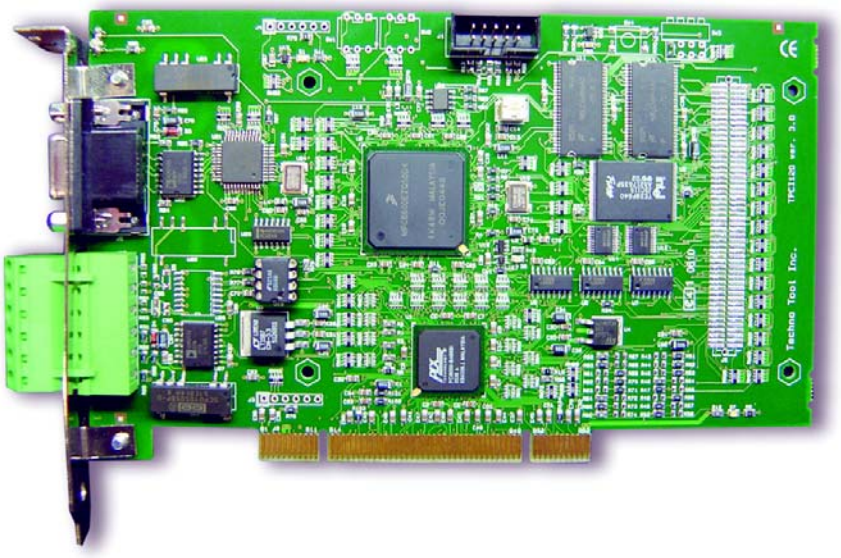
TECHNA-CHECK® **MODEL TCPCI120**



TCPCI120 Hardware Installation Manual

Updated November 2009
Released: January 2006

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1. TCPCI120 Technical Specification

Technical Specification:

PCI	**PCI rev. 2.2 - 32bit 33/66MHz.**
Operating System	**Windows XP**
Minimum System	**1Ghz Pentium 512MB RAM**
Profibus Dp	**DPV1 Interface (9pin Dsub).**
Proprietory Bus	**TTBUS (Phoenix Connector)**

1.1 Tool Monitoring System Overview

The main component of the PCI system is a PCI card which will always need to be inserted into a computer. The PCI card could be inserted into a CNC controller which is Windows XP based and has available PCI slots. The card could also be used in a stand alone PC (desktop) or Industrial PC installed in the machine.

The TCPCI120 interfaces the Tool Monitoring System to the Machine NC-Controller and to different types of Tool Monitor sensors. The TCPCI120 is thus basically a communication controller; the actual Tool-Monitoring is realized by the application TTMON, running on the PC. TTMON implements a maximum of a 20 channel (spindle) Tool Monitoring System with the capability of monitoring 128 cuts per channel.

1.2 The Tool Monitoring 'System' Concept

The Tool Monitoring System provides a common interface to different types of Tool Monitoring Sensors. Monitoring is based on either ***Power*** or ***Vibration***. The NC-controller provides control signals (Start, Learn and Reset), Cut Number and in some cases Measurement Values to the Tool Monitoring System. The Tool Monitoring System returns Alarms in case of Tooling Faults.

In this way the details about the operation of the various Tool Monitoring Functions are effectively hidden by the NC-controller.

The actual operation of the Tool-Monitoring PC-application **TTMON** is covered in a separate user manual.

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2. PCI-Board Installation

The TCPCI120 Board is a Plug ‘n’ Play (PnP) board and will be recognized by Windows XP during the first operating system boot after the board has been installed.

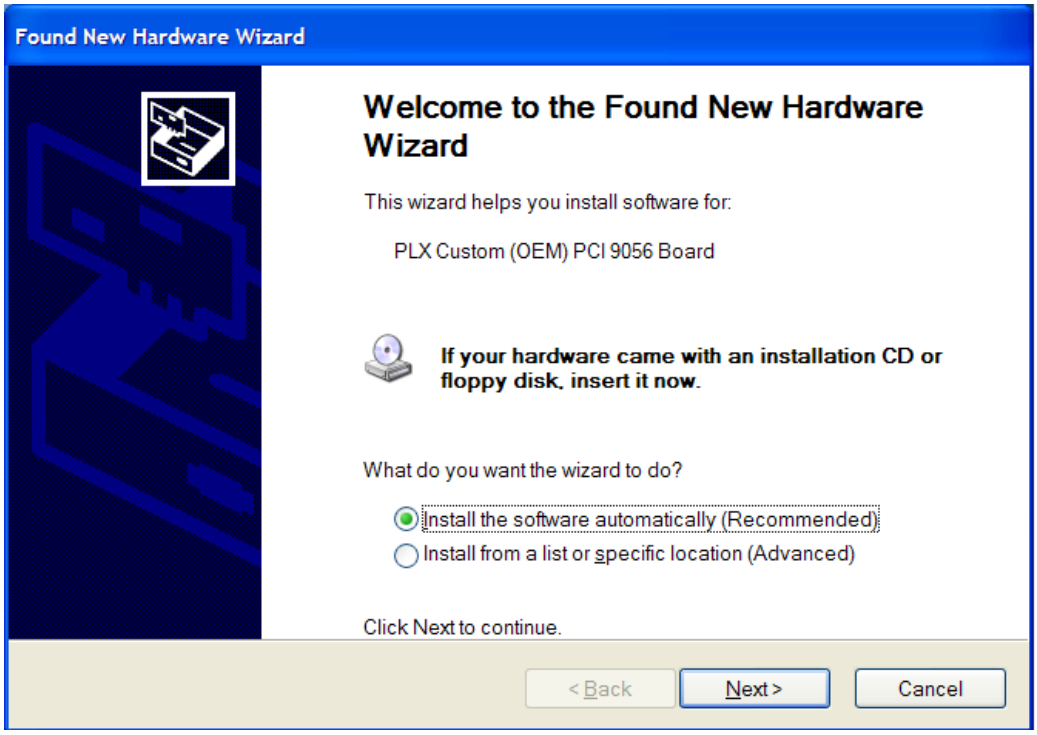
The TCPCI120 Board uses a Windows WDM driver supplied by PLX Corporation (the designer of the PCI-interface chip). The PLX-supplied ***PciSdk.inf*** file provides Windows with the necessary information to install the driver.

