

S3534SR
Ride-Thru System

208 - 460V AC, 5-50kW
50% Sag Ride-Thru System
For Variable Frequency AC Drives

Customer Reference Manual

Bonitron, Inc.
Nashville, TN



An industry leader in providing solutions for AC drives.

ABOUT BONITRON

Bonitron designs and manufactures quality industrial electronics that improve the reliability of processes and variable frequency drives worldwide. With products in numerous industries, and an educated and experienced team of engineers, Bonitron has seen thousands of products engineered since 1962 and welcomes custom applications.

With engineering, production, and testing all in the same facility, Bonitron is able to ensure its products are of the utmost quality and ready to be applied to your application.

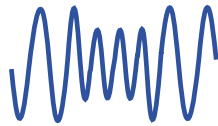
The Bonitron engineering team has the background and expertise necessary to design, develop, and manufacture the quality industrial electronic systems demanded in today's market. A strong academic background supported by continuing education is complemented by many years of hands-on field experience. A clear advantage Bonitron has over many competitors is combined on-site engineering labs and manufacturing facilities, which allows the engineering team to have immediate access to testing and manufacturing. This not only saves time during prototype development, but also is essential to providing only the highest quality products.

The sales and marketing teams work closely with engineering to provide up-to-date information and provide remarkable customer support to make sure you receive the best solution for your application. Thanks to this combination of quality products and superior customer support, Bonitron has products installed in critical applications worldwide.

AC DRIVE OPTIONS

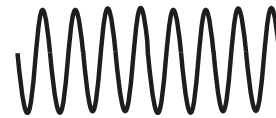
In 1975, Bonitron began working with AC inverter drive specialists at synthetic fiber plants to develop speed control systems that could be interfaced with their plant process computers. Ever since, Bonitron has developed AC drive options that solve application issues associated with modern AC variable frequency drives and aid in reducing drive faults. Below is a sampling of Bonitron's current product offering.

WORLD CLASS PRODUCTS



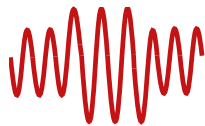
Undervoltage Solutions

Uninterruptible Power for Drives
(DC Bus Ride-Thru)
Voltage Regulators
Chargers and Dischargers
Energy Storage



Power Quality Solutions

12 and 18 Pulse Kits
Filtering
Noise and Transient Suppression
Power Factor Correction



Overvoltage Solutions

Braking Transistors
Braking Resistors
Transistor/Resistor Combo
Line Regeneration
Dynamic Braking for Servo Drives



Common Bus Solutions

Single Phase Power Supplies
3-Phase Power Supplies
Common Bus Sharing Diodes
Isolation Diodes
Bus Filter Capacitance



Green/Sustainable Solutions

Voltage Boosters
(for Solar and Wind Applications)
Line Regeneration
Power Factor Correction



Portable Maintenance Solutions

Capacitor Formers
Battery Testers
Capacitor Testers
Capacitor Dischargers

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1. INTRODUCTION

1.1. WHO SHOULD USE

This manual is intended for use by anyone who is responsible for integrating, installing, maintaining, troubleshooting, or using this equipment with any AC Drive System.

Please keep this manual for future reference.

1.2. PURPOSE AND SCOPE

This manual is a user's guide for the Model S3534SR 50% sag DC Bus Ride-Thru System. It will provide the user with the necessary information to successfully install, integrate, and use the S3534SR Module in a variable frequency AC drive system.

In the event of any conflict between this document and any publication and/or documentation related to the AC drive system, the latter shall have precedence.

1.3. MANUAL VERSION AND CHANGE RECORD

Rev 01 is the initial printing of this S3534SR manual.

Fuse and Ratings information was updated in Rev 01a of this manual.

Figure 1-1: S3534SR in the E61 Chassis



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2. PRODUCT DESCRIPTION / FEATURES

Bonitron S3534SR Sag Ride-Thru Systems provide protection from short term line sag events for Variable Frequency Drives (VFDs) that use a fixed rectifier and DC bus. The S3534SR provides sag protection for up to 2 seconds at 50% line sag on all 3 phases.

Industries with continuous processes can suffer huge losses from equipment downtime, loss of production, or damaged product when VFDs trip on under-voltage conditions. While many drives claim to have ride thru capability such as auto restart or kinetic buffering, none are able to control the motor during a complete loss of power.

Typical UPS solutions are designed to increase drive availability, but are connected in series which decreases overall drive system reliability. All Bonitron Ride Thru products connect in parallel with the drive, thus increasing system availability and reliability.

The internal M3534 boost module regulates the dropping battery voltage up to the drives desired DC bus level. This allows the drive to "ride through" these events while, maintaining motor speed and torque without experiencing drive shutdown.

A complete S3534SR system includes a booster, digital display, and a Type-1 enclosure. Standard systems and custom packages are available.

ADVANTAGES

Reliability

- Parallel connection to AC system
- Ride-Thru maintenance can be done while normal process is on-line
- Internal redundancy

Easy retrofit installation

- Works with almost any fixed bus, variable frequency, PWM drive
- Only 2 parallel connections to existing system for DC battery regulator
- Only 3 parallel connections for AC option
- Can use existing AC feed wiring
- Can use existing AC feed breakers

Instant response

Bumpless transfer

Easy commissioning

2.1. RELATED PRODUCTS AND DOCUMENTS

2.1.1. PRODUCTS

S3534CR SERIES RIDE-THRU SYSTEM

Incorporates electrolytic capacitors for short term power outages of 0.1 – 0.5 seconds or sags below 50%.

S3534UR SERIES RIDE-THRU SYSTEM

Incorporates ultra capacitors for short term power outages up to 3 seconds or sags below 50%.

S3534BR SERIES RIDE-THRU SYSTEM

Incorporates batteries for longer term power outages up to 1 minute or longer.

M3460 SERIES RIDE-THRU MODULES

The M3460R 230-575VAC Ride-Thru System is designed to maintain

inverter bus under 3-phase 50% sag conditions with multiple cabinet systems rated up to 1200kW.

The M3460B 350-400VDC Ride-Thru System is designed to boost a battery bank up to inverter level under 100% outage conditions.

M3528 ULTRA CAP / BATTERY CHARGER

M3528 is a voltage and current limited power supply used to charge electrical energy storage devices such as battery banks or ultra capacitor reservoirs for industrial voltage levels of 240 and 480V. User inputs allow for remote enable and second setpoint charging for battery equalization.

2.1.2. OTHER REFERENCE MANUALS

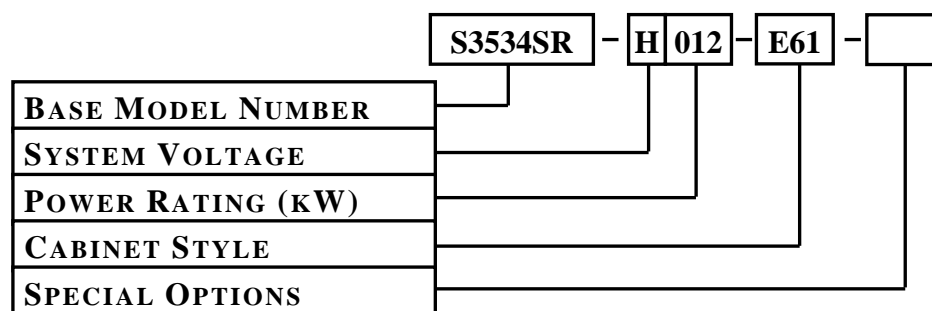
The following manuals are referenced in this manual. These individual manuals detail operation and setup of the individual components within the system.

- Boost converter: M3534R
- Display: M3660-DD3

Please visit our website (www.bonitron.com) for additional information.

2.2. PART NUMBER BREAKDOWN

Figure 2-1: Example of Part Number Breakdown



BASE MODEL NUMBER

The base model number for the 50% sag Ride-Thru System is **S3534SR**.

CONTROL VOLTAGE RATING

The System Voltage rating indicates the nominal AC/DC voltage levels of the AC Drive system the Ride-Thru is intended to support.

The S3534SR Ride-Thru System is available for either of several standard AC/DC voltages. A code letter indicates the system voltage.

Table 2-1: System Voltage Rating Codes

RATING CODE	VOLTAGES (NOMINAL AC LINE / DC BUS)
U	115VAC Line / 160VDC
L	230VAC Line / 320VDC
E	400VAC Line / 565VDC
H	460VAC Line / 640VDC

POWER (KW)

The Power rating indicates the maximum power in kilowatts that can safely be handled by the S3534SR. This rating is directly represented by a 3-digit value. For instance, the rating code for a 12kW S3534SR is **012**.

CHASSIS STYLE

Enclosure type and size is dependent on the Ride-Thru System specifications.

Table 2-2: Cabinet Sizes and Codes

CHASSIS CODE	CHASSIS DESCRIPTION
E61 / W61	24"(H) x 20"(W) x 12"(D) Type-1 wall mount enclosure
E63 / W63	30"(H) x 24"(W) x 12"(D) Type-1 wall mount enclosure

SPECIAL OPTIONS

There are no Special Options available at this time.

2.3. GENERAL SPECIFICATIONS

See Section 6 for specific model specifications.

Table 2-3: General Specifications Table

PARAMETER	SPECIFICATION
Boost Module Power Rating	5 – 50kW
AC Input Voltage	208 – 460VAC
DC Output Voltage	265 – 595VDC
DC Output Current	20 – 40 amps
Maximum Sag Duration	50% all 3 phases for 2 seconds
Inactive Power Usage	Less than 25 watts
Field Connections	AC Line Input DC Bus Output Ground
Disconnect	5-pole for AC in / DC out with door mounted actuator
Display	DD3 Digital Display is standard
Enclosure	Type-1
Operating Temperature	40°C
Storage Temp	-20°C to +65°C
Humidity	Below 90% non-condensing
Atmosphere	Free of corrosive gas and conductive dust

2.4. GENERAL PRECAUTIONS AND SAFETY WARNINGS



DANGER!

- **HIGH VOLTAGES MAY BE PRESENT!**
- **NEVER ATTEMPT TO OPERATE THIS PRODUCT WITH THE ENCLOSURE COVER REMOVED!**
- **NEVER ATTEMPT TO SERVICE THIS PRODUCT WITHOUT FIRST DISCONNECTING POWER TO AND FROM THE UNIT.**
- **ALWAYS ALLOW ADEQUATE TIME FOR RESIDUAL VOLTAGES TO DRAIN BEFORE REMOVING THE ENCLOSURE COVER.**
- **FAILURE TO HEED THESE WARNINGS MAY RESULT IN SERIOUS BODILY INJURY OR DEATH!**



CAUTION!

