PANTHER® PLUS

Terminal

Technical Manual

B15527000A
10/00

METTLER TOLEDO is recognized around the world for manufacturing and marketing high quality scales and weighing systems. With roots tracing back to 1901, the company takes pride in its long established record of employing innovation, technology, and a close working relationship with its customers to meet the diverse needs of the global marketplace. METTLER TOLEDO's worldwide headquarters are in Greifensee, Switzerland. Corporate offices for the North American Marketing Organization are in Columbus, Ohio.

CUSTOMER FEEDBACK

Your feedback is important to us! If you have a problem with this product, or just a suggestion on how we can serve you better, please fill out this form and send it to us. Your feedback will help us to improve product performance, quality and service. If you are in the United States, mail this post-paid form to the address on the reverse, or fax it to (614) 438-4355. If you are outside the United States, apply proper postage before mailing it to the address on the reverse side. You can also send your feedback via email to: quality_feedback.mtwt@mt.com.

Your Name:	Date:
Organization Name:	METTLER TOLEDO Order Number
Address:	Part / Product Name:
	Part / Model Number:
	Serial Number:
Phone Number: ( ) Fax Number: ( )	Company Name of Installation:
E-mail Address:	Contact Name:
	Phone Number:

How well did this product meet your expectations in its intended use?		Comments:
☐	Met and exceeded my needs	
☐	Met all needs	
☐	Met most needs	
☐	Met some needs	
☐	Did not meet my needs	

PROBLEM:

UNACCEPTABLE DELIVERY:

- ☐ Shipped late
- ☐ Shipped early
- ☐ Shipped to incorrect location
- ☐ Other (Please Specify)

OUT OF BOX ERROR:

- ☐ Wrong item
- ☐ Wrong part
- ☐ Missing equipment
- ☐ Equipment failure

- ☐ Wrong documentation
- ☐ Missing documentation
- ☐ Incorrectly calibrated
- ☐ Other (Please specify)

Additional Questions/Comments:

DO NOT WRITE IN SPACE BELOW; FOR METTLER TOLEDO USE ONLY

☐ Retail ☐ Light Industrial ☐ Heavy Industrial ☐ Systems

RESPONSE: Include Root Cause Analysis and Corrective Action Taken.

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Declaration of conformity

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Déclaration de conformité
Declaración de Conformidad
Verklaring de overeenstemming
Dichiarazione di conformitá

We/Wir/Nous/WIJ/Noi: **Mettler-Toledo, Inc.**
1150 Dearborn Drive
Worthington, Ohio 43085
USA

declare under our sole responsibility that the product,
erklären, in alleiniger Verantwortung, daß dieses Produkt,
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declaramos, bajo nuestra sola responsabilidad, que el producto,
verklaren onder onze verantwoordelijkheid, dat het product,
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Model/Type: **PANTHER**

to which this declaration relates is in conformity with the following standard(s) or other normative document(s).
auf das sich diese Erklärung bezieht, mitder/den folgenden Norm(en) oder Richtlinie(n) übereinstimmt.
Auquel se réfère cette déclaration est conforme à la (aux) norme(s) ou au(x) document(s) normatif(s).
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Waarnaar deze verklaring verwijst, aan de volende norm(en) of richtlijn(en) beantwoordt.
A cui si riferisce questa dichiarazione è conforme alla/e sequente/i norma/e o documento/i normativo/i.

CE Conformity / CE-Konformität / Conformité CE

90/384/EU	Nonautomatic Balances and Scales / Nichteselbsttätige Waagen / Balances à Functionnement non automatique
EN45501:1992	Adopted European Standard / Norme Européenne Adoptée / Angenommene Europäische Norm
89/336/EU	EMC Directive / EMU-Richtlinie / Directive concernant la CEM
EN55022, B	Emissions / Funkstörungen
EN50081-1	Immunity
73/23/EU	Low Voltage / Niederspannung / basse tension
EN60950	el. Safety / el. Sicherheit / sécurité el.

Other Directives and Standards / Andere Richtlinien und Normen / Autres documents
corresponding to local requirements / entsprechend lokalen Anforderungen / correspondant aux exigences locales

UL1950	el. Safety / el. Sicherheit / sécurité el. (if UL mark is applied)
C22.2 No. 950-M89	el. Safety / el. Sicherheit / sécurité el. (If cUL mark is applied)
FCC, Part 15, class A	Emissions / Funkstörungen

Darrell Flocken, Manager - Weights & Measures
Office of Weights and Measures
Worthington, Ohio USA
Revised February 1997 (added compliance to Non-automatic Weighing Instrument Directive)

according to EN45014

INTRODUCTION

This publication is provided solely as a guide for individuals who have received Technical Training in servicing the METTLER TOLEDO product.

Information regarding METTLER TOLEDO Technical Training may be obtained by writing to:

METTLER TOLEDO
1900 Polaris Parkway
Columbus, Ohio 43240
Phone: (US and Canada) 614- 438-4511
Phone: (All Others) 614-438-4888

FCC Notice

This device complies with Part 15 of the FCC Rules and the Radio Interference Requirements of the Canadian Department of Communications. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense.

SOFTWARE VERSION

This manual properly describes the operation and functionality of the METTLER TOLEDO PANTHER PLUS terminal, software part number 154878 L 02.3. The software version and part number are displayed during the power-up sequence of the scale.

METTLER TOLEDO RESERVES THE RIGHT TO MAKE REFINEMENTS OR CHANGES WITHOUT NOTICE.

PRECAUTIONS

READ this manual BEFORE operating or servicing this equipment.

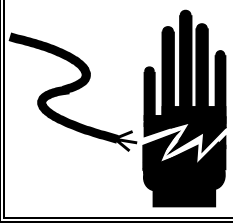
FOLLOW these instructions carefully.

SAVE this manual for future reference.

DO NOT allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this equipment.

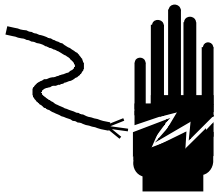
ALWAYS DISCONNECT this equipment from the power source before cleaning or performing maintenance.

CALL METTLER TOLEDO for parts, information, and service.



WARNING

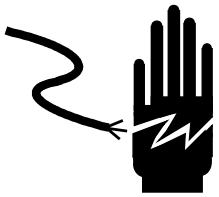
ONLY PERMIT QUALIFIED PERSONNEL TO SERVICE THIS EQUIPMENT. EXERCISE CARE WHEN MAKING CHECKS, TESTS AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM.



WARNING

FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD CONNECT TO PROPERLY GROUNDED OUTLET ONLY.

DO NOT REMOVE THE GROUND PRONG.



WARNING

DISCONNECT ALL POWER TO THIS UNIT BEFORE INSTALLING, SERVICING, CLEANING, OR REMOVING THE FUSE. FAILURE TO DO SO COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

CAUTION

BEFORE CONNECTING/DISCONNECTING ANY INTERNAL ELECTRONIC COMPONENTS OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT ALWAYS REMOVE POWER AND WAIT AT LEAST THIRTY (30) SECONDS BEFORE ANY CONNECTIONS OR DISCONNECTIONS ARE MADE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT OR BODILY HARM.

CONTENTS

1

Introduction and Product Overview

This manual provides information for installing, programming, and servicing the PANTHER PLUS scale terminal, a high performance, basic capability weighing instrument designed to meet the needs of simple weight indicating and over/under manual checkweighing. Information on operating this terminal (basic and advanced functions) can be found in the PANTHER PLUS Terminal User's Guide.

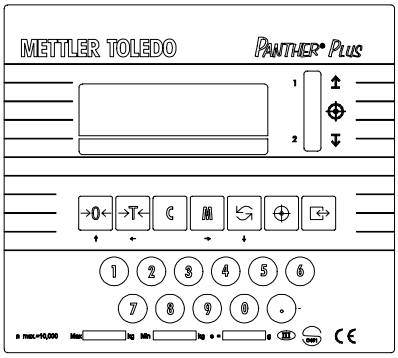


Figure 1-1

Review all instructions and safety precautions carefully. Only authorized personnel should perform installation and service procedures. If you discover a problem with the information provided, please complete and return the **Publication Evaluation Report** found in the back of this manual. If you encounter problems not covered in the manual, contact your authorized METTLER TOLEDO representative.

Model Identification

Use the information below to confirm the correct model number for the PANTHER PLUS terminal with which you will be working. The model number is found on the data plate on the side of the terminal.

P T H K - 1 X 0 0 - X X X

PANTHER PLUS Harsh Environment Terminal

Scale Interface
(1 = Analog load cell)

Interface Option
(0=No Option)
(8=Analog Option)

Unused

Unused

Market
(Refer to Market Destination Chart in the Appendix.)

Specifications

Model	PANTHER PLUS Terminal
Dimensions (H x W x D)	159 × 178 x 66 mm (6.25 x 7.00 x 2.59 in)
Construction	Stainless steel construction; provides NEMA 4x and IP65 protection
Shipping Weight	2.5 kg / 5.5 lbs
Power	Universal AC power supply
Operating Temperature	-10°C to 45°C (14°F to 113°F)
Display	**7-digit, 7-segment vacuum fluorescent numeric display** 12.7 mm high/ 0.55 in
Keypad	7-function, 11-numeric
Scale Performance	Internal resolution 1,000,000; External 10,000
Scale Interface	Maximum eight 350 ohm analog load cells
Scale Update Rate	300 hz
Discrete Outputs	3
Discrete Inputs	1
Serial Interface	RS232
Memory	N/A
Approvals	UL , cUL, CSA, CE, NTEP, OIML, NSC
Availability	North America, South America, Asia
Options	Analog Output, External I/O Box

Physical Dimensions

The location of the keyholes for wall mounting screws is shown below.

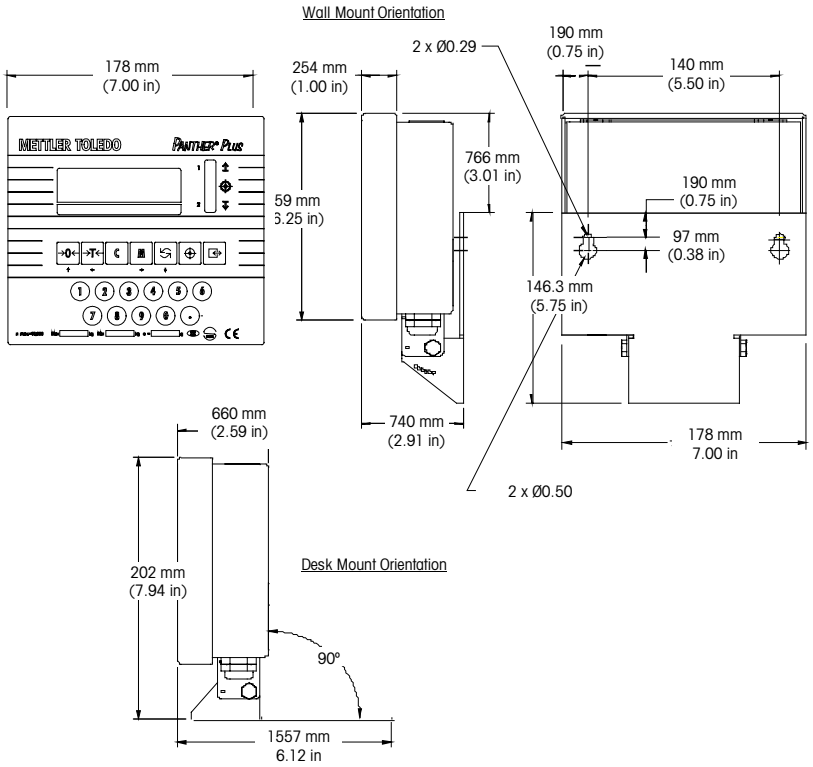
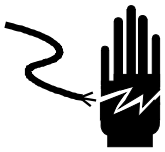


Figure 1-1

2 Installation

Warnings/Precautions



⚠ WARNING

ONLY PERMIT QUALIFIED PERSONNEL TO INSTALL AND SERVICE THIS EQUIPMENT. EXERCISE CARE WHEN MAKING CHECKS, TESTS AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

⚠ CAUTION

OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.

Inspection and Contents Checklist

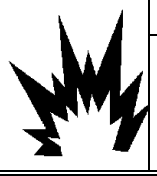
- If the terminal's shipping container appears damaged upon delivery, check inside for damage. File a freight claim with the carrier if necessary.
- If the container was undamaged, unpack the container if you have not already done so. Keep the original packing materials for future use.
- Make sure the PANTHER PLUS terminal package contains the following:
  - PANTHER PLUS Terminal (indicator)
  - Security Seal
  - Capacity Sheet Labels
  - Cursor Legends Labels
  - Address Labels
  - User's Guide
  - This Technical Manual (North America only)

Location/Environment

Before installing the PANTHER PLUS terminal, select the best location. Keep the following in mind:

- The terminal should only be operated between a temperature range of 14°F to 113 °F (–10°C to 45 °C) at 10% to 95% humidity, noncondensing.
- The storage temperature range is from –40°F to 140°F (–40°C to 60°C) at 10% to 95% humidity, noncondensing.
- The terminal's enclosure meets NEMA 4X (IP65) requirements for a dust-tight and splash-proof enclosure.

- **The PANTHER PLUS terminal is not intrinsically safe!** Contact your authorized METTLER TOLEDO representative about hazardous area applications.



⚠WARNING!

THE PANTHER PLUS TERMINAL IS NOT INTRINSICALLY SAFE! DO NOT USE IN AREAS CLASSIFIED AS HAZARDOUS BY THE NATIONAL ELECTRIC CODE (NEC) BECAUSE OF COMBUSTIBLE OR EXPLOSIVE ATMOSPHERES.

Opening the PANTHER PLUS Terminal

⚠ WARNING!

DISCONNECT POWER TO THIS UNIT BEFORE INSTALLING, SERVICING, CLEANING OR REMOVING THE FUSE. FAILURE TO DO SO COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

To access the Controller PCB for internal wiring and setting the switches, you must open the PANTHER PLUS terminal by following these steps:

1. Separate the front panel from the enclosure by inserting the tip of a flat-blade screwdriver into each of the two slots on the bottom of the front panel assembly. Figure 2-1 shows the location of the slots (A).
2. Gently push in toward the enclosure. You should hear a quiet "pop" when the cover has been released.
3. Push in on the side of the slot closest to the bottom of the cover. Repeat for the other slot.
4. Lift the bottom of the front panel out until it completely clears the enclosure.
5. Squeeze the top of the panel to the enclosure and raise it to clear the two top clips. The cover will swing down, hinged by a wire cable at the bottom.

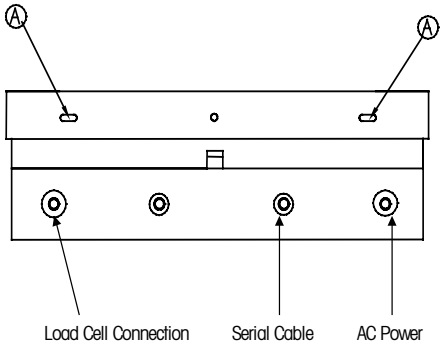


Figure 2-1

Connecting the Unit

To connect the unit:

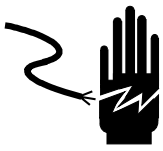
1. Pass the cables that enter the enclosure through an appropriately sized cable grip before connecting the wires.
2. Make the required electrical connections per the instructions in the section entitled Electrical Connections (beginning on the bottom of this page).
3. Connect the wires and re-secure the back cover.
4. Tighten the cable grip to provide a water-tight seal around the cable. This allows any internal cable slack to be received through the cable grip.
5. Push the bottom of the front cover over the enclosure. A snap sound indicates the cover is in place. Squeeze the front cover to the enclosure at all four corners to verify that all four clips are properly engaged.
6. You must reconfigure the terminal if you replaced the main PCB.

Power Requirements

The PANTHER PLUS terminal is provided with a universal (manually selectable) power supply which operates from 85 to 264 VAC and with a line frequency of 49 to 63 Hz. Power consumption is 12 Watts maximum. Power is applied through a permanently attached line cord.

The integrity of the power ground is important for safety and for the dependable operation of the terminal and its scale base. A poor ground can result in an unsafe condition if an electrical short develops in the equipment. A good ground connection is needed to minimize extraneous electrical noise pulses. The terminal should not share power lines with noise-generating equipment. To confirm ground integrity, use a commercial branch circuit analyzer. If adverse power conditions exist, a dedicated power circuit or power line conditioner may be required.

Electrical Connections



⚠ WARNING

DISCONNECT ALL POWER TO THIS UNIT BEFORE REMOVING THE FUSE OR SERVICING.

Connect the Load Cell

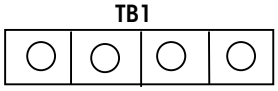
Disconnect the AC power to the PANTHER PLUS terminal. Make the appropriate load cell connection to the Controller PCB for load cells.

⚠CAUTION

TO AVOID DAMAGE TO THE PCB OR LOAD CELL, REMOVE POWER FROM THE PANTHER PLUS TERMINAL AND WAIT AT LEAST 30 SECONDS BEFORE CONNECTING OR DISCONNECTING ANY HARNESS.

Confirm Power Connection

The terminal is shipped with the power cord installed at the factory. Before applying power, confirm that it is wired properly for the AC voltage where the terminal will be used. The power cord connects to the TB1 terminal strip on the controller PCB.



