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**TDS-2 Module TDS-6 Unit User Manual
2.5.5r1**

Leading Network Intelligence

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1.0 OVERVIEW

Introduction   The Endace time distribution servers provide accurate synchronized timing signals to DAG cards for packet timestamping through use of global positioning system time signals.

The process involves a global positioning system [GPS] or code division multiple access system [CDMA], time distribution server components, and DAG cards.

In this chapter   This chapter covers the following sections of information.

- User Manual Purpose
- Time Distribution Server System

1.1 User Manual Purpose

Description   The purpose of this TDS 2 installation manual is to identify and explain:

- Installing TDS-2 Time Distribution Server Module
- Connecting TDS-6 Time Distribution Server Extension Unit
- Appendix A – TDS-2 Module, Connector Specifications
- Appendix B – TDS-6 Extension Unit, Connector Specifications

1.2 Time Distribution Server System

Description   The time distribution server system involves TDS-2 Time Distribution Server modules [TDS-2 module] receiving time signals either directly from a GPS receiver or a CDMA time receiver.

Accurate time synchronization information constantly transmitted by GPS satellites orbiting Earth is collated on the ground by GPS receivers. Receiver units can be mounted on building exteriors or elsewhere with an unobstructed sky view. A GPS receiver unit is connected to a TDS-2 module by fitting a DB25 cable to a DB25-toDB9 adapter on the module.

In many situations it is not possible or economic to run cable to a GPS receiving unit mounted externally on buildings. In this case, a CDMA cellular telephone network is used, where available. A CDMA system base station has a GPS receiver to collate the accurate timing transmitted by satellites.

Timing information is retransmitted from CDMA base stations to all CDMA receivers. Being of a lower frequency these transmissions can often be received within buildings without an external antenna.

1.2 Time Distribution Server System, continued

Description, continued

Time Distribution Server TDS-2 modules and TDS 6 units are connected by cable to a DAG card timing connector. The precise time reference signals are fed from receivers to TDS-2 Time Distribution Servers, which relay them to DAG cards, PC's or TDS 6 expander units.

The capacity of a TDS-2 module can be expanded six outputs at a time by chaining up to four TDS 6 expansion units without compromising timing accuracy.

The power source for TDS-2 modules is 12V DC through an adapter connected to an electrical mains source, or directly from a 12V DC source.

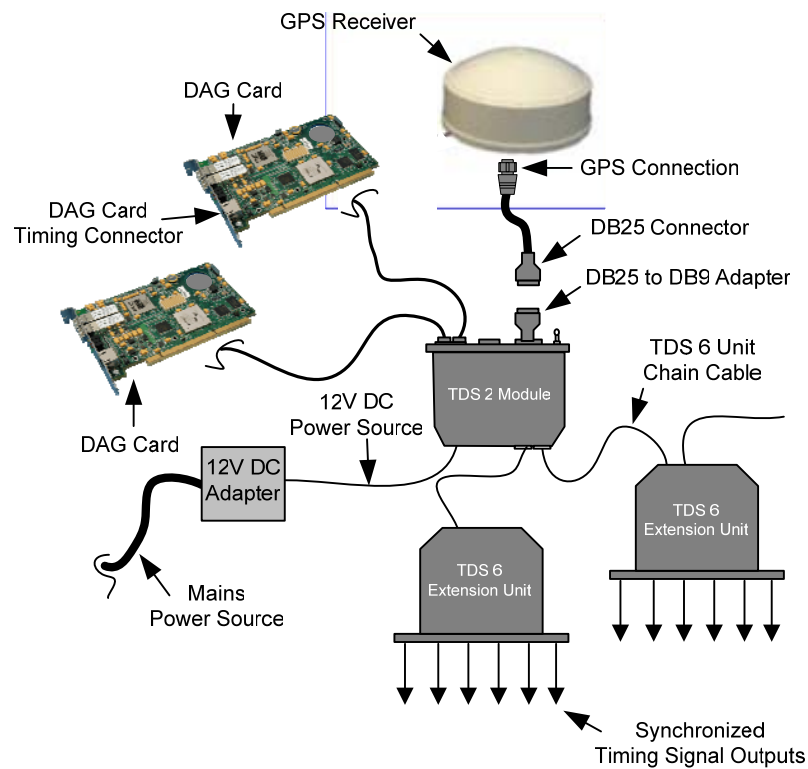**Figure**   Diagram 1-1 shows the typical time server distribution system.

