SYNAPSE

ERC108-118
ERS108-118

Enhanced Rack Controller with optional SNMP agent
(ERS/ERC108-118) for the SFR08 and SFR18

Installation and Operation manual

AXON®
THE HEART OF BROADCAST

Synapse

TECHNICAL MANUAL

ERS108-118
ERC108-118

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WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRICAL SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE

● ALWAYS disconnect your entire system from the AC mains before cleaning any component. The product frame (SFR18, SFR08 or SFR04) must be terminated with three-conductor AC mains power cord that includes an earth ground connection. To prevent shock hazard, all three connections must always be used.
● NEVER use flammable or combustible chemicals for cleaning components.
● NEVER operate this product if any cover is removed.
● NEVER wet the inside of this product with any liquid.
● NEVER pour or spill liquids directly onto this unit.
● NEVER block airflow through ventilation slots.
● NEVER bypass any fuse.
● NEVER replace any fuse with a value or type other than those specified.
● NEVER attempt to repair this product. If a problem occurs, contact your local Axon distributor.
● NEVER expose this product to extremely high or low temperatures.
● NEVER operate this product in an explosive atmosphere.

Warranty: Axon warrants their products according to the warranty policy as described in the general terms. That means that Axon Digital Design BV can only warrant the products as long as the serial numbers are not removed.

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This product complies with the requirements of the product family standards for audio, video, audio-visual entertainment lighting control apparatus for professional use as mentioned below.

CE	EN60950	Safety
	EN55103-1: 1996	Emission
	EN55103-2: 1996	Immunity

Axon Digital Design ERS/ERC108-118 Tested To Comply With FCC Standards FOR HOME OR OFFICE USE	This device complies with part 15 of the FCC Rules Operation is subject to the following two conditions: (1) This device may cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

Table of Contents

1 Introduction to Synapse

An Introduction to Synapse

Synapse is a modular system designed for the broadcast industry. High density, intuitive operation and high quality processing are key features of this system. Synapse offers a full range of converters and processing modules. Please visit the AXON Digital Design Website at www.axon.tv to obtain the latest information on our new products and updates.

Local Control Panel

The local control panel gives access to all adjustable parameters and provides status information for any of the cards in the Synapse frame, including the Synapse rack controller. The local control panel is also used to back-up and restore card settings.

! **Note:** "Axon Cortex" software will increase system flexibility of one or more synapse frames

Although not required to use Cortex with a Synapse frame, you are strongly advised to use a remote personal computer or laptop PC with Axon Cortex installed, as this increases the ease of use and understanding of the modules.

2 Unpacking and Placement

!	**Note:** “The ERS/ERC108-118 is already installed in your SFR08 or SFR18 frame. The instructions below are only necessary for replacement of the rack controller.”

Unpacking

The Axon Synapse card must be unpacked in an anti-static environment. Care must be taken NOT to touch components on the card – always handle the card carefully by the edges. The card must be stored and shipped in anti-static packaging. Ensuring that these precautions are followed will prevent premature failure from components mounted on the board.

Placing the card

The rack controller card can be placed vertically in an SFR18 frame, on the right side next to the AC connectors. Locate the guide slots to be used, slide in the mounted circuit board, and push it firmly to locate the connectors. In an SFR08 the rack controller is placed horizontally

Correct insertion of the controller is essential.

3 A Quick Start

Powering-up

On powering up the Synapse frame, the card set will use basic data and default initialisation settings.

Changing settings and parameters

The front panel controls or the Axon Cortex can be used to change settings. An overview of the settings can be found in chapter 5, 6 and 7 of this manual.

Front Panel Control

Front Panel Display and Cursor

```
[No Alarms]
```

Settings are displayed and changed as follows;

Use the cursor ‘arrows’ on the front panel to select the menu and parameter to be displayed and/or changed.

Press ►	To go forward through the menu structure.
Press ◄	To go back through the menu structure.
Press ▲	To move up within a menu or increase the value of a parameter.
Press ▼	To move down through a menu or decrease the value of a parameter.

NOTE: Whilst editing a setting, pressing ► twice will reset the value to its default.

Using the Synapse Local Control interface accessible from the front panel enables the Synapse system to be configured manually. On completion of the power up sequence the Local Control display shows:

```
Axon Synapse Control
Press > Key
```

By pressing the right arrow key once, the Local Control proceeds to the slot configuration selection. Slots are numbered 0 to 18 for an SFR18 and 0 to 8 for an SFR08. Slot 0 is the ERC/ERS108-118 itself and slots 1..18 are the card positions within the frame (examples show ERS/ERC108-118).

```
ERS118 [Select Card]
>S00=ERS118
```

Scrolling through these slots is performed using the up and down arrow key. Pressing the right-arrow key again enters the following menu where 6 predefined sub-menus can be selected. These are Status, Settings, Alarms, Backup, Restore and About.

```
ERS118 [Select Menu]
>Status
```

Press the right arrow key again to go to the status menu. Pressing the down arrow enters the menu that gives all status related menu items of a card. For the ERS/ERC108-118 the first status item is the '`NET STATUS`' header. Pressing the down arrow again you get the `IP_Adrr0` status item (scrolling as it doesn't fit the display).

```
ERS118 [Status]
>IP_Addr0=DHCP Asking
```

As status items in this menu are not changeable, the right arrow key does not activate another menu level. Pressing the left arrow key once returns the menu to the previous item, thus the following menu is displayed again:

```
ERS118 [Select Menu]
>Status
```

If the down arrow key is pressed, the display will show:

```
ERS118 [Select Menu]
>Settings
```

Pressing the right arrow key enters the settings menu. After pressing the down arrow key the first setting and its value are now displayed.

```
ERS118 [Settings]
 >IP_Conf0=DHCP
```

Other settings can be selected by pressing the up and down arrow keys. Pressing the right arrow key will edit the setting that is currently selected.

```
ERS118 [Edit Setting]
 IP_Conf0>DHCP
```

Pressing the up and down keys changes the value of this setting. To change large range values, e.g. H-Phase, keeping the up or down arrow key pressed gives a faster increment or decrement of the value. The value can be reset by pressing the right key when the value is being edited. The display will show `Press>` to `reset` in order to confirm the reset.

```
Press > to reset
 IP_Conf0>DHCP
```

Pressing the right arrow key again confirms the action and resets the setting. Pressing the left arrow key whilst in the card selection section of the ERS/ERC108-118 will present an 'Alarms' page where the last alarm can be viewed. If the Error LED is lit, the alarm responsible for the error will remain on the display and no further alarms will be displayed until the Error LED is cleared. To clear the Alarm and Error LED press the left arrow key whilst viewing the alarms page. To exit the Alarms page, use the right arrow key.

