#### Power:

Each SmartMotor<sup>™</sup> is operated from 24 to 48VDC. Some of the larger SmartMotor servos can draw high current.

It is highly recommended to use heavy gage wire to connect the larger motors. As a result, the "Add-A-Motor" cable is recommended for the 17 and 23 frame series only.

#### **Communications:**

Each SmartMotor has a primary RS-232 serial port and a secondary RS-485 port by re-assignment of ports E and F of the seven I/O points. Up to 120 SmartMotor servos may be separately addressed and are identifiable on either RS-232 or RS-485.

The most common and cost effective solution is typically RS-232 serial communications. Under this structure, each motor is placed in an electrical serial connection such that the transmit line of one motor is connected to the receive line of the next. Each motor will be set to "echo" the incoming data to the next motor down with approximately 1 millisecond propagation delay. There is no signal integrity loss from one motor to the next, which results in highly reliable communications.

#### The following cables/devices are used for RS-232 and Power connectivity:

CBLPWRCOM2-xM	Power and communications cable with flying leads or in conjunction with DIN-RS232 8 channel isolated communications board
CBLSM1-xM	Power and communications cable with DB-9 serial connector and power supply connector that fits our enclosed power supplies
CBLSM1-DEMO	Testing cable used with our PWR116 "laptop" type power supply
CBLSM1-x-y-z	Custom length multi-drop RS-232 daisy chain cable

#### The following cables are used for RS-485 and Power connectivity:

RS485-ISO	Converts primary RS-232 to isolated RS-485 (NOTE: uses Port G I/O pin)
CBLSM2-x-y-z	Custom multi drop isolated RS-485 (multiple RS485-ISO adapters)

#### Interfacing with I/O devices:

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Each SmartMotor has 7 TTL level user-configurable I/O. Each can be used as either inputs or outputs. The following is a quick review of I/O interfacing connectivity options:

CBLIO5V-xM	Direct connection to 5V TTL I/O
CBLIO5V-xM via OPTO2	24VDC isolation and conversion of 5V signals
CBLIO5V-xM via DINIO7	Motor breakout board to industry standard OPTO relays
CBLIO-ISO1-xM	Isolated 24VDC logic conversion cable

The following pages are a roadmap to motor connectivity. These pages show the physical layout of how cables are used including power, communications and I/O interconnection.

WARNING: Failure to protect against bus over voltage greater than 48VDC could cause immediate and irreparable damage to the electronics.

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SOFTWARE



The information in this section has been superseded. Please see the information in the latest product catalog at: <u>www.animatics.com/support/moog-animatics-catalog.html</u>

# **Class 5 D-Style LEDs and Connectors**



- · With no program and travel limit inputs are not grounded:
  - LED0 will be solid red for 500 milliseconds and then begin flashing green. LED1 will be off

WARNING: Pins 15 and 14 are intended for use with DE series motors for powering the controller only. Attempts to power a non-DE motor through those pins for use as the main servo drive power could result in immediate damage to the electronics and will void the warranty.

P4 (EXPANDED I/O option)





P3 (CANopen option)

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Courtesy of Steven Engineering, Inc - (800) 258-9200 - sales@steveneng.com - www.stevenengineering.com

# Class 5 D-Style Connection Maps

M-STYLE CONNECTIVITY POWER SUPPLIES & SHUNTS

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WARNING: Pins 15 and 14 are intended for use with DE series motors for powering the controller only. Attempts to power a non-DE motor through those pins for use as the main servo drive power could result in immediate damage to the electronics and will void the warranty.

### Class 5 Multi-Axis Connection Maps



### HIGHLY RECOMMENDED OPTION. PLEASE READ!

### Hardware "DE" Option:

The DE option for D-Style SmartMotors allows the controller and drive-amplifier to be powered from separate 24-48VDC power supplies.

- Controller can be powered from a standard 24VDC supply
- Position will not be lost on loss of drive-power
- No need to re-home
- · Load surges will not cause power surge on controller
- · Standard battery options are made simpler

NOTE: This power option applies only to D-Style SmartMotors with the DE option.



