

## Chapter 9 Redundant Controller

### 9.1 Before You Begin...

#### **What Does Redundant Controller Mean? Why Do We Need Redundant Controller?**

Redundant controller is using two or more RAID controllers in the same RAID system. If you have two controllers, both must be working normally and capable of monitoring each other at the same time. Each controller serves its own I/O requests. When a controller fails to function, another controller will temporarily take over for the failed controller. One of the goals of a RAID system is to provide a stable storage architecture. The functionality of a redundant controller increases the availability of the RAID system.

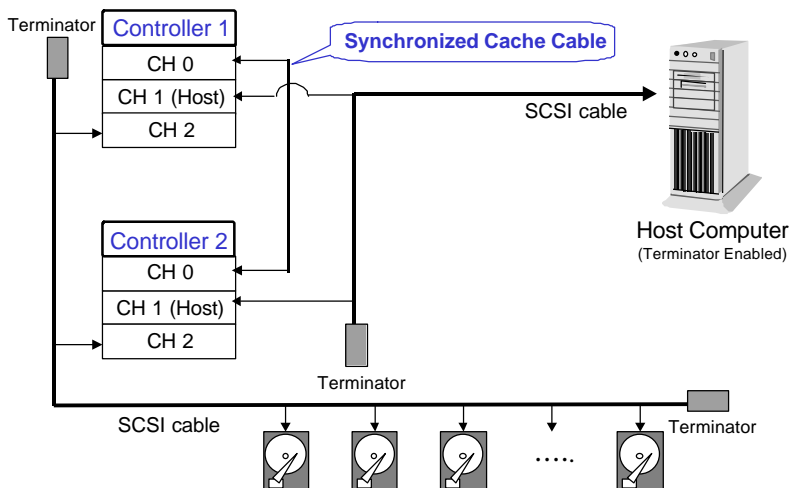
All electronic components have a lifetime. A simple memory parity error may sometimes cause a controller to completely hang up. This is the logic behind having a redundant controller – to minimize the chance of down time for the RAID system.

#### **What can the cache memory do for a redundant controller?**

There are always a lot of data stored in the cache memory. Normally, when a controller fails, data stored in the cache memory are lost; but this is not the case with the DA-3000 controller series. The controller has a dedicated hardware that performs cache synchronization. Using SCSI channel 0 as a cache synchronizing port, data stored in the cache memory will not be lost if one of the controllers fails.

#### **Write-Back Cache: Enabled or Disabled?**

When using the DA-3000 in a redundant controller configuration, Write-Back mode can be enabled when SCSI cable is used for redundant controller communication, which allows the cache data of the controllers to be synchronized. (Synchronizing the cache memories also achieves the goal of avoiding data loss if a controller fails to function.) However, if RS-232C cable is used with the DA-3000 for redundant controller communication, Write-Back Cache must be disabled. *(Refer to figure below for configuring DA-3000 Active-active redundant controllers with synchronized write-back cache.)*



## What is Primary controller and Secondary controller?

The Primary and Secondary controllers are used to serve the host computer's I/O requests. Take note that the configurations and settings can only be done on the Primary controller. The Secondary controller then synchronizes the configuration information of the Primary controller, making the configurations of the Primary and Secondary controllers exactly the same.

The controllers continuously monitor each other. When a controller detects that the other controller is not responding, the working controller will immediately take over for and disable the failed controller until it has been replaced and enabled by user command.

### **When should I choose Primary, Secondary or Autocfg mode?**

Generally Autocfg is the simplest way to configure the controllers. By setting each controller to Autocfg mode, the controllers will decide among themselves which will be the Primary or Secondary controller. If you need to specify a particular controller as Primary or Secondary, you must set this manually.

### **Limitations**

- Both controllers must use the same firmware version.
- The time of the takeover process is about 5 seconds. Some operating systems will not retry accessing the HDDs.

### **Quick Start**

To set up the redundant function of the controllers, you must perform a few basic steps. These steps will be described later in this chapter.