- **THIS PRODUCT SHOULD BE INSTALLED ACCORDINGLY ON NON-FLAMMABLE SURFACES WITH CLEARANCES OF AT LEAST TWO INCHES IN ALL DIRECTIONS.**
- **BEFORE ATTEMPTING INSTALLATION OR REMOVAL OF THIS PRODUCT, BE SURE TO REVIEW ALL DRIVE AND/OR RESISTIVE LOAD DOCUMENTATION FOR PERTINENT SAFETY PRECAUTIONS.**
- **INSTALLATION AND/OR REMOVAL OF THIS PRODUCT SHOULD ONLY BE ACCOMPLISHED BY A QUALIFIED ELECTRICIAN IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE OR EQUIVALENT REGULATIONS.**

ANY QUESTIONS AS TO APPLICATION, INSTALLATION, OR SERVICE SAFETY SHOULD BE DIRECTED TO THE EQUIPMENT SUPPLIER.

3. INSTALLATION INSTRUCTIONS



- **INSTALLATION AND/OR REMOVAL OF THIS PRODUCT SHOULD ONLY BE PERFORMED BY A QUALIFIED ELECTRICIAN IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE OR LOCAL CODES AND REGULATIONS.**

Proper installation of the S3534SR Ride-Thru System should be accomplished following the steps outlined below. Be sure to refer to the AC Drive instruction manual as these steps are performed. Please direct all installation inquiries that may arise during the installation and start up of this product to the equipment supplier or system integrator.

**** See Section 7.1 for additional installation considerations.**

3.1. ENVIRONMENT

The installation site for the module should be chosen with several considerations in mind.

- The unit has a Type-1 rating and will therefore require some protection from the elements.
- Conduit access for field wiring is provided on the top-right surface of the enclosure.
- The unit will require a minimum clearance of two (2) inches in all directions around it when mounted near a non-heat source.
- The mounting surface should be clean and dry.

3.2. UNPACKING

Upon receipt of this product, please verify that the product received matches the product that was ordered and that there is no obvious physical damage to the unit. If the wrong product was received or the product is damaged in any way, please contact the supplier from which the product was purchased.

3.3. MOUNTING

Once the installation site has been selected as outlined above, the unit should be mounted in place. The Ride-Thru enclosure is provided with (4) 7/16" diameter mounting holes.

Mounting holes should be drilled and mounting studs or anchors installed before positioning the enclosure. Mounting hardware is not supplied.

Refer to Section 6.5 of this manual to determine the correct mounting dimensions and provisions for the unit.



- **THE S3534SR ENCLOSURE IS HEAVY!**
- **A MINIMUM OF TWO PEOPLE SHOULD BE USED TO POSITION THE UNIT!**

3.4. WIRING AND CUSTOMER CONNECTIONS

This section provides information pertaining to the field wiring connections of the S3534SR Ride-Thru System. Actual connection points and terminal numbers of the AC Drive system will be found in the documentation provided with that system.

Be sure to review **all** pertinent AC Drive System documentation as well as the Power Wiring details in Section 3.4.1 before proceeding.



▪ **INTERCONNECT WIRING OF THIS PRODUCT SHOULD ONLY BE DONE BY A QUALIFIED ELECTRICIAN IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE OR EQUIVALENT REGULATIONS.**

3.4.1. POWER WIRING

Several illustrations are provided to assist with the field connection of the S3534SR Ride-Thru System to an existing AC drive system. Also, be sure to refer to the documentation supplied with the drive system for field connection points within that system.

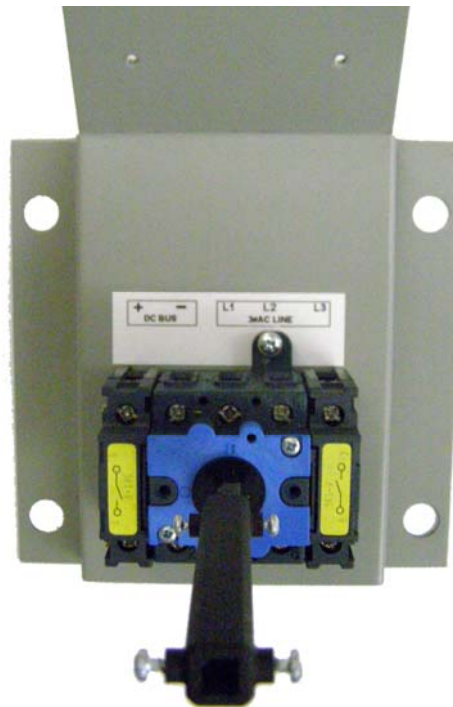
Figure 3-1 shows the typical Field Connection Terminal layout for the S3534SR. Figure 3-2 shows a typical power interconnection of the S3534SR with an existing AC Drive System.

Field connection terminals for the DC Bus output and AC Line input are located on field connection Disconnect Switch DISC1 at the top right of the enclosure backplate. Ground connection is located on the right side of the backplate. See Table 3-1 for wire sizing. See Figures 3-3 and 3-4 for the location of DISC1 in a typical enclosure.

Table 3-1: Field Wiring Connections

TERMINAL	FUNCTION	ELECTRICAL SPECS		MIN WIRE AWG	MAX WIRE AWG	TORQUE
DISC1-1	DC Power Output +	12 kW	650VDC, 20A	14 AWG	8 AWG	7 - 14 lb-in
DISC1-2	DC Power Output -		650VDC, 20A			7 - 14 lb-in
DISC1-3,4,5	AC Power Input		460VAC, 30A			7 - 14 lb-in
GND	System Ground	Limited by Ring Lug 3/8"				40 - 50 lb-in
DISC1-3	DC Power Output +	24 kW	650VDC, 30A	14 AWG	8 AWG	7 - 14 lb-in
DISC1-4	DC Power Output -		650VDC, 40A			7 - 14 lb-in
DISC1-3,4,6	AC Power Input		460VAC, 60A			7 - 14 lb-in
GND	System Ground	Limited by Ring Lug 3/8"				40 - 50 lb-in
DISC1-5	DC Power Output +	50 kW	650VDC, 85A	12 AWG	2 AWG	30 - 35 lb-in
DISC1-6	DC Power Output -		650VDC, 85A			30 - 35 lb-in
DISC1-3,4,7	AC Power Input		460VAC, 120A			30 - 35 lb-in
GND	System Ground	Limited by Ring Lug 3/8"				40 - 50 lb-in

Figure 3-1: S3534SR Field Connection Terminal Layout – DISC1



3.4.2. DC BUS OUTPUT (DISC1-1,2)

The DC output connections supply power to the drive being backed up. Connect them directly to the bus capacitors of the VFD. Make sure that there is no precharge resistor or DC link choke between this connection and the main DC bus filter capacitors of the drive. Failure to do so can lead to poor operation or failure.

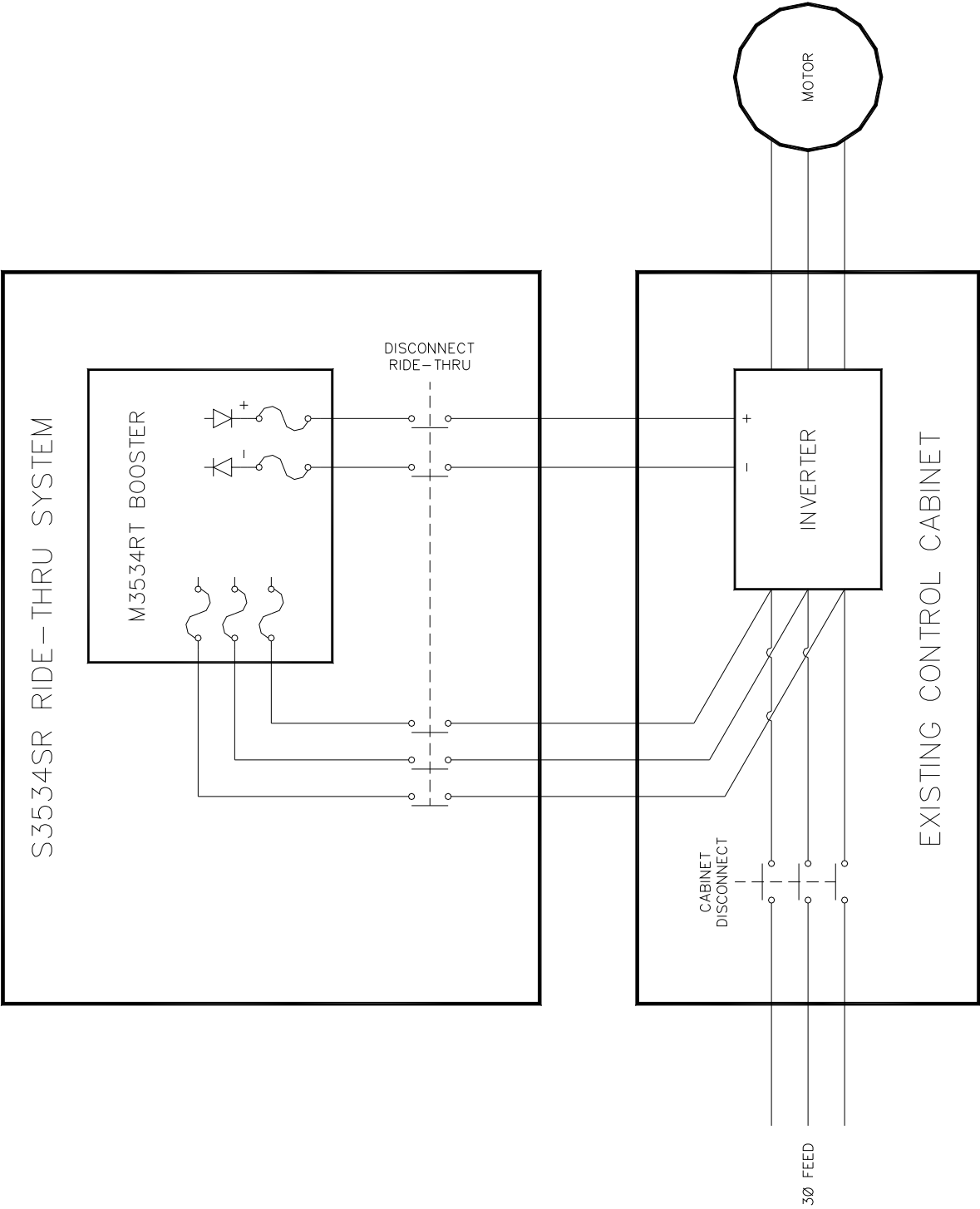
3.4.3. 3-PHASE AC LINE INPUT (DISC1-3,4,5)

The incoming 3 phase AC input connections are made at terminals DISC1-3, DISC1-4, and DISC1-5. Wire size depends on the rated power of the backup system. Refer to section 6 for recommended wire sizes.

3.4.4. GROUND

A main system ground should be connected to the grounding stud mounted on the backplate. This ground wire can be one gauge smaller than the incoming AC lines.