When the PC boots and the board is found you should see this:

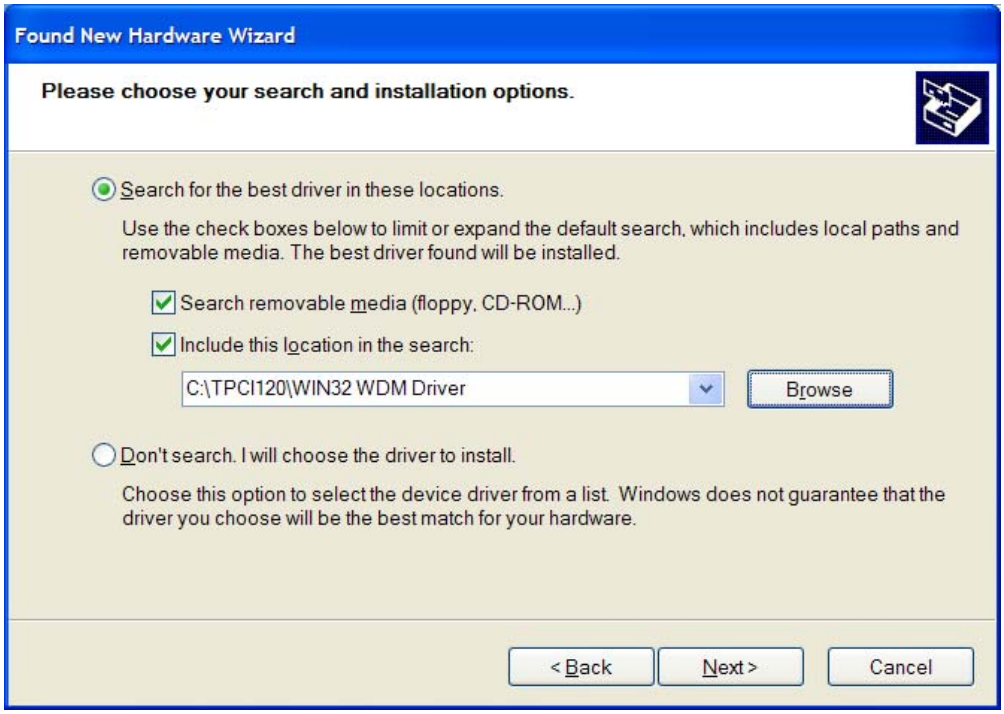
1. Windows detects the new hardware and generates a “*New Hardware Found*” message box. Acknowledge the message box.

2. Windows the displays the “Add New Hardware” Wizard, which will search for a suitable driver for the board.

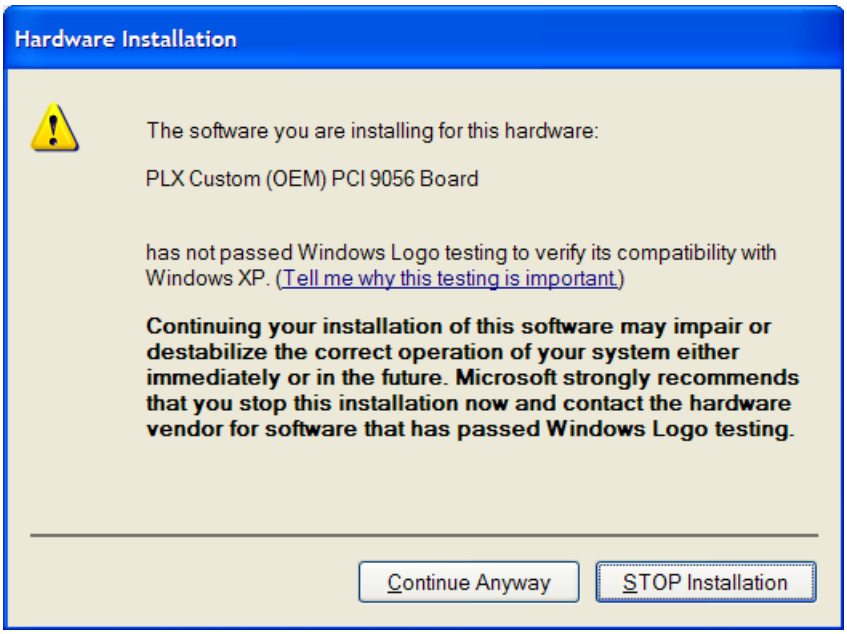
3. The board is recognized as a **PCI Bridge** or **Other PCI Bridge Device**. Click ***Next.***



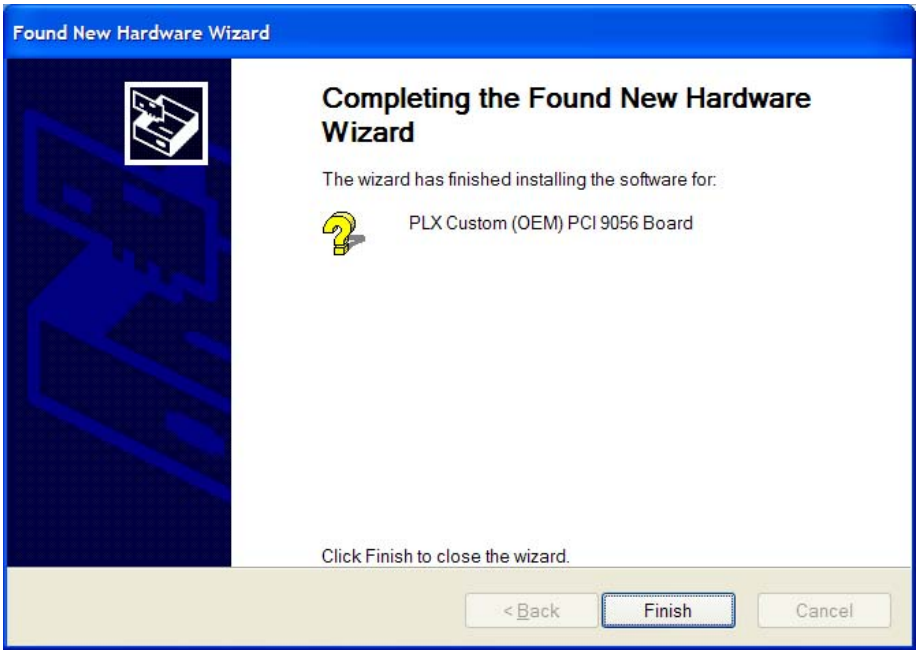
4. Select ***Install from a list or specific location (Advanced).*** Click ***Next***



