

# RS4 Data Streamer



## RS4 Overview

The RS4 Data Streamer is a high performance data storage array designed to store data streamed from the RZ2, our most powerful processor for high channel count data acquisition. Off-loading data streaming tasks from an RZ2 to the RS4 improves real-time performance and allows you to acquire continuous data over several days or weeks. Access to the RS4 storage array can be provided through a network connection, direct connection to a PC, or data transfer to a USB storage device.

The RS4 allows streaming of up to 1024 16-bit channels at rates up to ~25 kHz and fewer channels at rates up to ~50 kHz. Streamed data is stored as individual channels and can be stored in different numeric formats (Short, Float, etc.). Stored data can be easily reincorporated into the OpenEx data tank format for post processing. The RS4 is available with either 4 terabytes or 8 terabytes of storage and features 1 or 4 streaming ports.

## Power and Communication

Data is transferred to the RS4 through its streaming ports located on the back panel of the device. A special version of the RZ2 provides matching ports used to connect and stream data to the RS4. These ports ensure fast and reliable data transfer from the RZ2 and are color coded for correct wiring. Communication to the RS4 is provided through a touch screen user interface independent from the TDT system. Firmware updates for the RS4 interface are available online through the TDT web server. See “Config Tab” on page 2-19 for more information.

The RS4 contains an integrated switched-mode power supply. The power supply auto-detects your region’s voltage setting and no further configuration is needed. A switch located on the back panel of the RS4 is used to enable/disable the power supply.

## Software Control

Software control is implemented with circuit files developed using TDT's RP Visual Design Studio (RPvdsEx) on the RZ2 processor through TDT run-time applications such as OpenEx or custom applications. A single RPvdsEx storage macro is provided to configure the RZ2 to send data to the RS4. Once connected to the RZ2, a properly configured RS4 will automatically store the data it receives.

See the "RZ2 BioAmp Processor" on page 1-3 for more information on the RZ2. For circuit design techniques and a complete reference of the RPvdsEx circuit components, see "MultiProcessor Circuit Design" and "Multi-Channel Circuit Design" in the *RPvdsEx Manual*.

## Distributing Data to the RS4

The Stream\_Server\_MC macro is provided for configuring data storage from the RZ2 to the RS4. The macro provides settings for the number of channels, storage format, and decimation factor. See the macro internal help for more information.

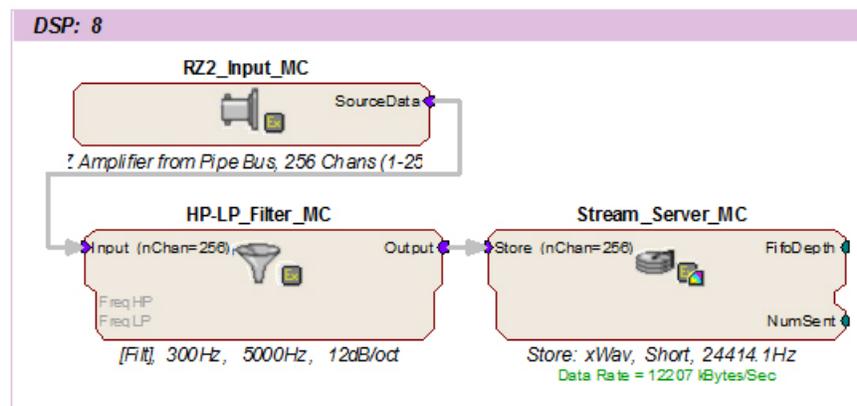


**Note:** The macro parameter summary, below the macro, lists important information such as the store name, data format, sample rate, and calculated data rate.

The following example illustrates a typical acquisition circuit designed for use with the RS4.



Assign this part of the circuit to the DSP that is physically connected to the RS4.



In this example, all circuit timing is handled by the CoreSweepControl macro. Acquisition and filtering are provided by the RZ2\_Input\_MC and HP-LP\_Filter\_MC macros. As data is input from a PZ amplifier, it is filtered and sent to the RS4 through the Stream\_Server\_MC macro.

It is important that the Stream\_Server\_MC macro is assigned to the DSP in the RZ that is physically connected to the RS4 (in this case, DSP-8) via fiber optic cables.

## Recording Sessions

When an RZ2 begins streaming data to the RS4, a recording period or session is initiated. A session is defined as any length of continuous streaming data sent to an RS4 streaming port. Each streaming port on the RS4 can initiate a session and sessions may run concurrently. When data is no longer streaming to the port or if streaming has been paused for longer than 1 second, the session is concluded and a new session will begin when a new data stream is presented.

For long recording sessions, the RS4 touchscreen configuration settings include an option to “Segment files every” with several time options to periodically close and reopen the session and save data in multiple, smaller data files. See “Ports Tab” on page 2-14 for more information.

**Important!** When recording data in OpenEx’s Preview mode, ensure that you place the hardware into Idle mode prior to switching to Record mode. Switching directly from Preview to Record mode will NOT terminate the data session. Failure to do this will cause any data recorded in Preview mode to be prepended to the data obtained in Record mode.

## Data Transfer Rate

The maximum data rate for each RS4 streaming port is 12.5 MB/s. This equates to streaming 256 16-bit channels at a sampling rate of ~25 kHz per streaming port. With four ports available, up to 1024 channels can be streamed to the RS4.

**Note:** When recording data it is important to compare the data rate calculated by the macro to the actual data rate reported by the RS4. If the reported data rate in the RS4 is not similar to the calculated data rate in the macro, this may indicate a hardware problem. If so, contact TDT.

## File System Check

Occasionally the RS4 will perform a file system check during the boot process. This is to ensure the integrity of the storage array and file system. You can view the progress of the file system check in the Status tab (see “Status Tab” on page 2-17, for more information) of the RS4 interface.

**Note:** The more files present on the storage array, the longer the file system check will take.

# Hardware Requirements

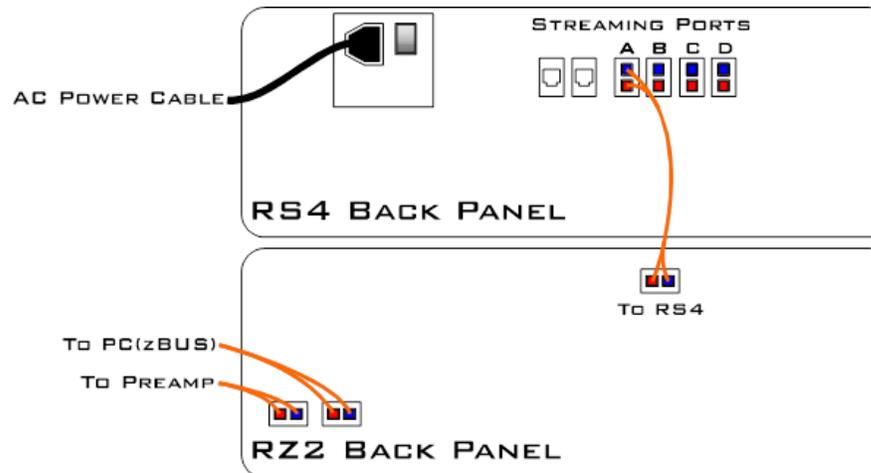
Basic requirements include an RS4, RZ2 equipped with at least one streaming port, and one fiber optic cable for connection between the RS4 and RZ2.