Figure 3-2: Typical S3534SR Interconnection with Existing Drive System



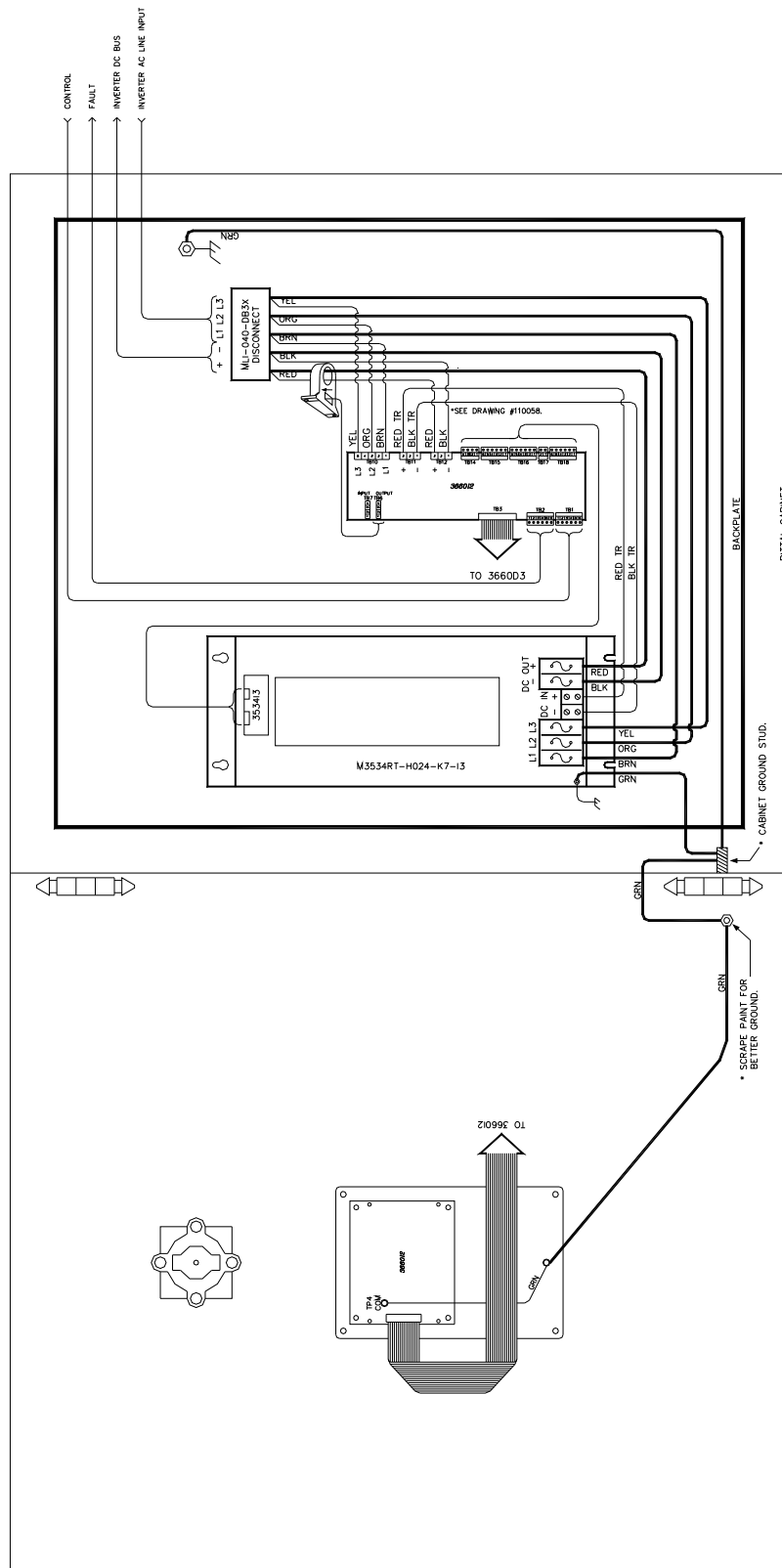
3.4.5. CONTROL WIRING

Control and Status connections are available on the 3660I2 board. See Figure 3-3 for location information. See Section 4 for I/O Descriptions.

Table 3-2: 3660I2 I/O Wiring Specifications

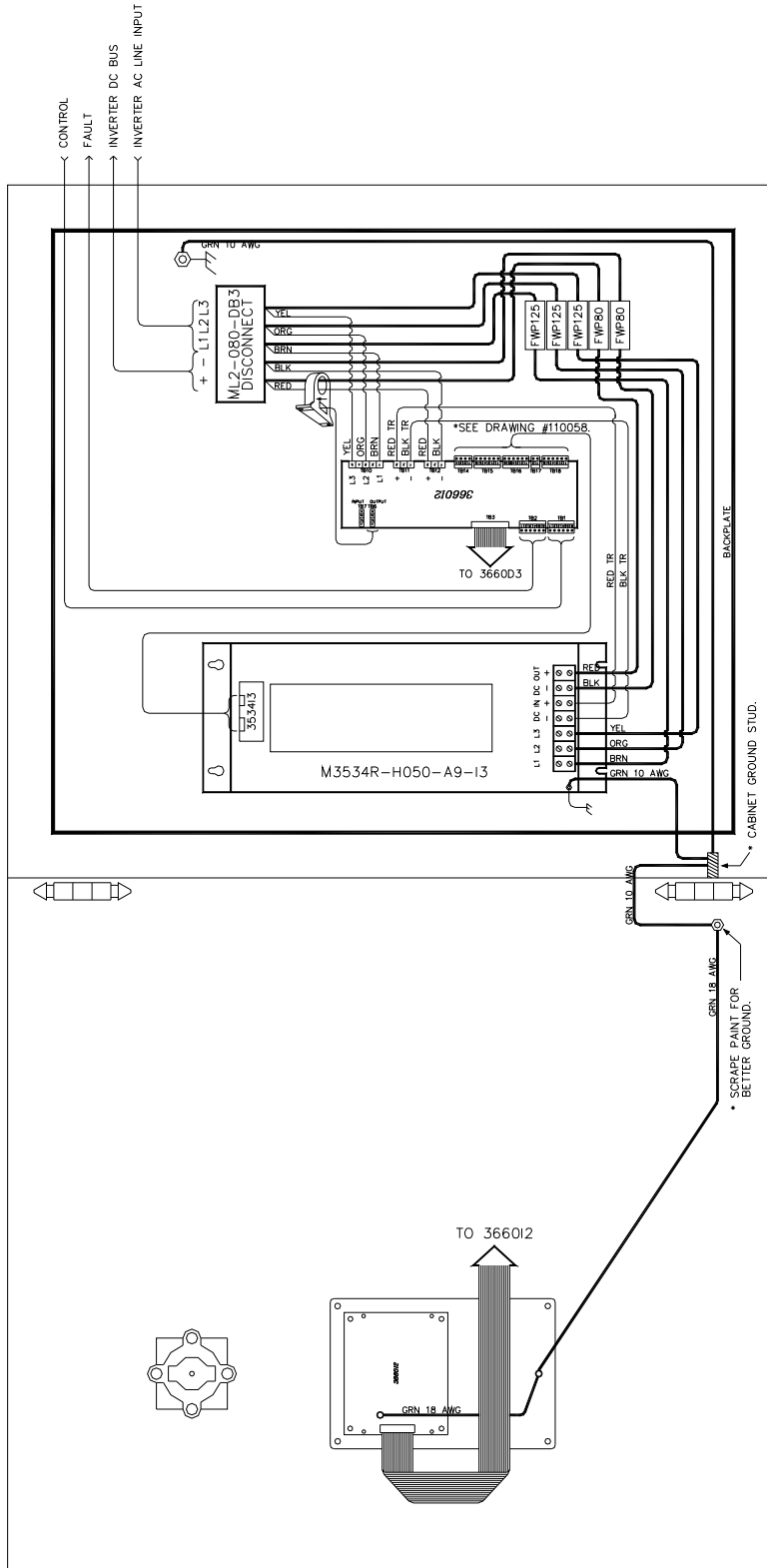
TERMINAL	FUNCTION	ELECTRICAL SPECIFICATIONS	MIN WIRE AWG	MAX WIRE AWG	TORQUE RATING
TB1-1 TB1-2	No Connection	24V, 100mA	18	12	0.22 Nm 2 in-lbs
TB1-3 TB1-4	Remote Test Input	24V, 100mA	18	12	0.22 Nm 2 in-lbs
TB1-5 TB1-6	Enable/Disable Input	24V, 100mA	18	12	0.22 Nm 2 in-lbs
TB2-1 TB2-2 TB2-3	Status 1 Output	300V max 100mA max	18	12	0.22 Nm 2 in-lbs
TB2-4 TB2-5 TB2-6	Status 2 Output	300V max 100mA max	18	12	0.22 Nm 2 in-lbs

Figure 3-3: S3534SR 12 - 24kW Ride-Thru System Internal Wiring



- ~NOTES~
1. ALL WRES SHOWN ARE 1/2 ANG UNLESS OTHERWISE SPECIFIED.
 2. ALL WRES SHOWN ARE 1/8 ANG UNLESS OTHERWISE SPECIFIED.

Figure 3-4: S3534SR 50kW Ride-Through System Internal Wiring



- ~NOTES~
1. ALL WIRES SHOWN ARE 8 AWG UNLESS OTHERWISE SPECIFIED.
 2. ALL WIRES SHOWN ARE 18 AWG UNLESS OTHERWISE SPECIFIED.