- Cable connections
  - Redundant controller cable
  - RS-232C cable (for Terminal Interface Operation\*)
  - SCSI cables
- Controller settings
  - Communication Parameters
  - Redundant Configuration

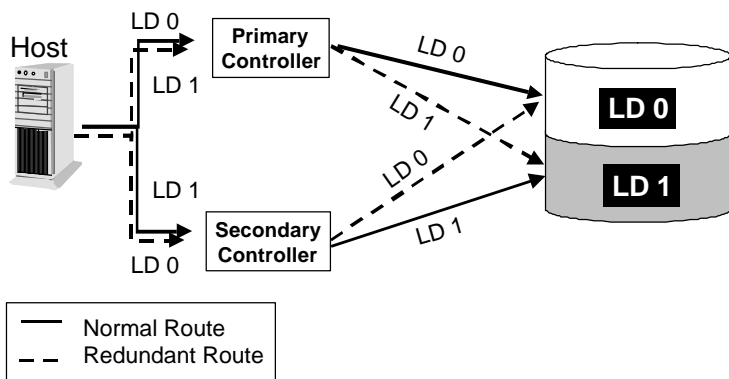
*\*The redundant function of the controllers can be enabled via the front panel or a terminal emulation program. Section 9.2 describes the procedures for using the front panel. The same menus and messages are displayed when using the terminal interface. The same result can be achieved regardless of the method used.*

*Connecting a RS-232C cable when using the terminal interface is highly recommended but is not essential for the redundant controller functionality.*

## 9.2 Setting Up The Redundant Controllers

### Example of Redundant Controllers

Here is a sample illustration of the redundant controller operation:



The host computer is connected to both the primary and secondary controllers. Each controller has one of its SCSI channels assigned as the host channel, with the other SCSI channels assigned as the drive channels.

### Cables and Connections

The following items will be used in this example:

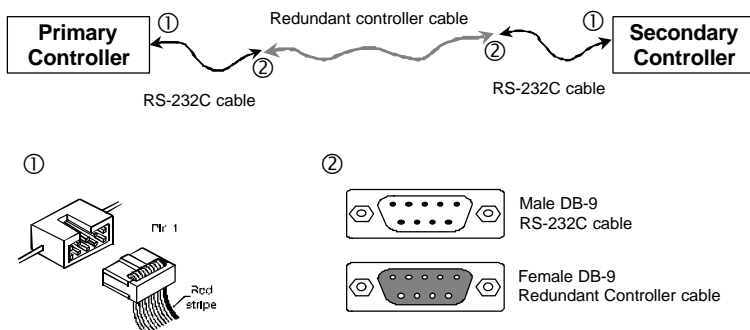
- Two DA-3000 controllers (both using the same firmware version)
- DA-ACCY-NM Null Modem
- DA-ACCY-EC RS-232C extension cable
- DA-ACCY-RC Redundant controller cable
- DA-ACCY-RD Dual RS-232C cable
- DA-ACCY-CC RS-232C cable (two pcs.)

### Connecting the Redundant Controller Cable

- Connect one end of the DA-ACCY-CC cable (RS-232C cable) to the DA-ACCY-RC cable (redundant controller cable). Now connect the other end of DA-ACCY-CC (the 2x5-box header end)

to each of the controller Redundant Controller port located on the backplane board.

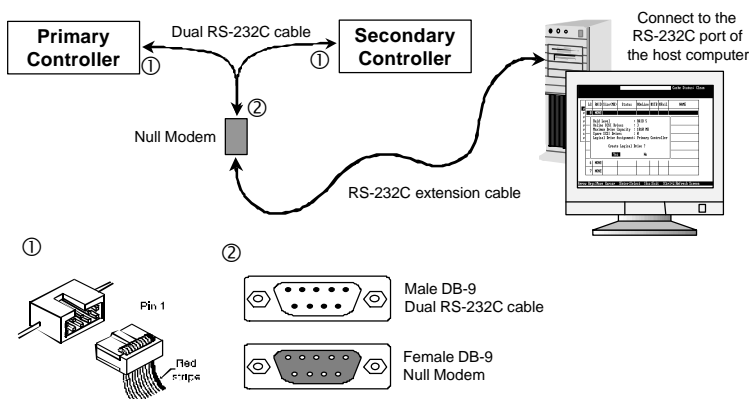
- Connect DA-ACCY-RC (redundant controller cable) to the redundant controller ports of the primary and secondary



controllers.

