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RMS Inverter Discharge Process

Revision 0.3

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Revision History

Version	Description of Versions / Changes	Updated by	Date
0.1	Initial version	Azam Khan	11/05/2012
0.2	Updated the mandatory condition that in VSM mode, pre-charge must be bypassed. If pre-charge is not bypassed, inverter cannot be discharged.	Azam Khan	11/05/2012
0.3	Added the option to enable discharge process with or without a fault.	Azam Khan	11/06/2012

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1 Introduction

1.1 Purpose

The purpose of this user manual is to provide information regarding the discharge of residual voltage from the pre-charge circuit when the inverter is disabled due to a fault, ignition shut down, or a CAN discharge command.

The intended audience of this document is primarily customers and end users of the PM controller.

1.2 Scope

This document describes different scenarios under which the RMS PM unit will have the capacitors discharged. These scenarios include:

1. A fault occurs
2. Ignition is turned off in key switch mode 1
3. A discharge command is sent through the CAN heartbeat command message in CAN mode

1.3 Definitions, Acronyms, and Abbreviations

Terms	Definitions
CAN	Controller area networking
DC	Direct current

1.4 References

- None

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2 Discharging the Inverter

Following table defines the important flags used to indicate the state of the discharge process:

Flag Name	Bit Position
Inverter Discharge Allowed	Bit 0: Discharge Flags
Inverter Discharge Enabled	Bit 1: Discharge Flags
Inverter Discharge Complete	Bit 2: Discharge Flags
Inverter Discharge Active	Bit 16: RUN Faults High Word

2.1 Mandatory Conditions

Inverter discharge will take place only when all of the following conditions are true:

1. The new EEPROM parameter, Inverter Discharge Enabled EEPROM is set to one of the following modes:

   (a) Discharge Enable without Faults (1):
   If Inverter Discharge Enabled EEPROM is set to 1, the discharge will not take place when a fault occurs.

   (b) Discharge Enable with Faults (2):
   If Inverter Discharge Enabled EEPROM is set to 2, the discharge will automatically take place when a fault occurs.

   This parameter is located with the pre-charge parameters, Pre-charge Bypassed EEPROM and Pre-charge Output EEPROM.

2. Pre-charge Bypassed EEPROM must be set to 0 if the inverter is operated in VSM mode. This ensures that in VSM mode, pre-charge is not bypassed and the MAIN contactor was engaged and disengaged properly. **If pre-charge is bypassed in VSM mode, the discharge feature cannot be used.**

3. Motor speed must be below 75 RPM. This condition is checked only after one of the events that trigger the discharge take place.

When condition 1 and 2 are true, the Inverter Discharge Allowed flag is set.

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2.2 Inverter Discharge Triggers

Following events will trigger the discharge process to begin:

1. A POST or RUN fault occurs and Discharge Enabled EEPROM is set to 1.
2. Ignition is turned off in Key Switch Mode 1
3. Discharge command is issued through CAN Heartbeat Command message in CAN mode

In any of the above events, the discharge process is activated (not enabled yet). This condition can be checked by checking bit 31, Inverter Discharge Active, of the RUN fault. Inverter Discharge Active is a dummy fault created to shut down the inverter properly.

Once, the Inverter Discharge Active flag is set, motor speed is checked. If it is below the threshold (75 RPM), discharge process will begin by setting the Inverter Discharge Enabled bit.

2.3 Inverter Discharge Complete

As soon as the Inverter Discharge Enabled flag is set, a timer will start and also the DC voltage is monitored. If 9 seconds elapse or the DC voltage falls below 50-V, the discharge process will stop and the Inverter discharge Complete flag will be set.

Once the Inverter Discharge Complete flag is set, it will not be reset until one of the following events take place:

1. Clear the faults if the discharge process was initiated by a fault.
2. Ignition input goes back high if the process was initiated by shutting the ignition off.
3. A Discharge Disable command is issues through CAN if the discharge process was initiated by Discharge Enable CAN command.