Figure 3-5: 3660I2 Board Control and Status Connections

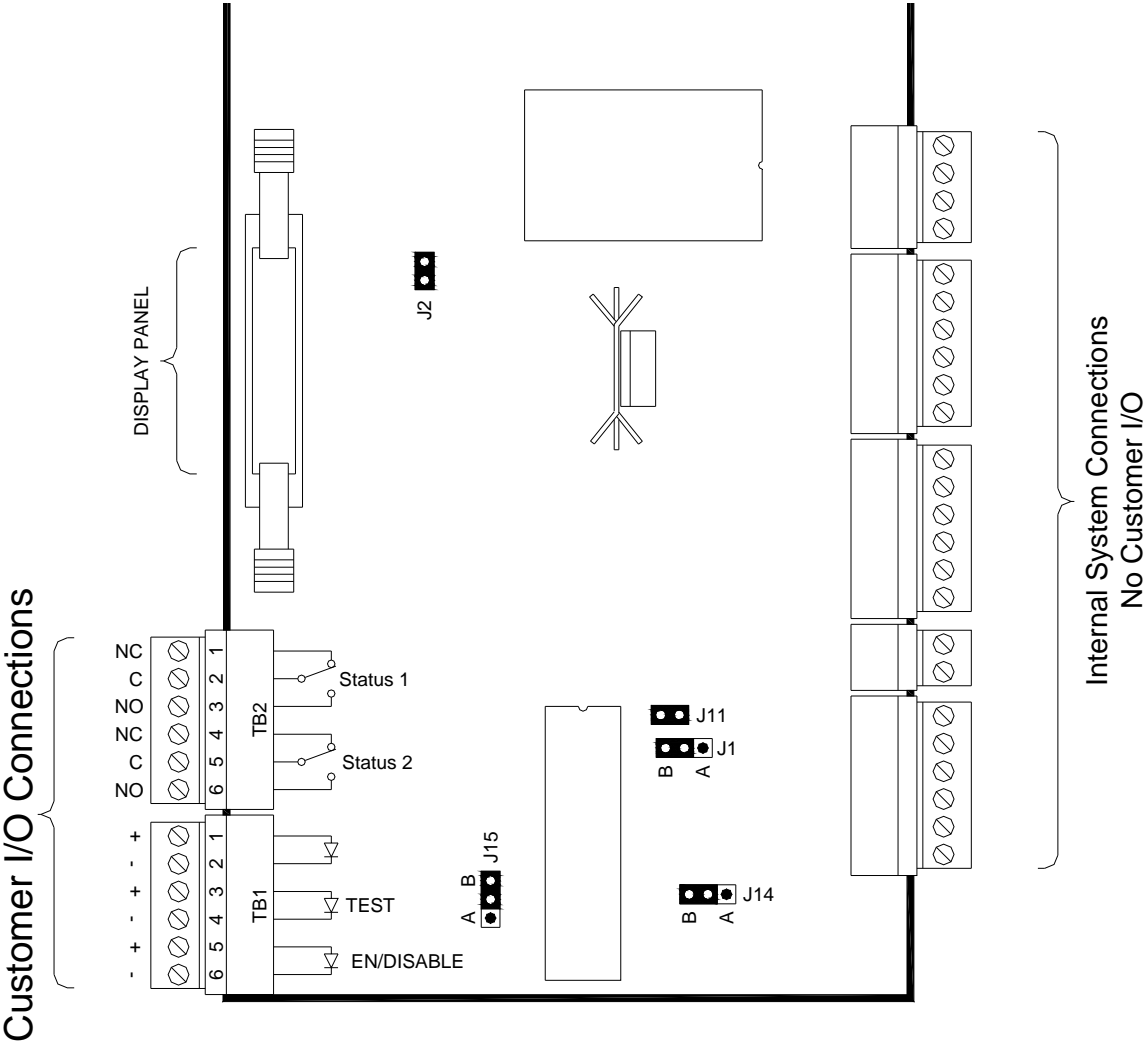
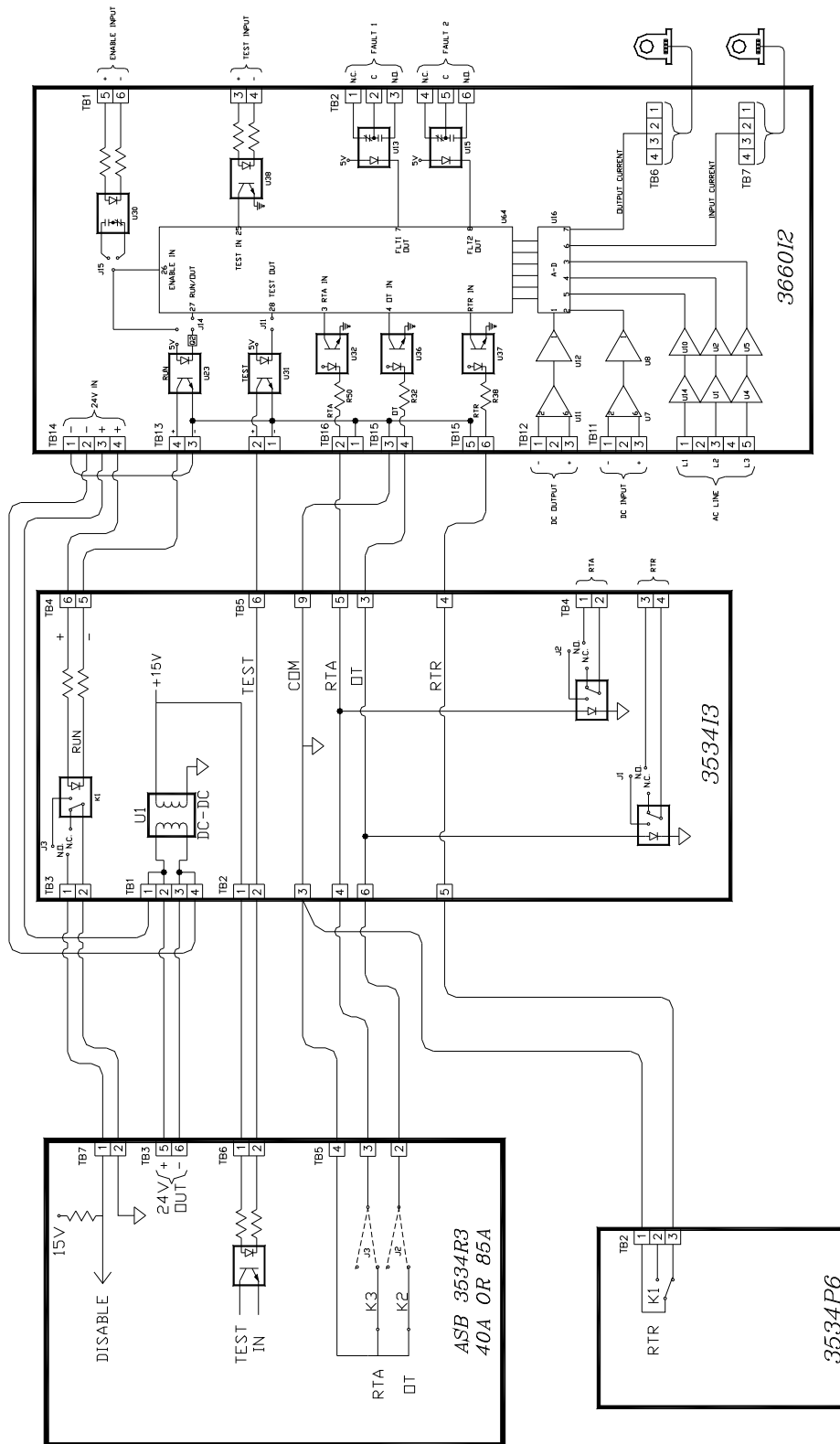


Figure 3-6: DD3 Diagnostic Display Signal Connections



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4. OPERATION

4.1. FUNCTIONAL DESCRIPTION

The S3534SR Ride-Thru System monitors the DC bus of the attached variable frequency drive and provides power in a voltage controlled, current limited supply directly to the filter capacitor section of the drive above the inverter stage.

During a sag event the internal DC bus of the VFD drops. When this level meets the threshold voltage of the S3534SR, power is delivered through blocking diodes to hold up the voltage in the VFD. The boost module regulates and boosts the output voltage to the drive at a constant voltage. In standby mode, or when the incoming AC power is normal, the system energy consumption is minimal.

4.2. FEATURES

4.2.1. TERMINAL STRIP I/O

All S3534SR Ride-Thru Systems use a M3534R booster module. See Figures 3-3 and 3-4 for the location of the booster module inside each cabinet.

Connect to the 3660I2 interface on the L bracket assembly for Control and Status Signals. See Figures 3-3, 3-5, and 3-6 for locations.

4.2.1.1. NO CONNECTIONS - TB1-1&2

This input is unassigned, and currently has no function. There is no connection required to these terminals.

4.2.1.2. REMOTE TEST INPUT - TB1-3&4

These terminals initiate the remote test function. Placing 24V+ on TB1-3 and 24V Common on TB1-4 will cause the system to go into Test mode as described in Section 4.2.4.2. Test mode can also be entered via the DD3 Digital Display on the front of the cabinet. See the M3660-DD3 Display Manual for 3534 for more information.

4.2.1.3. ENABLE/DISABLE INPUT - TB1-5&6

This 24V input enables the booster operation. If this signal is not exerted, the booster will not operate, even during a power interruption. This enable can be configured to be active high for enabling or disabling the Boost Mode operation. This can be configured with the jumpers described in Section 4.2.4.

4.2.1.4. STATUS 1 OUTPUT - TB2-1&2&3

These terminals are the Ready status output. When the Ride-Thru is enabled and ready for operation with no faults, these contacts will change states. This is a form C contact with Normally Closed on TB2-1, Common on TB2-2, and Normally Open on TB2-3.

4.2.1.5. STATUS 2 OUTPUT - TB2-4&5&6

These terminals are a status output that can be configured through the DD3 Display. When the Ride-Thru is enabled and ready for operation with no faults, these contacts will change states. This is a form C

contact with Normally Closed on TB2-4, Common on TB2-5, and Normally Open on TB2-6.

4.2.2. JUMPER CONFIGURATION

The following jumpers are located on the 3660I interface PCB mounted separately from the boost module.

Table 4-1: 3660 I2 Jumper Positions

JUMPER	DESCRIPTION	POSITION	
J2	Factory Use ONLY		Must be installed for proper operation
J11	Test Mode Enable	In (default)	Test Mode can be run from front display
		Out	Test Mode Disabled
J1, J14	Manual/Automatic Mode Selection	A	Manual Shutdown Mode
		B (default)	Automatic Shutdown Mode
J15	Enable Input Mode Selection	A (default)	Enable Mode - Active high to enable system
		B	Disable Mode - Active high to disable system

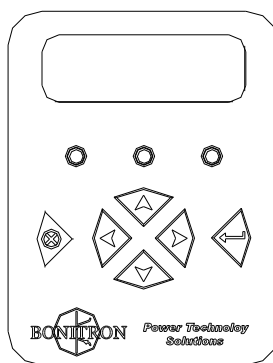
4.2.3. DIAGNOSTIC DISPLAY PANEL

The Ride-Thru Diagnostic Display Panel provides visual indication of the Ride-Thru module's operating status and also permits a system test to be performed. Features are detailed in Table 4-1 and Figure 4-1.

Table 4-2: Diagnostic Display Panel Features

PANEL NAME	LEDS & TEST SWITCH	METERS		COUNTERS		PANEL DIMS.
		VOLTMETER	AMMETER	TOTAL CYCLES	ACTIVE CYCLES	
DD3	✓	✓	✓	✓	✓	7.50" x 5.00"

Figure 4-1: DD3 Display Panel



4.2.4. BASIC DD3 DISPLAY SET UP

4.2.4.1. CONTROL MODES

4.2.4.1.1. ENABLE MODE - DEFAULT

This is the default mode for the Ride-Thru System. In this mode, the Booster Enable input on TB1-5&6 enables the booster. This requires the 24V input signal to be active even during power outages.

4.2.4.1.2. DISABLE MODE

In this mode, the operation of the Booster Enable input is inverted, and a 24V input signal on TB1-5&6 disables the booster. This mode does not require a 24V signal to be active when power is out.

4.2.4.1.3. AUTOMATIC (LOCAL) SHUTDOWN

In the effort of keeping the Bonitron module from running outside its specifications, Bonitron will ship with the system set up for automatic control. Since some applications are of such crucial importance, we realize the desire to continue running may outweigh any concerns for the Ride-Thru modules or battery bank. If your application is this critical, you may want to use the manual mode.

In this mode the processor monitors temperature, active run time, and input voltage, and can shut down the boost function if these go outside of desired parameters. These conditions generate a Fault signal (Status 2) and are available for remote notification. The Input under-voltage (IUV) meant to protect the battery bank from deep discharge can be disabled from the front panel in cases where process is more important than battery life.

To place the display in the Automatic mode, place J1 and J14 in the "B" positions.

4.2.4.1.4. MANUAL (REMOTE) SHUTDOWN

In this mode the processor will only monitor the system status, and will not shut down the run command. In this mode It is recommended that fault signals are monitored, and a remote enable or disable signal be used to stop booster operation.