Optional requirements for accessing data on the RS4 include a PC equipped with an Ethernet port or an Ethernet jack connected to a local area network, and an Ethernet cable.

## Setting-Up Your Hardware

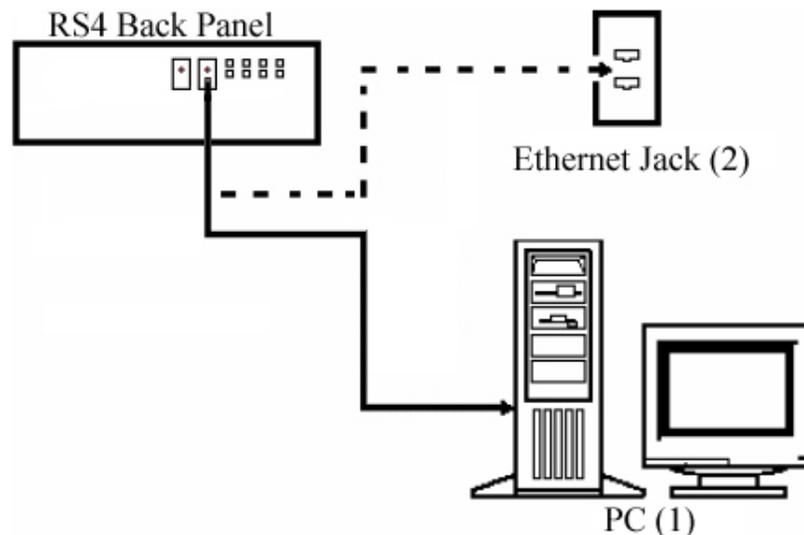
Basic setup for the RS4 Data Streamer includes connection to one or more RZ2 BioAmp Processors. Optionally, an Ethernet connection for direct connection to a PC or network is supported. Connect the RZ2 as illustrated in the following diagram.

**Important!** Make sure that all cables are connected before powering on the RS4.



**RS4 to RZ2 Connection Diagram**

In the diagram above, a single RZ2 provides one streaming input to the RS4. Additional RZ2 devices can be connected to the same RS4 provided it has vacant streaming ports (B, C, or D) available. The RZ2 is also connected to a preamplifier and PC (see “RZ2 BioAmp Processor” on page 1-3 for specific information). The fiber optic cables are color coded to prevent wiring errors.



**RS4 PC and Network Connection Diagram**

The diagram above illustrates possible connections from the RS4 to a PC (1) or network (2). Connect the Ethernet cable to the RS4 port labeled Network.

# Configuring the RS4

Default configuration settings allow the RS4 to begin streaming data immediately. The RS4 supports the DHCP (Dynamic Host Configuration) protocol for automatic configuration of network parameters. Once connected to an active network, the RS4 will attempt to lease an IP address.

## The DHCP Protocol

DHCP or “Dynamic Host Configuration Protocol” is a protocol used by networked devices (clients) to obtain various parameters necessary for the clients to operate in an IP (Internet Protocol) network. By using this protocol, system administration workload greatly decreases, and devices can be added to the network with minimal or no manual configuration.

DHCP automates the assignment of IP addresses, subnet masks, default gateway, and other IP parameters. Three modes for allocating IP addresses exist: Dynamic, Reserved, and Manual. The RS4 relies on Dynamic mode for its IP configuration. If no DHCP server responds, the device falls back on Manual mode and must be configured with the following default static IP configuration:

**IP Address:**                **10.1.0.42**  
**Netmask:**                 **255.255.255.0**

You can configure the IP address manually through the touchscreen interface. See “To enable manual configuration:” below or “Status Tab” on page 2-17.

### Dynamic mode

In dynamic mode a client is provided with a temporary IP address for a given length of time. The duration is dependent on the server configuration and may range from several hours to months.

The RS4 will automatically renew the current IP address as needed. This renewal is used by properly functioning clients to maintain the same IP address throughout their connection to a network.

## Accessing the RS4 Storage Array

There are two methods provided for accessing the RS4 storage array:

- Directly connecting to a PC
- Connection to a local area network

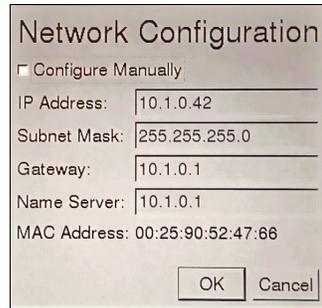
### Direct Connection to a PC

Direct connection to a PC allows data on the RS4 to be viewed and modified through the standard Microsoft Windows file sharing protocol.

**Important:** When using a Static IP, the RS4 Current IP must be set to “Configure Manually” using the touch screen interface.

#### To enable manual configuration:

1. Touch the **Status Tab** and then touch the **Current IP field**, to display the Network Configuration window.



Network Configuration

Configure Manually

IP Address: 10.1.0.42

Subnet Mask: 255.255.255.0

Gateway: 10.1.0.1

Name Server: 10.1.0.1

MAC Address: 00:25:90:52:47:66

OK Cancel

2. Touch the **Configure Manually** check box and click OK to accept the default value.

## Using Windows 7

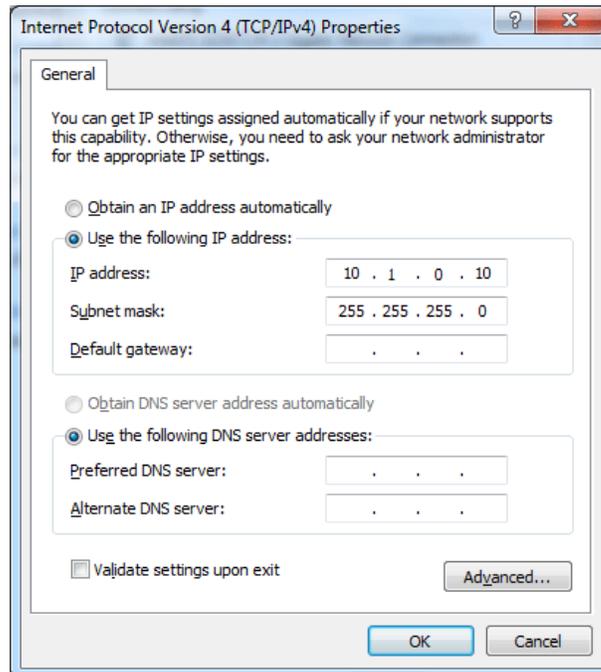
### To access the RS4 file system through a PC, running Windows 7:

