Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control (available from your local Allen-Bradley office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

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Throughout this manual we use notes to make you aware of safety considerations:

| ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage or economic loss |

Attention statements help you to:

- identify a hazard
- avoid a hazard
- recognize the consequences

Important: Identifies information that is critical for successful application and understanding of the product.

1336 FORCE, 1336 PLUS, DriveTools, RGU, HIM, GPT, DriveTools, and SCANport are trademarks of Rockwell Automation or its subsidiaries.
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Preface

Contents

The Regenerative DC Bus Supply Unit (RGU™) is a regenerative front end unit used to supply a common DC bus drive system.

This manual includes information for troubleshooting RGU failure conditions, troubleshooting components, and handling fault and warning conditions.

This preface supplies information on the following topics:

- who should use this manual
- safety precautions
- contents of this manual
- related documentation
- Rockwell Automation support

Who Should Use This Manual

This manual is intended for qualified personnel who are responsible for servicing the Bulletin 2364F Regenerative DC Bus Supply Unit (RGU).

If you do not have a basic understanding of this unit, please refer to the applicable documentation and system schematics, or contact your local Rockwell Automation Drive Systems representative for more information before using this product.

Be sure to read through this manual and through publication 2364F-5.01, *Regenerative DC Bus Supply Unit (RGU)–User Manual*, before servicing the RGU.
The following general precautions apply to Bulletin 2364F RGUs and to drive systems lineups.

**ATTENTION:** Only those familiar with the drive system, the products used in the system, and the associated machinery should plan or implement the installation, startup, and future maintenance of the system. Failure to comply can result in personal injury and/or equipment damage.

**ATTENTION:** Only connect Rockwell Automation common DC bus AC drives to the RGU common DC bus output.

**ATTENTION:** Do not connect any drives to the RGU common DC bus which have input voltage specifications greater than the maximum input voltages listed below.

<table>
<thead>
<tr>
<th>Nominal Input Voltage of RGU (V AC)</th>
<th>Maximum DC Input of Drive (V DC)</th>
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<tr>
<td>380</td>
<td>632</td>
</tr>
<tr>
<td>460</td>
<td>746</td>
</tr>
<tr>
<td>575</td>
<td>933</td>
</tr>
</tbody>
</table>

**ATTENTION:** Verify that all sources of AC and DC power are deenergized and locked out or tagged out in accordance with the requirements of ANSI/NFPA 70E, Part II.

**ATTENTION:** The system may contain stored energy devices. To avoid the hazard of electrical shock, verify that all voltage on capacitors has been discharged before attempting to service, repair, or remove a drive system or its components. You should only attempt the procedures in this manual if you are qualified to do so and are familiar with solid-state control equipment and the safety procedures in publication NFPA 70E.

**ATTENTION:** An incorrectly applied or installed drive system can result in component damage and/or a reduction in product life. Wiring or application errors—such as undersizing the motor, incorrect or inadequate AC supply, and excessive ambient temperatures—can result in the malfunction of the drive equipment.

**ATTENTION:** The drive system contains ESD (electrostatic discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, or repairing the RGU. Component damage can result in ESD control procedures are not followed. If you are not familiar with static control procedures, refer to Allen-Bradley publication 8000-4.5.2, *Guarding Against Electrostatic Damage* or any other applicable ESD protection handbook.

To reduce the risk of ESD damage to circuit boards, wear a grounding wrist strap when handling circuit boards. Store circuit boards in conductive packets.
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<th>Chapter</th>
<th>Title</th>
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<td>Information concerning safety, support, and reference documentation.</td>
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<td>Troubleshooting Faults and Warnings</td>
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<td></td>
<td>Glossary</td>
<td>Listing of terms that are used in this manual.</td>
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<tr>
<td></td>
<td>Index</td>
<td>Index of key topics in this manual.</td>
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## Related Documentation

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<th>For</th>
<th>Read This Document</th>
<th>Document Number</th>
</tr>
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<tbody>
<tr>
<td>Layout diagrams, specifications, setup instructions, and schematics of the RGU</td>
<td>Regenerative DC Bus Supply Unit (RGU)–User Manual</td>
<td>2364F-5.01</td>
</tr>
<tr>
<td>Information for operating and understanding the Graphic Programming Terminal</td>
<td>Bulletin 1201 Graphic Programming Terminal—User Manual</td>
<td>1201-5.0</td>
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<tr>
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<tr>
<td>Information for installing and configuring the Serial Communications Module</td>
<td>Bulletin 1203 Serial Communications Module–User Manual</td>
<td>1203-5.5</td>
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<td>Information for installing, configuring, programming, and troubleshooting the 1336 FORCE adjustable frequency AC drive</td>
<td>1336 FORCE Adjustable Frequency AC Drive–User Manual</td>
<td>1336 FORCE-5.12</td>
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<tr>
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<td>1336 PLUS Adjustable Frequency AC Drive–User Manual</td>
<td>1336 PLUS-5.0</td>
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<td>Instructions for properly handling and moving motor control centers (MCCs)</td>
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<td>Instructions for installing Bulletin 2300 motor control centers (MCCs), splicing busbars, and removing roll-out units</td>
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<td>Allen-Bradley Publication Index</td>
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<tr>
<td>A glossary of industrial automation terms and abbreviations</td>
<td>Industrial Automation Glossary</td>
<td>AG-7.1</td>
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Rockwell Automation Support

Rockwell Automation offers support services worldwide, with Sales/Support offices, authorized distributors, and authorized Systems Integrators located throughout the United States, plus Rockwell Automation representatives in every major country in the world.

Local Product Support

Please contact your local Rockwell Automation representative for:

- sales and order support
- product technical training
- warranty support
- support service agreements

Technical Product Assistance

If you need to contact us for technical assistance, please review the appropriate product manuals and the troubleshooting information in this manual first.

For the quickest possible response, please have the catalog numbers of your products ready when you call.
Introduction

Using This Manual

This manual provides information to help service personnel troubleshoot and correct the most common RGU conditions.

This troubleshooting guide is laid out with the following topics:

- Troubleshooting RGU Conditions
- Troubleshooting Warnings and Faults
- Testing Components
- Reference Information

This manual is to be used in conjunction with publication 2364F-5.01, Regenerative DC Bus Supply Unit (RGU)–User Manual, which provides component information, schematics, installation instructions, specifications, and a parameter list.

1336 FORCE Service Manuals

In addition to RGU publications, the 1336 FORCE service manuals (shown in Figure 1.1) provide information for testing and replacing components within the RGU power structure. See chapter 4 for more information.

Figure 1.1
1336 FORCE Service Manuals

<table>
<thead>
<tr>
<th>Manual</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1336 FORCE - 6.12</td>
<td>J-code</td>
</tr>
<tr>
<td>1336 FORCE - 6.13</td>
<td>K-code</td>
</tr>
<tr>
<td>1336 FORCE - 6.14</td>
<td>L-code</td>
</tr>
<tr>
<td>1336 FORCE - 6.15</td>
<td>M-code</td>
</tr>
<tr>
<td>1336 FORCE - 6.16</td>
<td>N-code</td>
</tr>
</tbody>
</table>

Note: Most of the construction and components of the N-code power structure are equivalent to the M-code power structure. Publication 1336 FORCE - 6.15 has sufficient information for servicing the N-code power structure.
Introduction

Basic Troubleshooting Techniques

When troubleshooting, refer to the system schematics and determine the components that are critical to the process. Test each of the critical components to determine the problem. Also, consider how the RGU’s programming parameters may be affecting the situation. Consider upgrading to the latest version of firmware available.

When a damaged component has been found, always try to determine the cause of the problem, rather than just replacing the component. Verify that equipment is connected and being used properly; verify that the parameters are properly set for the particular application; and so on. Try to determine and resolve all underlying problems to avoid future component failures.

For significant or recurring problems, contact your local Rockwell Automation office for support. Rockwell Automation support personnel can provide technical assistance and can offer information about hardware and software updates as they are made available.

Data Nameplates

The data nameplate provides the electrical ratings for the RGU, signifies the type of RGU, and identifies the options that have been included in the unit.

The data nameplate shown in Figure 1.2 is located in the input bay of the RGU and signifies the unit ratings, catalog string, and unique reference identifiers for the RGU.

Figure 1.2
Data Nameplate—RGU
The data nameplate shown in Figure 1.3 is located on the power structure and signifies the ratings and the catalog string for the power structure. Figure 1.3 also shows the basic catalog string format.

**Note:** For more catalog string information, refer to publication 2364F-5.01, Regenerative DC Bus Supply (RGU)–User Manual.

**Figure 1.3**
Data Nameplate–Power Structure

**Basic Catalog Strings**

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2364FA-JNN</td>
<td>J-code RGU, 380V AC</td>
</tr>
<tr>
<td>2364FA-JNB</td>
<td>J-code RGU, 460V AC</td>
</tr>
<tr>
<td>2364FA-JNC</td>
<td>J-code RGU, 575V AC</td>
</tr>
<tr>
<td>2364FA-KNN</td>
<td>K-code RGU, 380V AC</td>
</tr>
<tr>
<td>2364FA-KNB</td>
<td>K-code RGU, 460V AC</td>
</tr>
<tr>
<td>2364FA-KNC</td>
<td>K-code RGU, 575V AC</td>
</tr>
<tr>
<td>2364FA-LNN</td>
<td>L-code RGU, 380V AC</td>
</tr>
<tr>
<td>2364FA-LNB</td>
<td>L-code RGU, 460V AC</td>
</tr>
<tr>
<td>2364FA-LNC</td>
<td>L-code RGU, 575V AC</td>
</tr>
</tbody>
</table>

2364 Family

"A" Type Wiring

Power Structure

Regenerative DC Bus Supply Unit

Current Code M

460V AC Input
Starting and Operating the RGU

Figure 1.4 shows the process that should be used to start a unit which has been serviced. If the unit is set for local mode, the unit will automatically enable when started.

**Figure 1.4
Starting and Operating the RGU**

**Prestart Inspection**
- Verify that all tools and debris are out of the unit.
- With disconnect off, check the line-to-ground and line-to-line AC voltage in the unit (should be zero).
- Check the line-to-ground resistance before and after the main contactor (should be high).
- Check the bus-to-ground resistance for each DC bus (should be high).
- Check the line-to-line AC voltage ahead of the breaker (should comply with the input rating of the unit).

**Startup and Parameter Check**
- Push disconnect to on.
- Check the line-to-ground voltage between F7 and ground (should be about 120V AC).
- Turn start switch to on.
- Check the following parameters:
  - P4 Frame Catalog Number
  - P10 Nominal AC Line Voltage
  - P11 Rated AC Line Current
  - P12 AC Line Reactor Inductance
  - P13 Utility AC Line Frequency
  - P14 Measured AC Line Voltage
  - P143 Scaled Bus Feedback
  - P203 External Capacitance

*Refer to publication 2364F-5.01 for programming details.*

**Setting Up Local Mode (Unit Enables At Startup)**
- Set P8 (Remote/Local Selector) to 0.
- Reset or restart the unit.

*A signal must be applied to TB5-1 (isolation board) for the unit to enable (i.e. by timer relay).*

**Setting Up Remote Mode (Unit Enables By HIM/GPT)**
- Set P224 (SCANport Port Enable Mask) and P225 (SCANport Enable Mask) to 0100 0111.
- Set P8 (Remote/Local Selector) to 1.
- Enable the unit with a HIM, GPT, or other connected SCANport device.
This chapter provides troubleshooting instructions for the most common RGU conditions. Choose the topic that most closely represents the condition of your unit.