To place the display in the Manual mode so that automatic shutdown does NOT occur, place J1 and J14 in the "A" positions.

4.2.4.2. TEST MODE

In this mode a 24V input will cause the booster output voltage to increase so that the drive rectifier is reversed biased and power will flow from booster, proving that the switching circuits are operational and fuses are intact. Test can be initiated by an external contact or from the DD3 display panel.

To enable test mode place J11 "ON" (connecting both pins)

To disable test mode place J11 "OFF" (on one pin only)

Test mode cannot be initiated from the display or remotely unless J11 is installed.

4.2.4.3. OUTPUT STATUS SIGNALS

4.2.4.3.1. CLASS 1 FAULTS (STATUS 1) (NON-LATCHING FAULTS)

4.2.4.3.1.1. RTR (RIDE-THRU READY)

The RTR fault indicates that the M3534 Ride-Thru is not ready to operate. This fault will occur if the M3534 Ride-Thru is not enabled. This could also indicate damage to the M3534 Ride-Thru. Refer to the M3534R manual for more information.

4.2.4.3.1.2. FUSE (FUSE LOSS)

The Fuse fault indicates that one of the M3534 Ride-Thru stage fuses has blown. The booster will continue to operate with the remaining stages, but at a reduced capacity.

4.2.4.3.1.3. PCC (PRE-CHARGE COMPLETE)

The PCC fault indicates that the M3534 Ride-Thru has not finished precharging.

4.2.4.3.1.4. OUT UV (OUTPUT UNDERVOLTAGE)

The Out UV fault indicates that the Ride-Thru is failing to hold the DC bus at the desired level.

4.2.4.3.2. CLASS 2 FAULTS (STATUS 2) (LATCHING FAULTS)



PLEASE
NOTE!

- CLASS 2 FAULT SIGNALS WILL ALL REMOVE THE OUTPUT ENABLE SIGNAL TO SHUT DOWN THE UNIT. TO RESET THE UNIT, THE ERROR MUST BE CLEARED OF THE DISPLAY OR THE USER MUST CYCLE THE ENABLE SIGNAL TO THE SYSTEM.
- THIS OPERATION CAN BE CHANGED BY JUMPERS AND SETTING WITHIN THE DISPLAY AND INTERFACE CARD. SEE THE M3660DD3 DIGITAL DISPLAY MANUAL FOR MORE INFORMATION.

4.2.4.3.2.1. TEMP (OVER TEMPERATURE)

The Temp fault indicates that the M3534 Ride-Thru has overheated. This fault is latching and must be manually cleared, either by toggling the external ENABLE signal (TB1-5&6) off and back on, or by pressing the *left* and *right* buttons simultaneously.

4.2.4.3.2.2. RTA TIME

This fault indicates that the Ride-Thru has been active for more than the rated time. The system is not designed for continuous operation, this fault disables the Ride-Thru in order to protect it.

This fault is latching and must be manually cleared, either by toggling the external ENABLE signal (TB1-5&6) off and back on, or by pressing the *left* and *right* buttons simultaneously.

Table 4-3: Input Under-Voltage Automatic Shutdown Truth Table

DISPLAY SCREEN "DISABLE RIDE-THRU FOR IUV FAULT"	J1 & J14 POSITION ON 3660I INTERFACE PCB	AUTOMATIC SHUTDOWN ON IUV FAULT
No	Pos "A" (Manual)	No
No	Pos "B" (Auto)	No
Yes	Pos "A" (Manual)	No
Yes	Pos "B" (Auto)	Yes

4.2.5. FACTORY DEFAULTS

RUN COMMAND

Factory set for operation without external input command (J15 in the "B" position).

CONTROL MODE

Factory set for automatic shutdown with IUV disabled from front panel (J1 and J14 in the "B" position and display programmed to ignore IUV for auto-shutdown).

4.3. STARTUP

4.3.1. PRE POWER CHECKS

1. Ensure the Bonitron Ride-Thru has been properly installed as per the instructions in Section 3 of this manual.
2. The Ride-Thru DC bus threshold must be coordinated with the under voltage trip setting of the inverter. If the threshold is too close to the nominal bus, the Ride-Thru may supply power to the drive continuously, and overheat. If the threshold is too close to the under voltage trip level of the inverter, the system may not "ride through", and under voltage trips will still occur. Most inverters have an under voltage trip point of -15% of nominal. Some inverters can be reprogrammed to change this trip level. Bonitron typically would like the DC bus threshold to be about -10% of the nominal bus. For example, Bonitron sets all 460VAC systems to hold the DC bus to 585VDC.
 - Refer to your inverter's documentation for details on adjustment of the under voltage trip setting.
 - Some inverters automatically change this setting when the main voltage is programmed, and is typically 80-85% of full DC bus voltage.
 - Some inverters do not allow adjustment.
3. Refer to Section 4.4 for details on how the Ride-Thru DC bus threshold can be changed.
4. If start-up must be done during production runs, due to the wide variety of ground fault sensing schemes, and the fact that a few inverters may have a ground fault trip when using a parallel boost module, it is recommended to disable the inverter ground fault until testing can be done. See Section 7.2, step 7.
5. If equipped with the Ride-Thru disconnect, turn off, and apply power to the system. Otherwise, go to the Startup Procedure Section 4.3.2.

6. Ensure that the associated inverter is working properly.
7. Confirm the under voltage trip point if possible.

4.3.2. STARTUP PROCEDURE AND CHECKS

1. With power already applied to the associated drive, turn on disconnect switch.
 2. Voltmeter should read drive bus level and there should be no current flow
 3. S3534SR is now ready for operation.
 4. Full power operational testing is recommended during commissioning.
- For testing methods see Section 5.1.

4.4. OPERATIONAL ADJUSTMENTS

4.4.1. THRESHOLD VOLTAGE ADJUSTMENT PROCEDURE FOR S3534SR RIDE-THRU SYSTEMS

The "Threshold" voltage level is the voltage at which the S3534SR Ride-Thru System maintains the DC bus during a power sag. Whenever the DC bus level drops to the "Threshold" setpoint, the Ride-Thru becomes active to regulate the DC bus voltage to the "Threshold" setpoint voltage.

Generally, the "Threshold" level should be set at 10-15% below the nominal DC bus level. If running on single phase system, threshold levels may need to be lowered to prevent excessive activity. An actual on-site level setting must be determined by the loaded DC bus level as well as the amount of ripple present on the DC bus. The Ride-Thru should not become active during normal everyday operation.

During a test cycle the "Test Boost" level is typically elevated 17% above threshold on all S3534SR Ride-Thru Systems. These approximate levels are specified in the General Specifications section of the Customer Reference manual for each Ride-Thru model and are based on the original factory setting of the threshold level. Some field adjustment of this level may be required to achieve the optimum setpoint level for any given system.

Table 4-4 lists the typical factory setpoints for the "Threshold", "Over-Voltage", and "Test Boost" levels for the S3534SR Ride-Thru System based on the system AC or DC input voltage requirements. Be sure to check the Customer Reference manual for each Ride-Thru for specific setpoint levels.

Table 4-4: Factory Setpoints for Threshold and Test Boost Voltages

INPUT VOLTAGE	THRESHOLD	TEST BOOST	OVER-VOLTAGE
208VAC	265VDC	+45VDC	360VDC
230VAC	285VDC	+48VDC	360VDC
380VAC	485VDC	+82VDC	702VDC
400VAC	495VDC	+84VDC	702VDC
415VAC	505VDC	+86VDC	702VDC
460VAC	585VDC	+100VDC	702VDC

4.4.2. DETERMINING THRESHOLD VOLTAGE SETPOINT

Testing and adjustment of the THRESHOLD voltage setpoint can be performed on systems on the test bench, while unloaded and offline, or under on-line and loaded conditions as described in Methods 1, 2, and 3 in the M3534R manual. Each of the 3 methods described require that you monitor the DC bus voltage during the testing and adjustment procedures.

Note that threshold level drops by approximately 7V-10V from no-load to full-load. See Figure 4-2 in the M3534R manual for approximate volts-per-turn of threshold adjustment pot.

See Section 4 of the M3534R manual for complete details.

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5. MAINTENANCE AND TROUBLESHOOTING

Repairs or modifications to this equipment are to be performed by Bonitron approved personnel only. Any repair or modification to this equipment by personnel not approved by Bonitron will void any warranty remaining on this unit.

5.1. PERIODIC TESTING

Yearly testing of the ride through capability is recommended for critical applications. Testing can be done by sagging power to the system, or by using the TEST function.

1. Check Active cycle counters.
 - More than 10 counts per month may mean the Ride-Thru is improperly adjusted. Refer to Section 4.4.1 Threshold Voltage Adjustment Procedure (document # 073002) for adjustment details.
 - Note count for factory records.
2. Monitor front panel Display.
 - Display should be ON showing bar graph and value of selected parameter.
 - Green Power LED should be ON.
 - Yellow Ride-Thru Active and red Over-temperature LEDs should be OFF.
3. Verify Threshold by opening the AC disconnect to the Ride-Thru module (if equipped), and monitoring the DC bus with an analog meter or an oscilloscope. Refer to the Threshold Voltage Adjustment Procedure (document # 073002) in Section 4.4.1.
 - The DC bus voltage should drop until it reaches the threshold.
 - Ride-Thru Active LED should begin to **flash**.
 - DC bus should hold for a second at the threshold.
 - This threshold level should be approximately 10-12% below the nominal loaded inverter bus.

Each Bonitron Ride-Thru should be tested under load during initial start up to verify the functionality of the test circuit and that the test does not negatively affect the process. However, Bonitron recommends that, if the process is critical, the TEST cycle be initiated only during a shutdown to avoid unforeseen problems.

Verify switching circuits by pressing the **TEST** button while running the inverter at full load.

- Ride-Thru DC bus current should flow during the 2-second test cycle.
- Inverter input current should drop.
- Ride-Thru DC bus voltage should rise above the threshold. (+17% if lightly loaded, less if fully loaded.)
- Inverter DC bus voltage should rise above the threshold. (+17% if lightly loaded, less if fully loaded.)
- Ride-Thru Active LED should turn **ON**.
- Motor speed should remain constant.
- Active cycle counter (if used) should count test cycles.

This completes the maintenance procedure.

5.2. MAINTENANCE ITEMS

5.2.1. CAPACITOR REPLACEMENT RECOMMENDATIONS

Bonitron Model M3534R Ride-Thru uses high quality aluminum electrolytic capacitors and is designed for long life without maintenance. While a typical inverter may require capacitor replacement after a certain time due to the heavy ripple currents, the M3534R typically is in a standby mode waiting for a power disturbance.

With typical operating conditions of 35°C, caps running at 75% rated voltage, and a duty cycle of one sag per month, Bonitron recommends the capacitors be checked or replaced every 20 years.

5.2.2. CLEANING

Cleaning cycle depends entirely upon surrounding environment and quality of air inside cabinet.

