User Manual

Allen-Bradley

Bulletin 1608M MegaDySC Dynamic Voltage Sag Corrector

1608M—800-2400 Amp Models

Important User Information

Solid-state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.rockwellautomation.com/literature/) describes some important differences between solid-state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid-state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
	**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http:/www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Introduction

The Allen-Bradley Bulletin 1608M MegaDySC Dynamic Sag Corrector is engineered to provide years of trouble-free voltage sag (dip) protection. The patented DySC technology does not use batteries, requires only routine maintenance, includes three-stage transient voltage surge suppression, and has unparalleled energy efficiency. Most electronic devices found in industry today are susceptible to power disturbances. A momentary sag in line voltage can reset or damage sensitive production equipment. The MegaDySC provides instantaneous dynamic sag correction to help your equipment ride through these common events. The MegaDySC connects normal utility power directly to the load until a voltage sag occurs. During a sag, the MegaDySC inverter is activated-adding missing voltage to keep the load voltage within the normal range. When utility power returns to normal, the inverter is deactivated and the MegaDySC is quickly ready to correct the next sag.

The MegaDySC reports these voltage sag events through its integrated touch screen display and provides system status, voltage sag notification and history, runtime statistics and system history in a simple and intuitive touch-based user interface.

Safety Considerations

The MegaDySC is designed to operate in industrial applications. Follow these guidelines to ensure that the safety and installation of the MegaDySC are handled with appropriate care.

SHOCK HAZARD: The MegaDySC has high voltage remaining up to 5 minutes after disconnection from the AC line. Touching exposed or disconnected terminals, cables or parts of the MegaDySC can lead to serious injuries or even death. Wait for a minimum of 5 minutes before performing any service or testing on the MegaDySC after power is removed. High voltage remains if red LED indicators above capacitor banks are lighted. Keep the cabinet doors closed and locked to ensure proper cooling airflow and to protect personnel from dangerous voltages inside the MegaDySC.

ATTENTION: - To reduce the risk of fire or electric shock, install this MegaDySC in a temperature and humidity controlled, indoor environment, free of conductive contaminants.

- Avoid installing the MegaDySC directly near heat-emitting equipment such as ovens, heaters, or furnaces.
- Ambient temperature must not exceed 40°C (104°F).
- Do not operate near water or excessive humidity (95% max).
- When punching or drilling holes for conduit fittings, take care to avoid dropping metallic particles inside the enclosure as this can result in electrical damage.
- The system is not intended for outdoor use.
- The operating environment should be maintained within the parameters stated in this manual.
- Only authorized service personnel should perform service on the MegaDySC.
- Ensure all power is disconnected before performing installation or service.

ATTENTION: Internal components can be easily damaged by electrostatic discharge (ESD). Do not touch circuit boards or electronic components with hands or metal objects. The MegaDySC is not rated to directly power life support equipment.

- Ensure the area around the MegaDySC is clean and uncluttered.
- Observe all DANGER, CAUTION, and WARNING notices affixed to the inside and outside of the equipment.

Installation

System Components

MegaDySC systems comprise several sections, including multiple "DySC 400A Module" MegaDySC electronics cabinets and one Automatic Bypass Switchboard. The separate shipping split components must be mechanically and electrically interconnected at the time of installation. The MegaDySC cabinets house the static bypass (semiconductor switches) and voltage sag correction electronics. The Automatic Bypass Switchboard houses the maintenance bypass circuit breakers, master control circuits and voltage and current monitoring circuits. Table 1 shows the system components (shipping splits) of 480V-rated MegaDySC systems. Models with other voltage ratings are similarly configured.

This document applies to 1608M MegaDySC systems rated 800A to 2400A at 380V, 400V, 415V, 460V, or 480V.

Table 1 - MegaDySC System Models

Catalog Number *	Current Rating	3-Wire / 4-Wire	SR / ER	Switch-board	DySC 400A Modules	DySC 400A Modules with ER
1608M-800A480V3S	800A	3W	SR	1	2	-
1608M-800A480V3E	800A	3W	ER	1	-	2
1608M-800A480V4S	800A	4W	SR	1	2	-
1608M-800A480V4E	800A	4W	ER	1	-	2
1608M-1K2A480V3S	1200A	3W	SR	1	3	-
1608M-1K2A480V3E	1200A	3W	ER	1	-	3
1608M-1K2A480V4S	1200A	4W	SR	1	3	-
1608M-1K2A480V4E	1200A	4W	ER	1	-	3
1608M-1K6A480V3S	1600A	3W	SR	1	4	-
1608M-1K6A480V3E	1600A	3W	ER	1	-	4
1608M-1K6A480V4S	1600A	4W	SR	1	4	-
1608M-1K6A480V4E	1600A	4W	ER	1	-	4
1608M-2K0A480V3S	2000A	3W	SR	1	5	-
1608M-2K0A480V3E	2000A	3W	ER	1	-	5
1608M-2K0A480V4S	2000A	4W	SR	1	5	-
1608M-2K0A480V4E	2000A	4W	ER	1	-	5
1608M-2K4A480V3S	2400A	3W	SR	1	6	-
1608M-2K4A480V3E	2400A	3W	ER	1	-	6
1608M-2K4A480V4S	2400A	4W	SR	1	6	-
1608M-2K4A480V4E	2400A	4W	ER	1	-	6

*Other voltages available(380V, 400V, 415V, 460V, or 480V), contact Rockwell Automation for more information.

System Orientation and Layout

The required layout places the MegaDySC enclosures on the right-hand (RH) and left-hand (LH) sides of the Automatic Bypass Switchboard when viewed from the front. Each MegaDySC enclosure is labeled with its required position in the lineup. System components are labeled as in Table 2.

Table 2 - System Components Layout

Current Rating (A)	LH3	LH2	LH1	Switchboard	RH1	RH2	RH3
800			■	■	■		
1200		■	■	■	■		
1600		■	■	■	■	■	
2000	■	■	■	■	■	■	
2400	■	■	■	■	■	■	■

The enclosures must be mounted so that they abut tightly with no gap between the enclosures. Typical layout is shown in Figure 1 and Figure 2. The "ER" components shown in the figures are included only with ER models, not with SR models.

Figure 1 - Typical System Layout, Top View (800A ER model shown)

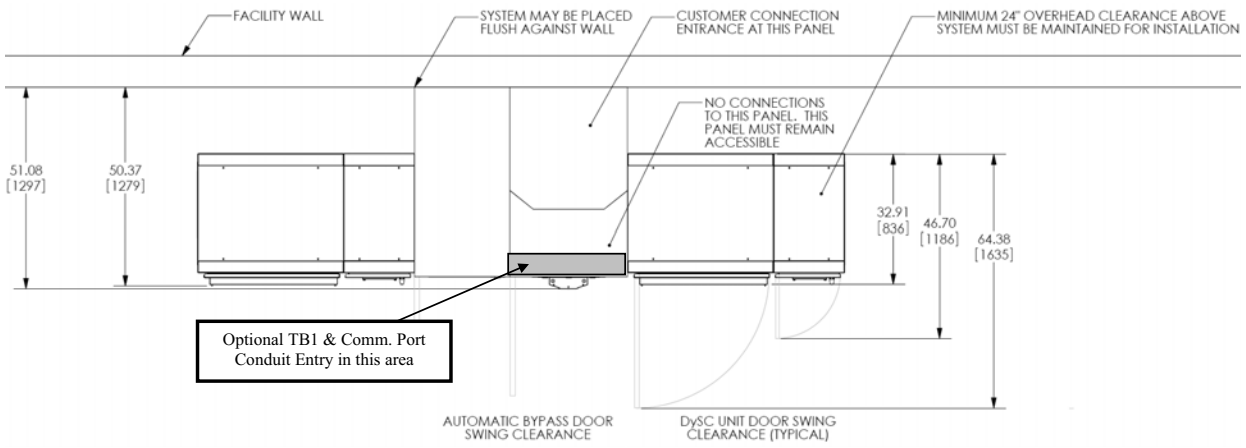
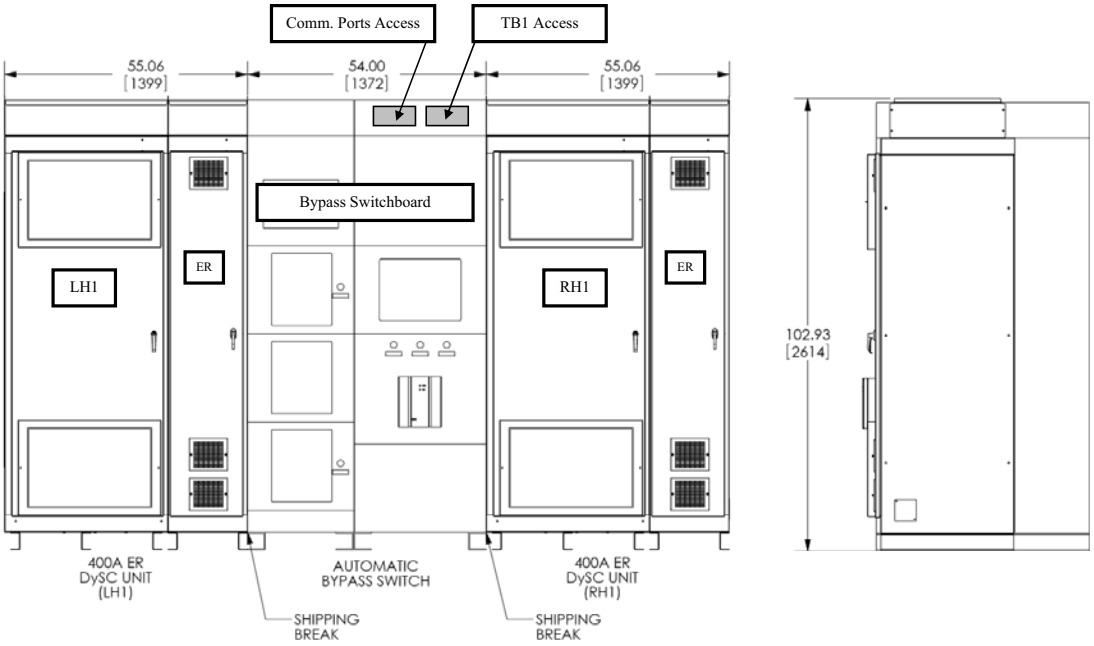


Figure 2 - Typical System Layout, Front View (800A ER model shown)



System Clearance

The MegaDySC and ER cabinet doors are hinged on the left, and clearance must be given to allow the door to swing open 90 degrees to the front of the enclosure, as shown in Figure 1.

