COMPUMOTOR CORPORATION™
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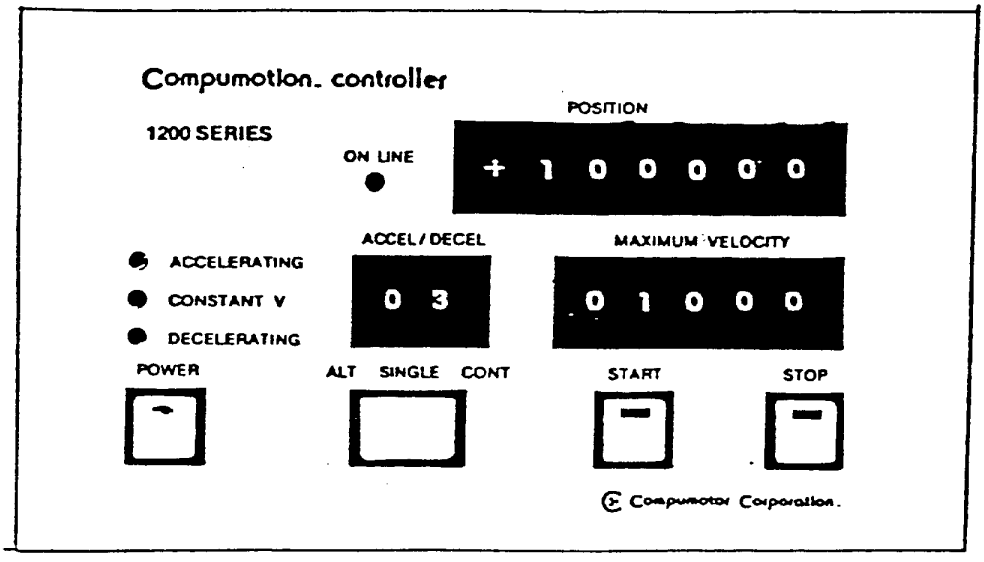
1200 SERIES

COMPUMOTION™ CONTROLLER



I. Overview

The 1200 Series COMPUMOTION™ CONTROLLERS are a family of microprocessor-based motion controllers designed to drive COMPUMOTOR CORPORATION'S line of high resolution motor/drivers. It is designed to be a stand-alone unit with front panel thumbwheel and switch control of motor function. The front panel controls may be over-ridden and complex motor control commands may be downloaded by a host computer over an optional RS-232C interface. The 1200 Series is also available with a blank front panel for applications requiring only a computer interface.

The 1200 Series is a single axis Controller intended to move preset distances or at preset velocities with thumbwheel (or computer) control of distance, maximum velocity, and maximum acceleration/deceleration rate.

II. Scope

The 1200 Series is designed to control COMPUMOTOR CORPORATION'S 25,000 pulse per revolution (ppr) motor/drivers. Other configurations are available for the 25,400 ppr Metric Option and the 50,000 ppr High Resolution Option. A special order version will also provide pulses for 200 step/rev stepper motors.

III. Front Panel Controls

The Front Control Panel contains groups of switches, thumbwheel controls, and status indicators. The thumbwheels select distance, run velocity, and acceleration/deceleration rate. The switches control starting, stopping, and mode selection.

(A) DISTANCE

This is a 6-decade thumbwheel used for controlling the number of revolutions the motor is to make. The standard range is from 0.001 revolutions to 999.999 revolutions. At the left end of this group is an additional thumbwheel used to determine motor direction. "+" corresponds to clockwise motor rotation (CW) and "-" corresponds to counterclockwise rotation (CCW). Directions are referenced from the mount end of the motor. See Option Table for other configurations.

(B) VELOCITY

This is a five-decade thumbwheel used for selecting the maximum desired velocity. It allows the maximum velocity of the motor to be set between 0.001 revolutions per second (3.6 revolutions/hour) and 20.000 revolutions per second (1,200 rpm). Settings of 0 and those over 20 rps are illegal and the Controller will not operate. Other velocity options are available; see Option Table.

(C) ACCELERATION/DECELERATION RATE

This is a 2-decade thumbwheel that selects the acceleration/deceleration rate for the motor. There are three ranges which may be set using an internal DIP Switch: 0.1 to 9.9, 1 to 99 and 10 to 590 revolutions per second^2. The front panel switches select values in these ranges.

