



GTX

2 or 1 Gbit/sec Fibre Channel

Jammer Module

Real-Time System Level Error Injection Module

- **Controlled, repeatable, real-time data modification**
- **Modify bits, bytes, words, or delete a frame**
- **Pass, overwrite, or recalculate the CRC**
- **Overwrite one ordered set with another**
- **Operate in any topology**
 - Point to point
 - Loop
 - Fabric
- **Operate with any upper-level protocol**
 - SCSI
 - IP
 - FICON (optional)
- **Trigger a protocol analyzer or other instruments at the error injection point**
- **Compatible with Finisar's GTX Instrument family**

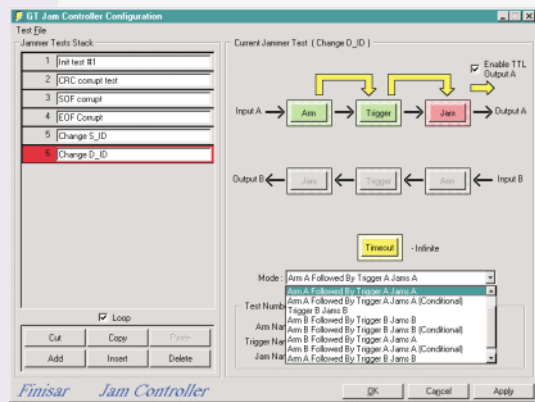
Fibre Channel networks must recover from all error conditions without losing or corrupting data. With the *GTX-J Jammer Module* installed in Finisar's GTX System, you can inject errors into the network in real time and verify that the recovery process operates correctly.

Each *Jammer Module* has a single simplex port for insertion between two network devices such as a host bus adapter and a storage system, hub, or switch. The *GTX-J* is transparent to the system, acting like an additional length of cable. Data passes through the module until it detects a specific sequence of events. The *Jammer* makes a user-defined modification to a specified frame or ordered set, and the module returns to pass-through mode.

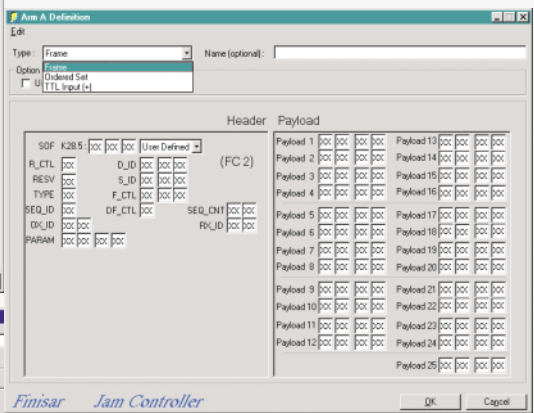
Frames may be modified in several ways—any field may be replaced by a user-defined value or changed randomly, truncated, or replaced with idles. The CRC may be corrected, creating a valid frame with modified contents. Ordered sets may be replaced with new values or with a simulated loss of signal. Multiple jam tests can be executed from a test stack.

The *GTX-J* is typically used in conjunction with one or more *GTX-A Protocol Analyzers*, capturing the unmodified and modified traffic and the system response.

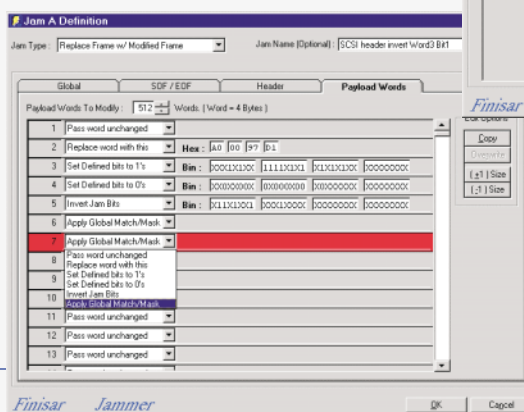
Control and configuration of the *Jammer* is via a simple graphical user interface. Define fault-recovery tests by specifying an Arm event sequence, a Jam event to be modified, and the error modifications to be made. API scripting is optional.



Create one or more tests for execution.

