Trig-Tek™

260B
Multi-Function Unit
User Manual

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This equipment contains voltage hazardous to human life and safety, and is capable of inflicting personal injury.

If this instrument is to be powered from the AC line (mains) through an autotransformer, ensure the common connector is connected to the neutral (earth pole) of the power supply.

Before operating the unit, ensure the conductor (green wire) is connected to the ground (earth) conductor of the power outlet. Do not use a two-conductor extension cord or a three-prong/two-prong adapter. This will defeat the protective feature of the third conductor in the power cord.

Maintenance and calibration procedures sometimes call for operation of the unit with power applied and protective covers removed. Read the procedures and heed warnings to avoid “live” circuit points.

Before operating this instrument:

1. Ensure the proper fuse is in place for the power source to operate.

2. Ensure all other devices connected to or in proximity to this instrument are properly grounded or connected to the protective third-wire earth ground.

If the instrument:

- fails to operate satisfactorily
- shows visible damage
- has been stored under unfavorable conditions
- has sustained stress

Do not operate until performance is checked by qualified personnel.

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DOCUMENT CHANGE HISTORY

Revision	Date	Description of Change
A	10/17/2011	Document Control Release

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Chapter 1
Introduction

The 260B (**Figure 1-1**) Multi-Function Unit is designed to be used where from 16 to 64 channels of pressure or temperature data are to be observed and/or recorded, and up to 80 channels of digital I/O.

The system is comprised of a Mother Board which connects up to four Daughter Board modules to the IP 1553 serial bus. Each of the modules has 16 pressure or temperature channels, a frequency counter, 12 TTL digital input channels, 8 TTL output channels and four open drain outputs with two amp current capability.

Each module has nonvolatile memory to store zero and gain coefficients as required to calibrate the channels and a built-in digital to analog converter on board to generate accurate DC voltages for calibration. They include RS232 bus for troubleshooting and a means for updating the flash to install new firmware changes. The serial data from the four modules is time division multiplexed, assembled and delivered to the bus with a 60/sec update rate.

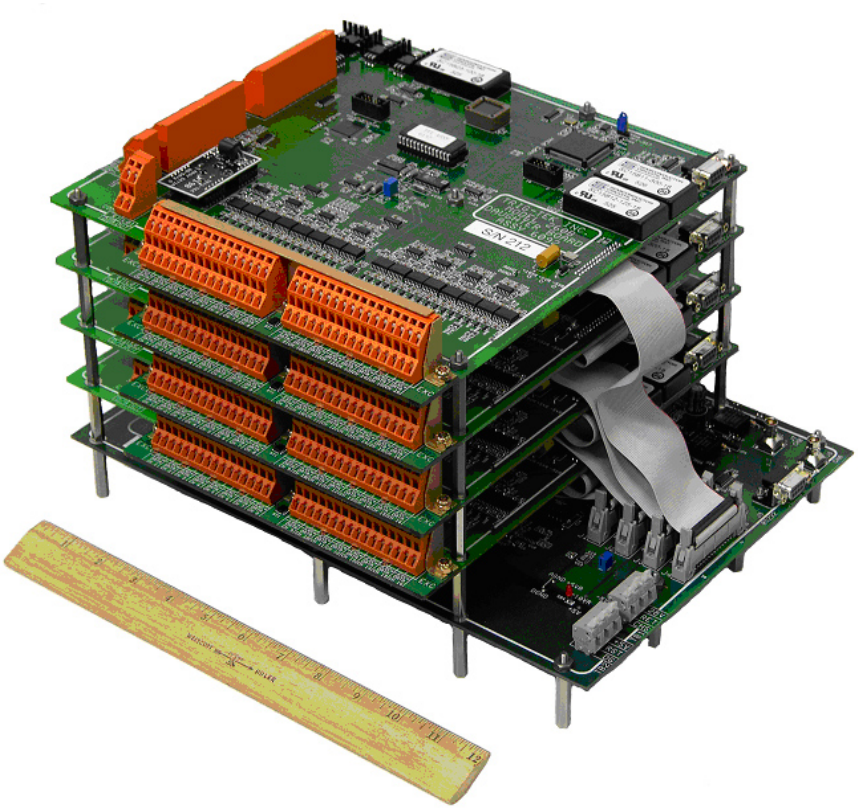

Figure 1-1: 260B Multi-Function Unit

Features

Features include:

- IP 1553 Bus
- 64 Channels Temperature or Pressure
- Frequency Counter
- 48 TTL Inputs
- 32 TTL Outputs
- 16 Open Drain outputs
- On board D/A converter
- Nonvolatile memory
- 60 Update per sec

Mother Board Specifications

Included in the Mother Board are the Reference Voltages and the Logic to interface up to four Daughter Boards to the IP 1553 Serial Bus.

Reference Voltages

All the reference voltages +5.00 Volts, -5.00 Volts and +10.00 Volts are derived from the same high precision 5.00 Volt reference. It has an adjustment to set the voltage level and has a 10 PPM C temperature coefficient. These three Reference Voltages are distributed via the interface connectors to the Daughter Boards.

Logic

The Mother Board uses a 16-bit micro controller to provide time division multiplexing to interface up to 4 Daughter Boards to the IP 1553 Serial Bus with a 60/sec update rate. The IP 1553 bus resides on the Mother Board.