Clearance for the Automatic Bypass switchboard should allow the door to swing (left side hinged) open 90 degrees to the front of its enclosure.

System Mounting

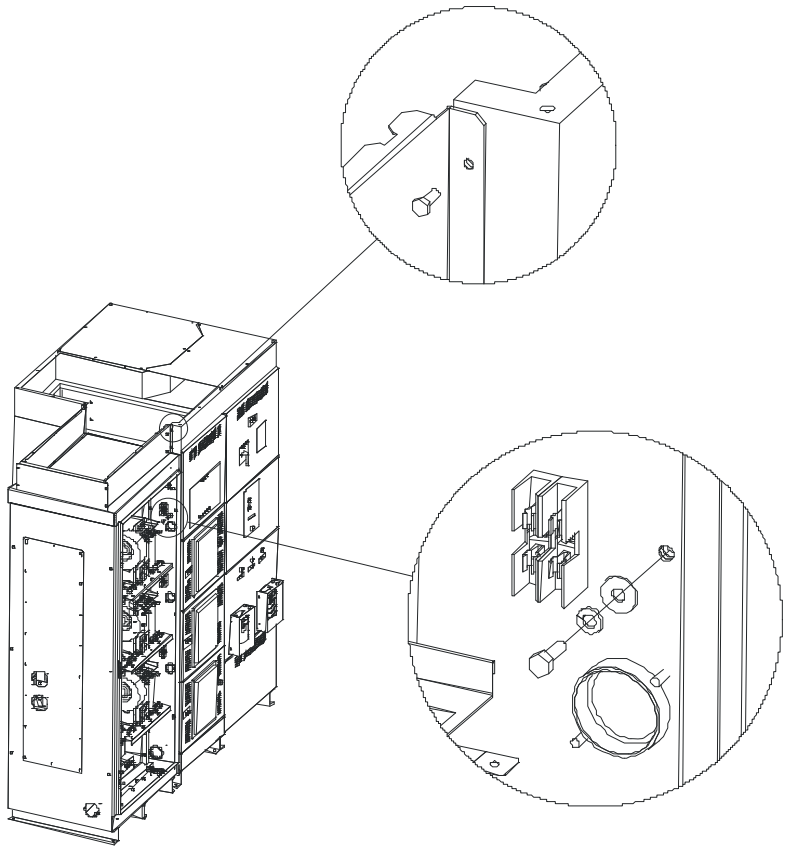
The MegaDySC is floor mounted, and should be secured using the 0.63" diameter mounting holes provided at the bottom of each section. Since each MegaDySC cabinet is provided with interconnecting cables to the Automatic Bypass switchboard, proper arrangement is critical. Follow the MegaDySC cabinet arrangement label located on the front of the Automatic Bypass switchboard for proper unit arrangement. MegaDySC cabinets are identified with a label located just above the main door handle.

Mechanical Interconnections

The MegaDySC and Switchboard cabinets should be bolted together for maximum stability. 3/8” x 1" bolts with 1" flat washer and lock washer are provided for this purpose (tighten to 25 lb-ft [42.4 N-m]). The bolts pass through the right side of each cabinet and screw into the weld nuts in the next enclosure in the lineup. There are three holes vertically aligned along the front edge and another three holes along the rear edge. The three rear bolts are optional and installation will require access from the rear.

In addition, the top-mounted wireway sections must be bolted together using the provided 1/4" hardware (torque to 66 lb-in [7.5 N-m]). See Figure 3 for typical fastening locations and hardware arrangement

Figure 3 - Mechanical Interconnections.



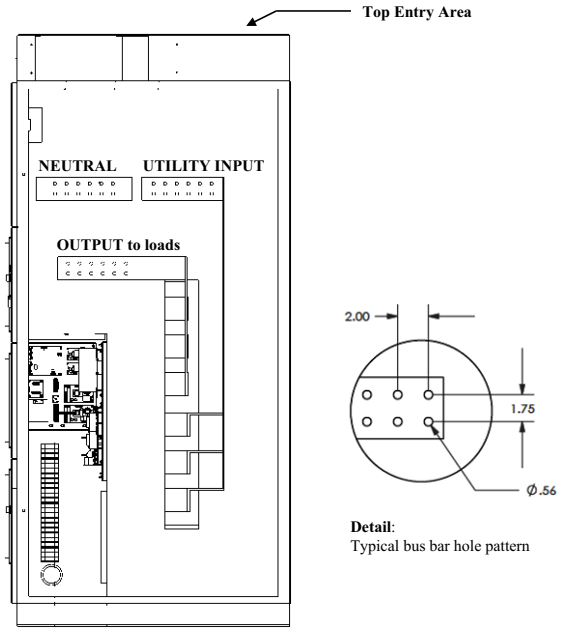
Electrical Interconnections

WARNING: Equipment must be earth-grounded according to local and national electric codes. Failure to supply proper equipment grounding may result in electrical shock or death. All interconnection wiring must be installed by a qualified electrician in compliance with the National Electrical Code standards.

The "DySC 400A Module" MegaDySC cabinets and the Automatic Bypass (ABP) Switchboard are shipped separately. The customer is responsible for system mounting. All interconnecting power cables are provided and will be connected by a factory-trained technician during commissioning. At commissioning the main cables will be routed from the MegaDySC cabinets to the appropriate ABP switchboard busbar terminals via the overhead wireway. A control wiring harness is also provided in the ABP and must be connected to the MegaDySC cabinets. Finally, the incoming electrical service and outgoing load cables are brought in through the top (or bottom) of the ABP switchboard and connected to the appropriate bus locations, as shown in Figure 4. AC input is

connected to the bus bar terminals labeled L1, L2, L3 and the protected load is connected to the bus bar terminals labeled X1, X2, X3.

Figure 4 - Bus Bar Details for Utility Input and Load Output Terminations



MegaDySC System Interconnections Checklist

The following list of checks is provided for reference only. Interconnections must be completed by factory-trained and authorized installation personnel.

- Connect each MegaDySC Unit's ground cable to the ground bus in ABP Switchboard.
- Connect line side cables from each MegaDySC Unit to the respective line input bus in the ABP Switchboard labeled L1, L2 and L3 respectively.
- Connect load side cables from each MegaDySC Unit to the respective load output bus in the ABP Switchboard labeled X1, X2 and X3 respectively. *Note: It is critical to match the phases on each MegaDySC section.*
- Plug the 4 duplex fiber optic cables into the appropriate transceiver found on the control PC boards of each MegaDySC Unit's phase inverter module.
- Plug in the control wire harnesses that interconnect the enclosures at the bottom of each unit.
- Check wiring for correct source and destination locations against approved drawings.
- Check all electrical terminations for proper torque.
- Refer start-up and commissioning to factory-trained and authorized service personnel.

Electrical Terminations for Input and Output Power

Customer power cables (3-phase input, 3-phase output to protected loads) enter the top of the Automatic Bypass Switchboard enclosure at the location labeled CUSTOMER CONNECTION ENTRANCE in Figure 1. The top panel should be removed to punch conduit holes. Bus bar locations and hole pattern are shown in Figure 4.

Utility Input and Load Wiring

Connect incoming earth ground conductor to the **GROUND** bus bar in accordance with the National Electrical Code and local codes.

UTILITY INPUT cables are terminated at bus bars labeled (left to right)

- L1
- L2
- L3

The Neutral input cables are terminated at the bus bar labeled

- **NEUTRAL** (For 4-wire systems only: Neutral connection is required for proper operation)

OUTPUT FOR PROTECTED LOADS cables are terminated at bus bars labeled

- X1
- X2
- X3

The Neutral output cables, if needed, are terminated at the same bus bar labeled

- **NEUTRAL** (present only in 4-wire systems)

Put Automatic Bypass Switchboard circuit breakers in these positions before energizing the system:

- CBI = OFF (open)
- CBB = ON (closed)
- CBO = OFF (open)

Replace all insulating panels, covers, close and lock all doors before energizing the system.

Communications

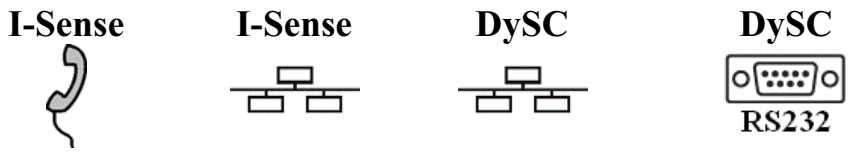
i-Sense Voltage Monitor

An i-Sense voltage monitor is mounted on the Automatic Bypass Switchboard to continuously monitor the 3-phase input and output voltages of the MegaDySC system. The i-Sense is wired in parallel with the bypass circuit breaker CBB. For 3-wire systems, the i-Sense monitors Line-Line voltages. For 4-wire systems, it monitors Line-Neutral voltages.

The i-Sense requires communication via the Internet to access the recorded voltage data. Two options for communication are provided: Ethernet (RJ45 port) or PSTN (analog only) telephone line (RJ11 port). These communications ports are extended to the top of the Bypass Switchboard for permanent wiring installation. The ports are labeled as shown in Figure 5.

Refer to the i-Sense User Manual (publication 1608S-UM001A-EN-P) for registration, configuration, and operation instructions.