3. You will have to configure the PC TCP/IP settings. Open Control Panel then double-click **Network and Sharing Center**.
4. Click the desired connection link (this is usually a Local Area Connection).
5. In the status dialog, click the **Properties** button.
6. In the item list, select **Internet Protocol (TCP/IP)** or if there are multiples, select **Internet Protocol (TCP/IPv4)**.
7. Click the **Properties** button.
8. Select **Use the following IP address** and enter these values:

**IP address:** 10.1.0.x; where x can be any value, 1 to 254 except 42

**Subnet mask:** 255.255.255.0

**Default gateway:** Leave empty



Internet Protocol Version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

Obtain an IP address automatically

Use the following IP address:

IP address: 10 . 1 . 0 . 10

Subnet mask: 255 . 255 . 255 . 0

Default gateway: . . .

Obtain DNS server address automatically

Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

Validate settings upon exit

Advanced...

OK Cancel

9. Click **OK**. The RS4 can now be accessed by the PC.
10. Obtain the RS4 device address.

- a. Press the **Ports** tab on the RS4 interface.
  - b. The device address is displayed at the top of the page to the right of **Device Name** field.
11. Enter the device address as shown in a windows address bar to access the RS4 file system.



The path **RS4-#XXXX\data** is used to access the RS4 storage array. Where # is the total number of streaming ports on the RS4 back panel, XXXX is the device **serial number** while the data folder contains the **data** saved to the storage array.

12. Access the files on the RS4 by reading or writing.



**WARNING!:** Do not attempt to write to the RS4 storage array at any time while data is actively streaming. Doing so may corrupt data currently being stored.

### Using Windows XP

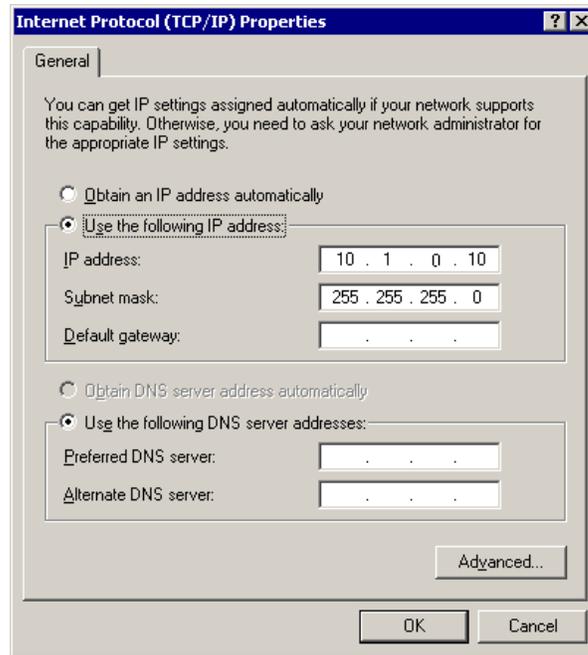
#### To access the RS4 file system through a PC:

1. You will have to configure the PC TCP/IP settings. Open **Control Panel** then double-click **Network Connections**.
2. Right-click the desired connection (this is usually a Local Area Connection) and select **Properties**.
3. Select Internet Protocol (TCP/IP) or if there are multiples, select Internet Protocol (TCP/IPv4).
4. Click the **Properties** button.
5. Select **Use the following IP address** and enter these values:

**IP address:** 10.1.0.x, where x can be any value from 1 to 254 except 42.

**Subnet mask:** 255.255.255.0

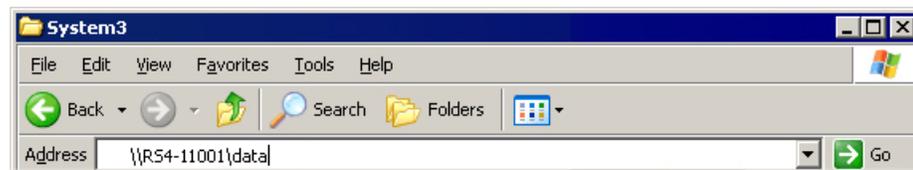
**Default gateway:** Leave empty



6. Click **OK**. The RS4 can now be accessed by the PC.
7. Obtain the RS4 device address. Press the **Ports** tab on the RS4 interface.

The device address is displayed at the top of the page to the right of **Device Name** field.

8. Enter the device address as shown in a windows address bar to access the RS4 file system.



The path **RS4-#XXXX\data** is used to access the RS4 storage array. Where # is the total number of streaming ports on the RS4 back panel, XXXX is the device serial number while the data folder contains the data saved to the storage array.

9. Access the files on the RS4 by reading or writing.



**WARNING!:** Do not attempt to write to the RS4 storage array at any time while data is actively streaming. Doing so may corrupt data currently being stored.

### Connecting Through a Network

Connection to a local area network also allows data to be viewed and modified through the standard Microsoft Windows file sharing protocol from any PC connected to the same network as the RS4.

#### To access the RS4 file system through a network:

DHCP must be enabled on the network in order to access the RS4. If DHCP is disabled or not supported, you can connect the RS4 directly to a PC (see “Direct

Connection to a PC” on page 2-7 for more information).

1. Obtain the RS4 device address.
2. Press the **Ports** tab on the RS4 interface.

The device address is displayed at the top of the page to the right of **Device Name** field.

3. Enter the device address in a windows address bar to access the RS4 file system.
4. Access the files on the RS4 by reading or writing.



**WARNING!:** Do not attempt to write to the RS4 storage array at any time while data is actively streaming. Doing so may corrupt data currently being stored.

### ***Finding the MAC Address***

In some labs, the network administrator may require RS4 users to provide the device’s MAC address.

**To determine the address, follow the instructions below:**

1. On the touchscreen interface, press the Status tab.
2. Press in the Current IP field.

A Network Configuration dialog is opened and the MAC address is displayed at the bottom of the pop-up window.