5. Browse for the Driver Location. Click ***Next***.

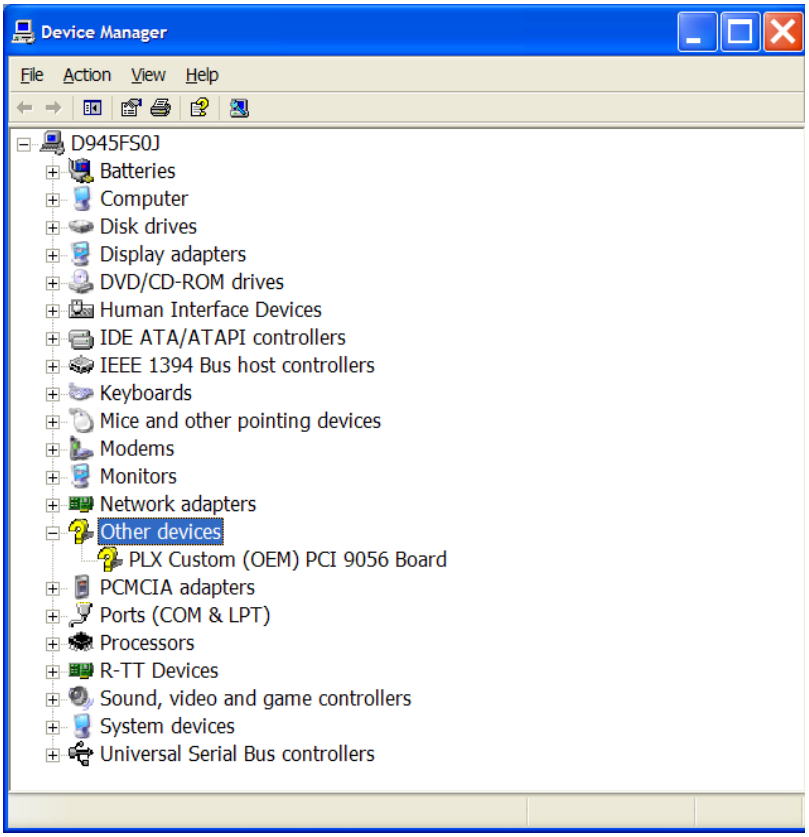


6. The driver was submitted to Microsoft for so called ***Driver Signing***. Please Select "*Continue Anyway*".

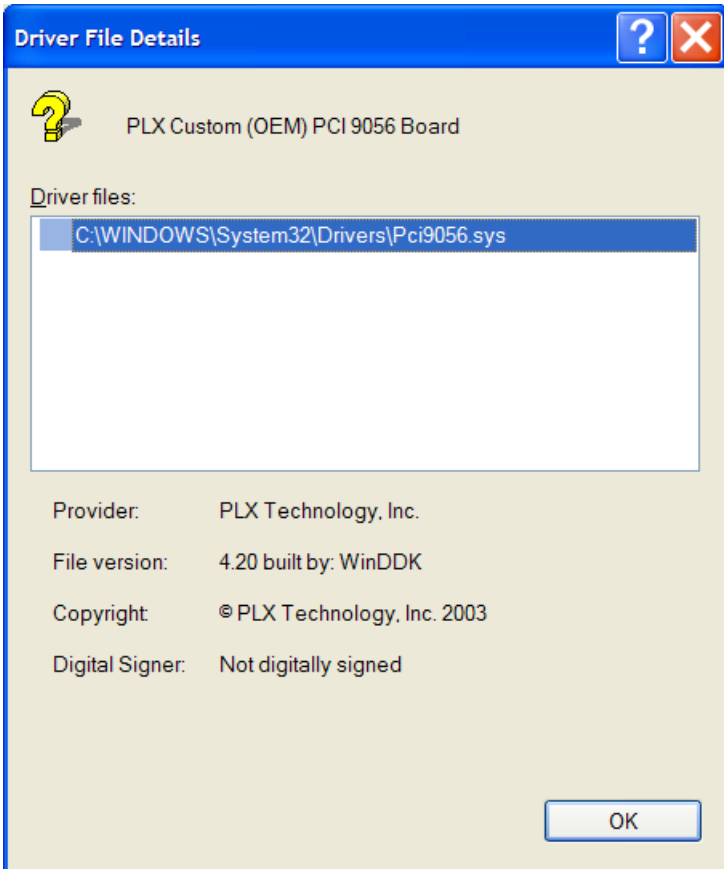


7. Driver installed successfully.

The driver can now be found in device manager as ***Other devices*** - ***PLC Custom (OEM) PCI 9056 Board***.



Driver Information.



3. TTBUS Networking

The TTBUS is a Proprietory Communication Bus designed to interface multiple Measurement Transducers and/or Digital I/O units to the Tool-Monitoring-System. The TTBUS is based upon traditional RS485 hardware.