Figure 5 - i-Sense and MegaDySC low voltage communications ports labeling



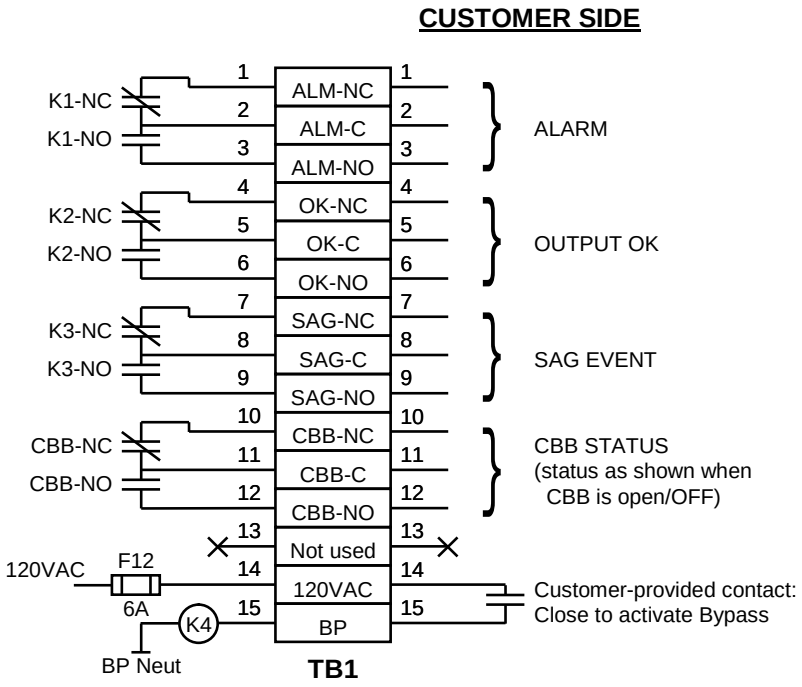
Remote Diagnostics—TB1 Relay Contacts

TB1 Schematic Diagram and Contact Ratings

The Automatic Bypass Switchboard contains relay dry contacts, available at terminal block TB1, for remote monitoring of the state of the Bypass Circuit Breaker and certain status conditions in the MegaDySC. Refer to Figure 6. TB1 is located in a compartment at the top of the right switchboard section. The terminal block is labeled: ***TB1 CUSTOMER CONTACTS***.

ATTENTION: Remove power from the MegaDySC system prior to connecting any alarm notification device. Access to the terminal contacts risks exposure to 120 VAC potential. Accidental operation of the automatic bypass circuit is possible.

Figure 6 - Schematic Diagram—Customer Contacts (TB1)



Relay Contact Ratings (Terminals 1-9 of TB1)

Relays ratings are:

- 110-277VAC 10A continuous, 16A short time
- 110-120VAC 1/3 hp max
- 220-250VAC 1/2 hp max
- 28VDC 10A continuous, 16A short time
- Min. recommended load: 100mA @ 5VDC or 0.5 W

CBB Contact Ratings (Terminals 10-12 of TB1)

- 110-600VAC 6A
- 24-48 VDC 2.5A
- 125-250 VDC 0.5A

Remote Bypass Customer-Provided Contact Rating (Terminals 14-15 of TB1)

The customer-provided contact must be rated for at least 120VAC. Coil power is 2 VA at 120 VAC (17 mA)

TB1 Contacts Functionality

ALARM Contacts

The NC contact will be closed during normal operating conditions. The NC contact will open if an alarm condition occurs that inhibits sag correction. It will also close when the DySC system is powered down (when the touchscreen display is off).

If and when an alarm condition clears (for example, a Static Switch Overload no longer exists) the relay will revert to its pre-fault position.

Alarms that will energize the Alarm Relay K1 coil are all those listed inTable 6 on page 36 with a severity of "Auto-Resetting" or "Call Service."

OUTPUT OK Contacts

The NC contact will be open during normal output (load) voltage conditions. The NC contact will close if the output rms voltage falls below 87% of rated for more than 3 cycles. It will also close when the DySC system is powered down.

SAG EVENT Contacts

The NC contact will be closed during normal input (line) voltage conditions. The NC contact will open during a detected voltage sag event. It will also close when the DySC system is powered down.

During a voltage sag, the relay coil will be energized for a minimum of 1 cycle, (16ms in 60 Hz application, 20ms in 50 Hz application), and for the duration of the detected event. The maximum relay close time is 25 ms, so some single-cycle events may not operate this relay contact. The maximum relay release time is 25 ms; the expected minimum pulse width is approximately 15-25 ms.

CBB STATUS Contacts

"Normal" position for the CBB Bypass Breaker is defined as the breaker being OFF, or Open. The Normally-Open (NO) auxiliary contacts are open when the Breaker is open.

NOTE:When the CBB breaker is closed, the MegaDySC cannot provide protection against sags.

Example: Normal mode: CBB will be Open; therefore CBB-NO = open, CBB-NC = closed. If CBB is closed, these states will be reversed.

Conditions that will automatically close the Bypass Circuit Breaker (CBB) are the last five rows of Table 3 on page 20.

Remote Seamless BYPASS Command Operation

A normally-open PLC contact, relay contact, or push-button contact may be connected between TB1/14 and TB1/15. Close the contact to initiate an automatic seamless bypass operation: CBB will close, then CBI and CBO will open, removing power from the MegaDySC cabinets; voltage sag correction will then be disabled.

This feature may be utilized as an Emergency Power Off (EPO) function for the MegaDySC cabinets only. Power to the output loads or output distribution panel, if present, will not be interrupted. Note that the automatic bypass functionality requires that nominal AC power is present at the switchboard input terminals.

Applying Power

ATTENTION: The MegaDySC system must be commissioned by factory-trained engineers. Do not energize the MegaDySC until instructed to do so by commissioning engineers.

- After installation make certain there are no metal filings or any conductive debris in or on any components inside the cabinets.
- Verify MegaDySC system voltage rating matches ac source voltage.
- Ensure all input and output terminations including grounding have been completed and are properly tightened.
- Replace all covers. Close and lock all cabinet and switchboard doors.
- Allow commissioning technicians to complete connections and initial checks
- Apply power only when instructed to do so by the commissioning technicians.
- After commissioning, follow instructions on the Automatic Bypass switchboard to put the system into Normal mode. The load is now being protected by the MegaDySC. The display should show "OK" in the upper left corner.

WARNING: The MegaDySC and (optional) ER cabinets are interlocked. Opening cabinet doors while in the MegaDySC "normal" mode will cause immediate automatic bypass operation and subsequent loss of voltage sag protection while in "maintenance bypass" mode. Automatic Bypass switchboard cabinet doors are not interlocked and should be kept locked to avoid exposure to dangerous voltages. (Refer to Servicing Notes on page 22)

NOTES:
1.Cycling input power in the sequence OFF--ON--OFF--ON within a one minute period will cause a "Limit Cycle Timeout" alarm. In such case sag correction will be disabled for one minute, after which the alarm will automatically reset.
2. Pushbutton "CBI ON" is disabled for one minute after CBI is opened for any reason.

Notes:

Operation

System Description

Raw utility power enters and routes through the Automatic Bypass switchboard to the load. In maintenance bypass mode the power bypasses the MegaDySC cabinets and passes directly to the load. In this mode the load is unprotected from voltage sags. In the Normal operation mode the MegaDySC cabinets are energized and the power is directed through the MegaDySC, protecting the load. See the following sections for MegaDySC and Automatic Bypass operation details.

ATTENTION: Operation in Normal Mode requires that the maintenance bypass circuit breaker (CBB) be open (OFF)-otherwise, voltage sag correction will be defeated by the mechanical bypass.

MegaDySC Operation

A master control panel, located in the switchboard enclosure, constantly monitors the line voltages and issues commands to the parallel-connected MegaDySC sections. Each MegaDySC section contains three power electronics modules (one module per phase). The modules act in parallel with the like phase modules in the other MegaDySC sections, under command of the master controls. Each module consists of a static switch and the sag-correcting electronics. The parallel modules are series-connected to the input line, and operate by adding the compensating voltage needed to restore the line to its nominal output. When the utility line voltage is adequate, the static switch will remain closed and no compensating voltage is added. When an insufficient line voltage event occurs, the static switch opens and the sag-correcting electronics (inverters) quickly add the balance of voltage necessary to regulate the load voltage.

Thermal switches are included to activate fans if the cabinet temperature or other internal temperatures exceed set limits.

A central touch screen display provides indication of the status of the MegaDySC operation. After power is switched on, the green “OK” box will be displayed in the upper left hand corner of the display, indicating that the output voltage is within a normal range of 88.5% to 110% of nominal.

A red “FAULT” box is displayed in the upper left hand corner of the display when an alarm condition is present on the MegaDySC. During this period sag correction is inhibited and the MegaDySC will continue to bypass the utility voltage directly to the load through the static bypass path.

An orange “Resetting” box is displayed when the previous alarm condition has cleared. Sag correction will remain inhibited until the reset period has expired (approximately 1 minute). A blue “SYSTEM OFFLINE” box is displayed

whenever the MegaDySC system is in the Maintenance Bypass mode (CBB closed and CBI open).

A list of conditions and indications is given in Table 3. Refer to Chapter 6 for further information on system alarms and status display.

Table 3 - Operational Conditions and Indications

CONDITION	DEFINITION	Touchscreen Display STATUS text*	INVERTER OPERATION	BYPASS MODE
Normal:	88.5% < V_{LINE} < 110%	Green "OK"	Standby	Static BP
Sag Event:	V_{LINE} < 88.5% for less than available runtime.	Green "OK"	Running	Inverter
Runtime Exceeded:	Cumulative runtime exceeded	Blinks Red, then Orange for 1 min. Repeats if condition persists	Inhibited	Static BP
Normal Mode, Overload:	Load current > 110%	Red during OL condition, Orange for 1 min. after OL ends	Inhibited	Static BP
Inverter Run Mode, Output Over current: (I^2t)	Load current > 150% for 3 cycles	Blinks Red, then Orange for 1 min. Repeats if condition persists	Inhibited	Static BP
Inverter Module Over-temperature	Module temperature limit exceeded	Blue, MegaDySC offline	Disconnected	Mech. Bypass
MegaDySC Over-temperature	Internal temperature limit exceeded	Blue, MegaDySC offline	Disconnected	Mech. Bypass
Static Switch Failure	Open SCR(s)	Blue, MegaDySC offline	Disconnected	Mech. Bypass
Main Fuse Open	Open Fuse(s)	Blue, MegaDySC offline	Disconnected	Mech. Bypass
Enclosure Door Open	Door Open	Blue, MegaDySC offline	Disconnected	Mech. Bypass

* The touchscreen will power down if both input and output voltages fall below approx. 75% of nominal

**An error message will be displayed while the red or orange text box is displayed. Refer to Chapter 6 for further information on accessing fault codes and status history.