1	Neutral
2	100V AC Hot
3	120V AC Hot
4	230V AC Hot

Standard Power Cord Colors	
Neutral	Blue
Hot	Brown
Ground (Chassis)	Green/Yellow

Analog Load Cell Connections

The maximum cable length for analog load cell connections to the PANTHER PLUS terminal depends on the total scale resistance (TSR) of the scale base. To calculate TSR:

$$TSR = \frac{\text{Load Cell Input Resistance (Ohms)}}{\text{Number of Load Cells}}$$

This chart gives recommended cable lengths based on TSR and cable gauge. The PANTHER PLUS terminal can power up to eight 350 Ohm analog load cells.

Recommended Maximum Cable Length			
TSR (Ohms)	**24 Gauge (feet)**	**20 Gauge (feet)**	**16 Gauge (feet)**
350	800	2000	4000
87	200	600	1000
45	100	300	500

Once the length of the cable is determined, connect to TB3 of the PANTHER PLUS Terminal Controller PCB. The pinout for TB3 is labeled on the bottom of the controller. The diagrams on the next page describe the PANTHER PLUS terminal analog load cell terminal strip TB3 wiring for standard 6-wire cable, Masstron 6-wire cable, and standard 4-wire cable.

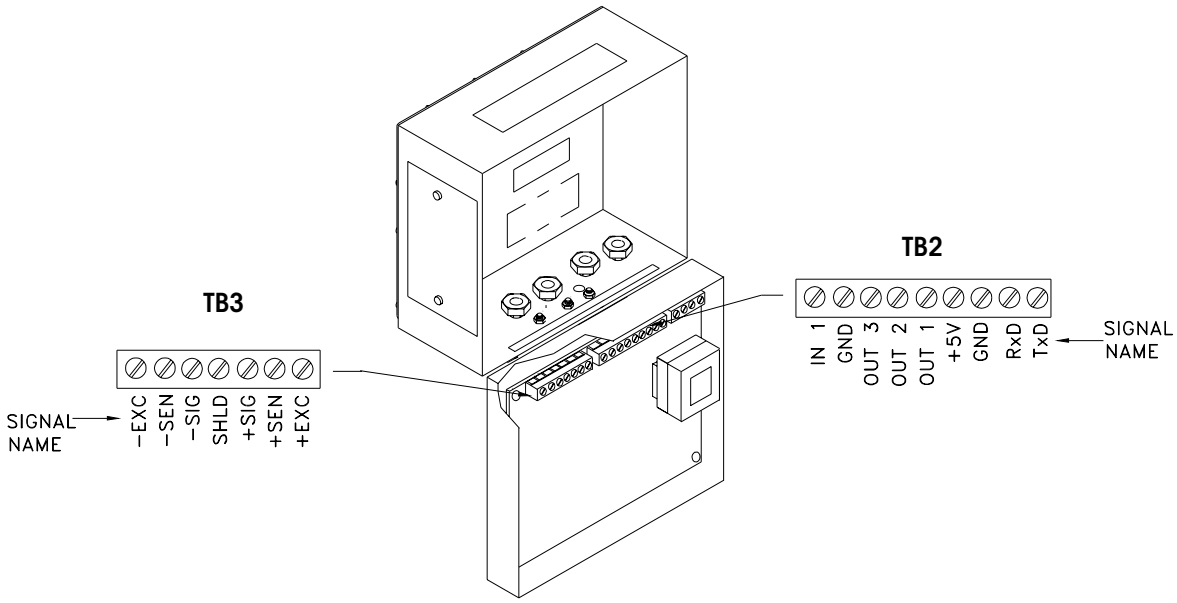


Figure 2-2: PANTHER PLUS Terminal

PANTHER PLUS TB3 Standard 6-wire Cable

Figure 2-3a

PANTHER PLUS TB3 Masstron 6-wire Cable

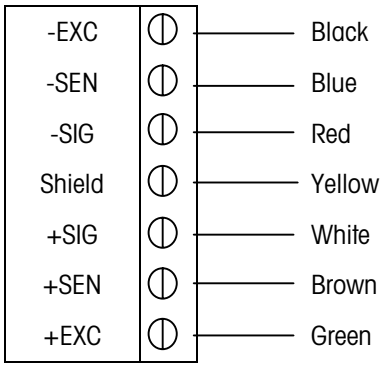


Figure 2-3b

PANTHER PLUS TB3 4-wire Cable

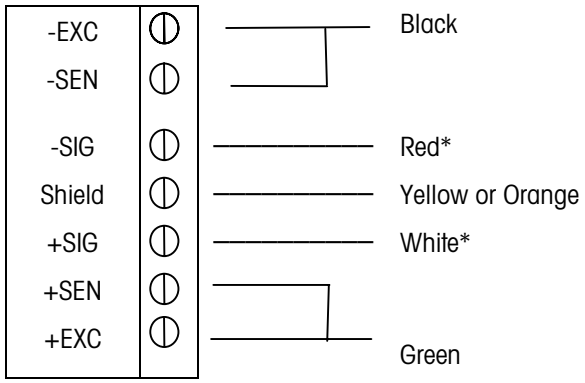


Figure 2-3c

*If an increase in load results in a decrease in weight display, reverse the signal wires (+SIG and –SIG).

Minimum Increment Size for Analog Scale Input

The minimum increment size selection for an analog scale input is determined by calculating the microvolts per increment for the desired build. To calculate the microvolts per increment, solve the following equation for μV per increment.

$$\mu V \text{ per Increment} = \frac{\text{Increment Size} \times \text{Cell Output} \times 5000}{\text{Load Cell Capacity} \times \text{Ratio}}$$

The increment size, scale capacity, and load cell capacity must all be measured in the same weight units, lb or kg. If the weight units for any of these variables are listed in kg units, multiply by 2.2046 to convert to lb units for the purposes of this calculation.

Load cell output is rated in mV/V (millivolts per volt of excitation), marked on load cell data tag. METTLER TOLEDO load cells are typically 2 mV/V. Other load cells can range from 1 mV/V to 4.5 mV/V.

The load cell capacity is the rated capacity marked on load cell data tag. The ratio is the total number of load cells in the system or the total lever ratio (if scale is a mechanical lever system conversion).

Sample Calculation

1. Refer to the following example of µV per increment calculation for a Model 2158 floor scale installation.

Scale Capacity	5000 lb
Increment Size	1.0 lb
Load Cell Capacity	2500 lb
Number of Cells	4
Cell Output	2 mV/V
Excitation Voltage	5 VDC

2. Use the following formula to calculate the µV per increment:

$$\mu V \text{ per Increment} = \frac{\text{Increment Size} \times \text{Cell Output} \times \text{excitation (mV)}}{\text{Load Cell Capacity} \times \text{Ratio}}$$

Substituting the 2158 parameters in the formula:

$$\mu V \text{ per Increment} = \frac{1.0 \text{ lb} \times 2 \text{ mV / V} \times 5000}{2500 \text{ lb} \times 4 \text{ load cells}} = 1.0 \mu V/\text{inc.}$$

The PANTHER PLUS terminal is approved as legal-for-trade at a minimum of 1 µV per increment. Acceptable weighing performance for non-legal-for-trade applications can be obtained when a minimum of 0.6 µV per increment is provided. At full scale, the maximum load cell output may not exceed 10 mV in the 2 mV/V jumper position or 15 mV in the 3 mV/V jumper position.

Serial Port

The COM1 serial port is bidirectional. It can receive simple commands or serial target data, as well as transmit data to a printer or other serial device.

The following diagram and table describe the PANTHER PLUS terminal block TB2 COM1 pin-to-pin cable connections using an RS-232 cable. The maximum recommended cable length is 50 feet (15.24 meters).

PANTHER PLUS TB2 COM1

⏀	TXD	RS-232 Transmit
⏀	RXD	RS-232 Receive
⏀	GND	Signal Ground

Figure 2-4

Pin Connection for METTLER TOLEDO Devices Using COM1 RS-232				
PANTHER PLUS TB2 COM1	**8806 8807 8845**	**8855 8856 8860**	**8861 8865 MP750**	**8617-TB2 9323-TB2 9325-TB2**
TXD	3*			2
RXD	--			--
GND	7*			3

*Each of these devices uses this connection.

Discrete Wiring

Discrete I/O TB2 terminal block assignments. All parallel port outputs are TTL Level, 5 VDC maximum.

Discrete input levels are $V_{IN\ LOW}$ = 0.0 - 0.8 VDC, $V_{IN\ HIGH}$ = 3.5 - 5.0 VDC.

TB2

⏀	+5 VDC, current limited to 15 mA
⏀	OUT1
⏀	OUT2
⏀	OUT3
⏀	GND
⏀	IN1

Refer to Appendix 3 for additional information on discrete I/O functions.

Figure 2-5

Analog Output

This section covers switches and wiring for the Analog Output Option. The Analog Output terminal strip is shown below.

Analog Output Terminal Strip

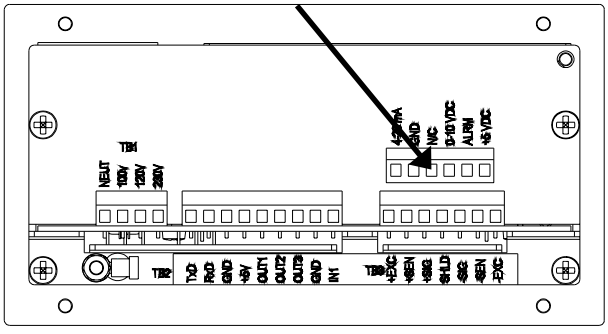
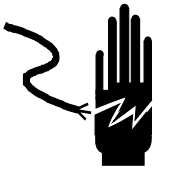


Figure 2-6

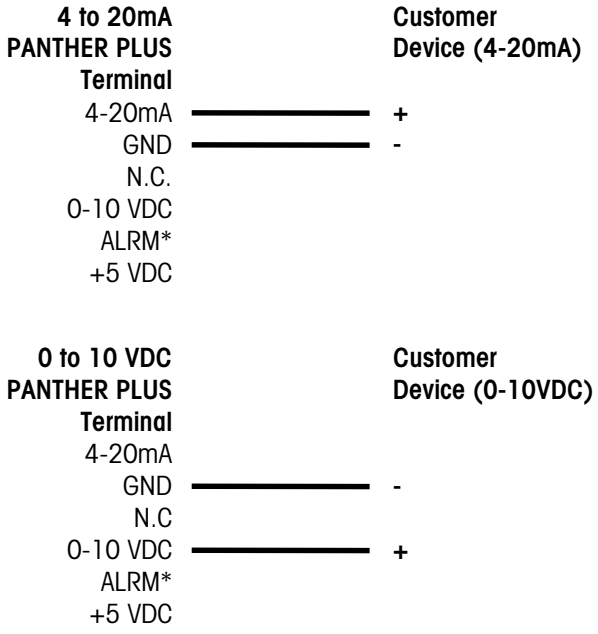
Wiring



⚠ WARNING

DO NOT APPLY POWER TO THE PANTHER PLUS TERMINAL UNTIL INSTALLATION OF COMPONENTS AND EXTERNAL WIRING HAVE BEEN COMPLETED. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY AND/OR PROPERTY DAMAGE.

The maximum recommended cable length for the 0-10VDC output is 50 feet (15.2 meters). The recommended cable for use with the analog output is shielded 2-conductor stranded 20 gauge cable (Belden #8762 or equivalent) which is available from METTLER TOLEDO using part number 510220190.



The ALRM Output (Alarm) is a normally open connection to the GND Terminal during normal operation. If the PANTHER PLUS terminal weight display goes to an over capacity or under zero display, or Setup is entered, the connection closes and the ALRM Output will be capable of sinking up to 30 mA DC. The voltage source can be the +5V supplied with the Analog Output PCB or a maximum of +30 VDC external source.

Controller PCB Switches and Jumpers

SW1 Switch Settings

1 Setup/Calibration Enable = On
Normal Operation = Off
2 Display Comma Tail = On
3 Not Used (Should be Off)
4 Test Mode (Must be Off)

Jumper W1 (Analog Version)

Installed = 2 mV/V Load Cells
Not Installed = 3 mV/V Load Cells

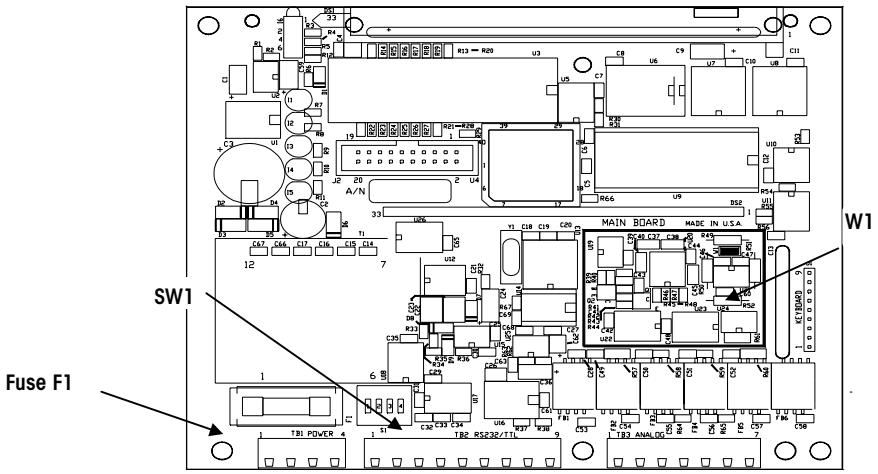
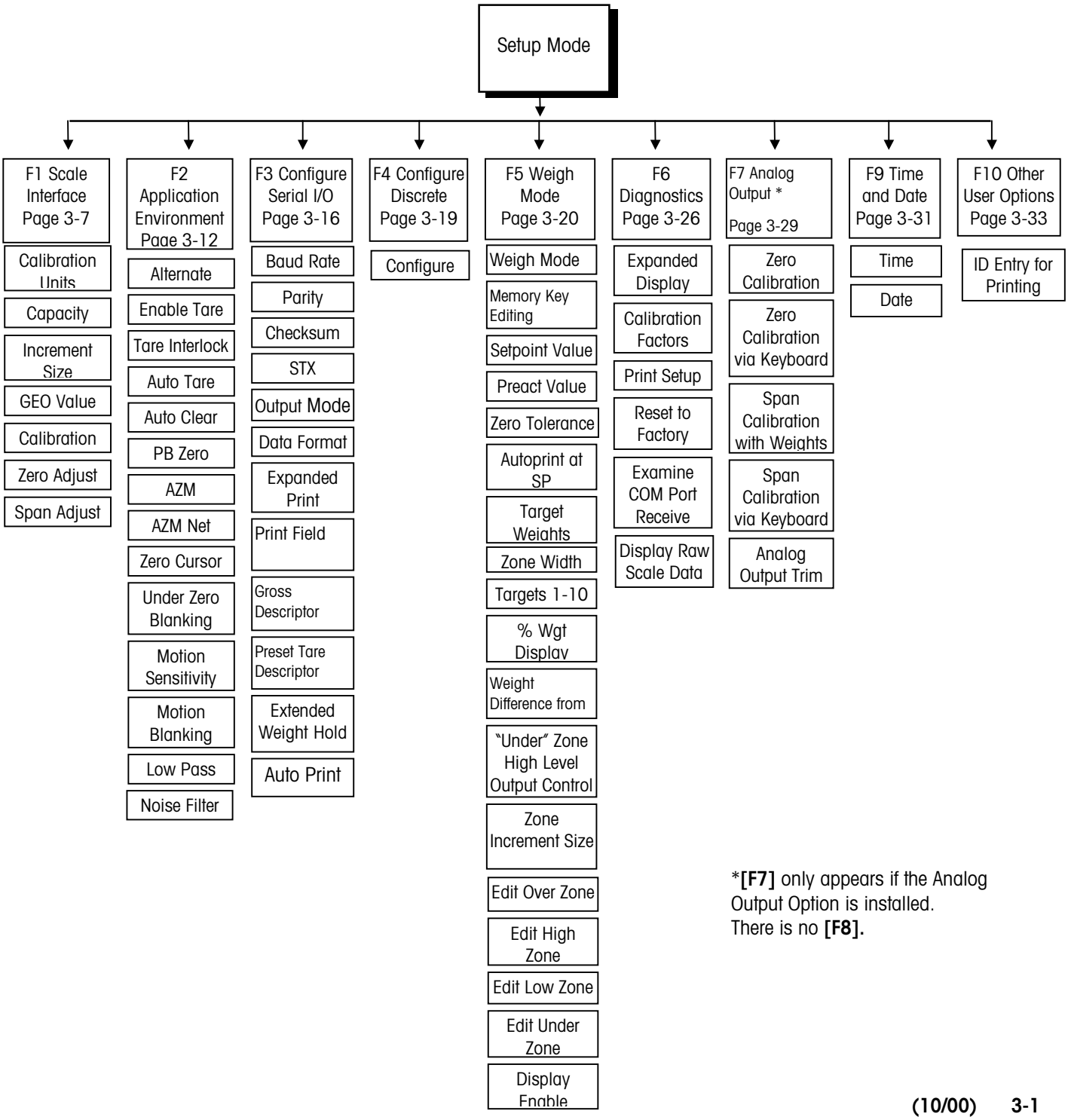


Figure 2-7

3

Programming and Configuration

The PANTHER PLUS terminal's functions and their accessibility to an operator are determined by how you configure the individual parameters of the terminal's program blocks (F1-F10). This chapter describes each program block and sub-block and walks you through the various options for configuring them. The factory defaults loaded into the PANTHER PLUS terminal appear on page 3-3.



