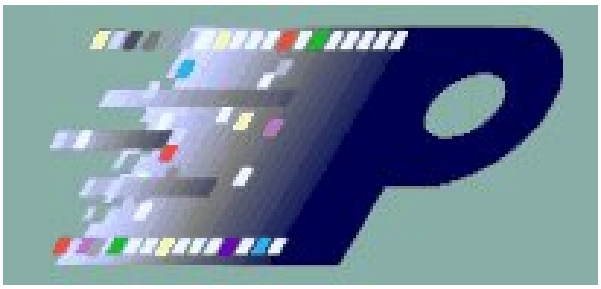

FCA6 Probe Quick Start User's Manual

1 General Description

The FCA6 (Fibre Channel Adapter – 6 fibers) is a probe that accepts 6 pairs of fiber optic cable. Each pair consists of a fiber that carries data to the probe (the "Input" or "Receive" fiber) and a fiber that will carry data away from the probe (the "Output" or "Transmit" fiber). The data is expected to conform to the Fibre Channel FC0 and FC1 layers (physical and signaling). The adapter converts the data on each Receive fiber to electrical signals and demultiplexes the bit-serial data to a 32 bit parallel representation. The parallel data and other signals are made available on the front panel for connection to a logic analyzer. Further, some "Helper" signals are presented on a separate connector, one set of helper signals for each three input fibers. Some of these signals are necessary to help with disassembly, others carry information that is associated with the input fibers passed in through a rear-panel connector from other sources.

The user can select signaling rate, checksum usage, logic analyzer module configuration, associations between channels ("Linking"), and stripping mode from the front panel.

All descriptions of "left" and "right" refer to the side of the unit as a user would see it when facing it, from the front of the unit looking toward the back of the unit

2 Probe Features

- "Linking" of fibers to make efficient use of the logic analyzer memory.
- Optional "Stripping" of idle and zero-data packets as well as support for storing "Data only".
- All user controls are on the front panel.

3 Probe Interfaces

The primary interface from the probe to the logic analyzer are the Mictor connectors on the front panel. Additionally, there are three BNC connectors on the rear panel for linking units or additional trigger sources. There are two DB25 connectors. The male DB25 labeled "Maintenance" is for remote control and reconfiguration of the unit in the field.

The female DB25 connector labeled "Custom I/O" has the following pinout:
1 – 3.3Volts DC via 100 ohm resistor
2 – "HelperABC" user bit 0
3 – "HelperABC" user bit 1
4 – "HelperABC" user bit 2
5 – "HelperABC" user bit 3
6 – "HelperABC" user bit 4
7 – "HelperABC" user bit 5

8 – "HelperDEF" user bit 0
9 – "HelperDEF" user bit 1
10 – "HelperDEF" user bit 2
11 – "HelperDEF" user bit 3
12 – "HelperDEF" user bit 4
13 – 5 Volts DC via 100 ohm resistor
14 - ground
15 – "HelperDEF" user bit 5
16 – ground
17 – Uncommitted, make no connection
18 - ground
19 – Uncommitted, make no connection
20 - ground
21 – Uncommitted, make no connection
22 - ground
23 – Uncommitted, make no connection
24 - ground
25 – Uncommitted, make no connection

The user bits accept TTL levels, preferably externally limited to 3.3 volts.

There is a connector labeled "TMPC Only" This is for **The *Moving Pixel* Company** test use only. Make no external connection to this connector.

A grounding post is also provided on the rear panel.

4 Connecting the Probe to the Logic Analyzer

Connection of the probe to the logic analyzer is done via Mictor connectors. See the bus support manual for how to connect the logic analyzer to the probe. It should be noted that the Mictor connectors are somewhat delicate. Users should insert the connectors, minimizing the side-to-side motion of the connector; try to insert it straight in. When releasing the cable from the probe, use two hands so that one hand can pull the latch while the other pulls the connector straight out of the probe, minimizing the side-to-side motion of the connector while disconnecting.

5 Controls and Operational Modes

On the front panel on the right side of the unit there are several controls and indicators. Selections are made via the Up/Down momentary switches.

The Up/Down momentary switch is used to select one of many possible selections. Toggling the switch upward selects the next higher option in the associated list, toggling the switch downward selects the next lower option.

5.1 "Format"

The Format control directs the probe on how to interpret the data being received. Currently defined formats include FPDP, ASM, and FC.
"FPDP" is an abbreviation for "Front Panel Data Port".