Automatic Bypass Switchboard Operation

The Automatic Bypass Switchboard consists of a bypass circuit breaker (CBB), an input circuit breaker (CBI), and an output circuit breaker (CBO). Refer to Figure 7. Under normal operating conditions raw input power is routed through CBI to the input of the MegaDySC sections. The output of the MegaDySC sections is routed to the load through CBO. CBB is normally open. CBB connects utility power to the load, bypassing the MegaDySC sections, when operating in the maintenance bypass mode.

Refer to page 23 for descriptions of the automatic bypass modes.

WARNING: Dangerous voltages can still exist within the MegaDySC enclosures even if the system is in Bypass mode. Refer servicing to qualified personnel.

ATTENTION: Follow these instructions to avoid interrupting load power! Do not attempt to change the position of any circuit breakers without becoming familiar with the operation of the MegaDySC system. Contact the factory immediately if the system fails to operate as outlined below. Voltage sag protection is not available whenever CBB is closed (red BYPASS CLOSED lamp is lighted).

Automatic Bypass Switchboard Operating Instructions

Automatic System

In the event of a fault in the MegaDySC system, bypass (CBB) will close.

The system will remain in bypass until manually transferred back to the MegaDySC

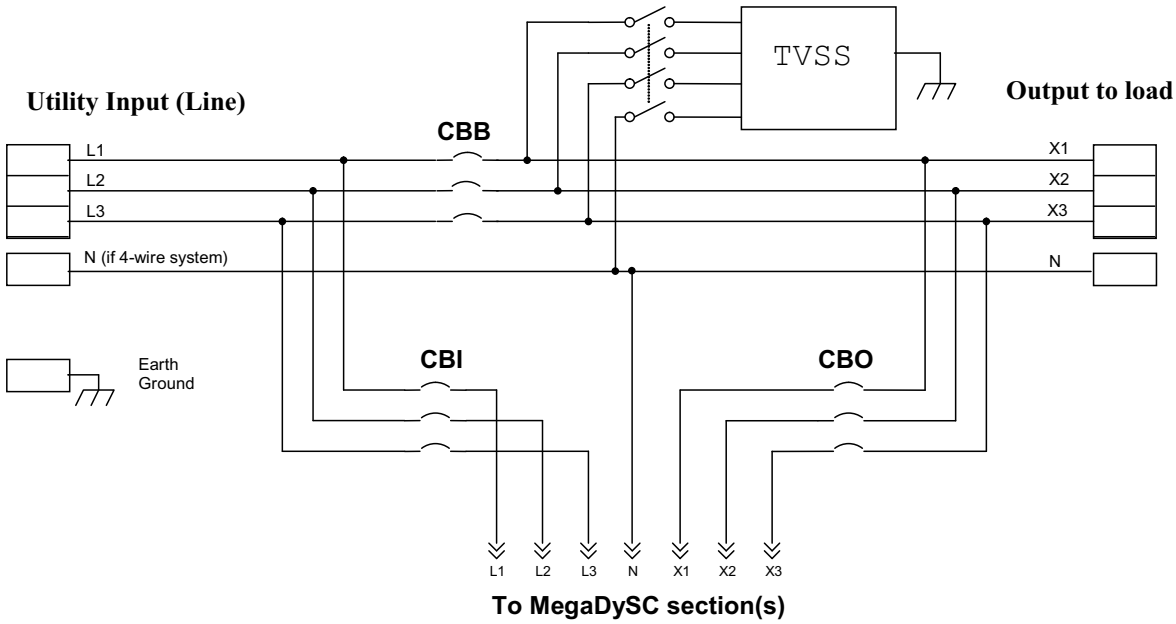
Manual Transfer to Maintenance Bypass

1. Press green “CBB ON” pushbutton
2. Confirm that red “BYPASS CLOSED” lamp is lit
3. Press red “OFF” pushbutton (part of CBI). Output breaker (CBO) will open automatically.
4. Confirm that both CBI and CBO are open
5. The MegaDySC is now bypassed and isolated for maintenance

Manual Transfer to MegaDySC

1. Charge CBI with pump handle. Press green “CBI ON” pushbutton. *Note: “CLOSE CBI” action is inhibited for one minute after power cycling.*
2. Confirm that the MegaDySC touch screen is lit, and the status displays “OK” in the upper-left corner.
3. Charge CBO with pump handle. Close CBO by pressing green pushbutton “CBO ON”.
4. Confirm that the MegaDySC touchscreen status displays “OK”.
5. Press red “CBB OFF” pushbutton
6. The MegaDySC system is now providing power to the load.

Figure 7 - Schematic Diagram of Automatic Bypass Switchboard Power Circuit



Note: The 3-wire MegaDySC models have not been evaluated by Underwriter's Laboratories, Inc.® for connection to a corner-grounded or ungrounded delta power source. Contact Technical Support for assistance.

Transient Voltage Surge Suppression

Over voltage transient protection is provided on the output of the MegaDySC. Indicator lights for each phase on the front of the TVSS panel (behind Bypass cabinet top front panel) are illuminated under normal operation. In case of a severe over-voltage transient event, internal fuses in the TVSS module may open. If TVSS operation is compromised, one or more of the indicator lights will be extinguished. A form C contact is provided inside the TVSS module for remote fault indication, if desired. Refer to the TVSS user manual for details on accessing that contact. If a fault is indicated, the TVSS disconnect fuse block (F25-F26-F27-F34) may be opened to allow servicing of the TVSS module. Refer servicing to qualified personnel.

Servicing Notes

Refer servicing to qualified and factory authorized personnel. Opening the MegaDySC cabinet door will shut down the MegaDySC system and force an automatic mechanical bypass. Refer to manual bypass instructions to perform a seamless transfer of power before opening the enclosure door for servicing.

WARNING: This enclosure contains energy storage devices. Dangerous voltages may exist within this enclosure after AC power has been removed. Do not touch any components within the enclosure if the red LEDs located above capacitor banks are lighted. If the red LEDs do not extinguish within 5 minutes, close the enclosure door and contact Technical Support.

Normal Mode

The **NORMAL** mode for the MegaDySC is Input Breaker (CBI) and Output Breaker (CBO) closed. The bypass breaker (CBB) must be open or the MegaDySC will not be able to correct voltage sags. There is a red indicator light on the bypass enclosure that is lighted when the bypass is closed. The green "OK" status box should be shown on the touchscreen display. The green "OK" box indicates that the voltage at the output of the MegaDySC is within the +10%, -13% normal window. Refer to Table 3 for operational conditions and indications.

Bypass Mode

The **BYPASS** mode for the MegaDySC is for Input Breaker (CBI) and Output Breaker (CBO) to be open. The bypass breaker (CBB) must be closed to provide power to the load while the MegaDySC is being serviced.
Refer to Automatic Bypass Switchboard Operation on page 20 or the placard on the bypass switchboard for instructions on transferring the system into and out of bypass mode.

WARNING: Servicing must only be performed by factory authorized and qualified personnel.

Test Mode

The **TEST** mode for the MegaDySC is for Input Breaker (CBI) to be closed and Output Breaker (CBO) to be open. The bypass breaker (CBB) must be closed to provide power to the load while the MegaDySC is being tested off-line.

WARNING: Testing must only be performed by factory authorized and qualified personnel.

Over-Current and Fault Protection

Fault protection is provided by a variety of protection devices including electronic, circuit breakers and fuses.

CBI and CBO are set to protect the MegaDySC conductors. If an upstream circuit breaker is present, CBB is typically coordinated to allow the upstream breaker to be the primary protection for the branch circuit.

Each MegaDySC section contains semiconductor fuses F1, F2, F3. These fuses provide short circuit protection for the MegaDySC modules. In the event of an internal short circuit, a fuse will clear and trigger an automatic transfer to mechanical bypass mode. Fuse tables appear in Chapter 7.

In addition, each module has an electronic current limit function that will protect the module from peak over currents during sag protection operation.

IMPORTANT In the event of the operation of any over current protection function, check the touchscreen display on the MegaDySC for error codes that may indicate the type of over current condition.

ATTENTION: Circuit Breaker settings must not be changed without consulting Technical Support.

Circuit Breaker Configuration

See the separate Circuit Breaker User Manuals for instructions on how to adjust the breaker set points.

Each of CBB, CBI, and CBO contains an electronic trip unit with several adjustable settings. These should be set as follows for Square-D Masterpact NW breakers:

CBB Set Points:

- Long-time Ir = 1 (100% of rating)
- Long-time tr = 24
- Short-time Isd = 10
- Short-time tsd = OFF/.4
- Instantaneous Ii = OFF

CBI and CBO Set Points:

- Long-time Ir = 1 (100% of rating)*
- Long-time tr = 4
- Short-time Isd = 6
- Short-time tsd = ON/.3
- Instantaneous Ii = OFF

**Note: CBI and CBO Long-time Ir = 0.95 for 2400A Systems only (2500A breaker frame)*

Troubleshooting Notes

Diagnostic indicators available on the MegaDySC system:

- Touchscreen display
- Red lamp on Automatic Bypass switchboard indicates when mechanical BYPASS CLOSED.
- Circuit breaker status (OPEN or CLOSED)
- System status relay contacts at TB1 (see Chapter 3)
- i-Sense voltage monitoring results via i-Grid (see Chapter 3)

IMPORTANT Record any Alarm or System Event messages seen on the display before contacting Technical Support

Display Screen

Overview

The MegaDySC touch screen display is a window to voltage sags and DySC protection. The display provides system status, voltage sag notification and history, runtime statistics and system history in a simple and intuitive touch-based user interface.