*[F7] only appears if the Analog Output Option is installed. There is no **[F8]**.

Entering the Program Block

NOTE: the setup switch can remain closed if terminal security is not required.

To access and configure the program blocks, you must enter Setup Mode.

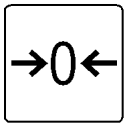
- Open the PANTHER PLUS terminal as described in Chapter 1. Close SW1-1.
- Close the terminal, and press **PRINT** and **ZERO** simultaneously.
- The **[F1]** prompt will be displayed, signaling you are now in Setup Mode.

General Programming Procedure

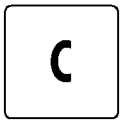
After accessing Setup Mode, each program block and sub-block can be configured. Program blocks and sub-blocks are configured using the keypad. In Setup Mode, each key has a specific function.

Keystroke Functions When In Setup Mode

The following keys are used to configure the program blocks in Setup Mode.

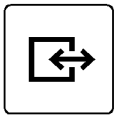


ZERO Backup to the previous step.



CLEAR resets a numeric data entry value to zero and/or allows programmer to skip to the end of setup.

SELECT increments the numeric data entry digit and/or allows the programmer to view the next in a selection list.

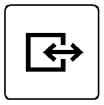


PRINT (ENTER) Accepts/terminates a data entry.

In addition, the numeric keys are used for entering numbers.

Entering and Configuring Program Blocks and Sub-blocks

NOTE: If the PANTHER PLUS terminal is being configured for the first time, it is recommended that the programmer configure each program block to assure the terminal is setup correctly for the specific application and/or environment. The factory settings for the PANTHER PLUS terminal follow this section. Once the **[F1]** prompt is displayed:

- Press the **SELECT** key will skip to the next block. 
- Press the **PRINT** key will enter the block. 
- Once **PRINT** is pressed, the PANTHER PLUS terminal advances to the first parameter in the block. The display shows the sub-block number and the current value setting (for example **[F1.2].)** NOTE: Although the sub-blocks will always appear in sequential order, some numbers may be skipped because a sub-block is not supported in this version of the software.
- Press **PRINT** to accept the value and advance to the next sub-block. Or, press the **SELECT** key to toggle through the choices until the desired selection is displayed.
- After the desired selection is displayed, press **PRINT** to accept the value. Continue this process until all required changes have been made.

Restoring Factory Settings

To restore the terminal to factory settings, go to **[F6.5]** and enter 1 to restore the North American factory settings or 2 to restore the export defaults.

Default Settings

The following is a list of the factory default setup parameters loaded in the PANTHER PLUS terminal. You can return to these settings by following the procedures outlined in Reset to Factory Defaults (F6.5).

Program Block/ Sub-Block	Settings (North America)	Settings (European)	Description
F1.2	1(lb)	2 (kg)	Calibration units = lb
F1.3	100 (lb)	60 (kg)	Scale Capacity
F1.4	0.01	0.02	Scale increment size
F1.6	0	0	Zero adjust
F1.7	0	0	Span adjust

Program Block/ Sub-Block	Settings (North America)	Settings (European)	Description
GEO	16	16	GEO Code
F2.1	0	0	Alternate units = none (unit switching disabled)
F2.3.1	2	2	Both pushbutton tare and keyboard tare enabled
F2.3.2	0 (disabled)	1 (enabled)	Tare interlock disabled
F2.3.3	0	0	Auto tare disabled
F2.3.4	0	0	Auto clear tare disabled
F2.4.1	1	1	Push button zero enabled, 2% range
F2.4.2	1(0.d window)	0 (disabled)	Auto zero maintenance
F2.4.3	0	0	Auto Zero Maintenance in net mode
F2.4.4	1	1	Zero cursor enabled
F2.4.5	0	0	No under zero blanking
F2.5	1	1	Motion sensitivity ± 0.5 increments
F2.5.1	0	0	Blanking Disabled
F2.6	2.0	5.0	Filter corner frequency
F2.6.1	0	0	Noise filter disabled
F3.1.1	9600	9600	baud
F3.1.4	2	2	even parity
F3.1.5	0	0	Checksum disabled
F3.1.6	0	0	STX disabled
F3.2	1	1	Demand output
F3.2.1	0	0	Print format = single line printing
F3.2.2	0	0	No expanded print
F3.2.3	23400	23400	Print Fields (G-T-N)
F3.2.4	1	1	Print "G" in Gross Weight Field
F3.2.5	0	1 "PT"	Preset Tare Descriptor is "T"
F3.3	0.0	0.0	Extended weight hold timer = 0.0 seconds
F3.4	0	0	Autoprint disabled
F4.1	1	1	Discrete input = Print command
F5.1	0	0	Indicator weighing mode
F5.2	1	1	Setpoints/Targets editing under **MEMORY** key
SP1	0	0	Setpoint 1/Target 1
SP2	0	0	Setpoint 2/Target 2
SP3	0	0	Target 3

Program Block/ Sub-Block	Settings (North America)	Settings (European)	Description
SP4	0	0	Target 4
SP5	0	0	Target 5
SP6	0	0	Target 6
SP7	0	0	Target 7
SP8	0	0	Target 8
SP9	0	0	Target 9
SP10	0	0	Target 10
P1	0	0	No preact for setpoint 1.
P2	0	0	No preact for setpoint 2.
F5.4	0	0	No zero tolerance
F5.5	0	0	No print at setpoint 1 coincidence
F5.6	0	0	No print at setpoint 2 coincidence
F5.7	1	1	Stored Target Weight Enabled (only appears if F5.1 = 2)
F5.7.1	0	0	Zone Weight Entered in Increments
o	0	0	Over zone width
h	0	0	High zone width
l	0	0	Under accept zone width
u	0	0	Low accept zone width
F5.7.2	0	0	Display is in Weight Units
F5.7.3	1	1	Disable Weight Difference from Target
F5.7.4	1	1	Output always on when weight is in "under" zone
o	0	0	Over zone width for pb/keyboard target
h	0	0	High zone width for pb/keyboard target
l	0	0	Low zone width for pb/keyboard target
u	0	0	Under zone width for pb/keyboard target
F5.9	1	1	Enable Weight Display and Status Lights
F6.1	0	0	No expanded display mode
F6.2	N/A	N/A	Edit Cal. Factors
F6.4	N/A	N/A	Print Setup
F6.5	N/A	N/A	Reset to Factory
F7.2	N/A	N/A	Analog Output Zero Calibration with Test Weights, no default

Program Block/ Sub-Block	Settings (North America)	Settings (European)	Description
			Test Weights, no default
F7.2.1	N/A	N/A	Analog Output Zero Calibration via Keyboard, no default
F7.3	N/A	N/A	Analog Output Span Calibration w/Test Weights, no default
F7.3.1	N/A	N/A	Analog Output Span Calibration with Keyboard, no default
F7.4	N/A	N/A	Analog Output Trim Adjustment, no default
F9.1	0	0	Time Disabled
F9.2	0	0	Date Disabled
F10.1	00	00	ID Entry for printing

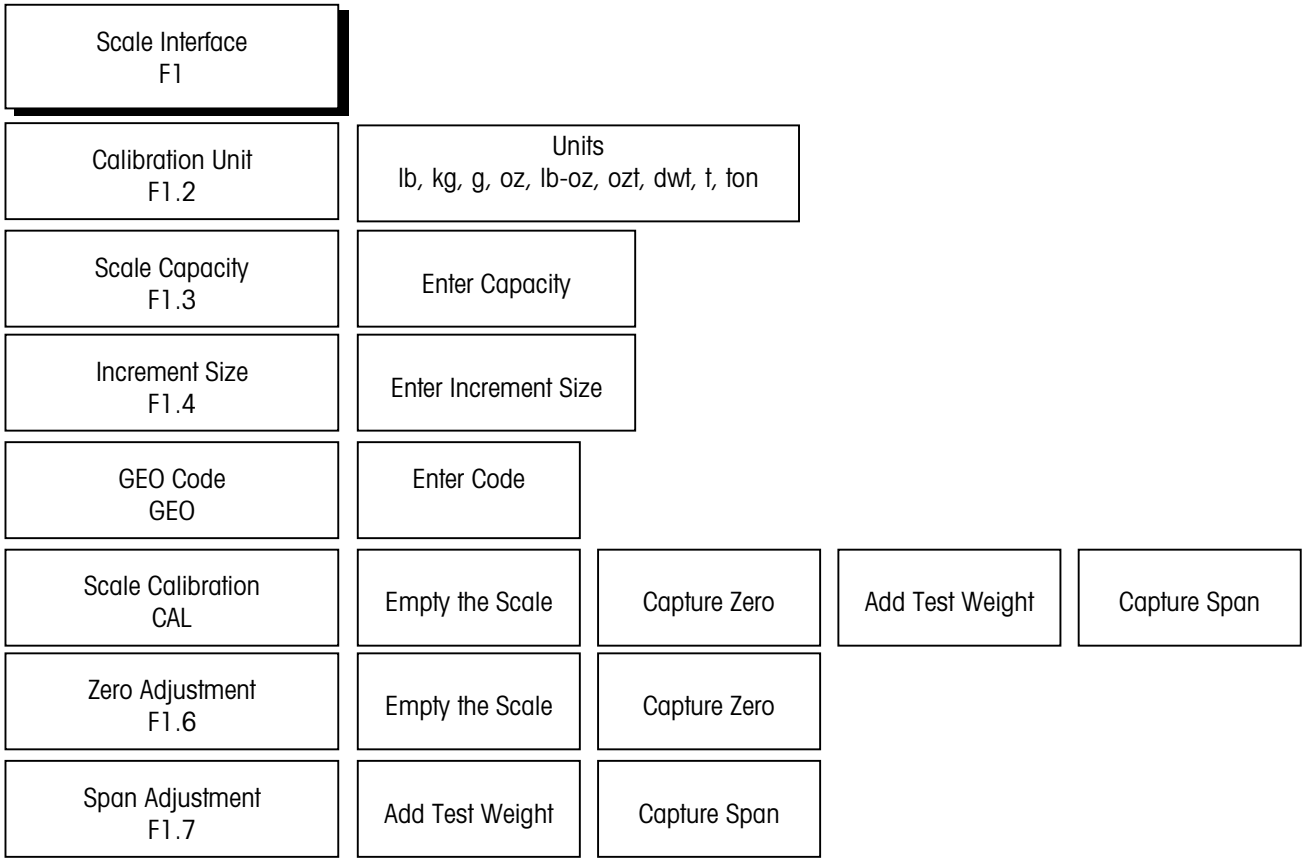
Exiting Program Blocks and Setup Mode

Once you have finished configuring the PANTHER PLUS terminal to meet the needs of your application, you can exit setup mode by doing the following:

- Press **CLEAR.** The **[CALOFF**] display appears.
- Press **PRINT**. The PANTHER PLUS terminal returns to the normal operating mode. The S1-1 switch can be turned off to secure the terminal.

F1 Scale Interface Program Block

The Scale Interface program block allows the user to set and calibrate the features that affect weighing performance. The following diagram describes this block:



[F1] SCALE INTERFACE

Press **PRINT** to access the Scale Interface program block and configure the sub-blocks.

Press **SELECT** to skip to the next program block.

NOTE: There is no **[F1.1**]. Upon entering the program block, the display will show **[F1.2].**

F1.2 Calibration Units Sub-block

Example:
The PANTHER PLUS terminal is calibrated using kg test weights and is switchable to metric tons. Kg is the primary unit and "ton" (metric tons) is the alternate unit. The "ton" overlay would be placed over the blank on the PANTHER PLUS terminal display lens.

NOTE: If neither the primary or alternate unit is lb or kg, then the left cursor (blank position) is used to indicate the primary unit and the right cursor (kg position) is used to indicate the alternate unit. Alternate unit decals are provided with the PANTHER PLUS terminal.

[F1.2 X] CALIBRATION UNITS: Enter the value for X that corresponds to the type of test weights that will be used for calibration.

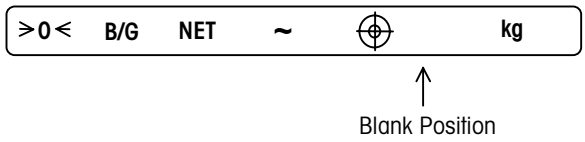
X = 1	lb
X = 2	kg
X = 3	g
X = 4	oz
X = 5	lb-oz
X = 6	ozt
X = 7	dwt
X = 8	t
X = 9	ton

The PANTHER PLUS terminal provides a wide selection of primary and alternate weight units.

- Primary Units are selected in Step F1.2 as Calibrated Units.
- Alternate Units are selected in Step F2.1.

If the primary weight unit selection is something other than kg or if alternate units will be used, an adhesive overlay (shipped with the PANTHER PLUS terminal) needs to be installed over the blank position or "kg" legend on the PANTHER PLUS display lens. This will correctly identify the displayed weight when shown converted to this unit (ton for metric tons for example). The label should be applied as follows:

- If one of the selected units is lb, the other legend overlay should be placed over "kg" and the lb overlay should be placed in the blank position.
- If one of the selected units is kg, the other legend overlay should be placed over the blank position.



NOTE: To access the legend label:

- Remove the AC power.
- Open the enclosure.
- Remove the controller PCB.
- Remove the legend label from the bottom of the display window.
- After modifying the label, reassemble in reverse order.

F1.3 Scale Capacity Sub-block

[F1.3] SCALE CAPACITY

[XXXXXX] Current scale capacity, available for Numeric Entry editing. Scale capacities from 1 to 500,000 are permitted.

Increment Size	Load Cell Scale Capacity Range	
	1000d	10000d
0.001	1	10
0.002	2	20
0.005	5	50
0.01	10	100
0.02	20	200
0.05	50	500
0.1	100	1000
0.2	200	2000
0.5	500	5000
1	1000	10000
2	2000	20000
5	5000	50000
10	10000	100000
20	20000	200000
50	50000	500000

Increment (oz) Size	lb-oz Scale Capacities	
	Minimum Build	Maximum Build
	1000d	**7950d**
0.02 oz	20 oz	159 oz
	(1.25 lb)	(9.94 lb)
	1000d	**3180d**
0.05 oz	50 oz	159 oz
	3.125	(9.94lb)
	1000d	**10,000d**
0.1 oz	100 oz	1000 oz
	(6.25 lb)	(62.5 lb)
	1000d	**7950d**
0.2 oz	200 oz	1590 oz
	(12.5 lb)	(99.4 lb)
	1000d	**3180d**
0.5 oz	500 oz	1590 oz
	(31.25 lb)	(99.4 lb)
	1000d	**10,000d**
1.0 oz	1000 oz	10,000 oz
	(62.5 lb)	(625.0 lb)
	1000d	**7950d**
2 oz	2000 oz	15,900 oz
	(125 lb)	(993.75 lb)
	1000d	**3180d**
5 oz	5000 oz	15,900 oz
	(312.5 lb)	(993.75 lb)

F1.4 Increment Size Sub-block

[F1.4] INCREMENT SIZE

[XXXX] Current Increment size is displayed for Selection List editing. Press the **SELECT** key to toggle through valid selections. The selection will be limited by the capacity chosen in **[F1.3].**

GEO Code Sub-block (No "F" Designation)

[GEO X X] GEO CODE

Values from 00 to 31 are accepted. The GEO Code is used to compensate for differences in the acceleration of gravity due to latitude and elevation if the scale was calibrated in one location then moved to another. Gravitational acceleration decreases with increasing height above sea level by approximately 0.2 parts per thousand every 1000 meters. The GEO Code has 32 settings with an increment size of 0.2 parts per thousand. The default GEO Code is 16 (U.S.) Refer to the GEO Code Table in the appendix.

Calibration Sub-block (No "F" Designation)

[CAL X] SCALE CALIBRATION PROCEDURE

X = 0 Skip calibration procedure
X = 1 Continue calibration

[E SCL] Empty scale platform and press **PRINT** to continue.

[15 CAL] Delay while initial is set (display counts down). If the motion sensitivity is not disabled and motion is detected at this step, the display returns to the **[E SCL]** prompt.

[Add Ld] Place test weight on the scale platform, and press **PRINT**.

[`XXXXXX] Enter the test weight value. No digits to the right of the decimal point are permitted. Maximum test weight is 105% of full scale capacity.

[15 CAL] There will be a delay while span is set (display counts down). If motion is detected at this step, the display returns to the **[Add Ld]** prompt.

[CAL d] "Calibration done" is displayed momentarily.

NOTE: When in lb-oz mode, enter the test weight value in ounces.

F1.6 Zero Calibration Adjust Sub-block

[F1.6 X] ZERO CALIBRATION ADJUST

X = 0 Skip zero adjustment
X = 1 Store current initial on scale as zero.

[15 CAL] If zero calibration adjust is selected the display counts down from 15 to 0 while scale reading are being taken. Scale motion causes the countdown to restart from 15. Pressing **CLEAR** at anytime during the countdown aborts zero adjust so that the motion sensitivity selection can be modified. When the countdown reaches "0," the scale reading is adjusted to the new zero reading.