**Note:** If the RS4 does not automatically identify on a network, you can force it to reset its IP address by unplugging the Ethernet cable the plugging it in again.

## Moving Stored Data to a Data Tank

Data stored on the RS4 can be easily reincorporated into the OpenEx DataTank format for post processing.

### **RS4 Storage Format**

The RS4 stores data in a format similar to the OpenEx DataTank format.

**Data stored on the RS4:**

- Contain an \*.sev file for each channel recorded in the stream.
- Do not contain other Data Tank file types (.tbk, .tdx, .tev, .tsq).
- Stores all of the channel data files in a single Data Tank folder.

These features allow single and multi-channel data to be copied and pasted directly into any OpenEx Data Tank folder.

### **Naming Convention**

When connected to an active network, TDT’s OpenEx software sends information to the RS4 via a broadcast UDP packet allowing it to properly name the streaming data sent to the RS4.

For example, if you are recording channel 1 for the event wavA on Block-3 from DemoTank2 the RS4 will store in the following location and format:

```
\data\DemoTank2\Block-3\DemoTank-Block-3_wavA_ch1.sev
```

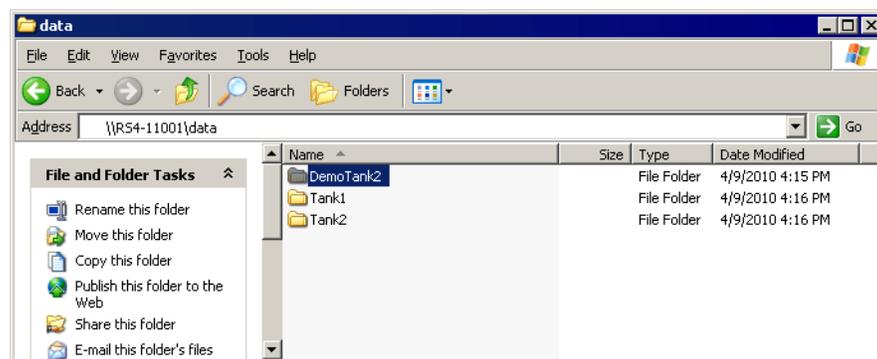
Without the OpenEx network information the RS4 falls back to the default data format:

```
\data\Event name-year-month-day-hour-minute-second\unnamed.sev
```

**Note:** The default format is also used if phantom storage is disabled in the Stream\_Server\_MC macro. See the macro internal help for more information.

#### To move blocks to a Data Tank:

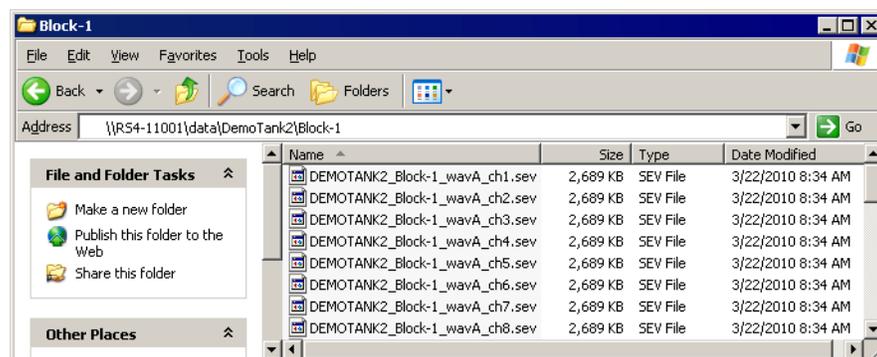
1. Access the RS4 file system on the local PC using the process described above.
2. Select the desired Data Tank.



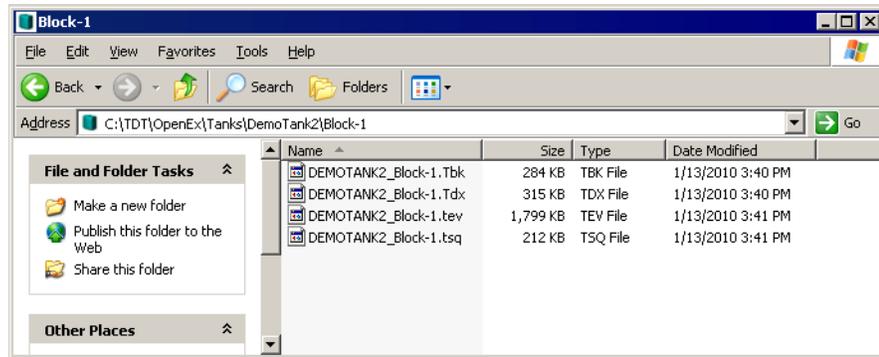
3. Copy the selected Data Tank to the local PC Data Tank.
4. If the Data Tanks share the same name, select **Yes to All** when asked to confirm possible overwrites. This will NOT overwrite data currently stored on the local drive since only the \*.sev files are copied.
5. If you wish to move only a single block, copy the desired block and place it into the local PC Data Tank folder.

#### To move individual channels to a Data Tank:

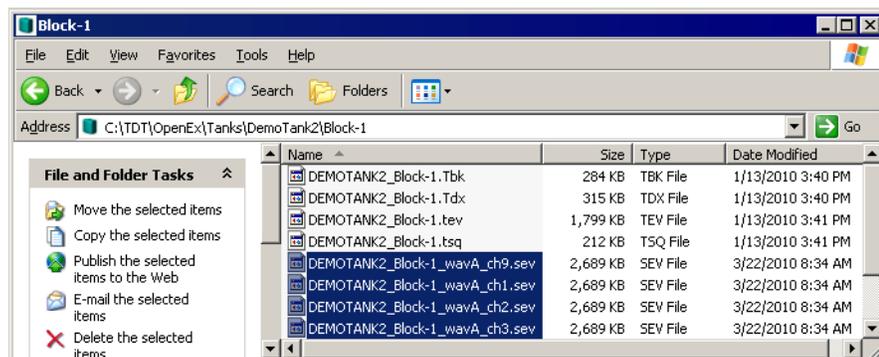
1. Access the RS4 file system on the local PC using the process described above.



2. Copy and paste the desired file(s) to the local PC Data Tank folder.
3. Open the Data Tank you wish to move the data to by browsing to the block folder in the Data Tank folder on the local PC.



4. Copy and paste the desired data from the RS4 to the local PC.



**Note:** Data sets containing a large number of channels, or long recording periods may take longer to display and process on the RS4 and will also lengthen the amount of time for file system checks. TDT recommends removing data that is no longer needed on the RS4 (“Storage Tab” on page 2-15 for more information on deleting data).