### Conditions Handled in This Chapter

- Unit Will Not Start
- Unit Will Not Enable
- Unit Overvoltage/Overcurrent Trips
- Damaged Components

If a condition cannot be resolved by the troubleshooting instructions in this manual, contact your local Rockwell Automation office for additional support.
Troubleshooting The RGU

Unit Will Not Start

After the disconnect lever and start switch have been turned on, the RGU should power any connected HIM or GPT devices and perform its precharge routine to raise the voltage of the capacitors on the DC bus. Check the following items if the unit will not operate.

1. Is power available to the unit?
   - Yes
   - No, make power available to the unit.

2. Are the AC line fuses in good condition?
   - Yes
   - No, replace all the AC line fuses.

3. Are the primary fuses (F4, F6) in good condition?
   - Yes
   - No, replace both of the primary fuses.

4. Is the control power fuse (F7) in good condition?
   - Yes
   - No, replace the control power fuse.

5. Are the precharge fuses (F2, F4) in good condition? (F9, F10 for J-code RGU)
   - Yes
   - No, replace both of the precharge fuses.

6. Test the precharge resistors (as instructed in Chapter 4). Are the precharge resistors at their rated resistance?
   - Yes
   - No, replace the damaged precharge resistors.

7. Test the IGBTs (as instructed in Chapter 4). Are any of the IGBTs damaged?
   - Yes
   - No, replace the damaged IGBTs. Test and replace the gate driver board and snubber boards as necessary.
   - Yes
   - No, replace the damaged bus fuses.

8. Are the DC bus fuse(s) in good condition?
   - Yes
   - No, replace the damaged bus fuses.

9. Test the main control board, isolation board, and gate driver board (see Chapter 4). Replace any damaged boards.

ATTENTION: Push the disconnect lever to off and verify zero volts across the DC bus before testing the following items.
Unit Will Not Enable

After the disconnect lever and start switch have been turned on, the RGU should power any connected HIM or GPT devices and perform its precharge routine to raise the voltage of the capacitors on the DC bus.

If the Remote/Local Selector (P8) is set to ‘Local Only’, the RGU should automatically enable when the precharge routine finishes. If the Remote/Local Selector is set to ‘Local+Remote’, the RGU should enable when an enable command is sent by a connected SCANport device (HIM, GPT, etc.).

Check the following items if the unit will not enable.

1. **Did the unit pass the precharge routine?**
   - **Yes:**
     - **Is the HIM/GPT screen illuminated?**
       - **Yes:**
         - **Resolve the fault condition, clear the fault, and reset the RGU (as necessary).**
       - **No:**
         - **Are there any faults indicated (on screen or in the fault queue)?**
           - **Yes:**
             - **Check the HIM/GPT and the cable. Test the main control board. Replace as necessary.**
           - **No:**
             - **Is a signal being applied to TB5-1 (Enable) on the isolation board?**
               - **Yes:**
                 - **Set the Local/Remote Selector to ‘Local+Remote’ (P8 = 1). Set the appropriate bits in P224 and P225 to 1 (see example).**
               - **No:**
                 - **Do you want to enable the RGU with a HIM, GPT, or other SCANport device?**
                   - **Yes:**
                     - **Set the Local/Remote Selector to ‘Local Only’ (P8 = 0). Verify the ‘En at Pwr Up’ fault is disabled (P180 bit 3 = 0) and reset the RGU.**
                   - **No:**
                     - **Did the unit pass the precharge routine?**
                       - **Yes:**
                         - **Is M1 closed (or CB1 closed, for N-code RGU)?**
                           - **No:**
                             - **Verify that the total capacitance on the DC bus is within the precharge capability of the RGU. Also, check P203 (External Capacitance).**
                           - **Yes:**
                             - **Is the HIM/GPT screen illuminated?**
                               - **No:**
                                 - **Are there any faults indicated (on screen or in the fault queue)?**
                                   - **Yes:**
                                     - **Check the RGU control circuitry and other associated circuitry with the system schematics.**
                                   - **No:**
                                     - **Is a signal being applied to TB5-1 (Enable) on the isolation board?**
                                       - **Yes:**
                                         - **Do you want to enable the RGU with a HIM, GPT, or other SCANport device?**
                                           - **Yes:**
                                             - **Set the Local/Remote Selector to ‘Local+Remote’ (P8 = 1). Set the appropriate bits in P224 and P225 to 1 (see example).**
                                           - **No:**
                                             - **Did the unit pass the precharge routine?**
                                               - **Yes:**
                                                 - **Is M1 closed (or CB1 closed, for N-code RGU)?**
                                                   - **No:**
                                                     - **Verify that the total capacitance on the DC bus is within the precharge capability of the RGU. Also, check P203 (External Capacitance).**
                                                     - **Yes:**
                                                       - **Is the HIM/GPT screen illuminated?**
                                                         - **No:**
                                                           - **Are there any faults indicated (on screen or in the fault queue)?**
                                                             - **Yes:**
                                                               - **Check the HIM/GPT and the cable. Test the main control board. Replace as necessary.**
                                                             - **No:**
                                                               - **Is a signal being applied to TB5-1 (Enable) on the isolation board?**
                                                                 - **Yes:**
                                                                   - **Do you want to enable the RGU with a HIM, GPT, or other SCANport device?**
                                                                     - **Yes:**
                                                                       - **Set the Local/Remote Selector to ‘Local+Remote’ (P8 = 1). Set the appropriate bits in P224 and P225 to 1 (see example).**
                                                                       - **No:**
                                                                         - **Did the unit pass the precharge routine?**
                                                                           - **Yes:**
                                                                             - **Is M1 closed (or CB1 closed, for N-code RGU)?**
                                                                               - **No:**
                                                                                 - **Verify that the total capacitance on the DC bus is within the precharge capability of the RGU. Also, check P203 (External Capacitance).**
                                                                                 - **Yes:**
                                                                                   - **Is the HIM/GPT screen illuminated?**
                                                                                     - **No:**
                                                                                       - **Are there any faults indicated (on screen or in the fault queue)?**
                                                                                        - **Yes:**
                                                                                          - **Check the HIM/GPT and the cable. Test the main control board. Replace as necessary.**
                                                                                        - **No:**
                                                                                          - **Is a signal being applied to TB5-1 (Enable) on the isolation board?**
                                                                                                           - **Yes:**
                                                                                                           - **Do you want to enable the RGU with a HIM, GPT, or other SCANport device?**
                                                                                                             - **Yes:**
                                                                                                               - **Set the Local/Remote Selector to ‘Local+Remote’ (P8 = 1). Set the appropriate bits in P224 and P225 to 1 (see example).**
                                                                                                             - **No:**
                                                                                                               - **Did the unit pass the precharge routine?**
                                                                                                                             - **Yes:**
                                                                                                                               - **Is M1 closed (or CB1 closed, for N-code RGU)?**
                                                                                                                                                - **No:**
                                                                                                                                                    - **Verify that the total capacitance on the DC bus is within the precharge capability of the RGU. Also, check P203 (External Capacitance).**
                                                                                                                                                    - **Yes:**
                                                                                                                                                       - **Is the HIM/GPT screen illuminated?**
                                                                                                                                 - **No:**
                                                                                                                                                  - **Are there any faults indicated (on screen or in the fault queue)?**
                                                                                                                                                  - **Yes:**
                                                                                                                                                          - **Check the HIM/GPT and the cable. Test the main control board. Replace as necessary.**
                                                                                                                                                          - **No:**
                                                                                                                                                          - **Is a signal being applied to TB5-1 (Enable) on the isolation board?**
                                                                                                           - **Yes:**
                                                                                                           - **Do you want to enable the RGU with a HIM, GPT, or other SCANport device?**
                                                                                                             - **Yes:**
                                                                                                               - **Set the Local/Remote Selector to ‘Local+Remote’ (P8 = 1). Set the appropriate bits in P224 and P225 to 1 (see example).**
                                                                                                             - **No:**
                                                                                                               - **Did the unit pass the precharge routine?**
                                                                                                                             - **Yes:**
                                                                  **Example:**
                                                                  To enable Ports 1, 2, and 6, configure P224 (SCANport Port Enable Mask) and P225 (SCANport Enable Mask) as shown.
                                                                  
                                                                  \[
                                                                  \text{0100 0111}
                                                                  \]
                                                                  Port 6 ———— RGU I/O
                                                                  Port 1 ———— Port 2

**Note:** The RGU can also be enabled by setting the ‘Enable Cmd’ bit to 1 in the Host Command Word (P32).
Unit Overvoltage/Overcurrent Trips

Check the following items if the unit frequently has an overvoltage or overcurrent trip.

- **Does the Frame Catalog Number (P4) show the appropriate catalog number for the unit?**
  - **Yes**: Set P4 to match the catalog number shown on the data nameplate (see Chapter 1).
  - **No**: Set P4 to match the catalog number shown on the data nameplate (see Chapter 1).

- **Does the AC Line Inductance (P12) show the total line inductance provided to the RGU (including external components)?**
  - **Yes**: Calculate the total inductance and set P12.
  - **No**: Calculate the total inductance and set P12.

- **Does the External Capacitance (P203) show the total capacitance for all inverters connected on the DC bus?**
  - **Yes**: Calculate the total capacitance on the DC bus and set P203 appropriately.
  - **No**: Calculate the total capacitance on the DC bus and set P203 appropriately.

- **Is the RGU being overloaded for extended periods of time (beyond its rated capability)?**
  - **Yes**: Adjust the period of overload application for the RGU.
  - **No**: Adjust the period of overload application for the RGU.

- **Are drives on the DC bus set to allow a very fast deceleration time (faster than the voltage loop bandwidth of the RGU)?**
  - **Yes**: Adjust the drives to an acceptable deceleration time.
  - **No**: Adjust the drives to an acceptable deceleration time.

- **Is the current loop bandwidth (P198) high enough for the application?**
  - **Yes**: Adjust P198 (Current Loop Bandwidth) appropriately for the application (see the setup chapter in publication 2364F-5.01).
  - **No**: Adjust P198 (Current Loop Bandwidth) appropriately for the application (see the setup chapter in publication 2364F-5.01).

- **Is the voltage loop bandwidth (P205) set appropriately for the application?**
  - **Yes**: Adjust P205 (Voltage Loop Bandwidth) appropriately for the application (see the setup chapter in publication 2364F-5.01).
  - **No**: Adjust P205 (Voltage Loop Bandwidth) appropriately for the application (see the setup chapter in publication 2364F-5.01).

**ATTENTION:** Push the disconnect lever to off and verify zero volts across the DC bus before testing the following items.

- **Are the burden resistors (on the isolation board) at their rated resistance?**
  - **Yes**: Test the main control board, gate driver board, and isolation board (as instructed in Chapter 4). Replace as necessary.
  - **No**: Replace the damaged burden resistors.
**Damaged Components**

Damaged components may be suspected if a loud discharge or melting smell has come from the RGU. Check the following items to find damaged components.

**ATTENTION:** Push the disconnect lever to off and verify zero volts across the DC bus before testing the following items.

