

Product Specification Sheet

Soft Limit Control System

Functional Specifications

The Motion Labs Soft Limit System is a wall-mounted standalone controller for fixed-speed electric chain hoists, configurable in increments of 8 channels, standard up to 32 channels with up to 80 channels available for custom systems. It provides precise, repeatable motion control using encoder feedback, with optional features like Load Monitoring utilizing Human Machine Interfaces (HMI). The Soft Limit controller is part of the 1225-D part number series.



Features

- Wall-mounted, standalone Soft Limit controller for fixed-speed electric chain hoists
- Encoder-based positional feedback for precise, repeatable motion control
- Scalable architecture in 8-channel increments (8–32 standard; up to 80 channels custom)
- Designed for entertainment, theatrical, and staging applications
- Integrated Programmable Logic Controller (PLC) based control system with local and remote operation
- Category 0 Emergency Stop (E-Stop)
- Fault monitoring with visual status indicators and reset functionality
- Touch Screen Operating System (TSOS) for centralized control and configuration
 - Available in 7.5" or 12" HMI displays
- Manual and automated Soft Limit control modes
- Hoist grouping and array control support
- Role-based user access
- Fault history tracking
- Modular system components include Power Cabinet(s), Power Cabinet(s), Flyboxes, and remote stations
- Optional load manager with load cell integration
- Optional TALOS SCADA integration for supervisory control
- Compatible with common fixed-speed entertainment hoists (e.g., CM Lodestar, Stagemaker SR series)
- Custom engineering support available for non-standard hoist compatibility and design

System Overview

The Motion Labs Soft Limit Controller is a wall-mounted, standalone control system designed to provide precise, repeatable motion limiting for fixed-speed electric chain hoists used in entertainment, theatrical, and staging applications. The system combines encoder-based positional feedback with a PLC-driven control architecture, allowing hoist travel limits to be defined, monitored, and recalled with a high degree of accuracy.

The Soft Limit Controller is modular by design and scalable in 8-channel increments, with standard configurations supporting up to 32 hoists and custom systems available for up to 80 channels. This scalable architecture allows the system to be tailored to productions of varying size and complexity while maintaining consistent functionality and operator experience across all configurations.

The system consists of dedicated wall-mounted power and control enclosures. The Power Cabinet provides main disconnect, interlocking, motor protection, and power distribution, while the Power Cabinet houses the PLC, encoder interface hardware, load monitoring interfaces (optional), emergency stop circuitry, and local remote connectivity. Encoder Fly Boxes interface directly with hoist-mounted encoders to provide real-time positional feedback to the control system, enabling accurate soft limit position-based control.

Operator Interface

Operator interaction is provided through the Touch Screen Operating System (TSOS), available in 7.5-inch and 12-inch touchscreen formats depending on channel count and system requirements. The TSOS serves as the centralized human-machine interface for system configuration, real-time monitoring, and operation. Through the TSOS, operators can define and adjust soft limit positions, monitor hoist status, view fault conditions, manage user access levels, and command hoists manually or move them to predefined positions. Hoists may be operated individually or grouped to support efficient system control.

Handheld and wall-mounted remote stations are available for local manual control and setup operations. These remote stations feature durable industrial enclosures, connections for multi-hoist handheld remotes with illuminated directional controls, and integrated emergency stop functionality to support safe operation in demanding environments.

Optional Features

Optional system features include integrated load monitoring with load cells, allowing real-time weight measurement for awareness and over/under weight shutdown for enhanced safety.

TALOS SCADA integration is available for supervisory control and system monitoring across multiple Motion Labs controllers. TALOS includes features including sequencing, cueing, allowing fixed speed and variable control systems to be operated in a single move.

Hoists

The Soft Limit Controller is designed for compatibility with commonly used fixed-speed entertainment hoists, including CM Lodestar and Stagemaker SR models. Other hoist models can be used but require consultation with our Engineering department.

Main Components

Soft Limit Components	
Component	Description
Power Cabinet(s) 1225-A-XX-XXX	Wall-mounted power distribution enclosure housing the main disconnect, system interlocking, motor circuit protection, and power distribution to fixed-speed hoists. This includes the main breaker, motor protection, contactors, and associated safety interlocks including safety relay. The enclosure is NEMA 1 rated, intended for indoor use only.
Power Cabinet(s) 1225-D-XX-XXX	Wall-mounted control enclosure housing the system PLC and all low-voltage control electronics. This includes the encoder interface printed circuit boards (PCBs), optional load cell interface PCBs, 12 VDC power supply, terminal connections, key switch, and local remote interface card. The enclosure is NEMA 1 rated, intended for indoor use only.
Remote Station(s) A-26-001-XXXX (Manual) A-26-003-XXXX (Automation)	<p>Manual Control</p> <p>Wall-mounted remote station providing connection for directional control of hoists through a multi-hoist handheld remote. Emergency Stop and Reset controls are available for this unit. This includes P26 connector(s) for the remote connection.</p> <p>Automation Control</p> <p>Wall-mounted automation interface station provides physical connection and mounting for the TSOS. It includes integrated Emergency Stop and Reset pushbuttons. It serves as a fixed automation access point while maintaining the system's approved safety architecture and control hierarchy.</p>
Power/Control Fly Boxes A-26-201-XXXX	Interconnect pull boxes are used to distribute power and control circuits between the main enclosures and field devices. They provide organized termination points for motor power and control signals and may incorporate local disconnect functionality to support modular system layouts and scalable installations.
Data Fly Boxes A-26-003-XXXX	Interconnect pull boxes used to interface connecting load cells, hoist-mounted encoders and other sensors to the control system PLC. These modules route signals, enabling precise real-time positional feedback for soft limit enforcement, position-based control functions, and weight feedback for over and underweight shutdown conditions.