After moving, the data can be processed using one of TDT’s Data Tank applications (such as OpenExplorer). To access the data using these applications simply select the associated block then select the event name (in this case Block-1 and wavA).

## RS4 Features

### Power Button

A power button located on the front plate of the RS4 is used to turn the device on and off. Prior to powering on/off, the device will enter a brief boot/shutdown period.

**Important!** Always power the RS4 down during an Idle state. Idle status can be checked in the Ports tab. Failure to power down during Idle status may result in the RS4 performing a file system check during the next boot process and possible data loss.

#### To turn off the RS4:

1. Ensure that the RS4 is in the Idle state prior to shutdown. To do this, press the Ports tab and verify that the current session name is Idle on all data ports.
2. Press the power button on the front panel.

**Note:** If the RS4 becomes unresponsive and fails to shutdown normally, you can shut the device down by holding the power button for longer than five seconds. This will force the device to shutdown. After a forced shutdown, the RS4 may perform a file system check.

## LCD Touch Screen

The LCD touch screen allows navigation through the RS4 interface. To make a selection, gently press the touch screen on the desired item. Standard click and drag options for the storage array are also supported in order to select multiple file system objects. To click and drag, gently press your finger on the start location then slide down the screen until the desired items are selected.

## Interface

The interface reports information and allows configuration of available options. A selection tab located on the right-side of the screen allows the user to select between the available pages. To navigate to the desired window, press the corresponding tab on the right side of the LCD screen.

### Ports Tab

The Ports tab provides information for storage array streams, local storage rates, and storage size.

**Note:** Keep in mind that the total available storage is based on the amount of free memory space after system allocation. For example, although the system specifications list 8 terabytes of storage space, 7.2 terabytes are actually available for data storage.

The screenshot shows the 'Ports' tab interface. At the top left, it displays 'Device Name: RS4-11001' and 'v1.0'. Below this, there are four sections for storage streams: 'Port A', 'Stream B - Port Not Installed', 'Stream C - Port Not Installed', and 'Stream D - Port Not Installed'. Each section shows 'Rate' and 'Amount Saved' as 'N/A'. On the right side, under 'Local Storage', it shows 'Array Size - Status: 1.8 TB - Active' and 'Percent full: 1%' with a progress bar. Below that, it says 'Will fill in approximately: -- Never --', 'Invalid Packets: 0', and 'Segment files every: 4 Hours' with a dropdown arrow.

**Firmware Version:** The currently installed firmware version number is displayed to the left of the local storage label on the Ports tab. This is useful for identifying the current firmware version and also to verify that a recent firmware update has been installed.

**Device Name:** Displays the assigned device name.

Port A, B, C, D: Displays port information regarding the currently installed storage array.

Rate:	Displays the approximate current data transfer rate in kB/s. This rate incorporates overheads in the data transfer protocol and may differ slightly from the data rate calculated by the macro.
Amount Saved:	Displays the amount of data saved to the storage array during the current recording session.
Name:	Displays the current session name. See “Naming Convention” on page 2-11 for more information.
<b>Local Storage:</b>	This area displays information relative to the currently installed array.
Array Size – Status:	Displays the status of the storage array.
nTB – Active:	Array is properly configured and its maximum storage space (nTB) is listed.
Not Ready:	No array is detected or the array is not yet ready
Percent Full:	Displays the percentage of space that has been used on the storage array.
Will fill in approximately:	Displays an estimate of how much time it will take to fill the storage array with data based on the data rates for the current session(s).
Segment files every:	For long recordings, set a value to indicate when the RS4 should close the recording session and open a new session. This allows the user to access the raw data for parallel processing before the recording is over.

The exact length of each file will be a multiple of a fixed block size, based on the sampling rate. It will be as close as possible to the selected setting value (i.e. 1hr, 4hr, etc.), but will not be exact (within 0.1 seconds or so of the exact desired duration). There will however be no overlap in the data at the beginnings and ends of the files.

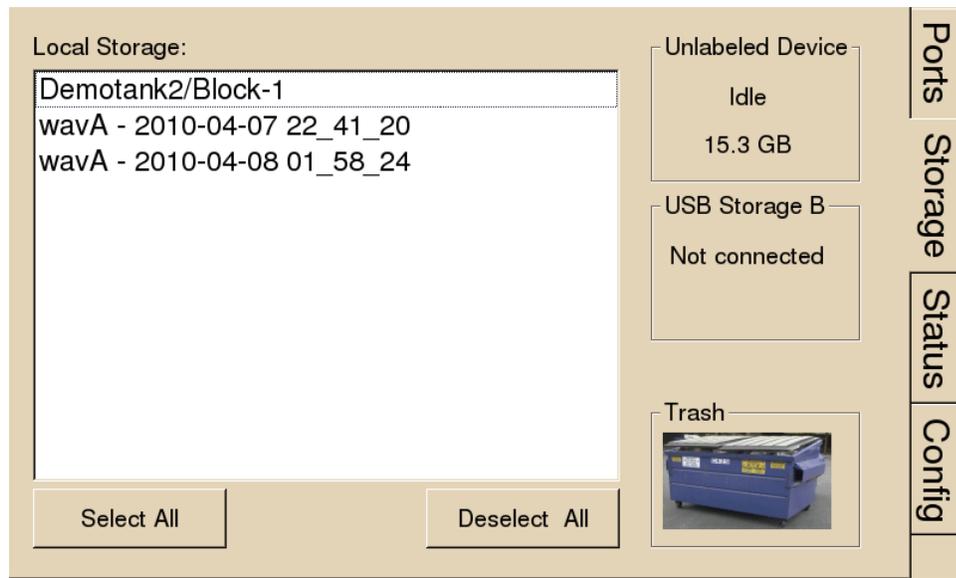
The files will be named as follows:

```
{TANK}_{BLOCK}_{STORE}_ch1.sev
{TANK}_{BLOCK}_{STORE}_ch1-1h.sev
{TANK}_{BLOCK}_{STORE}_ch1-2h.sev
...
{TANK}_{BLOCK}_{STORE}_ch2.sev
{TANK}_{BLOCK}_{STORE}_ch2-1h.sev
{TANK}_{BLOCK}_{STORE}_ch2-2h.sev
```

**Note:** If using Phantom Headers to merge the RS4 data with your other tank data, and using TTank to read it, only the first chunk will be accessible because it matches the expected naming scheme.

### Storage Tab

The Storage tab provides a list of file system objects stored on the currently installed storage array. Items may be selected and deleted or moved and copied to a USB device. Status information for any connected USB Storage devices is displayed.