F1.7 Span Calibration Adjust Sub-block

[F1.7 X] SPAN CALIBRATION ADJUST

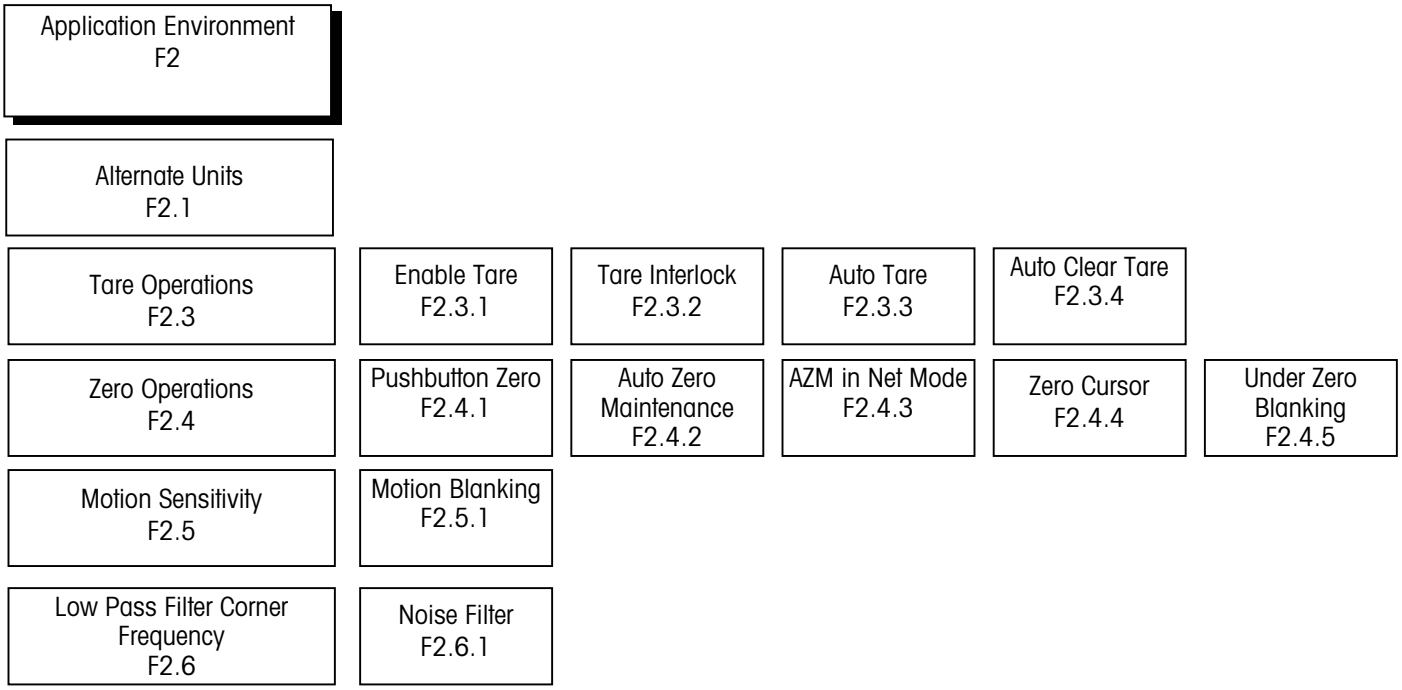
X = 0 Skip span calibration adjust
X = 1 Perform span calibration adjustment.

[0] Numeric data entry of current scale test load. If the **PRINT** key is pressed with the display showing **" 0"** then span adjust is aborted.

[15 CAL] After valid (non-zero) data entry, the display counts down from 15 to 0 while scale readings are taken. Scale motion causes the countdown to restart from 15.

Pressing **CLEAR** during the countdown aborts span adjust so that the motion sensitivity selection can be modified. When the countdown reaches "0," an attempt is made to calculate the span calibration. If the weight is negative, over-capacity or in expand mode, **[E 35]** is displayed to show that the span adjustment cannot be performed. If the entered weight is more than twice the original displayed weight, **[E 35]** is displayed. Press any key to clear **[E 35]** and proceed to the end of setup.

F2 Application Environment Block



[F2] APPLICATION ENVIRONMENT

Press **PRINT** to enter this program block and configure the sub-blocks.

Press **SELECT** to skip to **[F3].**

F2.1 Alternate Units Sub-block

Example:
The PANTHER PLUS terminal is calibrated using kg test weights and is switchable to metric tons. kg is the primary unit and "ton" (metric tons) is the alternate unit. The "ton" overlay would be placed over the blank position on the PANTHER PLUS terminal display lens.

[F2.1 X] ALTERNATE UNITS: Enter a value for X that corresponds to the unit of measure desired as a secondary unit.

X = 0	None
X = 1	lb
X = 2	kg
X = 3	g
X = 4	oz
X = 5	lb-oz
X = 6	ozt
X = 7	dwt
X = 8	t
X = 9	ton (metric)

Refer to setup step F1.2 for additional information on the optional weight legends.

F2.3 Tare Operations Sub-block

For lb-oz mode, no Keyboard Tare is permitted. Remote Tare from the discrete input or serial port is possible if enabled.

[F2.3] TARE OPERATIONS

Press **SELECT** to skip to [F2.4], press **PRINT** to continue.

[F2.3.1 X] ENABLE TARE FROM FRONT PANEL: Enter a value for X that will enable or disable Tare.

X = 0 Tare disabled

X = 1 Only Pushbutton Tare enabled

X = 2 Both Pushbutton Tare and Keyboard Tare enabled

[F2.3.2 X] TARE INTERLOCK: The tare interlock feature, if enabled, places certain limitations on how tare values can be cleared and entered in legal-for-trade applications. Specifically, tare interlock meets legal-for-trade requirements by making the following restrictions:

- Tare weights can be cleared only at gross zero (scale empty)
- Tare can be entered only when the scale is in gross mode
- Previous tare values must be cleared before a new tare value can be entered (chain tare disabled)

X = 0 Tare Interlock disabled

X = 1 Tare interlock enabled

[F2.3.3 X] AUTO TARE

X = 0 Auto Tare disabled

X = 1 Auto Tare enabled after no motion following > 5d when in GROSS mode

[F2.3.4 X] AUTO CLEAR TARE

X = 0 Auto Clear Tare disabled

X = 1 Auto Clear Tare enabled, tare automatically clears at gross zero

F2.4 Zero Operations Sub-block

If AZM=0, the tare and zero value will be stored during a power loss. The terminal will display a correct net value when power is restored.

[F2.4] ZERO OPERATIONS

Press **SELECT** to skip to [F2.5], press **PRINT** to continue.

[F2.4.1 X] PUSHBUTTON ZERO ENABLE

X = 0 Pushbutton zero disabled

X = 1 Enable pushbutton zero and AZM within ±2% FS range

X = 2 Enable pushbutton zero and AZM within ±20% FS range

[F2.4.2 X] AUTO ZERO MAINTENANCE: This automatically compensates for small changes in zero resulting from material build-up or

temperature changes. This sub-block lets you select the weight range (±) around gross zero within which the PANTHER PLUS terminal will capture zero. If residual weight on the scale exceeds the weight range, the terminal will not capture zero.

X = 0 No AZM or zero capture at power-up

X = 1 AZM within 0.5 d window; power-up zero capture ±2%.

X = 2 AZM within 1d window; power-up zero capture ±2%.

X = 3 AZM within 3d window; power-up zero capture ±2%.

[F2.4.3 X] AZM IN NET MODE

X = 0 Disable AZM in net mode

X = 1 Enable AZM in net mode

[F2.4.4 X] ZERO CURSOR

X = 0 No Zero cursor

X = 1 Zero cursor enabled

[F2.4.5 X] UNDER ZERO BLANKING

X = 0 No Under Zero blanking

X = 1 Blank Display and internal signal "Under Capacity" if gross weight is greater than 5d under zero.

F2.5 Motion Sensitivity Selection Sub-block

[F2.5 X] MOTION SENSITIVITY SELECTION: The motion detection feature determines when a no-motion condition exists on the scale platform. The sensitivity level determines what is considered stable. Printing, pushbutton zero, and tare entry will wait for scale stability before carrying out the command. Stability detection occurs over a predefined period of time and allows a predetermined "acceptable" amount of motion in scale increments.

X = 0 Motion detector disabled

X = 1 1.0 d motion sensitivity

X = 2 3.0 d motion sensitivity

[F2.5.1 X] MOTION BLANKING

X = 0 Blanking disabled

X = 1 Blank LEDs during motion. (Also turns off discrete outputs in over/under mode).

X = 2 Blank LEDs and weight display during motion. (Also turns off discrete outputs in over/under mode.)

F2.6 Low Pass Filter Corner Frequency

[F2.6 X.X] LOW PASS FILTER CORNER FREQUENCY

X.X is the numeric data entry for the low pass filter corner frequency (0.5 - 9.9 Hz).

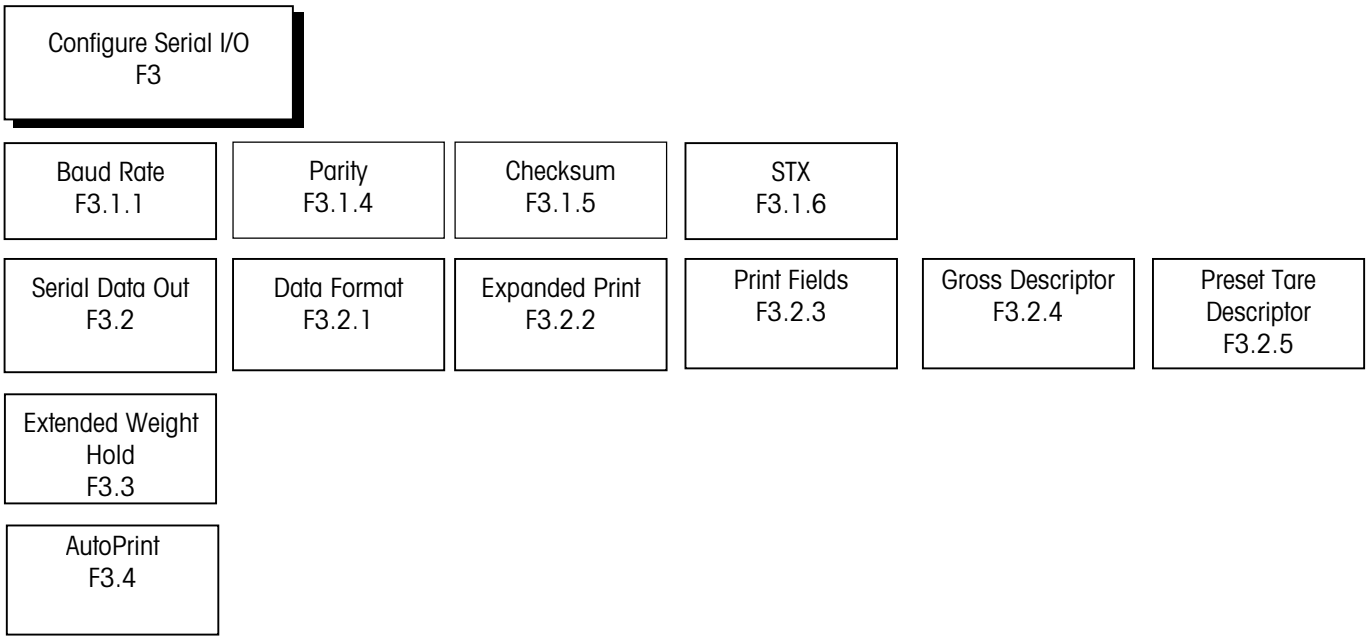
NOTE: Noise filter should not be enabled in batching or filling operations.

[F2.6.1 X] NOISE FILTER ENABLE/DISABLE

X = 0 Disable noise filter

X = 1 Enable noise filter

F3 Configure Serial I/O Block



[F3] CONFIGURE SERIAL I/O

Press **PRINT** to enter this sub-block and configure the sub-blocks.

Press **SELECT** to skip to [F4].

F3.1 Select Serial Port Parameters Sub-block

[F3.1.1] BAUD RATE

[XXXX] XXXX = Select 300, 1200, 2400, 4800, or 9600 baud

[F3.1.4 X] PARITY

X = 0 No parity

X = 1 Odd parity

X = 2 Even parity

[F3.1.5 X] CHECKSUM

X = 0 No checksum sent

X = 1 Checksum enabled

[F3.1.6 X] STX

X = 0 No STX sent

X = 1 STX enabled

F3.2 Serial Data Out Sub-block

Refer to Appendix 1 and 2 for details on output strings.

[F3.2 X] SERIAL DATA OUT

- X = 0 Continuous mode. If continuous mode, the display skips to [F3.3 X].
- X = 1 Demand mode. Continue to next step.
- X = 2 SICS Protocol. If 2 is selected, the display skips to F4.

[F3.2.1 X] DATA FORMAT (Demand Mode output only)

- X = 0 Single line.
- X = 1 Multiple line.
- X = 2 Single line with over/under status (over/under mode only)

[F3.2.2 X] EXPANDED PRINT (Demand Mode output only)

- X = 0 Normal print
- X = 1 Expanded print

[F3.2.3 X] PRINT FIELD SELECTION (Demand Mode output only)

[XXXXX] Select the order in which the five fields print by entering numerically:

- X = 0 No field
- X = 1 Displayed Weight
- X = 2 Gross Weight
- X = 3 Tare Weight
- X = 4 Net Weight
- X = 5 Time
- X = 6 Date
- X = 7 ID

If "No Field" is selected, seven spaces will be inserted as the data field. If multiple line output format is selected, the "No Field" will also include a carriage return and line feed characters at the end of the line. In order to reduce the number of fields or lines transmitted, any "No Field" selections at the end of the selection string will be ignored. For example, in multiple line format:

[00061] will print as:

<sp><sp><sp><sp><sp><sp><sp>CRLF

<sp><sp><sp><sp><sp><sp><sp>CRLF

<sp><sp><sp><sp><sp><sp><sp>CRLF

Time <CR><LF>

[61000] will print as:

Time <CR><LF>

Displayed Weight <CR><LF>

[F3.2.4 X] PRINT 'G' IN GROSS WEIGHT FIELD (COM1, Demand Mode output only)

X = 0 No 'G' is printed in gross weight field after weight symbol.

X = 1 'G' is printed in gross weight field after weight symbol.

[F3.2.5 X] PRINTED TARE DESCRIPTORS SELECTION FOR PRESET TARE

X = 0 Print "T" as tare descriptor when a preset tare is entered.

X = 1 Print "PT" as tare descriptor when a preset tare is entered.

F3.3 Extended Weight Hold Sub-block

[F3.3 X.X] EXTENDED WEIGHT HOLD DISPLAY

Use the numeric keypad to enter a value for the time (in seconds from 0.0 to 9.9) that the weight will be held (frozen) on the display when a print is initiated.

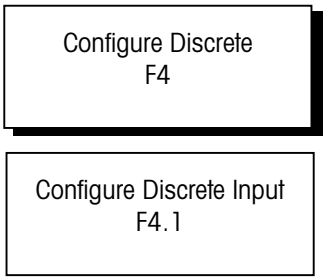
F3.4 AutoPrint

[F3.4 x] AUTOPRINT (COM 1 Demand Mode only)

X = 0 No auto printing

X = 1 Auto print enabled.

F4 Configure Discrete Block



[F4] CONFIGURE DISCRETE

Press **PRINT** to enter this block and configure the sub-blocks.

Press **SELECT** to skip this block.

