# FIBER ENHANCED BACKPLANE

## Installation Guide

**Minimum Requirements for Running this Feature**

**RSCAD Version:** 4.004

**PB5 Firmware Version:** 23

**GTWIF OS Version:** 4.104 Build 3

Please note: This feature is only effective in RTDS Simulator racks containing at least 3 PB5 cards. Any non-PB5 cards in the rack must be GPC cards. This feature is ineffective in racks containing 3PC cards.

RTDS Technologies

# 1.0 INTRODUCTION

The RTDS Simulator is a parallel processing computer composed of multiple processor cards mounted on a backplane. The transfer of data between processor cards via the backplane is necessary in each time-step. As simulation cases increase in size and complexity, the time required for data transfer increases and begins to represent a significant portion of the time-step. Additionally, some emerging power system component models have intensive data transfer demands.

The purpose of the fiber enhanced backplane is to offload a portion of the data transfer from the backplane to optical fiber cables. For some simulation cases, this feature can significantly reduce the time associated with data transfer. When paired with the correct hardware, the fiber enhanced backplane can increase the maximum network solution size from the previous limit of 72 single-phase nodes to 90 single-phase nodes. Two network solutions may still be used per rack, so each rack can now solve up to 180 single-phase nodes.

In order to implement the fiber enhanced backplane, the user must first make card-to-card hardware connections using optical fibers, and then enable the feature in the RSCAD software. The process is described in this document.

# 2.0 HARDWARE INSTRUCTIONS

## 2.1 ALL-PB5 RACKS

The implementation of the fiber enhanced backplane requires that each PB5 card in the rack is connected via optical fiber to the PB5 card running the network solution. The network solution can be on any card, but we recommend that the network solution be placed on Card 1. The automatic processor assignment function normally assigns Card 1 for the network solution, so if the user places the network solution on a different card, they must manually assign the network solution processor number in every draft case using the enhanced backplane. Placing the network solution on Card 1 avoids this process.

Each PB5 card has 8 high speed GT ports. Any card-to-card connection will work, regardless of the GT port used. For convenience, we would recommend connecting the cables as follows:

| Network Solution Card Port # | Destination PB5 Card # | Destination PB5 Port # |
|---|---|---|
| 2 | 2 | 8 |
| 3 | 3 | 8 |
| 4 | 4 | 8 |
| 5 | 5 | 8 |
| 6 | 6 | 8 |

Figure 1. Card-to-card connection example for all-PB5 rack

## 2.2 PB5-GPC MIXED RACKS

Both PB5 and GPC cards can be installed in the RTDS rack to use this feature, but the GPC processor usage must be limited to controls or small time-step components only. The network solution and any power system components must be allocated to PB5 processors (and *not* GPC processors) in order to take advantage of the increased network solution size.

There is a component available which blocks the availability of GPC processors for component allocation. This component will aid users who are running the enhanced fiber backplane on mixed PB5-GPC racks. This component is described in the software section below.

In a PB5-GPC mixed rack, each auxiliary PB5 card is connected to a PB5 card running the network solution by optical fiber. The GPC cards, which are running only controls or small time-step components, are not connected to the network solution card by fiber.

# 3.0 SOFTWARE INSTRUCTIONS

## 3.1 DRAFT CASE

To enable this feature in RSCAD, place the RISC Network Solution: Automatic Placement component (**rtds_risc_NET**) in the Draft case. Edit the **GT0EN** parameter so that Network Solution Fiber Communication is **Enabled**.


Figure 2. rtds_risc_NET component

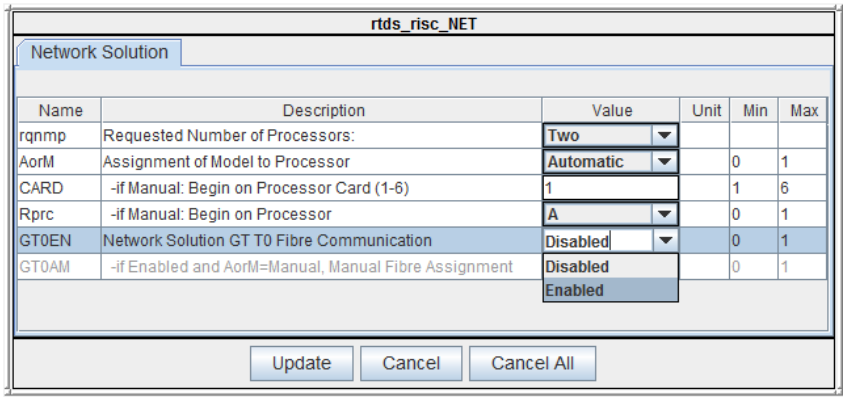



Figure 3. Edit Parameters menu for rtds_risc_NET component

The user also has the option to either automatically or manually assign the fiber connections. In most cases, automatic fiber assignment—the automatic detection of hardware connections made by the user—is desirable. This is achieved by keeping the **GT0AM** parameter set to **No**.