An example of the display under normal conditions when no alarms have occurred or when an alarm has cleared.

```
[No Alarms]
```

An example of the display when an Alarm has occurred.

```
S15 [Alarm Trigger]
001:INP_LOSS
```

Menu Structure Example

Slot	Module		Item		Parameter		Setting
▲							
▲							
S02			Identity				
▲			▲				
S01	SFS10	▶	Set-tings	▶	Standard_dig	▶	Auto
▼			▼		▼		▼
S00	ERS118		Status		Mode		625
			▼		▼		▼
			Events		Ref-Input		525
					▼		
					H-Delay		
					▼		
					▼		

Introduction to Cortex

To set up a frame's rack controller, we strongly advise to have Axon Cortex installed on a PC which is connected to the rack controller via Ethernet. Cortex is a windows based application to configure, manager and control your equipment. Cortex employs Ethernet communication to each device in your chosen workflow, providing the ability to both configure and monitor devices at local and remote sites.

The application allows up to 64 user-groups to be defined. For each group the level of access can be restricted, not only to program functionality but also to control access of individual settings on specific devices. Limitless users can be added and assigned to one of these groups, each with their own unique password.

Cortex works with all Synapse products without upgrade or the purchase of additional software. Advanced features, such as integrated router control, user-configurable GUIs and third-party SNMP monitoring, are available as costed options, and are protected by the use of a USB dongle for the purchased options.

Download the latest version

A free-of-charge version of Cortex is available to customers from AXON's website (www.axon.tv). Make sure that you have the latest version when setting up a new frame.

Minimum system requirements

The following list, lists the prerequisite software and minimum hardware and software requirements for running Cortex. To determine if the computer meets the system requirements, from the **Start** menu, right-click **My Computer**, and then click **Properties**. The **General** tab displays the CPU type and speed, and the amount of installed memory (RAM).

Prerequisite software
Microsoft .NET Framework (Automatically installed if not present)
Microsoft Internet Explorer 6.0 Service Pack 1 (SP1) or later (prerequisite for .NET Framework)
Adobe Reader V8 or later (www.adobe.com/products/reader) for manual viewer

RAM
Minimum: 192 MB
Recommended: 512 MB or higher

Hard Disk space
Minimum: 600 MB (please note the SQL database size in Cortex should be reduced if HDD space is limited below 1GB)
Recommended: 1GB or higher

Processor
Pentium III Compatible or higher
Minimum: 500 MHz
Recommended: 1 GHz or higher
Recommended Screen Resolution
At least 1024 x 768

Other
Ethernet/Wireless adapter fitted with support for IP connections

Operating System
Windows Server 2003 SP1
Windows Server 2003 Enterprise Edition SP1
Windows Server 2003 Datacenter Edition SP1
Windows Server 2003 Web Edition SP1
Windows Small Business Server 2003 Standard Edition SP1
Windows Small Business Server 2003 Premium Edition SP1
Windows XP Professional SP2

Windows XP Home Edition SP2
Windows XP Tablet Edition SP2
Windows XP Media Edition SP2
Windows 2000 Professional Edition SP4
Windows 2000 Server Edition SP4
Windows 2000 Advanced Edition SP4
Windows 2000 Datacenter Server Edition SP4
Virtual PC
Virtual Server
Windows Vista Home Basic
Windows Vista Home Premium
Windows Vista Business
Windows Vista Enterprise
Windows Vista Ultimate
Windows 7

Note: There is no support in this release for Windows XP Embedded Edition.

Installation of Cortex

When you've downloaded the latest version, extract the file onto a local drive and click on the file named 'setup.exe'.

The Cortex installer will start by installing SQL Server 2005 Express SP2, this is a pre-requisite for running Cortex as all the local data storage is stored using this server. Accept the initial licence agreement for this and then wait whilst this application installs (likely to take between 5 and 20 minutes depending on the specification of the PC). The Cortex application will then be installed by following the on screen directions which will complete the rest of this installation.

Logging on

When starting the Cortex application for the first time it will automatically log the user on as an Administrator, however if the options have changed previously it can prompt the user for the User name and password. By default the User name is Admin, which can be selected from the pull down list and the password is "Cortex" (case sensitive). Once the application has finished its initialisation sequence the user can change the list of users and passwords for each user.

Network adapter

When the program is invoked it will by default carry out a search on the sub-net of the first network adapter installed in the PC. If it finds Synapse frames on this sub-net it will add and display them in the system view. If you require to use a different network adapter by default then this can be changed in the IP tab of the Configuration dialog. Also if other sub-nets contain Synapse frames then these can either be manually added using System->Add Frame to Network or by searching additional sub-nets again configured from the IP tab of the Configuration dialog.

When the program finds a rack controller it will then interrogate the frame and cards it contains to pull back all the information from them.

It will add status events to the log on reading the status so that the initial status level for the device will reflect its current state.

Windows firewall

When the program is run for the first time the Windows firewall will normally warn the user of a security risk. In order for Cortex to work correctly the unblock button should be pressed. If the firewall blocks the program then the broadcast network UDP messages will be blocked and Cortex will not update to reflect changes made by other clients on the Synapse system.

