CM1-C User Guide.

Introduction

The CM1-T is an Ethernet based Cool Muscle. It offers all the functionality of the standard Cool Muscle but enables connections over TCP/IP, UDP, Modbus-TCP and EtherNet/IP. This variant of the Cool Muscle cannot be daisy chained.

The following terminology is important to understand how to understand this document and how to operate the motor.

Term	Description
Protocols	The protocols are the different Ethernet languages the user can implement to communicate to the controls methods. They are • TCP/IP and UDP • Modbus-TCP • EtherNet/IP
Control method	The control method indicates how the motor controller is communicated with, updated and controlled. Control methods are • CML- the motor runs logic and program banks • Direct Control - the motor receives position, speed, acceleration/deceleration and torque values to dynamically move between targets
Mode of operation	The mode of operation is how the motor controller operates in Direct Control. This is how the motor's motion controller generates a set of outputs to the motor driver. These are typically • CML mode - traditional operation of the motor • Profile mode - operate the motor by in position and/or speed control • Torque mode - operate the motor by limiting torque and speed.
TCP/UDP	This refers to any port or protocol that can be connected using TCP/IP and/or UDP.

The following diagram shows how the protocols break down to the different modes of operation
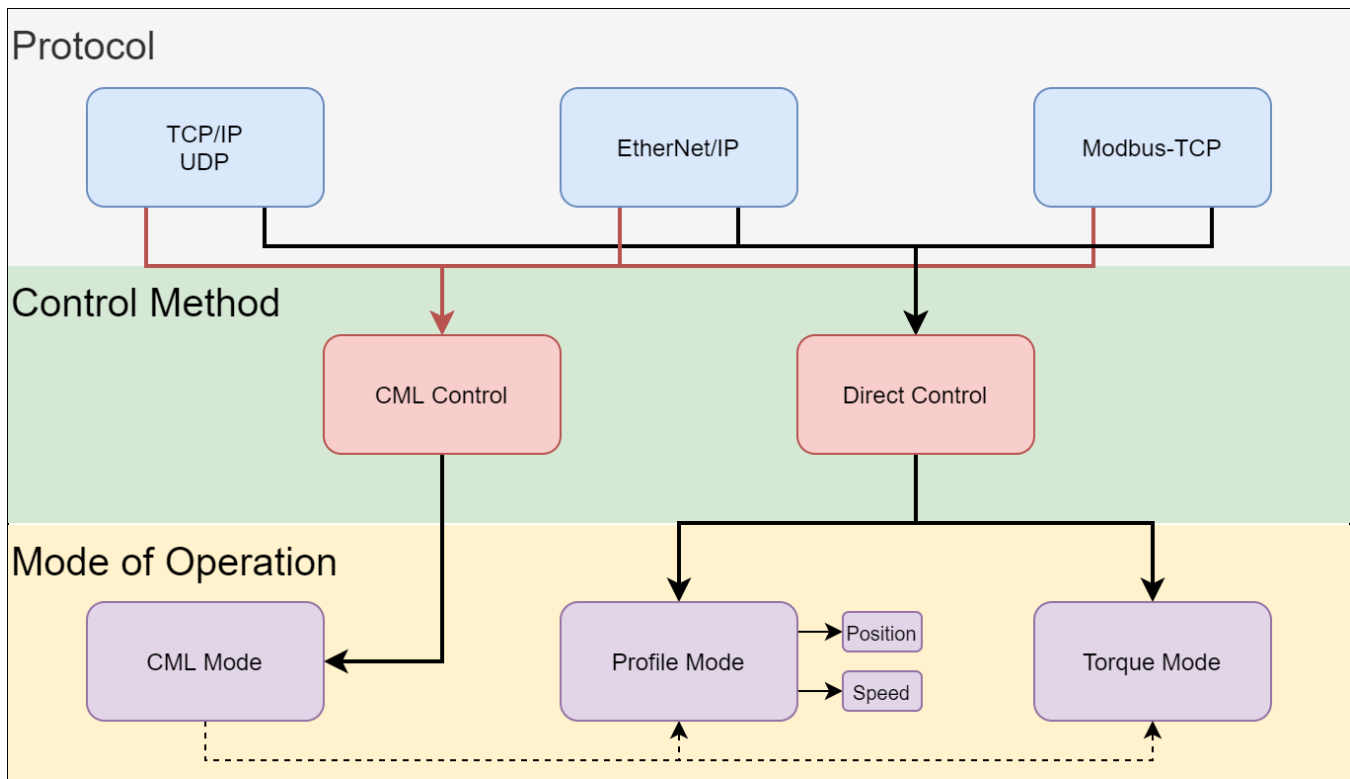
Connections and Port