Please see the *SmartMotor Installation & Startup Guide* for the schematic diagram and installation details.

See pages 184-186 for details on protective shunts.

WARNING: Pins 15 and 14 are intended for use with DE option D-Style SmartMotors for powering the controller only. Attempts to power a non-DE D-Style SmartMotor through those pins for use as the main servo drive power could result in immediate damage to the electronics and will void the warranty.

WARNING: If an E-stop contact is placed between the motor drive input and power supply, a shunt or shorting contact into the drive power connection must be installed to ensure protection against bus overvoltage when the E-stop contacts open.



# Class 5 D-Style Connection Maps (Continued)

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# Class 5 D-Style Connection Maps (Continued)



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### CBLSM1-3M

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Power and Communications Cable for Main 7W2 Connector on Moog Animatics SmartMotor™

CBLSM1 series is the main power and communications cable consisting of a 7W2 main motor connector split out to a pre-wired RS-232 DB-9 connector to plug directly into any standard PC serial port.

The power is split off and has a connector that plugs into our enclosed frame power supplies.



To Select port

Standard Length		Custom Length		
Part Number	Length	Part Number	Length	
CBLSM1-3M	3 meters	CBLSM1-x	x (in feet)	
CBLSM1-10M	10 meters			

NOTE: Communications Shield is connected at the DB-9 end, but NOT the motor end. The power cable is connected at the motor connector shell but electrically isolated from the any internal electronic components.



# CBLPWRCOM2-xM

#### CBLPWRCOM2-xM

Power and Communications Cable (Flying Leads) for Main 7W2 Connector on Moog Animatics SmartMotor™

CBLPWRCOM2 series is a power and communications cable consisting of a 7W2 main motor connector with communications internally shielded from power and a full shield over entire length terminating at a metal jacket inside the over-molded connector.

Part Number	Length
CBLPWRCOM2-3M	3 meters
CBLPWRCOM2-5M	5 meters
CBLPWRCOM2-10M	10 meters

NOTE: Communications shield is connected at the DB-9 end, but NOT the motor end. The power cable is connected at the motor connector shell but electrically isolated from the any internal electronic components.



### Add-a-Motor Cable

#### CBLSMADD-xM (Moog Animatics "Add-A-Motor™" Cable)

Power and Communications Daisy Chain Cable for Networking Power and Communications to Multiple Moog Animatics SmartMotor Servos

**CBLSMADD** series is the main power and communications cable consisting of a feed-through 7W2 main motor connector split out to a single second motor 7W2 connector.

The cable is designed to allow ease of connection to multiple motors in a single RS-232 serial daisy chain network. The Main Power Ground wire is of a larger gauge to decrease noise emissions at the ground-plane level. The RS-232 Communications lines are internally shielded from the power lines.

Part Number	Length
CBLSMADD-0.3	0.3 meters
CBLSMADD-1.0	1 meters
CBLSMADD-3.0	3 meters
CBLSMADD-7.5	7.5 meters



NOTE: Due to gauge of the main power lines, it is not recommended to use the "Add-A-Motor" cables with the larger 34 frame SmartMotor. If there is just one 34 frame SmartMotor in a system design, then it should be the first motor in the chain so as to minimize voltage drop effects over the entire network.



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SUPPLIES & SHUNTS



# CBLIO5V-xM

### CBLIO5V 5V TTL I/O Interface Cable

Main I/O Connector Cable (Flying Leads) for DB-15 Connector on Moog Animatics SmartMotor™

**CBLIO5V** series is for all 5VTTL I/O, communications, encoder output, and control power input (when needed for –DE option motors).

The cable is organized in separately shielded twisted pairs to provide better noise immunity and lower emissions.

Part Number	Length
CBLIO5V-3M	3 meters
CBLIO5V-5M	5 meters
CBLIO5V-10M	10 meters

NOTE: The shields DO NOT have electrical contact with each other or the connector shell. This allows for proper grounding in the control cabinet or at termination point determined by user thereby eliminating ground loops.