If the program has been blocked then it can be changed by accessing the Windows Firewall from the Control Panel. The exception dialog will allow the user to 'Add Program' by browsing to the executable and adding this to the list of exceptions.

Note that some network switch devices can also block network UDP broadcast messages so if these broadcasts are still not seen with Cortex in a Synapse system after checking the firewall then the configuration of 'intelligent' hubs or switches should also be verified.

4 The ERS/ERC108-118 Card

Introduction

The ERC118 is the central controller of the Synapse SFR18 system frame. The ERC108 is the controller of the Synapse SFR08 system. The ERS108 and 118 include an SNMP agent. It is used to configure, control and monitor Synapse systems and to provide network connectivity. The ERS/ERC108-118 also provides an input for two independent references with loop through.

Automatic IP Address Configuration

If the network has a Dynamic Host Configuration Protocol (DHCP) server available, the Synapse system can use this service to configure its IP address settings automatically. Using `Settings>IP_Conf0`, choose `DHCP`.

!

Remark: "In most cases, the IP address that is assigned using DHCP is dynamic; it must be re-obtained regularly and it can change over time. Please contact the network administrator in order to configure the DHCP assigned IP address to be fixed. See Manual IP address configuration. ."

Verify the IP address configuration in `Status>IP_Addr`, which should now read `DHCP Leased` or `DHCP Infin`. In case a DHCP server is not present, manual configuration must be used instead. See below.

Manual IP Address Configuration

Consult your network administrator to obtain an IP address, network prefix or subnet mask and gateway address. Use the `Settings>NetwPrefix0` to set the network prefix. Alternatively, if a subnet mask is given, use `Settings mNM0` to set the subnet mask. Use the `Settings>mIP0` item to set the IP address.

Use the `Settings>mGW0` item to set the gateway address. If you do not have a gateway, or gateway address, use 0.0.0.0 instead. (Use reset to quickly obtain 0.0.0.0.).

Finally, using `Settings>IP_Addr0`, choose `Manual`.

MAC address

All RRC/ERC and RRS/ERS cards have a unique MAC address. Sometimes you are required to know this address in case your company uses secured networks and firewalls. A rack controller's MAC address contains 6 pairs of digits build up out of 2 parts, looking as follows: `xx : xx : xx : yy : zz : zz`

`X =`	00 03 41 -> axon MAC address
`Y & Z =`	unique allocated numbers

In ERS/ERC108-118 the MAC address can be found under `Status > MAC0`. Note that this setting is not available in the RRS/RRC18.

5 Settings Menu

Introduction

The settings menu displays the current state of each setting within the ERS/ERC108-118 and enables the item to be changed or adjusted. Settings can be changed using the front panel of the Synapse frame (SFR18 or SFR08) or via Cortex.

NETWORK

IP_Conf0

Configuring Synapse for an Internet Protocol network can be performed manually or it can be set automatically using DHCP. If `IP_Conf0` is set to `Manual`, IP addressing is configured through the `IP0`, `NM0` (or `NetwPrefix0`) and `GW0` (Gateway) settings. If it is set to `DHCP`, Synapse uses the DHCP network service to configure itself automatically. The default setting of `IP_Conf0` is `DHCP`.

mIP0

`mIP0` sets the manual IP address of the Synapse system. This address is only used if `IP_Conf0` is set to `Manual` and the address becomes effective as soon as you leave the edit mode or if the address is reset. If an IP address is set manually, the `mNM0` must also be set manually.

mNM0

The manual subnet mask of the Synapse system, `mNM0`. This mask is only used if `IP_Conf0` is set to `Manual` and the mask becomes effective as soon as the edit mode is left or if the mask is reset. There are only 32 valid subnet masks. An alternative way of configuring the subnet mask is by use of the `NetwPrefix0` setting.

mGW0

`mGW0` sets the manual gateway address used by the Synapse system to communicate with remote network hosts. This address is only used if `IP_Conf0` is set to `Manual` and the address becomes effective as soon as edit mode is left or if the gateway address is reset.

mPri_DNS

`mPri_DNS` sets the manual primary Dynamic Name Server (DNS), used by the synapse system to connect with a dynamic name location (for instance an NTP server), instead of only an IP address. This setting is only used if `IP_Conf0` is set to manual and the address becomes effective as soon as edit mode is left or if the DNS address is reset.

mSec_DNS

`mSec_DNS` sets the manual secondary Dynamic Name Server (DNS), used by the synapse system to connect with a dynamic name location (for instance an NTP server), instead of only an IP address. This setting is only used if `IP_Conf0` is set to manual and the address becomes effective as soon as edit mode is left or if the DNS address is reset.

Broadcasts

The `Broadcasts` setting indicates whether changes to the Synapse system should be announced on the local network using the Axon Control Protocol (ACP). When `Broadcasts` is enabled, every change is broadcast on the local network allowing local clients to monitor the Synapse system in real time. The settings of `Broadcasts` are `On` or `Off`. The default setting of `Broadcasts` is `On`.

Forwarding0

If `Forwarding0` is enabled, changes to the Synapse system are sent to a single host (through IP unicasting). This host's IP address can be set using the `FW0` setting. The settings for `Forwarding0` are `On` or `Off`. The default setting is `Off`.

FW0

`FW0` sets the IP address of a single IP host, possibly on a remote network, which receives Synapse system changes through the Axon Control Protocol (ACP). Only used when `Forwarding0` is enabled.

Forwarding1

Besides forwarding0, you can also set a second IP to forward system changes to. This is done with the setting `Forwarding1`. When it is enabled, changes to the Synapse system are sent to a single host (through IP unicasting). This host's IP address can be set using the `FW1` setting. The settings for `Forwarding1` are `On` or `Off`. The default setting is `Off`.

FW1

`FW1` sets the IP address of a single IP host, possibly on a remote network, which receives Synapse system changes through the Axon Control Protocol (ACP). Only used when `Forwarding1` is enabled.

