REFTEK™

Technical Introduction
to the

72A Series Data Acquisition Systems

December 1996

Document No. 72A-R-001-00.1
This document supersedes the October 1993 version with the same title

Refraction Technology, Inc.
2626 Lombardy Lane
Dallas Texas 75220
USA

Telephone (214) 353-0609
Fax (214) 353-9659
eMail info@reftek.com
FTP ftp.reftek.com

This document file is located at h:\wpdata\docsets\tech-ref\das-over\72a-int.doc

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Technical Introduction to the REFTEK 72A Series DAS

The REFTEK 72A series Data Acquisition System (DAS) is a versatile, portable, data digitizer/recorder of ruggedized construction for unattended field use. Refraction Technology manufactures a range of these instruments in different configurations, each having its own special characteristics. Due to modular construction methods, much of the hardware, and software also, is common to multiple product configurations. These DAS models share many of the same basic functions and applications. The general usage, control and operation that is common to all units is described more fully in REFTEK’s Operations Reference Manual for the 72A Series DAS.

A common feature of the 72A Series DAS configurations is that they all have hardware, firmware and software that complies with the requirements of the Program for Array Seismic Studies of the Continental Lithosphere (PASSCAL).

This document provides a brief introductory overview and a model comparison of the range of 72A series DAS’s. It is arranged as follows:

- A general introduction to the 72A-07 and 72A-08 models
- A list of REFTEK standard DAS units
- A list of the circuit boards comprising each “standard” DAS model
- A features comparison listing of the 72A series DAS units

General Introduction

The 72A series DAS is a microprocessor-based high resolution instrument that uses either a Motorola or Toshiba 68HC000 type microprocessor. A 72A series DAS contains a set of erasable, programmable, read-only memory chips (EPROMs) that contain the firmware instructions for the microprocessor. In the DAS, the microprocessor is always located on the RT319 CPU board.

A user controls the basic operation and data recording functions of a DAS by establishing a set of control parameters then downloading them to the DAS via a DOS-based interface. REFTEK recommends the use of its Field Setup Controller (FSC) program that runs on a PC, workstation, laptop or palmtop as the control interface. For detailed information refer to REFTEK’s Field Setup Controller Operations document. Generally, the DAS data recording function is controlled by carefully selected trigger parameters, by time settings, by continuous recording, or by combinations of these features. Various internal data recording options are available on the -07 model. The -08 requires an external recorder. Several options are available for high accuracy DAS timekeeping.

Each 72A series DAS model has a specific configuration of internal circuit boards and unique features. The exact recording capabilities of each model are determined by its hardware configuration and the CPU control code.

This document reviews the “standard” configurations and briefly summarizes their abilities. Information on hardware that is identical across multiple configurations is also provided. A more comprehensive DAS review is provided in the Technical Overview which pertains to the particular version a user has ordered.

When supplied with power from a REFTEK 72A-04 Auxiliary Power Subsystem, a 72A series DAS can operate unattended for more than three days. By using a 12-volt car battery, you can extend the operating period to a month. Solar panel arrays complete with chargers can also be supplied for long-term instrument deployment in remote locations.
72A DAS Units & Variants

Refraction Technology, Inc. currently produces two baseline DAS models, the 72A-07 and the 72A-08, each baseline model is available in several variations as follows:

- Model 72A-07/ND
- Model 72A-07/G/ND
- Model 72A-07/G/500 or /1000 or /2000
- Model 72A-08
- Model 72A-08/3
- Model 72A-08/6

Additional options provide for DAS memory expansion, and the inclusion of a sensor self-test capability. Remote DAS control using modems and a REFTEK 114 Remote Access Computer is also available. However, the presence or absence of these options is not signified by the DAS model designation.

Board Lists for Standard DAS’s

All 72A Series DAS units have a modular construction using a card cage housing various PCB’s. The backplane of this cage identifies the particular hardware configuration and serial number of the individual DAS. The 72A-07 series normally have a seven-slot cage; the 72A-08 series have 10-slot cages. Each PCB has a REFTEK number and name and its own document which is provided in the Technical Reference Documents volume. The PCB documents typically includes the following:

- a statement of the board’s primary function
- an explanation of it’s electronic operation
- applicable programming considerations
- the technical specifications
- a parts listing
- parts layout and schematic drawings

Boards for the 72A-07/ND

The 72A-07/ND DAS normally contains the following boards:

- RT319 Central Processor Unit (CPU) board
- RT371 Communications board
- RT373 Analog-to-Digital Converter board (24 bit)
- RT344 Power Supply and PGA board*
- RT345 Lid Interconnect board
- RT346 Backplane

*The RT344 holds up to 2Mb of SRAM or PSRAM

Optional boards for this model are:

- RT284 Mass Memory board (adds up to 4MB of CMOS RAM)
- RT336 Telemetry Modem board
- RT275 Test Bus (digital-to-analog converter)
Boards for the 72A-07/G/ND
The 72A-07/G/ND DAS normally contains the following boards:

- RT319 Central Processor Unit (CPU) board
- RT371 Communications board
- RT373 Analog-to-Digital Converter board (24 bit)
- RT344 Power Supply and PGA*
- RT387 Lid Interconnect board
- RT346 Backplane
- RT380 GPS Receiver board

*The RT344 holds up to 2Mb of SRAM or PSRAM

Any two of the following optional boards can be used with this model:
- RT275 Test Bus (digital-to-analog converter)
- RT284 Mass Memory card (adds up to 4MB of CMOS RAM)
- RT336 Telemetry Modem

Boards for the 72A-07/G/500
The final digits show the capacity of the incorporated drive. Drives of 1000 Mb (1GB) or larger may be incorporated as they appear on the market. These DAS’s normally contain the following boards:

- RT319 Central Processor Unit (CPU) board
- RT371 Communications board
- RT373 Analog-to-Digital Converter board (24 bit)
- RT344 Power Supply and PGA*
- RT387 Lid Interconnect board
- RT346 Backplane
- RT380 GPS Receiver board
- RT365 Disk Power Supply unit (not a plug-in board)

*The RT344 holds up to 2Mb of SRAM or PSRAM

Any two of the following optional boards can be used with this model:
- RT275 Test Bus (digital-to-analog converter)
- RT284 Mass Memory card (adds up to 4MB of CMOS RAM)
- RT336 Telemetry Modem
Boards for the 72A-08

The 72A-08 has 3 24-bit channels plus 3 16-bit channels. It typically contains:

- RT275 Test Bus board (digital-to-analog converter)
- RT280 Three Channel Filter board (Channels 1-3)
- RT291 Backplane
- RT329 Transition board
- RT371 Communications board
- RT373 Analog-to-Digital Converter board (24 bit Channels 4-6)
- RT314 Analog-to-Digital Converter board (16-bit) with DSP
- RT319 Central Processor Unit (CPU) board
- RT344 Power Supply and PGA board*
- RT345 Lid Interconnect board

*The RT344 holds up to 2Mb of SRAM or PSRAM

Any of the first three boards listed may be added to this model:

- RT284 Mass Memory board (12Mb maximum at 4Mb/board)
- RT301 Low Noise Preamplifier (for 16-bit channels only)
- RT336 Telemetry Modem board
- RT373 ADC - replaces RT280 above

Boards for the 72A-08/3

The 72A-08 has 3 24-bit channels and typically contains:

- RT275 Test Bus board (digital-to-analog converter)
- RT291 Backplane
- RT329 Transition board
- RT371 Communications board
- RT373 Analog-to-Digital Converter board (24 bit)
- RT319 Central Processor Unit (CPU) board*
- RT344 Power Supply and PGA board
- RT345 Lid Interconnect board

*The RT344 holds up to 2Mb of SRAM or PSRAM

The following optional boards may be used on this model:

- RT284 Mass Memory board (12Mb maximum at 4Mb/board)
- RT336 Telemetry Modem board
Boards for the 72A-08/6
The 72A-08 has 6 24-bit channels and typically contains:

- RT275 Test Bus board (digital-to-analog converter)
- RT291 Backplane
- RT329 Transition board
- RT371 Communications board
- RT373 Analog-to-Digital Converter board (24 bit) - two boards
- RT319 Central Processor Unit (CPU) board
- RT344 Power Supply and PGA board*
- RT345 Lid Interconnect board

*The RT344 holds up to 2Mb of SRAM or PSRAM

One of the following optional boards may be installed on this model:

- RT284 Mass Memory board (12Mb maximum at 4Mb/board)
- RT336 Telemetry Modem board
## Feature Comparison of 72A Series DAS Models

<table>
<thead>
<tr>
<th>Feature</th>
<th>72A-07</th>
<th>72A-08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Channels</td>
<td>3 @ 24-bit resolution</td>
<td>3 or 6 @ 24-bit resolution</td>
</tr>
<tr>
<td></td>
<td>or</td>
<td>or</td>
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<tr>
<td></td>
<td>3 @ 24-bit + 3 @ 16-bit</td>
<td>resolution</td>
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<tr>
<td>Broadband Dynamic Range</td>
<td>130dB at 1 to 125Hz sample</td>
<td>130dB at 1 to 125Hz sample</td>
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<tr>
<td>Data Streams</td>
<td>8 maximum</td>
<td>8 maximum</td>
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<tr>
<td>Sample Rates</td>
<td>same across all data streams (no DSP) programmable rates are: 1, 2, 4, 8, 10, 20, 25, 40, 50, 100, 125, 200, 250, 500, or 1000 sps</td>
<td>programmable stream-to-stream at 1, 2, 4, 8, 10, 20, 25, 40, 50, 100, 125, 200, 250, 500, or 1000 sps</td>
</tr>
<tr>
<td>Gain Settings</td>
<td>each channel programmable at unity or 30dB</td>
<td>On 24-bit channels - each channel programmable at unity or 30dB. On 16-bit channels - programmable at 0, 18, 30, 42, 54, 66 or 78dB</td>
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<tr>
<td>Internal RAM</td>
<td>512K minimum (expandable)</td>
<td>512K minimum (expandable)</td>
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<tr>
<td>Primary Data Storage</td>
<td>internal or external SCSI disk of 500Mb or greater with auto data transfer from RAM</td>
<td>external SCSI disk of 500Mb or greater with auto data transfer from RAM</td>
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<tr>
<td>Timekeeping</td>
<td>either VCXO or internal GPS</td>
<td>Either VCXO or external GPS</td>
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<tr>
<td>FIR Filters</td>
<td>Passband = 85% Nyquist</td>
<td>Passband = 80% Nyquist</td>
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<td></td>
<td>Stopband = -130dB</td>
<td>Stopband = -130dB (1st filter)</td>
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<tr>
<td></td>
<td></td>
<td>-100dB (2nd. filter - for resampling)</td>
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<tr>
<td>Full Scale Input</td>
<td>20vpp differential @ unity gain</td>
<td>20 vpp differential @ unity gain</td>
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<td></td>
<td>7.5 vpp differential @ unity gain</td>
<td>for 16-bit channels</td>
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<tr>
<td>Triggers</td>
<td>continuous</td>
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<td>event (STA/LTA)</td>
<td>event (STA/LTA)</td>
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<td></td>
<td>cross stream</td>
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<tr>
<td>Other Features</td>
<td>Optional sensor calibration function</td>
<td>Standard sensor calibration function</td>
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