- **Is there any visible damage to the MOVs?**
  - Yes: Replace the MOVs.
  - No:
    - **Are the AC line fuses in good condition?**
      - Yes: Replace all the AC line fuses.
      - No:
        - **Test the IGBTs (as instructed in Chapter 4). Are any IGBTs damaged?**
          - Yes: Replace the damaged IGBTs. Test and replace the gate driver board and snubber boards as necessary.
          - No:
            - **Are the DC bus fuse(s) in good condition?**
              - Yes: Check the RGU for melted wiring. Test the isolation board and gate driver board (as instructed in Chapter 4). Replace as necessary.
              - No: Replace the damaged fuses.
Handling Fault Conditions

Typically, a fault condition can be resolved through the process shown in the flowchart below. See chapter 3 for details on handling specific faults and warnings.
Chapter 3

Troubleshooting Faults and Warnings

Contents

This chapter covers the faults and warnings which may indicate troubled conditions in the RGU. When the RGU indicates a warning, fault, or status condition, you may need to take remedial action as stated in this chapter.

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<td>How to Check the Warning and Fault Queues</td>
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<td>Resetting the RGU</td>
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<td>Troubleshooting Faults and Warnings</td>
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Faults and Warnings

A fault situation will typically cause the RGU to report the condition and disable. A warning situation will cause the RGU to report the condition, but the RGU will continue normal operation (with regard to the condition). The RGU will indicate a situation as either a fault or warning according to the configuration of the fault/warning select parameters.

When the RGU faults, the HIM or GPT will immediately report the fault on screen.

Figure 3.1
Fault Announcement–HIM

Figure 3.2
Fault Announcement–GPT
How to Check the Warning and Fault Queues

When a fault condition occurs, the RGU will store the fault information in the fault queue. The fault queue will indicate the fault condition, the sequence number of the fault, and will display ‘Trip’ if the fault caused the RGU to trip. To view the warning or fault queue with a HIM, choose Control Status, then choose either Fault Queue or Warning Queue, then choose View Queue to open the queue (as shown in Figure 3.3).

Figure 3.3
Checking the Fault Queue–HIM

![Diagram of how to check the fault queue with a HIM]

Typically, the fault (or fault queue) will need to be cleared before the RGU can be enabled again. To clear the fault queue, choose Control Status, then choose Fault Queue, then choose Clear Queue (as shown in Figure 3.4). The fault queue will clear, and the unit can be enabled again (a reset may be required to rectify any hardware or software conditions).

Figure 3.4
Clearing the Fault Queue–HIM

![Diagram of how to clear the fault queue with a HIM]
To view the warning or fault queue with a GPT, go to the main menu by pushing F1, then choose either *Fault Queue* or *Warning Queue*. The fault queue should appear as shown in Figure 3.5.

The fault queue can be cleared by entering the fault queue and pressing F1 to clear the fault or F2 to clear the queue. An individual fault can be cleared on a GPT by pressing the stop button (on any screen).

**Figure 3.5**
Checking the Fault Queue–GPT

Select Main Menu (F1)

Select Item 3 (Fault Queue)

Sequence Number and Fault Type

To clear the Fault Queue, Press F2.

Fault Number

Date and Time of Fault
### Resetting the RGU

If a fault is the result of a hardware or software failure, the unit may need to be reset to reinitialize the hardware and software before the unit can be enabled.

The RGU can be reset by:

- Cycling power to the RGU.
- Sending a reset command through a HIM, GPT, or other SCANport device.

To reset the RGU with a HIM, choose *Control Status*, then choose *Reset Drive*.

![Figure 3.6 Resetting the RGU–HIM](image)

To reset the RGU with a GPT, press F3 (while in the fault queue).

![Figure 3.7 Resetting the RGU–GPT](image)

To reset the RGU with other SCANport devices, send a reset command through the Host Command Word (P32 bit 7).
**Troubleshooting Faults and Warnings**

The following list provides information for understanding and troubleshooting each fault or warning condition in the RGU.

Parameters can be stored in the internal memory of a GPT or Series B HIM, or can be stored and printed out using DriveTools software.

**Important:** Always record or store parameters before upgrading firmware or replacing the main control board.

![ATTENTION: Do not attempt to alter or modify any printed circuit boards. Any attempt to alter or modify boards may result in personal injury or property damage.]

<table>
<thead>
<tr>
<th>Number</th>
<th>Fault</th>
<th>Indicates</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>ROM Bad CRC</td>
<td>Program memory error detected.</td>
<td>Try restarting the RGU, verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>1</td>
<td>RAM Error</td>
<td>RAM error detected.</td>
<td>Try restarting the RGU, verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>2</td>
<td>BatRAM Err</td>
<td>Battery-backed RAM error detected.</td>
<td>Try restarting the RGU, verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>3</td>
<td>DSP Load</td>
<td>Error detected while loading DSP program memory at startup.</td>
<td>Try restarting the RGU, verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>4</td>
<td>FPGA Load</td>
<td>Error detected while loading FPGA firmware at startup.</td>
<td>Try restarting the RGU, verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>5</td>
<td>lnq Foldback W</td>
<td>The current is being limited due to high heatsink temperatures.</td>
<td>The internal wiring may be at risk of overheating. Check that the door fans are operating properly, and verify that the RGU is operating at the appropriately derated current (see the specifications appendix in 2364F-5.01). Verify that the RGU is not operating in overload for an extended period of time.</td>
</tr>
</tbody>
</table>

**Note:** 'W' indicates that the condition is normally reported as a warning, rather than a fault.
<table>
<thead>
<tr>
<th>Number</th>
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</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>M1 Open</td>
<td>M1 contactor opened while the RGU is in ready or running state.</td>
<td>Clear the fault and try resetting/restarting the RGU. Check all feedback wiring. Verify that the door-mounted start switch is turned on. Check that timer relay (TR1) is set to 3 seconds. Check for any other fault activity that may be causing the M1 Open fault.</td>
</tr>
<tr>
<td>7</td>
<td>SCAnport Err</td>
<td>Error detected in SCAnport controlling device (or device missing).</td>
<td>Verify that the SCAnport device is connected properly. Pull the plug out and reconnect. If necessary, try resetting or restarting the RGU.</td>
</tr>
<tr>
<td>8</td>
<td>R2R HW Error</td>
<td>Error detected in the R2R hardware by the CAN chip (which is responsible for R2R communications).</td>
<td>Clear the fault and try resetting/restarting the RGU. Check the R2R board(s) and wiring connections. Troubleshoot the board(s) and replace as necessary.</td>
</tr>
<tr>
<td>9</td>
<td>Control Volt</td>
<td>The voltage supplied to the main control board is too low for reliable operation.</td>
<td>The boards receive power from the DC bus. Check the wiring from the gate driver board (J10) to the DC bus. Check the ribbon cable connection between the gate driver board (J1) and the main control board (J3). Check the TE connection on main control board (J11) and the gate driver board (TB7-2). Troubleshoot the gate driver board and main control board and replace as necessary.</td>
</tr>
<tr>
<td>10</td>
<td>H/S Overtemp</td>
<td>The heatsink temperature has exceeded the prescribed temperature limit (100°C for J-L codes, 110°C for M and N-codes).</td>
<td>Check that the door fans are operating properly, and verify that the RGU is operating at the appropriately derated current (see the specifications appendix in 2364F-5.01). Verify that the RGU is not operating in overload for an extended period of time. Check internal wiring and components for heat damage (melted wiring or burn marks).</td>
</tr>
<tr>
<td>11</td>
<td>Bus Low</td>
<td>The DC bus voltage is under the DC Bus Low Setting (P28, default 71% of nominal).</td>
<td>Verify the parameter setup. Check the Frame Catalog Number (P4), the Scaled Bus Feedback (P143), the Bus Voltage Feedback Calibration (P144), and the DC Bus Low Setting (P28). Check the bus for shorts to ground (PE).</td>
</tr>
<tr>
<td>12</td>
<td>Bus High</td>
<td>The DC bus voltage has exceeded the DC Bus High Setting (P29, default 114% of nominal).</td>
<td>Verify the parameter setup. Check the Frame Catalog Number (P4), the Scaled Bus Feedback (P143), the Bus Voltage Feedback Calibration (P144), and the DC Bus High Setting (P29).</td>
</tr>
<tr>
<td>13</td>
<td>BRAM Chksum</td>
<td>The checksum of data in battery-backed RAM was bad. The data is deemed as unreliable.</td>
<td>Try restarting the RGU, verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>14</td>
<td>Prchrg Fail</td>
<td>The DC bus voltage was high enough to power the control boards (200V DC), but did not rise to the RMS value of the AC line to allow the main contactor (M1) to close.</td>
<td>There may be too many inverters attached to the DC bus (the precharge routine can only accommodate a certain amount of external capacitance). If necessary, disconnect some of the inverters until the RGU has completed its precharge, or contact Rockwell Automation for other solutions. Check the precharge resistors, the precharge fuses, and the precharge contactor (M2). Also, check for shorts between the DC bus and ground (PE).</td>
</tr>
<tr>
<td>15</td>
<td>DSP Timeout</td>
<td>The host processor did not receive data from the DSP. The host assumes that the DSP is not running.</td>
<td>Try restarting the RGU, verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>16</td>
<td>Desaturizan</td>
<td>A power module was overloaded so severely that the power module was forced out of full ‘turn on’ condition.</td>
<td>Check the power modules as indicated in chapter 4. Check the line fuses and DC bus fuse (if equipped). If the components are good, clear the fault and reset/restart the RGU.</td>
</tr>
<tr>
<td>Number</td>
<td>Fault</td>
<td>Indicates</td>
<td>Action</td>
</tr>
<tr>
<td>--------</td>
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<td>---------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>17</td>
<td>P177 bit 1 Board Intlk</td>
<td>The voltage feedback connector (J1) or the current feedback connector (J7) is not plugged into the isolation board.</td>
<td>Verify that the J1 and J7 connections on the isolation board are secure and that the wiring is in good condition. Check the AC line sensor fuses (F17 - 19). In an N-code RGU, check the LEM power supply located on the upper front of the power structure roll out unit.</td>
</tr>
<tr>
<td>18</td>
<td>P177 bit 2 HW Bus OverV</td>
<td>The hardware has detected a DC bus voltage over 810V DC (380/460V AC) or 1000V DC (575V AC).</td>
<td>Verify that the setup parameters are programmed appropriately (see the setup chapter of 2364F-5.01). Also, check the burden resistors on the isolation board. Check the operation of other drives in the system.</td>
</tr>
<tr>
<td>19</td>
<td>P177 bit 3 HW Line I</td>
<td>The hardware has detected an AC line overcurrent.</td>
<td>Verify that the setup parameters are programmed appropriately (see the setup chapter of 2364F-5.01). Check for any shorts to ground. Also, check the burden resistors on the isolation board. Clear the fault and try resetting/restarting the RGU.</td>
</tr>
<tr>
<td>20</td>
<td>P177 bit 4 Zero Seq Err</td>
<td>The 3-phase input to the unit is out of balance. The current vector sum is not near zero.</td>
<td>Clear the fault and try resetting/restarting the RGU. Verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). If the problem cannot be resolved, contact Rockwell Automation for hardware updates. If necessary, replace the main control board and/or send the board to Rockwell Automation for testing.</td>
</tr>
<tr>
<td>21</td>
<td>P177 bit 5 Phase Lock L</td>
<td>One or more phases from the AC line have lost power or have browned out.</td>
<td>The RGU can continue to operate until power is lost from two phases, or until power becomes too low for the RGU to compensate to load. If the phase(s) do not return, verify that the circuit breaker is closed, check the power source, check all AC connections, check the incoming AC line fuses (F1, F2, F3), and check for shorts to ground (PE). If there is no actual phase loss, check the AC line sensor fuses and the J1 connection to the isolation board.</td>
</tr>
<tr>
<td>22</td>
<td>P177 bit 6 Phase Loss</td>
<td>A phase from the AC line has lost power.</td>
<td>The RGU can continue to operate on single-phase power, but may trip if the load becomes too great, or may trip if the RGU is forced to regenerate. If the phase does not return, check the power source, check the incoming AC line fuses (F1, F2, F3), and check for shorts from the lost phase to ground (PE). If there is no actual phase loss, check the AC line sensor fuses and the J1 connection to the isolation board.</td>
</tr>
<tr>
<td>23</td>
<td>Not Used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Not Used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Not Used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>P177 bit 10 SW Line I</td>
<td>The software has detected an AC line overcurrent.</td>
<td>Verify that the setup parameters are programmed appropriately (see the setup chapter of 2364F-5.01). Check for any shorts to ground. Also, check the burden resistors on the isolation board.</td>
</tr>
<tr>
<td>27</td>
<td>P177 bit 11 I Offset Err</td>
<td>An excessive line current has been detected during initial power up.</td>
<td>Check the parameters for any unusual current settings. Check for any shorts to ground. Verify that the correct burden resistors are installed on the isolation board.</td>
</tr>
</tbody>
</table>