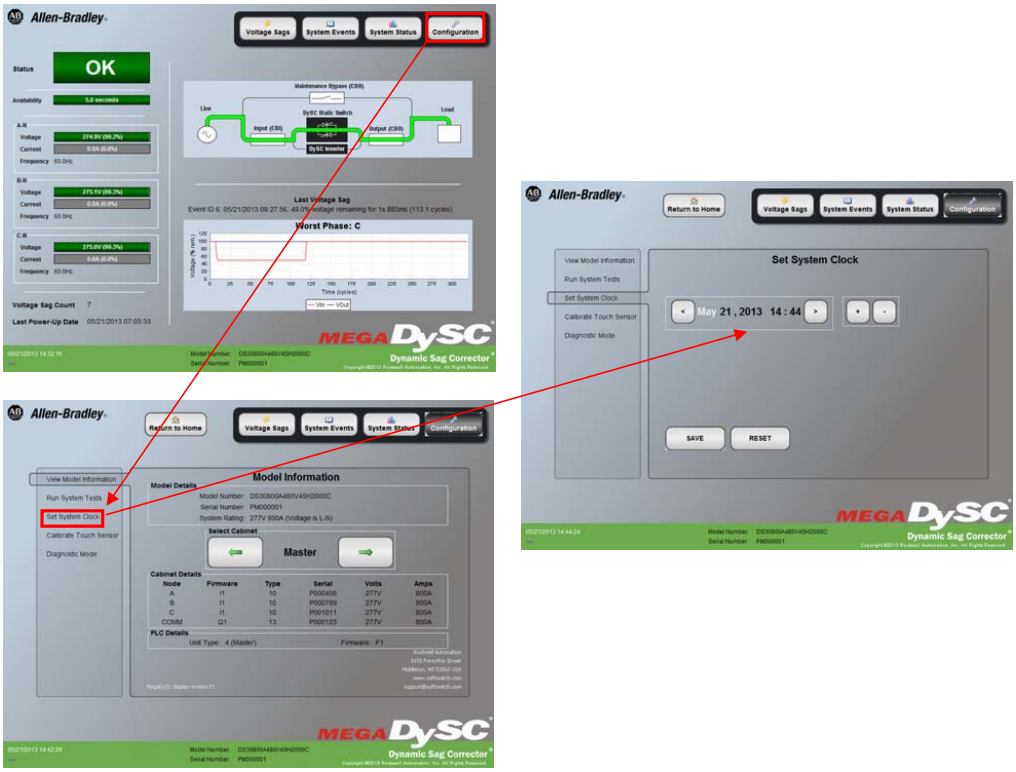
Quick Start

At commissioning time perform the following steps to configure your system.

Note: The touch screen is optimized for use with a plastic stylus or bare finger. When the system first starts, the "HOME" screen is displayed.

Step 1: Press the "Configuration" button at the top of the screen (See Figure 8).

Figure 8 - Quick Start



Step 2: Set date and time by pressing "Set System Clock" on the left side of the screen (See Figure 8).

Step 3: Use the left/right arrows under "System Clock" to highlight each component. Use the plus (+) and minus (-) buttons to set the correct time and/or date.

Step 4: Press the "Save" button to store the new date/time and format settings.

Note: Pressing "View Model Information" on the "Configuration" screen provides model information about the MegaDySC system. It includes model number, serial number, voltage and current ratings. Unit details are also present including component serial numbers and firmware version numbers.

ATTENTION: TO AVOID DAMAGING THE TOUCH DISPLAY:
Do not subject the touch display to heavy impact.
Use your bare finger or plastic stylus to tap the touch display.
Do not use anything that might cut or damage the touch screen membrane.
The touch display panel is not waterproof.
Do not use alcohol, ammonia, toluene, or acetone cleaners on the display.

Home Screen

The "HOME" screen of the display provides a snapshot view of the status of the entire system (See Figure 9). You can return to this screen from any other screen by pressing the "Return to Home" button at the top of the screen.

Figure 9 - Home Screen

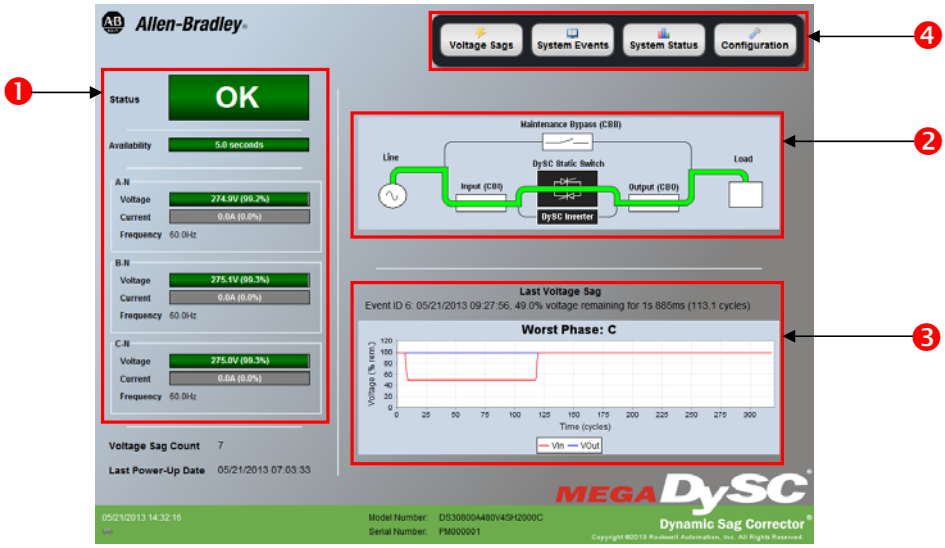


Table 4 - Home Screen

Item	Description	Function
1	Status	Real-time system status: available runtime, output voltage, load current, and frequency.
2	System Operation	Graphical view of operational state.
3	Last Event Details	Information about the last voltage sag: event start time, event duration, and sag depth.
4	Main Menu	The menu buttons at the bottom of the screen navigate through: **Voltage Sags**: Displays the "Voltage Sag Log" screen. **System Events**: Displays the "System Event Log" screen. **System Status**: Displays the "System Status" screen. **Configuration**: Displays the "System Configuration" screen.

System Status

The "System Status" screen displays the real-time overall system status (See Table 5). You can access this screen by pressing the "System Status" button in the menu.

Figure 10 - System Status Screen

Table 5 - System Status

Item	Description	Function
1	System Status	Overall system status including: status, availability to correct sags, and internal cabinet temperature. Voltage, current, frequency, and static switch temperature are displayed for all phases. The percentage displayed following the voltage and current is the percent of nominal value for the MegaDySC unit. Nominal values are listed on the "View Model Information" screen.
2	Cabinet Layout	The system component cabinets are displayed; press a cabinet for more detail.
3	Waveforms	Real-time waveform capture; line voltage, load voltage, or load current can be selected for display.

Note: You can toggle between the two screens in Figure 10 by pressing "System Summary" and "Line & Load Waveforms" on the left side of the screen.

Cabinet Status

When a cabinet image is pressed, detailed status for the selected cabinet will be displayed in a popup window (SeeFigure 11). Press the “Close” button to close the popup and return to the System Status screen.

Figure 11 - Cabinet Status

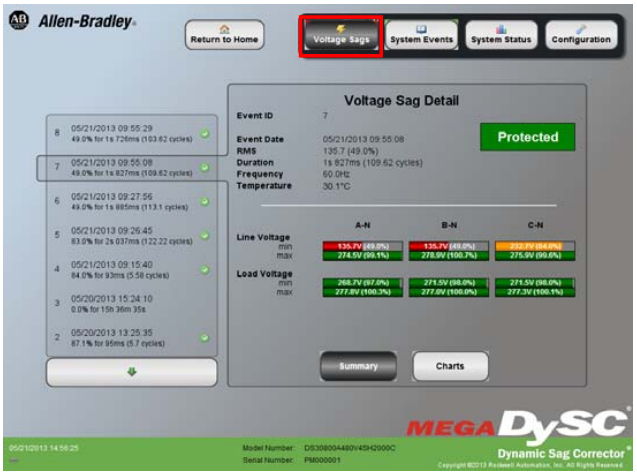
Voltage Sags

A voltage sag is defined as the period when input rms voltage drops to less than 88.5% of the rated MegaDySC voltage. Details of each voltage sag and corresponding MegaDySC protection are captured and saved to the voltage sag log.

Voltage Sag Log

The “Voltage Sags” screen (See Figure 12) displays a list of the last 60 voltage sags. You can access this screen by pressing the “Voltage Sags” button in the menu.

Figure 12 - Voltage Sag Log



The left side of the screen contains the list of voltage sags, which are identified by the following fields:

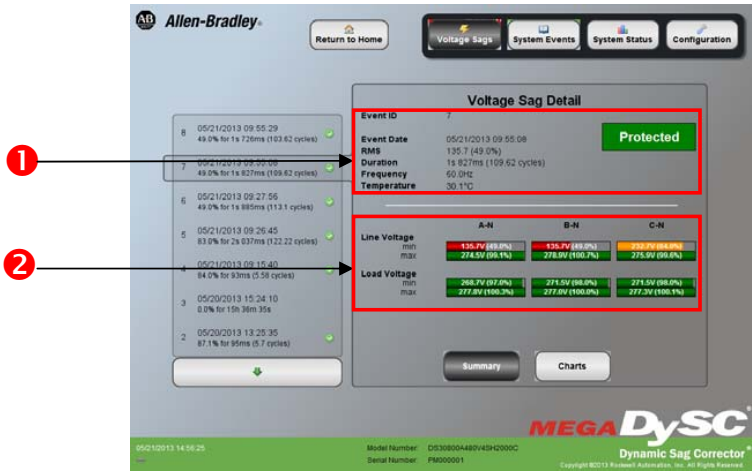
Description	Function
#	Unique ID within the list identifying each voltage sag.
Time	Start date and time of the voltage sag.
RMS%	Worst-case RMS voltage (percent of nominal) across all phases.
Duration.	Duration of the voltage sag.

