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We are focused at the professional end of the marketplace, primarily working with customers for whom high performance, quality and service are key, whilst realising the cost savings that second user equipment offers. As such, we fully test & refurbish equipment in our in-house, traceable Lab. Items are supplied with manuals, accessories and typically a full no-quibble 2 year warranty. Our staff have extensive backgrounds in T&M, totalling over 150 years of combined experience, which enables us to deliver industry-leading service and support. We endeavour to be customer focused in every way right down to the detail, such as offering free delivery on sales, covering the cost of warranty returns BOTH ways (plus supplying a loan unit, if available) and supplying a free business tool with every order.

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- Manuals and accessories required for normal operation.
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- Support from our team of seasoned Test & Measurement engineers.
- ISO9001 quality assurance.

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SECTION 1 GENERAL INFORMATION

1.1 INTRODUCTION

This manual contains information describing TTC’s 2.048M/Nx64K Data Interface Adaptor (Model 41800). This information is divided into the following sections: general information, interface description, installation and set-up, mainframe set-up, interface specifications, and service information.

The 2.048M/Nx64K Data Interface allows the FIREBERD mainframe to test communications equipment and systems that comply with CCITT G.703, G.704, G.732, 2048 kbps, and Nx64 kbps signal recommendations for framed or unframed data.

The 2.048M/Nx64K Data Interface allows any selection of Nx64 kbps timeslots within the 2.048 Mbps signal to be accessed for bit error analysis. This allows real-time analysis of any number of timeslots (up to 30 or 31, depending on the selected multiframing).

1.2 INTERFACE FEATURES

The 2.048M/Nx64K Data Interface has the following features:

- Unframed or framed 2048 kbps signal analysis with TS-16 CAS (Channel Associated Signalling) and/or CRC4 multiframing.
- Nx64 kbps or Nx56 kbps analysis with unrestricted timeslot selection.
- Nx64 insert mode.
- Round-trip delay¹ measurement.
- Frequency measurement.
- Timing Slips and Wander¹ measurements.
- Jitter² measurements.
- Positive and negative base-to-peak digital signal level measurements, in dB.
- In-service monitoring.
- G.821 performance analysis.
- Four selectable transmitter timing sources.
- Programmable timeslot and ABCD IDLE codes.

1. FIREBERD 6000 only.
2. FIREBERD 6000 with Jitter option installed.
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Interface Compatibility

- Selectable MSB or LSB stuffing in Nx56 kbps analysis mode.
- Selectable voice coding: A-Law or μ-Law.
- Single or consecutive FAS Word error insertion.
- Logic and/or code error insertion (single or variable rate).
- AMI or HDB3 coding.
- Test loopback.
- Voice mode through a telephone handset.
- ABCD signalling access with CAS multiframing.
- Selectable input termination, including MONITOR mode.
- Output line build-out level selection.
- Display Frame Alignment Signal, Not Frame Alignment Signal, Multiframe Alignment Signal, and Receive Byte of selected timeslot.
- Transmit alarms.
- Programmable TS0 national bits, international bits, and TS-16 spare bits.
- Broadcast mode.
- 2Mbps alarm detection.

1.3 INTERFACE COMPATIBILITY

The 2.048M/Nx64K Data Interface is designed in accordance with and meets the applicable sections of the following recommendations.

- G.703
- G.704
- G.732
- G.821
- G.823
- O.171
- O.161
NOTE
The FIREBERD $2^{20}$.1 pattern follows the North American Specification and is not compatible with the $2^{20}$.1 pattern specified in CCITT Recommendation V.57.

1.4 OPTIONS AND ACCESSORIES

The following cables and accessories are available from TTC for use with the Model 41800 2.048M/Nx64K Data Interface.

- Model 30662 BNC to BNC cable (2.0m).
- Model 30687 Siemens 3-pin connector to Siemens 3-pin connector.
- Model 30761 Siemens 3-pin connector to bantam plug (2.0m).
- Model 31066 BNC (75Ω Unbalanced) connector to Siemens 3-pin connector (120Ω Balanced) adaptor (2.0m).
SECTION 2 INTERFERENCE DESCRIPTION

2.1 INTRODUCTION

This section contains a physical and functional description of the 2.048M/Nx64K Data Interface, its capabilities, and features.

2.2 PHYSICAL DESCRIPTION

The 2.048M/Nx64K Data Interface Adaptor (Model 41800) plugs into the FIREBERD mainframe interface slot. The FIREBERD mainframe connector provides the supply voltages to the interface module. Two thumbscrews secure the interface into the FIREBERD mainframe. Six connectors, on the interface module front panel, allow connection to the circuit under test. These connectors include: one RJ8 (4-pin) connector, two banana connectors, and three BNC connectors. A 4-segment DIP switch, located inside the protective plastic cover, determines the line coding (AMI or HDB3), the Nx56 kbps bit order (MSB or LSB), and the voice coding (μ-Law or A-Law). When viewing the interface front panel, the DIP switch (S1) is located on the right side of the interface assembly. The switch segment setting and function selected is listed in Table 2-1. The default setting is: segments 1, 2, and 3 closed.

Table 2-1. DIP Switch S1 Setting and Selection

<table>
<thead>
<tr>
<th>Segment</th>
<th>Setting</th>
<th>Open</th>
<th>Closed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Code Selection</td>
<td>AMI</td>
<td>HDB3</td>
</tr>
<tr>
<td>2</td>
<td>Nx56k Format</td>
<td>MSB=1 (1+7)</td>
<td>LSB=1 (7+1)</td>
</tr>
<tr>
<td>3</td>
<td>Voice Coding</td>
<td>μ-Law</td>
<td>A-Law</td>
</tr>
<tr>
<td>4</td>
<td>Unused</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 2-1 illustrates the 2.048M/Nx64K Data Interface front panel.