NetwPrefix0

`NetwPrefix0` sets the manual IP network prefix of the Synapse system. This address is only used if `IP_Conf0` is set to `Manual`. The address becomes effective as soon as the edit mode is left or if the address is reset. An alternative way of configuring the network prefix is by use of the `mNM0` setting. The default setting of `NetwPrefix0` is `24 Bit`.

ErrorThreshold

If an alarm occurs with a priority above this threshold, the front cover error LED will be enabled. The error LED can be cleared by pressing the ◄ arrow key in the alarms page.

Redund_Pwr_Test

`Redund_Pwr_Test` tests the on-board redundant reference circuitry. If a reference amplifier fails, it is possible to switch over to the backup amplifier using this setting. If the on-board primary power supply fails, the second circuit is activated automatically. The settings of `Redund_Pwr_Test` are `On` and `Off`, the default setting is `Off`.

Trap-Dest_0 (ERS108-118 only)	If `Trap-Dest_0` is set to `on`, SNMP traps are delivered to the SNMP trap receiver for which the IP address must be set with the `TD_0 setting`. The default setting is `off`.
TD_0 (ERS108-118 only)	`TD_0` sets the IP address for the first SNMP trap receiver the SNMP manager. This is a unicast address on the local or remote network
Trap-Dest_1 (ERS108-118 only)	If `Trap-Dest_1` is set to `on`, SNMP traps are delivered to the SNMP trap receiver for which the IP address must be in `TD_1`. The default setting is `off`.
TD_1 (ERS108-118 only)	`TD_1` sets the IP for the second SNMP trap receiver or the SNMP manager. This is a unicast address on the local or remote network
NTPServer1	Here you can assign the primary NTP server IP address or DNS name to which the ERC/ERS should synchronize its date and time.
NTPServer2	Here you can assign the secondary NTP IP address or DNS name to which the ERC/ERS should synchronize its date and time, in case the ERC/ERS cannot synch to the primary NTP server.
NTPOffsetH	With this setting you can add an offset in hours to the NTP time between -15 and +15 hours. Since NTP is usually UTC, this setting should be set conform your time zone.
NTPOffsetM	With this setting you can add an offset in minutes to the NTP time between -59 and +59 minutes.
Time_Broadcast	With this setting you can switch on or off in-frame broadcasting (via the internal bus) of the NTP time code to all cards.
USB-Relay_chk	The ERC/ERS does not have a general pupose interface (GPI) like the RRC/RRS models had. However, the USB interface can be used to connect a USB relay for remote monitoring of your power supply status and general errors. To use this function, you have to buy a USB relay controller. The ERC/ERS has built in compatibility with this hardware : http://kmtronic.com/usb-relay-controller-two-channels.html This little plastic box has one USB connector and two phoenix style screw terminals.

At power up Relay 1 will be closed (active, so NO is close). If one of the two (or both) power supplies ceases to function, the relay is released. Relay 2 will be hard coupled to the error led on the front and is normally open.

This menu item is added in case only one power supply is used.

Possible settings are:

- `Supply1:` only PSU1 is monitored
- `Supply2:` only PSU2 is monitored
- `Supply1-2:` both power supplies are monitored (default)

If the ERC starts up and the USB dongle is present, relay1 will be set. The PSU monitoring thread will monitor the power supplies every second and set the PSU LEDs accordingly. Each time it will check if the relay is there and set the relay value accordingly (taking the value of `USB-relay_chk` into account).

Whenever the alarm LED is set, relay 2 is closed; whenever the alarm LED is reset relay 2 is closed.

Note: If the relay is plugged into a running ERC and the alarm LED is lit, the ERC will NOT close relay2. Closing relay2 will only happen if the relay is present at the time the alarm LED will be set. Of course after resetting the alarm relay2 will operate as expected.

Note: When a different serial device with an FT232 chipset is connected to the ERC the behaviour is undefined.

Fan_Speed_Control
(For SFR18-Gen3 only)

Allows to select fan speed setting

- `Fast` (100% pwm)
- `Medium` (80% pwm)
- `Slow` (60% pwm)

The preferred setting is `Fast` for optimal cooling.

Warning: when choosing a lower setting monitoring of temperatures is required.

6 Status Menu

Introduction

The status menu indicates the status of each item listed below.

IP_Addr0

Shows the current IP aquire method. Can be `Manual`, `DHCP_Asking`, `DHCP_Leased` or `DHCP_Infin`.

IP0

Shows the current IP address in use by the Synapse system

NM0

shows the current IP subnet mask in use by the Synapse system

GW0

Shows the current gateway IP in use by the Synapse system

MAC0

This item shows the ERC/ERS' MAC address.

Pri_DNS

Shows the current primary DNS server in use by the Synapse system.

Sec_DNS

Shows the current secondary DNS server in use by the Synapse system.

PSU_Top

`PSU_Top` gives the status of the top power supply within the Synapse frame. The status can be `OK` or `NA` (not available).

PSU_Bottom

`PSU_Bottom` gives the status of the Bottom power supply within the Synapse frame. The status can be `OK` or `NA` (not available).

Temp_Left

`Temp_Left` gives the current temperature (in degrees Celsius) of the left side inside the Synapse frame as measured by the temperature sensor. The status displays -999 when a fan is not connected, or the sensor is defect.

Temp_Right

`Temp_Right` gives the current temperature (in degrees Celsius) of the right side inside the Synapse frame as measured by the temperature sensor. The status displays -999 when a fan is not connected, or the sensor is defect.

ERC_Temp

`ERC_Temp` gives the current temperature (in degrees Celsius) of the ERS/ERC108-118 itself as measured by the onboard temperature sensor. Displays -999 if the sensor is defect.