Figure 1-1. Typical Time Server Distribution System.

2.0 INSTALLING TDS-2 TIME DISTRIBUTION SERVER MODULE

Introduction   Installation of the TDS-2 module involves connecting to an AC mains power source or 12V DC source and then connecting to a suitable timing single source. A 2.5mm plug fits to a 12V DC power source jack marked on the TDS-2 module rear panel.

In this chapter   This chapter covers the following sections of information.

- TDS-2 Time Distribution Server Module Overview
- TDS-2 Time Distribution Server Module Connection to Power Sources
- Connect TDS-2 Module to Code Division Multiple Access Source
- Connect TDS-2 Module to Global Positioning System Time Signal Source
- Connection to TDS-2 Time Distribution Server Module Applications

2.1 TDS-2 Time Distribution Server Module Overview

Description   The TDS-2 Time Distribution Server module has a distinct architecture relative to its purpose with specific system requirements. The module also has accessories available that expand its function.

In this section   This section covers the following topics of information.

- Connect TDS-2 Module to Electrical Mains Power Source
- Connect TDS-2 Module to 12V DC Power Source
- TDS-2 Time Distribution Server Module Accessories

2.1.1 TDS-2 Time Distribution Server Module Architecture

Description   The TDS-2 module is fitted with cable ports and connectors to receive precise time signal inputs, replicate them, and distribute directly to one or two DAG cards. The TDS-2 architecture features include:

- GPS input from Trimble Acutime 2000 GPS time receiver, Type RS422.
- CDMA input from Endrun Technologies Praecis Ct CDMA time receiver, Type RS232.
- Connection to a PC to monitor timing information and provide network time services via NTP.
- Two outputs enabling connection of up to two DAG cards.
- Chain Out - enables daisy-chaining of TDS-6 modules through connection to a single external time reference.
- Status LED indicators
- Accepts 12V DC power from an external source.
- Supplies DC power to GPS receiver.

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2.1.1 TDS-2 Time Distribution Server Module Architecture, continued

CAUTION The standard Ethernet cables and patch equipment do not carry Ethernet signals and must never be connected to Ethernet equipment such as hubs, routers, or NICs.

TDS-2 module face-plate The TDS-2 module face-plate is fitted with:

- Signal source selector switch
- CDMA signal input connector
- GPS signal input connector
- LED's for power source, PPS and SERIAL signal status
- Timing signal outlet ports

Figure Figure 2-1 shows the TDS-2 module face-plate architecture.

Figure 2-1. TDS-2 Module Face-plate Architecture.

The timing signal outputs are provided through RJ45 connectors, and may be connected to DAG cards with standard Ethernet cables and patch equipment.

When DC power is provided to the module, the power LEDs display.

Continued on next page

2.1.1 TDS-2 Time Distribution Server Module Architecture, continued

TDS-2 back-plate
The TDS-2 module rear-plate contains:

- 12V DC power inlet
- Power status LED
- PPS status LED
- Host connector for connection to a PC
- Chain out port for optional connection to Endace TDS-6 signal expansion units