Use the up/down arrows to navigate through the list. The currently selected voltage sag will appear in the detail pane on the right side of the screen.

Voltage Sag Detail

The right-side of the Voltage Sag screen shows detailed information about the selected voltage sag (See Figure 13).

Figure 13 - Voltage Sag Detail, Summary Data



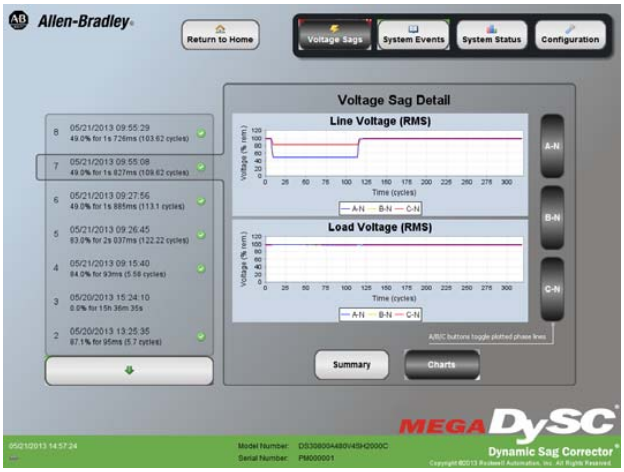
Item	Description	Function
1	Summary	**Event ID: U**nique ID within the list (0-29) to identify the voltage sag. **Event Date:** Start date and time of the voltage sag. **RMS:** Worst-case RMS voltage and percent of rated voltage across all phases. **Duration:** Duration of the voltage sag. **Frequency:** Frequency of the line prior to the start of the voltage sag. **Temperature:** Internal temperature of the MegaDySC prior to the start of the voltage sag.
2	Magnitude	**Line Voltage:** Line RMS voltage and percent of rated (L-N basis). **Load Voltage:** Load RMS voltage and percent of nominal (L-N basis).

Voltage Sag RMS Voltage Charts

The line and load RMS voltage are displayed for each phase (See Figure 14). You can access this screen by pressing the "Charts" button as shown in Figure 13.

By pressing the A, B, or C buttons to the right of the charts, you can show or hide each of the three phase voltages.

Figure 14 - Voltage Sag Detail, RMS Voltage Charts

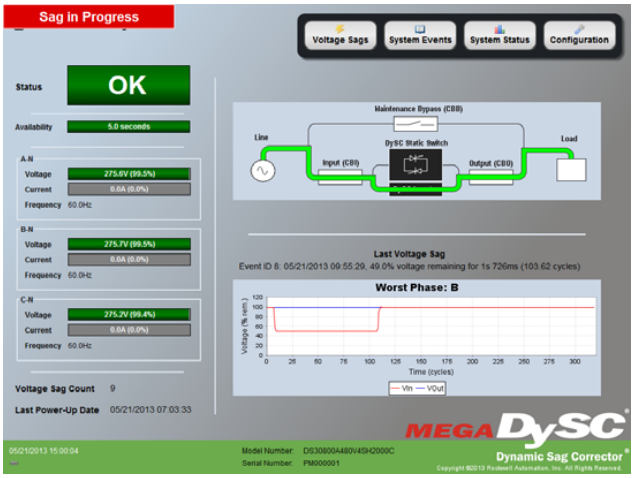


Voltage Sag Notification

When the MegaDySC system first detects a voltage sag, a red box displaying "Sag In Progress" will appear in the upper left hand corner of the screen. (See Figure 15)

When the voltage sag is over, the red box will disappear.

Figure 15 - Voltage Sag Detected



System Events

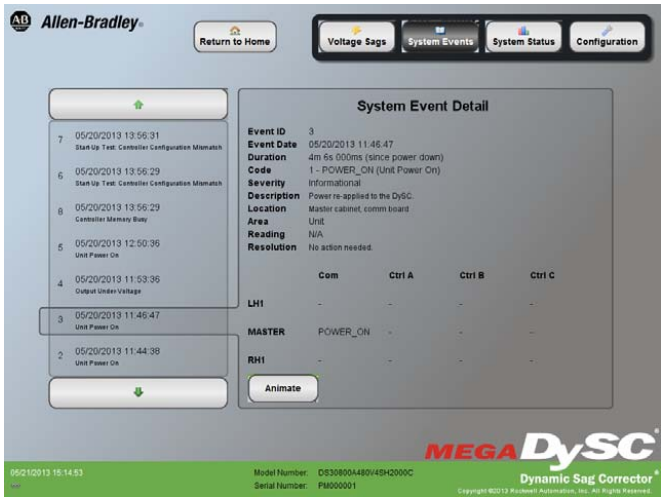
The MegaDySC tracks all operational alarms. These “System Events” are classified into five groups based on severity, as listed in the following table.

Severity	Description
Informational	Purely informational. No action is required.
Auto-Resetting	The DySC will reset within 60 seconds. No user action is required.
User Attention	User action may be required to correct a problem. The DySC will reset 60 seconds after the error condition is corrected.
Manual-Reset	For system events that force an automatic transfer to mechanical bypass, a manual reset of the DySC system will be required.
Call Service	For events classified as Call Service, factory trained service support will be required.

System Event Log

The “System Event Log” screen displays a list of the last 40 system faults in chronological order (See Figure 16). You can access this screen by pressing the “System Events” button in the menu.

Figure 16 - System Event Log



The left side of the screen contains the list of system events, which are identified by these fields:

Description	Function
#	Unique ID within the list identifying each system event
Time	Start time of the fault.
Name	Name and description of the alarm.

Use the up/down arrows to navigate through the list. Detail for the currently selected event is shown to the right of the list.

System Event Detail

The right side of the System Event Detail page displays detailed information that was recorded during the selected event (See Figure 16).

The "Animate" button displays a time-lapse view of the system events as they were recorded.

Description	Function
Time/Duration	Event Date: Date and start time of the system event. Duration: The amount of time the event lasted.
Type	**Event ID:** Unique ID within the list (0-39) to identify the event. **Code:** Abbreviation of the event followed by a numeric fault code in parentheses. **Severity:** Severity of the fault. **Description:** Name of the event (Reference Table 6 on page 36).
Component	**Location:** The location in the system where the event originated (e.g.: Phase A, Phase B, Phase C). **Area:** The specific area within the location where the event originated (e.g.: Inverter). **Reading:** a data value relevant to the System Event may be recorded in some cases, e.g., detail for an "Inverter Over-Current" alarm would include a reading of the causal high current value. The reading "N.A." is displayed if no appropriate data value exists.

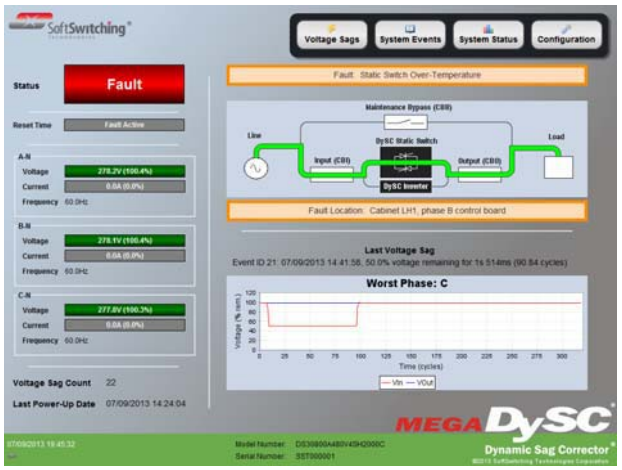
Note: Each time the unit is powered up, the system will generate an informational "Unit Power On" event to record the power up time. The duration of this event is the time since the last power down.

System Event Notification

When the MegaDySC system first detects an alarm condition, a popup window will be displayed (See Figure 17). The popup window can be closed by tapping the "Close" button or waiting 15 seconds. While the alarm is active the display will show "Fault" in the status field. (See Figure 18).

Figure 17 - System Event Detection

Figure 18 - System Event In Progress



After the alarm condition is corrected, the MegaDySC must reset before sag correction is available. During this time the display will show “Resetting” in the status field and indicate the amount of time left before the reset is complete. (See Figure 19). When the reset time is complete a new popup window will be displayed. Tap “View Event” to view the complete event detail, or “Close” to close the popup window (See Figure 20).

Figure 19 - System Event Resetting

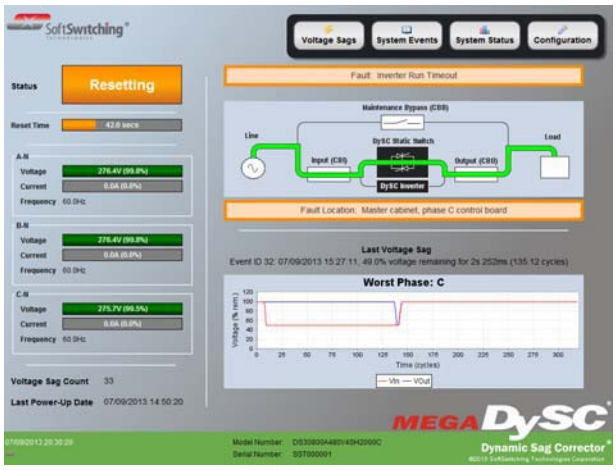
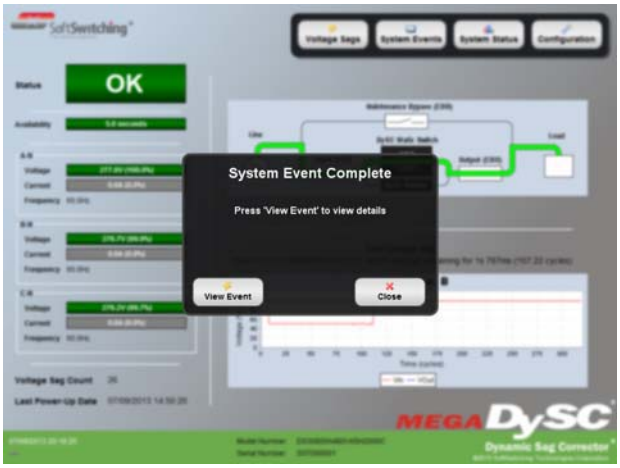


Figure 20 - System Event Complete



If a “Call Service” severity system event is detected, record the system event details including: name, description, location, and reading. Contact Rockwell Automation Technical Support. If the alarm clears, the touch screen will automatically go back to normal operation.