WARNING: Pins 15 and 14 are intended for use with DE series motors for powering the controller only. Attempts to power a non-DE motor through those pins for use as the main servo drive power could result in immediate damage to the electronics and will void the warranty.





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# I/O Cables

### CBLIO-ISO1 24VDC TTL I/O Converter Cable

The CBLIO-ISO1 cable provides optically isolated 24VDC I/O interface to the controller.

The cable is user configurable as 4 inputs and 3 outputs OR 5 inputs and 2 outputs.

Additionally, this cable provides direct connection to:

RS-232 Primary Communications Port (Ch. 0) Encoder Output Control Power Input

Part Number	Length
CBLIO-ISO1-3M	3 meter
CBLIO-ISO1-5M	5 meter
CBLIO-ISO1-10M	10 meter

It can be used with standard or DE option Moog Animatics SmartMotor™



WARNING: Pins 15 and 14 are intended for use with DE series motors for powering the controller only. Attempts to power a non-DE motor through those pins for use as the main servo drive power could result in immediate damage to the electronics and will void the warranty.



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### CAN Bus Flying Lead Cables, Right Angle Connector

The CAN FL cables are standard CAN bus communications cables rated to >1MB data transmission rate.

CBLIP series cables are sealed M12 threaded connector brass pins with gold plating, maximum 4.0A 250V foil shield with black PVC jacket ~7.4mm diameter.

Part Number	Description	Length
CBLIP-CAN-FL-1MRA	Flying Lead Right Angle Connector	1 meter
CBLIP-CAN-FL-3MRA	Flying Lead Right Angle Connector	3 meters
CBLIP-CAN-EXT-1M	CAN Bus Extension Cable	1 meter
CBLIP-CAN-EXT-2M	CAN Bus Extension Cable	2 meters
CBLIP-CAN-EXT-3M	CAN Bus Extension Cable	3 meters



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### CBLIP-CAN-Y1

### CAN Bus Y Cables, Right Angle Connector

The CAN Y1 series is intended for CAN bus communications connectivity between two motors with addition of a T-connector in line. Rated to >1MB data transmission rate.

This allows for cascading of multiple SmartMotor servos and the addition of a shunt resistor when required.

CBLIP series cables are sealed M12 threaded connector brass pins with gold plating, maximum 4.0A 250V foil shield with black PVC jacket ~7.4mm diameter.



#### **Right Angle Connector**

Part Number	Length
CBLIP-CAN-Y1-0.5MRA	0.5 meters
CBLIP-CAN-Y1-1MRA	1 meters
CBLIP-CAN-Y1-3MRA	3 meters



NOTE: At least one shunt resistor is required on ALL CAN bus networks. Please consult the factory for additional information.

# CAN Bus T Connector and Shunts

### "T" CONNECTOR FEMALE-FEMALE-MALE CBLIP-T-FFM

T connectors may be used in place of Y cables and in conjunction with CAN bus extension cables.

Shunt resistors MUST BE used to allow proper biasing of CAN Bus cables.

It is suggested to have at least one at furthest end of bus. Two may be required at opposing ends.



### Female Terminating Resistor, 120 Ohms CBLIP-TRF120

Shunt resistors MUST BE used to allow proper biasing of CAN Bus cables.

It is suggested to have at least one at furthest end of bus. Two may be required at opposing ends.



#### Male Terminating Resistor, 120 Ohms CBLIP-TRM120

Shunt resistors MUST BE used to allow proper biasing of CAN Bus cables.

It is suggested to have at least one at furthest end of bus. Two may be required at opposing ends.



NOTE: At least one shunt resistor is required on ALL CAN bus networks. Please consult the factory for additional information.

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### CBLIP-IO 24VDC TTL I/O Cable

The expanded I/O cables are for use with the -AD1 expanded I/O option on all Class 5 non-sealed SmartMotor™ servos. Each cable is a 12-conductor shielded cable. 2 conductors are for +24VDC I/O power. The other 10 are for 10 channels of I/O.