Figure
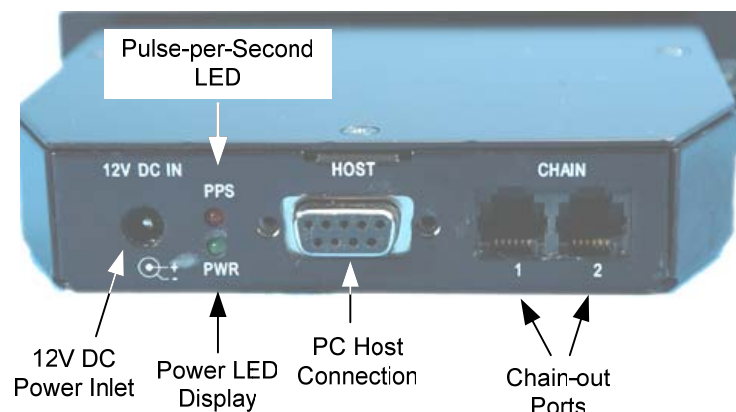Figure 2-2 shows the TDS-2 module rear-plate architecture.

Figure 2-2. TDS-2 Module Rear-plate Architecture.

TDS-6 module
When additional time synchronization outputs are required, the capacity of a TDS-2 module is expanded six outputs at a time without compromising timing accuracy by attaching up to four Endace TDS6 units.

One TDS-2 module with the maximum number of TDS-6 expansion modules provides 24 time synchronization outputs derived from a single external time standard. The TDS-6 unit outputs are connected to up to 24 DAG cards using conventional Ethernet style patch cables.

2.1.2 TDS-2 Time Distribution Server Module System Requirements

Description
The TDS-2 Time Distribution Server module minimum operating system requirements are:

- 12V DC power to rear panel, typical power consumption is 2 watts
- An external time reference source:
  - GPS input from Trimble Acutime 2000 GPS time receiver, Type RS422
  - CDMA input from Endrun Technologies Praecis Ct CDMA time receiver, Type RS232
- Standard Ethernet type RJ45-RJ45 cabling for connecting to DAG cards

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2.1.2 TDS-2 Time Distribution Server Module System Requirements, continued

Timing signal ports	The timing signal ports use RJ45 connectors. Connections to DAG cards are made with normal Ethernet style Cat-5/6 cables and infrastructure, using straight-through type only.
Trimble Acutime 2000 GPS Kit	The Trimble Acutime 2000 GPS receiver can be purchased as part of the Acutime 2000 Synchronisation Kit, including integrated antenna/receiver, 100 foot cable, power supply, and signal converter, Trimble part number 40986-00. Only the antenna/receiver and cable are needed for use with the TDS-2. The antenna/receiver can be purchased separately [39091-00], with matching cables in 50, 100, 200, and 400 foot lengths [23098, 23099, 24017, 24260].
Praecis Ct CDMA time receiver	The Praecis Ct CDMA time receiver is available directly from Endrun Technologies Ltd. There must be a CDMA network available with good signal at the intended installation site. This may be checked with a CDMA cellular phone in digital mode.
CAUTION	The TDS-2 must never be connected directly to active Ethernet equipment**.**

2.1.3 TDS-2 Time Distribution Server Module Accessories

Description	The accessories included with the TDS-2 Time Distribution Server include: • One DB9-to-DB25 Adapter, enabling connection of Trimble Acutime 2000 to TDS-2 module NOTE: Only the adapter supplied is used for this connection.
Optional extras	• 12V DC power adapter • 19" rack-mount kit available - 1U (1.75") standard size • Endace TDS-6 Time Distribution Expansion Unit

2.2 TDS-2 Time Distribution Server Module Connection to Power Sources

Introduction	The TDS-2 module can function with alternative power sources. The module can be connected either to an electrical mains power source using an AC-to-DC adapter, or directly to a DC power source.
In this section	This section covers the following topics of information. • Connect TDS-2 Module to Electrical Mains Power Source • Connect TDS-2 Module to 12V DC Power Source

2.2.1 Connect TDS-2 Module to Electrical Mains Power Source

Description   The TDS-2 module accepts electrical mains power using an optional AC/DC adapter.

Procedure   Follow this step to connect the TDS-2 module to mains power source.