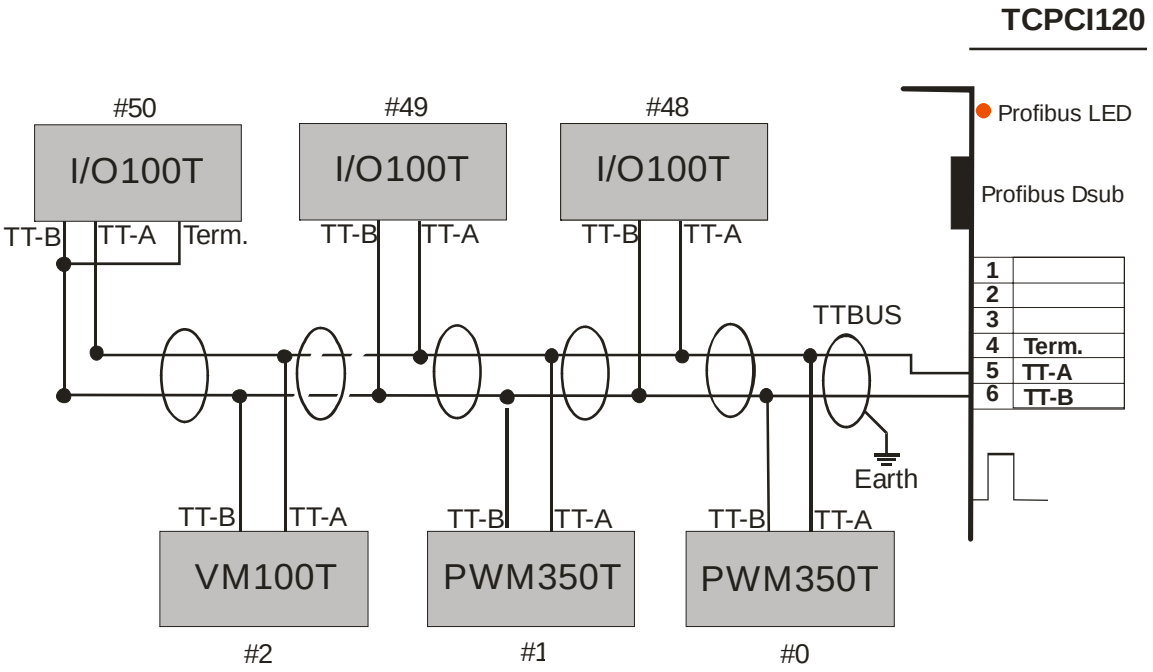
Today 3 different TTBUS devices have been developed.

PWM350T	**3-Phase Power Transducer**
VM100T	**Vibration Sensor Interface Unit**
I/O100T	**Digital I/O Unit**.

In the future other type of sensors may be added.

Detailed specifications of the TTBUS units are found in the appendices of this manual. Each TTBUS unit is assigned a unique address on the network. The address is programmed by 2 BCD switches located on the front of the transducers. The Tool Monitoring System automatically locates transducers on the TTBUS. A Channel Mapping menu in TTMON is used to map the different transducers to the different channels.

3.1 TTBUS Wiring



Important note:
Please use **good-quality** low-resistance twisted and shielded cable earth-connected at one or both ends for the TTBUS network.
Last unit in the TTBUS network chain **must** be terminated.
Termination is possible in all units by adding external wire.
Make the stubs as short as possible.

4. Profibus Networking

4.1 Profibus Cycle-Time Considerations

The Profibus cycle time should be a maximum of 10 -15 ms (milliseconds) equal to 67 – 100 profibus telegram transfers per second. To achieve this a Profibus transmission speed (baud rate) of 1Mb and higher is probably required. If this requirement is not met the synchronization from cycle to cycle is affected and also measurement accuracy may be lost (if the measurement value is supplied from the Profibus network).

4.2 The output telegram from the Profibus Master to the TCPCI120

The output telegram length is always 80 bytes - 4 bytes for each channel. Data is always sent for 20 channels no matter how many channels are actually used. Data sent for channels not present should be zero. The purpose of the output telegram is to supply control signals, cut number and possibly measurement value to the TCPCI120 Tool Monitoring System.

Telegram Format:

BitFlags#1, Measurement#1, CutNumber#1,BitFlags#2, Measurement#2, CutNumber#2, …… BitFlags#20, Measurement#20, CutNumber#20

Telegram Data-Byte Numbering:

Byte No		
0	**BitFlags#1**	Channel #1 – 8 bits
1, 2	**Measurement#1**	Channel #1 – 16 bits
3	**CutNumber#1**	Channel #1 – 8 bits
4	**BitFlags#2**	Channel #2 – 8 bits
5, 6	**Measurement#2**	Channel #2 – 16 bits
7	**CutNumber#2**	Channel #2 – 8 bits
…..		
76	**BitFlags#20**	Channel #20 – 8 bits
77, 78	**Measurement#20**	Channel #20 – 16 bits
79	**CutNumber#20**	Channel #20 – 8 bits

BitFlags# - b7b6b5bb3b2b1b0

```
#define PROFIBUS_MODE_MASK
   (PROFIBUS_MODE1 | PROFIBUS_MODE2 | PROFIBUS_MODE3) // b6b5b4

// PROFIBUS - bit_signals –
   Externally Generated Signals - Inputs
#define START_SIGNAL_ACTIVATED       0x01   // b0 = Start Signal
#define LEARN_SIGNAL_ACTIVATED       0x02    // b1 = Learn Signal
#define RESET_ALARM_SIGNAL_ACTIVATED 0x04    // b2 = Reset Signal
#define PROFIBUS_SPARE               0x08    // b3 = not used
#define PROFIBUS_MODE1               0x10    // b4 = Profibus mode
#define PROFIBUS_MODE2               0x20    // b3 = Profibus mode
#define PROFIBUS_MODE3               0x40    // b2 = Profibus mode
#define PROFIBUS_UNIT_PRESENT        0x80    // b1 = Channel Present
```

Measurement# – 2 Byte MSB, LSB
16 bit measurement value 0 – 1000 decimal = 0.0 – 100.0%

CutNumber# – 1 Byte

4.3 The input telegram from TCPCI120 to the Profibus Master

The input telegram (to the Profibus Master) is always 20 bytes long – 1 byte for each channel. Channel #1 is first and Channel #20 is the last byte. The purpose of the inputs is to report Alarms and other status information to the master (NC controller).