**Local Storage:** Data items stored on the RS4 storage array are populated in the local storage list. Multiple items may be selected using press and drag techniques.

Select All: Press to select all items in the list.

Deselect All: Press to deselect all items in the list.

**USB Storage A, B:** Displays connection information for USB devices detected on USB ports A and B. Select item(s) from the local storage list and press the desired USB Storage connection indicator to prompt the copy dialog. From this dialog you may:

Copy: Press to copy the selected item(s) to the desired USB Storage device. Copied items remain on the storage array.

Move: Press to move the selected item(s) to the desired USB storage device. Moved items are copied onto the USB storage device and deleted from the storage array.

Cancel: Press to cancel the current USB data transfer.

**Note:** When moving or copying items the RS4 interface may become temporarily unresponsive.

**Trash:** Select item(s) from the local storage list and press the Trash icon to permanently delete them. A dialog will prompt asking to confirm the deletion of the item(s).

## Status Tab

The screenshot shows the Status Tab interface with a sidebar on the right containing buttons for Ports, Storage, Status, and Config. The main content area is divided into several sections:

- System:**
  - Processor Usage: 0% 0% 2%
  - Core Temperatures (F): 113.0 105.8 104.0 107.6
  - Fan Speeds (RPM): 1683 1934 2125
  - Current IP: 10.10.10.126
- Storage Array:**
  - Array is active and mounted
  - Progress bar: 10%
  - Resync complete in 295.1min
- Data Ports:**
  - Memory Buffers (U/F/A): 0/ 0/ 0
  - 0/ 0/ 0
  - N/A
  - N/A
- Communication Errors:**
  - 0
  - 0
  - ?
  - ?

Buttons at the bottom right include "Clear Error Count" and "View Log Window".

The Status tab provides system information such as processor usage rates, core temperatures, fan speeds, device IP address, array reformat progress, memory buffer allocation, and communication errors. Log information can also be retrieved from this tab.

**System:** Displays important system status information.

**Processor Usage:** Displays the current percent usage for each processor core.

**Core Temperatures (F):** Displays the current processor core temperatures measured in Fahrenheit.

**Fan Speeds (RPM):** Displays the approximate rpm for all three fans located inside of the RS4.

**Current IP:** Displays the currently assigned IP address for the RS4. Press to display Network Configuration Window.

The Network Configuration dialog box has a title bar "Network Configuration" and a checkbox "Configure Manually" which is currently unchecked. Below the checkbox are several input fields:

- IP Address: 10.1.0.42
- Subnet Mask: 255.255.255.0
- Gateway: 10.1.0.1
- Name Server: 10.1.0.1
- MAC Address: 00:25:90:52:47:66

At the bottom right are "OK" and "Cancel" buttons.

Configure Manually – select to enable manual configuration and make fields editable.

**Storage Array:** Displays information about the state of the current storage array.

**Active and mounted:** Storage array is available and ready to store data.

**Active and not mounted:** A support storage array is available but is not configured to store data.

**Array was not found!:** The system did not detect a supported storage array.

**Progress bar:** Displays progress for various processes which run on the RS4 including:

**Reformatting:** When reformatting a storage array, the progress completed (%) as well as the estimated amount of time remaining is displayed.

**Resyncing:** If a mirrored array type has been formatted, the progress completed (%) as well as the estimated amount of time remaining for the Resync process is displayed. See “Mirrored” on page 2-20, for more information.

**File System Check:** If the RS4 is performing a file system check, the progress completed (%) and estimated amount of time remaining is displayed. During this time the status array will not be ready.

**Check button:**

When the storage array is in mirrored configuration, disk check button appears at the bottom left corner. Pressing the **Check** button begins a disk check to see if the data on both images are identical. This process can take several hours. A progress bar and an estimated time to completion are displayed.

During this time the Ports tab will report that the array status is “Checking”. No data access should occur during checking.

The button will stay depressed for the duration of the disk check.

You can stop the disk check at any time by pressing the **Check** button again.

TDT recommends performing a disk check on a mirrored configuration every 7-30 days.

**Data Ports:** Displays storage information for all installed memory buffers and any communication errors present.

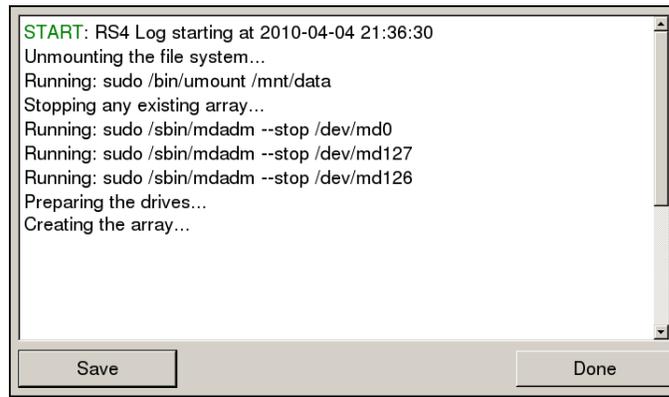
**Memory Buffers (U/F/A):** Displays the number of memory buffers currently used, free, and allocated.

**Communication Errors:** Displays the current count of communication errors between the RS4 and interfaced RZ2s. This value should be zero. If not, the current data session may not contain valid data.

If the count increases continuously at a high rate (>1500 errors per second), the RZ connected to that port might not be synchronized to the PCI card. Check the fiber optic connection from the RZ device to the PCI card and use zBusMon to confirm RZ to PC communication.

**Clear Error Count:** Press to clear all communication errors currently listed.

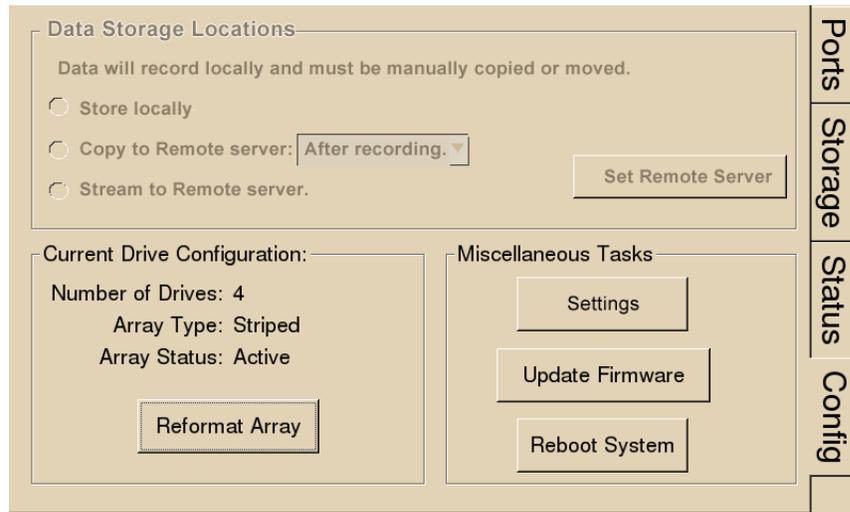
**View Log Window:** A log stores relevant messages and any communication errors encountered while the RS4 is in use. Click to open and view the log window. The log.txt file can be copied from the storage array for transfer to a PC.