No.	Step	Key Points
1.	Connect to mains power.	Connect TR36A12 AC/DC adapter to a mains power source via a suitable IEC 32/C8 cable. Connect the TR36A12 2.5mm DC plug to the receptable on TDS-2 module back-plate.

2.2.2 Connect TDS-2 Module to 12V DC Power Source

Description   For connection of the TDS-2 module directly to a 12V DC power source the polarity is indicated on the rear face of the module, directly below the 12V DC power receptable.

The TDS-2 module has an internal reverse polarity protection diode but no fuse protection.

Procedure   Follow this step to connect the TDS-2 unit to the 12 volt DC power source.

Step 1   **Connect DC Power Source**

Run a suitable lead from the 12V power source to TDS-2 module and fit a 2.5mm DC coaxial plug.

CAUTION: If the module is being fitted to an unprotected power source, an external fuse of 2 amps value is required.

2.3 Connect TDS-2 Module to Code Division Multiple Access Source

Description   An RJ45 cable is used to connect a TDS-2 module to a CDMA source via an adapter supplied with the CDMA receiver.

The module signal source selection switch is set to CDMA and the LED flashes indicate processes are occurring in relation to timing signal and SERIAL packet activity.

Continued on next page

2.3 Connect TDS-2 Module to Code Division Multiple Access Source, continued

Procedure   Follow these steps to connect the code division multiple access source.

Step 1   **Connect CDMA Receiver**

Connect RJ45 cable from CDMA receiver to DB9-to-RJ45 adapter supplied with CDMA kit.

Set signal source selection switch to CDMA.

CAUTION: Only use the DB9-to-RJ45 adapter supplied with CDMA receiver otherwise damage will occur to the equipment.

Step 2   **Check Timing Signal.**

When CDMA unit locks onto the network, the CDMA receiver's LEDs activate, with the PPS LED flashing once per second indicating the timing signal is being received.

The PPS LED on the TDS-2 front faceplate should now be flashing.

2.4 Connect TDS-2 Module to Global Positioning System Time Signal Source

Description   The TDS-2 module is connected by cable to the GPS receiver signal source and the signal source selection switch is set to GPS.

After 5-15 minutes the GPS antenna locks onto the GPS satellites and the activity LEDs start flashing.

Procedure   Follow these steps to connect TDS-2 module to global positioning time signal source.

Step 1   **Connect GPS Receiver**

Connect GPS receiver to the TDS-2 module GPS signal input using the cable and Endace supplied adapter.

The TDS-2 automatically supplies DC power through this cable to the antenna.

Continued on next page

2.4 Connect TDS-2 Module to Global Positioning System Time Signal Source, continued

Procedure (continued)

Step 2   **Set Module to Receive GPS Signal**

Set input signal selection switch to GPS position. This sets the GPS as the active signal source.

NOTE: The TDS-2 module LEDs will indicate the GPS receiver status after a 5 to 15 minute delay during which the system correlates orbiting signal sources.

Step 3   **Check Module Operating Status**

The PPS LED flashes once per second indicating the timing signal is present.

The SERIAL LED flashes to indicate time information packets are present.

Step 4   **Change GPS Settings**

If a change is required to GPS settings, connect a PC directly to GPS receiver via the Trimble Synchronization Interface Module.

2.5 Connection to TDS-2 Time Distribution Server Module Applications

Introduction   A PC can be connected to the 'Host' DB-9 connector using a 'straight through' or 'modem' SERIAL cable.

This connection can be used to provide a reference clock to the PC in order to operate a NTP server.

In this chapter   This chapter covers the following sections of information.

- DAG Card Signals Output Connection
- PC Connection to TDS-2 Time Distribution Server Module

2.5.1 DAG Card Signals Output Connection

Description   Once the TDS-2 module is fully functioning, a DAG card can be connected via a standard Ethernet patch cable connected to the timing signal output ports.

2.5.2 PC Connection to TDS-2 Time Distribution Server Module

Description   Once the TDS-2 module is fully functioning, a PC can be connected via the module's host connection.