Temp_Front (ERC/ERS108 only)	`Temp_Front` gives the current temperature (in degrees Celsius) of the front size inside the Synapse framt as measured by the temperature sensor on the Fan tray. Displays -999 if the sensor is defect.
Left_Fan_Status	Indicates the status of the left backside fan (inside the top lid of the SFR18). Can be NA (Not available), Error or OK.
Right_Fan_Status	Indicates the status of the right backside fan (inside the top lid of the frame). Can be NA (Not available), Error or OK.
Front_Fan_Status (ERC/ERS108 only)	Indicates the status of the front tray fan. Can be NA (Not available), Error or OK.
Fans_PwrStatus (ERC/ERS118 only)	Indicates the status of the power supply to the fans. Can be OK or Error.
Front_PwrStatus	Indicates the status of the power supply to the front of the frame. Can be OK or Error. This item is not available in the ERC/ERS108.
SPF_Status	`SPF_Status` give the current status of the Synapse Package File (SPF). The status can be `Idle`, `Done`, `Busy` or `Error`. When `SPF_Status` indicates `Idle` or `Done` the ERS is ready to receive a Synapse Package File. When `SPF_Status` indicates `Done` this shows that the last download was successful.
SPF_Progress	`SPF_Progress` indicates the progress of a programming action in progress. Initially it will be at 100%. While programming the value will start at 0% and increase to 100%, only to be reset to 0% when the next programming action starts.
Redund_Ref_Pwr	`Redund_Ref_Pwr` indicates whether the onboard reference power supply is available. The status can be `OK` or `NA` (not available).
NTP_Status	This status item indicates that status of the NTP sync. Can be `NTP Not Synced`, `NTP Synced` or `Lost NTP Sync`.
MIB_SO ~ MIB_S18 (ERS108-118 only)	`MIB_Slot number` indicates the MIB file and version required for each slot. Note that replacing a card can change the required mib because a new firmware version may change existing objects and may introduce new objects and values.

	PSU statuses (only available in SFR18-Gen3 and SFR08 frames)
PSU1_Voltage	Voltage measurement of the bottom power supply. Nominal value is 30V.
PSU1_Current	Current measurement of the bottom power supply. Value depands on the cards inside the rack.
PSU1_Fan_Status	Status of the bottom power supply fan. Can be `NA` (Not Available), `Error` or `OK`.
PSU1_Temperature	Ambient temperature of the bottom power supply in degrees Celcius. Will be set to -999 when not available.
PSU2_Voltage	Voltage measurement of the top power supply. Nominal value is 30V.
PSU2_Current	Current measurement of the top power supply. Value depands on the cards inside the rack.
PSU2_Fan_Status	Status of the top power supply fan. Can be `NA` (Not Available), `Error` or `OK`.
PSU2_Temperature	Ambient temperature of the top power supply in degrees Celcius. Will be set to -999 when not available.
	Reaf fan statuses (only available in SFR18-Gen3 frames)
ReaFan1_Status ~ RearFan5_Status	Status of the rear fans in an SFR18-Gen3. RearFan1 is the left most fan, seen from the front. RearFan5 is the right most fan, seen from the front. Status can be `NA` (Not Available), `Error` or `OK`.
Temp_Rear_Left	Temperature at the left side of the rear fans, seen from the front, in degrees Celsius. Will indicate `-999` when not available.
Temp_Rear_Center	Temperature at the center of the rear fans, seen from the front, in degrees Celsius. Will indicate `-999` when not available.
Temp_Rear_Right	Temperature at the right side of the rear fans, seen from the front, in degrees Celsius. Will indicate `-999` when not available.

7 Events Menu

Introduction

An event is a special message that is generated on the card asynchronously. This means that it is not the response to a request to the card, but a spontaneous message.

What is the Goal of an event?

The goal of events is to inform the environment about a changing condition on the card. A message may be broadcast to mark the change in status. The message is volatile and cannot be retrieved from the system after it has been broadcast. There are several means by which the message can be filtered.

Events

The events reported by the ERS/ERC108-118 are as follows;

Announcements

`Announcements` is not an event. This item is only used for switching the announcement of status changes on/off. 0=off, other =on. Beware: This does NOT influence the announcement from the cards within the frame or the announcing of the Frame Status object. Use the 'Settings' menu items 'Broadcasts' and 'Forwarding' for Announcement propagation on the network.

PSU_T

The removal or failure of the top PSU, can be detected and monitored using this event.

PSU_B

The removal or failure of the bottom PSU can be detected and monitored using this event.

Temperature

If the temperature inside the Synapse frame rises above 50 degrees Celsius and the priority of Temperature is set greater than zero an event is generated. 50°C is the upper limit of the operating temperature range.

Ref_Backup

The failure of the reference power circuitry can be detected and monitored using this event.

Fans

The failure of fans can be detected and monitored using this event.

Card-Presence
(ERS108-118 only)

Insertion or removal of any card is signalled by this event.

What information is available in an event?

The message consists of the following items;

1) A message string to show what has happened in text, for example: “INP_LOSS”, “REF_LOSS”, “INP_RETURN”.
2) A tag that also shows what happens, but with a predefined number: e.g. 1 (= loss of input), 2 (= loss of reference), 129(= 1+128 = return of input). For a list of these predefined tags see the table on the next page.
3) A priority that marks the importance of an event. This value is defined by the user and can have any value between 1 and 255, or 0 when disabled.
4) A slot number of the source of this event.

The Message String

The message string is defined in the card and is therefore fixed. It may be used in controlling software like Cortex to show the event.

The Tag

The tag is also defined in the card. The tag has a fixed meaning. When controlling or monitoring software should make decisions based on events, it is easier to use the tag instead of interpreting a string. The first implementation is the tag controlled switch in the GPI16.
In cases where the event marks a change to fault status (e.g. 1 for Loss of Input) the complement is marked by the tag increased by 128 (80_{hex}) (e.g. 129 (81_{hex}) for Return of Input).