Maintaining the Touch Screen Panel

Take care not to damage the touch display.

- Do not subject the touch display to heavy impact.
- Use your bare finger or a plastic stylus to tap the touch display.
- Do not tap, push, or rub the touch display surface with any object that might cut or damage the touch screen membrane (no glass, metal, pens, pencils, or screwdrivers).
- The touch display panel is not waterproof.

Cleaning the Control Panel

- Use a soft cloth to clean the touch display.
- Do not use harsh detergent or an abrasive sponge.
- DO NOT USE alcohol, ammonia, toluene, or acetone.

Restarting the Touch Screen Interface

If the touch screen interface becomes unresponsive, it can be reset by one of the following methods:

Soft Reset: Press and hold the bottom-right corner of the screen for 5 seconds to reinitialize the touch screen interface. While you are holding this corner, you will see “gui restart” and a timer counting down in the status bar.

Hard Reset: Press the blue pushbutton to the left of the touch screen to force the touch panel hardware to reboot. Upon reboot, the touch screen interface will be redisplayed.

Maintenance

Preventative Maintenance

The MegaDySC requires very little preventative maintenance. The MegaDySC should be checked periodically for proper air flow and status indicator operation.

Monthly Checks

- Ensure the touch screen display is working and no active events are displayed.
- Check that the Automatic Bypass switchboard is in the MegaDySC Normal mode.
- Update system time, if needed, see Figure 8 on page 25.
- Clean the display screen if needed. See page33.
- Ensure air intake and exhaust filters are not covered or obstructed.

3-6 Month Checks

- Check air filters and clean when necessary.
  - Air filters for the MegaDySC will require periodic cleaning, with the frequency depending on the environment.
  - Filters are located on the doors of each MegaDySC and ER cabinet, and can be accessed with the doors closed.
  - The MegaDySC need not have power removed for this operation.
  - Remove the grill covers by unscrewing the knurled nuts; the washable foam filter pads are behind the grill cover.
  - Replace or gently wash the foam filter pads as needed with a light non-abrasive soap and water mixture. Towel-dry; do not wring-out.
  - Place the filter and grill cover back into their location and re-install the knurled nuts until finger tight.
  - Replace filters if damaged.
  - Consult Rockwell Automation technical support for replacement filters.
  - Replacement filters must be no more restrictive to air flow than the original equipment filters.
- Check fan for proper operation.
  - Refer to the Hardware Service Manual for fan test instructions.

Table 6 - System Event Table

Event Code	Code Name	Full Name	Severity	Area	Event Description	Event Resolution
1	POWER_ON	DySC Power On	Informational	Unit	Power re-applied to the DySC.	No action needed.
4	T_FAN_ST	Fan Test Start	Informational	Unit	Start acknowledgment of DySC fan test.	No action needed.
5	T_IN_ST_1	Inverter Test (.5 cycles) Start	Informational	Unit	Start acknowledgment of DySC 0.5 cycle inverter test.	No action needed.
6	T_IN_ST_2	Inverter Test (3 cycles) Start	Informational	Unit	Start acknowledgment of DySC 3 cycle inverter test.	No action needed.
7	T_IN_ST_3	Inverter Test (5.5 seconds) Start	Informational	Unit	Start acknowledgment of DySC 5.5 second inverter test.	No action needed.
9	EXTERNAL	External Inhibit	Auto-Resetting	Inverter	Controller is inhibited by another phase controller.	Review event details from other phase controllers.
10	EXT_SLAVE	External Slave Cabinet Inhibit	Auto-Resetting	Inverter	Master controller is inhibited by another phase master controller.	Review event details from slave controllers.
11	RUN_TO	Inverter Run Timeout	Auto-Resetting	Inverter	DySC inverter had a total cumulative runtime of more than rated.	No action needed.
12	LIM_CYCLE	Inverter Limit Cycle Timeout	Auto-Resetting	Inverter	Power was re-applied more than once within a 58 second period.	No action needed.
13	STAT_OT	Static Switch Over-Temperature	User Attention	Static Switch	Static switch heatsink temperature was greater than maximum rating.	Verify ambient temperature is within DySC specification. Check for damaged fans. Check for dirty or obstructed air filters.
14	OVERLOAD	Overload	User Attention	Unit	Inverter inhibited because load current exceeded maximum rating.	Reduce load. In parallel DySC systems, verify proper current sharing among slave cabinets.
15	DC_OV	DC Bus Over-Voltage	User Attention	Inverter	Positive or negative half of DC bus voltage exceeded maximum rating.	Verify line voltage is within ratings. Verify proper DySC application. Call service.
16	CNTRL_UV	Controller Power Under-Voltage	User Attention	Inverter	DySC control power supply is out of tolerance.	Verify DySC is online and line voltage is within ratings. Call service.
17	OUTPUT_UV	Output Under-Voltage	User Attention	Inverter	DySC output voltage was less than 80% of nominal during sag correction. Sag condition likely outside of DySC specification.	Verify line voltage is within ratings. Verify proper DySC application.
18	INV_OC	Inverter Over-Current	User Attention	Inverter	Inverter current exceeded maximum rating during sag correction.	Verify load current is within ratings. Verify mechanical bypass circuit breaker CBB is open. Verify proper DySC application.
19	DC_UV	DC Bus Under-Voltage	User Attention	Inverter	DC bus voltage below operational range.	Verify line voltage is within ratings. Call service.
20	OUTPUT_OV	Output Over-Voltage	Call Service	Inverter	DySC output voltage was greater than 115% of nominal during sag correction.	Call service.
22	IGBT	IGBT Pack	User Attention	Inverter	IGBT pack reported error. Possible sag condition outside of DySC specification.	Verify line voltage is within ratings. Verify proper DySC application. Call Service.
24	GATE_ERR	Gate Command Error	Call Service	Static Switch	Master/slave gate command error.	Call service.
25	SYNC_ERR	Line Synchronization Error	Call Service	Inverter	Inverter not synchronized to line when sag detected.	Call service.
26	SLAVE_1	Slave Cabinet 1 Inhibit	Auto-Resetting	Inverter	Master controller inhibited by slave controller.	Review event details from slave controllers.
27	SLAVE_2	Slave Cabinet 2 Inhibit	Auto-Resetting	Inverter	Master controller inhibited by slave controller.	Review event details from slave controllers.
28	CR_SLV_1	Critical Slave Cabinet 1 Inhibit	Manual Reset	Static Switch	Master controller inhibited by slave controller. Mechanical bypass commanded.	Review event details from slave controllers. Call service.
29	CR_SLV_2	Critical Slave Cabinet 2 Inhibit	Manual Reset	Static Switch	Master controller inhibited by slave controller. Mechanical bypass commanded.	Review event details from slave controllers. Call service.
30	CRIT_OL	Critical Static Switch Overload	User Attention	Static Switch	Slave cabinet current exceeded maximum rating. Mechanical bypass commanded.	Verify proper current sharing among slave cabinets. Verify proper DySC application. Call service.

Event Code	Code Name	Full Name	Severity	Area	Event Description	Event Resolution
31	CONFIG	Configuration Alert	Call Service	Inverter	Controller configuration has changed.	Call service.
32	CNTRL_MEM	Controller Memory Busy	Auto-Resetting	Inverter	Controller is loading new data into Flash memory.	No action needed.
33	UNBALANCE	Start-Up Test: DC Bus Unbalance	Call Service	Inverter	Positive and negative halves of the DC bus did not charge equally during power up.	Call service.
34	AC_V_CHK	Start-Up Test: AC Voltage Check	Call Service	Inverter	Output voltage was detected out of tolerance during the start-up test.	Call service.
35	ROLL_CALL	Start-Up Test: Controller Roll Call Timeout	Call Service	Unit	Controller communication problem detected during start-up test.	Call service.
36	COM_VER	Start-Up Test: Communication Compatibility Mismatch	Call Service	Unit	Firmware communication compatibility problem detected during start-up test.	Call service.
37	CNFG_TO	Start-Up Test: Controller Configuration Timeout	Call Service	Unit	Controller communication problem detected during start-up test.	Call service.
38	CNFG_ERR	Start-Up Test: Controller Configuration Mismatch	Call Service	Unit	Controller firmware configuration problem detected during start-up test.	Call service.
39	FIRM_TO	Start-Up Test: Controller Firmware Check Timeout	Call Service	Unit	Controller communication problem detected during start-up test.	Call service.
40	FIvRM_DIFF	Start-Up Test: Controller Firmware Revision Mismatch	Call Service	Unit	Controller firmware revision mismatch detected during start-up test.	Call service.
41	SRL_TO	Start-Up Test: Controller Serial Number Check Timeout	Call Service	Unit	Controller communication problem detected during start-up test.	Call service.
42	SRL_DIFF	Start-Up Test: Serial Number Mismatch	Informational	Unit	Controller serial number mismatch detected during start-up test.	No action needed.
44	T_INV_TO	Inverter Test Timeout	Call Service	Unit	Phase control board failed to respond to Comm board's Inverter test.	Call service.
46	DOOR_OPEN	DySC Cabinet Door Open	Manual Reset	Unit	DySC door was opened. Mechanical bypass commanded.	Close door. Manually reset DySC.
47	CRIT_OT	Critical Over-Temperature	Manual Reset	Unit	Internal DySC temperature exceeded maximum rating. Mechanical bypass commanded.	Verify ambient temperature is within DySC specification. Check for damaged fans. Check for dirty or obstructed air filters. Manually reset DySC.
48	FUSE_OPEN	Fuse Open	Call Service	Unit	One of the DySC fuses was detected open. Mechanical bypass commanded.	Call service.
49	OPEN_SCR_A	Open SCR Phase A	Call Service	Static Switch	The SCR on the phase A module was detected open.	Call service.
50	OPEN_SCR_B	Open SCR Phase B	Call Service	Static Switch	The SCR on the phase B module was detected open.	Call service.
51	OPEN_SCR_C	Open SCR Phase C	Call Service	Static Switch	The SCR on the phase C module was detected open.	Call service.
52	EXT_MB	External Mechanical Bypass Command	Manual Reset	Unit	The DySC was externally commanded to transfer to mechanical bypass.	Manually reset DySC.
53	DYN_BRAKE	Dynamic Brake Error	Call Service	Unit	A problem was detected with the DySC dynamic brake controller.	Call service.
54	SLAVE_OL	Critical Slave Cabinet Overload	User Attention	Unit	Slave cabinet current exceeded maximum rating. Mechanical bypass commanded.	Verify proper current sharing among slave cabinets. Verify proper DySC application. Call service.
55	MSTR_A_UV	Phase A Master Controller Under-Voltage	Call Service	Unit	Phase A master controller power supply failure. Mechanical bypass commanded.	Call service.
56	MSTR_B_UV	Phase B Master Controller Under-Voltage	Call Service	Unit	Phase B master controller power supply failure. Mechanical bypass commanded.	Call service.
57	MSTR_C_UV	Phase C Master Controller Under-Voltage	Call Service	Unit	Phase C master controller power supply failure. Mechanical bypass commanded.	Call service.
58	PLC_ERR	Programmable Logic Controller Error	Call Service	PLC	PLC error detected.	Call service.