Soft Limit Components	
Component	Description
Multi-hoist Handheld Remote A-16-301-XXXX (Small Frame) A-16-302-XXXX (Large Frame) A-16-303-XXXX (Extra Large Frame)	Multi-channel handheld control device allowing simultaneous manual control of multiple hoists from a single pendant. Available in various channel counts to match system configuration. Features illuminated directional controls, ergonomic layout, and integrated safety functions for efficient multi-hoist operation.
Touch Screen Operating System (TSOS) A-17-005-XXXX	Touchscreen human-machine interface available in 7.5" or 12" formats, providing centralized system configuration, monitoring, and operational control. It includes on-screen access to hoist status, position data, soft limit setup, fault management, and user access control. Physical interface includes Emergency Stop pushbutton, HMI, along with connectivity for system communication, power, and estop signals.
TALOS A-17-012-0001	TALOS SCADA platform provides supervisory monitoring and control of Motion Labs automation sub systems. It allows for centralized visibility, coordination, and system-level management across multiple controllers within a unified software environment. A necessary platform for operating fixed speed and variable speed stage machinery from a single location.

Configurations

The Motion Labs Soft Limit Controller is configured by selecting channel capacity, operator interface, and optional system features to meet the specific requirements of the application. All systems share a common control architecture and operator experience regardless of size or configuration.

Channel Capacity

- Configurable in standard blocks of 8 channels
- Standard configurations available in 8, 16, 24, and 32 channels
- Custom configurations are available up to 80 channels upon request

Operator Interface (HMI)

- 7.5" Touch Screen Operating System (TSOS)
 - Recommended for systems 8 channels and below
 - Supports basic configuration, monitoring, and control
- 12" Touch Screen Operating System (TSOS)
 - Recommended for systems above 8 channels
 - Provides expanded screen space for grouped hoist management and system visualization

Control & Expansion Options

- Remote Control Stations
 - Wall-mounted options for local manual control
 - Connects to handhelds and consoles with directional controls, GO and KILL pushbuttons and a push-pull Emergency Stop button
- Load Monitoring (Optional)
 - Integrated load cell support for real-time weight measurement
 - Provides over and underweight shutdown for safety
 - Load data accessible through TSOS for monitoring and system awareness
- Automation & Integration (Optional)
 - Additional PLC interfaces available for advanced automation or external control integration

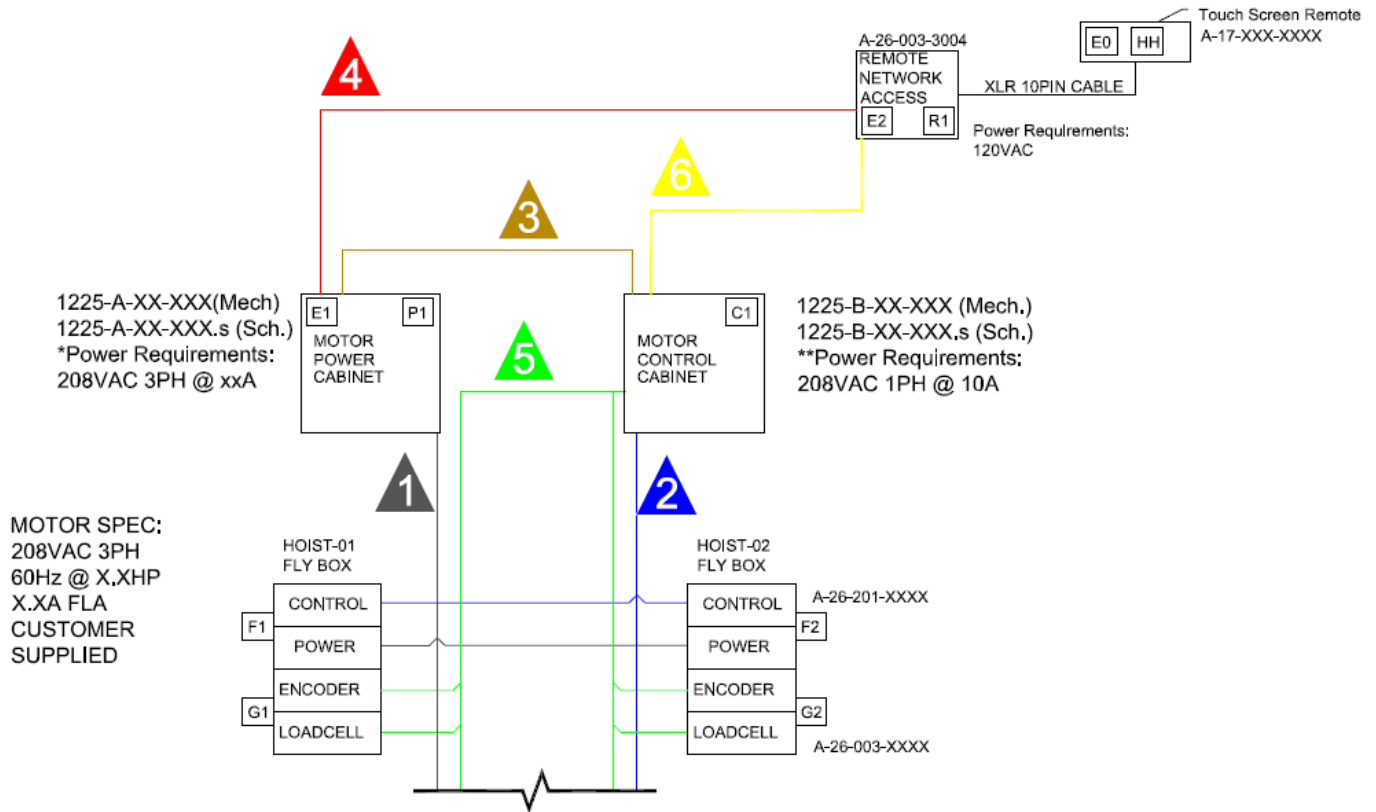
Supervisory Control (Optional)