Telegram Format:

InputFlags#1, InputsFlags#2 …… InputFlags#20

InputFlags - b7b6b5bb3b2b1b0

```
#define ACTIVE_READY        0x01  // b0 = Po Measured or Touched
                                      (BK MICRO)
#define SPARE1              0x02  // b1 = bit not used
#define TOUCHED             0x04  // b2 = Touched
#define IDLE_ALARM          0x08  // b3 = IDLE_ALARM
#define BLUNTCOUNT_ALARM    0x10  // b4 = BLUNTCOUNT_ALARM
#define MISSING_ALARM       0x20  // b5 = MISSING_ALARM
#define BLUNT_ALARM         0x40  // b6 = BLUNT_ALARM
#define BREAK_ALARM         0x80  // b7 = BREAK ALARM
```

ACTIVE_READY
This bit is set when the Tool Monitoring becomes active.
Example1: Start Signal has been activated and Idle Power calculated.
Example2: Target tool has been checked for presence – future BK Mikro application.
In some cases cycle time can be saved by waiting for this bit to get activated before the tool feeds towards the target. The alternative (or maybe traditional way) is to introduce a fixed delay large enough until Idle Power has been calculated.

SPARE1
Not used.

TOUCHED
Is used with the Touch-Limit function and set when the tool touches the part – signal reaches the touch-limit.

IDLE_ALARM
Signals the presence of an IDLE_ALARM.

BLUNTCOUNT_ALARM
Signals the presence of a BLUNTCOUNT_ALARM.

MISSING_ALARM
Signals the precense of a MISSING_ALARM.

BLUNT_ALARM
Signals the precense of a BLUNT_ALARM.

BREAK_ALARM
Signals the precense of a BREAK_ALARM.

4.3 The Profibus GSD File TPCI0A0B.GSD

```
; ============================================================
; Techna Tool Inc.
;
; File : TPCI0A0B.GSD
; Revision : 1.0
; Last Modification : 05/09/2005
; ============================================================
;
#Profibus_DP
; General device information
GSD_Revision            = 1
Vendor_Name             = "Techna Tool Inc."
Model_Name              = "TPCI120"
Revision                = "V1.0"
Ident_Number            = 0x0A0B
Protocol_Ident          = 0         ; 0 = PROFIBUS-DP only
Station_Type            = 0         ; 0 = DP-Slave
FMS_supp                = 0         ; FMS is not supported
Hardware_Release        = "A1"
Software_Release        = "V1.0"

; Supported baudrates
9.6_supp                = 1
19.2_supp               = 1
45.45_supp              = 1
93.75_supp              = 1
187.5_supp              = 1
500_supp                = 1
1.5M_supp               = 1
3M_supp                 = 1
6M_supp                 = 1
12M_supp                = 1

; MaxTsdr default values for supported baudrates
MaxTsdr_9.6             = 60
MaxTsdr_19.2            = 60
MaxTsdr_45.45           = 60
MaxTsdr_93.75           = 60
MaxTsdr_187.5           = 60
MaxTsdr_500             = 100
MaxTsdr_1.5M            = 150
MaxTsdr_3M              = 250
MaxTsdr_6M              = 450
MaxTsdr_12M             = 800

; General supported features
Redundancy              = 0         ; Redundancy not supported
Repeater_Ctrl_Sig       = 2         ; RTS Signal with TTL level
24V Pins                = 0         ;
Implementation_Type     = "ASIC_solution, VPC3+"
```

```
; DP Slave related information
Freeze_Mode_supp        = 0         ; Freeze-Mode not supported
Sync_Mode_supp          = 0         ; Sync.-Mode not supported
Auto_Baud_supp          = 1         ; Automatic baud control supported
Max_Diag_Data_Len       = 6
Set_Slave_Add_supp      = 0         ; Set Slave address not supported
User_Prm_Data_Len       = 05        ;
Min_Slave_Intervall     = 5         ; 500us
Slave_Family            = 1@TT@TPCI

; Modules information
Modular_Station         = 0
Max_Module              = 1
Max_Input_Len           = 20
Max_Output_Len          = 80
Max_Data_Len            = 100

Module = "80 Byte out/ 20 Byte In" 0x2f,0x2f,0x2f,0x2f,0x2f,0x1f,0x13

EndModule
```

Appendix A. PWM350T Technical Specification

TECHNA-CHECK® *PWM350T Load Transducer*

Power Transducer for 3-phase Inductive Loads

A fast measurement transducer specifically developed for Machine Tool Monitoring applications.

PWM350T measures motor power, kW.

- **TTBUS Networked Unit**
- **4 Remotely Programmable Measurement Ranges**
- **Remotely Programmable Averaging**

Power Measurement

4 quadrant analogue multiplication.
Measures power after variable frequency inverter.

Ultra Compact DIN rail mount

Less than 2" of rail space.

Current wires feeds through 3 holes in unit

3 internal 50 Amp. current sensors.

Monitor any size motor

(external CT >50Amp.)

Technical Specification

Mechanical

Housing:	Polycarbonate.
Mounting:	35 mm DIN-rail.
Protection Class:	IP40.
Temp. Range:	-15 to + 50 C.
Weight:	App. 500g (1 lb).
Dimensions:	D 118 x B 45 x H 137,5 mm.
Connections:	Max 2,5 mm^2 (AVG 24).

Electrical

Voltage Input:	3 x 0-500 V PWM (0-600V max).
Current Input:	3 x 50 Amp. 5Hz - 5kHz or 3 x 25 Amp. 5Hz - 5kHz or 3 x 12,5 Amp. 5Hz - 5kHz see side label for actual range
Power Range:	0 - 43.3 kW.
Supply:	18-36 V DC max. 2.5 Watt.
TTBUS:	RS485 electrically isolated.

Measurement Ranges

The Measurement range is programmable from the TTBUS.

Unit Type	3 x 50 A .	3 x 25 A.	3 x 12,5 A
100%	43.3 kW	21,7 kW	10,8 kW
50%	21.7 kW	10,8 kW	5,42 kW
20%	8.66 kW	4,33 kW	2,17 kW
5%	2.17 kW	1,08 kW	0,54 kW

The PWM350T is designed primarily for measuring the power delivered to motors by variable frequency inverters. Power is measured from the formula:

$$P = \sqrt{3} \times U \times I \times \cos\varphi$$

The PWM350T Power Transducer is specifically developed to function as a load transducer for the ***TECHNA CHECK***® Range of Machine Tool Monitors.