"ASM" is an abbreviation for "Anonymous Subscriber Messaging". Currently there is no specific support for this mode; this label is a place-holder.

"FC" is an abbreviation for "Fibre Channel". Currently there is no specific support for this mode; this label is a place-holder.

There are also three unused positions. Operation in any un-supported or unused position is not defined.

5.2 "Mode"

The Mode control directs the probe as to what data to pass on to the logic analyzer or, conversely, what data to strip out. Currently defined modes include "Pass All", "Strip Idle", and "Data Only".

"Pass All" will cause all data received to be passed on to the logic analyzer.

"Strip Idle" will pass all data packets with their "control signals" (ordered sets) except Idle and Zero-Data packets as defined by the Fibre Channel spec and the FPDP spec.

"Data Only" will pass payload data only, no checksums, no "control signals" (ordered sets). External signals being passed on the "Helper" signals will be passed only when the data is passed to the logic analyzer. Because of the implementation of the probe, this means that in most linkages, the helper signal(s) will have happened earlier in time than indicated by the logic analyzer by a variable amount of time.

There are also three unused positions. Operation in any un-supported or unused position is not defined.

5.3 "Module"

The Module control indicates to the probe the width of the logic analyzer modules to which the probe is connected. **While there are several positions defined, the only one that operates is the "4 Ch" position. The others are reserved for future use.**

"4 Ch" means the unit is connected to a 136 channel logic analyzer module

5.4 "Link"

The Like control indicates to the probe the number of fibers (starting from the left of the unit) that should be "linked", considered to be on the same clock and at the same source data rate (not to be confused with the Fibre Channel baud rate).

A selection of "1" indicates that none of the fibers are linked. A selection of "2" indicates that the first two fibers starting from the left of the unit are linked. The rest of the settings follow the this pattern.

This control is used by the probe to determine which fibers are associated with each other and a particular output clock signal. These indications need to be correct only in the case where very efficient use of the LA memory is required. If this input is set incorrectly, the probe will function and capture data but perhaps not as efficiently as it could.

For example, if two channels are "linked", it is possible that their data packets will arrive at the probe at different times, yet they were generated on the same source clock at the same time. The data from each channel is put into a FIFO and clocked out of the FIFO to the logic analyzer **only** once both FIFOs have some data (an error case is when one becomes nearly full and the other is empty: it will not pack data in this situation). In this way, the data for each channel arrives at the logic analyzer at the same time and occupies part of the same data record in the logic analyzer, restored to the same form in which it left from its source before it was packetized and transmitted. If we did not link the channels, neither would be stored in a FIFO; they would be clocked into the logic analyzer immediately upon reception. The first data in each channel would have no relation to the other in the LA memory.

5.5 "CRC"

In FPDP **format**, the checksum is optional. The probe needs to know if the checksum is present or absent so that it can interpret the data packet properly. Further, the "Receive Good" indicators must know if the checksum is present or not.

5.6 "Rate"

Fibre Channel defines two baud rates: 1.0625 Gbps and 2.125 Gbps. Select "1G for the former and "2G" for the latter.

5.7 "Xmt"

The probe supports two transmit modes: Tee and Repeat. In Tee mode, the probe functions like it had been "Tee'd" into the fiber pair. Fibers operate in a two pair set, the data received by the probe on the first fiber pair is retransmitted on the second fiber pair and vice-versa.
In Repeat mode, the data received by the probe on a given fiber pair is retransmitted on the transmit fiber in the same pair.

5.8 "Test"

This switch is active when the associated LED is green. This switch causes the unit to transmit a test pattern on all transmit fibers. The type of test pattern is controlled by the "Format" switch. When the unit is placed in Test mode, the "Xmt" switch should be in the "Tee" position.

This switch is not part of the specification of the unit and may change function without notice.

5.9 "Arm"

After the probe is powered up, it is not ready to operate, it must be "Arm"ed first. Once Armed, it will record the data presented by each fiber starting at the next packet boundary. It will not record partial packets. In a system where the data generation event can be controlled, the unit should be "Armed". The "Ready" indicator will turn on. Next the data source should be enabled. As soon as the probe starts to acquire data, it will extinguish the Ready indicator. Data will start transferring to the logic analyzer. Because there is no feedback between the LA and the probe, the probe will continue to pass data to the LA even after it is full (or has completed it's acquisition). To start another acquisition, the data generator need be reset, then the probe re-armed then the LA should be re-armed ("Started"). The probe must be rearmed because it may have some data still in it from a previous acquisition. This data should be cleared before a new acquisition starts.