- TALOS SCADA Integration
 - Enables supervisory monitoring and control of multiple Motion Labs controllers
 - Provides centralized system visibility and operational oversight
 - Allows for integrated moves with variable speed and fix speed MLI Automation Systems

Custom Engineering

- Integrating hoists outside standard supported models
- Non-standard channel counts or expanded system architectures
- Application-specific hardware or software modifications

Typical System Layout



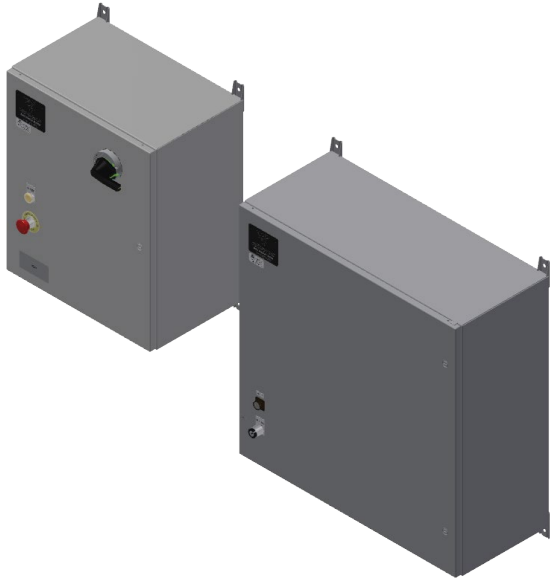
LEGEND

<p>1 POWER CIRCUITS INDICATED BY BLACK LINES SPECIFICATIONS: 12AWG 4 CONDUCTORS PER CHANNEL (3PH PLUS GROUND)</p>	<p>C1 = 1225-B-XX-XXX, CONTROL PANEL, FOR UP TO 8 HOISTS</p>
<p>2 LOW VOLTAGE AC CONTROL CIRCUITS INDICATED BY DARK BLUE LINES SPECIFICATIONS: 14AWG 3 CONDUCTORS PER CHANNEL</p>	<p>E0 = E-STOP IN HMI HANDHELD CONTROLLER</p>
<p>3 INTERCONNECT CIRCUIT INDICATED BY BROWN LINES SPECIFICATIONS: 14AWG 2 CONDUCTORS</p>	<p>E1 = E-STOP SWITCH IN P1</p>
<p>4 E-STOP CIRCUIT INDICATED BY RED LINES SPECIFICATIONS: 14AWG 6 CONDUCTORS</p>	<p>F1-F7 = A-26-201-XXXX, HOIST POWER/CONTROL CONNECTION BOXES</p>
<p>5 DATA CABLE INDICATED BY GREEN LINES SPECIFICATIONS: 3 PAIR TWISTED 22AWG W/SHIELD ML P/N ML-3PR/22 ENC</p>	<p>G1-G7 = A-26-003-XXXX, HOIST ENCODER CONNECTION BOXES</p>
<p>6 NETWORK CABLE INDICATED BY YELLOW LINES SPECIFICATIONS: CAT6 W/ SHIELD</p>	<p>P1 = 1225-A-XX-XXX, POWER PANEL, HOISTS 1-7, X.XHP</p> <p>R1 = A-26-003-3004, REMOTE BOX</p> <p>HH = HMI HAND-HELD CONTROLLER</p>

Power & Power Cabinets

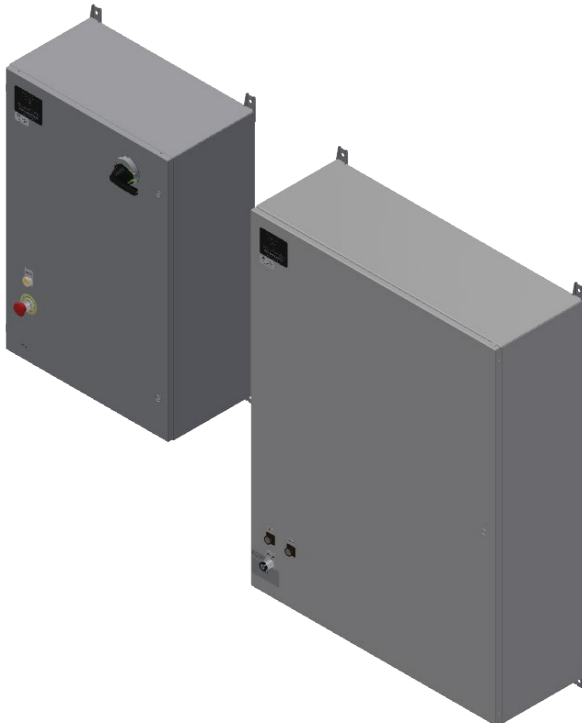
Power and Power Cabinets are both required for Soft Limit Control Systems. Power Cabinets are the same cabinets used in non-automated install control systems. The 1225-A Power Cabinet is always sized by the horsepower of the hoists. The 1225-D Power Cabinets are unique to automation systems and replace the 1225-B cabinets in non-automated control systems.

Typical 8 Channel System



A typical 8-channel Soft Limit Control System uses one Power Cabinet (P1) and one Power Cabinet (C1). The Power Cabinet distributes motor power to the hoists and is sized based on the hoist horsepower requirements. The Power Cabinet manages encoder feedback, safety monitoring, and system control logic. The two cabinets are interconnected through control wiring, allowing the system to control motion, monitor faults, and maintain safe operating limits for up to eight hoists. Enclosure sizes for typical 208VAC 8 channel systems are 24"x20"x12" for the Power Cabinet and 30"x30"x12" for the Power Cabinet.

Typical 16 Channel System



A typical 16-channel Soft Limit Control System uses a larger configuration consisting of a Power Cabinet (P1) and Power Cabinet (C1) designed to support additional hoists. The Power Cabinet provides the required motor power distribution, while the Power Cabinet processes encoder signals, safety inputs, and system communication. These cabinets are interconnected through dedicated control wiring to coordinate operation and safely manage up to sixteen hoists within the system. Enclosure sizes for typical 208VAC 16 channel systems are 36x24x12 for the Power Cabinet and 48x36x12 for the automation Power Cabinet.