Any TCP/IP enabled client device can connect and communicate with the CM1-T. The table below lists the ports and protocols they are associated with

Protocol	Port #	# TCP	# UDP	Description
CML	10001	1	1	Protocol used by the standard motor. Program the motor to run from IO, etc.
Direct Control Port	10002	1	1	Directly control the motor in a number of modes such as position, speed and torque
Modbus-TCP	502	1	0	Modbus access to all motor registers including CML and Direct Control.
Motor Information Port	30718	0	1	1. Query the motors configuration (Network configuration, serial number, etc) 2. Qeury/Stream the motors information (status, position, speed, etc)
EtherNet/IP	44818 2222	2 0	1 1	EtherNet/IP CIP EtherNet/IP IO

Additional connection information can be found in Network Configuration.

General Usage and Operation

CML Programming

Refer to the CM1-C User Guide for details on using CML. You will find information on the following in this manual:

- K parameters (setup parameters)
- H parameters (postion controller gain parameters)
- Motor registers (position, speed, acceleration, torque, etc)
- Variable registers
- Program banks
- Logic banks
- Inputs and Outputs

As stated in the introduction the CM1-T is a standalone motor and cannot be used in a daisy-chain configuration. As such there are features in CML related to multiple motor networks which will not function if programmed.

Features that <u>cannot</u> be used in the CM1-T:

- Executing motion on another motor
  - I.e Program and logic banks can only reference motor ID 1.
- Reading input and setting outputs on another motor
- Coordinated motion with another motor

Modbus-TCP

Modbus-TCP reads and writes to all motor registers.

- CML Control - Typical usage would be executing logic and program banks with Modbus registers reading and/or writing to get motor information as well as intervening in operation as required.
- Direct Control - A set of registers can run the motor directly (see Direct Control).

EtherNet/IP

See the EtherNet/IP section of this document for details on using the CM1-T with EtherNet/IP

Connecting in Control Room

Control Room is the Cool Muscle Windows application to program the motors. It is typically not used for run-time operation but this can depend on the user's requirements. Control Room can open up a connection in either standard CML mode or by Modbus-TCP. Two instances of Control Room can be opened if the user needs to use Modbus-TCP and CML simultaneously.

Note: You cannot program in CML mode if the connection is opened in Modbus Mode and you cannot use the Modbus Window if the connection is opened not in Modbus Mode.

To connect to a motor use the TCP/IP options, Connect to IP and Enable Modbus Mode functions on the Connection tab as shown below.

Search for available motors and their IP addresses

Connect to selected IP

Enable Modbus mode if required
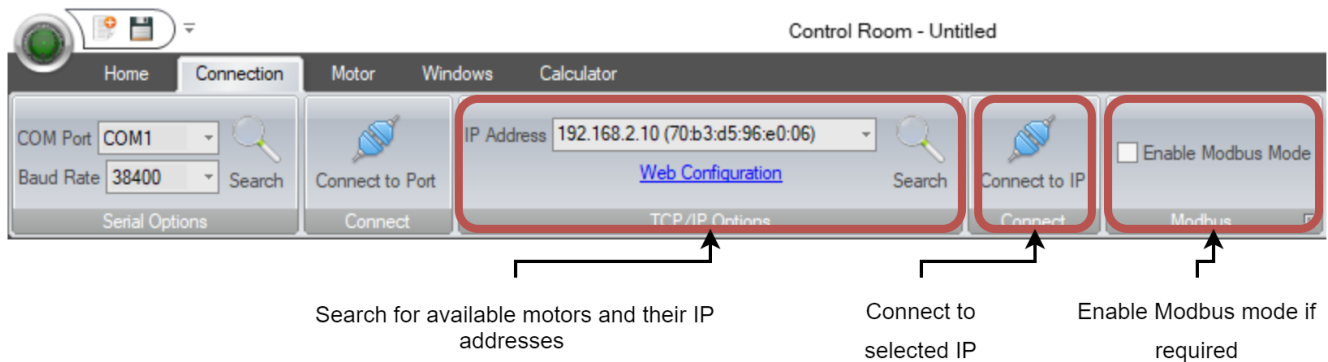
Search Button

- If any motors are available they will be displayed by IP with their MAC address

Connect to IP Button

- Once the correct motor is selected in the IP Address drop down list click the Connect to IP button to connect to the motor

Enable Modbus Mode Checkbox

- If the motor is set to modbus check the Enable Modbus Mode before opening the connection. This will allow the Control Room modbus window to operate.

Note: The Web Configuration is not available on the CM1-T. Use the Network Configuration Tool to setup network related parameters.