Reset (manual)

Microprocessor Reset	Short to Ground (momentary)
+5 Volts	5V @ 250 milliamps
Digital Ground	DG
Connector	3 Pin terminal strip (marked TB2 +5, RS, DG)

IP 1553 Data Bus Interface

Connector	Two triaxial BNC connectors marked J8 CH A and J7 CH B

Environmental

Operating Temperature	-10 to 70°C
Storage Temperature	-40 to 85°C

Dimensions

1.25” high x 10” wide x 14” long.

Power

Voltage/Current	18 to 36 Volts DC @ 125 mA Current
Connector	3-Pin Terminal strip (marked TB1 28V, RET CHS-chassis gnd)

Daughter Board Specifications

Up to four Daughter Boards will interconnect with a Mother Board to interface with the IP 1553 Serial Bus.

The Daughter Board has nonvolatile memory accessed via the RS-232 Serial bus for storing the offsets and gain coefficients for each channel.

Data Inputs (16 channels)

Impedance	>50 meg
Input Level - Gain: 1	-10 V to +10 VDC
Gain: 10	-1 V to +1 VDC
Gain: 100	-0.1 V to +0.1 VDC
DC Offset vs. Temp	±1 µv/°C
Gain	1, 10, 100, ±0.05%
A/D Reading Accuracy	
Accumulative Offset Error	12 mV (adjustable to Zero)
Accumulative Gain Error	0.6% FS (adjustable to ±1 LSB)
Linearity	±2 LSB
Open Thermocouple Detection	-1.00 ±0.05 Volt indication (with the GAIN of 100)

Over Voltage Protection	Up to 40 Volts
Adjacent Channel Isolation	>76 dB
Connector	32 pins of a 64-pin terminal strip (marked DATA+ and -, and the Channel number)

Analog outputs are multiplexed into a 16 bit analog to digital converter. The digital data is placed on the DATA bus.

Freq Input (1 ea)

Impedance	>200 k Ohms
Frequency Range	1 Hz to 5 kHz
Accuracy	Reading ±0.05 Hz (±3 RPM)
Wave Form	Sine, square, triangle or pulse (pulse width >40μs)
Level	50 mV to 200 V pk-pk
Connector	Terminal strip (marked FREQ Input + and -). Top two terminals are signal input. The lower two are +5 Volts excitation and DG.

Digital Input (12 ea.)

Function	TTL Logic
Impedance	>470 k Ohms
Input Protection	>50 Volts
Connector	TERMINAL-Top 1 to 12 terminals are signals. The lower 12 are DG

EXC Outputs (16 channels)

Impedance	Less than 0.1 Ohm
Level	5.00 VDC, ±20 millivolts
Current	Short circuit protected above 100 milliamps each channel
Connector	32 pins of a 64-pin terminal strip (marked EXC + and –, and Channel Numbers)

Cold Junction

LM35 RTD	
Temperature Repeatability	±0.5°C

D to A Outputs (X1 and X.001)

Impedance	<50 Ohms
Level (X1)	-10 to +10 Volts DC
Level (X.001)	-10 to +10 millivolts DC
Accuracy	Setting ±.05% of FS
Connectors	TERMINALS-Top 2 SIG, the lower 2 COM. (marked X1-X.01 D/A OUTPUT)

Digital Outputs (8 EA.)

Level	0 to 5 Volts
Source Current	Up to 20 mA
Connectors	Terminals-Top 8 SIG, lower 8 DG (marked TTL OUTPUTS CH 1 to 8)

FET Outputs (High Current) 4 ea.

Voltage	Up to 60 Volts
Source CURR	Up to 2 Amps
Connector	TERMINALS-Top 4 Source, Lower 4 DRAIN must be returned to DG)

Enviromentatl

Operating Temperature	-10 to 70°C
Storage Temperature	-40 to 85°C

Dimensions

1.25” high x 10” wide x 11” long

Power

Voltage	Input Voltage ranges 18-36 VDC (unregulated.) 3-Pins Terminal Strip (marked 28V)

Current	Daughter Board - 400 milliamps
Connector	3-Pin terminals marked 28V, RET and CHS (chassis ground)

Chapter 2
Installation

The 260B Multi-Function Unit is designed on printed circuit boards with a mounting hole pattern shown in (**Figures 2-1 and 2-2**).

The Mother Board is mounted to a flat surface using 1/4" hex standoffs 1-1/4 or 1-1/2 long with a number 8 stud on one end and threaded the other. Fasten the standoffs to the flat surface using the hole pattern shown stud end up.

Place the Mother Board on the studs. Screw lock nuts on the four studs on the right end of the Mother Board. The other nine will receive 1-1/2" number 8 standoffs. Place the Daughter Board on them. Using this method install up to four Daughter Boards, the top board will be screwed down with the number 8 lock nuts.

As the Daughter Boards are mounted install the cables in the receptacles on the Mother Board, being careful to dress the cable in a manner to insure it won't be damaged.

The wiring to the terminal should be connected as the boards are installed.

Wiring

The terminal strips on the system are spring loaded and will accept up to 16 Gage wires. A small screwdriver is used to release or install the wires. Care should be taken to insure proper wire penetration.

Diagrams of the Mother Board and Daughter Board are shown with the terminal connectors in (**Figures 2-1 and 2-2**).