**Note:** ‘W’ indicates that the condition is normally reported as a warning, rather than a fault.
<table>
<thead>
<tr>
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<th>Fault</th>
<th>Indicates</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>DualPort TO</td>
<td>The DSP did not receive any data from the host processor. The DSP assumes that the host is not running.</td>
<td>Clear the fault and try resetting/restarting the RGU. Verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>29</td>
<td>Not Used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Not Used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>DSP Fault</td>
<td>DSP is in faulted state (reason unknown).</td>
<td>Clear the fault and try resetting/restarting the RGU. Verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>32</td>
<td>Clock Loss</td>
<td>W The host processor was reset due to a clock loss.</td>
<td>Try resetting/restarting the RGU when possible. Verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>33</td>
<td>Double Bus</td>
<td>W The host processor was reset due to a memory access error. The memory device was not responding in cycle.</td>
<td>Try resetting/restarting the RGU when possible. Verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>34</td>
<td>Watchdog</td>
<td>W The host processor was reset due to a watchdog situation.</td>
<td>Try resetting/restarting the RGU when possible. Verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>35</td>
<td>En at Pwr Up</td>
<td>The RGU enabled immediately at power up.</td>
<td>Verify that the parameters are programmed appropriately. If the RGU is set to “Local Mode Only” (P8 = 0), then this fault can be suppressed or can be reported as a warning by reprogramming P181 and/or P182.</td>
</tr>
<tr>
<td>36</td>
<td>Battery Low</td>
<td>W The lithium battery in the battery-backed RAM is low. If the RGU is powered down, all setup parameters will be lost.</td>
<td>Replace the battery on the U11 RAM chip as indicated in chapter 4 (or send the main control board in for repair).</td>
</tr>
<tr>
<td>37</td>
<td>TIO Loss</td>
<td>The slave RGU could not synchronize with the master RGU on power up since the TIO signal could not be found.</td>
<td>Verify that the master unit is operating properly. Check the R2R boards and fiber optic connections. Secure all terminals. If an R2R hub board is equipped, verify the wiring arrangement. Reset the RGUs.</td>
</tr>
<tr>
<td>38</td>
<td>R2R Dup Addr</td>
<td>The CAN chip detected two nodes trying to use a duplicate address.</td>
<td>Verify that only one unit is set as a master unit (P5). Check the R2R boards and fiber optic connections. Secure all terminals. If an R2R hub board is equipped, verify the wiring arrangement. Reset the RGUs. If necessary, reinstall or upgrade the firmware.</td>
</tr>
<tr>
<td>39</td>
<td>Lost Master</td>
<td>The slave RGU is not receiving data from the master unit (seen only on a slave RGU in a master-slave configuration).</td>
<td>Check the R2R boards and fiber optic connections. Secure all terminals. If an R2R hub board is equipped, verify the wiring arrangement. Verify that the master RGU is operating properly. Reset the RGUs.</td>
</tr>
<tr>
<td>Number</td>
<td>Fault</td>
<td>Indicates</td>
<td>Action</td>
</tr>
<tr>
<td>--------</td>
<td>------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>40</td>
<td>DPRAM Error</td>
<td>An error has been detected in the dual port RAM between the host processor and the DSP.</td>
<td>Clear the fault and try resetting/restarting the RGU. Verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>41</td>
<td>No Vloop Tic</td>
<td>The primary clock for the host processor (which is used to synchronize with the DSP) is missing.</td>
<td>The unit switches to the internal timer, but synchronization between the host processor and the DSP is lost. Try restarting the RGU, verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware. Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>42</td>
<td>No Fast Task</td>
<td>A watchdog error has been detected in the main control loop task of the host processor.</td>
<td>Clear the fault and try resetting/restarting the RGU. Verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>43</td>
<td>No Bgnd Task</td>
<td>A watchdog error has been detected in a background task of the host processor.</td>
<td>Clear the fault and try resetting/restarting the RGU. Verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>44</td>
<td>Addr Bus Err</td>
<td>An address bus error has been detected on the main control board.</td>
<td>Clear the fault and try resetting/restarting the RGU, verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware (or upgrade to the latest available firmware). Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>45</td>
<td>Data Bus Err</td>
<td>A data bus error has been detected on the main control board.</td>
<td>Clear the fault and try resetting/restarting the RGU, verify that all connections to the main control board are in place, and check the main control board for any obvious damage or any debris which may be shorting circuitry. If necessary, try reinstalling the firmware. Replace the board and/or send the board in for repair if the problem cannot be resolved.</td>
</tr>
<tr>
<td>46</td>
<td>Line Low</td>
<td>The input line voltage has fallen below the minimum threshold (as defined in P26).</td>
<td>Verify the parameter setup. Check the Frame Catalog Number (P4), the Rated AC Line Current (P11), and the AC Line Low Setting (P26). Verify that the current feedback burden resistors (on the isolation board) are appropriately sized.</td>
</tr>
<tr>
<td>47</td>
<td>Line High</td>
<td>The input line voltage has exceeded the maximum threshold (as defined in P27).</td>
<td>Verify the parameter setup. Check the Frame Catalog Number (P4), the Rated AC Line Current (P11), and the AC Line High Setting (P27). Check that the current feedback burden resistors (on the isolation board) are appropriately sized.</td>
</tr>
<tr>
<td>48</td>
<td>I2t Warnings</td>
<td>The I2t wire protection has evaluated the heatsink to power module junction temperatures, and is indicating that the temperature is at half of the trip point.</td>
<td>The internal wiring may be at risk of overheating. Check that all the door fans are operating properly, and verify that the RGU is operating at the appropriately derated current (see the specification appendix of 2364F-5.01). Verify that the RGU is not operating in overload for an extended period of time.</td>
</tr>
</tbody>
</table>

Note: 'W' indicates that the condition is normally reported as a warning, rather than a fault.
### Troubleshooting Faults and Warnings

<table>
<thead>
<tr>
<th>Number</th>
<th>Fault</th>
<th>Indicates</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>49</td>
<td>I2t Overload</td>
<td>W</td>
<td>The I2t wire protection has tripped the unit since the heatsink to power module junction temperature has exceeded the maximum allowed.</td>
</tr>
<tr>
<td></td>
<td>P183 bit 1</td>
<td></td>
<td>The internal wiring may be at risk of overheating. Check that the door fans are operating properly, and verify that the RGU is operating at the appropriately derated current (see the specifications appendix in 2364F-5.01). Verify that the RGU is not operating in overload for an extended period of time. Check internal wiring and components for heat damage (melted wiring or burn marks).</td>
</tr>
<tr>
<td>50</td>
<td>H/S Hightemp</td>
<td>W</td>
<td>The heatsink temperature has exceeded 80ºC.</td>
</tr>
<tr>
<td></td>
<td>P183 bit 2</td>
<td></td>
<td>Check that the door fans are operating properly. Verify that the RGU is operating at the appropriately derated current (see the specifications appendix in 2364F-5.01). Verify that the RGU is not operating in overload for an extended period of time.</td>
</tr>
<tr>
<td>51</td>
<td>Reset Req’d</td>
<td>W</td>
<td>The RGU recognizes that a reset is required.</td>
</tr>
<tr>
<td></td>
<td>P183 bit 3</td>
<td></td>
<td>Reset the RGU. Either shut down the RGU and restart, or reset the RGU through a HIM or GPT.</td>
</tr>
<tr>
<td>52</td>
<td>NTC Open</td>
<td>W</td>
<td>The RGU has detected that the circuit for the NTC bridge thermal sensor is open.</td>
</tr>
<tr>
<td></td>
<td>P183 bit 4</td>
<td></td>
<td>Verify that the NTC wiring is in good condition. Check the connection on the main control board (J2). If necessary, replace the NTC sensor.</td>
</tr>
<tr>
<td>53</td>
<td>NTC Short</td>
<td>W</td>
<td>The RGU has detected that the NTC bridge thermal sensor wires are shorted together.</td>
</tr>
<tr>
<td></td>
<td>P183 bit 5</td>
<td></td>
<td>Verify that the NTC wiring is in good condition. Check the connection on the main control board (J2). If necessary, replace the NTC sensor.</td>
</tr>
<tr>
<td>54</td>
<td>MSTR Faulted</td>
<td>W</td>
<td>The slave RGU has received a faulted status from the master RGU through the R2R network.</td>
</tr>
<tr>
<td></td>
<td>P183 bit 6</td>
<td></td>
<td>Check the master RGU fault queue and correct the situation. Shut down the RGUs in the system. Restart all the RGUs after all the power has been discharged from the DC bus (restart the master RGU first).</td>
</tr>
<tr>
<td>55</td>
<td>1 Phase Warn</td>
<td>W</td>
<td>The RGU has detected a single phase condition on the incoming AC power. The threshold for detecting this condition is set by 1 Phase Threshold (P147).</td>
</tr>
<tr>
<td></td>
<td>P183 bit 7</td>
<td></td>
<td>If the phase does not return, check the power source, check the incoming AC line fuses (F1, F2, F3), and check for shorts from the lost phase to ground (PE). If there is no actual phase loss, check the AC line sensor fuses and the J1 connection to the isolation board.</td>
</tr>
<tr>
<td>56</td>
<td>1 Phase Err</td>
<td></td>
<td>The detected single phase condition has persisted beyond the time limit specified by 1 Phase Err Delay (P148).</td>
</tr>
<tr>
<td></td>
<td>P183 bit 8</td>
<td></td>
<td>If the phase does not return, check the power source, check the incoming AC line fuses (F1, F2, F3), and check for shorts from the lost phase to ground (PE). If there is no actual phase loss, check the AC line sensor fuses and the J1 connection to the isolation board.</td>
</tr>
</tbody>
</table>

**Note:** 'W' indicates that the condition is normally reported as a warning, rather than a fault.
Testing Components

This chapter provides instructions for testing RGU components. The topics listed below are covered in this chapter.