The PPS signal and SERIAL data packet is then received by the PC. If the timing signal is being generated by a CDMA receiver, the packet can be read on a PC via a standard terminal package.

If the timing signal is being generated by a GPS, a decoding software program, such as supplied with the Trimble Acutime 2000 Kit, needs to be installed for on-screen display of the packet-read.

This connection can also be used to provide a reference clock to the PC in order to operate a NTP server.

Procedure   Follow these steps to connect a PC directly to a TDS-2 module.

Step 1   **Connect TDS-2 Module to PC**

Use a straight-through DB9M-to-DB9F SERIAL cable.

Step 2   **Check Signal Source Switch**

Ensure TDS-2 module switch is set to correct timing signal source position.

3.0 CONNECTING TDS-6 TIME DISTRIBUTION SERVER EXTENSION UNIT

Introduction   Connecting a TDS-2 module to a TDS-6 Time Distribution Server unit expands distribution of global time synchronization signals to multiple destinations.

The TDS-6 expansion unit provides 6 time signal synchronization outputs derived from a single TDS-2 module connection.

Each time-synchronization output is independently driven with power derived from a TDS-2 module through the chain cables.

Figure   Figure 3-1 shows the TDS-6 Time Distribution Server extension unit.
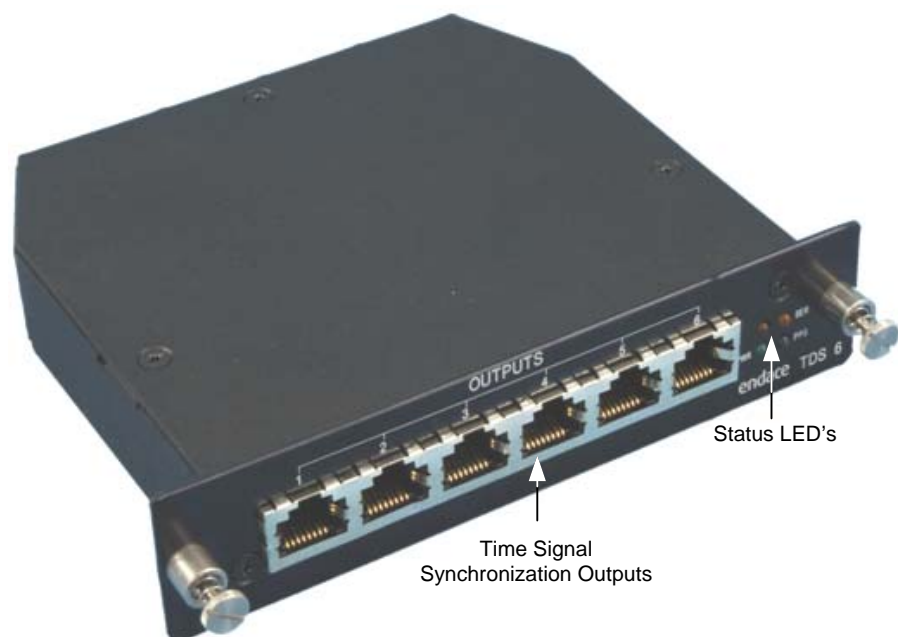

Figure 3-1. TDS-6 Time Distribution Server Extension Unit.

In this chapter   This chapter covers the following sections of information.

- DAG Card Signals Output Connection
- Connect Additional TDS-6 Time Distribution Server Extension Units

3.1 Install TDS-6 Time Distribution Server Extension Unit

Description   Installing a TDS-6 unit involves connecting to an RS422 GPS time source output from a TDS-2 module. The synchronized time signals travel from the TDS-2 CHAIN port to TDS-6 extension unit through chain cables. The signals travel to DAG cards through the TDS-6 unit synchronization outputs.

A TDS-6 Time Distribution Server extension unit is firmly fixed in a position where cables are readily accessed without obstruction.