Servicing

ATTENTION: Service must be performed by qualified personnel only.

Refer to the Hardware Service Manual for detailed instructions. Before attempting any servicing that requires opening the MegaDySC doors first put the system into Maintenance Bypass mode as described in the section Automatic Bypass Switchboard Operation on page 20

WARNING: The MegaDySC and optional ER cabinets are interlocked. Opening cabinet doors while in the MegaDySC "normal" mode will cause immediate automatic bypass operation and subsequent loss of voltage sag protection while in "maintenance bypass" mode. Automatic Bypass switchboard cabinet doors are not interlocked and should be kept locked to avoid exposure to dangerous voltages.

Automatic Circuit Breakers, Safety Interlocks and Stored Energy

Figure 7 on page 22 shows the arrangement of circuit breakers CBI, CBO, and CBB of the Automatic Bypass switchboard. If the MegaDySC cabinet doors are opened while the system is operating in normal mode the circuit breaker CBB will automatically close and CBI and CBO will be automatically opened, putting the system into maintenance bypass mode until it is manually reset. Voltage sag protection is not possible in the maintenance bypass mode. All doors should be kept locked to avoid this situation.

The MegaDySC includes a fast-discharge circuit to quickly dissipate stored energy when the circuit breaker CBI is opened. CBI may be operated automatically by the door interlock switches or other protection devices. CBI can also be operated manually.

If the upstream power is interrupted before CBI is opened the fast-discharge circuit will not be triggered. In that case wait at least 30 minutes before opening the MegaDySC cabinet or ER cabinet doors to avoid exposure to charged capacitors. High voltage remains on capacitors if the red LED indicators above the module capacitor banks are lighted.

Fuses

Fast-acting fuses are included to protect the MegaDySC system in the event of a load-short circuit or other conditions. Fuses are located within the Automatic Bypass switchboard cabinet, the MegaDySC cabinet and the optional ER storage cabinet. To maintain protection of the MegaDySC system, fuses must be replaced with the same or exact replacement type. Replacement fuses are available through Rockwell Automation Technical Support and should only be replaced by qualified and factory authorized service personnel.

Automatic Bypass Switchboard Fuses

Refer to the fuse listing label located on the switchboard cover for fuse size and type. Before replacing a switchboard fuse authorized service personnel will require removal of power to the Automatic Bypass switchboard by opening and locking-out the upstream circuit breaker.

WARNING: De-energize the Bypass switchboard before removing covers to access fuses. Failure to comply with this warning can result in injury or death

MegaDySC and ER Cabinet Fuses

A large label inside the MegaDySC doors shows fuse locations. A similar label is located within the optional ER storage cabinets. Fuse types are listed in Table 7. Before replacing a MegaDySC cabinet fuse, factory authorized service personnel must transfer the MegaDySC system to maintenance bypass mode. No attempt should be made to service the MegaDySC if red LEDs located above the DC bus capacitors are lighted.

WARNING: De-energize the MegaDySC electronics by placing the system into Maintenance Bypass mode before opening the MegaDySC or ER cabinet doors to replace any fuse.

WARNING: The MegaDySC has high voltage remaining up to 30 minutes after disconnection from the AC line. Touching exposed or disconnected terminals, cables or parts of the MegaDySC can lead to serious injuries or even death. Wait for a minimum of 5 minutes before performing any service or testing on the MegaDySC after power is removed. Keep doors closed until all internal LED indicators are extinguished.

WARNING: Keep the cabinet doors closed to ensure proper cooling airflow and to protect personnel from dangerous voltages inside the MegaDySC

IMPORTANT A qualified electrician must replace the fuses. Open the front cabinet door(s) to access the fuse holders and fuses.

To maintain protection of the MegaDySC, be sure to replace the fuse with the same type and rating. These fuses are available through Rockwell Automation Technical Support.

Table 7 - MegaDySC Fuse Schedule

MegaDySC Main Cabinet Fuses			
Fuse Reference	**Fuse Location**	**Fuse Rating**	**Manufacturer Part Number**
F1, F2, F3	Main Cabinet: Main Power Input	800A/500V	Mersen A50QS800-4IL
F4, F5, F6	Main Cabinet: Cross-Coupling Transformer	200A/600V	Mersen AJT200
F10, F11	Main Cabinet: Output Control Transformer	4A/600V	Mersen TRS4R
F12	Main Cabinet: Input Control Transformer	2A/600V	Mersen TRS2R
F13 - F24 (SR Models)	Main Cabinet: Dynamic Brake	20A/600Vdc	Mersen ATM20
F13 - F24 (ER Models)	Main Cabinet: Dynamic Brake	25A/600Vdc	Mersen ATM25
MegaDySC Power Module Fuses			
Fuse Reference	**Fuse Location**	**Fuse Rating**	**Manufacturer Part Number**
F1, F2	Power Module (x3): Voltage Feedback	2A/600V	Mersen ATQR2
F3	Power Module (x3): Inverter Output	400A/500V	Mersen A50QS400-4IL
MegaDySC ER Cabinet Module Fuses (ER models only)			
Fuse Reference	**Fuse Location**	**Fuse Rating**	**Manufacturer Part Number**
F1, F2, F3, F4	ER Module (x6)	70A/500Vdc	Mersen A50QS70-4

Specifications

Table 8 - Typical Technical Specifications 800-2400 A MegaDySC

Electrical Input/Output (Normal Mode—Static Switch)	
Connection Configuration	Series-connected with load. Under normal line condition, the static switch passes utility voltage directly to the load
Rated Input Voltage	3-Phase: 380, 400, 415, 460, 480V[1]
Voltage Range	±10%
Static Bypass Current	100% rated rms current continuous, 150%-400% @ 5 sec., 400%-600% @ 0.5 sec., 600% @ 0.1s
Frequency	50/60 Hz Auto Sensing
Frequency Range (tracking)	45 to 65 Hz
TVSS	Output SPD, 80kA/mode. Protects L-L & L-G on all models; L-N & N-G (4-wire models)
Efficiency	> 99%
System Short Circuit Current Rating (SCCR)	65kA (800A, 1200A models), 85kA (1600A, 2000A models), 100kA (2400A models)
Phase (wiring)	3 phases+Ground (3-wire models) or 3 phases+Neutral+Ground (4-wire models)
Electrical Output (Sag Correction Mode—Inverter)	
Sag Detection Voltage	88.5% of rated voltage
Response Time (typical)	0.7 ms detection, 1.2 ms inverter reaction (<2ms)
Output Voltage	Pre-sag rms voltage
Voltage Regulation	±5% typical, +5% / -13% of nominal max
Output Current	rated current, rms amperes[2]
Crest Factor (at rated load)	1.45
Load	Power factor -0.5 to +0.9. Not rated for DC loads; max. allowable 2% DC loading
Voltage Waveform	Sine wave
Voltage Sag Correction Times	
Single Event	
3 phase 87% to 50% voltage remaining	5 seconds
All three phases to zero voltage remaining	50ms (SR) or 200ms (ER). Based on nameplate ratings with a power factor of 0.7
Multiple Events	
Max Sag Correction Time	5 seconds cumulative usage
Sequential Sag Recovery	0 seconds (assuming cumulative run-time available)
Full Recovery Time	Max. 5 minutes
Mechanical	
Enclosure Ratings	NEMA 1 (IP20)
Cable Entry	Top or Bottom of Switchboard section
Cooling	Filtered Forced air, controlled
Access	Front for servicing. Rear access required for bottom entry installation.
Environmental	
Ambient Temperature	0 to 40°C (32°F to 104°F)
Storage Temperature	-40°C to 75°C (-40°F to 167°F)
Relative Humidity	0 to 95% non-condensing
Altitude	Rated current available to 1000m (3300ft). De-rate output current 10% per 1000m, from 1000m to 3000m (9900ft).
Audible Noise	< 70dBA at 1 meter
Safety and Compliance	
Agency Approvals	cULus Listed (UL 1012)
Standards Compliance	Exceeds SEMI F47 Standard; IEEE Std C62.41.1 and UL 1449 3rd Ed. Compliant

1. MegaDySC has not been evaluated for use in Corner Grounded or Ungrounded Delta Power Systems in systems rated over 240V.

2. When using MegaDySC with motor drive loads, either insert 3% to 5% line reactance at MegaDySC output or limit motor drive loads to 60% of MegaDySC rating

Notes:

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support, you can find technical manuals, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools. You can also visit our Knowledgebase at http://www.rockwellautomation.com/knowledgebase for FAQs, technical information, support chat and forums, software updates, and to sign up for product notification updates.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect^{SM} support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/support/.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/rockwellautomation/support/overview.page, or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to help ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

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