### Topics in this Chapter
- Testing and Replacing Parts in the Power Structure
- Testing the Main Control Board
- Testing the Gate Driver Board
- Testing the Isolation Board
- Testing the Control Power Filter
- Testing the Line RC Suppressor
- Testing the DC Bus Suppressor
- Testing MOVs
- Testing Precharge Resistors
- Testing IGBTs
- Terminal Blocks

**ATTENTION:** Do not attempt to alter or modify any printed circuit boards in the RGU. Any attempt to alter or modify boards may result in personal injury or property damage.
Testing Components

Testing and Replacing Parts in the Power Structure

The RGU power structure design is based on the 1336 FORCE drive. To test or replace parts in the power structure, refer to the instructions in this publication, and refer to the appropriate 1336 FORCE service manual, listed in Table 4.A, for additional details.

Table 4.A: 1336 FORCE Service Manuals

<table>
<thead>
<tr>
<th>RGU Current Code</th>
<th>Reference Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>1336 FORCE - 6.12</td>
</tr>
<tr>
<td>K</td>
<td>1336 FORCE - 6.13</td>
</tr>
<tr>
<td>L</td>
<td>1336 FORCE - 6.14</td>
</tr>
<tr>
<td>M</td>
<td>1336 FORCE - 6.15</td>
</tr>
<tr>
<td>N</td>
<td>Not available at time of publishing</td>
</tr>
</tbody>
</table>

Note: Most of the construction and components of the N-code power structure are equivalent to the M-code power structure. Publication 1336 FORCE - 6.15 can be used to service N-code power structures.

How the RGU Power Structure Differs From the 1336 FORCE

When using the 1336 FORCE service manuals, take note that the RGU power structure differs from the 1336 FORCE in the following regards:

- The power structure has an isolation board in place of the 1336 FORCE precharge board.
- The power structure has an RGU main control board in place of the 1336T main control board, standard adapter board, and HIM mounting bracket.
- The power structure does not include SCRs, SCR heatsinks, SCR snubber boards, or the SCR cooling fan.
- The power structure does not include a ground sense current transducer.
- The power structure does not include a DC bus inductor.
- The power structure can include an optional R2R communication board, R2R hub board, and/or SCANport interface board.
- The power structure may include a third current transducer on phase L2.
- The power structure may have a power supply filter board mounted below the gate driver board.
Testing the Main Control Board

The main control board regulates the power structure operation, and is capable of communication with external devices through SCANport and analog I/O.

Figure 4.1
Main Control Board

Note: A full listing of test points and a detailed drawing of the main control board can be found in Appendix A.

Important: Always record or store parameters before replacing the main control board, upgrading firmware, or replacing the battery for the battery-backed memory (parameters can be stored in the internal memory of a GPT or Series B HIM, or can be stored on a PC using DriveTools).
1. With power applied to the unit, check the LED indicators on the main control board (see Figure 4.2).

**Figure 4.2**  
**LED Indicators**

- **Normal Operation**
  The LEDs should be illuminated as shown when the unit is enabled.

- **Fault LED(s) are Illuminated**
  Check the fault queue if either of the fault LEDs are illuminated (see chapter 3 to troubleshoot).  
  *Reinstall firmware if the host fault LED is flashing.*

- **Power LEDs are not Illuminated (or are weak)**
  Check the wiring connections on the main control board and test the gate driver board if the power LEDs are not illuminated or are weak.

2. Set meter for DC voltage. Check the power supply to the main control board by testing the voltage across the test points shown in Table 4.B.

**Table 4.B: Power Supply Test Points—Main Control Board**

<table>
<thead>
<tr>
<th>Test Points</th>
<th>Typical Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP4 to AGND</td>
<td>4.7 to 5.3V DC</td>
</tr>
<tr>
<td>TP20 to AGND</td>
<td>14.4 to 15.4V DC</td>
</tr>
<tr>
<td>TP26 to AGND</td>
<td>-14.4 to -15.4V DC</td>
</tr>
</tbody>
</table>

*Note: If a low voltage is seen, the ribbon cable (at J3) may need to be connected/replaced, or the gate driver board may need to be tested (the gate driver board supplies power for the main control board and isolation board).*
3. Set meter for AC voltage. Check the AC line feedback by testing the voltage of TP32, TP33, and TP34 with respect to AGND. Table 4.C shows the typical voltages that should be seen for these test points.

Table 4.C: AC Line Feedback Test Points–Main Control Board

<table>
<thead>
<tr>
<th>Rated Line Voltage</th>
<th>Typical Voltage at Test Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>380V AC</td>
<td>1.08 to 1.21V AC</td>
</tr>
<tr>
<td>460V AC</td>
<td>1.28 to 1.42V AC</td>
</tr>
<tr>
<td>575V AC</td>
<td>1.62 to 1.76V AC</td>
</tr>
</tbody>
</table>

*Note: If a low voltage is seen, the ribbon cable (at J12) may need to be connected/replaced, or the isolation board may need to be tested.*

Consider checking the gate driver board and isolation board, as necessary. If there are firmware or SCANport problems, try reinstalling or upgrading to the latest available firmware.

If the board has failed any of these tests, or if the unit continually faults with the items shown in Table 4.D, the board may be damaged. Consider replacing the board and/or sending the board to Rockwell Automation for repair.

Table 4.D: AC Line Feedback Test Points–Main Control Board

<table>
<thead>
<tr>
<th>Fault Number</th>
<th>Fault Name</th>
<th>Fault Number</th>
<th>Fault Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>ROM Bad CRC</td>
<td>32</td>
<td>Clock Loss</td>
</tr>
<tr>
<td>1</td>
<td>RAM Error</td>
<td>33</td>
<td>Double Bus</td>
</tr>
<tr>
<td>2</td>
<td>BatRAM Err</td>
<td>34</td>
<td>Watchdog</td>
</tr>
<tr>
<td>3</td>
<td>DSP Load</td>
<td>36</td>
<td>Battery Low</td>
</tr>
<tr>
<td>4</td>
<td>FPGA Load</td>
<td>40</td>
<td>DPRAM Err</td>
</tr>
<tr>
<td>7</td>
<td>SCANport Err</td>
<td>41</td>
<td>No Vloop Tic</td>
</tr>
<tr>
<td>13</td>
<td>BRAM Chksum</td>
<td>42</td>
<td>No Fast Task</td>
</tr>
<tr>
<td>15</td>
<td>DSP Timeout</td>
<td>43</td>
<td>No Bgnd Task</td>
</tr>
<tr>
<td>28</td>
<td>DualPort TO</td>
<td>44</td>
<td>Addr Bus Err</td>
</tr>
<tr>
<td>31</td>
<td>DSP Fault</td>
<td>45</td>
<td>Data Bus Err</td>
</tr>
</tbody>
</table>
Replacing the Battery for the Battery-Backed Memory on the Main Control Board

Replacing the battery on the main control board (U11) will erase all modified parameters. Record parameters before replacing the battery.

1. Push the disconnect lever to off and wait for all voltage to discharge from the unit. Do not continue until all voltage has dissipated from the DC bus.

2. Verify that there is no voltage across the DC bus (see Figure 4.12 and Figure 4.13 for check points).

3. Verify that there is no voltage across the terminals and subcomponents of the main control board.

4. Put on an electrostatic discharge (ESD) protective strap and connect the strap to one of the door latches.

5. Grasp the battery, from the top and bottom, and gently pull the battery off of U11 as shown in Figure 4.3 (note the orientation of the battery).

6. Gently press the new battery into place (the battery can only be installed in one orientation).

7. Properly dispose of the lithium battery according to your local ordinances and company procedures.

Figure 4.3
Replacing the Battery for the Battery-Backed Memory

See publication 1756-5.68 for guidelines concerning lithium battery disposal.
**Testing the Gate Driver Board**

The gate driver board turns the IGBT gates on and off and supplies power to the main control board and isolation board.

**Figure 4.4**

*Accessing the Gate Driver Board*

![Diagram of gate driver board with instructions to remove screws and nuts.](image-url)
Note: A full listing of test points and a detailed illustration of the gate driver board can be found in Appendix A.

1. Push the disconnect lever to off and wait for all voltage to discharge from the unit. Do not continue until all voltage has dissipated from the DC bus.

2. Verify that there is no voltage across the DC bus (see Figure 4.12 and Figure 4.13 for check points).

3. Disconnect all wiring from the main control board (J2, J3, J9, J10, J11, J12, and TB1).

4. Remove the mounting panel for the main control board (see Figure 4.4).

5. Test fuses F1 and F3 on the gate driver board. If a fuse is damaged, replace the board (the damaged board can be sent to Rockwell Automation for repair).

6. Secure all wiring to the gate driver board (J1, J7, J8, J10, and TB7).
7. Set meter(s) to test for DC voltage.

8. Connect meter leads to the test points indicated in Table 4.E (if necessary, test only one set of test points at a time).

<table>
<thead>
<tr>
<th>Table 4.E: Power Supply Test Points–Gate Driver Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Points</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>TP4 to DGND</td>
</tr>
<tr>
<td>TP5 to DGND</td>
</tr>
<tr>
<td>TB6 to DGND</td>
</tr>
</tbody>
</table>

9. With the meter leads connected, reattach the mounting panel for the main control board.

10. Reconnect all wiring to the main control board (J2, J3, J9, J10, J11, J12, and TB1).

11. Push the disconnect lever to on and turn the start switch to on.

12. Check the voltage readings. If the readings do not comply with Table 4.E, replace the gate driver board.

   **Note:** If the gate driver board is damaged, IGBTs and snubber boards may also need to be tested.

If the board has failed any of these tests, or if the unit continually faults with the items shown in Table 4.F, the board may be damaged. Consider replacing the board and/or sending the board to Rockwell Automation for further testing and repair.

<table>
<thead>
<tr>
<th>Table 4.F: Typical Faults–Possibly Involving the Gate Driver Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fault Number</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>16</td>
</tr>
</tbody>
</table>

For additional test procedures, see the appropriate 1336 FORCE service manual (see Table 4.A).
Testing the Isolation Board

The isolation board receives feedback from the AC line, DC bus, current transducers, main contactor (M1), and reset button. This feedback is passed to the main control board for processing.

Figure 4.6
Isolation Board

Note: A detailed illustration of the isolation board can be found in Appendix A.

1. Push the disconnect lever to off and wait for all voltage to discharge from the unit. Do not continue until all voltage has dissipated from the DC bus.

2. Verify that there is no voltage across the DC bus (see Figure 4.12 and Figure 4.13 for check points).

3. Verify that there is no voltage across the terminals and subcomponents of the isolation board.
4. Set meter to test resistance.

5. Check the resistance of each burden resistor. Replace any burden resistors that do not comply with the specifications given in Table 4.G.