Connecting the TDS-6 unit involves inserting the supplied chain cable to the TDS-6 CHAIN 1 port and inserting the other end into a vacant TDS-2 module CHAIN port.

Figure   Figure 3-2 shows the typical TDS-2 module and TDS-6 unit connection configuration.
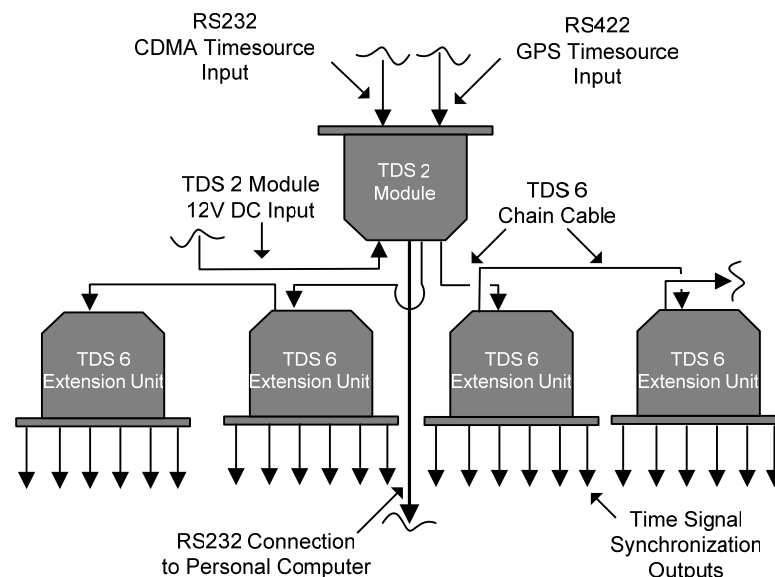

Figure 3-2. Typical TDS-2 Module and TDS-6 Unit Connection Configuration.

Procedure   Follow these steps to install a TDS-6 Time Distribution Server extension unit to a TDS-2 module.

Step 1   **Position TDS-6 Unit**

Fix unit firmly in a position where the chain cable reaches to TDS-2 module CHAIN outlet port without strain or obstruction.

Check cable run to DAG card to ensure sufficient length between unit and card location.

Continued on next page

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3.1 Install TDS-6 Time Distribution Server Extension Unit, continued

Procedure, continued

Step 2   **Fit chain cable**.

Plug chain cable into TDS-6 CHAIN 1 inlet port.

Plug the other end of cable into a vacant TDS-2 module CHAIN output.

Step 3   **Connect TDS-6 Unit to DAG Card**

On front plate of TDS-6 unit, plug cable into a vacant outlet and insert other end into DAG card.

Step 4   **Inspect TDS Unit Operating Status**

On the front of TDS-6 unit, check power LED is ON and status LED's are flashing for:

- PPS
- SERIAL

On the back of the unit, check PPS LED is flashing.

NOTE: If the LED's are not flashing check the TDS-2 module is powered, and check connections. In event of a function failure, contact Endace support; support@endace.com

3.2 Connect Additional TDS-6 Time Distribution Server Extension Units

Description   A number of TDS-6 units can be coupled together like a daisy-chain to enable extension of time-synchronization output to more DAG cards or PC's.

If the two TDS-2 module chain outputs are in use, with two TDS-6 units already being connected, additional TDS-6 units can be chained to the first TDS-6 units.

3.2 Connect Additional TDS-6 Time Distribution Server Extension Units, continued

Procedure   Follow these steps to chain additional TDS-6 Time Distribution Server extension units.

Step 1.   Position TDS-6 unit

Fix unit firmly in a position where chain cable will reach a functioning TDS-6 unit CHAIN outlet without strain or obstruction.

Check cable run to intended destination to ensure sufficient length to chained TDS-6 unit.

Step 2.   Chain to Functioning TDS-6 Unit

Connect supplied cable to functioning TDS-6 unit CHAIN 2 outlet and connect other end to CHAIN 1 input on the new TDS-6 unit.