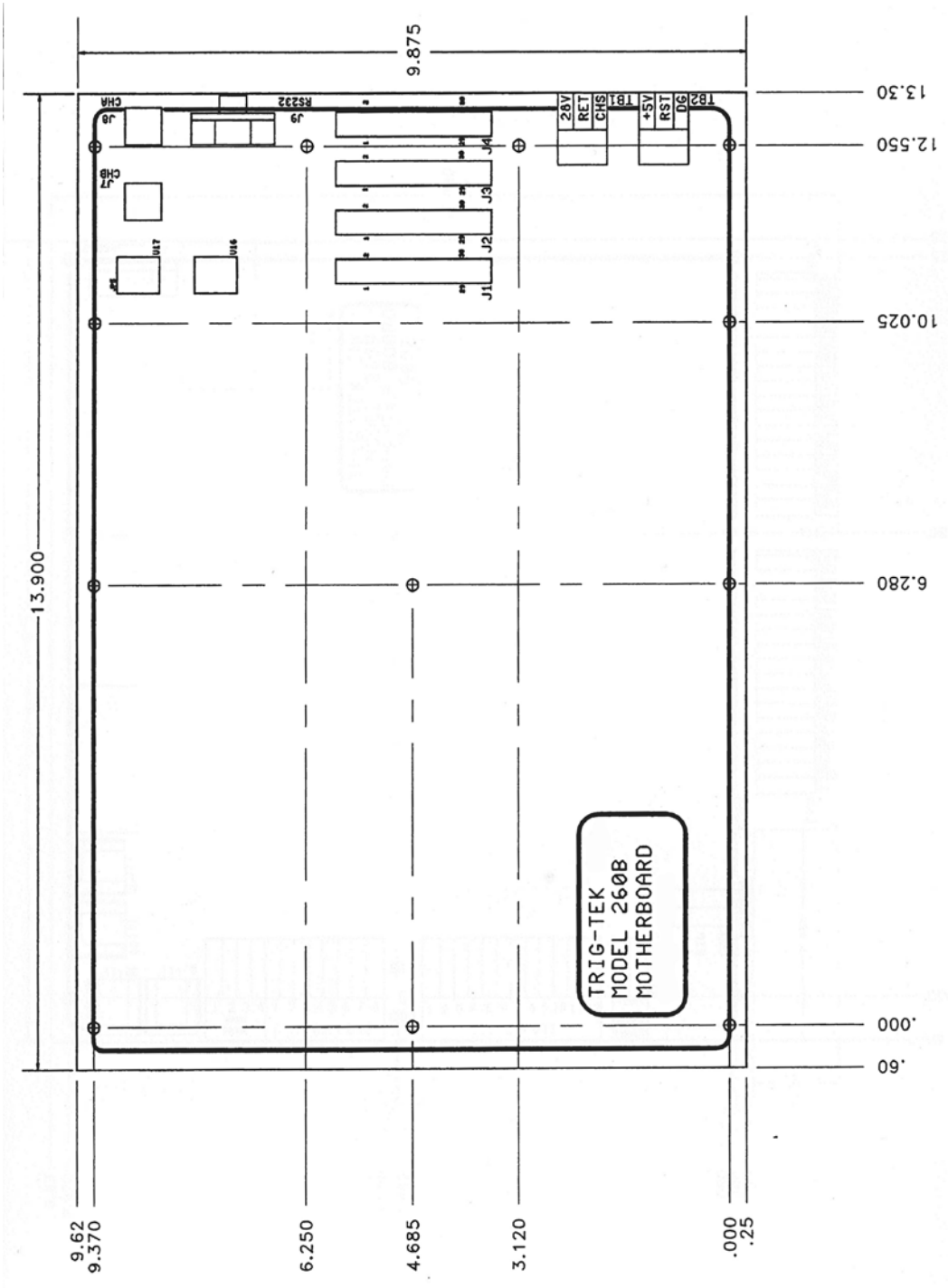

Figure 2-1: Motherboard Mounting Diagram

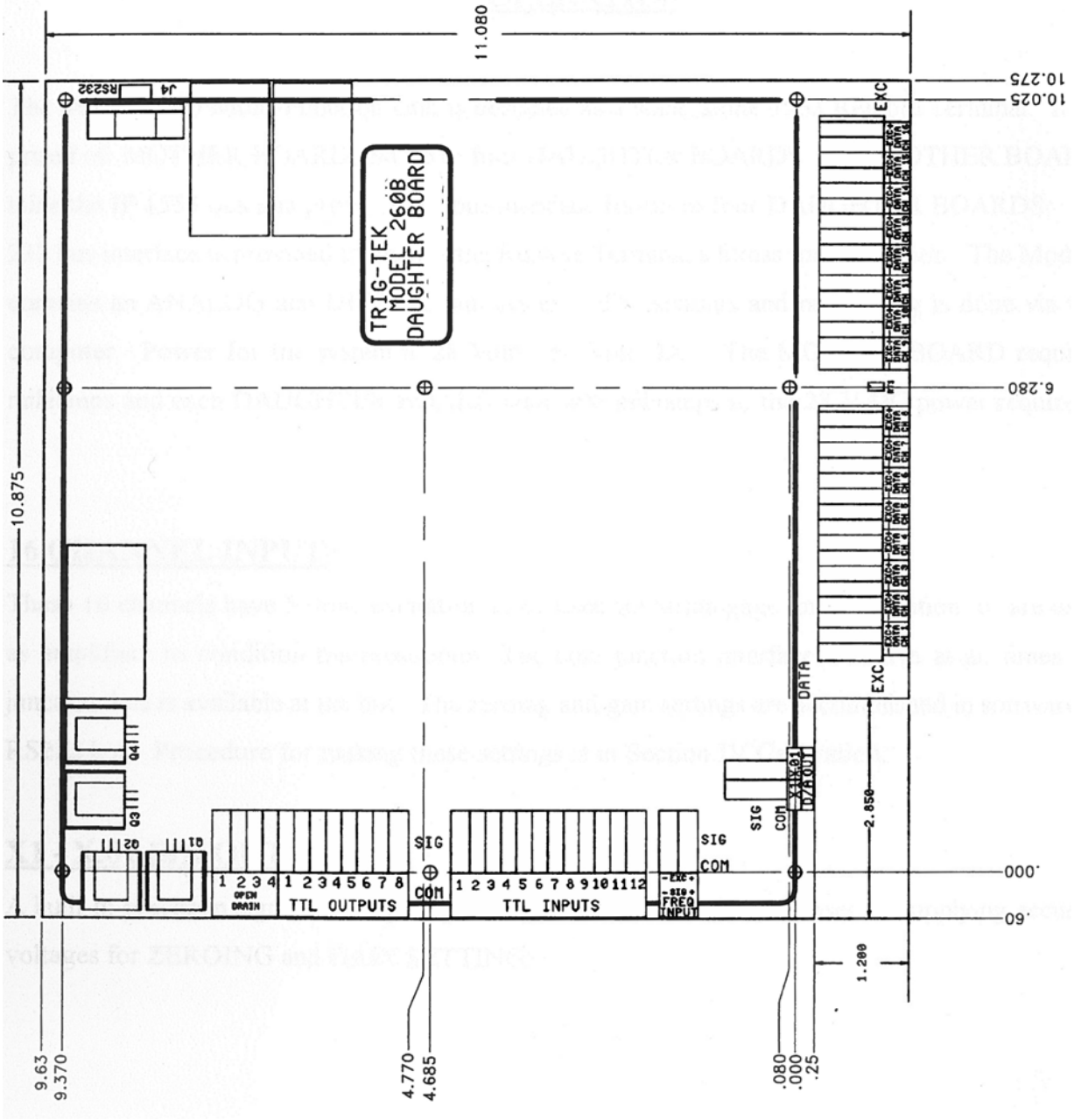

Figure 2-2: Daughter Board Mounting Diagram

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Chapter 3
Operation

The 260B Multi-Function Unit is designed as a stand alone 1553 Remote Terminal. It is comprised of Mother Board and up to four Daughter Boards. The Mother Board contains the IP 1553 bus and provides the bus interface for up to four Daughter Boards. An RS-232 bus interface is provided to change the Remote Terminal address for calibration.

The 260B contains an Analog and Digital sub system. The settings and monitoring is done via the host computer. Power for the system is 28 Volts ±8 Volts DC. The Mother Board requires 125 milliamps and each Daughter Board adds 400 milliamps to the 28 V DC power requirements.

16 Channel Inputs

These 16 channels have 5 Volts excitation to be used for strain gage implementation, or are used only as amplifiers to condition thermocouples. The cold junction interface is active at all times and the junction data is available at the bus. The zeroing and gain settings are accomplished in software via the RS232 bus. Procedure for making these settings is in (**Chapter 4, Channel Calibration**).

X1-X.001 D/A Out

A built-in precision signal D/A signal generator is built in for the purposes of supplying accurate DC voltages for Zeroing and Gain Settings.

Freq Input