**Table 4.G: Burden Resistor Specifications**

<table>
<thead>
<tr>
<th>Current Code</th>
<th>Rated Input Voltage</th>
<th>Rated Resistance (Acceptable Readings)</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>380/460</td>
<td>8.87 ohm (8.84-9.31 ohm)</td>
</tr>
<tr>
<td>J</td>
<td>575</td>
<td>11.0 ohm (10.45-11.55 ohm)</td>
</tr>
<tr>
<td>K</td>
<td>380/460/575</td>
<td>7.5 ohm (7.12-7.88 ohm)</td>
</tr>
<tr>
<td>L</td>
<td>380/460</td>
<td>6.19 ohm (5.88-6.50 ohm)</td>
</tr>
<tr>
<td>L</td>
<td>575</td>
<td>7.15 ohm (6.79-7.51 ohm)</td>
</tr>
<tr>
<td>M</td>
<td>380/460</td>
<td>4.02 ohm (3.82-4.22 ohm)</td>
</tr>
<tr>
<td>M</td>
<td>575</td>
<td>4.53 ohm (4.30-4.76 ohm)</td>
</tr>
<tr>
<td>N</td>
<td>380/460</td>
<td>3.01 ohm (2.86-3.16 ohm)</td>
</tr>
<tr>
<td>N</td>
<td>575</td>
<td>3.40 ohm (3.23-3.57 ohm)</td>
</tr>
</tbody>
</table>

6. Check all wiring connections on the isolation board and verify that SW1 is set appropriately (115V AC).

7. Set meter to test AC voltage. While applying power to the unit, check the voltage across the bus control relay (TB6-6 to TB6-9). The voltage should rise to 115V AC during precharge, then drop to zero after precharge.

If the board has failed any of these tests, or if the unit continually faults with the items shown in Table 4.H, the board may be damaged. Consider replacing the board and/or sending the board to Rockwell Automation for repair.

**Table 4.H: Typical Faults–Possibly Involving Isolation Board**

<table>
<thead>
<tr>
<th>Fault Number</th>
<th>Fault Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Board Intlk</td>
</tr>
<tr>
<td>20</td>
<td>Zero Seq Err</td>
</tr>
<tr>
<td>21</td>
<td>Phase Lock Loop</td>
</tr>
<tr>
<td>22</td>
<td>Phase Loss</td>
</tr>
<tr>
<td>27</td>
<td>I Offset Err</td>
</tr>
</tbody>
</table>
Testing the Control Power Filter

The control power filter reduces the noise in the control power. The effectiveness of the filter can be checked by viewing the waveforms before and after the filter (there should be less noise seen after the filter, as shown in Figure 4.7).

Push the disconnect lever to off and wait for all voltage to discharge from the unit. Do not continue until all voltage has dissipated from the DC bus.

Verify that there is no voltage across the DC bus (see Figure 4.12 and Figure 4.13 for check points).

Verify that there is no voltage across the subcomponents of the control power filter.

Set meter for resistance and check the resistor. For 4 kHz filters, the resistance should be 0.8-1.4 ohms (1 ohm rating). For 2 kHz filters, the resistance should be 1.3-1.9 ohms (1.5 ohm rating).

Check the continuity between C1-1 and the connection point for the control power transformer (PT1).

If the filter has failed any of these tests, it may be damaged. Replace the filter and consider replacing any associated wiring or fuses, as necessary.

Figure 4.7
Voltage Waveforms Ahead and After the Control Power Filter

![Voltage Waveforms](image-url)
Testing the Line RC Suppressor

The line RC suppressor discharges excess voltage from the AC lines.

1. Push the disconnect lever to off and wait for all voltage to discharge from the unit. Do not continue until all voltage has dissipated from the DC bus.

2. Verify that there is no voltage across the DC bus (see Figure 4.12 and Figure 4.13 for check points).

3. Verify that there is no voltage across the subcomponents of the suppressor.

4. Check the board, fuses, and any associated wiring for visible damage (burn marks, or damaged subcomponents).

5. Remove fuses F14, F15, and F16.

6. Set meter for resistance and test each resistor on the board. Each resistor should read 670-700 k-ohm (680 k-ohm rating).


If the board has failed any of these tests, the board may be damaged. Replace the board and consider replacing any associated wiring or fuses, as necessary.

Figure 4.8
Line RC Suppressor
**Testing the DC Bus Suppressor**

The DC bus suppressor discharges excess voltage from the DC bus.

1. Push the disconnect lever to off and wait for all voltage to discharge from the unit. Do not continue until all voltage has dissipated from the DC bus.

2. Verify that there is no voltage across the DC bus (see Figure 4.12 and Figure 4.13 for check points).

3. Verify that there is no voltage across the subcomponents of the suppressor.

4. Check the suppressor and any associated wiring for visible damage (burn marks or damaged subcomponents).

5. Check the resistance between the top of each capacitor with respect to the PE terminal. The meter should show 8-10 ohms.

6. Set meter for resistance and test each resistor. The two middle resistors should read 8.5-9.5 k-ohms (9 k-ohm rating). The two outer resistors should read 14.7-15.8 ohms (15 ohm rating).

If the suppressor has failed any of the above tests, it may be damaged. Replace the suppressor and consider replacing any associated wiring, as necessary.

**Figure 4.9**
**DC Bus Suppressor**
Testing MOVs

MOVs provide surge, line-to-line, and line-to-ground protection for the RGU.

1. Push the disconnect lever to off and wait for all voltage to discharge from the unit. Do not continue until all voltage has dissipated from the DC bus.

2. Verify that there is no voltage across the DC bus (see Figure 4.12 and Figure 4.13 for check points).

3. Observe the MOVs (typically located near the circuit breaker). Replace any MOVs that are visibly damaged.

Testing Precharge Resistors

The precharge resistors help the RGU supply appropriate voltage to the internal capacitors during the precharge routine.

1. Push the disconnect lever to off and wait for all voltage to discharge from the unit. Do not continue until all voltage has dissipated from the DC bus.

2. Verify that there is no voltage across the DC bus (see Figure 4.12 and Figure 4.13 for check points).

3. Check the precharge fuses.

4. Set meter to check resistance. Disconnect and check each of the precharge resistors. Resistors should indicate a resistance of 5.6-6.8 ohms (6 ohm rating).

   Note: Older J-code RGU resistors should have a resistance of 26.5-28.0 ohms (27 ohm rating). This resistor is shown in Figure 4.10.

Replace any damaged components and associated wiring, as necessary.
Testing IGBTs

IGBTs can be checked by testing the resistance of the AC terminals with respect to the DC busbars.

1. Push the disconnect lever to off and wait for all voltage to discharge from the unit. Do not continue until all voltage has dissipated from the DC bus.

2. Verify that there is no voltage across the DC bus (see Figure 4.12 and Figure 4.13 for check points).

3. Test the resistance between L1 and DC Bus+. J, K, and L-code RGUs should show a high resistance (over 500 k-ohms), M and N-code RGUs should indicate a resistance of 5 to 10 k-ohms (since two IGBTs are installed in parallel). Test the other two lines (L2 and L3) with respect to DC Bus+.

4. Test the resistance of L1, L2, and L3 with respect to DC Bus-. Again, J, K, and L-code RGUs should read over 500 k-ohms, while M and N-code RGUs should read 5 to 10 k-ohms.

5. Set meter to check diodes. Take a reading of L1 to DC Bus+ (with negative lead on the DC bus). A reading of 0.2 to 0.4 volts should be seen. Test the other two lines with respect to DC Bus+.

6. Take a reading of L1 to DC Bus- (with positive lead on DC bus). Again a reading of 0.2 to 0.4 volts should be seen. Test the other two lines with respect to DC Bus-.

If any of these tests have failed, the particular IGBTs may be damaged (opened or shorted). Replace any damaged IGBTs and consider testing the gate driver board and snubber boards.

Additional test instructions for the IGBTs (power modules) can be seen in the 1336 FORCE service manuals (see Table 4.A).
Figure 4.12
Check Points on AC Line and DC Bus (J, K, and L-code RGUs)

Figure 4.13
Check Points on AC Line and DC Bus (M and N-code RGUs)
Terminal Blocks

The RGU includes two terminal blocks which are available for customer connections (TB1 and TB2, shown in Figure 4.14). These terminal blocks are located in the leftmost bay of the unit.

The RGU also has an analog I/O terminal block available for customer connections (TB1, on the main control board). Details for connecting, programming, and using analog I/O can be found in publication 2364F-5.01.

N-code RGUs also include an additional terminal block (TB3). This terminal block is dedicated for motor-operated circuit breaker wiring.

Figure 4.14
Terminal Blocks–TB1 and TB2
Appendix A

Reference Information

Contents

This appendix includes reference information for the RGU, as indicated below.

Reference Information in This Chapter

Specifications
Printed Circuit Boards
Test Points
Board-to-Board Schematics
Firmware Diagrams

Specifications

Table A: Functional Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>97%</td>
</tr>
<tr>
<td>AC Input Frequency Tolerance</td>
<td>45 to 65 Hz</td>
</tr>
<tr>
<td>AC Input Voltage Tolerance</td>
<td>±10%</td>
</tr>
<tr>
<td>Motoring Output Current Overload</td>
<td>150% of rated current for 60 seconds</td>
</tr>
<tr>
<td>Regenerating Output Current Overload</td>
<td>150% of rated current for 60 seconds</td>
</tr>
<tr>
<td></td>
<td>150% of rated current for 30 seconds (380/460V AC N-code RGUs at 40°C, or 575V AC N-code RGUs at 30°C)</td>
</tr>
<tr>
<td>Output Voltage Variation</td>
<td>10% maximum for a ±100% DC output current step load change</td>
</tr>
<tr>
<td>Resolution of Output Voltage Selection</td>
<td>1.0V</td>
</tr>
<tr>
<td>Voltage Regulator Bandwidth</td>
<td>200 radians/sec maximum</td>
</tr>
<tr>
<td>Current Regulator Bandwidth</td>
<td>800 radians/sec (for 2 kHz units)</td>
</tr>
<tr>
<td></td>
<td>1200 radians/sec (for 4 kHz units)</td>
</tr>
</tbody>
</table>
### Table B: Electrical Specifications–Part 1