Step 3.   Inspect TDS-6 unit operating status

On front of new unit, check the power LED is ON and status LED's are flashing for:

- PPS
- SERIAL

On the back of the unit, check the PPS LED is flashing constantly.

NOTE: If the LED's are not flashing check the TDS-2 module is powered and operating, or check connections. In the event of a function failure contact Endace support; support@endace.com

APPENDIX A – TDS-2 MODULE, CONNECTOR SPECIFICATIONS

Introduction   The specifications for the TDS-2 module connector pin-outs include:

- RS422 RJ45 Timing DB2J to DB9 Signal Output
- RS232 DB9 CDMA Input
- RS422 DB9 GPS Input
- RS232 Host PC Connection
- RS422 RJ45 Timing Signal Output
- DB25 to DB9 GPS Adapter

RS422 RJ45 Timing DB2J to DB9 Signal Output

Description   The TDS-2 module has two RJ45 socket outputs for connecting to DAG card RS422 synchronisation input port. The socket consists of 8 pins. The pin-out configuration is shown below.

1:    NC
2:    NC
3:    PPS Out+
4:    SERIAL Out+
5:    SERIAL Out-
6:    PPS Out-
7:    NC
8:    NC

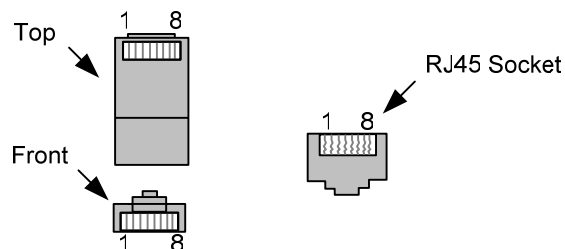**Figure**   Figure 5-1 shows the DAG RJ45 plug and socket pin-out configuration..

Figure 5-1. DAG RS45 Plug and Socket Pin-out Configuration.

RS232 DB9 CDMA Input

Description   The TDS-2 module has one DB9 input for connecting the Endrun
Technologies Praecis Ct CDMA time receiver using standard Ethernet
type cables. The pin-out configuration is shown below.

1:    PPS In
2:    SERIAL In
3:    Ext-SERIAL out
4:    NC
5:    Ground
6:    NC
7:    CTS Out
8:    NC
9:    NC

NOTE: "In" and "Out" destinations relate to TDS modules and TDS-6
units.

RS422 DB9 GPS Input

Description   The one DB9 input is used for connecting a Trimble Acutime global
positioning system receiver. The pin-out configuration is shown below.

1:    Event Out + [optional]
2:    Event Out – [optional]
3:    PPS In +
4:    SERIAL In +
5:    SERIAL In -
6:    PPS In -
7:    N/C
8:    Ground
9:    Power Out [12V DC]

RS232 Host PC Connection

Description   A standard female DB9 on the TDS-2 module enables connection to a host
PC. The pin-out configuration is shown below.

1.   PPS Out
2.   SERIAL Out
3.   Ext-SERIAL In
4.   CDMA port, pin 4
5.   GND
6.   CDMA port, pin 6
7.   CTS IN
8.   CDMA port, pin 8
9.   CDMA port, pin 9

RS422 Chain Output

Description A two-port six-position, six-contact modular jack provides direct connection for up to two TDS-6 modules. The pin-out configuration is shown below.