The Frequency input will accept signals with levels of 50 mV to 100 Volts RMS in the frequency range of 1 Hz to 25 kHz. The cycle time of the signal is determined by the micro controller and the result sent out via the 1553 bus. The computer does the calculation to derive the frequency in software. Four terminals at the input provide differentials or single-ended operation with 5 Volts available to operate pickup requiring voltage excitation.

TTL Inputs

Each 260B Daughter Board has 12 TTL Inputs marked 1 thru 12. These inputs are read by the controller and the status of each channel is enunciated via the 1553 Bus.

TTL Outputs

Each 260B Daughter Board has 8 TTL outputs marked 1 thru 8, status of these outputs are controlled from the host computer via the 1553 Bus. These outputs will sink or drive 20 milliamps.

Open Drain Outputs

The Board has four open drain outputs. Each will sink up to 2 amps of current and is protected up to 60 Volts. See (**Fig. 3-1**) for proper connections.

The Drain and Source of the FET are brought out on terminals and are floating with respect to digital ground to which the gate is referenced. The purpose for floating the FET source is to assure that solenoid power source has a proper return path as the current may be up to 2 Amps.

If the power source for the solenoid is floating then the FET source must be connected to the Digital ground at the board edge. This should be done by jumpering the Source terminal to the ground terminal of an adjacent digital channel. If the Power Source Ground is common with the digital ground it will provide the source ground.