Cleaning off dust, debris, or chemical build-up on high voltage bus bars or other exposed components may be necessary. If cleaning is needed:

1. Remove power, tag out according to all local safety procedures, and allow all voltages to drain to safe levels.
2. Check for residual voltages with meter.
3. Clean affected areas with rag, brush, or denatured alcohol, depending on the type of contamination.
4. Once area is clean and dry, reapply power.

5.2.3. FANS

- Fans run only while RT is active and should have a life of 20 years if the RT is properly adjusted.
- To check operation of fan, initiate activity.
- 20 and 40 amp models: Fan should run for 2-3 minutes.
- 85 amp and above models: Fan should run for 30 minutes.
- If fan does not run, replace with equivalent 24V fan.

5.3. TROUBLESHOOTING

SYMPTOM	ACTION
No ride through capability	<ul style="list-style-type: none"> • Check for Display Panel power <ul style="list-style-type: none"> ○ If no Display power, check AC input fuses to Boost Module ○ If AC Fuses are OK, check for power to the display interface ○ If OK, replace display interface ○ If not OK, check or replace Boost Module (see Booster manual)
Display Fault LED on	<ul style="list-style-type: none"> • Ensure external Enable command is ok (if used) • Check Boost Module for Overtemperature
Status 1 Output tripped	<ul style="list-style-type: none"> • Check for phase loss • Check for Booster Ready signal
Status 2 Output tripped	<ul style="list-style-type: none"> • Check for Overtemp • Check for Low Threshold causing Active time-out shutdown
Initiate TEST cycle	<ul style="list-style-type: none"> • RTA LED should turn ON • Drive bus should increase <ul style="list-style-type: none"> ○ If no RTA or drive bus increase check for high AC line level ○ If no RTA or drive bus increase and AC line level is OK, see Boost Module manual

6. ENGINEERING DATA

6.1. RATINGS

Table 6-1: S3534SR Cabinet Systems Ratings Table

50% Sag Booster in Type-1 enclosure with disconnect, display, and fusing

MODEL NUMBER	BOOSTER kW	AC LINE CURRENT	DC BUS CURRENT	MIN DC BUS VOLTAGE	DIMENSIONS H x W x D	WEIGHT LBS
230VAC DRIVES						
S3534SR-L006-E61	6	30	20	285	24 x 20 x 12	75
S3534SR-L012-E61	12	60	40	285	24 x 20 x 12	85
S3534SR-L025-E63	24	120	85	285	30 x 24 x 12	135
380VAC DRIVES (380-415)						
S3534SR-E010-E61	10	30	20	500	24 x 20 x 12	75
S3534SR-E020-E61	20	60	40	500	24 x 20 x 12	85
S3534SR-E043-E63	40	120	85	500	30 x 24 x 12	135
460VAC DRIVES						
S3534SR-H012-E61	12	30	20	585	24 x 20 x 12	75
S3534SR-H024-E61	24	60	40	585	24 x 20 x 12	85
S3534SR-H050-E63	50	120	85	585	30 x 24 x 12	135

Note: Systems operating on 208VAC or 433VAC should be derated, and the setpoints adjusted to allow for operation at reduced voltages. Contact supplier for details.

6.2. WATT LOSS

S3534SR 20 amp models use less than 20W in stand-by mode, and are 93% (or better) efficient at full load.

S3534SR 40 amp models use less than 25W in stand-by mode, and are 93% (or better) efficient at full load.

S3534SR 85 amp models use less than 30W in stand-by mode, and are 93% (or better) efficient at full load.

6.3. CERTIFICATIONS

M3534 Boosters are certified to meet SEMI-47 specifications.

6.4. FUSE/CIRCUIT BREAKER SIZING AND RATINGS

20 – 24kW (40 Amp) fuses are located inside the M3534R Booster enclosure.

40 – 50kW (85 Amp) fuses are located on cabinet backplate.

Table 6-2: Fuse Sizing and Rating

RIDE-THRU MODEL NUMBER	AC FUSE	DC FUSE	AC INPUT WIRE GAUGE	DC OUTPUT WIRE GAUGE
230VAC INPUT				
S3534SR-L006-E61	A60Q30	A70Q25	10	8
S3534SR-L012-E61	A60Q40	FWP50	8	8
S3534SR-L025-E63	FWP125	A70Q40	2	2
380VAC INPUT				
S3534SR-E010-E61	A60Q30	A70Q25	10	8
S3534SR-E020-E61	A60Q40	FWP50	8	8
S3534SR-E043-E63	FWP125	A70Q80	2	2
460VAC INPUT				
S3534SR-H012-E61	A60Q30	A70Q25	10	8
S3534SR-H024-E61	A60Q40	FWP50	8	8
S3534SR-H050-E63	FWP125	A70Q80	2	2

6.5. DIMENSIONS AND MECHANICAL DRAWINGS

Figure 6-1: S3534SR 'E61'/'W61' Enclosure Dimensional Outline

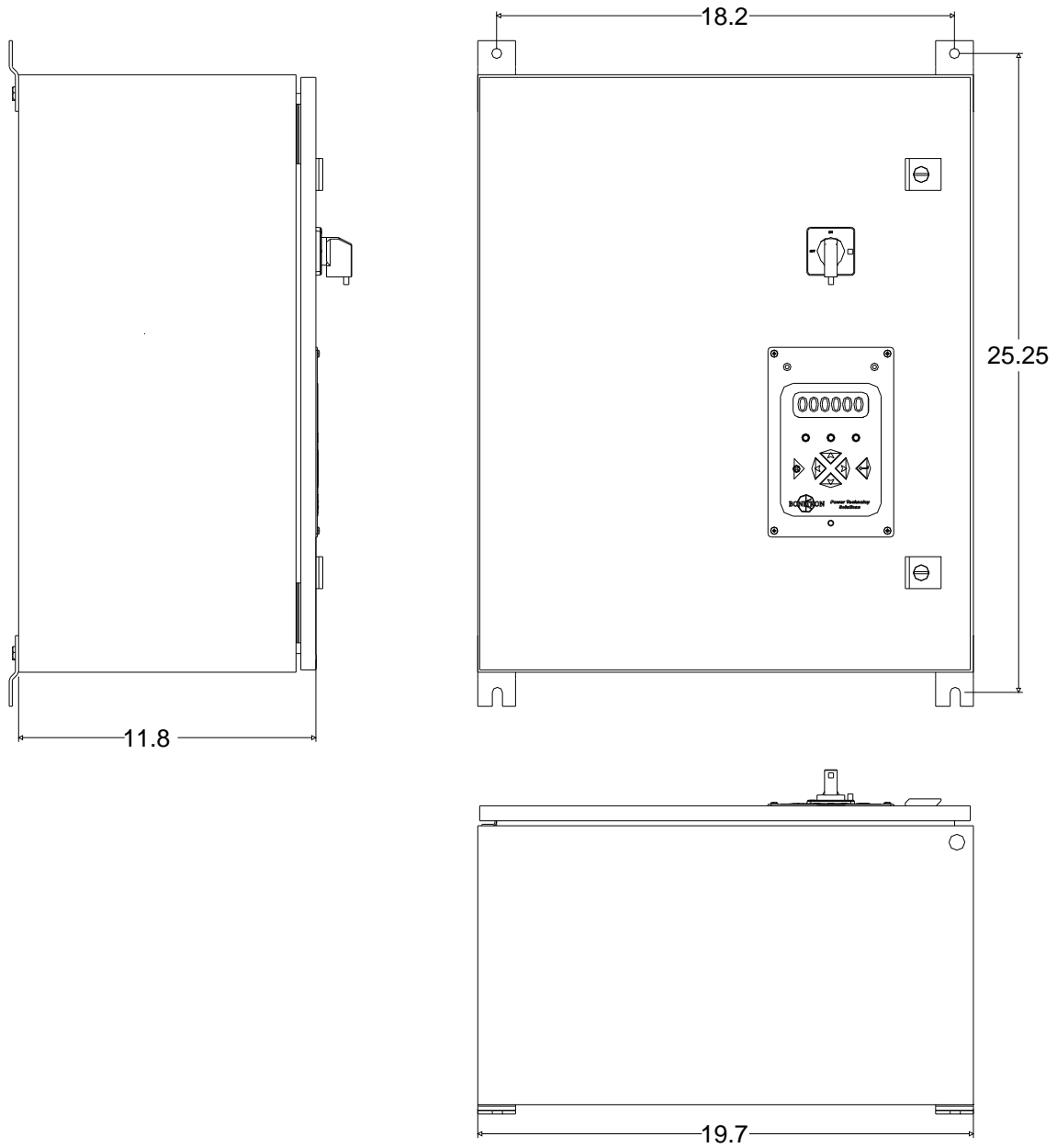
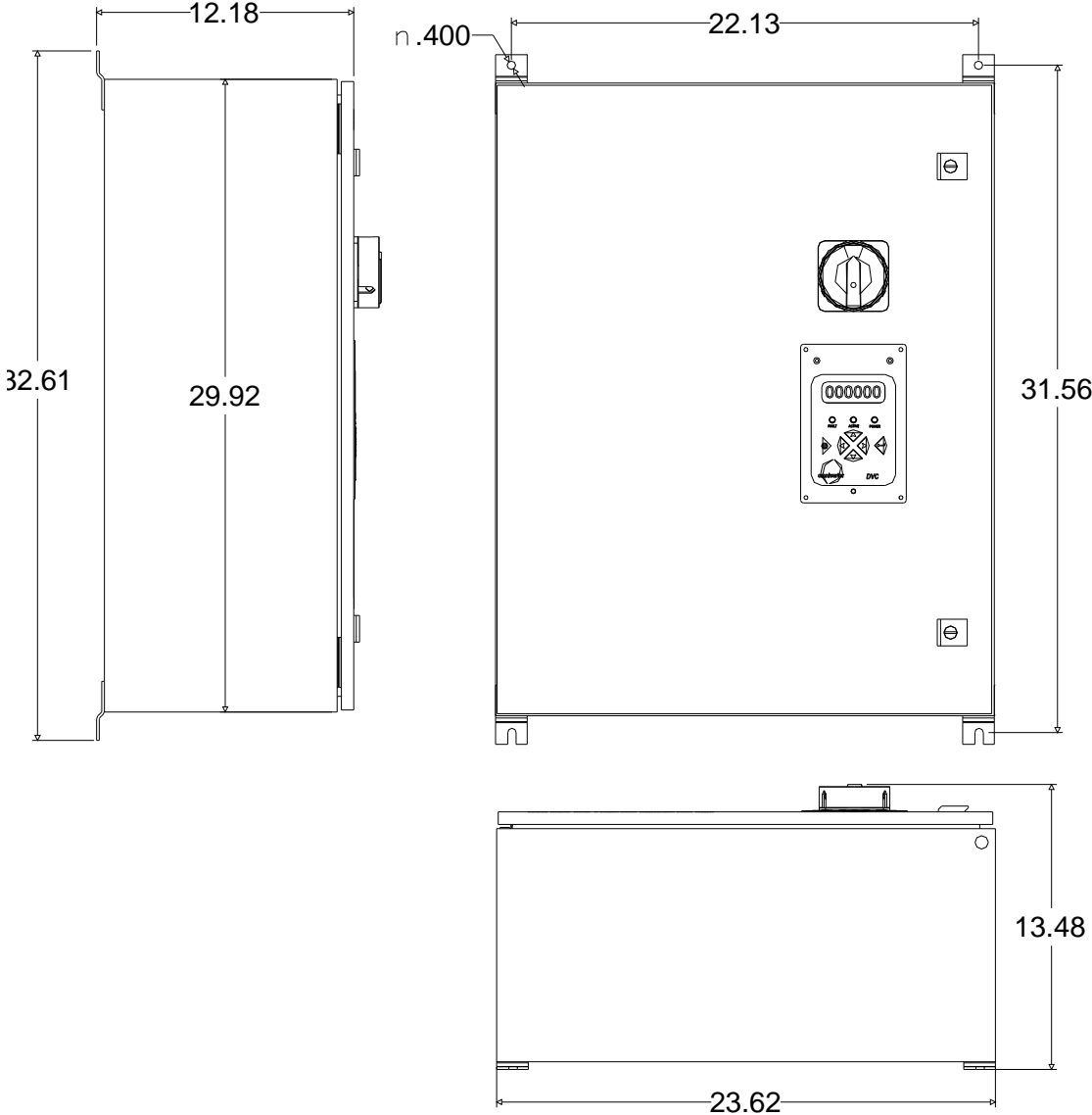
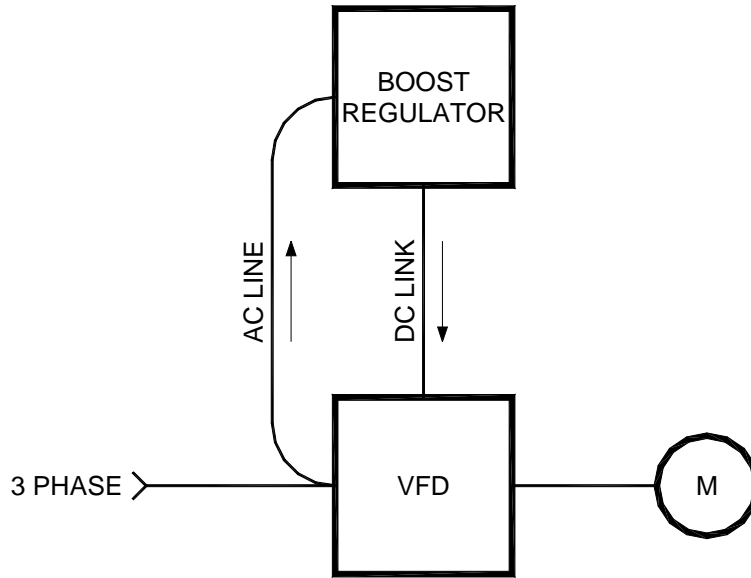