In a system where data is flowing continuously and it is not practical to restart it for an acquisition, operation is similar. The re-arming of the probe causes it to reset internally and wait for the next complete data packet on each input fiber. Because data is continuously flowing in the system, the "Ready" indicator will flash briefly when armed because a new acquisition will begin almost immediately. The tricky part is clearing the logic analyzer simultaneously with re-arming the probe. There is no way to make this clean without using one of the additional signals listed in the next section.

6 Triggering of the Probe and the Logic Analyzer

A brief description of triggering can be found in the section above "Arm".

There are several different types of triggering situations. In some systems, it is possible to control the start of data generation. In some systems, data generation is continuous and un-interruptable. In some systems the user may wish to trigger several probes simultaneously. In others, the user may wish to have the LA trigger the probe(s) or the probe(s) trigger the logic analyzer. The methods for each of these situations is described below.

In addition to the "Arm" switch provided on the front panel, there are two additional trigger/reset sources for the unit and one output to feed downstream devices. Each of these is located on the rear panel of the probe.

6.1 Cascaded Probes

There are some instances where it is desirable to simultaneously arm two or more FCA6 probes so that the data acquired across several fibers is consistent. This need is addressed through the TrigIn and TrigOut signals on the rear of the unit.

Assign one probe to be the "master", other probe(s)s to be the slave(s). Connect the TrigOut" on the master to the TrigIn on the slave(s). The "Arm" switch on the master will control the arming of the master and the slaves.

6.2 Triggering the Logic Analyzer from the Probe

By connecting the TrigOut on the Probe to the Trig In on the LA, the LA will start an acquisition after the Probe arms and starts sending data to the LA.

6.3 Arming the Probe from the Logic Analyzer

By connecting the TrigIn on the Probe to the Trig Out on the logic analyzer, the Start button on the LA can rearm the probe. This is useful only in situations where the data generator can also be started and stopped at will. The data generator should be stopped, the LA should be stopped and then started. This action will arm the probe. The data generator can now be started.

7 Channel Linking

There are two uses for the probe: capturing data for disassembly ("Debug") and capturing data for post-processing ("Data Capture"). When using the probe for Debug, generally one optical fiber is being captured. This involves two connections to the logic analyzer: the data connection for the fiber and the helper connection associated with the fiber. Currently, debug on the logic analyzer is limited to the left-most fiber. This is not a hardware limitation and will probably be removed in subsequent versions of the disassembly package. See the FCATLA users manual for more information.

When using the probe for Data Capture, the goal is to capture as much data as possible for off-line analysis. Further, data on channels that were initially aligned before being packetized and transmitted via Fibre Channel ideally would be re-aligned. The probe tries to accommodate these requirements by introducing the concept of Channel Linking. When channels are Linked, the probe hardware tries to align them so that records in the logic analyzer have the first byte in the first packet (after Arming and triggering) on each linked fiber occupy the same record even though they might not have arrived at the probe at the same point in time because of channel skew and packet slicing. Linked channels have their data stored in FIFOs internal to the probe. Special synchronization circuitry guarantees that, if the data generation system starts cleanly after the probe has been Armed, and if the time skew between the linked fibers is reasonable (hundreds of nanoseconds in the current release of probe firmware), and if the clock rates of each fiber are very close, then the data will be presented to the logic analyzer as if it were synchronous.

7.1 Linking

The user sets the "Link" control to indicate the number of fibers that are linked. Linked channels must start from the left-most fiber to the right. A setting of "1" indicates no linking, a setting of "2" indicates that the leftmost two fibers are linked, and so on.

7.2 Slips

If the conditions for linked channels are not met, then a data slip can occur. This happens when the probe has data to output for most but not all of the linked channels and its FIFOs for those channels are nearing full. The probe will output a record of data to the logic analyzer, repeating the data on the channel for which it does not have data. The slip will be indicated in the record since, along with the data, there is an "enable" signal that is also recorded by the logic analyzer for each fiber. This enable signal, normally "true" for each channel when there is no slip, will be false for the fiber on which the slip occurred.