The PWM350T is available as a 3 x 50 Amp, 3 x 25 Amp or a 3 x 12,5 Amp transducer.

The three motor wires U, V and W **must** pass through the holes in the transducer in the **same direction** to the motor either from Top-Bottom or from Bottom-Up.

Note: The PWM350T is designed for use with inductive loads only (motors).

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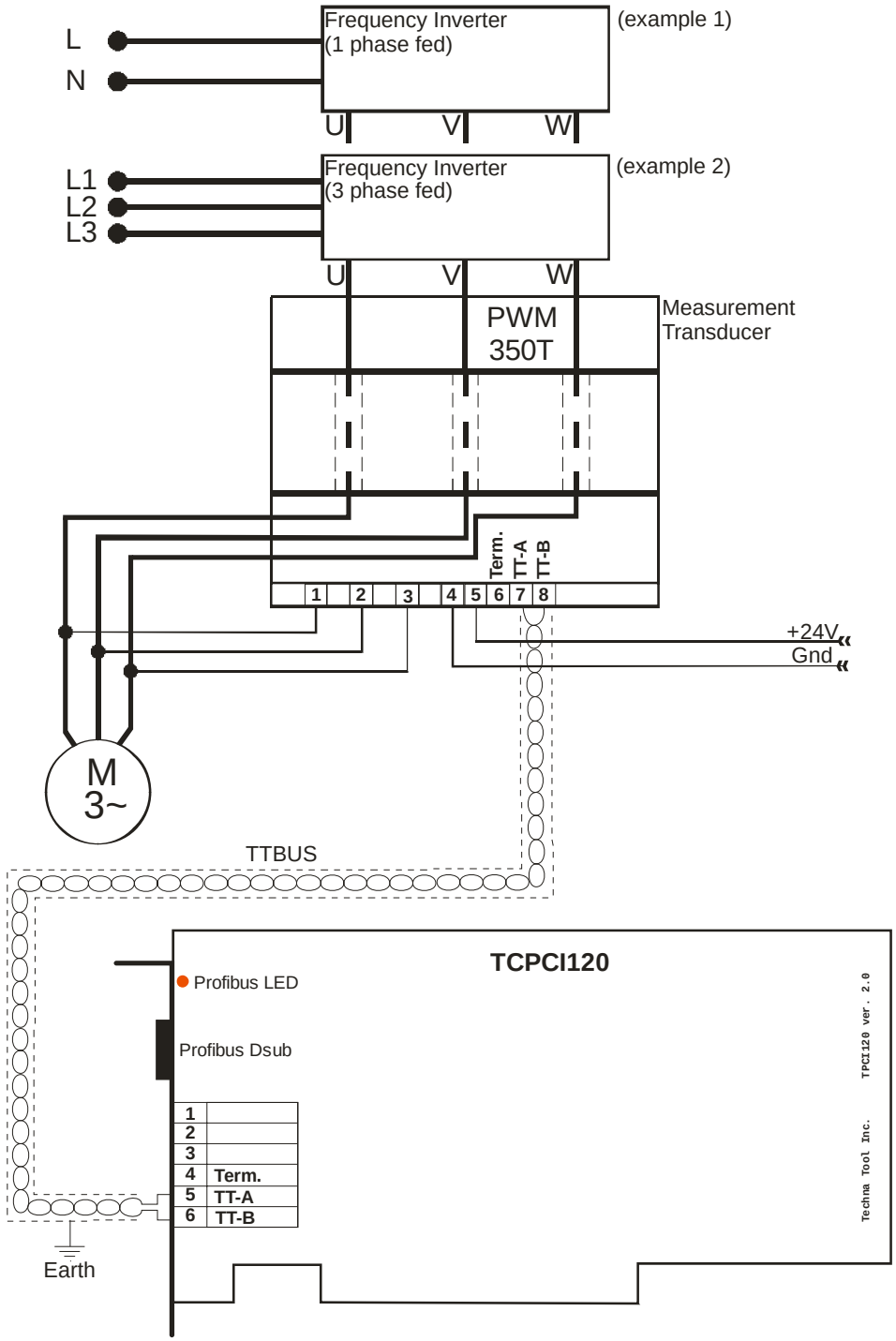


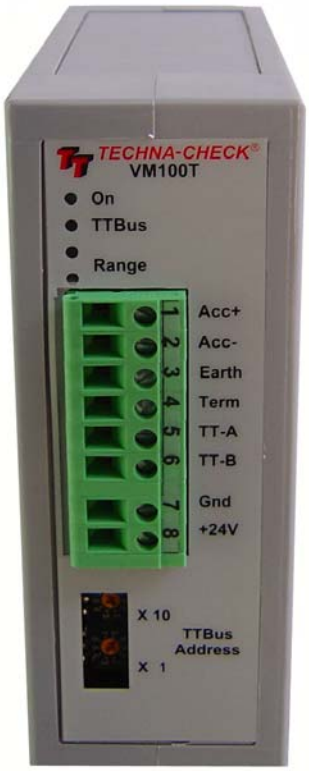
Note!
Please use **good-quality** low-resistance twisted and shielded cable earth-connected at one or both ends for the TTBUS network.
Last unit in the TTBUS network chain **must** be terminated.
Please connect a wire between terminal 6 and 8 on the PWM350T (the TTBUS slave) when termination is required

Appendix B. VM100T Technical Specifications

TECHNA-CHECK® *VM100T Vibration Interface*

Vibration Sensor Interface

A measurement transducer, which provides Vibration Monitoring for the ***TECHNA-CHECK®*** *units.*



VM100T measures vibration (acceleration).