Figure 6-2: S3534SR 'E63'/'W63' Enclosure Dimensional Outline



6.6. BLOCK DIAGRAMS

Figure 6-3: Ride-Thru System Configuration 1



2 SECOND, 50% SAG PROTECTION USING DC BOOSTER ONLY

6.7. SUPPLEMENTAL DRAWINGS

Figure 6-4: Drive DC Bus without Bonitron @ 50% Sag

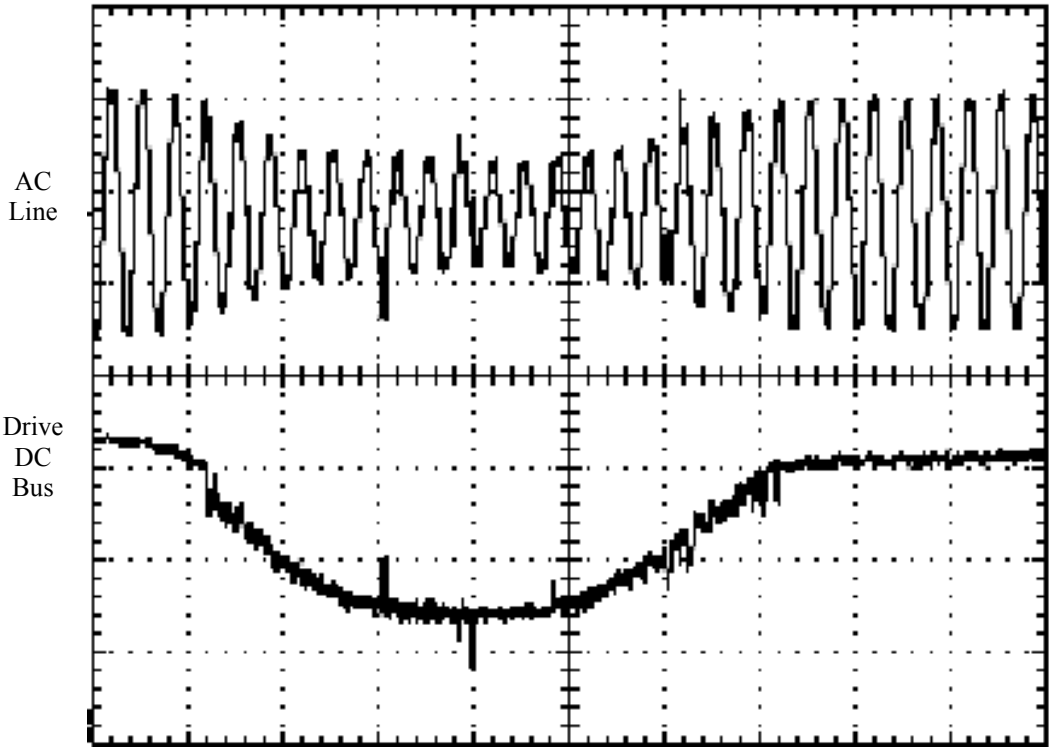


Figure 6-5: Drive DC Bus with Bonitron @ 50% Sag

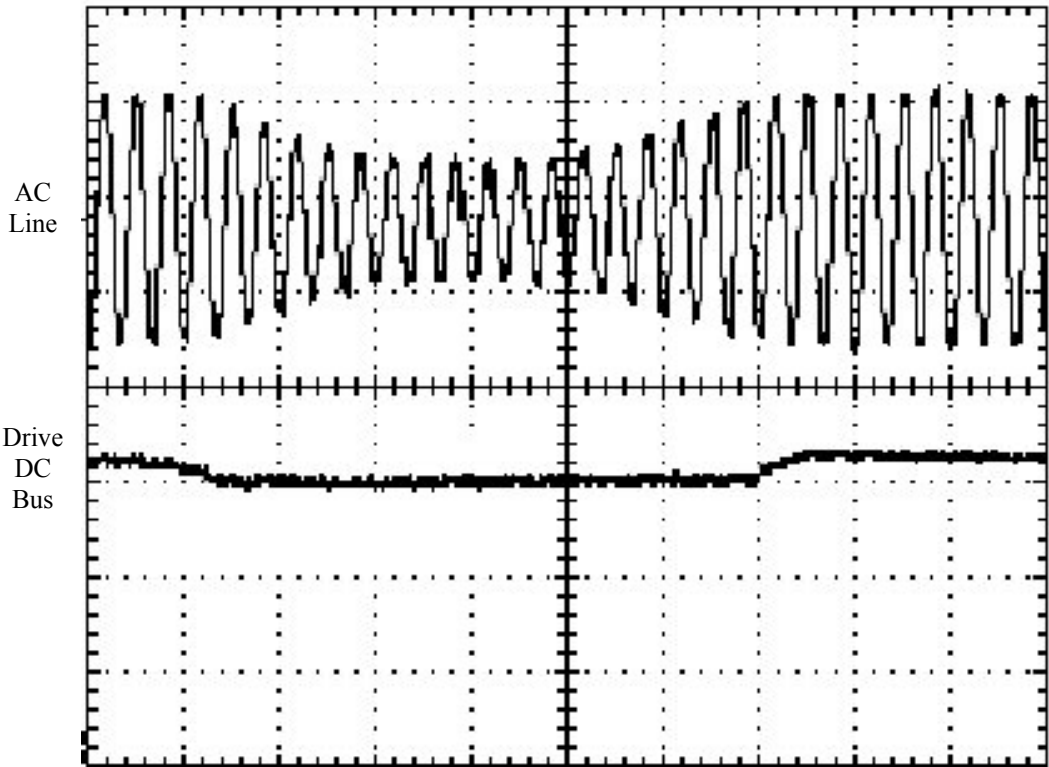
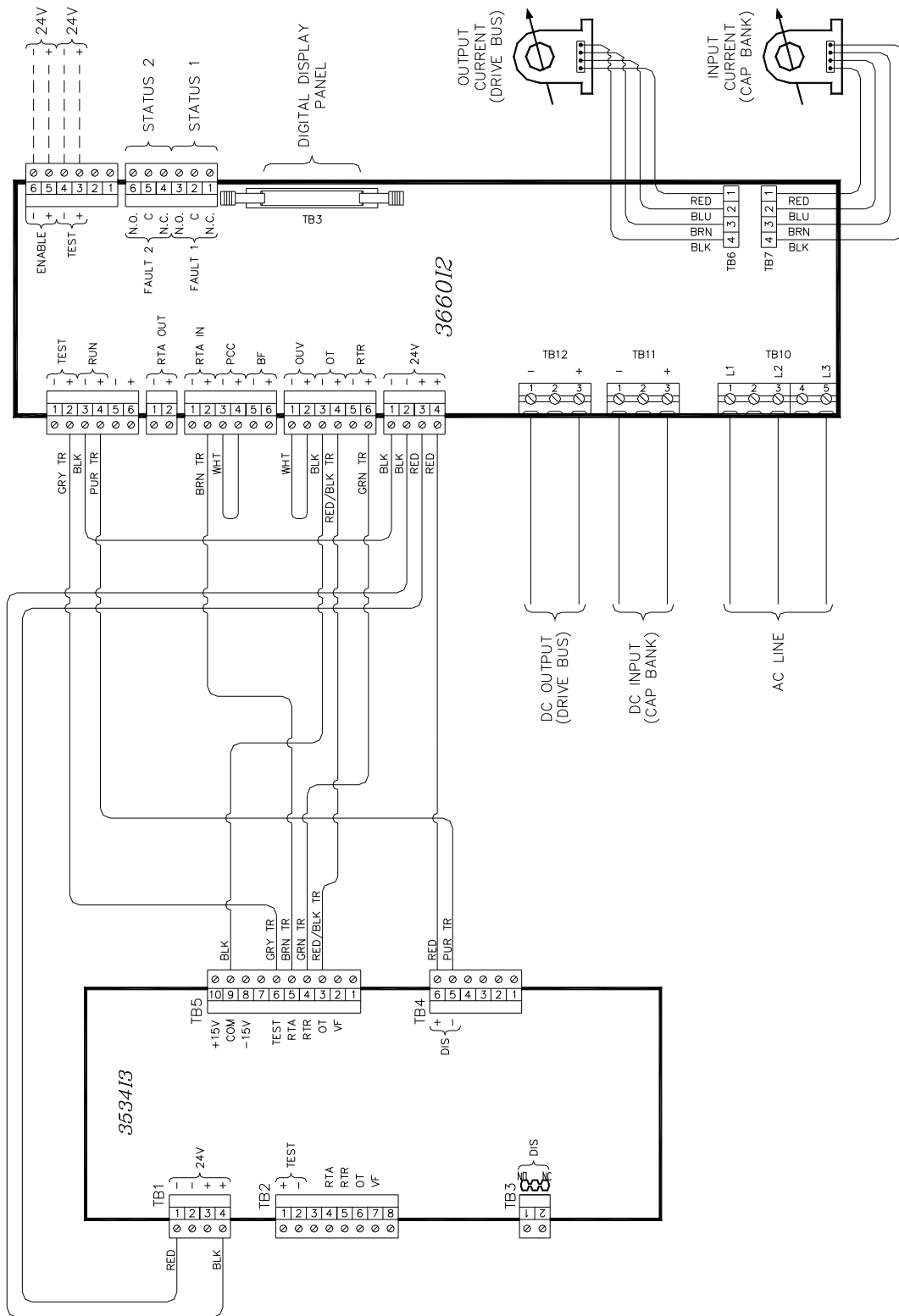