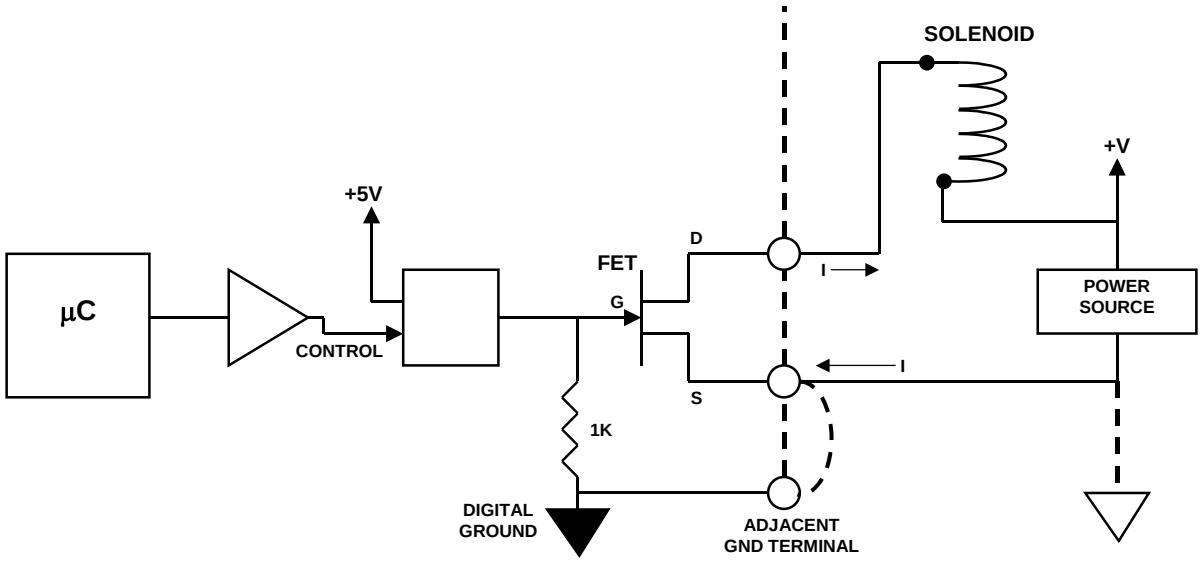

Figure 3-1: Open Drain Port Schematic

Chapter 4
Channel Calibration

There is only one adjustment for the 260B Daughter board (A/D Adjust R1). This adjustment is done at the factory and should not be changed by the user.

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Chapter 5
IP 1533 Bus Specification

The IP 1553 Bus interfaces the 260B (Remote Terminal) to the Host Computer. The Host Computer transfers the SETUP information to the Remote Terminal and monitors and records the data sent from the terminal.

Mode Codes

The 260B Remote Terminal will process all valid commands from either the 1553 Channel A or B. The Bus controller can then retry commands on the opposite channel if the terminal fails to respond.

Transmit Subaddresses

Transmit Subaddresses are used to transmit data words to the Bus Controller. A maximum of 32 16-bit words can be transmitted in a single message. So if the Bus Controller wants to read data words from a subaddress, it sends a "Transmit" command to the Remote Terminal.

Receive Subaddresses

Receive Subaddresses are used to receive data words from the Bus Controller. A maximum of 32 16-bit words can be received in a single message. So if the Bus Controller wants to write data word to subaddresses, it sends a "Receive" command to the Remote Terminal.

Input Data Board 1
Subaddress 3 Transmit 30 Words

Word	Description	Word	Description
1	A/D Channel 1	17	A/D Channel 17
2	A/D Channel 2	18	A/D Channel 18
3	A/D Channel 3	19	A/D Channel 19
4	A/D Channel 4	20	A/D Channel 20
5	A/D Channel 5	21	Period Count 16-Bit MWS
6	A/D Channel 6	22	Period Count 16-Bit LSW
7	A/D Channel 7	23	Nycles
8	A/D Channel 8	24	Digital Input
9	A/D Channel 9	25	Cal Saved Flag 1= Saved 0=Unsaved
10	A/D Channel 10	26	Board 1 Status 0=Ok 1=Error
11	A/D Channel 11	27	Board 1 Installed 0=Missing 1= Installed
12	A/D Channel 12	28	Board 2 Installed 0=Missing 1= Installed
13	A/D Channel 13	29	Board 3 Installed 0=Missing 1= Installed
14	A/D Channel 14	30	Board 4 Installed 0=Missing 1=Installed
15	A/D Channel 15		
16	A/D Channel 16		

Data Word Definition

D/A Channel

Words 1-20 contain I-bit data word from the A/D channel. The format of the data word is:

0x7FFF = +32767 counts = +9.9997 volts

0x0000 = 0 counts = 0.0000 volts

0x8000 = -32768 counts = -10.0 volts

Frequency Input

Words 21 and 22 form a 32-bit integer (Period Count) Word 23 is Ncycles. Input frequency is computed as follows:

Freq= {1/ (Period Count/Ncycles)} x4000000

Digital Input

Word 24 is a bit field of the digital inputs. Bits 0-11 represent digital inputs 1-12. Bits 12-15 are unused and contain zeros.

Cal Saved Flag

The Remote Terminal sets this flag to a 1 after calibration data is saved to nonvolatile memory. The Remote Terminal sets this flag to a 0 when the corresponding Cal Save Request flag is cleared.

Board Status

The Remote Terminal sets this flag to a 1 if an error is detected on a mezzanine board. The Remote Terminal sets this flag to a 0 when a mezzanine board is functioning properly.