(D) START BUTTON

The START button is an illuminated pushbutton that initiates motor motion when pressed. It is illuminated when the Controller is waiting for a new command. It is normally extinguished during a move with one exception (see "CONTINUOUS" mode described below). The Controller may also be started remotely through the rear panel "REMOTE" connector.

(E) STOP BUTTON

The STOP button is an illuminated pushbutton that can be used to abort a move in progress. It is normally extinguished. When pressed, its light will be illuminated and the motor will be decelerated to a stop at the rate selected by the acceleration/deceleration thumbwheels when START was pressed.

The lamp will be extinguished when the motor has come to a complete stop. The Controller may be stopped remotely through the rear panel "REMOTE" connector. This connection provides for limit switches if they are incorporated in the system.

(F) MODE SELECT

The MODE SELECT switch is a three-position rocker switch used to select one of three operating modes as described below.

1. SINGLE MOVE

This is the traditional, preset indexing mode. The desired number of shaft rotations is set along with the maximum velocity and acceleration/deceleration rate. When "START" is pressed, the motor is accelerated and may or may not reach constant velocity before being decelerated to a stop after the precise distance specified has been moved.

2. ALTERNATE

This mode is similar to "SINGLE MOVE" except that when the move has been completed, the Controller changes the motor direction and re-executes the move in the opposite direction. This alternating cycle repeats until "STOP" is pressed. At this time, the motor is returned to its original starting position before stopping. This mode is useful for the testing and breaking in of limited travel mechanisms.

3. CONTINUOUS

This mode is specifically for applications requiring motion at predetermined velocities, but without a specified distance to be traveled. When this mode is selected and "START" is pressed, the motor ramps up at the selected acceleration rate to the programmed velocity. The motor will continue to rotate at that velocity. When the motor reaches this constant velocity, the "START" button will illuminate. A new velocity and acceleration/deceleration rate may then be selected. When "START" is pressed again, the motor will ramp up or down to the new velocity. This may be done as many times as is desired. Motion will continue until "STOP" is pressed, the Limit Switch line is grounded or zero velocity is selected on the velocity thumbwheels and "START" is pressed. With the optional RS-232C interface, the conroller, when stopped, can report the total distance travelled since the preceding stop, to a host computer or terminal.

(G) STATUS INDICATORS

There are four front panel LED's that indicate the status of the Controller at any given moment.

1. ACCEL light indicates that the motor is accelerating.

2. CONSTANT V light indicates that the motor is rotating at the constant velocity selected by the corresponding thumbwheels.

3. DECEL light indicates that the motor is decelerating.

4. ON-LINE light indicates that the 1200 Series is under computer control. All front panel controls except "STOP"are disabled when this is lit. In Controllers without a computer interface option this light will always be extinguished.

IV. Rear Panel

The rear panel contains a 120VAC receptacle, a 9-pin "D" connector for output to the motor(s), a 15-pin "D" connector for remote input/output, and a 25-pin "D" connector if an optional computer interface is installed.

(A) MOTOR CONNECTOR

This 9-pin "D" connector provides TTL-compatible outputs for step and direction. They are intended to drive the opto-coupler isolated inputs of up to four COMPUMOTOR™ drivers or a similar number of 200 step/rev or 400 step/rev motor translators.

(B) REMOTE CONNECTOR

This 15-pin "D" connector allows remote start/stop of the Controller. These inputs must be low-going TTL levels of at least 10 microseconds. Switch closures to ground must be RC debounced by the user. Also on this connector is an analog input that can be used to override the Controller's crystal referenced frequency source. This can be used in conjunction with a joystick or other analog input to control motor velocity remotely. An analog control signal from any source in the range 0 to 2VDC maximum may be used. The maximum velocity available under joystick control is determined by the velocity thumbwheels on the Front Control Panel or the current velocity if the RS-232C Computer Interface Option is "ON-LINE".

V. Computer Interface

This option will allow for remote programming and control of the 1200 Series. RS-232C is currently available with IEEE-488 in planning stages. See Appendix A for a summary specification.

VI. Mechanical/Electrical

(A) MECHANICAL

The Controller is packaged in a metal box, 8.375" W x 5.25" H x 14" deep. Two units may be mounted side-by-side in a standard 19" NEMA rack. An adjustable tilt handle and instrument case are available as options. A half-rack mounting option allows a single Controller to be mounted in either a half or full-sized NEMA rack.