F4.1 Configure Discrete Input Sub-block

[F4.1 X] CONFIGURE DISCRETE INPUT

Assign a function to the discrete input:

X = 0 No function

X = 1 Print

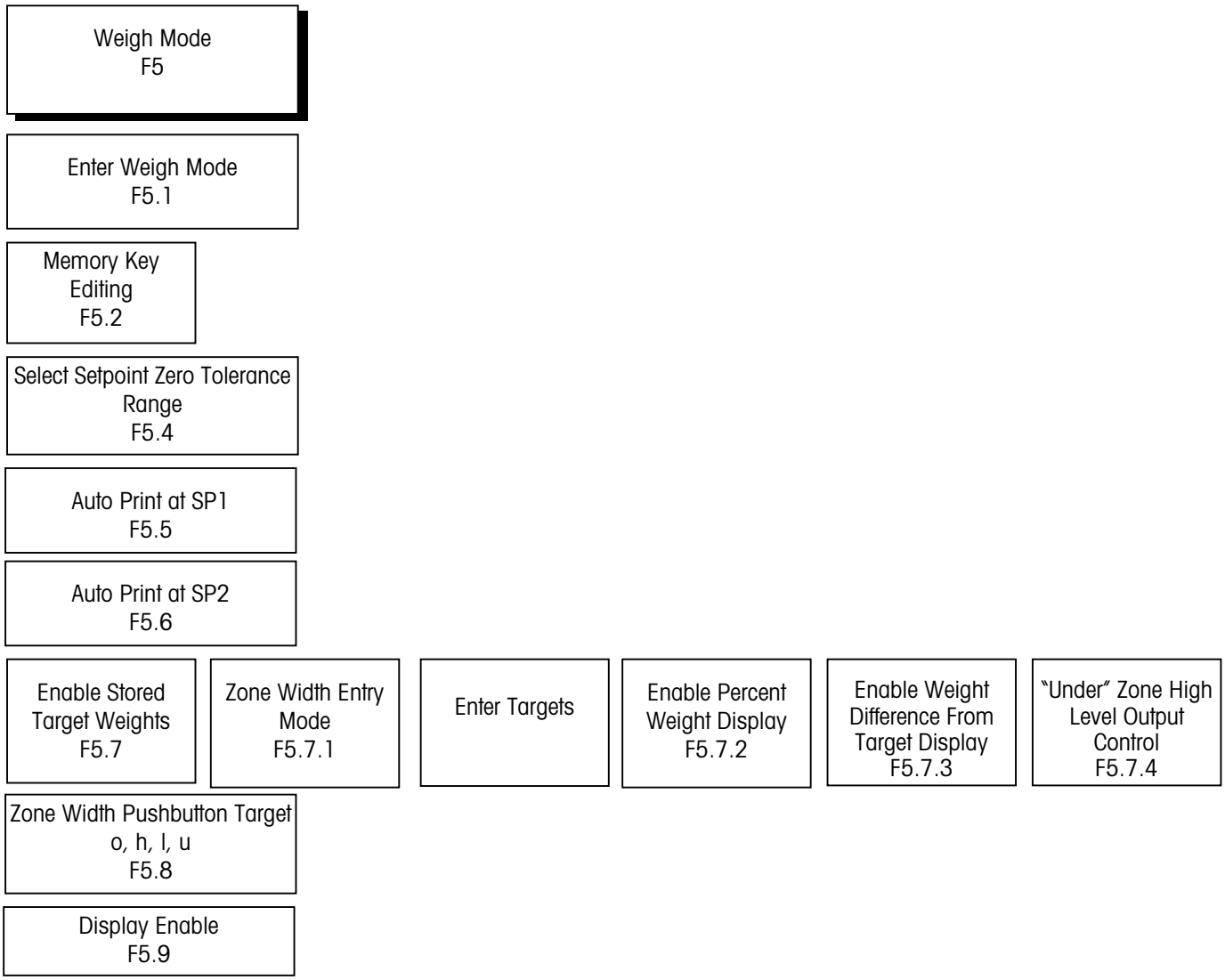
X = 2 Tare

X = 3 Zero

X = 4 Select (switches units)

X = 5 Target

F5 Weigh Mode Block



[F5] WEIGH MODE

Press **PRINT** to enter this block and configure the sub-blocks.

Press **SELECT** to skip to **[F6].**

F5.1 Enter Weigh Mode Sub-block

[F5.1 X] ENTER WEIGH MODE

X = 0 Indicator Mode (Setpoints and targets disabled). Skip to **[F6].** The terminal will operate as a straight weighing instrument.

X = 1 Setpoint Mode

X = 2 Over/Under Mode

F5.2 Memory Key Editing Sub-block

[F5.2 X] MEMORY KEY EDITING (Only appears if Setpoint Mode was selected in F5.1.)

X = 0 No Setpoint or Over/Under editing using **MEMORY** key

Setpoint or Over/Under editing only in Setup Mode.

Proceed to Setpoint or Over/Under Editing.

NOTE: If F5.1 was set to 2 (Setpoint Mode), the display goes directly to F5.7.

X = 1 Setpoints/Targets edited only using the **MEMORY** key. Preact /Zones editing only in Setup Mode. Proceed to Preact or Zone Editing.

If F5.1 was set to 2 (Setpoint Mode), the display goes to F5.7.

X = 2 Setpoints/Targets and Preacts/Zones may be edited only using the **MEMORY** key. Tolerance editing only in Setup mode. Proceed to Tolerance Editing.

If F5.1 was set to 2 (Setpoint Mode), the display goes to F5.7.

X = 3 All Setpoint or Over/Under editing is done only using the **MEMORY** key.

If F5.1 was set to 2 (Setpoint Mode), the display goes to F5.7.

NOTE: The next two sections related to the entry of setpoint values are allowed from the front panel.

The following section permits editing of Setpoint related functions. If the Weigh Mode is "Indicator" or "Over/Under" skip this section. If F5.2 (Memory Key Editing) = 0, skip Setpoint Entry and proceed to Preact or Zone Editing.

[SP1] ENTER SETPOINT 1

Press **CLEAR** to go to preact editing or **PRINT** to proceed.

[012345] Display now shows the previous setpoint 1 value, which may now be edited. If the new setpoint value is less than the existing preact value, then **[E 20]** will be displayed for approximately 2 seconds to flag the error before the display returns to the **[SP1]** display.

[SP2] ENTER SETPOINT 2

Press **CLEAR** to proceed to preact editing.

Press **PRINT** to proceed.

Press **ZERO** to backup to **[SP1]**

[012345] The display shows the previous setpoint 2 value. If the new value is less than the existing preact value, **[E 20]** is displayed for 2 seconds to flag the error before the display returns to **[SP2].**

If the Weigh Mode is in "Indicator" or "Over/Under," skip this section. If F5.2 (Memory Key Editing) = 1, skip Preact Entry. Values entered for preact adjust the corresponding cutoff action as follows: Setpoint actuation = Setpoint entry - preact entry

NOTE: If the editing of Preact values from the front panel is allowed, skip the next two steps related to Preact Entry.

[P1] ENTER PREACT FOR SETPOINT 1

Press **CLEAR** to go to F5.4 or **PRINT** to proceed.

[012345] Display shows the previous preact value for editing.

Press **ZERO** back up to **[SP2].**

Press **PRINT** to accept entry and go to **[P2]**

Press **CLEAR** to zero display and start entry of a new value.

If the new preact value is greater than the existing setpoint value, then **[E 20]** will be displayed for approximately 2 seconds to flag the error before the display returns to the **[P1]** display.

[P2] ENTER PREACT FOR SETPOINT 2

Press **CLEAR** to go to F5.4 or **PRINT** to proceed.

[012345] Display shows the previous preact 2 value for editing.

Press **ZERO** back up to **[P1].**

NOTE: If the editing of setpoint zero tolerance values from the front panel is allowed, skip the next section.

Press **PRINT** to accept entry and proceed to **[F5.4]**

Press **CLEAR** to zero display and start entry of a new value.

If the new preact value is greater than the existing setpoint value, then **[E 20]** will be displayed for approximately 2 seconds to flag the error before the display returns to the **[P2]** display.

If the Weigh Mode is in "Indicator" or "Over/Under," skip this section. If F5.2 (Memory Key Editing) = 2, skip Select Setpoint Zero Tolerance Range Entry.

F5.4 Select Setpoint Zero Tolerance Range Sub-block

[F5.4 X] SELECT SETPOINT ZERO TOLERANCE RANGE.

X = 0 No zero tolerance output.

X = 1 1 increment.

X = 5 5 increments.

F5.5 Auto Print at SP1 Sub-block

[F5.5 X] AUTO PRINT AT SP1 (Setpoint Mode only)

X = 0 Auto print at SP1 disabled

X = 1 Auto print when setpoint reached after coming from zero.

F5.6 Auto Print at SP2 Sub-block

[F5.6 X] AUTO PRINT AT SP2 (Setpoint Mode only)

X = 0 Auto print at SP2 disabled

X = 1 Auto print when setpoint reached after coming from zero.

F5.7 Enable Stored Target Weights Sub-block

(Only appears if Over/Under Mode is selected in F5.1)

[F5.7 X] ENABLE STORED TARGET WEIGHTS

X = 0 Disable stored target weight. Skip to zone editing

X = 1 Enable stored target weight. If entry of target values from the front panel is allowed, skip the next four steps.

[F5.7.1] ZONE WIDTH ENTRY MODE

X = 0 Zone width entered in increments 0 to full scale divisions.

X = 1 Zone width entered as % of target, 0 to 100%

X = 2 Zone is entered as actual weight value (in primary units)

[SPn] ENTER TARGET n (Only if F5.2 = 0)

Press **CLEAR** to go to F5.7.2.

Press **PRINT** to proceed. Value is displayed. Edit. Press **PRINT**.

Press **ZERO** to backup to **[F5.7]** You cannot use **ZERO** to back up through the setpoints.

Press **SELECT** to move to other setpoints.

[012345] The display now shows the previous target n value for editing. When new value is entered, press **PRINT**.

If:	Enter Zone As:
F5.7.1 = 0	0 to Full Scale Increments
F5.7.1 = 1	0 to 99.0 Percent
F5.7.1 = 2	Actual Weight

[o XX] ENTER TARGET "n" OVER ZONE (Only if F5.2 = 0 or 1.)

XX = Current value for over zone.

[h XX] ENTER TARGET "n" HIGH ZONE (Only if F5.2 = 0 or 1.)

XX = Current value for high zone.

[l XX] ENTER TARGET "n" LOW ZONE (Only if F5.2 = 0 or 1.)

XX = Current value for low zone.

[u XX] ENTER TARGET "n" UNDER ZONE (Only if F5.2 = 0 or 1.)

XX = Current value for under zone.

NOTE: Repeat the above steps for up to 10 targets total. Pressing **ENTER** will continue through the steps to set additional targets. Pressing **SELECT** moves you through the setpoints without setting them.

[F5.7.2 X] ENABLE PERCENT WEIGHT DISPLAY

X = 0 Weight display is in weight units

X = 1 Weight display is in percent of target

If F5.7.2 is set to 1, the display skips to F5.7.4.

[F5.7.3 X] ENABLE WEIGHT DIFFERENCE FROM TARGET DISPLAY MODE

When enabled, if a valid target weight is available, weight is displayed as the difference from the target weight instead of the "normal" weight.

X = 0 Disable Weight Difference from Target

X = 1 Enable Weight Difference from Target

[F5.7.4 X] WEIGHT UNDER TARGET HIGH LEVEL OUTPUT CONTROL

X=0 Under target output always on when weight falls below Low zone.

X=1 Under target output on until weight falls below 10 increments of gross zero.

If F5.2 (Memory Key Editing) = 2 or 3, skip to F5.7.

F5.8 Zone Increment Size for Pushbutton Target

NOTE: If the Weigh Mode is "Indicator" or "Setpoint" skip this section.

If:	Enter Zone As:
F5.7.1 = 0	0 to Full Scale Increments
F5.7.1 = 1	0 to 99.0 Percent
F5.7.1 = 2	Actual Weight

[o X.XX] EDIT OVER ZONE FOR PUSHBUTTON TARGET (SPO)

XX = Current value for over zone.

[h X.XX] EDIT HIGH ZONE FOR PUSHBUTTON TARGET (SPO)

XX = Current value for high zone.

[l X.XX] EDIT LOW ZONE FOR PUSHBUTTON TARGET (SPO)

XX = Current value for low zone.

[u X.XX] EDIT UNDER ZONE FOR PUSHBUTTON TARGET (SPO)

XX = Current value for under zone.

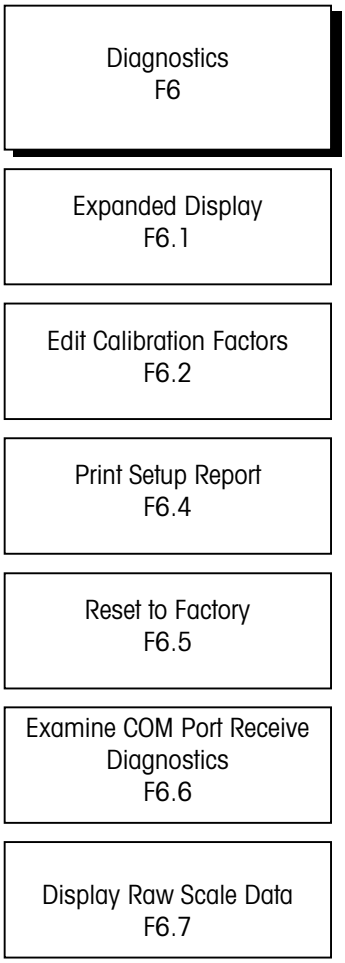
F5.9 Display Enable Sub-Block

[F5.9 X] Display Enable

X = 0 Status lights only

X = 1 Weight display and status lights

F6 Diagnostics Block



[F6] DIAGNOSTICS

Press **PRINT** to continue configuring this program block.

Press **SELECT** to skip to **[F9]** (or **[F7]** if the Analog Output Option is installed.)

F6.1 Expanded Display Sub-block

[F6.1 X] EXPANDED DISPLAY.

X = 0 Normal display mode

X = 1 Weight displayed in minors

F6.2 Edit Calibration Factors Sub-block

[F6.2 X] EDIT CALIBRATION FACTORS

X = 0 Skip this block

X = 1 Edit calibration factors

[123456] Zero factor, available for numeric data editing

[123456] Span factor, available for numeric data editing, page 1

[123456] Span factor, available for numeric data editing, page 2

F6.4 Print Setup

Display will show [PS - XX] during printing. The XX will increment from 01 to indicate printing is proceeding.

[F6.4 X] PRINT SETUP

X = 0 Skip this sub-block

X = 1 Print setup report

F6.5 Reset to Factory Defaults

[F6.5 X] RESET SOFTSWITCH CONFIGURATION TO FACTORY SETTINGS

X = 0 Skip this sub-block

X = 1 Restore all settings to factory defaults

X = 2 Restore all settings to European factory defaults

[LOAd 0] At the **Are you sure**? prompt. Toggle to "1" for yes, "0" to abort, then press **PRINT**. If "yes", soft switches are set to the factory default values.

F6.6 Examine COM Port Receive Buffer Diagnostics

[F6.6 X] EXAMINE COM PORT RECEIVE BUFFER DIAGNOSTICS

X = 0 Skip this sub-block.

X = 1 Examine com port 1 receive buffer.

X = 2 Examine com port 2 receive buffer (if host PCB is installed)

X = 3 Examine com port 3 receive buffer (DLC data in digital version only)

[nnn xx] Where "nnn" is current receive buffer read pointer offset (0-255) and "xx" is the data in hex. The receive buffers are circular buffers 256 bytes in length. The read pointer is an offset into the buffer that points to the next byte to be read. Press **MEMORY** to advance forward through the receive buffer or **TARE** to step backward through the receive buffer. Press **ENTER** or **CLEAR** to exit this diagnostic. The receive interrupt is disabled while in the diagnostic.

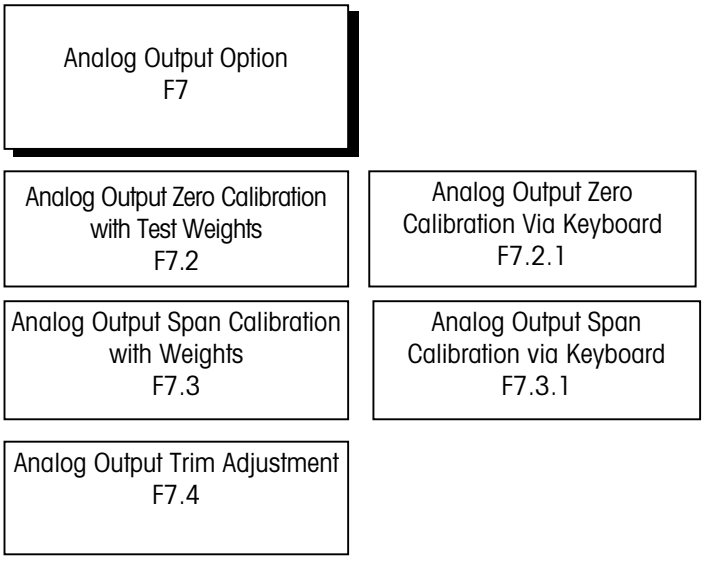
[F6.7 X] DISPLAY RAW SCALE DATA

X = 0 Skip this sub-block.

X = 1 Display raw counts

[nnnnnnn] Where "nnnnnnn" are the raw filtered counts. The raw counts are zero adjusted (fine zero has been subtracted off) in the digital version, but not zero adjusted in the analog version.

F7 Analog Output Option Block



[F7] ANALOG OUTPUT OPTION (if option is installed)

Press **SELECT** to skip to **[F 9].**

Press **PRINT** to continue.

F7.2 Analog Output Zero Calibration with Test Weights

[F7.2 X] ANALOG OUTPUT ZERO CALIBRATION WITH WEIGHTS

X=0 Skip this block.

X=1 Proceed to:

[0 Ld] Press the **PRINT** key to acknowledge desired 'zero' weight is on scale.

[15 CAL] Delay while reading for application zero reading taken.
Go to **[F7.4 X].**

[F7.2.1 X] ANALOG OUTPUT ZERO CALIBRATION VIA KEYBOARD

X = 0 Skip this step.

[ZZZZZZ] X = 1 Numeric Data entry of the previous application zero offset value.

Go to **[F7.3.1 X]**

F7.3 Analog Output Span Calibration with Test Weights Sub-block

[F7.3 X] ANALOG OUTPUT SPAN CALIBRATION WITH WEIGHTS

X = 0 Skip this step.

[15 CAL] X = 1 Delay while zero reading for span determination made.

[Add Ld] Press **PRINT** to acknowledge addition of 'span' weight to the platform.

[15 CAL] Delay while reading for span determination is made. If a weight less than 1000d is used, an error message **[E 32]** is displayed and the previous span calibration is retained. This error display can be terminated by:

ZERO key -- prompt **[F7.4 X]**

CLEAR key -- prompt **[CALOFF].**

PRINT key-- prompt **[F7.4 X]**

If no errors occurred, advance to **[CALOFF]**

[F7.3.1 X] ANALOG OUTPUT SPAN CALIBRATION VIA KEYBOARD

X = 0 Skip this step

[123456] X = 1 Numeric Data entry of previous span factor value.