## Connecting the Controllers to the Terminal Interface

- Connect the D-sub end of DA-ACCY-RD (Dual RS-232C cable) to DA-ACCY-NM (Null Modem) and connect the other two 2x5 headers to the COM 1 serial port of each controller. Connect one end of the DA-ACCY-EC (RS-232C extension cable) to DA-ACCY-



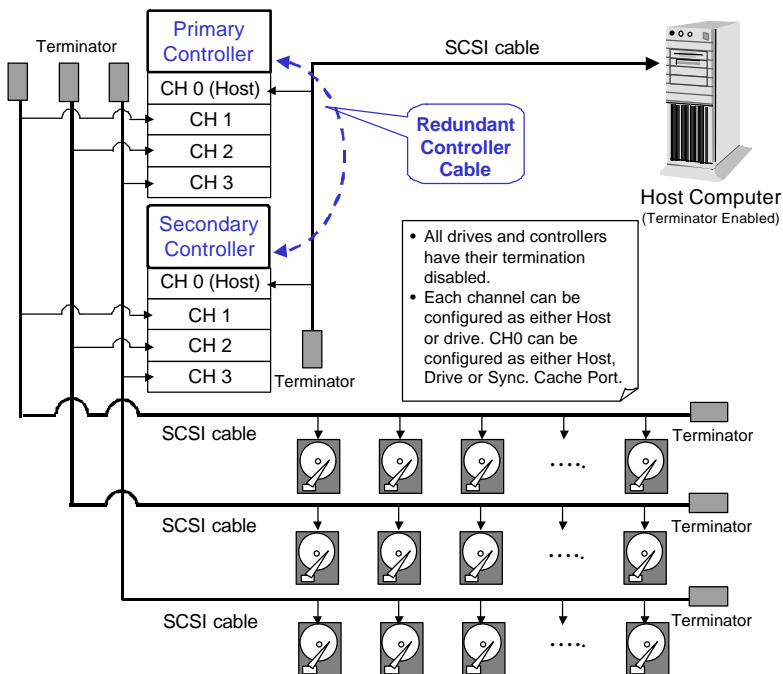
NM (Null Modem) and the other end to the RS-232C port of your host computer.

## **Connecting the SCSI Cable to the Host Computer**

- Connect an end of the SCSI cable to the SCSI port of the host computer, then enable the SCSI terminator of the SCSI port. Connect the other end of the SCSI cable with an external SCSI terminator.
- Connect one of the SCSI connectors, located at the middle of the SCSI cable, to a controller and another connector to the other controller.
- Disable both controllers' host channel SCSI terminations.
- The channels of the two controllers that are both connected to a Host Channel SCSI cable must be the same. For example: If controller 1 uses channel 0, controller 2 must also use channel 0.

## **Connecting the SCSI Cables to the Hard Drives**

- Disable the SCSI terminator on all hard drives.
- Disable the controller's drive channel SCSI termination.
- Connect both end of the SCSI cable with an external SCSI terminator.
- Connect the other connectors of the SCSI cable to hard drives and controllers.
- The channels of the two controllers that are connected to a Drive Channel SCSI cable must be the same. For example: If controller 1 uses channel 0, controller 2 must also use channel 0.
- Repeat the above steps for the other drive channels.
- Connect a power connector to each controller.
- Refer to the figure below for the illustration.



## Setting the Controllers using the Front Panel

### Redundant Configuration using Automatic Setting

Power-on Controller 1. Make sure Controller 2 is powered-off.

Press **ENT** for two seconds on the front panel of Controller 1 to enter the Main Menu. Use ▼ or ▲ to navigate through the menus. Choose “View and Edit Peripheral Dev..” (View and Edit Peripheral Devices), then press **ENT**.

View and Edit  
Peripheral Dev

Choose “Set Peripheral Devices Entry”, then press **ENT**.