Board Installed

The Remote Terminal sets this flag to a 1 when a Daughter Board is installed. The Remote Terminal sets this flag to a 0 when a Daughter Board is missing.

Block Temperature

Word 17 (A/D Channel 17) indicates the block temperature for the Daughter Board (Scale 100 mV = 1°C).

+5 V Reference

Word 18 (A/D Channel 18) represents the +5 V reference for the Daughter Board.

D/A Output

Word 19 (A/D Channel 19) indicates the voltage at the D/A output.

Digital Ground

Word 20 (A/D Channel 20) indicates the ground voltage on the Daughter Board.

Input Data Board 2
Subaddress 4 Transmit 26 Words

Word	Description	Word	Description
1	A/D Channel 1	17	A/D Channel 17
2	A/D Channel 2	18	A/D Channel 18
3	A/D Channel 3	19	A/D Channel 19
4	A/D Channel 4	20	A/D Channel 20
5	A/D Channel 5	21	Period Count 16-Bit MWS
6	A/D Channel 6	22	Period Count 16-Bit LSW
7	A/D Channel 7	23	Ncycles
8	A/D Channel 8	24	Digital Input
9	A/D Channel 9	25	Cal Saved Flag 1=Saved 0=Unsaved
10	A/D Channel 10	26	Board 2 Status 0=Ok 1=Error
11	A/D Channel 11		
12	A/D Channel 12		
13	A/D Channel 13		
14	A/D Channel 14		
15	A/D Channel 15		
16	A/D Channel 16		

Data Word Definition

A/D Channel

Words 1-20 contain I-bit data word from the A/D channel. The format of the data word is:

0x7FFF = +32767 counts = +9.9997 volts

0x0000 = 0 counts = 0.0000 volts

0x8000 = -32768 counts = -10.0 volts

Frequency Input

Words 21 and 22 form a 32-bit integer (Period Count) Word 23 is Ncycles. Input frequency is computed as follows:

Freq= {1/ (Period Count/Ncycles} x4000000

Digital Input

Word 24 is a bit field of the digital inputs. Bits 0-11 represent digital inputs 1-12. Bits 12-15 are unused and contain zeros.

Cal Saved Flag

The Remote Terminal sets this flag to a 1 after calibration data is saved to nonvolatile memory. The Remote Terminal sets this flag to a 0 when the corresponding Cal Save Request flag is cleared.

Board Status

The Remote Terminal sets this flag to a 1 if an error is detected on a Daughter Board. The Remote Terminal sets this flag to a 0 when a Daughter Board is functioning properly.

Block Temperature

Word 17 (A/D Channel 17) indicates the block temperature for the Daughter Board (Scale 100 mV = 1° C).

+5 V Reference

Word 18 (A/D Channel 18) represents the +5 V reference for the Daughter Board.

D/A Output

Word 19 (A/D Channel 19) indicates the voltage at the D/A output.

Digital Ground

Word 20 (A/D Channel 20) indicates the ground voltage on the Daughter Board.

Input Data Board 3
Subaddress 5 Transmit 26 Words

Word	Description	Word	Description
1	A/D Channel 1	17	A/D Channel 17
2	A/D Channel 2	18	A/D Channel 18
3	A/D Channel 3	19	A/D Channel 19
4	A/D Channel 4	20	A/D Channel 20
5	A/D Channel 5	21	Period Count 16-Bit MWS
6	A/D Channel 6	22	Period Count 16-Bit LSW
7	A/D Channel 7	23	Nycles
8	A/D Channel 8	24	Digital Input
9	A/D Channel 9	25	Cal Saved Flag 1= Saved 0=UnSaved
10	A/D Channel 10	26	Board 3 Status 0=Ok 1=Error
11	A/D Channel 11		
12	A/D Channel 12		
13	A/D Channel 13		
14	A/D Channel 14		
15	A/D Channel 15		
16	A/D Channel 16		

Data Word Definition

A/D Channel

Words 1-20 contain 1-bit data word from the A/D channel. The format of the data word is:

0x7FFF = +32767 counts = +9.9997 volts

0x0000 = 0 counts = 0.0000 volts

0x8000 = -32768 counts = -10.0 volts

Frequency Input

Words 21 and 22 form a 32-bit integer (Period Count) Word 23 is Ncycles. Input frequency is computed as follows:

Freq= {1/ (Period Count/Ncycles)} x4000000

Digital Input

Word 24 is a bit field of the digital inputs. Bits 0-11 represent digital inputs 1-12. Bits 12-15 are unused and contain zeros.

Cal Saved Flag

The Remote Terminal sets this flag to a 1 after calibration data is saved to nonvolatile memory. The Remote Terminal sets this flag to a 0 when the corresponding Cal Save Request flag is cleared.

Board Status

The Remote Terminal sets this flag to a 1 if an error is detected on a Daughter Board. The Remote Terminal sets this flag to a 0 when a Daughter Board is functioning properly.

Block Temperature

Word 17 (A/D Channel 17) indicates the block temperature for the Daughter Board (Scale 100 mV = 1° C).

+5 V Reference

Word 18 (A/D Channel 18) represents the +5 V reference for the Daughter Board.

D/A Output

Word 19 (A/D Channel 19) indicates the voltage at the D/A output.

Digital Ground

Word 20 (A/D Channel 20) indicates the ground voltage on the Daughter Board.