**Note:** Individual comments can be saved as well. Use standard drag techniques to highlight the desired comment(s) and click **Save** to write the selection to the log.txt file.

### Config Tab

The Config tab provides options for reformatting the currently installed storage array, updating the RS4 firmware, and rebooting the system.



**Data Storage Locations:** Not currently implemented.

**Current Drive Configuration:** Displays information about the currently installed data drives.

**Number of Drives:** Displays the number of drives currently installed and optionally their corresponding array usage.

**Array Type:** Displays the currently configured array type and the status of the drives.

Striped: Array type is currently configured as striped.

Mirrored(UUUU): Array type is currently configured as mirrored. A U indicates that a drive is up and running. A \_ indicates a drive failure.

Missing: No array type is detected. See “Config Tab” on page 2-19, for more information.

Array Status:	Displays the current status of the array.  Preparing: Storage array is currently being reformatted.  Resyncing: Storage array is being reformatted as a mirrored array and is currently resyncing the mirrored partitions. See Mirrored below for more information.  N/A: Storage array is not detected.  Active: Storage array is detected and configured.
Reformat Array:	Press to prompt the reformat array dialog. This dialog will ask for confirmation as well as the desired array type: Striped or Mirrored. Reformatting an array will erase all data contained in the array. Note: When reformatting an array, the interface may become temporarily unresponsive.
<b>Miscellaneous Tasks:</b>	Provides options for updating the current RS4 firmware and rebooting the system.
Settings:	Press to display the settings window, then set date and time and select unit of measure for temperature.
Update Firmware:	Press to update the RS4 firmware. Firmware is downloaded from the TDT server and automatically installed on the RS4. Connection to a network that has Internet connectivity is required to retrieve any updates.
Reboot System:	Press to reboot the system.

## Storage Array Types

Two RAID based array types are supported on the RS4, Striped and Mirrored. When reformatting the storage array, either type may be selected for the new format. Each type has advantages and disadvantages and is suited for particular situations.

### Striped

Striped array types offer quick reformatting (several minutes), efficient data storage, and performs streaming tasks at the maximum transfer rate. This type does NOT protect against data drive failures and loss of a data drive will result in loss of data. Since the data is not backed-up as is the case in mirrored arrays, striped storage arrays offer twice the amount of storage space that mirrored arrays provide. This format is useful for those who wish to stream large amounts of data and are using an external solution to provide data recovery in the event of drive failure.

### Mirrored

Mirrored array types offer data loss prevention at the cost of some transfer rate limitations and reduced storage space. Unlike striped array types, data drives are mirrored and data is backed-up. This results in longer write times and also a much longer reformatting period (hours). This format is useful for those who are streaming smaller amounts of data and are concerned with data loss prevention.

Mirrored arrays will prevent data loss if any single drive fails. RS4 devices that contain four data drives, in some cases, are protected if two of the four data drives fail. The storage capacity, however, is cut in half.

A resyncing status is displayed while reformatting a mirrored array. This status is unique to the mirrored array type and is verification for the mirrored partitions of the array. One partition is read while another partition is simultaneously written to. This ensures that mirrored partitions are in sync to provide data loss prevention. Prior to completion of the resyncing process, data loss prevention is disabled.

**Note:** If the resyncing process is interrupted by a loss of power or shutdown of the system, it will resume to where it left off prior to the interruption.

**To reformat the RS4 storage array:**

1. Press the **Config** tab on the RS4 interface.
2. Press the **Reformat Array** button.
3. Press the desired array type or press Cancel to exit.

## USB Ports

Two USB 2.0 ports are provided for small/slower data transfers (typically less than several GB of data) or for access to the storage array when no network or PC is available. The ports support connections at any time while the device is powered.

When supported USB media is detected, the interface will display only the total space existing on the media as a reference. It does NOT display available space on the media.

**Note:** TDT recommends that you do not attempt to copy or move files using the USB ports while a recording session is active.

## Device Status LEDs

The device status LEDs report streaming or network activity. The following tables display the status LED indicators.

### Video

Not currently implemented.

## Network

Status	Information
Off	No network traffic detected.
Lit	Network traffic is present and detected on the RS4.

## Storage

Status	Information
Off	No storage access to the RS4 is detected.
Lit	Storage access to the RS4 is in progress

## Ethernet Ports

Two Ethernet ports are provided on the back panel, Video and Network.

### Video Port

Not currently implemented.

### Network Port

The Network port allows connections to either a PC or local area network via a standard Ethernet cable. The RS4 supports automatic DHCP protocol, see “The DHCP Protocol” on page 2-7 for more information.

# Troubleshooting

The following section provides examples and solutions to some of the errors that could be encountered while using the RS4 Data Streamer.

## Device Will Not Power Up

Check the position of the power supply switch. If set to the “O” position the power supply is disabled. To enable, simply ensure that the switch is in the “1” position and attempt to power on the RS4. If the device does not power up after verifying that the power supply is enabled contact TDT.

## Can't Access the RS4 Storage Array

Check the Ethernet cable connection to ensure that the RS4 is connected to a network or PC using the Network Ethernet port located on the back panel of the RS4. If the Ethernet cable is connected to the Video Ethernet port, network traffic will cause the Video status LED to light up. See “Setting-Up Your Hardware” on page 2-6 for connection diagrams.

If you are attempting to access the RS4 through a network, ensure that the server supports DHCP. If not, the RS4 will default to its static IP address (10.1.0.42). If you encounter this issue, see “Direct Connection to a PC” on page 2-7 for information on how to access the RS4 using a direct connection to a PC.

## RS4 Interface Becomes Slow or Unresponsive

Researchers who use the OpenEx preview mode extensively may find the interface to behave sluggishly. The RS4 does not throw out data recorded while in preview mode. Data recorded in preview mode is stored as unnamed data on the RS4 and is readily distinguishable from legitimate data recorded during an actual experiment. TDT recommends removing unnecessary data remaining on the storage array.