(B) ELECTRICAL

The 1200 Series operates on 117VAC 50 or 60 Hz and consumes 10 to 20 watts depending on the computer interface supplied. Power "ON" is indicated by an illuminated front panel power switch.

(C) ENVIRONMENTAL

Ambient temperature while operating must be maintained in the range of 0 to 40°C (32° to 105°F). Storage temperatures may be from -40° to +85°C (-40° to 185°F).

(D) REAR PANEL CONNECTORS

See Appendix B.

(E) BLOCK DIAGRAM

See Appendix C.

(F) INTERNAL DIP SWITCH SETTINGS

1. Acceleration Range 1:
   1 - 99 rev/sec^2; Switch 1 - OFF, Switch 2 - OFF.

2. Acceleration Range 2:
   10 - 590 rev/sec^2; Switch 1 - OFF, Switch 2 - ON.

3. Acceleration Range 3:
   0.1 - 9.9 rev/sec^2; Switch 1 - ON, Switch 2 - ON.

4. Jog with START Button; Switch 3 - ON = Disable.

5. Alternate Mode Control: Switch 4 - ON = Complete Cycle in Alternate Mode after "STOP".

   Switch 4 - OFF = Abort Cycle in Alternate Mode after "STOP".

6. Analog Hysterisis: Switch 8 - ON = 100mV.

   Switch 8 - OFF = 0mV.

Switches 5, 6 and 7 are currently not used.

APPENDIX A

RS-232C SUMMARY INFORMATION

Introduction: Up to 16 1200 Series Controllers may be communicated to independently from a single RS-232C port on the host.

Modes:

MN: Single Move (move from A to B and stop).

MC: Continuous (accelerate to set velocity and maintain velocity until stopped or changed).

MA: Alternate (move from A to B and back to A, continue until stopped).

Command Format:

DCXXXX ← Value
- C: Command
- D: Device Number (1 - 16 inclusive, no Device Number or 0 = all).

Note: Each command must be followed by a command delimiter (ASCII 'space' or 'carriage return')

Command	Purpose	Range of Standard (Value) - See Option Table
D(VALUE)	Set Distance	.001 to 999.999 revolutions
V(VALUE)	Set Maximum Velocity	.001 to 20 rev/sec
A(VALUE)	Set Maximum Acceleration	.1 to 590 rev/sec^2
H(+ or -)	Set Direction	+ = CW, - = CCW
L(VALUE)	Set Loop Counter	0 - 999 repetitions
T(VALUE)	Set Time Delay	.01 to 999.999 seconds

E: Enable RS-232C Communication and disable Front Control Panel if present.

F: Enable Front Control Panel Communication and disable RS-232C and return control to the Front Control Panel

G: Go; start move with current Mode and parameter settings.

K: Emergency Stop; inhibits all pulse generation

N: End of Loop Indicator

S: Controlled Stop at preset deceleration rate

Y: Terminate Loop Execution

Z: Emergency Stop and System Reset

(D)P: Request Position (total distance traveled since motor was last at rest)

(D)B: Request Command Buffer Status (R=Not Full, B=Full)

(D)R: Request Operation Status (R=Ready, B=Busy)

(D) = Device Number must be specified

Baud Rates: 110, 300, 600, 1200, 2400, 4800 and 9600 Switch-selectable, operator programmable. Full Duplex.

UART Parameters: Parity ON or OFF, Parity ODD or EVEN, Data Bits 7 or 8, Stop Bits 1 or 2.

For more information, request COMPUMOTOR CORPORATION Application Note #6: "RS-232C Computer Interface."

APPENDIX B

REAR PANEL CONNECTOR PIN-OUTS

MOTOR CONNECTOR
(9-Pin "D" Canon DE9P)

Pin Number	Function
1	Position Pulse Out
2	Direction Level Out
3	NC
4	NC
5	NC
6	Position Pulse Return (GND)
7	Direction Level Return (GND)
8	NC
9	NC