Defining Tags

The tags defined for the ERS/ERC108-118 are:

Event Menu Item	Tag		Description
Announcements	0 or NA	0 or NA	Announcing of report and control values
PSU_T	07_{hex}=PSU_ERROR	87_{hex}= PSU_OK	Power Supply status
PSU_B	07_{hex}= PSU_ERROR	87_{hex}= PSU_OK	Power Supply status
Temperature	$0A_{hex}$=TEMP_TOO_HIGH	$8A_{hex}$= TEMP_OK	Temperature OK or higher than threshold
Ref_Backup	09_{hex}= REF_BACKUP_ERROR	89_{hex}= REF_BACKUP_OK	Reference status
Fans	33_{hex}= FAN_SPEED_LOW	87_{hex}= FAN_SPEED_OK	Fan status
Card presence	14_{hex} = Card inserted	09_{hex}= Card removed	Monitors card presence

The Priority

The priority is a user-defined value. The higher the priority of the alarm, the higher this value. Setting the priority to Zero disables the announcement of this alarm. Alarms with priorities equal or higher than the ErrorThreshold setting of the ERC/ERS will cause the error LED on the Synapse rack front panel to light.

The Address

Together with the message string or the tag, the slot number or address of the card is relevant to be able to assign the event to a certain card.

8 Backup, Restore and About menus

Introduction

The Backup, Restore and About menus provide file management facilities and identification information for the cards installed in the Synapse frame. Backup, Restore and About can be accessed from the front panel of the Synapse frame only.

!	**Note:** Backup and restore does not work for all cards. Linux cards do not support this feature.

Backup Menu Item

There are no settings to backup for the ERS/ERC108-118, the settings are automatically stored in non-volatile memory.

On the ERS/ERC108-118 there is backup memory space for the card inserted in slots 1 to 18. This space is used to manually store the actual settings of a card, automatic backups are not performed. Backups can only be restored to the same slot and to a card of identical type and micro firmware version.

The Parameter Table file on each card is used as the source for these backups. The ACP protocol also provides access to these files for fast configuration of a card. These files are unstructured and have only a valid meaning for the actual software on the card.

Restore Menu Item

The ERC/ERS can backup the settings from cards in slot 1 to 18 but not its own settings. Restoring can be manually performed for slots 1 to 18 to configure a card when it is replaced or hot swapped.

About Menu Item

These items describe the identity of the card. In order of appearance:

Card Label
User Defined Label
Card Description
Software Version
Hardware Version
Product Code
Serial Number
Card ID
Key
Features
SNMP

The user defined label can be used to label the Synapse system. It can be set by the remote configuration software.

9 Upgrading the ERC/ERS in Cortex

Micro Firmware

The micro firmware file is zero sized and only provides a dialog to enable the so called "boot mode". In this mode the ERC/ERS firmware can be upgraded.

To upgrade the ERC/ERS perform the following steps:

1. Make sure the ERC/ERS is connected to an Ethernet network and can be reached using the Cortex application.

2. If the ERC/ERS IP addressing is not currently configured, contact a network administrator to obtain IP address settings for the network.

3. Ensure that your network functions correctly, if the network performs poorly the update MAY fail. E.g. if the network suffers from broadcasts storms a bounded amount of required retries may not suffice.

4. In Cortex locate your frame; expand it using the + icon in front of it. Right click on the line for the ERS/ERC108-118 and select "Upload Firmware" from the popup menu

5. At the bottom of the modal dialog that now shows up select the SPF file you want to upgrade to.

6. Select the checkbox on the top left to the card named "Rack controller" In the file column the name of the spf file will now show. Make sure that you have no other boxes checked.

7. Press the button "Program Devices". A confirmation dialog will show up informing you that this will interrupt the operation of the device. Confirm this message if you want to proceed. After this there can be a second confirmation. This only happens if there is another programming action in progress or if the previous programming action failed. Warning: Confirming this second message will result in aborting the already ongoing programming action!

8. The upload can take up to a minute or more if your network is busy. Once completed the ERC/ERS will automatically return to operational mode. Where possible existing settings will be retained.

Parameter Table

This is not used. It's only here for compatibility purposes.

SPFS1 ~ SPFS18

Synapse Package files (SPF) for each slot within the frame.
Use these files to update the firmware on a card. The ERC/ERS will perform checks on the file to prevent corruption of firmware and performs automatic bootmode / operational mode settings.

10 LED indication

Front Panel LEDs

The PSU1/PSU2 LEDs in the Synapse frame cover show the availability and functioning of the PSUs. The error LED shows a triggered alarm from within the frame with a priority above the Error Threshold setting.

Error LED

The error LED remains lit until explicitly cleared by user intervention. Cleared alarms will not disable the error led. The error LED can be cleared by pressing the ◄ key in the alarms page.

Communication LEDs

The two LEDs of each network interface of the ERS/ERC108-118 itself display a valid link and activity on the network. If the Ethernet is connected properly the left link-led should be lit. The right activity LED blinks when there is network activity.

11 Networking explained

Synapse In A Network

The Synapse frame can be connected to a network using its Ethernet STP connector. Synapse uses the Internet Protocol (IP) to communicate with other devices on the network; often computers. The network may be as small as a link between a PC and the Synapse system or as large as the entire Internet.

Network Terminology

By connecting the Synapse system to an IP network, it becomes a so-called host. As a host, the Synapse system can be reached from other hosts such as computers. The network may be a part of any number of interconnected networks, such as the Internet. Multiple networks are interconnected by routers and gateways. The network the Synapse system is directly connected to, is called the subnet, or local network. Other connected networks are called remote networks. A host usually has one interface on the network, routers and gateways have multiple network interfaces

IP Addressing

Each host interface connected to an IP network has a unique IP address, so an attached Synapse system has its own address as well.

IP Address Representation

IP addresses are represented as four decimal numbers, separated by periods. Each number ranges from 0 to 255 (inclusive), representing one byte (or eight bits). So, in total, an IP address consists of four times eight bits, which equals 32 bits For example, 10.17.209.8 and 127.0.0.1 both are valid IP addresses. It is suggested that leading zeros are omitted, as some operating systems will use this to indicate octal notation. Therefore, instead of using 010.017.209.008, use 10.17.209.8.