F7.4 Analog Output Trim Adjustment

[F7.4 X] ANALOG OUTPUT TRIM ADJUSTMENT

X=0 Skip this section

X=1 Continue calibration using constant Zero and Full Scale values.

X=2 Continue calibration using active load cell weight. Empty the scale when calibrating Zero and load scale when adjusting Span.

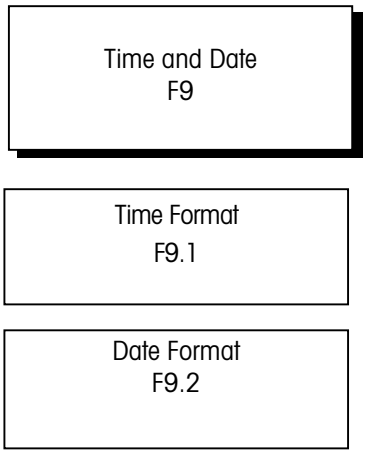
[0 FAS] Decrease zero reading analog output with **SELECT** key or increase with **ZERO** key. One 'click' per key operation.

[0 SLO] If **MEMORY** is pressed, alter zero reading analog output as above but at a slower rate. Successive operation of the **MEMORY** key causes a toggle back and forth between fast and slow mode operation. Finish entry with the **ENTER** key. Abort using **CLEAR**.

[S FAS] Decrease span reading analog output with **SELECT** key or Increase with the **ZERO** key. One 'click' per key operation.

[S SLO] If the **MEMORY** key is pressed, then alter span reading as above at a slower rate. Successive operation of the **MEMORY** key causes a toggle back and forth between fast and slow mode prompt and operation. Finish entry with **PRINT** key. Abort using the **CLEAR** key.

F9 Time and Date Program Block



[F9] TIME AND DATE

Press **SELECT** to skip to **[F10]**.

Press **PRINT** to continue programming this sub-block.

F9.1 Time Format

[F9.1 X] TIME FORMAT

X = 0 Time disabled

X = 1 HH:MM (12-Hour Format)

X = 2 HH:MM (24-Hour Format)

If the Time Format is disabled, skip to Date Format entry.

[HHMM A] If time format is 12-hour clock, enter the time in hours and minutes. Press **SELECT** to toggle between 'A' (AM) and 'P' (PM) after entering all four digits. Press **PRINT**.

[HHMM] If time format is 24-hour clock, enter the time in hours and minute in 24-hour format. Then press **PRINT**.

F9.2 Date Format

[F9.2 X] DATE FORMAT

X = 0 Date disabled

X = 1 MM/DD/YY

X = 2 DD.MM.YY

If the Date Format is disabled, skip to **[F10]**

[MMDDYY] Enter the month, day, and year if in MM/DD/YY format. Press **PRINT**.

[DDMMYY] Enter the day, month, and year if in DD.MM.YY format. Press **PRINT.**

F10 Other User Options Program Block

Other User Options
F10

ID Entry for Printing
F10.1

[F10] OTHER USE OPTIONS

Press **SELECT** or **CLEAR** to skip to **[CALOFF].**

Press **PRINT** to continue configuring this sub-block.

F10.1 ID Entry for Printing

[F10.1 XX] ID Entry for Printing

Values from 00 to 99 are accepted. The ID can be selected as a print field.

Exit Setup Mode Program Block

[CALOFF] EXIT SETUP MODE

[CALOFF] reminds the user to move the Setup switch to "off".

Press **ZERO** to return to the previous block or **PRINT** to exit setup.

Additional Information

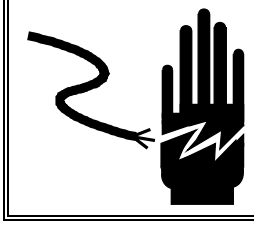
In order to secure the PANTHER PLUS terminal from accidental or unintentional changes in setup mode, turn switch SW1-1 off.

In legal-for-trade applications, after checking for correct operation and turning switch SW1-1 off, the PANTHER PLUS terminal enclosure must be "sealed." The enclosure may be sealed by using adhesive labels on two opposite sides of the enclosure and sticking the labels between the front and rear portions of the enclosure. If a wire and lead seal are required, loop the wire through the bottom center hole of the front door, and secure it with a seal.

Once the has been configured (programmed), it is ready for use. Instructions for using the PANTHER PLUS terminal are provided in the PANTHER PLUS User's Guide. Operators can perform any of the basic functions listed in that manual. The advanced functions must have been enabled during the programming sequence you just completed in order for operators to have access to them.

4 Service and Maintenance

Cleaning and Maintenance



WARNING

ONLY PERMIT QUALIFIED PERSONNEL TO SERVICE THIS EQUIPMENT. EXERCISE CARE WHEN MAKING CHECKS, TESTS AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM.

When cleaning the PANTHER PLUS terminal, wipe the keyboard and display with a clean, soft cloth dampened with a mild glass cleaner. Do not use any type of industrial solvent such as toluene or isopropanol (IPA). They may damage the terminal's finish. Do not spray cleaner directly onto the terminal. Regular maintenance inspections by a qualified service technician are also recommended.

Troubleshooting

If problems occur, do not attempt to repair the terminal before the source of the problem has been determined. Record as much information as possible about what has happened including any error messages and physical responses of the terminal and/or scale. If the PANTHER PLUS terminal is malfunctioning, perform the troubleshooting tests described in the next few pages to identify the problem.

Error Codes and Actions

Error	Description	Corrective Measures
E1	PROGRAM MEMORY ERROR	Check power supply voltages. Replace Main Logic PCB.
E2	INTERNAL RAM ERROR	Check power supply voltages. Replace Main Logic PCB.
E3	EEPROM MEMORY ERROR	Check power supply voltages. Reprogram. Recalibrate. Replace Main Logic PCB.
E4	EXTERNAL RAM ERROR	Replace Main Logic PCB.

Error	Description	Corrective Measures
E7	A/D CIRCUIT MALFUNCTION OR NO ANALOG LOAD CELL CONNECTED	Program for correct load cell type. Check load cells and cables. Check power supply voltages. Replace Main Logic PCB
E16	INTERNAL MATH ERROR	Press **CLEAR** to acknowledge. Unit will reset.
E20	PREACT VALUE IS GREATER THAN SETPOINT VALUE	Clear preact value, then re-enter setpoint value
E32	INSUFFICIENT TEST WEIGHT USED FOR CALIBRATION	Recalibrate using more test weight
E34	TEST WEIGHT EXCEEDS 105% OF CAPACITY.	Use less than 105% of capacity Press **CLEAR** and re-enter
E35	SPAN CALIBRATION ERROR.	Recalibrate. If error persists, check programming or replace load cell. Check load cell connections.
E36	ANALOG LOAD CELL OUT OF RANGE.	Recalibrate. Replace load cell
E50	WEIGHT CANNOT BE DISPLAYED IN ALTERNATE UNITS.	Some alternate units combinations are illegal. Choose another scale build or disable alternate units.
E60	STACK OVERFLOW	Press **CLEAR**. Unit resets.
E90	TARGET ZONE(S) INVALID.	Press **CLEAR** to acknowledge and re-enter values.
EEE	POSITIVE MORE THAN ZONE CAPTURE LIMIT OF 2% OF SCALE CAPACITY.	Remove material from scale base. Disable AZM in setup. Cycle power.
-EEE	NEGATIVE MORE THAN ZONE CAPTURE LIMIT OF 2% OF SCALE CAPACITY	Disable AZM in setup. Calibrate scale. Cycle power.
o E	OVER ZONE IS OUT OF RANGE OR DOES NOT FIT BUILD (ACTUAL WEIGHT ZONES ONLY).	Press **CLEAR** to acknowledge and re-enter zone.
h E	HIGH ZONE IS OUT OF RANGE OR DOES NOT FIT BUILD (ACTUAL WEIGHT ZONES ONLY)	Press **CLEAR** to acknowledge and re-enter zone.
l E	LOW ZONE IS OUT OF RANGE OR DOES NOT FIT BUILD (ACTUAL WEIGHT ZONES ONLY).	Press **CLEAR** to acknowledge and re-enter zone.
u E	UNDER ZONE IS OUT OF RANGE OR DOES NOT FIT BUILD (ACTUAL WEIGHT ZONES ONLY).	Press **CLEAR** to acknowledge and re-enter zone.

AC Power Test

Using a multi-meter, check the AC input power. Input power must be within -15% and +10% of the nominal AC line voltage.

Main Logic PCB Voltage Test

PANTHER PLUS Terminal Analog

Verify voltage of 5.00 VDC between + and - Excitation (±10%). If the PANTHER PLUS Terminal has power and there is no excitation voltage, replace the PCB.

Discrete Output Voltage

When measuring the higher baud rates in the Demand mode, the meter display will fluctuate for a shorter period of time.

With no load applied and the PANTHER PLUS terminal at gross zero, the following voltages should be measured. Refer to the following table for correct voltage readings.

Test Points	Voltage Readings
GND & +5 VDC	5 VDC*
+5 VDC & OUT1	5 VDC*
+5 VDC & OUT2	5 VDC*
+5 VDC & OUT3	5 VDC*

*If voltages are not within the +4.5 to +5.2 VDC range, check for:

- Check wiring. Refer to the Appendix, Discrete Outputs.
- Correct programming.
- Correct setpoint weight values.

RS232 Serial Output Test

Use the following test procedure to determine whether the RS-232 serial port is operational.

1. Remove power from the PANTHER PLUS terminal and the printer and disconnect the data cable from the printer.
2. Set the volt meter to read 20 volts DC.
3. Connect the red lead to pin 3 of the printer end of the data cable and connect the black lead to pin 7.
4. Apply power. The meter should read as follows:
   - In Demand mode, the meter should read between –5 and –15 with no fluctuation.
   - In Continuous mode, the meter should fluctuate between –5 and +5 continuously. The constant fluctuation on the meter display indicates the scale/indicator is transmitting information.

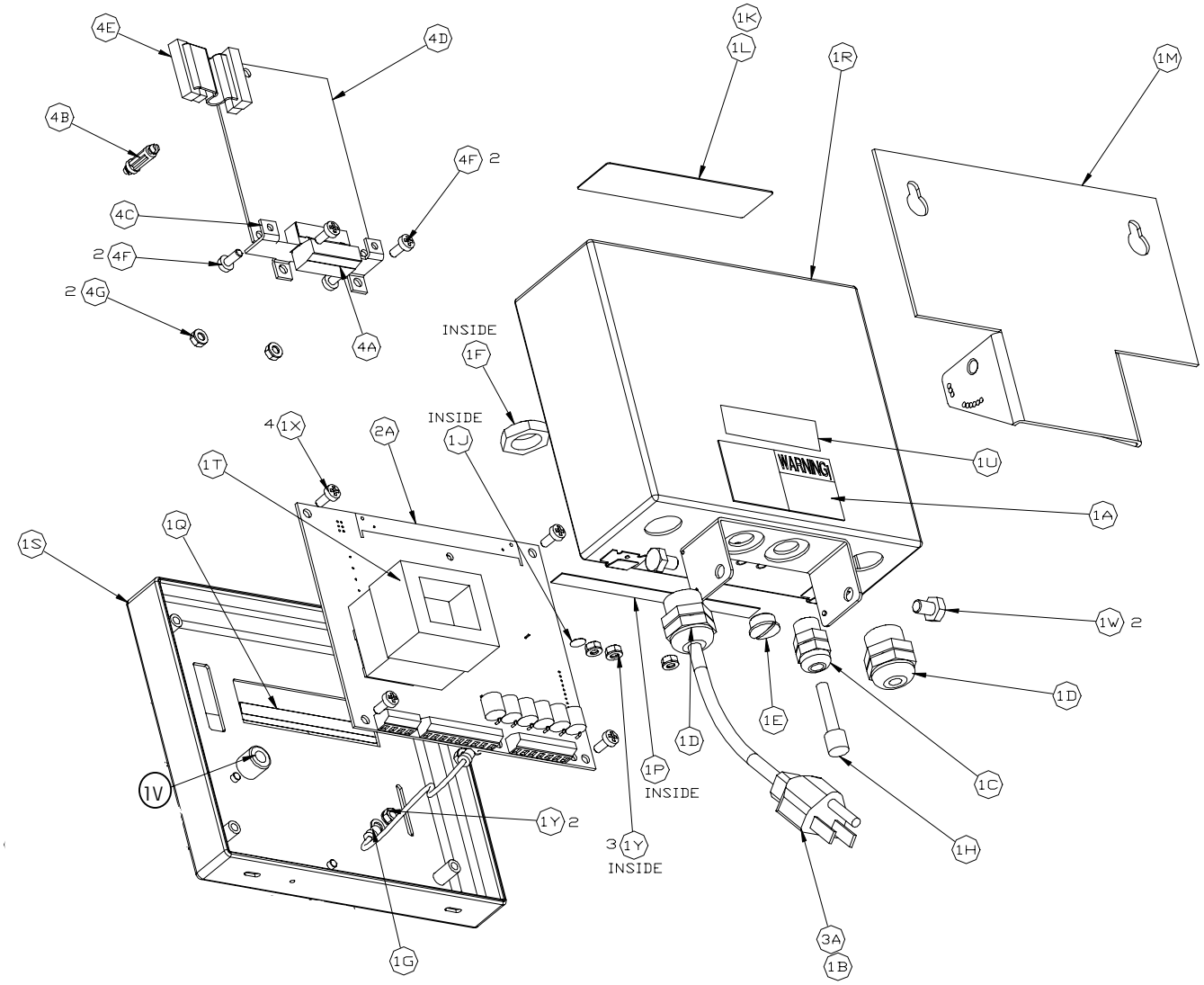
To test Demand baud rates, press the **PRINT** key. The display should fluctuate between –5 volts to +5 volts for the duration of the transmission, then become stable again. This indicates the terminal has transmitted data.

Analog Output Option

Test the voltages of each output to ground. Depending on the calibration of the scale and the displayed weight, each output should be outputting a linear voltage with respect to calibration. If the voltages are not present or the error code repeats, replace the analog output PCB.

5 Parts and Accessories

PANTHER PLUS Terminal



PANTHER PLUS TERMINAL PARTS

Sym	Qty	Part Number	Description
1A	1	(*)12237300A	LABEL, WARNING-POWER
1B	1	(*)12471400A	TERMINAL. #2 RING
1C	1	(*)12901800A	BUSHING, CORD W/ NUT .11 - .25
1D	2	(*)13002300A	BUSHING, CORD W/ NUT .11 - .25
1E	1	(*)14399900A	HOLE PLUG, PG7
1F	1	(*)14577900A	HEX NUT, PG7
1G	1	(*)15048200A	GROUND HARNESS
1H	1	(*)14467600A	HOLE PLUG, .24/.38 DIA.
1J	1	(*)14531400A	LABEL, GROUND BSI
1K	1	(*)14800000A	LABEL, DATA
1L	1	(*)14801800A	SHIELD, LABEL
1M	1	(*)14826100A	BRACKET, MOUNTING
1P	1	(*)14828700A	LABEL, CONTROLLER I/O
1Q	1	(*)15530100A	LEGEND PLATE, CURSOR
1R	1	(*)14829300A	ENCLOSURE ASSEMBLY
1S	1	(*)15517400A	FRONT COVER/KEYBOARD ASSEMBLY
1T	1	(*)14829600A	DAMPER PAD, TRANSFORMER
1U	1	(*)11397100A	LABEL, FCC
1V	1	(*)14830500A	RUBBER FOOT
1W	2	R02072020	SCREW, 1/4-20 X .38 HEX HEAD STAINLESS STEEL
1X	4	R0511100A	SCREW, M4 X 10 PH PAN HEAD
1Y	4	R0519600A	HEX NUT, M4 W/ LOCKWASHER

Add for Scale Option (PTHK-1XXX-XXX)

2A	1	(*)15493700A	PCB ASSEMBLY, MAIN ANALOG LOAD CELL

Add for Power Cord

3A	1	(*)14962000A	LINE CORD, NORTH AMERICA
	1	(*)14503200A	LINE CORD, CONTINENTAL EUROPE
	1	(*)13894700A	LINE CORD, U.K./IRELAND
	1	(*)14962300A	LINE CORD, AUSTRALIA
	1	(*)14962400A	LINE CORD, CHILE (ITALY)

Add for Analog Output Interface Option (PTHN-X8XX-XXX)

4A	1	(*)13162500A	CONNECTOR PLUG, 6 POS. ANALOG OUTPUT
4B	1	(*)14467400A	SPACER, SNAP-IN 5/8"
4C	1	(*)14829500A	MOUNTING BRACKET
4D	1	(*)14882700A	PCB ASSEMBLY, ANALOG OUTPUT
4E	1	(*)14915300A	HARNESS, OPTION
4F	4	R0511100A	SCREW, M4 X 10 PH PAN
4G	2	R0519600A	NUT, HEX M4 W/ LOCKWASHER

(*) May have revision letter prefix.

6 Appendices

Appendix 1: RS232 Serial I/O

The PANTHER PLUS terminal has a bi-directional RS-232 port that may be programmed for several functions. The input can be used to provide simple commands from another device or if programmed in the host mode, can receive more in-depth information. The output can be configured for simple output to a printer or computer, continuous output to a remote display, or as a more advanced host interface.