Remote Access Cabinets

Manual



The Manual Remote Access Cabinet provides a connection point for a multi-hoist handheld remote, allowing operators to manually control the hoist system from a remote location. This cabinet includes integrated emergency stop (E-Stop) functionality to immediately halt system operation if required. An optional reset function can also be included depending on system requirements. The manual cabinet is commonly used in applications where direct operator control is required while maintaining system safety.

Part Number Table		
Part Number	Type	Description
A-26-001-0002	P26, E-Stop	Flybox, 8CH P26, E-Stop, 8X10X
A-26-001-0021	P26, E-stop, Reset	Flybox, 8CH P26, E-Stop, Reset 8X10X4
A-26-001-3001	P26, E-Stop	Flybox, 16CH P26, E-Stop, 12X12X4
A-26-001-4003	P26, E-Stop	Flybox, 24CH P26, E-Stop, 3X P26, 12X12X4
A-26-001-5001	P26, E-Stop	Flybox, 32CH P26, E-Stop, 12X12X4
A-26-001-5002	P26, E-stop, Reset	Flybox, 32CH P26, E-Stop, Reset 12X12X4

Automation

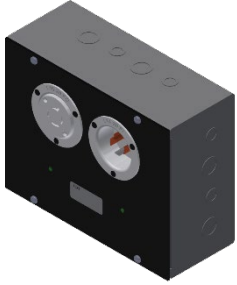


The Automation Remote Access Cabinet provides an interface for connecting the Touch Screen Operating System (TSOS) to the hoist control system for automated operation. This cabinet enables centralized system control through the TSOS interface while maintaining critical safety features. It includes emergency stop (E-Stop) functionality and reset capability to ensure safe system operation during automated control scenarios.

Part Number Table		
Part Number	Type	Description
A-26-003-3013	10Pin XLR, E-stop, Reset	Flybox, E-Stop, TSOS Remote Plug-in, XLR 10Pin, 16X12X8, 120VAC

Fly Boxes

Power/Control

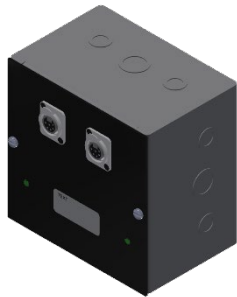


The Power / Control Flybox provides the primary connection point between the hoist and the control system. It distributes power to the hoist motor while also carrying the control signals required for up and down operation. These flyboxes are available with a variety of industry-standard connector pinouts to accommodate different hoist and system configurations. In addition to power and control distribution, the flybox serves as a system point of disconnection, allowing the hoist to be safely isolated from the system when required.

Part Number Table

Part Number	Type	Description
A-26-201-0001	Dual Twist, 0900-01	Flybox, Dual Twist, 0900-01, 10X8X4
A-26-201-3000	P14, P14-01	Flybox, P14, P14-01, 6X6X4
A-26-201-4000	C7, C7-30	Flybox, P7, C7-30, 6X6X4
A-26-201-7400	2 x C7, C7-30	Flybox, C7, 2X C7-30, 10X8X4
A-26-201-7000	4 x C7, C7-30	Flybox, P7, 4X C7-30, 12X12X4
A-26-201-7300	4 x P14, P14-01	4X P14-01 Flybox, 12X12X4

Data



The Data Flybox provides a centralized connection point for encoder and load cell feedback signals between the hoists and the control system. These signals allow the system to monitor position, movement, and load information during operation. The flybox helps organize these connections while maintaining reliable signal integrity in demanding rigging environments. The Data Flybox provides a convenient connection and disconnection point for system setup and servicing.

Part Number Table

Part Number	Type	Description
A-26-003-0001	1 x Encoder	Flybox, XLR, Female, XLR-6-01, 6X6X4
A-26-003-0005	2 x Encoder	Flybox, 2X XLR, Female, XLR-6-06, 6X6X4
A-26-003-0007	4 x Encoder	Flybox, 4X XLR, Female, XLR-6-01, 8X10X4
A-26-003-0004	1 x Loadcell	Flybox, XLR, Female, XLR-6-02, Loadcell, 6X6X4
A-26-003-2000	1 x Encoder 1 x Loadcell	Flybox, 2X XLR, 1X XLR-6-01, 1X XLR-6-02, 6X6X4

Combined Power/Control & Data



The Combined Power / Control & Data Flybox integrates power distribution, control signals, and feedback connections into a single enclosure for each hoist channel. These units provide motor power and up/down control signals while also supporting encoder and load cell feedback connections for position and load monitoring. By consolidating these connections into one flybox, system wiring is simplified and installation time is reduced. The combined unit supports industry-standard connector pinouts and serves as a convenient point of disconnection between the hoist and the control system.

Part Number Table		
Part Number	Type	Description
A-26-201-8001	P14, P14-01, 1 x Encoder	Flybox, P14, P14-01, XLR, Female, XLR-6-01, Encoder, 10X8X4
A-26-201-3008	P14, P14-01 1 x Encoder 1 x Loadcell	Flybox, P14, P14-01, 2X XLR Female, XLR-6-01, Encoder, XLR-6-02, Loadcell, 10X8X4
A-26-201-4013	C7, C7-30 1 x Encoder	Flybox, P7, C7-30, XLR, Female, XLR-6-01, Encoder, 6X6X4
A-26-201-7403	2 x C7, C7-30 2 x Encoder	Flybox, C7, 2X C7-30, 2X XLR-6-01, 10x8x4
A-26-201-7601	2 x P14, P14-01 2 x Encoder	Flybox, P14, 2X P14-01, 2X XLR-6-01, 10x8x4

Multi-hoist Handheld Remote

Small Frame



The small frame multi-hoist handheld remote is used for smaller systems and comes in 4-8 channels. It has a Go pushbutton, a Kill pushbutton, and up/down toggles and direction indicators for each channel.