Network and Host Number Network Prefix

The first series of bits represent the local network number, the remaining number of bits represent the unique host interface number of the host on that local network. The number of bits that define the network number is called the Network Prefix and ranges from 0 to 32 bits (inclusive). For the ERS/ERC108-118 the maximum is 30 bits. Prefixes of 31 and 32 do not yield a usable network.

Subnet Mask

An alternative way to represent the network prefix is to write the four decimal numbers that correspond to all network number bits set to 1, and all host number bits set to 0. This notation is called the subnet mask. For example, a network prefix 255.255.0.0 corresponds with a network prefix of 16 bits.

IP Gateway

If the local network is connected with other networks, the Synapse system needs the IP address of a gateway to the other networks. However, gateways do not propagate the Synapse system Announcements so they do not reach computers outside the local network.

ACP Considerations

Management protocols like ACP and SNMP use the unreliable transport protocol UDP. This is a simple wrapper protocol for sending data using IP packets directly instead of using a reliable TCP connection. TCP is also possible for up to 10 clients.
The result of this is a fast transfer of events or notifications to the management station. Because there is no connection between the hosts the use of the broadcast address is allowed. ACP Announcements are sent using this subnet broadcast address.
In the broadcast address the host part of the IP address is all set to binary ones. You can easily calculate this broadcast address by OR-ing your inverted subnet mask with the IPaddress.

Example:
The Subnet Mask is 255.255.255.0
The host IP Address is 192.168.0.1

Thus 255.255.255.0 inverted is 0.0.0.255. OR-ed with 192.168.0.1 gives us 192.168.0.255 as broadcast address. As stated earlier, Announcements do not pass the gateway. The Forward Address setting of the system can be used to send the Announcements to one host inside or outside the local network.

This host can be used to further propagate the Announcements and is thus an Application Gateway for the ACP protocol.

12 SNMP explained (ERS108-118 only)

Introduction

The Simple Network Management Protocol (SNMP) is part of the TCP/IP suite of protocols. It can be used for controlling and monitoring network equipment and other devices, the Axon SFR18, SFR08 and SFR04 for example. Such devices are called 'Agents' in SNMP terminology. Since SNMP is a standard TCP/IP protocol, management applications are available from third parties such as HP additional solutions are available from the public domain. The section 'Further Reading' gives a starting point to find more information about this subject.

The SNMP is 'simple' since there are only 4 'functions' in SNMPv1. This is also true because the 'Structure of Management Information' restricts the managed data types to approximately 10. Though the protocol is 'Simple' it is not 'Trivial'. Building your own SNMP application or setting up Management station can take some time

Agent Setup & Usage

Here are a few guidelines for installing the Agent, without explaining the specific details of your management application

Loading MIB Files

Before the Agent can be used it is advisable to load the card MIB files into your Management application. A description on how to load the MIBs should be included in the documentation of your SNMP Manager. There should not be any error or warning messages when loading the MIB. However if you do encounter an error, please report this with a short description of the error message to Axon Technical Support. The Agent does not need to load the card MIB files because it gets its management information directly from the cards. The SNMP agent is operational after powering up the rack controller

Setting Up Traps

Synapse traps can be enabled by setting the 'Event' objects in a card MIB to a value greater than zero. The SNMP authentication failure trap can be enabled or disabled from the SNMP group in the MIB-2 tree.

The trap destination is set in the rack controller MIB by setting the "Trap-Dest_0" object to 'on' and set the destination IP address in the 'TD_0 object. The destination IP address is typically the address of your SNMP Management station or an SNMP proxy Agent.

If the rack controller is located outside your sub-network you must specify the gateway address `mGW0` on your rack controller. These settings can also be performed from the local front panel of your frame.

Where are the MIB files?

The MIB files are supplied on the CD-ROM provided with the Synapse frame or rack controller. If you cannot find the MIB file for the card in use, Axon may be able to generate such a file for you. The file may not be available as the card software version may not be fully SNMP compliant or for some other reasons. Please contact Axon Technical Support for details.

Agent Specifications

The agent conforms to SNMPv1 (RFC1157), and MIB-II (RFC1213).

The following MIB-II groups are implemented:

system	.iso.org.dod.internet.mgmt.mib-2.system
interfaces	.iso.org.dod.internet.mgmt.mib-2.if
AT	.iso.org.dod.internet.mgmt.mib-2.at
ip	.iso.org.dod.internet.mgmt.mib-2.ip
icmp	.iso.org.dod.internet.mgmt.mib-2.icmp
udp	.iso.org.dod.internet.mgmt.mib-2.udp
snmp	iso.org.dod.internet.mgmt.mib-2.snmp

Below the enterprise number 7829 for Axon Digital Design there is room for Axon specific private MIBs.

Currently two nodes are defined.

.iso.org.dod.internet.private.enterprises.axon.synapse
.iso.org.dod.internet.private.enterprises.axon.synapsetraps

The synapse object identifier points to the cards that can be available in a Synapse frame. The installed cards are dynamically registered with the SNMP Agent.

The agent is capable of sending authentication failure traps. Alarms originating from the cards can be sent as SNMP generic traps. These traps are globally defined in the synapsetraps.mib file.

There is one fixed community. This is the standard 'public' community for both MIB-II and the Synapse MIBs.

13 Example configurations

Quick Setup

This is a reduced configuration for quick Setup.

For connection with a Microsoft windows PC or laptop without a DHCP server using a single hub or cross-cable.

In Windows NT based systems you need administrative rights on your machine to do this. If you're not familiar with these procedures, ask your local expert or network administrator to do this for you.