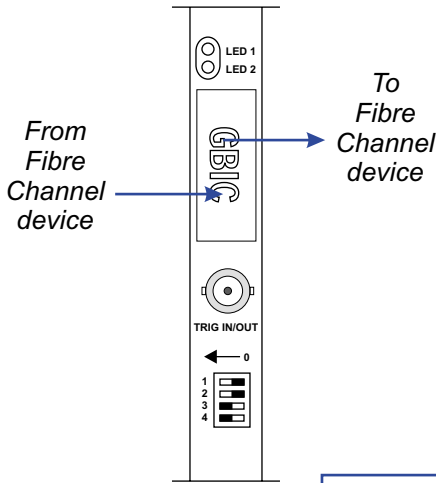


Specify the frame or ordered set sequence and specific event to be modified.



Set the specific modifications to be made in the frame or ordered set.

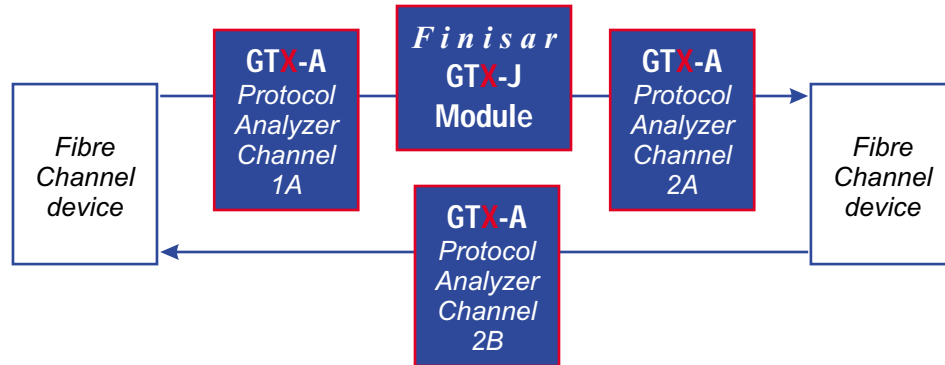
Fibre Channel GTX System Jammer Module



Typical Test System Configuration

The *GTX-J Jammer Module* is a single port device for insertion anywhere in a Fibre Channel data path. The *GTX-J* typically connects with shortwave 850 nm GBICs which allows for easy insertion into the path.

You may use a trigger IN TTL+ signal to replace an Arm term in an event recognition sequence. The module can also generate a trigger OUT signal at the time of data modification, which your test system can use to trigger protocol analyzers or other equipment.



You can use the *GTX-J* with protocol analyzers to capture network traffic around the Jam event. In the above diagram, Channel 1A captures the unmodified traffic, Channel 2A captures the modified traffic. Analyzer Channel 2B captures the response to the data modification.

For systems with copper interfaces, Finisar recommends using the Finisar *GT-K09 DB-9 Passive Hub* to insert the *Jammer* into the link.

A Simple Experiment

For this experiment, the *GTX-J* configuration above is connected between an HBA and a RAID. The experiment is to corrupt a Frame by changing a SCSI Read Command Frame to a SCSI Data Frame. The CRC in the Frame has been recalculated so that it is valid at the Fibre Channel layer.

The RAID receives the errant Data Frame and ignores it. In parallel, the HBA has started a timer that is waiting for a SCSI Transfer Ready Frame to arrive from the RAID. After 10 seconds, the HBA decides that there is a SCSI problem and sends a Target Reset. This action is a correct response to the injected error.

Bookmark	hh:mm:ss.ms us . ns	Delta (us)	GLA::Port [...]	Ordered Set	P/L Data	R_CTL	D_ID	S_ID	DF_CTL	OX_ID
	000:00:00.000 001.912									
original read frame	000:00:01.580 879.363		Channel 1-A	SOFi3	SCSI Cmd = Read(10); ATS::Of; C...	FC4Cmd	0000E1	000001	00	4048
modified to data frame	000:00:01.580 882.325	2.962	Channel 2-A	SOFi3	00000000 00000000 00000002 280...	FC4SData	0000E1	000001	00	4048
host resets	000:00:11.571 372.750	9990490.425	Channel 1-A	SOFi3	ATS::Of; CTS::Of; Target Reset; ...	FC4Cmd	0000E1	000001	00	8000

System Compatibility

The *GTX-J Jammer Module* is user or factory installable in any Finisar GTX System with one available PCI slot.

For a demonstration of the capabilities of Finisar Fibre Channel instrumentation, call Finisar or your local sales representative.