In some cases, the user may want to manually assign the fiber connections. For manual assignment of fibers to be available, the **AorM** parameter must first be set to **Manual**. This will then allow the user to set the **GT0AM** parameter to **Yes**.

The manual fiber assignments can then be made by clicking the **T0 Fiber Connections** panel. The example settings in Figure 4 show the fiber connections which correspond to the hardware installation pictured in Figure 1.

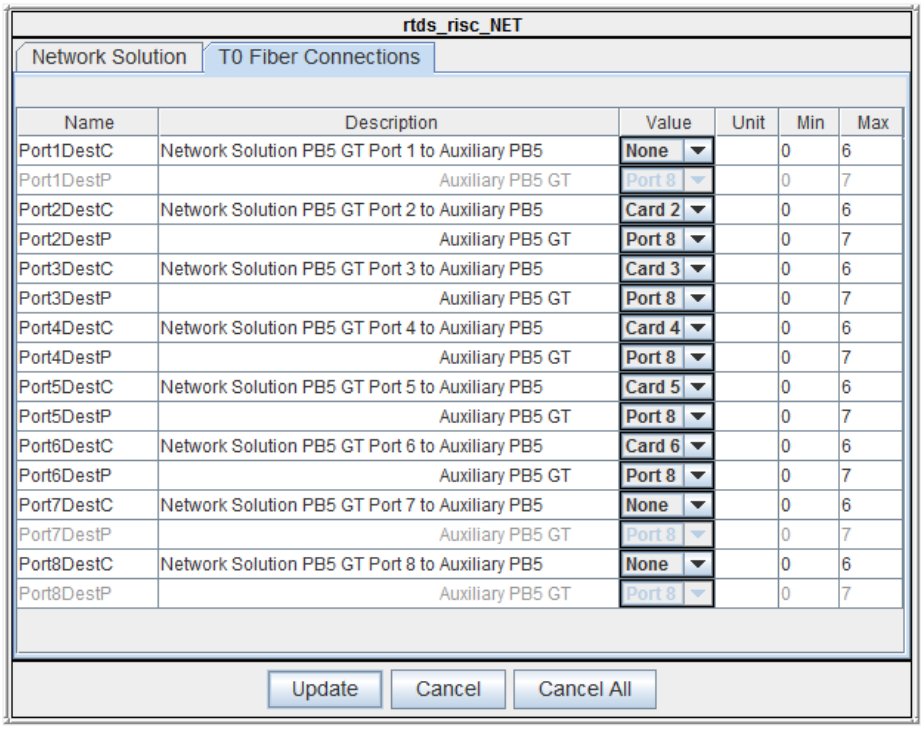
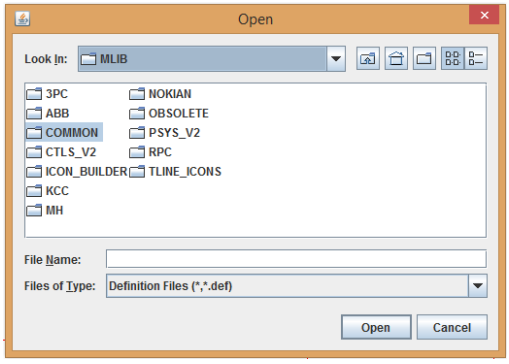



Figure 4. Manual fiber connection assignment

If a mixed PB5-GPC rack is being used, the user can add component **rtds_risc_BLK1PR** to the Draft case in order to block the availability of GPC processors. This component can be found in the Master Library under the Common category and is pictured in Figure 5 below.

This component blocks the availability of a given RISC processor for any type of component, including power system components, controls, and small time-step components. Nothing will be automatically assigned to the processor specified. The user can still manually assign components to a blocked processor.



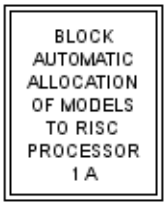




Figure 5. rtds_risc_BLK1PR component

If only one network solution is used on the rack, it is recommended that the user places the controls and small time-step processors on the same card as the network solution. This allows all remaining PB5 processors to be used for power systems components, and will maximize the benefit of the fiber enhancement.

Manual assignment of the controls processor can be accomplished using the **rtds_risc_ctl_PROCASN** component shown in Figure 6.


Figure 6. rtds_risc_ctl_PROCASN component

Manual assignment of the small time-step processor can be accomplished using the Edit Parameters menu of the **rtds_vsc_BRIDGE_BOX** component as in Figure 7.