- TTBUS Networked Unit
- 4 Remotely Programmable Measurement Ranges
- 4 Remotely Programmable RMS averaging periods
- Remotely Programmable filters

Technical Specification

Mechanical

Housing:	Polycarbonate.
Mounting:	35 mm DIN-rail.
Protection Class:	IP40.
Temp. Range:	-15 to + 50 C.
Weight:	App. 300g (1 lb).
Dimensions:	D 118 x B 45 x H 137,5 mm.
Connections:	Max 2,5 mm^2 (AVG 24).

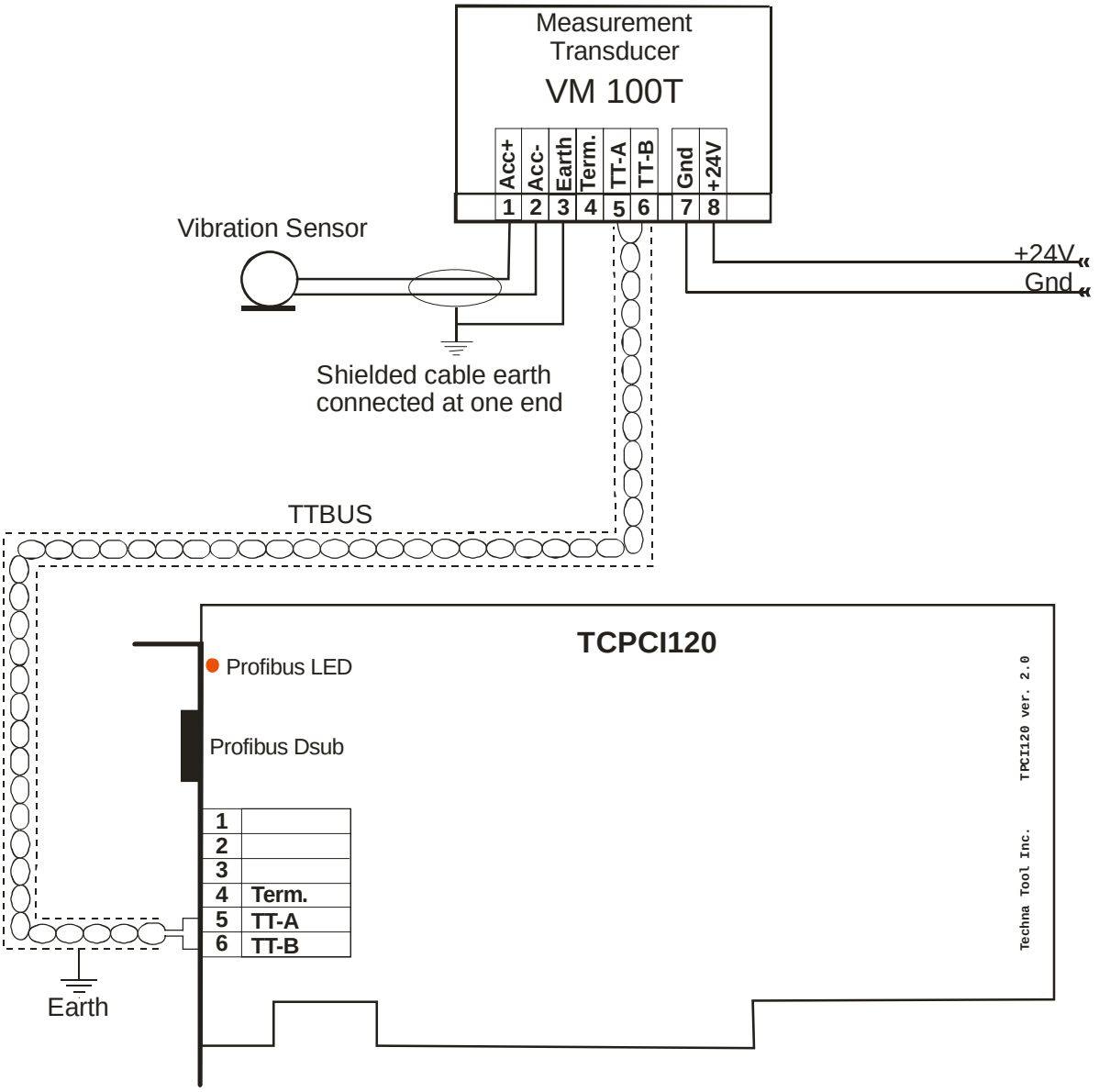
Electrical

Sensor Input:	Proprietory. Sensor supplied with unit.
Vibration Range:	+- 0.5G, 0 - 1000 Hz
Supply:	18-24 V DC max. 2.5 Watt.
TTBUS:	RS485.

The VM100T interfaces a propriety acceleration sensor to the existing ***TECHNA-CHECK®*** range of Machine Tool Monitors.

The purpose of the vibration monitoring is to catch the damage of a tool like a milling cutter, which has damaged one of its inserts. When one insert is broken the next insert is forced to cut twice the amount of material, which will generate machine vibrations to be picked up by the VM100T.

Another application is to protect high-speed spindles against operation with an unbalanced tool, which may lead to rapid wearing and destruction of the spindle bearings.



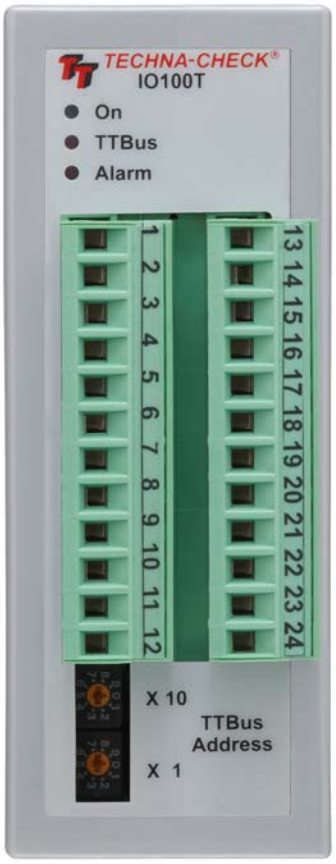
Note!
Please use **good-quality** low-resistance twisted and shielded cable earth-connected at one or both ends for the TTBUS network.
Last unit in the TTBUS network chain **must** be terminated.
Please connect a wire between terminal 4 and 6 on the VM100T (the TTBUS slave) when termination is required

Appendix C. IO100T Technical Specifications

TECHNA-CHECK® *IO100T Digital I/O Interface*

Parallel Digital I/O Interface

An interface unit which interfaces traditional parallel I/O to the ***TECHNA CHECK***® TPCI120 unit.