The output is always 10 bit framing (1 start bit, 7 ASCII data bits, 1 parity bit, and 1 stop bit). The parity bit is selectable in setup as even, odd or always a '0'. The baud rate is also selectable from 300 to 9600. An ASCII Start of Text (STX) and a checksum character may be added to the data output if desired.

The checksum character is defined as the 2's complement of sum of the 7 least significant bits of all preceding characters including the <STX> and <CR> (dropping all bits that carry past the 7 least significant bits). The checksum character is transmitted with the same parity as all other characters. The checksum must be supported, but may be optionally selected "off" by the installer, in which case the character is not sent.

Serial Input

The PANTHER PLUS terminal has an input mode that allows simple commands to be received. These commands duplicate the front panel keyboard functions. Note that all characters are uppercase and no control characters need to be sent. All other ASCII characters are ignored, which permits the use of termination characters such as CR (Carriage Return) or LF (Line Feed). The following commands are recognized by the PANTHER PLUS terminal when the output mode is programmed as demand or continuous.

Command	Function	Description
C	Clear	Clear target or tare value
T	Tare	Take a pushbutton tare (always active)
P	Print	Transmit data
Z	Zero	Zero the scale (if within range and no-motion)
S	Send	Transmit data
U	Select	Switch units (if enabled in setup)
X	Target	Take a pushbutton target (over/under mode only)

When the PANTHER PLUS terminal used in the over/under mode, in addition to these simple commands, target and zone values may be downloaded to memory. The following format must be used to download these values into memory locations 01 through 10:

<STX><A><nn><Target><H Zone><HA Zone><LA Zone><L Zone><ETB><CR>

STX -	ASCII 'Start of Text' character (02 hex)
A -	ASCII uppercase letter 'A' (41 hex)
nn -	2 ASCII digits of memory target number from '01' to '10'.
Target -	6 ASCII digits (decimal point implied). Value must be padded with leading zeroes to complete a 6 digit field. Targets must be entered with proper increment to match scale build or download is ignored.
H Zone -	6 ASCII digit high zone (in either increments or percent as selected in setup).
HA Zone - selected	6 ASCII digit high accept zone (in either increments or percent as in setup).
LA Zone - selected	6 ASCII digit low accept zone (in either increments or percent as in setup).
L Zone -	6 ASCII digit low zone (in either increments or percent as selected in setup).
ETB -	ASCII 'End of Block' character (17 hex)
CR -	ASCII 'Carriage Return' (0D hex)

Demand Output

The PANTHER PLUS terminal can be programmed for the demand mode. In this mode, the terminal will transmit serial data when a print command is issued using the **PRINT** key, an autoprint cycle or a remote print request from a host. Detection of motion delays print initiation until motion has ceased. The demand output is inhibited under gross zero and when in the expanded weight mode.

Up to five fields may be selected to print in any order in the demand mode. The choices are: displayed weight, gross weight, tare weight, net weight, time, date and a blank field. The format of the output data can be programmed as either single line format or multiple line format.

The following ASCII characters are common to all demand mode formats.

STX	ASCII Start of Text character (02 hex), transmitted only if enabled in setup
SP	ASCII Space character (20 hex)
CR	ASCII Carriage Return character (0D hex)
CHK	Checksum, transmitted only if enabled in setup.
LF	ASCII Line Feed character (0A hex)
SO	ASCII Shift Out (0E hex), used to initiate double width printing. Only in displayed weight, net weight, or gross weight (if showing gross weight) fields.
SI	ASCII Shift In character (0F hex), used to terminate double width printing. Only in displayed weight, net weight, or gross weight (if showing gross weight) fields.

The following fields may be selected in any order for data output

GROSS Wt.

DATA	SO	X	X	X	X	X	X	X	SP	k	g	SP	G	SI
NOTES		A								B			C	

TARE Wt.

DATA	X	X	X	X	X	X	X	SP	k	g	SP	T
NOTES	A								B			C

NET Wt.

DATA	SO	X	X	X	X	X	X	X	SP	k	g	SP	N	E	T	SI
NOTES		A								B			C			

TIME

DATA	SP	SP	X	X	:	X	X	SP	A	M
NOTES		D							E	

DATE

DATA	SP	SP	X	X	.	X	X	.	X	X
NOTES			F							

Notes:

A — Right justified weight field consisting of 7 characters including leading spaces and decimal point (if any).

B — Right justified weight unit field of 2 characters.

C — Variable weight legend field of either 1 or 3 characters (G, T or NET).

D — Time field of 5 characters. Format selectable in setup as either 12 or 24 hour. Leading zeroes are sent.

E — Time legend of AM or PM if 12 hour clock selected in setup. Not transmitted in 24-hour format.

F — Date field of 8 characters. Format selectable in setup as either MM/DD/YY or DD.MM.YY where MM is the month, DD is the day and YY is the year.

Format Notes:

Percent Weight — Only displayed weight, time, date, and blank fields will be printed when displaying weight as percent (F5.7.2 = 1)

Status — The "status" field is available in the over-under mode. The status words are: "OVER", "HIGH", "ACCEPT", "LOW", or "UNDER".

Blank — A blank field is transmitted as 7 spaces. If a blank field is chosen as a trailing field in the format, it is not transmitted. Using this feature allows you to limit the number of data fields transmitted.

LB-OZ Mode

For lb-oz scale builds, the data output matches other builds except that there are two weight fields sent for each gross, tare and net weight.

gross = <signed gross weight, lb portion><lb><sp><gross weight, oz portion><oz>

tare = <tare weight, lb portion><lb><sp><tare weight, oz portion ><oz>

net = <signed net weight, lb portion><lb><sp><net weight, oz portion ><oz>

SINGLE LINE FORMAT

DATA	STX	Field 1	SP	Field 2	SP	Field 3	SP	Field 4	SP	Field 5	CR	CHK	LF

MULTIPLE LINE FORMAT

DATA	STX	Field 1	CR	CHK	LF

DATA	Field 2	CR	CHK	LF

DATA	Field 3	CR	CHK	LF

DATA	Field 4	CR	CHK	LF

DATA	Field 5	CR	CHK	LF

SINGLE LINE FORMAT WITH OVER-UNDER STATUS

DATA	STX	Field 1	SP	Field 2	SP	Field 3	SP	Field 4	SP	Field 5	SP	Status	CR	CHK	LF

Continuous Output

The continuous output mode of the PANTHER PLUS terminal may be used to continuously send weight data and scale status information to a remote device such as a PC or a remote display. A data string will be output once each A/D cycle of the PANTHER PLUS terminal.

There are two modes of continuous output available. In the indicator or over/under mode, only weight and scale status are transmitted. In the setpoint mode, setpoint status bits are added to indicate the status of each of the setpoints.

Both a Start of Text (STX) and a checksum (CHK) character are selectable in the setup of the PANTHER PLUS terminal.

DATA	STX	SW A	SW B	SW C	X	X	X	X	X	X	X	X	X	X	X	X	CR	CHK
NOTES	A	B Status Bytes			C Indicated Weight					D Tare Weight							E	F

Notes:

A ASCII Start of Text character (02 hex), always transmitted

B Status words. Refer to following Status Byte table for details.

C Displayed weight. Either gross or net weight. Six digits, no decimal point or sign. Non significant leading zeroes are replaced with spaces.

D Tare weight. Six digits, no decimal point.

E ASCII Carriage Return character (0D hex)

F Checksum, transmitted only if enabled in setup

The following tables detail the standard status bytes for standard continuous output and standard continuous short output.

Bit Identification Table for Status Byte A			
Bits 0, 1 and 2			
2	1	0	**Decimal Point Location**
0	0	1	XXXXX0
0	1	0	XXXXX
0	1	1	XXXX.X
1	0	0	XXX.XX
1	0	1	XX.XXX
Bits 3 and 4			
4	3		**Build Code**
0	1		X1
1	0		X2
1	1		X5
Bit 5			Always = 1
Bit 6			Always = 0

Bit Identification Table for Status Byte B	
Status Bits	**Function**
Bit 0	Gross = 0, Net = 1
Bit 1	Sign, Positive = 0, Negative = 1
Bit 2	Out of Range = 1 (Over capacity or Under Zero)
Bit 3	Motion = 1
Bit 4	lb = 0, kg = 1 (see also Status Byte C, bits 0-2)
Bit 5	Always = 1
Bit 6	Zero Not Captured = 1

Bit Identification Table for Status Byte C			
Bits 0, 1 and 2			Weight Description
2	1	0	
0	0	0	lb or kg, selected by Status Byte B, bit 4
0	0	1	grams (g)
0	1	0	metric tons (t)
0	1	1	ounces (oz)
1	0	0	troy ounces (ozt)
1	0	1	penny weight (dwt)
1	1	0	tons (ton)
1	1	1	custom units
Bit 3			Print Request = 1
Bit 4			Expand Data x 10 = 1
Bit 5			Always = 1
Bit 6			Always = 0

Continuous Setpoint Status Bytes A, B, and C

The continuous output mode format also supports setpoint operation. This setpoint format is identical to the standard continuous format except for some differences in the status bytes. The following tables detail the status bytes for the setpoint status byte mode (F5.1=1).

Bit Identification Table for Status Byte A			
Bits 0, 1 and 2			
2	1	0	Decimal Point Location
0	0	1	XXXXX0
0	1	0	XXXXXX
0	1	1	XXXXX.X
1	0	0	XXXX.XX
1	0	0	XXX.XXX
Bit 3	Setpoint 1, Feeding = 0		
Bit 4	Setpoint 2, Feeding = 0		
Bit 5	Always = 1		
Bit 6	Always=1		

Bit Identification Table for Status Byte B	
Status Bits	**Function**
Bit 0	Gross = 0, Net = 1
Bit 1	Sign, Positive = 0, Negative = 1
Bit 2	Out of Range = 1 (Over capacity or Under Zero)
Bit 3	Motion = 1
Bit 4	lb = 0, kg = 1 (see also Status Byte C, bits 0-2)
Bit 5	Always = 1
Bit 6	Setpoint 1, Weight Tolerance or Zero Tolerance; In Tolerance = 0, Out Tolerance = 1

Bit Identification Table for Status Byte C			
Bits 0, 1 and 2			
2	**1**	**0**	**Weight Description**
0	0	0	lb or kg, selected by Status Byte B, bit 4
0	0	1	grams (g)
0	1	0	metric tons (t)
0	1	1	ounces (oz)
1	0	0	troy ounces (ozt)
1	0	1	penny weight (dwt)
1	1	0	tons (ton)
1	1	1	custom units
Bit 3			Print Request = 1
Bit 4			Always = 1
Bit 5			Always = 1
Bit 6			Always = 1

Note: If the scale is in lb-oz mode, the weight description will be in ounces only.

Serial Data Output in Continuous Mode

A 300-9600 baud continuous output may be selected instead of the print on demand output. This data consists of 16 or 18 bytes transmitted in a 10-bit ASCII frame consisting of: 1 start bit, 7 data bits, 1 even parity bit, and 1 stop bit.

The format is:

Character	Function
1	STX (Start of text - Optional)
2	Status Word A
3	Status Word B
4	Status Word C
5	Weight MSD
6	Weight
7	Weight
8	Weight
9	Weight
10	Weight LSD
11	Tare Weight MSD
12	Tare Weight
13	Tare Weight
14	Tare Weight
15	Tare Weight
16	Tare Weight LSD
17	CR (carriage return)
18	CKSM (Checksum - Optional

Non-significant weight data and tare data digits will be transmitted as spaces. A description of the status words A, B, and C is shown in Tables 4-6.

TABLE 4A - CONTINUOUS MODE STATUS WORD A - SETPOINTS ENABLED (F5.1=1)

STATUS WORD A - SETPOINT OPTION ENABLED (F5.1=1)				
Bit 0, 1, 2	**Encoded Decimal Point**			
	Display	**Bit 2**	**Bit 1**	**Bit 0**
	XXXXX0	0	0	1
	XXXXX	0	1	0
	XXXX.X	0	1	1
	XXX.XX	1	0	0
	XX.XXX	1	0	1
Bit 3	Setpoint Output 1 (0 = less than setpoint value)			
Bit 4	Setpoint Output 2 (0 = less than setpoint value)			
Bit 5	Always = 1			
Bit 6	Always = 1			
Bit 7	Parity of Status Word A			

TABLE 4B - CONTINUOUS MODE STATUS WORD A - SETPOINTS DISABLED (F5.1=1)

STATUS WORD A - SETPOINTS OPTION DISABLED (F5.1=1)				
Bit 0, 1, 2 Encode Decimal Point				
	Display	**Bit 2**	**Bit 1**	**Bit 0**
	XXXXX0		0	01
	XXXXXX	0	1	0
	XXXXX.X	0	1	1
	XXXX.XX	1	0	0
	XXX.XXX	1	0	1
Bit 3, 4 Increment Size		3	4	
	X1	0	1	
	X2	1	0	
	X5	1	1	
Bit 5	Always = 1			
Bit 6	Always = 1			
Bit 7	Parity of Status Word A			

TABLE 5 - CONTINUOUS MODE STATUS WORD B

STATUS WORD B	
Bit 0	Gross = 0, Net = 1
Bit 1	Minus sign = 1
Bit 2	Overcapacity = 1
Bit 3	Motion = 1
Bit 4*	lb = 0, kg = 1
Bit 5	Always = 1
Bit 6	- If setpoints enabled (F5.1 = 1), bit 6 = within zero tolerance. - If setpoints disabled (F5.1 = 0), bit 6 = Power Up Flag.
Bit 7	Parity of Status Word B

Note: Bit 4 is set if units are other than lb or kg.

TABLE 6 – BIT IDENTIFICATION TABLE FOR STATUS BYTE C

Bit Identification Table for Status Byte C			
Bits 0, 1 and 2			
2	**1**	**0**	**Weight Description**
0	0	0	lb or kg, selected by Status Byte B, bit 4
0	0	1	grams (g)
0	1	0	metric tons (t)
0	1	1	ounces (oz)
1	0	0	troy ounces (ozt)
1	0	1	penny weight (dwt)
1	1	0	tons (ton)
1	1	1	custom units
Bit 3			Print Request = 1
Bit 4			Always = 1
Bit 5			Always = 1
Bit 6			Always = 1

Appendix 2: Standard Interface Command Set (SICS) Protocol

All new METTLER TOLEDO indicators support the standardized command set "METTLER TOLEDO Standard Interface Command Set" (MT-SICS), which is divided into 4 levels, depending on the functionality of the weighing instrument. The PANTHER PLUS terminal supports the MT-SICS level 0 command set.

What Do the Commands of MT-SICS Level 0 Offer?
You can use the commands of MT-SICS level 0 to perform the following operations via the interface:

- Request weighing results
- Tare the terminal
- Zero the terminal
- Identify MT-SICS implementation
- Identify the terminal
- Reset the terminal

Additional Documentation on Data Interface
Settings of the interface such as baud rate, parity, and connector pin assignments are described in previous sections of this manual.

Version number of the MT-SICS
Each level of the MT-SICS has its own version number which can be requested with the command I1.

This section describes: MT-SICS level 0, version 2.1x.

You can use the command I1 via the interface to request the MT-SICS level and MT-SICS version implemented on the PANTHER PLUS terminal.

Command Formats
Each command received by the PANTHER PLUS terminal via the data interface is acknowledged by a response of the PANTHER PLUS terminal to the transmitter. Commands and responses are data strings with a fixed format.

Commands sent to the balance comprise one or more characters of the ASCII character set. Here, the following must be noted:

- Enter commands only in uppercase.
- The possible parameters of the command must be separated from one another and from the command name by a space (ASCII 32 dec. in this description represented as _).
- Each command must be closed by CR LF (ASCII 13 dec., 10 dec.)

The characters CR and LF, which can be inputted using the **ENTER** or **RETURN** key of most entry keypads, are not listed in this description, but it is essential they be included for communications with the PANTHER PLUS terminal.

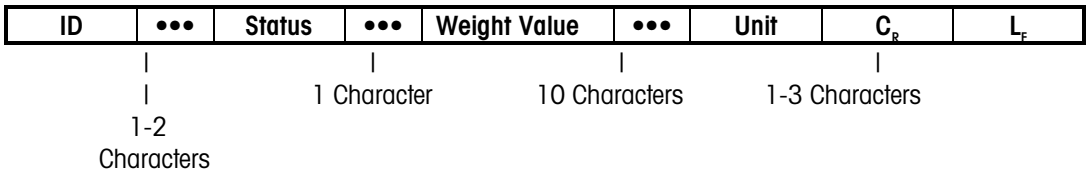
Response Formats

All responses sent by the PANTHER PLUS terminal to the transmitter to acknowledge the received command have one of the following formats:

- Response with weight value
- Response without weight value
- Error message

Format of the Response with Weight Value

A general description of the response with weight value is the following:



- ID--Response identification.
- _-- Space (ASCII 32 dec.)
- Status--Status of the terminal, see description of the commands and responses.
- Weight Value--Weighing result: shown as number with 10 digits, including sign directly in front of the first digit. The weight value appears right-aligned. Preceding zeroes are not shown with the exception of the zero to the left of the decimal point.
- Unit--Weight unit displayed after the terminal has been switched on.
- CR--Carriage Return (ASCII 13 dec.)
- LF--Line Feed (ASCII 10 dec.)

Comment--CR LF will not be shown in the description.