<table>
<thead>
<tr>
<th>RGU Current Code</th>
<th>Nominal Input Voltage (V AC)</th>
<th>Nominal AC Line Current (A AC)</th>
<th>Input Power (kVA)</th>
<th>Nominal DC Bus Voltage (V DC)</th>
<th>Maximum Continuous DC Bus Current (A DC)</th>
<th>Rated DC Bus (kW)</th>
<th>Basic Capacity (kVA)</th>
<th>Standard Capacity (kVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>380</td>
<td>77</td>
<td>51</td>
<td>564</td>
<td>85</td>
<td>49</td>
<td>2.0</td>
<td>5.0</td>
</tr>
<tr>
<td>K</td>
<td>380</td>
<td>182</td>
<td>120</td>
<td>564</td>
<td>200</td>
<td>116</td>
<td>2.0</td>
<td>5.0</td>
</tr>
<tr>
<td>L</td>
<td>380</td>
<td>330</td>
<td>217</td>
<td>564</td>
<td>363</td>
<td>211</td>
<td>2.0</td>
<td>5.0</td>
</tr>
<tr>
<td>M</td>
<td>380</td>
<td>678</td>
<td>447</td>
<td>564</td>
<td>746</td>
<td>433</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>N</td>
<td>380</td>
<td>906</td>
<td>596</td>
<td>564</td>
<td>997</td>
<td>578</td>
<td>5.0</td>
<td>10.0</td>
</tr>
<tr>
<td>J</td>
<td>460</td>
<td>77</td>
<td>61</td>
<td>683</td>
<td>85</td>
<td>59</td>
<td>2.0</td>
<td>5.0</td>
</tr>
<tr>
<td>K</td>
<td>460</td>
<td>182</td>
<td>145</td>
<td>683</td>
<td>201</td>
<td>141</td>
<td>2.0</td>
<td>5.0</td>
</tr>
<tr>
<td>L</td>
<td>460</td>
<td>330</td>
<td>263</td>
<td>683</td>
<td>364</td>
<td>255</td>
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<td>5.0</td>
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<tr>
<td>M</td>
<td>460</td>
<td>678</td>
<td>541</td>
<td>683</td>
<td>749</td>
<td>524</td>
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<td>5.0</td>
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<tr>
<td>N</td>
<td>460</td>
<td>906</td>
<td>722</td>
<td>683</td>
<td>1000</td>
<td>700</td>
<td>5.0</td>
<td>10.0</td>
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<tr>
<td>J</td>
<td>575</td>
<td>77</td>
<td>62</td>
<td>848</td>
<td>88</td>
<td>74</td>
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<td>5.0</td>
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<tr>
<td>K</td>
<td>575</td>
<td>182</td>
<td>181</td>
<td>848</td>
<td>201</td>
<td>170</td>
<td>2.0</td>
<td>5.0</td>
</tr>
<tr>
<td>L</td>
<td>575</td>
<td>286</td>
<td>285</td>
<td>848</td>
<td>326</td>
<td>276</td>
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<td>5.0</td>
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<td>M</td>
<td>575</td>
<td>602</td>
<td>600</td>
<td>848</td>
<td>686</td>
<td>582</td>
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<td>5.0</td>
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<tr>
<td>N</td>
<td>575</td>
<td>802</td>
<td>799</td>
<td>848</td>
<td>914</td>
<td>775</td>
<td>5.0</td>
<td>10.0</td>
</tr>
</tbody>
</table>

1. The continuous AC line current values apply to both motoring and regenerating operations.
2. Rated DC bus kW is the power available on the DC thru bus at rated voltage and current.
### Electrical Specifications—Part 2

**Table C: Typical Capacitor Bank Values per Drive in uf/10 (For 380/460V AC Lineups)**

<table>
<thead>
<tr>
<th>RGU Current Code</th>
<th>Input Voltage (V AC)</th>
<th>Internal Capacitance (uf)</th>
<th>Line Inductance (uH)</th>
<th>Overcurrent Trip (Arms)</th>
<th>Overcurrent Trip Reference (TP20 Volts)</th>
<th>Overvoltage Trip (V DC)</th>
<th>Overvoltage Trip Reference (TP22 Volts)</th>
<th>Burden Resistor (Ohms)</th>
<th>Warning Temperature (ºC)</th>
<th>Trip Temperature (ºC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>J 380</td>
<td>6450</td>
<td>1193</td>
<td>173</td>
<td>4.55</td>
<td>820</td>
<td>3.75</td>
<td>8.87</td>
<td>80</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>K 380</td>
<td>12000</td>
<td>510</td>
<td>409</td>
<td>4.55</td>
<td>820</td>
<td>3.75</td>
<td>7.50</td>
<td>80</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>L 380</td>
<td>15000</td>
<td>317</td>
<td>743</td>
<td>4.55</td>
<td>820</td>
<td>3.75</td>
<td>6.19</td>
<td>80</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>M 380</td>
<td>24000</td>
<td>137</td>
<td>1526</td>
<td>4.55</td>
<td>820</td>
<td>3.75</td>
<td>4.02</td>
<td>80</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>N 380</td>
<td>24000</td>
<td>102</td>
<td>2039</td>
<td>4.55</td>
<td>820</td>
<td>3.75</td>
<td>3.01</td>
<td>80</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>J 460</td>
<td>6450</td>
<td>1193</td>
<td>173</td>
<td>4.55</td>
<td>820</td>
<td>3.75</td>
<td>8.87</td>
<td>80</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>K 460</td>
<td>12000</td>
<td>510</td>
<td>409</td>
<td>4.55</td>
<td>820</td>
<td>3.75</td>
<td>7.50</td>
<td>80</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>L 460</td>
<td>15000</td>
<td>317</td>
<td>743</td>
<td>4.55</td>
<td>820</td>
<td>3.75</td>
<td>6.19</td>
<td>80</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>M 460</td>
<td>24000</td>
<td>137</td>
<td>1526</td>
<td>4.55</td>
<td>820</td>
<td>3.75</td>
<td>4.02</td>
<td>80</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>N 460</td>
<td>24000</td>
<td>102</td>
<td>2039</td>
<td>4.55</td>
<td>820</td>
<td>3.75</td>
<td>3.01</td>
<td>80</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>J 575</td>
<td>2860</td>
<td>1853</td>
<td>140</td>
<td>4.55</td>
<td>1025</td>
<td>4.69</td>
<td>11.0</td>
<td>80</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>K 575</td>
<td>6000</td>
<td>832</td>
<td>409</td>
<td>4.55</td>
<td>1025</td>
<td>4.69</td>
<td>7.50</td>
<td>80</td>
<td>100</td>
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<tr>
<td>L 575</td>
<td>15000</td>
<td>404</td>
<td>644</td>
<td>4.55</td>
<td>1025</td>
<td>4.69</td>
<td>7.15</td>
<td>80</td>
<td>100</td>
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<tr>
<td>M 575</td>
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<td>191</td>
<td>1354</td>
<td>4.55</td>
<td>1025</td>
<td>4.69</td>
<td>4.53</td>
<td>80</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>N 575</td>
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<td>1805</td>
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<td>4.69</td>
<td>3.40</td>
<td>80</td>
<td>110</td>
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**Table D: Typical Capacitor Bank Values per Drive in uf/10 (For 575V AC Lineups)**

<table>
<thead>
<tr>
<th>Frame Size</th>
<th>HP</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1336 FORCE/SA3100</td>
<td>0.5-1</td>
<td>1.5</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>7.5-10</td>
<td>15-20</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>1336 IMPACT</td>
<td>16</td>
<td>22</td>
<td>33</td>
<td>47</td>
<td>68</td>
<td>135</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1336 PLUS/T1336 PLUS II</td>
<td>16</td>
<td>22</td>
<td>33</td>
<td>47</td>
<td>68</td>
<td>135</td>
<td>135</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Table E: Typical Capacitor Bank Values for each SA3000 Inverter (in uf/10)**

<table>
<thead>
<tr>
<th>Inverter</th>
<th>Capacitance</th>
<th>A</th>
<th>56A</th>
<th>70A</th>
<th>112A</th>
<th>140A</th>
<th>192A</th>
<th>240A</th>
<th>534A</th>
<th>972A</th>
<th>1457A</th>
</tr>
</thead>
<tbody>
<tr>
<td>380</td>
<td>470</td>
<td>760</td>
<td>940</td>
<td>1330</td>
<td>1645</td>
<td>3200</td>
<td>6400</td>
<td>12800</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Printed Circuit Boards

Figure 1
Main Control Board

To Gate Driver Board (J1)

To TE

Available for User Connections (Analog I/O)

To Isolation Board (J2)

To NTC Bridge Thermal Sensor

To SCANport Device

To SCANport Device

To Laptop PC (Used Only for Upgrading Firmware)

Flash Memory

Host Processor

Digital Signal Processor (DSP)
Figure 2
Gate Driver Board

To Main Control Board (J3)

To DC Bus

To Power Module Snubber Boards

To PE

Figure 3
Isolation Board

To AC Line, DC Bus

To Main Control Board (J12)

To Current Transducers (LEMs)

Note: TB2 is only used in Series B RGUs (or RGUs with 3-CT current feedback). See Figure 7.
<table>
<thead>
<tr>
<th>Test Points</th>
<th>Name</th>
<th>Description</th>
<th>Scale</th>
<th>Typical Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP1</td>
<td>AGND</td>
<td>Analog Ground</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TP2</td>
<td>DGND</td>
<td>Digital Ground</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TP3</td>
<td>DGND</td>
<td>Digital Ground</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TP4</td>
<td>+5V</td>
<td>+5V Power Supply</td>
<td>1:1</td>
<td>4.8 to 5.5V DC</td>
</tr>
<tr>
<td>TP5</td>
<td>DGND</td>
<td>Digital Ground</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TP6</td>
<td>RESET</td>
<td>Ground for Reset</td>
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<td>-</td>
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<tr>
<td>TP7</td>
<td>DGND</td>
<td>Digital Ground</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TP8</td>
<td>ANIN8</td>
<td>Analog In 8 Reference</td>
<td>-</td>
<td>-10 to +10V DC (see parameter P44 in pub 2364F-5.01)</td>
</tr>
<tr>
<td>TP9</td>
<td>DESAT</td>
<td>Power Desaturation Trip</td>
<td>Factory Use Only</td>
<td>-</td>
</tr>
<tr>
<td>TP10</td>
<td>ABS I</td>
<td>Absolute Value of Line Current</td>
<td>1.95V AC=Rated Current</td>
<td>1.75 to 2.15V AC (at full load)</td>
</tr>
<tr>
<td>TP11</td>
<td>DSP DAC3</td>
<td>DSP DAC 3 Output</td>
<td>Factory Use Only</td>
<td>-</td>
</tr>
<tr>
<td>TP12</td>
<td>AGND</td>
<td>Analog Ground</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TP13</td>
<td>DSP DAC2</td>
<td>DSP DAC 2 Output</td>
<td>Factory Use Only</td>
<td>-</td>
</tr>
<tr>
<td>TP14</td>
<td>+5VREF</td>
<td>+5V Reference</td>
<td>1:1</td>
<td>4.8 to 5.3V DC</td>
</tr>
<tr>
<td>TP15</td>
<td>-5VREF</td>
<td>-5V Reference</td>
<td>1:1</td>
<td>-5.3 to -4.8V DC</td>
</tr>
<tr>
<td>TP16</td>
<td>+10VREF</td>
<td>+10V Reference</td>
<td>1:1</td>
<td>9.6 to 10.4V DC</td>
</tr>
<tr>
<td>TP17</td>
<td>OCT REF</td>
<td>Overcurrent Trip</td>
<td>4.04V = 200% (225% of rated current)</td>
<td></td>
</tr>
<tr>
<td>TP18</td>
<td>EDC</td>
<td>DC Bus/Line Voltage</td>
<td>5V DC= 713V DC</td>
<td>2.50/3.02/3.78V DC (depending on rated line voltage)</td>
</tr>
<tr>
<td>TP19</td>
<td>OVT REF</td>
<td>Overvoltage Trip</td>
<td>5V DC= 1125V DC</td>
<td>3.08/3.73/4.66V DC (depending on rated line voltage)</td>
</tr>
<tr>
<td>TP20</td>
<td>+15V</td>
<td>+15V Power Supply</td>
<td>1:1</td>
<td>14.4 to 15.4V DC</td>
</tr>
<tr>
<td>TP21</td>
<td>ISS</td>
<td>Simulated S-Phase Current</td>
<td>1.95V AC=Rated Current</td>
<td>1.75 to 2.15V AC (at full load)</td>
</tr>
<tr>
<td>TP22</td>
<td>IR</td>
<td>Line Current (R)</td>
<td>1.95V AC=Rated Current</td>
<td>1.75 to 2.15V AC (at full load)</td>
</tr>
<tr>
<td>TP23</td>
<td>AGND</td>
<td>Analog Ground</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TP24</td>
<td>IT</td>
<td>Line Current (T)</td>
<td>1.95V AC=Rated Current</td>
<td>1.75 to 2.15V AC (at full load)</td>
</tr>
<tr>
<td>TP25</td>
<td>IS</td>
<td>Line Current (S)</td>
<td>1.95V AC=Rated Current</td>
<td>1.75 to 2.15V AC (at full load)</td>
</tr>
<tr>
<td>TP26</td>
<td>-15V</td>
<td>-15V Power Supply</td>
<td>1:1</td>
<td>-14.4 to -15.4V DC</td>
</tr>
<tr>
<td>TP27</td>
<td>ANIN1</td>
<td>Analog In 1</td>
<td>10V DC = Full Scale</td>
<td>-10 to 10V DC (see parameter P36 in pub 2364F-5.01)</td>
</tr>
<tr>
<td>TP28</td>
<td>ANIN2</td>
<td>Analog In 2</td>
<td>10V DC = Full Scale</td>
<td>-10 to 10V DC (see parameter P37 in pub 2364F-5.01)</td>
</tr>
<tr>
<td>TP29</td>
<td>AGND</td>
<td>Analog Ground</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TP30</td>
<td>ANOUT1</td>
<td>Analog Out 1</td>
<td>10V DC = Full Scale</td>
<td>-10 to 10V DC (see parameter P47 in pub 2364F-5.01)</td>
</tr>
<tr>
<td>TP31</td>
<td>ANOUT2</td>
<td>Analog Out 2</td>
<td>10V DC = Full Scale</td>
<td>-10 to 10V DC (see parameter P48 in pub 2364F-5.01)</td>
</tr>
<tr>
<td>TP32</td>
<td>VR</td>
<td>Voltage (R)</td>
<td>1.435V AC = 277V AC</td>
<td>1.14/1.38/1.71V AC (depending on rated line voltage)</td>
</tr>
<tr>
<td>TP33</td>
<td>VS</td>
<td>Voltage (S)</td>
<td>1.435V AC = 277V AC</td>
<td>1.14/1.38/1.71V AC (depending on rated line voltage)</td>
</tr>
<tr>
<td>TP34</td>
<td>VT</td>
<td>Voltage (T)</td>
<td>1.435V AC = 277V AC</td>
<td>1.14/1.38/1.71V AC (depending on rated line voltage)</td>
</tr>
<tr>
<td>TP35</td>
<td>+BUS</td>
<td>+Bus Voltage to Ground</td>
<td>5V DC = 1125V DC</td>
<td>1.25/1.51/1.89V AC (depending on rated line voltage)</td>
</tr>
<tr>
<td>TP36</td>
<td>-BUS</td>
<td>-Bus Voltage to Ground</td>
<td>5V DC = 1125V DC</td>
<td>1.25/1.51/1.89V AC (depending on rated line voltage)</td>
</tr>
<tr>
<td>TP37</td>
<td>BUS</td>
<td>Bus Voltage</td>
<td>5V DC = 1125V DC</td>
<td>1.25/1.51/1.89V AC (depending on rated line voltage)</td>
</tr>
</tbody>
</table>
### Table G: Test Points–Gate Driver Board