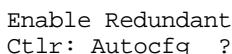
Set Peripheral  
Devices Entry

Choose “Redundant Ctlr Function\_\_\_”, and then press **ENT**. (Note: The current

Redundant Ctlr  
Function Disable

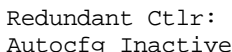
setting will be displayed on the LCD. If this controller has never been set as a redundant controller before, the default setting of the redundant controller function is Disabled. The message “Redundant Ctlr Function Disable” will be displayed on the LCD. Press **ENT** to go to the next step.)

The message “Enable Redundant Ctlr: Autocfg?” will appear. Use ▼ or ▲ to scroll through the available options (“Primary,” “Secondary” or “Autocfg”), then press **ENT** for two seconds to select “Autocfg.”

A rectangular LCD screen with a black border. The text "Enable Redundant Ctlr: Autocfg ?" is displayed in a white, monospaced font on a black background.

Enable Redundant  
Ctlr: Autocfg ?

The message “Redundant Ctlr Autocfg Inactive” will appear.

A rectangular LCD screen with a black border. The text "Redundant Ctlr: Autocfg Inactive" is displayed in a white, monospaced font on a black background.

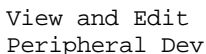
Redundant Ctlr:  
Autocfg Inactive

Power-off Controller 1, and then power-on Controller 2. Set Controller 2 to “**Autocfg**” as described in the above steps. Power-off Controller 2.

When the redundant controller function is set to the “Automatic” setting, the controllers will decide among themselves which will be the Primary or Secondary controller. If you need to specify a particular controller as Primary or Secondary, do not set it as “autocfg”; choose “primary” or “secondary” instead. Refer to the following section.

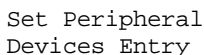
### **Redundant Configuration Using Manual Setting**

Power-on Controller 1. Make sure Controller 2 is powered-off.

A rectangular LCD screen with a black border. The text "View and Edit Peripheral Dev" is displayed in a white, monospaced font on a black background.

View and Edit  
Peripheral Dev

Press **ENT** for two seconds on the front panel of Controller 1 to enter the Main Menu. Use ▼ or ▲ to navigate through the menus. Choose “View and Edit Peripheral Dev..”, then press **ENT**.

A rectangular LCD screen with a black border. The text "Set Peripheral Devices Entry" is displayed in a white, monospaced font on a black background.

Set Peripheral  
Devices Entry



Choose “Set Peripheral Device Entry”, then press **ENT**.

Choose “Redundant Ctlr Function\_\_\_”, and then press **ENT**. (Note: The current setting will be displayed on the LCD. If this controller has never been set as a redundant controller before, the default setting of the redundant controller function is Disabled. The message “Redundant Ctlr Function Disable” will be displayed on the LCD. Press **ENT** to go to the next step.)

Redundant Ctlr  
Function Disable

The message “Enable Redundant Ctlr: Autocfg?” will appear. Use ▼ or ▲ to scroll through the available options (“Primary,” “Secondary” or “Autocfg”). Press **ENT** for two seconds on “Primary.”

Enable Redundant  
Ctlr: Autocfg ?

The message “Redundant Ctlr Primary Inactive” will appear.

Redundant Ctlr  
Primary Inactive

Power-off Controller 1, then power-on Controller 2. Set Controller 2 to “Secondary” as described in the above steps.

Redundant Ctlr  
Secndry Inactive

Power-off Controller 2.

### Starting-up the Redundant Controllers

Power-on all hard drives and the two controllers. The message “RC connecting... <ENT> to cancel” will appear on the LCD display of the two controllers. After a few seconds, the Primary controller will startup with the model number and firmware version displayed on the LCD, while the Secondary controller will display the

RC connecting...  
<ENT> to cancel

message “RC Standing By.. <ENT> to Cancel” on its LCD. A few seconds later, the LCD display on the Secondary controller will be similar to the LCD display on the Primary controller.

During normal operation, the controllers continuously monitor each other. Each controller is always ready to take over for the other controller, in the unlikely event of a controller failure.

The Primary and Secondary controllers synchronize each other configurations and settings at frequent intervals through the DA-ACCY-RC Redundant Controller Cable or through the synchronized cache SCSI cable on channel 0. For the DA-3000, write-back cache is still enabled if SCSI channel 0 is used as the synchronized cache channel.