1:	GND	7:	GND
2:	PPS Out +	8:	PPS Out +
3:	SERIAL Out +	9:	SERIAL Out +
4:	SERIAL Out -	10:	SERIAL Out -
5:	PPS Out -	11:	PPS Out -
6:	Power Out [12V DC]	12:	Power Out [12V DC]

Figure Figure 5-2 shows the TDS-2 module chain output pin-out configuration.
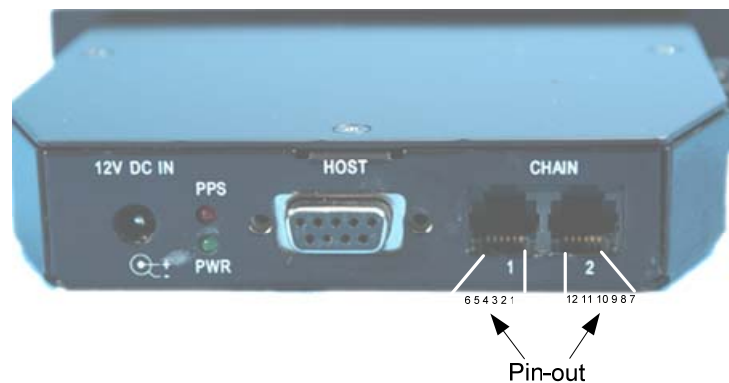

Figure 5-2. TDS-2 Module Chain Output Pin-out Configuration.

DB25 to DB9 GPS Adapter Plug

Description The Endace supplied DB25 to DB9 GPS adaptor plug housed in a single body enables connection of the Trimble Acutime receiver to a TDS-2 module.

DB9 Male	Signal Name	DB25 Female
Shell	Shield Drain	Shell
1:	Event +	12
2:	Event -	24
3:	PPS+	21
4:	SERIAL+	22
5:	SERIAL-	10
6:	PPS-	9
7.	N/C	-
8.	GND	7
9.	12VGPS	1

APPENDIX B – TDS-6 EXTENSION UNIT, CONNECTOR SPECIFICATIONS

RS422 RJ45 Timing Signal Output

Description   There are six RS422 ports on the TDS-6 unit on a RJ45 modular jack that provides synchronized timing signals to DAG card RSS422 input ports.

1.	N/C
2.	N/C
3.	PPS Out +
4.	SERIAL Out +
5.	SERIAL Out -
6.	PPS Out -
7.	N/C
8.	N/C

Figure   Figure 5-3 shows the TDS-6 timing signal outputs pin-out configuration.
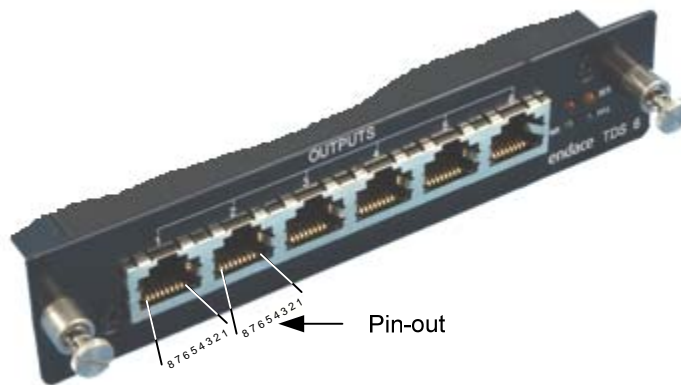
Figure 5-3. TDS-6 Timing Signal Outputs Pin-out Configuration.

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RS422 Chain Connection

Description   A two-port, six-position, six-contact modular jack on a TDS-6 facilitates chaining of additional TDS-6 units.

1:	GND		7:	GND
2:	PPS In +		8:	PPS Out +
3:	SERIAL In +		9:	SERIAL Out +
4:	SERIAL In -		10:	SERIAL Out -
5:	PPS In -		11:	PPS Out -
6:	12V DC Power in		12:	12V DC Power out

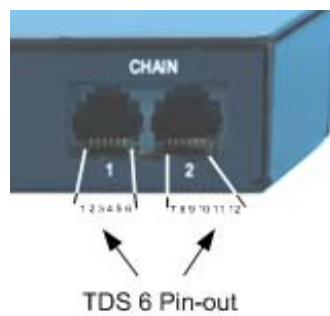**Figure**   Figure 5-4 shows the TDS-6 module chain connector pin-out configuration.

Figure 5-4. TDS-6 Module Chain Connector Pin-out Configuration.