Input Data Board 4
Subaddress 6 Transmit 26 Words

Word	Description	Word	Description
1	A/D Channel 1	17	A/D Channel 17
2	A/D Channel 2	18	A/D Channel 18
3	A/D Channel 3	19	A/D Channel 19
4	A/D Channel 4	20	A/D Channel 20
5	A/D Channel 5	21	Period Count 16-Bit MWS
6	A/D Channel 6	22	Period Count 16-Bit LSW
7	A/D Channel 7	23	Nycles
8	A/D Channel 8	24	Digital Input
9	A/D Channel 9	25	Cal Saved Flag 1= Saved 0=UnSaved
10	A/D Channel 10	26	Board 4 Status 0=Ok 1=Error
11	A/D Channel 11		
12	A/D Channel 12		
13	A/D Channel 13		
14	A/D Channel 14		
15	A/D Channel 15		
16	A/D Channel 16		

Data Word Definition

A/D Channel

Words 1-20 contain 1-bit data word from the A/D channel. The format of the data word is:

0x7FFF = +32767 counts = +9.9997 volts

0x0000 = 0 counts = 0.0000 volts

0x8000 = -32768 counts = -10.0 volts

Frequency Input

Words 21 and 22 form a 32-bit integer (Period Count) Word 23 is Ncycles. Input frequency is computed as follows:

Freq= {1/ (Period Count/Ncycles)} x4000000

Digital Input

Word 24 is a bit field of the digital inputs. Bits 0-11 represent digital inputs 1-12. Bits 12-15 are unused and contain zeros.

Cal Saved Flag

The Remote Terminal sets this flag to a 1 after calibration data is saved to nonvolatile memory. The Remote Terminal sets this flag to a 0 when the corresponding Cal Save Request flag is cleared.

Board Status

The Remote Terminal sets this flag to a 1 if an error is detected on a Daughter Board. The Remote Terminal sets this flag to a 0 when a Daughter Board is functioning properly.

Block Temperature

Word 17 (A/D Channel 17) indicates the block temperature for the Daughter Board (Scale 100 mV = 1°C).

+5 V Reference

Word 18 (A/D Channel 18) represents the +5 V reference for the Daughter Board.

D/A Output

Word 19 (A/D Channel 19) indicates the voltage at the D/A output.

Digital Ground

Word 20 (A/D Channel 20) indicates the ground voltage on the Daughter Board.

Output Data Board 1-4
Subaddress 3 Receive 12 Words

Word	Description
1	D/A Channel Board 1
2	D/A Channel Board 2
3	D/A Channel Board 3
4	D/A Channel Board 4
5	Digital Output Board 1
6	Digital Output Board 2
7	Digital Output Board 3
8	Digital Output Board 4
9	Board 1 CAL Save Request Flag 1=Save Request 0=No Request
10	Board 2 CAL Save Request Flag 1=Save Request 0=No Request
11	Board 3 CAL Save Request Flag 1=Save Request 0=No Request
12	Board 4 CAL Save Request Flag 1=Save Request 0=No Request

Data Word Definition

A/D Channel

Words 1-4 contain 16-bit data to send to the D/A channel for boards 1-4. The format of the data word is:

0x7FFF = +32767 counts = +9.9997 volts

0x0000 = 0 counts = 0.0000 volts

0x8000 = -32768 counts = -10.0 volts

Digital Input

Word 5-8 is a bit field of the digital outputs for boards 1-4. Bits 0-11 represent digital inputs 1-12. Bits 12-15 are unused and contain zeros.

Calibration Save Request Flags

Words 9-12 are used as calibration save request flags for boards 1-4. The Bus controller shall populate Remote Terminal subaddresses 7-14 prior to setting any of the calibration save flags. The Bus controller shall set a flag to a 1 indicating to the Remote Terminal that calibration data should be saved. The Bus Controller shall set a flag to a 0 when the Remote Terminal sets a corresponding CAL SAVED flag.

Calibration Data Board 1
Subaddress 7 Receive/Transmit 21 Words

Word	Description	Word	Description
1	A/D 1 Offset	17	A/D 17 Offset
2	A/D 2 Offset	18	A/D 18 Offset
3	A/D 3 Offset	19	A/D 19 Offset
4	A/D 4 Offset	20	A/D 20 Offset
5	A/D 5 Offset	21	D/A 1 Offset
6	A/D 6 Offset		
7	A/D 7 Offset		
8	A/D 8 Offset		
9	A/D 9 Offset		
10	A/D 10 Offset		
11	A/D 11 Offset		
12	A/D 12 Offset		
13	A/D 13 Offset		
14	A/D 14 Offset		
15	A/D 15 Offset		
16	A/D 16 Offset		

Offset
16-bit signed integer offset in counts

Calibration Data Board 1
Subaddress 8 Receive/Transmit 21 Words

Word	Description	Word	Description
1	A/D 1 Slope	17	A/D 17 Slope
2	A/D 2 Slope	18	A/D 18 Slope
3	A/D 3 Slope	19	A/D 19 Slope
4	A/D 4 Slope	20	A/D 20 Slope
5	A/D 5 Slope	21	D/A 1 Slope
6	A/D 6 Slope		
7	A/D 7 Slope		
8	A/D 8 Slope		
9	A/D 9 Slope		
10	A/D 10 Slope		
11	A/D 11 Slope		
12	A/D 12 Slope		
13	A/D 13 Slope		
14	A/D 14 Slope		
15	A/D 15 Slope		
16	A/D 16 Slope		