Please refer to the section in Chapter 9, “Connecting the Controllers to the Terminal Interface,” for details on using the DA-ACCY-RD (Dual RS-232C cable) to connect both controllers. Please note that only the Primary controller will serve the terminal interface. The secondary controller only accepts and responds to the Primary controller. However, if the Primary controller happens to fail, the Secondary controller will take over and become the Primary controller, so it is preferred to connect both controllers using the DA-ACCY-RD (Dual RS-232C cable).

## **Assigning Logical Drives to the Secondary Controller**

A logical drive can be assigned to the Primary or Secondary controller. When creating a logical drive, the logical drive will by default be assigned to the Primary controller. It can be assigned to the Secondary controller if the host computer is connected to the Secondary controller. The logical drive will not be able to be accessed by the Secondary controller if this logical drive has not been assigned to the Secondary controller.

Press **ENT** for two seconds on the front panel of the Primary controller to enter the Main Menu.

Use ▼ or ▲ to navigate through the menus. Choose “View and Edit Logical Drives..”, then press **ENT**.

View and Edit  
Logical Drives

Create a logical drive or choose an existing logical drive, then press **ENT** to see the logical drive menu.

Choose “Logical Drive Assignment.. “, then press **ENT**.

Logical Drive  
Assignment..

The message “Redud Ctlr LG Assign Sec Ctlr?” will appear. Press **ENT** for two seconds to confirm. The logical drive has now been assigned to the Secondary controller.

Redud Ctlr LG  
Assign Sec Ctlr?

Map the LUN to the Secondary controller. The Secondary controller must have a host SCSI ID created. (Create the Secondary controller’s SCSI ID or add a SCSI ID channel in “View and Edit SCSI Channels” of the Main Menu.)

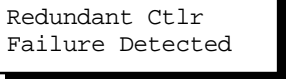
Reset the two controllers and host computers for the settings to take effect.

### 9.3 When One of the Controller Fails...

#### What will happen when the one of the controllers fails?

When one of the controller fails, the other controller will take over in a few seconds (about 8 seconds).

The red ATTN LED will light up, and the message “Redundant Ctlr Failure Detected” will appear on the LCD. The beeper in the controller will start to beep.



Redundant Ctlr  
Failure Detected

The message “Controller ALERT: Redundant Controller Failure Detected” will also appear on the screen of the terminal interface.

After a controller takes over, it will simultaneously act as both controllers. If it is the Primary controller that failed, the Secondary Controller becomes the Primary Controller. If the failed controller is replaced by a new one later on, the new controller will act as the Secondary Controller.

Some operating systems will not retry accessing the hard disk drives.

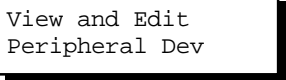
#### When and How is the Failed Controller Replaced?

Remove the failed controller **after** the take-over of the “working” controller has been completed.

**The new controller has to be pre-configured as the “Secondary Controller” or in the “Autocfg” mode.** (Configure the new controller without the redundant cable and SCSI cables connected.)

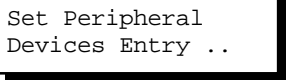
When the new controller is connected, it will appear as if it does not exist. Execute the following steps for the new controller to function. Press **ENT** for 2 seconds on the Primary Controller to enter the Main Menu.

Use ▼ or ▲ to choose “View and Edit Peripheral Dev..”, then press **ENT**.



View and Edit  
Peripheral Dev

Choose “Set Peripheral Device Entry..”, then press **ENT**.



Set Peripheral  
Devices Entry ..

Choose “Redundant Ctlr Function\_\_”, then press **ENT**.

Redundant Ctlr  
Function\_\_

The message “Redundant Ctlr Autocfg Degraded” will appear on the LCD.

Redundant Ctlr  
Autocfg Degraded

Press **ENT** and the message “Deassert Reset on Failed Ctlr?” will appear.

Deassert Reset on  
Failed Ctlr?

Press **ENT** for 2 seconds and the controller will start to scan for the new controller.

Redundant Ctlr  
Scanning

The new controller will then start to initialize.

Initializing...  
Please Wait...

Once initialized, it will begin acting as the Secondary Controller.

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