Large Frame



The large frame multi-hoist handheld remote is used for medium to large systems and comes in 16-32 channels. These remotes can be plugged anywhere in any Motion Laboratories control systems where 16-32 channels of control are needed. They have one remote tail for every 8 channels. It has a Go pushbutton, a Kill pushbutton, and up/down toggles and direction indicators for each channel.

Extra Large Frame



The extra large frame multi-hoist handheld remote is used for very large systems and comes in 40 plus channels. These remotes can be plugged anywhere in any Motion Laboratories control systems where 40 channels or more of control are needed. They have one remote tail for every 8 channels. It has a Go pushbutton, a Kill pushbutton, and up/down toggles and direction indicators for each channel.

NOTE: We can accommodate any size Multi-hoist Handheld Remote need for the project scope.

Part Number Table		
Part Number	Type	Description
A-16-301-0001	Small Frame	Remote Hand Held, 4Channel, Yellow, 10FT Tail
A-16-301-0003	Small Frame	Remote Hand Held, 8Channel, Yellow, 10FT Tail
A-16-302-0002	Large Frame	Remote Hand Held, 16Channel, Yellow, 5FT Tail
A-16-302-0003	Large Frame	Remote Hand Held, 24Channel, Yellow, 5FT Tail
A-16-302-0004	Large Frame	Remote Hand Held, 32Channel, Yellow, 5FT Tail
A-16-303-0004	Extra Large Frame	Remote Hand Held, 40 Channel, 5X8, Yellow, 10' Tail (8' External)
A-16-303-0001	Extra Large Frame	Remote Hand Held, 48 Channel, 6X8, Yellow, 10' Tail (8' External)

Touch Screen Operating System (TSOS)

Handheld



The Handheld Touch Screen Operating System (TSOS) provides a compact and portable control solution for hoist systems. Featuring a smaller integrated HMI display, it is well suited for applications requiring control of up to eight hoists. Its lightweight design allows operators to move freely while maintaining full control of the system, making it ideal for smaller setups, temporary installations, or applications where mobility and simplicity are important.

Console



The TSOS Console provides a larger, fixed control interface designed for systems with more than eight hoists, though it can also be used for smaller systems when a larger display or dedicated control station is preferred. The larger HMI improves visibility and system monitoring for complex operations. The console can also be equipped with rear-mounted truss clamps, allowing it to be pipe mounted for truss installations, making it well suited for touring, stage, and permanent rigging control environments.

Part Number Table		
Part Number	Type	Description
A-17-005-0014	Console	PLC Control System, Touch Screen Operating System (TSOS), HMI 12", Console, XLR-10-01, E-Stop, Truss Mount
A-17-005-0015	Handheld	PLC Control System, Touch-Screen Operating System (TSOS), HMI 7.5", Handheld, XLR-10-01, E-Stop

Supported Hoists

The Motion Labs Soft Limit Fixed Speed Hoist Controller is designed to operate with standard fixed-speed electric chain hoists commonly used in the entertainment and staging industry. The following hoist models are supported as standard:

CM Lodestar (New Generation, Small and Large Frame)

Hoist Model	Speed	Capacity	HP
F	16 fpm	500 kg	½
L	16 fpm	1000 kg	1
R	8 fpm	2000 kg	1
RR	16 fpm	2000 kg	2
RRS	16 fpm	2000 kg	2

- Voltage: 208–230V or 400–460V, 3-phase
- Duty cycle: H4 (high duty) rating
- Capacities: typically, 1/8 ton through 2 ton (small frame), up to 2 ton (large frame)
- Lifting speeds: ~8–16 fpm (varies by model)
- Equipped with DC brake, mechanical overload protection, and slip clutch

Stagemaker SR Series

Hoist Model	Speed	Capacity	HP
SR 05	16 fpm	250 – 500 kg	½
SR 10	16 fpm	500 – 2000 kg	1

- Capacity: up to 2000 kg (4409 lbs.)
- Lifting speed: ~ (16 fpm) at 60 Hz
- Standard 3-phase power supply
- Double brake system, limit switches, and IP55 protection rating

All Other Hoists

Customers requiring control of hoists outside the above-mentioned models should contact the Sales Department. Engineering will review the specific hoist requirements and provide a proper quotation for any hardware or software modifications necessary to ensure compatibility.

Physical & Installation Notes

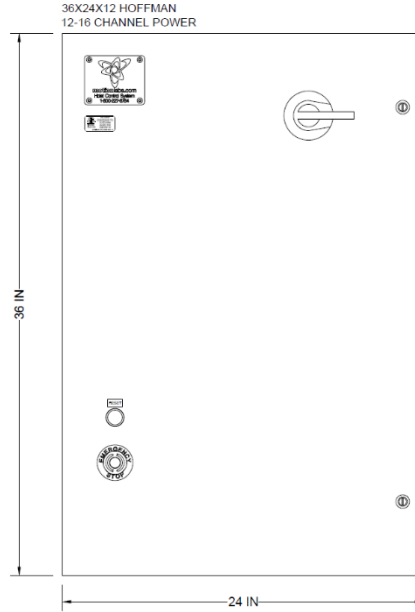
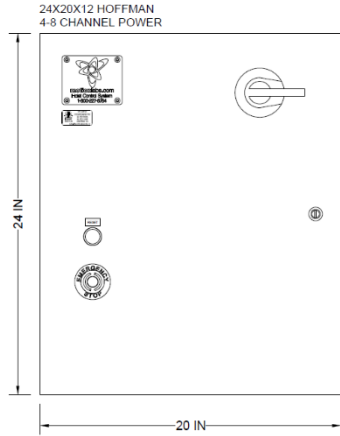
- All enclosures are wall-mounted, NEMA 1 rated, powder-coated, with discrete labels and wiring schematics inside.
- Interconnected field wiring is required for all enclosures. Field wiring is detailed in the document package and is the responsibility of the purchaser.
- Any enclosure needing source power will be detailed in the document package and is the responsibility of the purchaser.
- Remote access cabinets are to be located so the operator has a clear line of sight to the controlled equipment or hazard area to support safe operation.
- Power/control Flyboxes are a means of disconnecting the stage machinery from the system. They should be placed in a location that is accessible to qualified personnel.