Slope
16-bit unsigned integer slope fraction. Scaling=2.0/65536.0

Calibration Data Board 2
Subaddress 9 Receive/Transmit 21 Words

Word	Description	Word	Description
1	A/D 1 Offset	17	A/D 17 Offset
2	A/D 2 Offset	18	A/D 18 Offset
3	A/D 3 Offset	19	A/D 19 Offset
4	A/D 4 Offset	20	A/D 20 Offset
5	A/D 5 Offset	21	D/A 1 Offset
6	A/D 6 Offset		
7	A/D 7 Offset		
8	A/D 8 Offset		
9	A/D 9 Offset		
10	A/D 10 Offset		
11	A/D 11 Offset		
12	A/D 12 Offset		
13	A/D 13 Offset		
14	A/D 14 Offset		
15	A/D 15 Offset		
16	A/D 16 Offset		

Offset
16-bit signed integer offset in counts

Calibration Data Board 2
Subaddress 10 Receive/Transmit 21 Words

Word	Description	Word	Description
1	A/D 1 Slope	17	A/D 17 Slope
2	A/D 2 Slope	18	A/D 18 Slope
3	A/D 3 Slope	19	A/D 19 Slope
4	A/D 4 Slope	20	A/D 20 Slope
5	A/D 5 Slope	21	D/A 1 Slope
6	A/D 6 Slope		
7	A/D 7 Slope		
8	A/D 8 Slope		
9	A/D 9 Slope		
10	A/D 10 Slope		
11	A/D 11 Slope		
12	A/D 12 Slope		
13	A/D 13 Slope		
14	A/D 14 Slope		
15	A/D 15 Slope		
16	A/D 16 Slope		

Slope
16-bit unsigned integer slope fraction. Scaling=2.0/65536.0

Calibration Data Board 3
Subaddress 11 Receive/Transmit 21 Words

Word	Description	Word	Description
1	A/D 1 Offset	17	A/D 17 Offset
2	A/D 2 Offset	18	A/D 18 Offset
3	A/D 3 Offset	19	A/D 19 Offset
4	A/D 4 Offset	20	A/D 20 Offset
5	A/D 5 Offset	21	D/A 1 Offset
6	A/D 6 Offset		
7	A/D 7 Offset		
8	A/D 8 Offset		
9	A/D 9 Offset		
10	A/D 10 Offset		
11	A/D 11 Offset		
12	A/D 12 Offset		
13	A/D 13 Offset		
14	A/D 14 Offset		
15	A/D 15 Offset		
16	A/D 16 Offset		

Offset
16-bit signed integer offset in counts

Calibration Data Board 3
Subaddress 12 Receive/Transmit 21 Words

Word	Description	Word	Description
1	A/D 1 Slope	17	A/D 17 Slope
2	A/D 2 Slope	18	A/D 18 Slope
3	A/D 3 Slope	19	A/D 19 Slope
4	A/D 4 Slope	20	A/D 20 Slope
5	A/D 5 Slope	21	D/A 1 Slope
6	A/D 6 Slope		
7	A/D 7 Slope		
8	A/D 8 Slope		
9	A/D 9 Slope		
10	A/D 10 Slope		
11	A/D 11 Slope		
12	A/D 12 Slope		
13	A/D 13 Slope		
14	A/D 14 Slope		
15	A/D 15 Slope		
16	A/D 16 Slope		

Slope
16-bit unsigned integer slope fraction. Scaling=2.0/65536.0

Calibration Data Board 4
Subaddress 13 Receive/Transmit 21 Words

Word	Description	Word	Description
1	A/D 1 Offset	17	A/D 17 Offset
2	A/D 2 Offset	18	A/D 18 Offset
3	A/D 3 Offset	19	A/D 19 Offset
4	A/D 4 Offset	20	A/D 20 Offset
5	A/D 5 Offset	21	D/A 1 Offset
6	A/D 6 Offset		
7	A/D 7 Offset		
8	A/D 8 Offset		
9	A/D 9 Offset		
10	A/D 10 Offset		
11	A/D 11 Offset		
12	A/D 12 Offset		
13	A/D 13 Offset		
14	A/D 14 Offset		
15	A/D 15 Offset		
16	A/D 16 Offset		

Offset
16-bit signed integer offset in counts.

Calibration Data Board 4
Subaddress 14 Receive/Transmit 21 Words

Word	Description	Word	Description
1	A/D 1 Slope	17	A/D 17 Slope
2	A/D 2 Slope	18	A/D 18 Slope
3	A/D 3 Slope	19	A/D 19 Slope
4	A/D 4 Slope	20	A/D 20 Slope
5	A/D 5 Slope	21	D/A 1 Slope
6	A/D 6 Slope		
7	A/D 7 Slope		
8	A/D 8 Slope		
9	A/D 9 Slope		
10	A/D 10 Slope		
11	A/D 11 Slope		
12	A/D 12 Slope		
13	A/D 13 Slope		
14	A/D 14 Slope		
15	A/D 15 Slope		
16	A/D 16 Slope		

Slope
16-bit unsigned integer slope fraction. Scaling=2.0/65536.0