## RS4 Is Not Correctly Naming Data

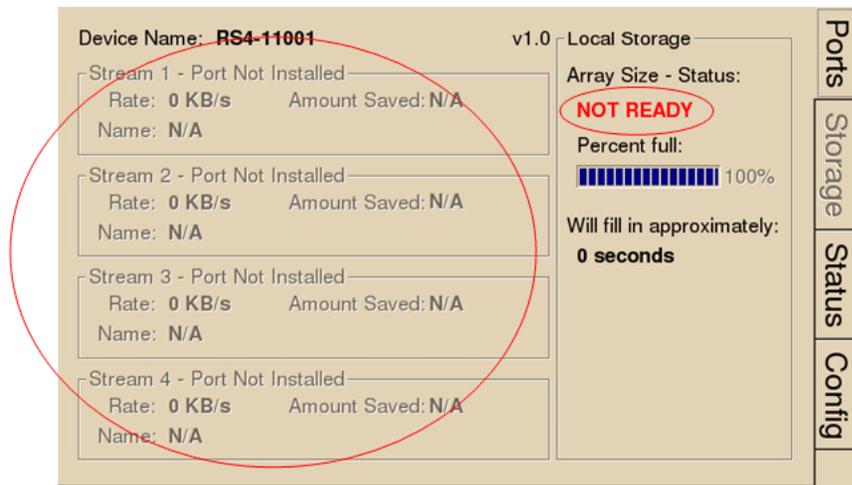
When connected to an active network, TDT's OpenEx software sends information to the RS4 via a broadcast UDP packet allowing it to properly name the streaming data sent to the RS4. If the RS4 is powered on before connecting the necessary network cables it may default to the basic naming format:

```
\data\Event name-year-month-day-hour-minute-second\unnamed.sev
```

Power off the RS4, connect all the necessary cables then power the RS4 back on.

## Port Tab Errors

Below is an example of errors that can be encountered on the Port tab.



Ports that are not currently installed will be displayed in grayed out text. In most cases it is normal to see 3 of the 4 Streams disabled (since RS4 devices come installed with 1 or 4 data ports). Hardware failures can cause all ports to be grayed out. If you encounter this issue, contact TDT.

Array status messages will determine whether or not a storage array is currently installed properly. If the NOT READY status is displayed, the storage array may require reformatting (Check the Status tab for more details). See "Storage Array Types" on page 2-20 for information on reformatting.

## Status Tab Errors

The screenshot displays the Status Tab interface with the following data:

System		Core Temperatures (F):	
Processor Usage:		0%	0%
		1%	0%
		????.??	????.??
		????.??	????.??
Fan Speeds (RPM):			
		?????	?????
		?????	?????
Current IP: 10.10.10.126			

Data Ports	
Memory Buffers (U/F/A):	N/A
	N/A
	N/A
	N/A
Communication Errors:	
	10
	?
	?
	?

Storage Array: Array not found

Progress bar: 0%

Buttons: Clear Error Count, View Log Window

Sidebar: Ports, Storage, Status, Config

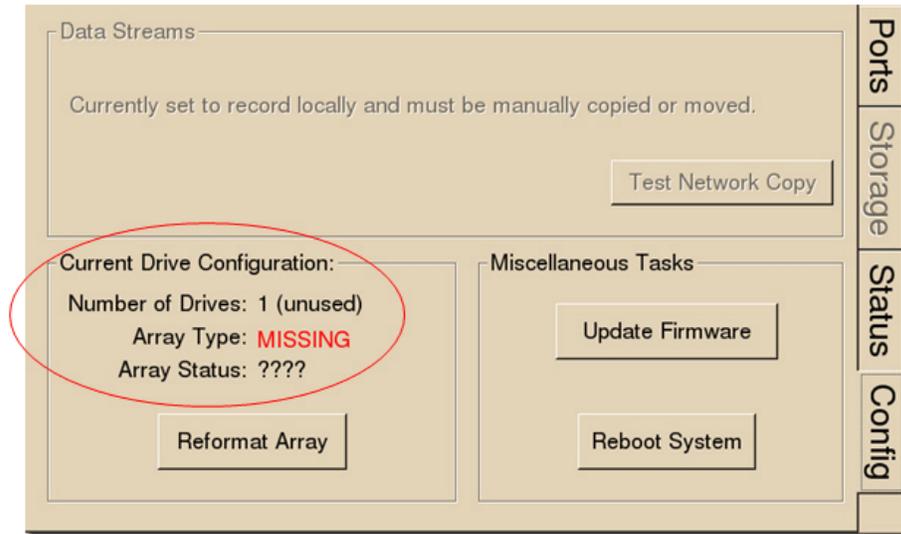
Temperature sensor failures will be displayed as ????.?? in the Status tab. If you encounter this issue, contact TDT.

Typical fan speed rates should be 1500 RPM and 3500 RPM under heavy processing loads. Fan failures will be displayed as ????? in the Status tab. If you encounter this issue, contact TDT.

Unformatted storage arrays will cause an Array not found status to be displayed. This may also be caused by disk drive failures within the RS4. You may attempt to reformat the storage array. See “Storage Array Types” on page 2-20 for information on reformatting. If reformatting is not desired, contact TDT.

Communication errors are compiled per recording session for currently installed streaming ports and will indicate if a streaming port had a communication failure at some point during the session. Data recorded during the session may be invalid. Communication errors may result from wiring errors between the RZ2 and RS4. Cycling power on the RZ2(s) may fix the issue. Refer to the “RS4 to RZ2 Connection Diagram” on page 2-6 for a proper wiring example. If the wiring is correct this may indicate a bad fiber optic cable that will need to be replaced.

## Config Tab Errors



Drive configuration errors may occur if the RS4 is unable to detect a properly formatted storage array. You may attempt to reformat the storage array. See “Storage Array Types” on page 20 for information on reformatting. If reformatting is not desired, contact TDT.

**Note:** If using a mirrored array type, drive failures will be displayed using an underscore. For Example, if drives 1 and 2 fail the Array Type will read:

Array Type: **Mirrored (\_ \_UU)**

Data in these scenarios are most likely recoverable. If you encounter this issue contact TDT. You may attempt to recover the data by accessing the RS4 file system to move the data to a local PC prior to reformatting the array.

## RS4 Technical Specifications

<b>Processing Cores</b>	4
<b>Storage Array Size</b>	4 Terabytes or 8 Terabytes
<b>Streaming Ports</b>	
<b>Number of Ports</b>	1 or 4
<b>Port Speed</b>	12.5 MB/sec (per port)