In Windows enter Start > Settings > Control Panel > Network > Protocols > TCP/IP (Properties) > IP Address

Specify an IP address: 192.168.0.1
Specify a Subnet Mask: 255.255.255.0
Specify a Default Gateway: 0.0.0.0

The last digit of the IP address is free to choose between 1 and 254, if not used already in your network. E.g. if you assign 192.168.0.1 to your PC, your frame(s) must be on 192.168.0.2, 192.168.0.3 etc.

The last zero in the Subnet Mask delimits this usable host range. There are thus 254 valid IP addresses on network 192.168.0.0 .

Restart your PC or laptop to activate these settings. The settings for the SFR18 must be: ERS/ERC108-118 > settings

	default	user setting
mIP0	= 0.0.0.0	= 192.168.0.2
mNM0	= 0.0.0.0	= 255.255.255.0
mGW0	= 0.0.0.0	= 0.0.0.0
Broadcasts	= Off/On	= On
Forwarding0	= Off/On	= Off
FW0	= 0.0.0.0	= 0.0.0.0
Forwarding1	= Off/On	= Off
FW1	= 0.0.0.0	= 0.0.0.0
NetwPrefix0	= 24 bits	= 24 bits
IP_Conf0	= DHCP/Manual	= Manual

When Broadcasts or Forwarding are set to On, Cortex can detect a frame power up. The correct setting of the Subnet Mask is vital to the operation of the network!

The broadcast IP address on this simple network is 192.168.0.255. The calculation of this address is explained in the chapter 11 'Networking Explained' under ACP Considerations.

Operation On A Network Using DHCP

For connection with a Microsoft windows PC or laptop with a DHCP server. Ensure that the network you are going to use is not heavily loaded. See 'Networking Explained' under ACP Considerations.

In Windows enter Start > Settings > Control Panel > Network > Protocols > TCP/IP (Properties) > IP Address >Obtain an IP address from a DHCP server.

Ensure your computer runs the DHCP client and has an assigned IP address. You can view the current IP address of your computer by running the 'ipconfig' command from a DOS prompt.

Restart your PC or laptop to activate these settings.

The settings for the SFR must be: ERS/ERC108-118 > settings

	default	user setting
mIP0	= 0.0.0.0	= not relevant
mNM0	= 0.0.0.0	= not relevant
mGW0	= 0.0.0.0	= not relevant
Broadcasts	= Off/On	= On
Forwarding0	= Off/On	= Off
FW0	= 0.0.0.0	= 0.0.0.0
Forwarding1	= Off/On	= Off
FW1	= 0.0.0.0	= 0.0.0.0
NetwPrefix0	= 24 bits	= not relevant
IP_Conf0	= DHCP/Manual	= DHCP

The currently assigned IP0, NM0 and GW0 address can be viewed in the status menu.

When Broadcasts or Forwarding are set to On the Synapse configuration tool can detect a frame powering up.

As described in the chapter 4 "The ERS/ERC108-118 Card" the assigned addresses may change over time. Ask your network administrator for a fixed IP Address.

Note that a change of the network address or loss of connection of the ERC/ERS does not affect the operation of the frame

Further Reading

This manual describes the ERS/ERC108-118 card. For more information on the TCP/IP protocol suite:
Information about Ethernet can be found at: http://www.ieee802.org

ACP Source Development Kit (SDK) is available from Axon.

Documentation for the ACP protocol is available from Axon.

Internetworking with TCP/IP Principles, protocols, and architecture
Douglas E. Comer
Prentice Hall

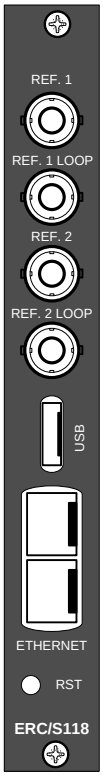
TCP/IP Illustrated
W. Richard Stevens
Addison-Wesley

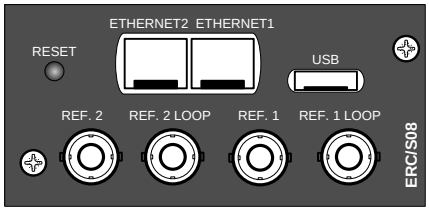
RFCs can be obtained from http://www.rfc-editor.org/

Information about Ethernet can be found at
http://docwiki.cisco.com/wiki/Internetworking_Technology_Handbook

14 Connector Panel

The ERS/ERC108-118 backplane:





!Unused inputs and outputs must be terminated with the correct impedance!

Ethernet failover

The ERS/ERC108-118 has 2 Ethernet connectors. These connectors logically define one network interface. They are configured as an auto failover. Since they constitute the same network interface, if a second cable is connected, it must be connected to the same network segment as the primary cable. If for whatever reason the input link of the primary ERC connector is lost, a failover will happen and the second network connector will get the same MAC and IP addresses. On the ERC/ERS118 the upper interface is the primary interface. On the ERC/ERS108 the right Ethernet interface is the primary one.

USB relay for remote PSU monitoring

The ERC/ERS does not have a general pupose interface (GPI) like the RRC/RRS models had. However, the USB interface can be used to connect a USB relay for remote monitoring of your power supply status and general errors.

To use this function, you have to buy a USB relay controller. The ERC/ERS has built in compatibility with this hardware : http://kmtronic.com/usb-relay-controller-two-channels.html

15 Specification

Ethernet

Interface	Shielded Twisted Pair (STP)
Data rate	1Gb/s

Video Reference

Bandwidth	10MHz
Input impedance	High (requires loop load)
Input level	1Vpp@75Ohm

Software

Internet Protocol version 4 (IPv4)
Classless Inter-domain Routing (CLID)

Internet Control and Management Protocol (ICMP) RFC792

User Datagram Protocol (UDP) RFC768

Dynamic Host Configuration Protocol (DHCP) per RFC 2131
Axon Control Protocol version 1 (ACP)
Documentation available from Axon

Miscellaneous

Supply Voltage	30VDC
Power Consumption	3.6W to 9W
Weight	200g
Operating temperature	0 ºC to 50 ºC
Dimensions	144 x 153x 20 mm

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