CBLIP series cables are sealed M12 threaded connector brass pins with gold plating, maximum 4.0A 250V foil shield with black PVC jacket ~7.4mm diameter.

Part Number	Description	Length
CBLIP-IO-FL-1MRA	Flying Lead Right Angle Connector	1 meter
CBLIP-IO-FL-3MRA	Flying Lead Right Angle Connector	3 meters
CBLIP-IO-EXT-1M	I/O Extension Cable	1 meter
CBLIP-IO-EXT-2M	I/O Extension Cable	2 meters
CBLIP-IO-EXT-3M	I/O Extension Cable	3 meters



### CBLSM1-X-Y-Z (Moog Animatics Custom Build-to-Order)

Custom Multi-Motor Power and Communications Daisy Chain Cable for Networking Power and Communications to Multiple Moog Animatics SmartMotor Servos

These cables are made to order where:

- X = Cable length in Feet from the first motor to the Power and Serial connectors
- Y = Number of Motors
- Z = Distance in feet from one motor to the next

**NOTE:** This part numbering system does not allow for different length between each motor daisy chain network.

The RS-232 Communications lines are in a separate shielded cable from the main power cable for optimum noise immunity.

#### Example:

CBLSM1- 10- 3- 5 would give you a 3-motor cable with 10 feet to the first motor and 5 feet between each motor.



### Example of 3-Motor CBLSM1-X-Y-Z shown

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### CBLSM2-X-Y-Z (Custom Build-to-Order)

#### Isolated RS-485 Multi-Drop Custom Cable

This cable makes use of the RS232485 converter at the host and a single RS485-ISO adapter at each motor.

The adapters have power hard wired and RS-485 wired together via jumper cables with a 4-pin G-grid Molex connector at each end.

As a result, it is easy to add or remove a given motor on the bus for setup and troubleshooting.

Since the RS485-ISO adapters are used, the entire bus is isolated and shielded for maximum noise immunity in electrically harsh environments.

These cables are made to order where:

- X = Cable length in feet from the first motor to the power and serial connectors
- **Y** = Number of motors
- Z = Distance in feet from one motor to the next

NOTE: This part numbering system does not allow for different length between each motor daisy chain network.

#### Example:

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CBLSM2- 10- 3- 5 would give you a 3-motor cable with 10 feet to the first motor and 5 feet between each motor

# NOTE: At least one shunt resistor is required on ALL CAN bus networks. Please consult the factory for additional information.





# Isolated RS-485 Power & Comm. Cable

### RS485-ISO

The RS485-ISO adapter provides electrically isolated conversion from RS-232 on the main 7W2 connector to RS-485. The adapter comes standard with a 10-foot power cable and two parallel 4 pin Molex RS-485 connectors.

RS-485 provides improved noise immunity over cable lengths of up to 1,000 ft (305m). It also allows you to operate a network of up to 120 SmartMotor servos in parallel, rather than daisy-chaining the communications from one motor to the next.

The adapter draws power and ground from the SmartMotor main connector (pins 2 and 5). It does require the use of the main connector G-Sync line (pin 1) for readwrite control of the 485 transceiver.

The RS485-ISO communications adapter can be ordered with or without the power cable (no cable P/N: RS485ISO-NOCBL).





### CBLSM1-DEMO

### CBLSM1-DEMO

Training/Testing Power and Communications Cable for Main 7W2 Connector on Moog Animatics SmartMotor™

CBLSM1-Demo cable is only available in a fixed length of ~1 Meter. Similar to the CBLSM1-xM series, it consists of a 7W2 main motor connector split out to a pre-wired RS-232 DB-9 connector to plug directly into any standard PC serial port. The power to the motor is provided via a single 5mm diameter 2.1 mm center pin DC connector.

This connector accepts Moog Animatics PWR116V 24VDC power supply.