Figure 6-6: Display Wiring with DD3 and 3660I2



6.8. RECOMMENDED SPARE PARTS

PART #	DESCRIPTION	QTY
M3534R-xxx-A5 20Amp	Booster Module	1
A60Q30	A60Q30 AC fuse	3
A70Q25	A70Q25 DC fuse	2
M3534R-xxx-K7 40A	Booster Module	1
A60Q40	A60Q40 AC fuse	3
FWP50	FWP50 DC fuse	2
M3534R-xxx-A9 85A	Booster Module	1
FWP 125	FWP 125 AC fuse	3
A70Q80	A70Q80 DC fuse	2

7. APPENDICES

7.1. INSTALLATION CONSIDERATIONS FOR DRIVE RIDE-THRU SYSTEMS

The following items should be considered when installing a Bonitron Ride-Thru module.

1. Inverter logic voltage must be "backed up"
2. Most new Inverters derive logic supply from DC bus
3. Install small UPS on circuits with AC feed
4. Any control or Interlock relays must be "backed up"
 - Test Relays at half voltage for dropout
 - Use DC relays on logic supply
 - Install small UPS on circuits with AC feed
5. Determine the maximum motor voltage needed
 - To ensure "Threshold" level is sufficient to supply motor
 - Most inverters automatically compensate RMS to motor with 10% low DC bus level
6. Verify actual AC line voltage and DC bus level
 - To ensure "Threshold" level is set – 10% of actual DC bus level
 - To ensure valleys of ripple do not cause unwanted activity
7. Determine Inverter low bus trip point
 - To ensure "Threshold" level is above inverter dropout
8. Determine Inverter high bus trip point
 - To ensure "Test" level will not over voltage inverter
9. Inverter ground fault circuits
 - Ride-Thru currents on 20 amp model may use Inverter bridge negative diodes during operation
 - Circuits can be de-sensitized
 - External "upstream" ground fault circuits may be added
10. Electrical safety
 - Ride-Thru should not have AC power when inverter does not
 - RT and Inverter should feed from same point
 - Use shunt trip interlock between Inverter and Ride-Thru if RT power is not fed downstream of inverter power switch
 - Label Inverter as having two power sources
11. Monitoring of status signals
 - Fault contacts available for remote control room monitoring
12. Input feed should be capable of 2x rated current during the 2 sec 50% dip
 - RT RMS rating is 1 percent of system KW
 - Most Inverter feeds have been sized for a 150-200% surge for motor starting
13. IR drop of wiring
 - This subtracts from the 50% dip spec

7.2. TYPICAL DRIVE BUS VOLTAGE LEVELS

Figure 7-1: Typical Drive Bus Voltage Levels for 400VAC Systems (VDC)

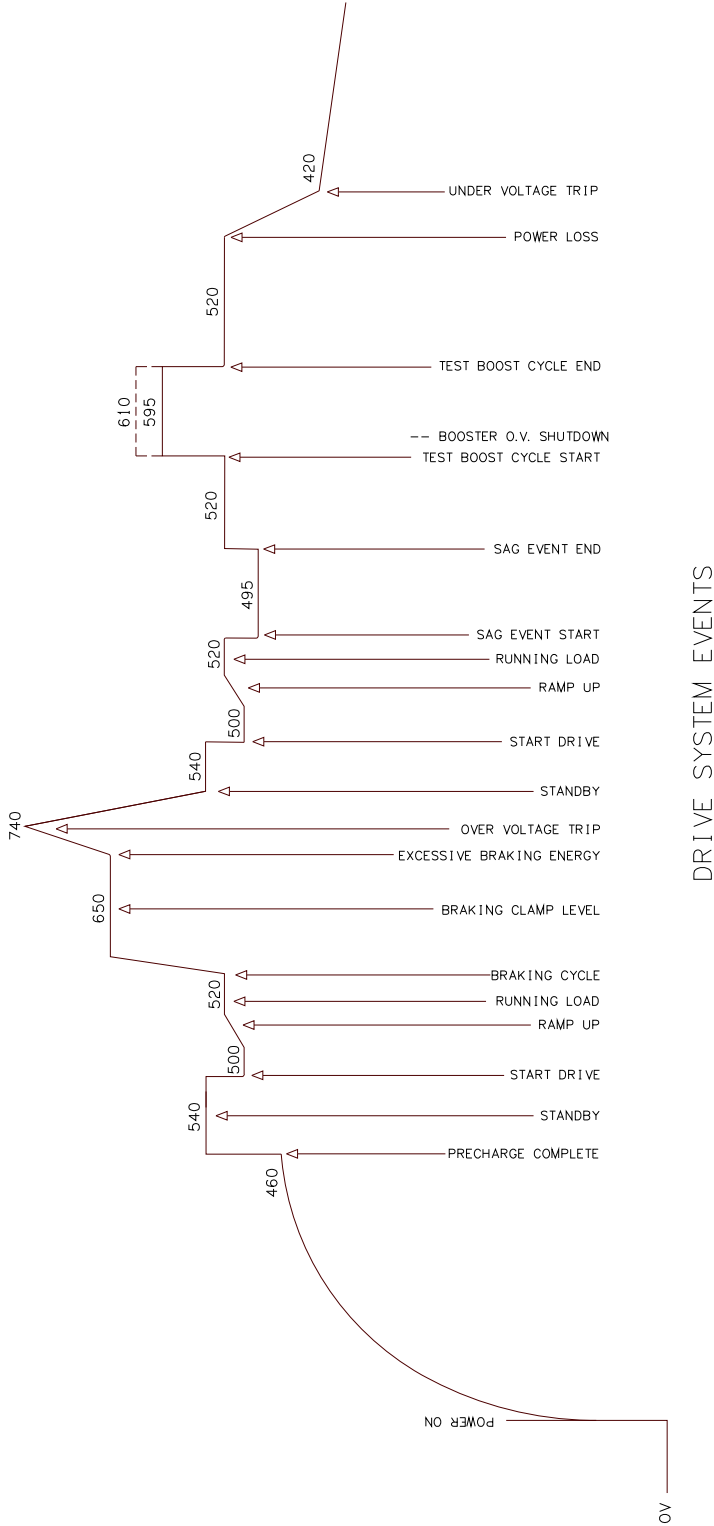
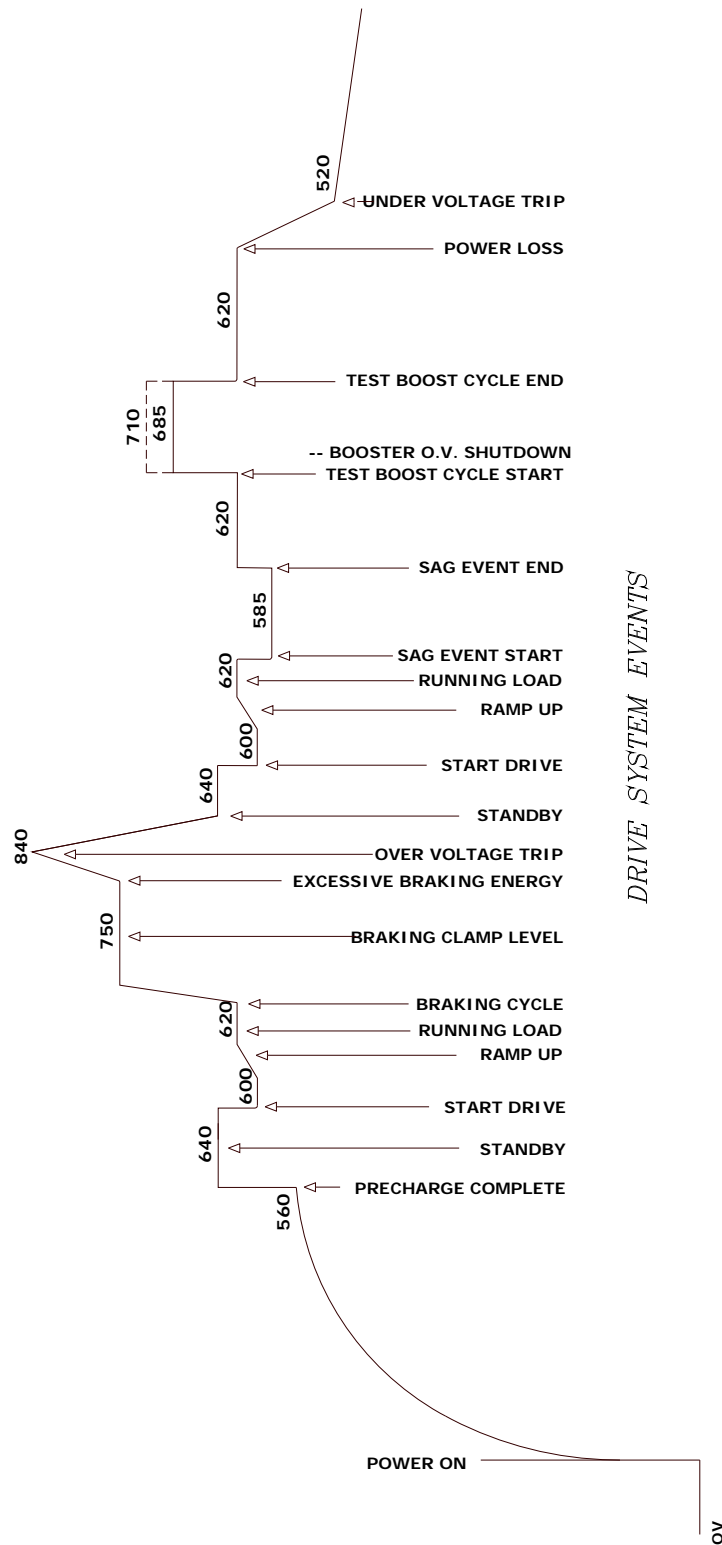


Figure 7-2: Typical Drive Bus Voltage Levels for 460VAC Systems (VDC)



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