<table>
<thead>
<tr>
<th>Test Points</th>
<th>Name</th>
<th>Description</th>
<th>Scale</th>
<th>Typical Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP1</td>
<td>+BUS</td>
<td>Positive Bus Input</td>
<td>1:1</td>
<td>½ rated DC bus voltage</td>
</tr>
<tr>
<td>TP2</td>
<td>-BUS</td>
<td>Negative Bus Input</td>
<td>1:1</td>
<td>½ rated DC bus voltage</td>
</tr>
<tr>
<td>TP3</td>
<td>+24V</td>
<td>+24V Power Supply</td>
<td>1:1</td>
<td>23.7 to 24.3V DC</td>
</tr>
<tr>
<td>TP4</td>
<td>+5V</td>
<td>+5V Reference</td>
<td>1:1</td>
<td>4.8 to 5.4V DC</td>
</tr>
<tr>
<td>TP5</td>
<td>+15V</td>
<td>+15V Reference</td>
<td>1:1</td>
<td>14.4 to 15.4V DC</td>
</tr>
<tr>
<td>TP6</td>
<td>-15V</td>
<td>-15V Reference</td>
<td>1:1</td>
<td>-14.4 to -15.4V DC</td>
</tr>
<tr>
<td>TP7</td>
<td>DGND</td>
<td>Digital Ground</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TP8</td>
<td>ISO12</td>
<td>Tachometer/Encoder</td>
<td>Not Used</td>
<td>-</td>
</tr>
<tr>
<td>TP9</td>
<td>ISO12RTN</td>
<td>Tachometer/Encoder</td>
<td>Not Used</td>
<td>-</td>
</tr>
<tr>
<td>TP10</td>
<td>PS IN-</td>
<td>Power Supply In-</td>
<td>1:1</td>
<td>½ rated DC bus voltage</td>
</tr>
<tr>
<td>TP14</td>
<td>+EXT</td>
<td>External Resistor Discharge+</td>
<td>Not Used</td>
<td>-</td>
</tr>
<tr>
<td>TP16</td>
<td>PS IN+</td>
<td>Power Supply In+</td>
<td>1:1</td>
<td>½ rated DC bus voltage</td>
</tr>
<tr>
<td>TP17</td>
<td>-24V</td>
<td>-24V Power Supply</td>
<td>1:1</td>
<td>-23.7 to -24.4V DC</td>
</tr>
<tr>
<td>TP18</td>
<td>DGND</td>
<td>Digital Ground</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TP19</td>
<td>-EXT</td>
<td>External Resistor Discharge-</td>
<td>Not Used</td>
<td>-</td>
</tr>
</tbody>
</table>
Figure 5
Firmware Block Diagram–Regulation
The Id function block is not used in slave units.
Figure 6 shows the parameter settings that are made in response to a control mode selection.

**Figure 6**
**RGU Control Mode Selection**

<table>
<thead>
<tr>
<th>#</th>
<th>Parameter Name</th>
<th>Master</th>
<th>Slave</th>
<th>Stand alone</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>RGU Control Mode</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>Iq Mode Select</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>Slave set to Aux Iq Command</td>
</tr>
<tr>
<td>198</td>
<td>Current Loop Bandwidth</td>
<td>1000</td>
<td>1000</td>
<td>1200</td>
<td></td>
</tr>
<tr>
<td>267</td>
<td>RGU-to-RGU Transmit Address</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>Master set to transmit</td>
</tr>
<tr>
<td>268</td>
<td>RGU-to-RGU Receive 1 Address</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>Slave set to receive</td>
</tr>
<tr>
<td>271</td>
<td>RGU-to-RGU Transmit Indirect 1</td>
<td>96</td>
<td>0</td>
<td>0</td>
<td>Master set to transmit P96 (Iq Reference)</td>
</tr>
<tr>
<td>272</td>
<td>RGU-to-RGU Transmit Indirect 2</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>Master set to transmit P20 (Master Status)</td>
</tr>
<tr>
<td>273</td>
<td>RGU-to-RGU Receive1, Indirect 1</td>
<td>0</td>
<td>89</td>
<td>0</td>
<td>Slave set to receive to P89 (Aux Iq Command)</td>
</tr>
<tr>
<td>274</td>
<td>RGU-to-RGU Receive1, Indirect 2</td>
<td>0</td>
<td>20</td>
<td>0</td>
<td>Slave set to receive to P20 (Master Status)</td>
</tr>
</tbody>
</table>

**Figure 7**
**Line Sensing Current Transducers**

3 Current Transducers

2 Current Transducers
1336 FORCE Adjustable Frequency AC Drive
   An adjustable frequency AC drive produced by Rockwell Automation. Most of the
   construction and components of the RGU power structure are equivalent to the
   1336 FORCE drive.

Control Power Filter
   A filter used to reduce harmonics and noise in the 115V AC control power.

Digital Signal Processor (DSP)
   The digital signal processor which is located on the main control board of the RGU.
   This component processes current commands for the RGU.

Disable
   When a unit is disabled, the control logic is not directing current flow operations. A
   unit is typically disabled by a disable command or by a fault condition.

Disconnect
   A circuit breaking device.

Enable
   When a unit is enabled, the control logic is directing the motoring or regenerative
   current by modulating its hardware (IGBTs).

Feedback
   Signals from the hardware which indicate the hardware status to the control logic.

Gate Driver Board
   The RGU gate driver board is responsible for modulating the power modules and
   supplying power to the control boards. The gate driver board is interfaced with the
   main control board.

Graphic Programming Terminal (GPT)
   A programming terminal with a graphical LED display and a pushbutton keyboard
   which is used to program, control, and view the status of a unit. The GPT is also
   able to load and store parameters in its local memory.

Host Processor
   The main processor on the main control board of the RGU. This component
   processes feedback and controls most of the activities in the RGU.

Human Interface Module (HIM)
   A programming terminal used to program, control, and view the status of a unit.

Insulated Gate Bipolar Transistor (IGBT)
   A transistor which can be used to allow current to flow in two opposite directions.
   Also known as power module.

Isolation Board
   The RGU isolation board receives direct feedback from the AC line, DC bus, and
   current transducers. This board supplies scaled feedback to the main control board.
Main Control Board
The RGU main control board regulates the voltage and current, oversees activities in the unit, and processes I/O. This board is isolated from the power circuitry.

Metal-Oxide Varistor (MOV)
A component used to protect against voltage surges and excessively high line-to-line/line-to-ground voltages.

Motoring Current
Current which is being supplied to the inverters (through the DC bus) for motoring.

Non-Regenerative DC Bus Supply Unit (NRU)
A six-pulse DC power supply produced by Rockwell Automation. The NRU is typically used as a front end power supply on a drive system lineup.

Overload
A condition where the unit is supplying current above its rated current. For example, operating a unit at 150% overload would indicate that the unit is supplying 150% of its rated current. Most units can operate with an overload condition for a short period of time.

Power Factor (pf)
A measurement of the time phase difference between the voltage and current in an AC circuit.

Power Module
A transistor used in the RGU and 1336 products to convert regulated power between AC and DC. See also insulated gate bipolar transistor (IGBT).

Power Structure
A 3-phase power bridge built in the RGU which converts AC to DC (motoring current) and DC to PWM AC (regenerative current). The power structure includes control boards, a precharge circuit, a power bridge, and a capacitor bank.

Regenerative DC Bus Supply Unit (RGU)
A regenerative DC power supply unit produced by Rockwell Automation. The RGU is typically used as a front end power supply to provide motoring and regenerative current for a drive system lineup.

Regenerating Current
Current which is being driven back from the motors (from motoring induction) to the DC bus. RGUs are able to place regenerating current back onto the AC line.

RGU-to-RGU (R2R) Communications
A communication link used between master and slave RGUs. In R2R communications, the master RGU passes current commands, status information, and synchronization signals to the slave RGUs.

SCANport
Communications technology which is used by many Rockwell Automation products. HIMs, PLCs, and many drive systems products can communicate with one another through SCANport.
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