IO100T features.

- TTBUS Networked Unit
- 3 Relay Alarm Outputs
- 7 Digital Inputs for Cut-Number
- Digital Input for START and RESET

Technical Specification

Mechanical

Housing:	Polycarbonate.
Mounting:	35 mm DIN-rail.
Protection Class:	IP40.
Temp. Range:	-15 to + 50 C.
Weight:	App. 300g (1 lb).
Dimensions:	D 118 x B 45 x H 137,5 mm.
Connections:	Max 2,5 mm^2 (AVG 24).

Electrical

Digital Inputs:	10-30 VDC.
Relay Outputs:	250 VAC max, 5 A max.
Sensor Input:	Proprietory. Sensor supplied with unit.
Supply:	18-24 V DC max. 2.5 Watt.

The IO100T interfaces traditional NC-controllers, which are not Profibus capable, to the ***TECHNA CHECK***® TPCI120 Tool-Monitor-System.

It is possible for multiple channels (spindles) to share a single IO100T. Could be a round-table machine where all stations changes operation (production change) simultaneously. In this case the alarms outputs is the logical OR of alarms generated by the channels. Thus if one channels makes an alarm the corresponding alarms relay is activated.

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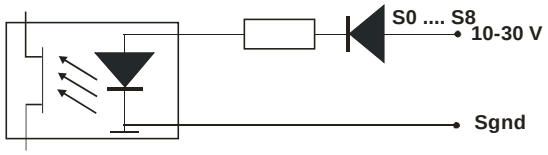
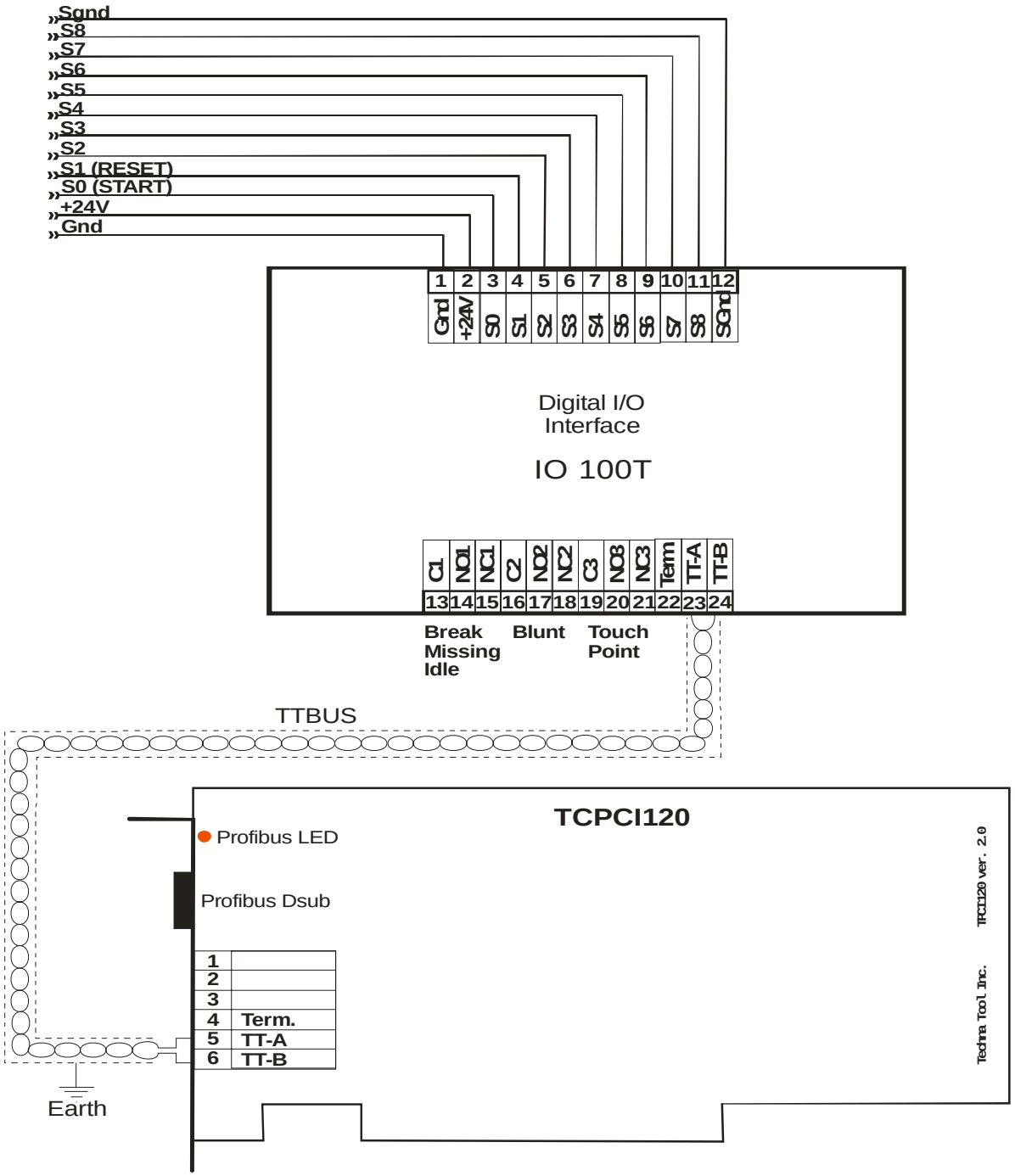
Digital inputs S0 - S8





Note!
Please use good-quality twisted pair and shielded cable, earth-connected at one or both ends for the TTBUS network.
Last unit in the TTBUS network chain must be terminated.
Please connect a wire between terminal 22 and 24 on the IO100T (the TTBUS slave), when termination is required.