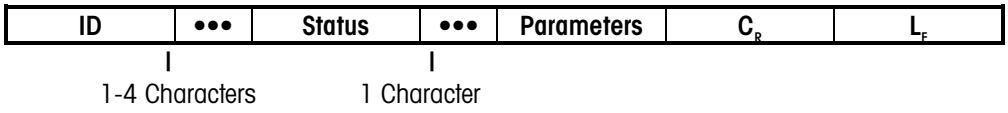
Example

Response with stable weight value of 0.256 g:

S_S_ _ _ _ _ _0.256_g

Format of the Response Without Weight Value

A general description of the response without weight value is the following:



- ID--Response identification.
- _--Space (ASCII 32 dec.)
- Status--Status of the terminal, see description of the commands and responses.
- Parameters--Command-dependent response code.
- Unit--Weight unit displayed after the terminal has been switched on.
- CR--Carriage Return (ASCII 13 dec.)
- LF--Line Feed (ASCII 10 dec.)

Error messages

ID	C_R	L_F

ID--Error Identification

The PANTHER PLUS terminal supports the following two error ID:.

- ES--Syntax error
  The terminal does not recognize the command.

CR--Carriage return (ASCII 13 dec.)
LF--Line Feed (ASCII 10 dec.)

Tips for the Programmer. Command and Response---You can improve the dependability of your application software by having your program evaluate the response of the terminal to a command. The response is the acknowledgment that the terminal has received the command.

Reset. To start from a determined state when establishing the communication between terminal and system, you should send a reset command to the terminal. When the terminal or system is switched on or off, faulty characters can be received or sent.

Quotation Marks ("""). Quotation marks included in the command must always be entered.

Commands and Responses MT-SICS Level 0

The PANTHER PLUS terminal receives commands from the system computer and acknowledges the command with an appropriate response. The following sections contain a detailed description of all commands of the command set in alphabetical order with the associated responses. Commands and responses are closed with CR and LF. These termination characters are not shown in the following description, but they must always be entered with commands or sent with responses.

The commands of MT-SICS level 0 are supported by the PANTHER PLUS terminal and include:

- I1 Inquiry of MT-SICS level and MT-SICS version
- I2 Inquiry of terminal data
- I3 Inquiry of terminal SW version
- I4 Inquiry of serial number
- S Send stable weight value
- SI Send weight value immediately
- SIR Send weight value immediately and repeat
- T Tare
- Z Zero
- @ Reset

1. I1--INQUIRY OF MT-SICS LEVEL AND MT-SICS VERSIONS
Command: I1--Inquiry of MT-SICS level and MT-SICS versions
Response: I1_A_"x1"_"x2"_"x3"_"x4"_"x5"

- x1 = 0--Terminal with MT-SICS level 0
- x2--Version of the implemented MT-SICS0 commands
- x3--Version of the implemented MT-SICS1 commands
- x4--Version of the implemented MT-SICS2 commands
- x5--Version of the implemented MT-SICS3 commands

Example
Command I1--Inquiry of MT-SICS level and versions used in the PANTHER PLUS terminal.
Response--I 1_A_"0"_"2.10"_""_""_""
- 0 Level 0 implemented in PANTHER PLUS terminal
- 2.10 Level 0, version 2.10 in PANTHER PLUS terminal
- "" Level 1 not supported in PANTHER PLUS terminal
- "" Level 2 not supported in PANTHER PLUS terminal
- "" Level 3 not supported in PANTHER PLUS terminal

Comments
- In the case of MT-SICS level, only fully implemented levels are listed. In other words, if it is not possible to implement all commands from a certain level, the level is not specified.
- In the case of the MT-SICS version, all levels are specified even those only partially implemented.

2. I2--INQUIRY OF TERMINAL DATA
Command: I2--Inquiry of terminal type.
Response: I2_A_"text" • Terminal data as "text".

Example
Command I2--Inquiry of PANTHER PLUS terminal type.
Response--I2_A_"Panther_Plus_ _ _ _ _ _10000_lb"
- This response shows the PANTHER PLUS terminal is used with analog load cells and has been calibrated for 10000 lb capacity.

3. I3--INQUIRY OF TERMINAL SOFTWARE VERSION
Command: I3--Inquiry of terminal SW version
Response: I3_A_"text" • Terminal SW version as "text".

Example
Command I3--Inquiry of terminal SW version.
Response--I3_A_"0.00_0.00_154879R
- 0.00--PANTHER PLUS terminal has no operating system
- 0.00--Always this value for PANTHER PLUS terminal
- 154879R--PANTHER PLUS terminal software number

4. I4--INQUIRY OF SERIAL NUMBER
Command: I4--Inquiry of serial number.
Response: I4_A_"text"
- Serial number as "text"

Example
Command I4--Inquiry of serial number
Response--I4_A_"00000000
- 0000000000--Always this value for the PANTHER PLUS terminal.

Comments
- The response to I4 appears after the reset command (@) and at power-up.

5. S--SEND STABLE WEIGHT VALUE
Command: S--Send the current stable weight
Responses:

- S_S_WeightValue_Unit--Current stable weight value.
- S_I--Command not executable (time-out since stability was not achieved.)
- S_+ --Terminal in overcapacity range.
- S_- --Terminal in undercapacity range.

Example
Command S--Send a stable weight value.
Response: S_S_ _ _ _ _100.00_g

- The current stable weight is 100.00 g.

Comments

- The duration of the stability time-out is 2 seconds for the PANTHER PLUS.
- The weight unit is the currently selected unit.

6. SI--SEND WEIGHT VALUE IMMEDIATELY
Command: SI--Send the current weight value regardless of scale stability.
Responses:

- S_S_WeightValue_Unit--Stable weight value.
- S_D_WeightValue_Unit--Dynamic weight value.
- S_+ --Terminal in overcapacity range.
- S_- --Terminal in undercapacity range.

Example
Command SI--Send current weight value.
Response: S_D_ _ _ _ _129.02_LB

- The current dynamic weight is 129.02 LB.

Comments

- The response to the command SI is the last internal weight value (stable or dynamic) prior to receipt of the command SI.
- The weight unit is the currently selected unit.

7. SIR--SEND WEIGHT VALUE IMMEDIATELY AND REPEAT
Command: SIR--Send weight values repeatedly, regardless of terminal stability.
Responses:

- S_S_WeightValue_Unit--Stable weight value.
- S_D_WeightValue_Unit--Dynamic weight value.
- S_+ --Terminal in overcapacity range.
- S_- --Terminal in undercapacity range.

Example
Command: SIR--Send current weight values at intervals.
Responses:

- S_D_ _ _ _ _129.02_LB
- S_D_ _ _ _ _129.06_LB
- S_D_ _ _ _ _129.08_LB
- S_D_ _ _ _ _114.14_LB
- ...__Terminal sends stable or dynamic weight values at intervals.

Comments

- SIR is overwritten by the commands S, SI, SIR, @ and thus cancelled.
- The PANTHER PLUS terminal updates 20 times per second.
- The weight unit is the currently selected unit.

8. T--TARE
Command: T--Tare, i.e. store next stable weight value as new tare weight value.

Responses:
• T_S_WeightValue_Unit--Taring performed, i.e. stability criterion and taring range complied with. The tare weight value returned corresponds to the weight change on the terminal since the last zero setting.
• T_I--Taring not performed (time-out since stability was not reached.)
• T_+ --Upper limit of taring range exceeded.
• T_- --Lower limit of taring range exceeded.

Example
Command: T--The PANTHER PLUS terminal is tared and has a value of 100.00 kg in the tare memory.
Response--T_S_ _ _ _ _100.00_kg
Comments
• The tare memory is overwritten by the new tare weight value.
• The duration of the stability time-out is 2 seconds.
• The tare memory can be cleared using the command Z.
• The weight unit is the currently selected unit.

9. Z--ZERO
Command: Z--Zero the terminal.
Responses:
• Z_A--The following then holds:
  • Gross = net + tare = 0
• Zero setting performed, (i.e. complied with stability criterion and zero setting range.
• Z_I--Zero setting not performed (time-out since stability not reached).
• Z_+ --Upper limit of zero setting range exceeded.
• Z_- --Lower limit of zero setting range exceeded.

Example
Command Z--Zero.
Response--Z_A--Zero setting performed.

Comments
• The tare memory is cleared during zero setting.
• The duration of the stability time-out is 2 seconds for the PANTHER PLUS terminal.

10. @--RESET
Command: @--Reset the terminal to the conditions found after switching on.
Response:
• I4_A_"text"--Serial number of the terminal, the terminal is ready for operation.

Example
Command @--Reset
Response--I4_A_"0000000000"--PANTHER PLUS terminal reset and sends the null serial number.

Comments
• All commands awaiting responses are canceled.
• The tare memory is reset to zero.

- The "reset" command is always executed.

Appendix 3: Discrete I/O Reference

The PANTHER PLUS terminal has a discrete I/O port with one input terminal and three output terminals.

Inputs

Inputs can be programmed as various commands including tare, clear tare, zero scale, print, switch units or blank display.

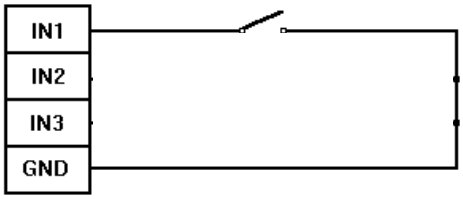
The input is TTL compatible and capable of handling from 5 to 24 volt DC signals. To initiate the input, you must ground the input terminal. Input functions are edge triggered and must be held at logic ground level for at least 100 ms. The following table defines the available functions:

FUNCTION NAME	TYPE	DESCRIPTION OF ACTION
Tare	Edge	Tares the Scale to a Net Mode
Zero	Edge	Zeros the Scale
Print	Edge	Initiates a Print
Switch Units	Edge	Switches the Scale Weight Units
None	N/A	Input Not Assigned

It is not necessary to supply any voltage to the inputs when not triggering. Internally, a 5 volt power supply with a pull-up resistor keeps the inputs in the "OFF" condition.

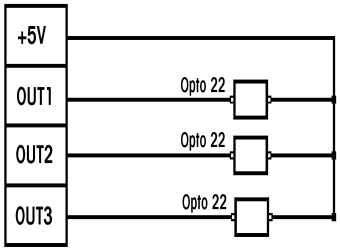
Because the signals are low level, the maximum recommended distance between the PANTHER PLUS terminal and the device triggering the input (a switch or relay contact) is 10 feet or less.

The following diagram shows a typical wiring scheme.



Outputs

The outputs are +5 VDC. A solid state relay or OPTO 22 is typically connected to buffer the outputs to a 120 or 220 volt AC signal. An output terminal supplies a 5 volt DC supply for reference to the setpoint outputs. Make sure the total current draw from the devices used (relays or optos) does not exceed115 mA. If the calculated current draw exceeds 115 mA, an external power supply is required. External power supplies are available from authorized METTLER TOLEDO representatives. The following diagram shows a typical wiring scheme:



The discrete outputs may be used in conjunction with either the setpoint mode or over/under mode.

Setpoint Mode

The setpoint outputs are negative true and "ON" when the scale weight is below the setpoint coincidence value. The setpoints operate on the absolute value of the scale weight so they can be used for both weigh-in and weigh-out processes. No interlocks or relay logic are included with the standard Lynx. If start-stop logic is required, METTLER TOLEDO recommends that you purchase this hardware (and design) through your local authorized METTLER TOLEDO representative. The outputs are assigned the following functions:

Output	Function
Out 1	Setpoint 1
Out 2	Setpoint 2
Out 3	Zero Tolerance

Over/Under Mode

The discrete outputs available in the over/under mode coincide with the "Over," "Accept," and "Under" LEDs on the front panel of the PANTHER PLUS terminal. The outputs are assigned the following functions:

Output	Function
Out 1	Under
Out 2	OK, OK light, OK heavy
Out 3	Over

Appendix 4: Geo Codes

Use the following Geo Codes if you relocate the PANTHER PLUS terminal to a location other than the original location where it was calibrated.

Northern and southern latitude in degrees and minutes	**Height above sea-level in meters**										
	0 325	325 650	650 975	975 1300	1300 1625	1625 1950	1950 2275	2275 2600	2600 2925	2925 3250	3250 3575
	Height above sea-level in feet										
	0 1060	1060 2130	2130 3200	3200 4260	4260 5330	5330 6400	6400 7460	7460 8530	8530 9600	9600 10660	10660 11730
0° 0′ —5° 46′	5	4	4	3	3	2	2	1	1	0	0
5° 46′ — 9° 52′	5	5	4	4	3	3	2	2	1	1	0
9° 52′ — 12° 44′	6	5	5	4	4	3	3	2	2	1	1
12° 44′ — 15° 6′	6	6	5	5	4	4	3	3	2	2	1
15° 6′ — 17° 10′	7	6	6	5	5	4	4	3	3	2	2
17° 10′ — 19° 2′	7	7	6	6	5	5	4	4	3	3	2
19° 2′ — 20° 45′	8	7	7	6	6	5	5	4	4	3	3
20° 45′ — 22° 22′	8	8	7	7	6	6	5	5	4	4	3
22° 22′ — 23° 54′	9	8	8	7	7	6	6	5	5	4	4
23° 54′ — 25° 21′	9	9	8	8	7	7	6	6	5	5	4
25° 21′ — 26° 45′	10	9	9	8	8	7	7	6	6	5	5
26° 45′ — 28° 6′	10	10	9	9	8	8	7	7	6	6	5
28° 6′ — 29° 25′	11	10	10	9	9	8	8	7	7	6	6
29° 25′ — 30° 41′	11	11	10	10	9	9	8	8	7	7	6
30° 41′ — 31° 56′	12	11	11	10	10	9	9	8	8	7	7
31° 56′ — 33° 9′	12	12	11	11	10	10	9	9	8	8	7
33° 9′ — 34° 21′	13	12	12	11	11	10	10	9	9	8	8
34° 21′ — 35° 31′	13	13	12	12	11	11	10	10	9	9	8
35° 31′ — 36° 41′	14	13	13	12	12	11	11	10	10	9	9
36° 41′ — 37° 50′	14	14	13	13	12	12	11	11	10	10	9
37° 50′ — 38° 58′	15	14	14	13	13	12	12	11	11	10	10
38° 58′ — 40° 5′	15	15	14	14	13	13	12	12	11	11	10
40° 5′ — 41° 12′	16	15	15	14	14	13	13	12	12	11	11
41° 12′ — 42° 19′	16	16	15	15	14	14	13	13	12	12	11
42° 19′ — 43° 26′	17	16	16	15	15	14	14	13	13	12	12
43° 26′ — 44° 32′	17	17	16	16	15	15	14	14	13	13	12
44° 32′ — 45° 38′	18	17	17	16	16	15	15	14	14	13	13
45° 38′ — 46° 45′	18	18	17	17	16	16	15	15	14	14	13
46° 45′ — 47° 51′	19	18	18	17	17	16	16	15	15	14	14
47° 51′ — 48° 58′	19	19	18	18	17	17	16	16	15	15	14
48° 58′ — 50° 6′	20	19	19	18	18	17	17	16	16	15	15
50° 6′ — 51° 13′	20	20	19	19	18	18	17	17	16	16	15
51° 13′ — 52° 22′	21	20	20	19	19	18	18	17	17	16	16
52° 22′ — 53° 31′	21	21	20	20	19	19	18	18	17	17	16
53° 31′ — 54° 41′	22	21	21	20	20	19	19	18	18	17	17

Northern and southern latitude in degrees and minutes	Height above sea-level in meters										
	0 325	325 650	650 975	975 1300	1300 1625	1625 1950	1950 2275	2275 2600	2600 2925	2925 3250	3250 3575
	Height above sea-level in feet										
	0 1060	1060 2130	2130 3200	3200 4260	4260 5330	5330 6400	6400 7460	7460 8530	8530 9600	9600 10660	10660 11730
54° 41′ — 55° 52′	22	22	21	21	20	20	19	19	18	18	17
55° 52′ — 57° 4′	23	22	22	21	21	20	20	19	19	18	18
57° 4′ — 58° 17′	23	23	22	22	21	21	20	20	19	19	18
58° 17′ — 59° 32′	24	23	23	22	22	21	21	20	20	19	19
59° 32′ — 60° 49′	24	24	23	23	22	22	21	21	20	20	19
60° 49′ — 62° 9′	25	24	24	23	23	22	22	21	21	20	20
62° 9′ — 63° 30′	25	25	24	24	23	23	22	22	21	21	20
63° 30′ — 64° 55′	26	25	25	24	24	23	23	22	22	21	21
64° 55′ — 66° 24′	26	26	25	25	24	24	23	23	22	22	21
66° 24′ — 67° 57′	27	26	26	25	25	24	24	23	23	22	22
67° 57′ — 69° 35′	27	27	26	26	25	25	24	24	23	23	22
69° 35′ — 71° 21′	28	27	27	26	26	25	25	24	24	23	23
71° 21′ — 73° 16′	28	28	27	27	26	26	25	25	24	24	23
73° 16′ — 75° 24′	29	28	28	27	27	26	26	25	25	24	24
75° 24′ — 77° 52′	29	29	28	28	27	27	26	26	25	25	24
77° 52′ — 80° 56′	30	29	29	28	28	27	27	26	26	25	25
80° 56′ — 85° 45′	30	30	29	29	28	28	27	27	26	26	25
85° 45′ — 90° 00′	31	30	30	29	29	28	28	27	27	26	26

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