Restrictions

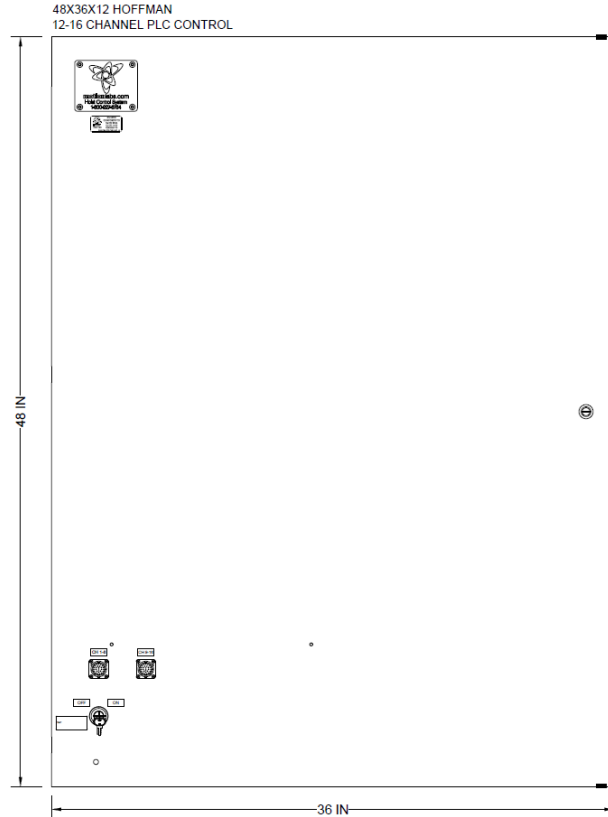
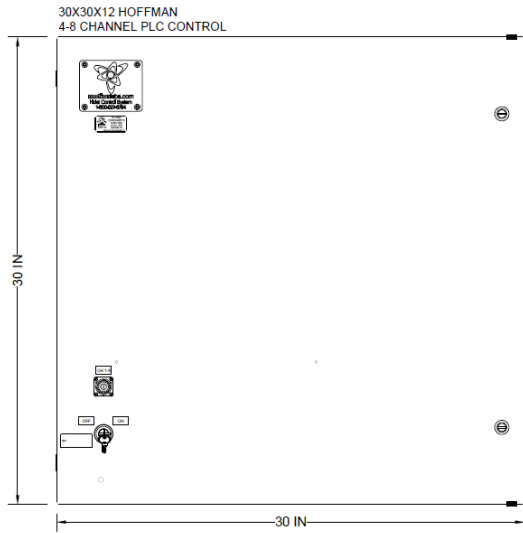
- Data runs, have a length restriction of 1000 feet. These are typically detailed on the flow and interconnect diagram as green lines and in the legend as triangle number 5.
- Data runs must not be touching or exposed to large amounts of Radio Frequency (RF) interference.
- Network runs carry ethernet communications and have a length restriction of 300 feet. These are typically detailed on the flow and interconnect diagram as yellow lines and in the legend as triangle number 6.
 - If the network runs are 300 feet or longer, then a fiber optic network switch must be placed at both ends and then converted back to ethernet. Motion Laboratories provides this solution integrated into enclosures.