![Figure 2-1. 2.048M/Nx64K Data Interface](image-url)
### 2.2.1 HANDSET

The RJ8 connector is used to attach a handset to the HANDSET connector. A standard telephone handset is used to drop and insert a voice channel. Figure 2-2 illustrates the HANDSET connector. Table 2-2 lists the RJ8 connector pin assignments.

![Figure 2-2. Handset Connector](image)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Microphone +</td>
</tr>
<tr>
<td>2</td>
<td>Speaker +</td>
</tr>
<tr>
<td>3</td>
<td>Speaker -</td>
</tr>
<tr>
<td>4</td>
<td>Microphone -</td>
</tr>
</tbody>
</table>

### 2.2.2 2.048M REF IN

This BNC connector accepts a bipolar (AMI- or HDB3-encoded) framed or unframed 2048 kbps reference signal from an external source. This reference signal is used for timing slips, wander measurements, and can be used as a transmit timing source. The input impedance for this connector is 75 ohms. The signal at this connector can be used as the generator clock source when GEN CLK is set to INTF and the IF CLK menu item is set to REF.

### 2.2.3 120 Ω BAL RCVR

This banana connector is used when connecting to balanced circuits. This connector provides a 120-ohm load impedance to the received signal when INPUT is set to TERM or MON. When INPUT is set to BRDG, the input impedance is greater than 1KΩ.

### 2.2.4 120 Ω BAL XMTR

This banana connector is used when connecting to balanced circuits. This connector provides a 120-ohm source impedance to the transmitted signal.
2.2.5 XMTR 75 \( \Omega \) UNBAL

This BNC connector is used when connecting to unbalanced circuits. This connector provides a 75-ohm source impedance to the transmitted signal.

2.2.6 RCVR 75 \( \Omega \) UNBAL

This BNC connector is used when connecting to unbalanced circuits. This connector provides a 75-ohm load impedance to the received signal when INPUT is set to TERM or MON. When INPUT is set to BRDG, the input impedance is greater than 1K\( \Omega \).

**NOTE**

The 75\( \Omega \) and 120\( \Omega \) inputs (RCVR) are connected together internally. Thus, only one connector type should be used at any time.

2.3 FUNCTIONAL DESCRIPTION

The Data Interface provides the FIREBERD Communications Analyzer with the ability to test in one of the following modes of operation:

- **FULL2M** - Full 2048 kbps BERT
- **Nx64k** - Nx64 kbps BERT
- **N64INS** - Nx64 kbps Insert
- **VOICE** - Voice
- **BRDCST** - Broadcast
- **TLB** - Test loopback

The following paragraphs provide additional information about each mode of operation.

2.3.1 FULL 2M

In FULL2M mode, the 2.048M/Nx64K Data Interface provides access to the entire 2048 kbps signal (2048 kbps for unframed operation, 1984 kbps for framed operation, or 1920 kbps for framed with TS16 set to ON), allowing the FIREBERD to analyze the signal. This mode allows the entire 2M bandwidth to be tested.

2.3.2 Nx64k

In Nx64k mode, any number of transmit or receive timeslots can be selected for Nx64 kbps or Nx56 kbps BERT analysis. This allows individual timeslots or groups of timeslots to be tested. The timeslots that are not used for BERT are filled with a selectable 8-bit idle code.

2.3.3 N64INS

In N64INS mode, the setup is identical to the Nx64k mode, except the unused timeslots are filled with received data in the same timeslots (instead of the 8-bit idle code). This mode allows the FIREBERD to
perform Nx64 kbps BERT analysis from a 2 Mbps access point without disrupting live traffic on the entire 2 Mbps bandwidth. This mode is not valid with SELF LOOP on.

### 2.3.4 VOICE

In Voice mode, one timeslot is selected for monitoring, or separate timeslots selected for talk and listen. The selected timeslot contains the information from the handset. The signalling bits can be monitored in the RESULTS display window. If the selected timeslot transmission is enabled, the ABCD signalling bits can be changed. To enable ABCD signalling, TS16 must not be set OFF.

### 2.3.5 BRDCST

In Broadcast mode, the entire selected test pattern is inserted into each timeslot and repeated either 30 times (if TS16 is On) or 31 times (if TS16 is Off) for Nx64k mode only. The first 9 bits are inserted in timeslot 1, the first 8 bits into timeslot 2, etc. until the entire pattern is transmitted. One timeslot must be specified to receive the transmitted pattern.*

### 2.3.6 TLB

In TLB (test loopback) mode, the full received 2048 kbps is looped back to the transmit output. At the receive input, analysis is performed on all the timeslots (similar to FULL 2M). The data is re-clocked and code efforts are corrected before retransmission. TLB mode is not valid when SELF LOOP is on.

### 2.4 SELF-LOOP OPERATION

Pressing the SELF LOOP switch, located on the FIREBERD front panel, enables the mainframe self-loop mode. The self-loop mode internally loops the 2.048M/Nx64K Data Interface output to its input. This provides the ability to verify the operation of the FIREBERD mainframe and the 2.048M/Nx64K Data Interface. Any cables attached to the interface do not have to be disconnected, since the interface connectors are electronically isolated during self-loop operation.

**NOTE**

If the 2.048M/Nx64K Interface is set to perform Nx64k BERT on different receive and transmit timeslots, the FIREBERD cannot attain pattern synchronization in SELF LOOP.

† Requires FRAMED operation to be selected to prevent the message *Current mode requires framing* from being flashed in the results display.

1. The GEN FREQ and RCVR FREQ results displayed in these modes are the data bit rates, not the line rates (e.g., 1x64k = 64000; 2x64k = 128 000).

* 1x64 kbps BERT analysis is performed in this selected received timeslot.