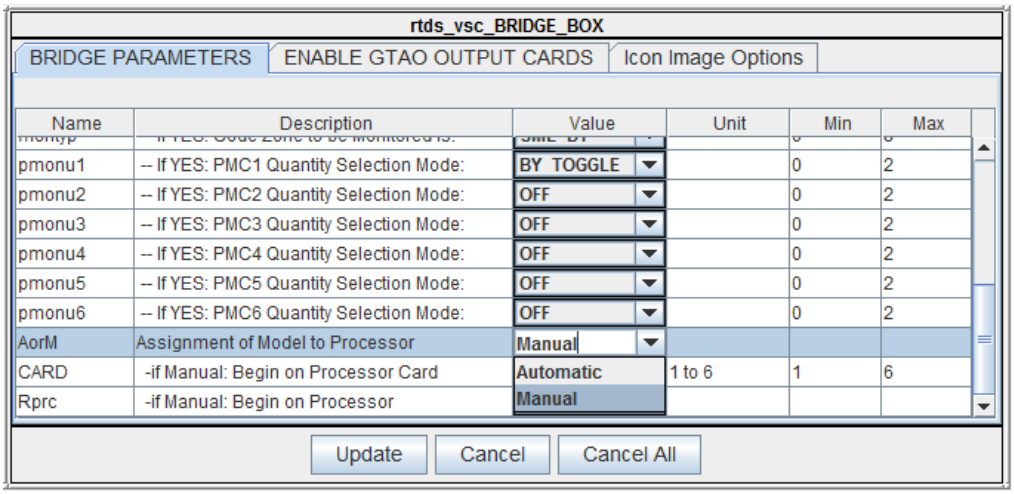



Figure 7. rtds_vsc_BRIDGE_BOX component

## 3.2 CONFIG FILE UPDATES

The Config File Editor is equipped to display the fiber connections made by the user. Select the rack that has the fiber enhancements installed and click the **Get Selected Rack Configuration** button in the upper right-hand corner. The Config File Editor will then be automatically populated with the fiber configuration. The screenshot shown in Figure 8 on the following page corresponds to the fiber connections pictured in Figure 1.

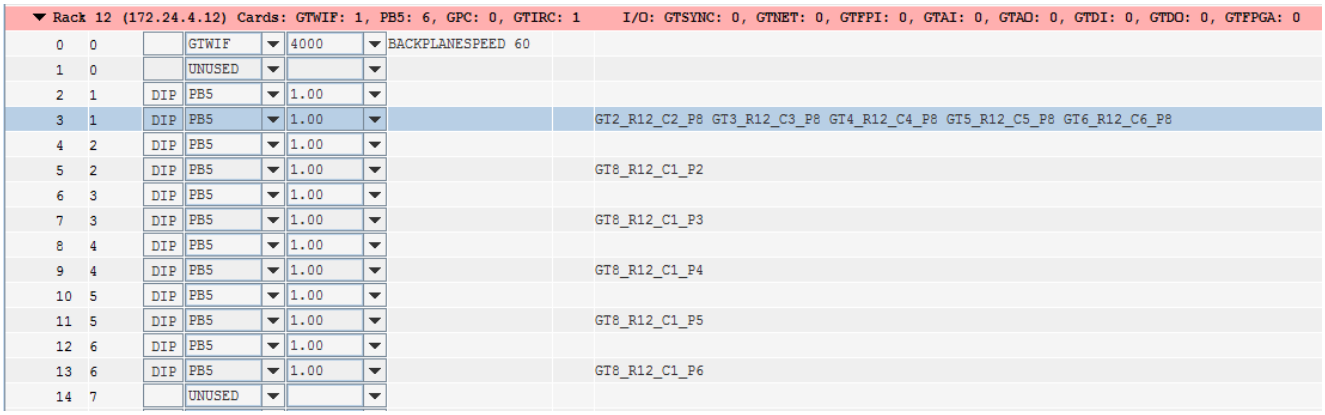



Figure 8. Config File Editor including fiber connections

The configuration can also be manually updated by clicking on the peripherals phrase, which opens up the editor shown in Figure 9.

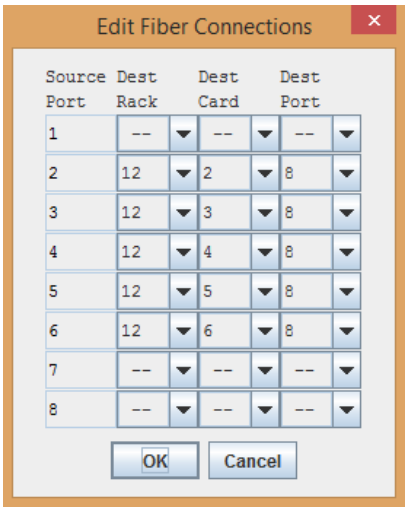



Figure 9. Editing fiber connections manually

# 4.0 MULTI-RACK SIMULATIONS

If the user is running a simulation case involving multiple racks, it is mandatory that **all subsystems** have the Fiber Enhanced Backplane feature fully enabled—regardless of the number of nodes in each subsystem. This means that each subsystem involved, **even those with less than 72 single-phase nodes**, must meet all of the following criteria:

- Must have the **GTOEN** parameter Enabled in the **rtds_risc_NET** component.
- The network solution and all power system components must be run on PB5 cards. Any GPC cards in the rack must be running controls and small-timestep components only.
- Must have installed fiber cables connecting each PB5 card to the PB5 running the network solution.

If these conditions are not met for **all racks involved** in the simulation, the user will experience a node number limit error.