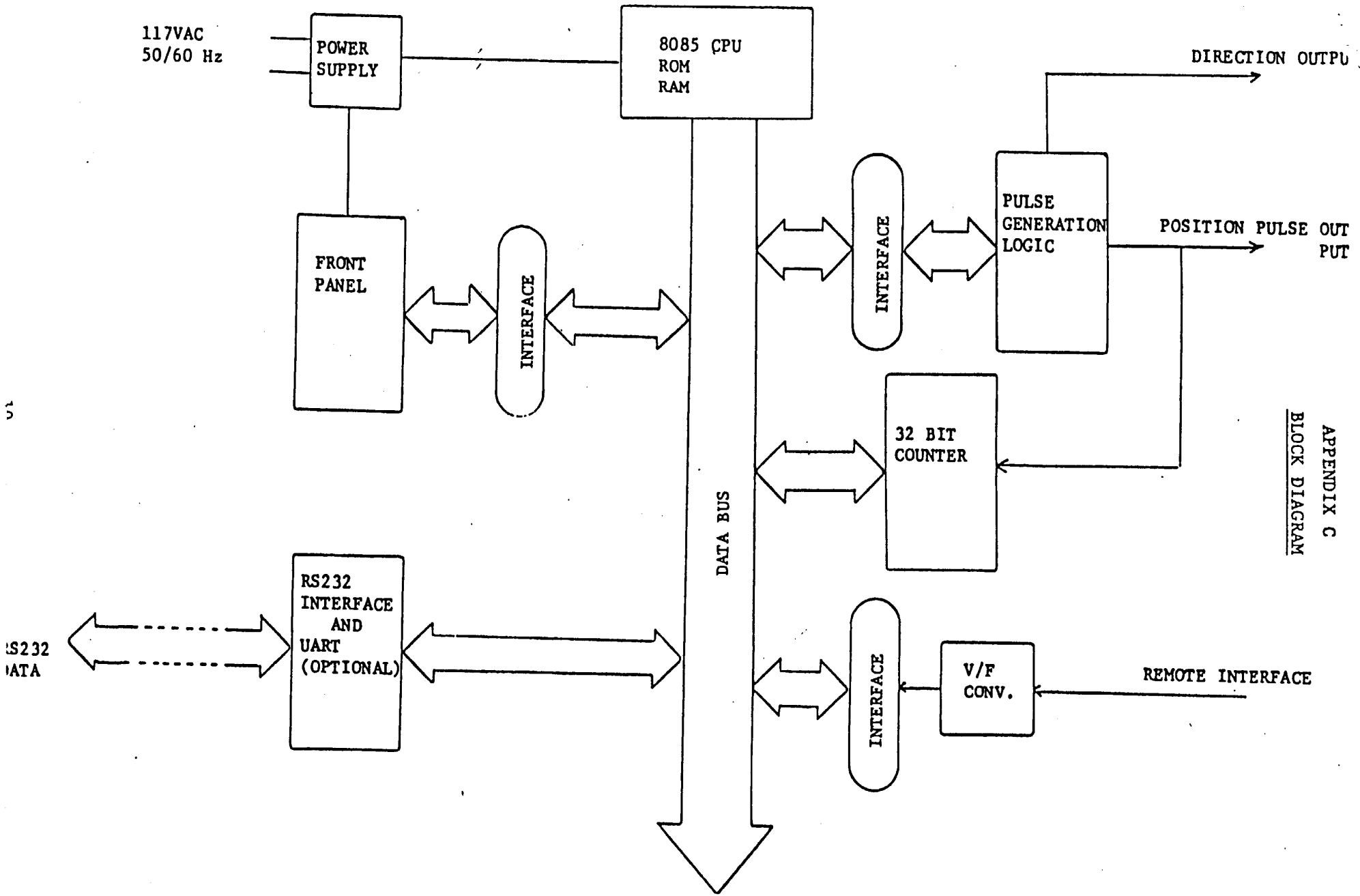
RS-232C CONNECTOR
(25-Pin "D" Canon DB25P)

Pin Number	Answer	Originate
2	Transmit	Receive
3	Receive	Transmit
7	GND	GND
Others	NC	NC

REMOTE CONNECTOR
(15-Pin "D" Canon DA15P)

Pin Number	Function
1	$\overline{\text{STOP}}$ (Limit)
2	$\overline{\text{START}}$
3	$\overline{\text{ANALOG ENABLE}}$
4	External Directio Input
5	Analog Voltage Input (0-2VDC)
6	+5VDC Source
7	NC
8	NC
9	GND
10	GND
11	GND
12	GND
13	GND
14	NC
15	NC

NC = No Connection
GND = Signal Ground



APPENDIX C
BLOCK DIAGRAM