Typical Enclosure Dimensions

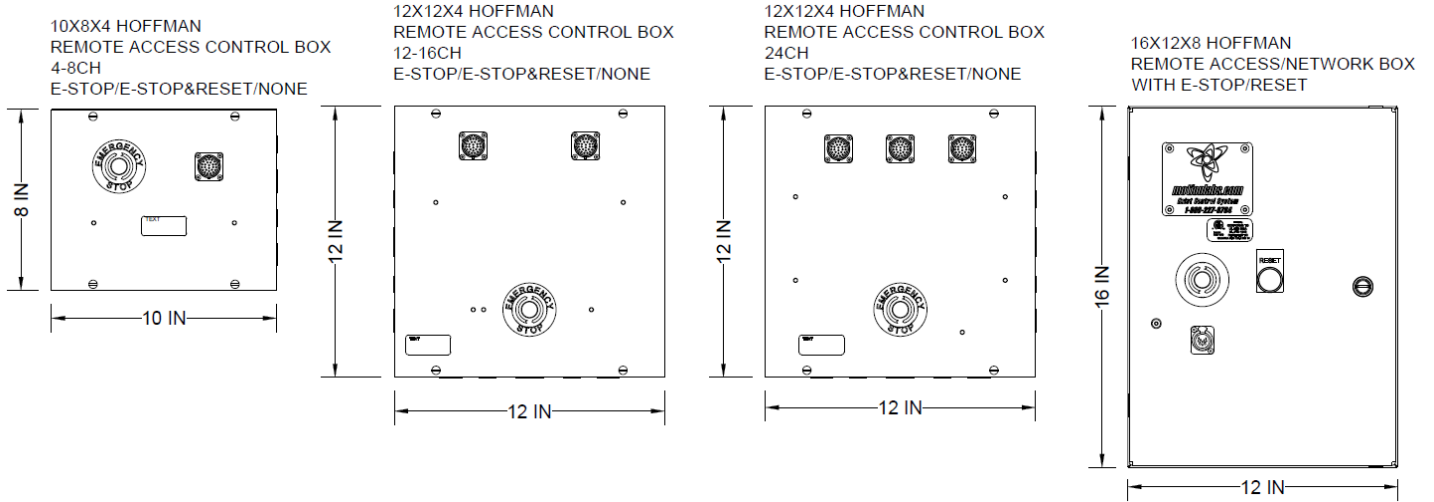
Power Cabinets



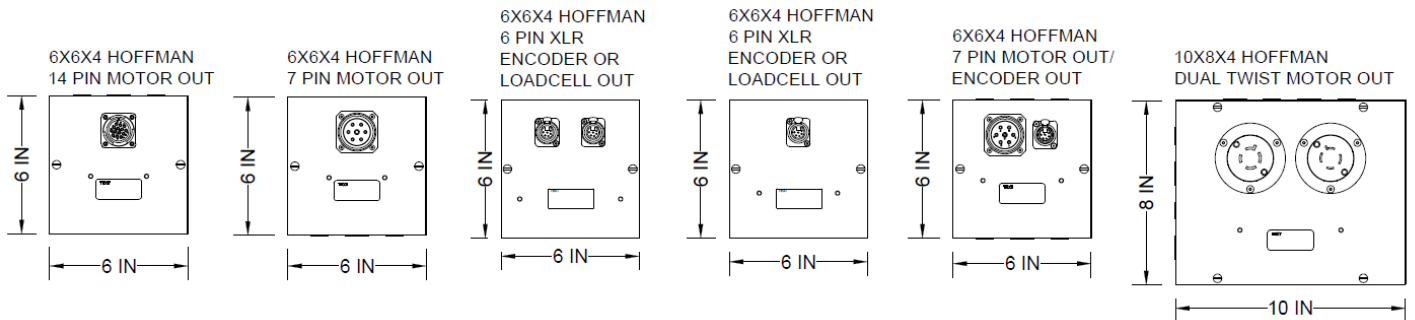
Automation Power Cabinets



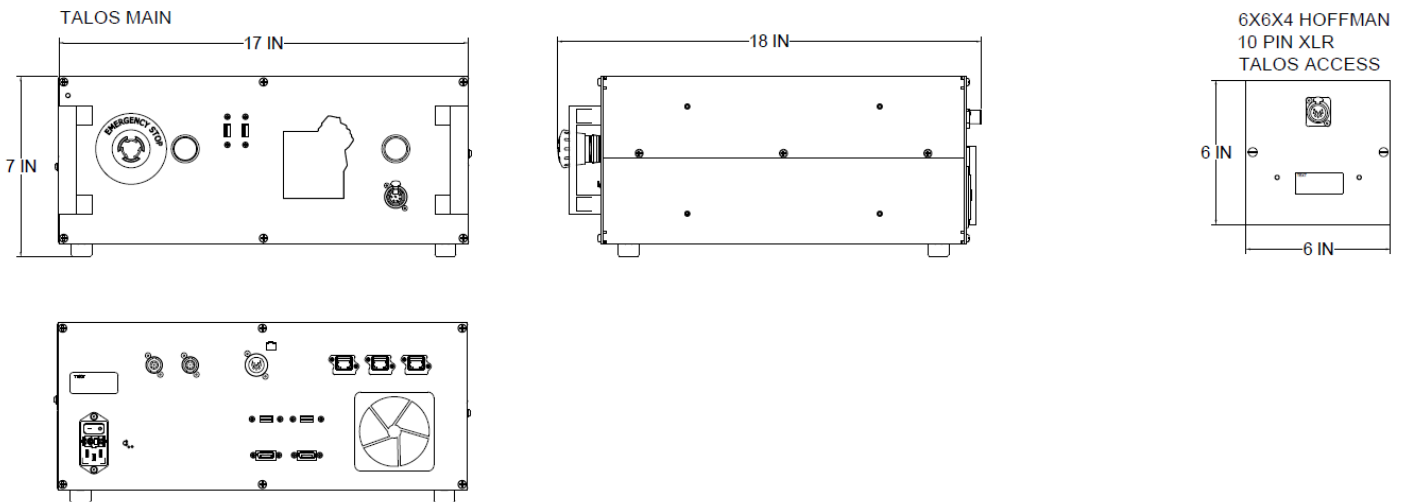
Remote Access Cabinets



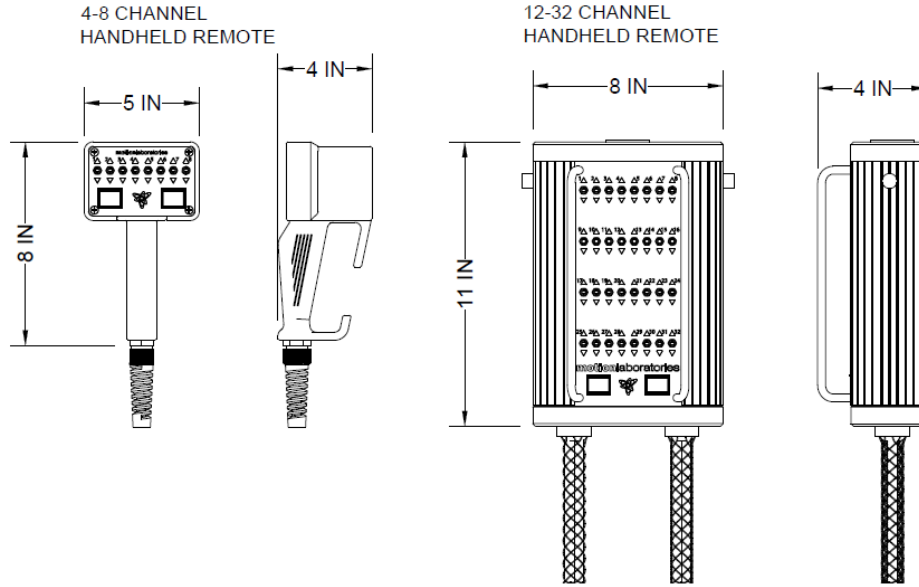
Flyboxes



TALOS and TALOS Access Flybox

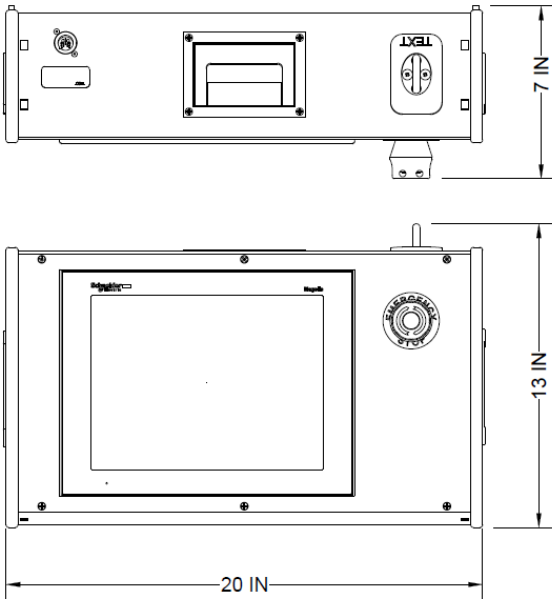


Multi-hoist Handheld Remote

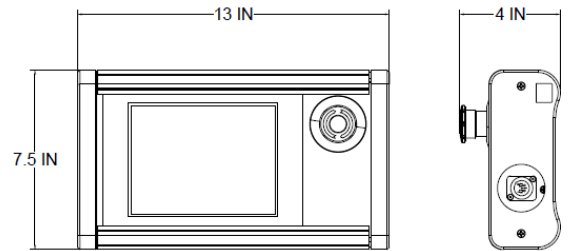


Touch Screen Operating System (TSOS)

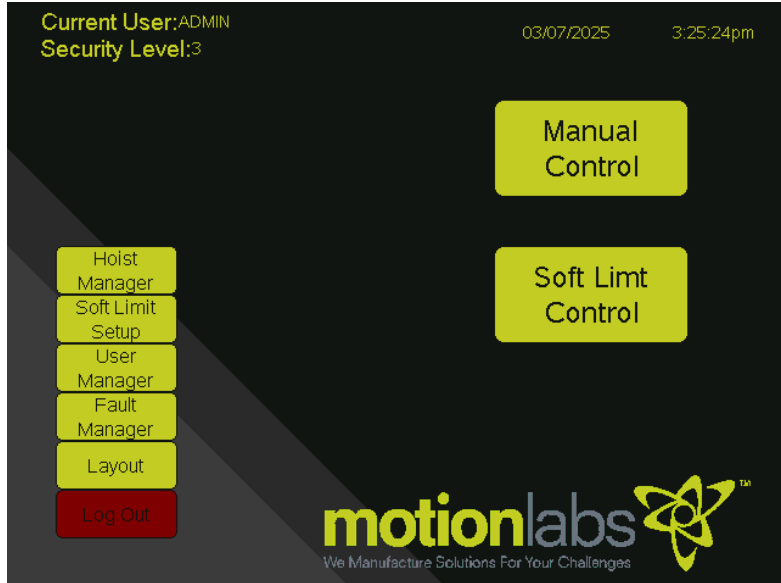
TSOS TRUSS MOUNT
CONSOLE FOR PLC SYSTEMS



TSOS HANDHELD
FOR PLC SYSTEMS

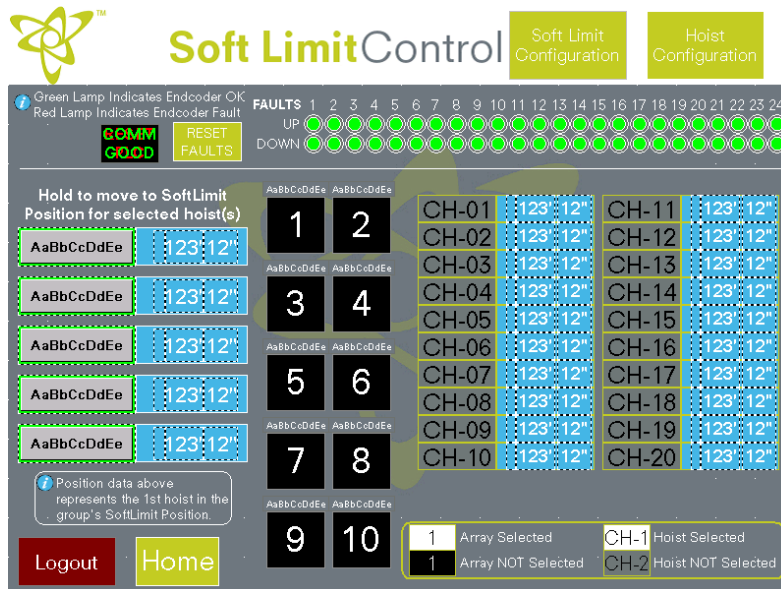


Screen Shots



TSOS Home Screen

The Home Screen for the Soft Limit Control System is the main interface for accessing system functions. It displays the current user, security level, date, and time at the top of the screen. The center of the interface provides quick access to Manual Control and Soft Limit Control, allowing operators to control the hoist system and manage software-based movement limits. A navigation panel on the left provides access to administrative features such as Hoist Manager, Soft Limit Setup, User Manager, Fault Manager, and Layout, along with a Log Out option for secure system exit. The layout is designed to provide clear and efficient access to key system controls.



TSOS Soft Limit Control Screen

The Soft Limit Control Screen provides operators with a centralized interface to monitor and control hoist Soft Limit positions. The screen displays real-time encoder status, communication health, and fault indicators, allowing quick identification of system issues. Operators can select individual hoists or arrays, then move them to predefined Soft Limit positions using the predefined Soft Limit run buttons. Clear visual indicators and position data help ensure safe, precise, and repeatable hoist positioning during operation.