DT220

Scale Weight Indicator
Data Terminal

Installation/Calibration/Operation

Version 1.c   06/13/08

Table of Contents

Introduction

Congratulations on your purchase and welcome to the DT220 User's Manual. This manual describes the installation, calibration and setup, and operation of the DT220 weigh scale indicator. The DT220 is a Weigh Scale Indicator Data Terminal with rugged design and state-of-the-art technology. It is designed for use in industrial environments to perform the following functions:

- Data Collection – the DT220 collects data from the A/D, serial communication ports, TTL inputs, and the full alpha/numeric keyboard.
- Database Management – up to 6 data tables are available for organizing, storing and reporting data.
- Additional Functions - trip level event monitor, programmable "Scale Basic" functions, TTL level 'setpoint' inputs and outputs, and remote control via TTL inputs or RS232 serial input.

The DT220 has the following interfaces:

Three bi-directional serial communication ports that are used for printer output, bar code input, computer communications, and remote control applications. The serial ports support RS232, RS422, RS485, and 20ma Current Loop communication.

One parallel TTL port for output to a printer.

TTL inputs (7) and TTL outputs (8).

What's In Each Section

This manual is organized and divided into separate sections:
> **Installation**
> **Calibration**
> **Setup**
> **Operation**
> **Testing**

The importance of some information in various sections depends on what features of the DT220 are to be utilized. It is recommended that each installer and user review all sections of the manual and determine what information is useful to their personal needs.

Installation and Setup allow a user to quickly get the DT220 in a working manner for simple use and testing.

Set Operation Parameters and **Parameter Functions** concentrate upon additional scale parameters and interfacing to peripheral devices such as printers, computer, PLCs, remote displays/scoreboards, etc.

Diagnostic Tests and **Troubleshooting** supply fast and simple diagnostic and troubleshooting instructions for abnormal situation.

Hardware and Wiring Diagrams provides external-wiring instructions.

Scale Basic / Event Monitor Programming

The DT220 has "Scale Basic" programming capabilities, which allow you to customize the operation of the DT220 to your application. Scale Basic is designed to be similar to the common BASIC language used in computer programming.

Event Monitors work with Scale Basic functions to provide event driven programming capabilities, such as activating setpoint relays. Events trigger Scale Basic functions. Scale Basic functions execute programs that service the events.

A Scale Basic & Event Monitor Programming Manual may be obtained through your IDS Dealer

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All such items should be returned in its original shipping container. Any damage not reported when the purchaser originally received the hardware or software is also subject to resonable repair fees to bring it back to new condition. The purchaser will be advised of these fees in writing at the time they are accessed.

All items returned should be returned with a Return Material Authorization number (RMA) issued by an IDS employee. The RMA number should be clearly marked on the outside of the box.

General Description

This section gives you a general description on the operation of the DT220's keyboard and display. The keyboard is used to initiate weighing functions, for data entry, maintenance, setup, and testing. The numeric display is used for weight and error display and for data entry. Additional information about the keyboard and display is provided in section: **Using the DT220**.

DT220 Display

The display has 8 lines x 40 characters in text mode and also provides a large character display of 1 line x 8 characters.

The DT220 Keyboard

The keyboard is used to initiate functions and for data input and setup of the DT220. The keyboard has 4 sections: Alpha keys, Numeric Keypad, Function Keys, and Control keys.

Alpha Keys and Numeric Keys

The alpha keys are laid out in the "QWERTY" format. They are used for general-purpose data entry. The numeric keys are laid out in the standard calculator format.

Function Keys

The function keys ZERO, TARE, GROSS/NET, UNITS and PRINT are used to perform the functions of zeroing the scale, tarring the scale, switching the weight display between gross and net display, switching the weight display between LB and KG display, and printing the weight. The top row keys are function keys used for special purpose functions.

Control Keys

The control keys Caps Lock, Shift, Space, Clear Entry, Review, Cont., and Enter are used to control the data entry operations.

Installation and Setup

This section provides information about unpacking, installing, and setup of the DT220. It also directs the installer to the appropriate sections of the manual for hardware and setup installation.

Unpacking the DT220

Installation begins with unpacking the DT220. Observe any instructions or cautions, which appear in the shipping container. Check the items in the shipping container against the following item check list or the packing list. IDS, Inc. will not accept responsibility for shortages against the packing list unless notified within 30 days. All equipment and accessories are inspected and tested by IDS before shipment. Inspect the equipment carefully. If shipping damage is evident, notify IDS immediately. Take photographs if necessary. You are responsible for final claim. Save the packing and shipping container in case you need to store, return, or transport the DT220 for any reason.

Item check list

- DT220 - Weight Scale Indicator
- This User's Manual
- Capacity labels
- A sheet that describes the capacity label placement

NOTE: The container may include additional items that have been purchased separately.

Installation Guide

Connect DT220 to weight indicator / load cell

To use the internal weight indicator, connect the load cell wiring to the Load Cell Terminal Block located inside DT220's enclosure. (optional analog card must be installed)

See the HARDWARE INSTALLATION AND WIRING section for pin assignments and a sample cable drawing.

The DT220 can be connected to an external weight indicator and used as a data terminal. If you are using an external weight indicator, connect to Com port 1 and send a continuous gross weight data string with weight status bits. See Meter Select section for more details.

Connect DT220 to the printer (optional)

The DT220 can be connected to a printer using a serial interface (Com Port 1, 2, or 3) or the parallel "Centronix". See **Hardware and Wiring Diagrams** for pin assignments and sample cable drawings. See **Set Operation Parameters**, and **Parameter Functions** for other communication setup parameters.

Connect DT220 to host device (optional)

Serial Communications Port 2 can provide a continuous output of scale data. This is used for connection to a host device such as a computer or to a remote display (scoreboard). Continuous output transmission can be enabled or disabled and the output format can be customized to interface with the host device. **See Hardware and Wiring Diagrams** for pin assignments and sample cable drawings. See **Set Operation Parameters**, and **Parameter Functions** for other communication setup parameters.

Apply AC Power to the DT220

After the load cell and optional equipment has been connected, apply power through the power cord.

Note: The socket outlet should be installed near the equipment and be easily accessible.

On power-up, the DT220:
Reads the database index.
Waits for a new weight reading.
Executes the "Power on Start" Scale Basic function.
Enters the weight display / event scan loop.

The DT220 is now ready for **initialization**, calibration, and configuration. Continue with Setup Guide.

Setup Guide

Press the **Shift** key once and then Function Key **CFG/TEST** (top right) to enter the configuration setup menu. Setup the DT220 in the following order:

System Initialize

The DT220 is initialized at the factory.   The Initialize function sets the configuration parameters to their default values. To return the DT220 to factory default values use one of the System Initialize menu selections.

Configure Scale Parameters

The DT220 Scale Parameters should be configured first. If an external weight indicator is used, match the scale parameters with the external weight indicator's parameters. If the weight indicator module is installed in the DT220 then set the scale parameters to match the scale.

Calibrate the Weight Indicator

If the weight indicator module is installed, then calibrate the scale using one of the Calibrate menu selections.

Using the DT220

The DT220 has 8 function keys located at the top of the keyboard, 5 Scale oriented function keys under the 8 function keys, a numeric keypad, an alpha keyboard, and 7 control keys at the bottom of the keyboard. This section of the DT220 manual describes what the keys are used for and how to use them.

Keyboard Layout
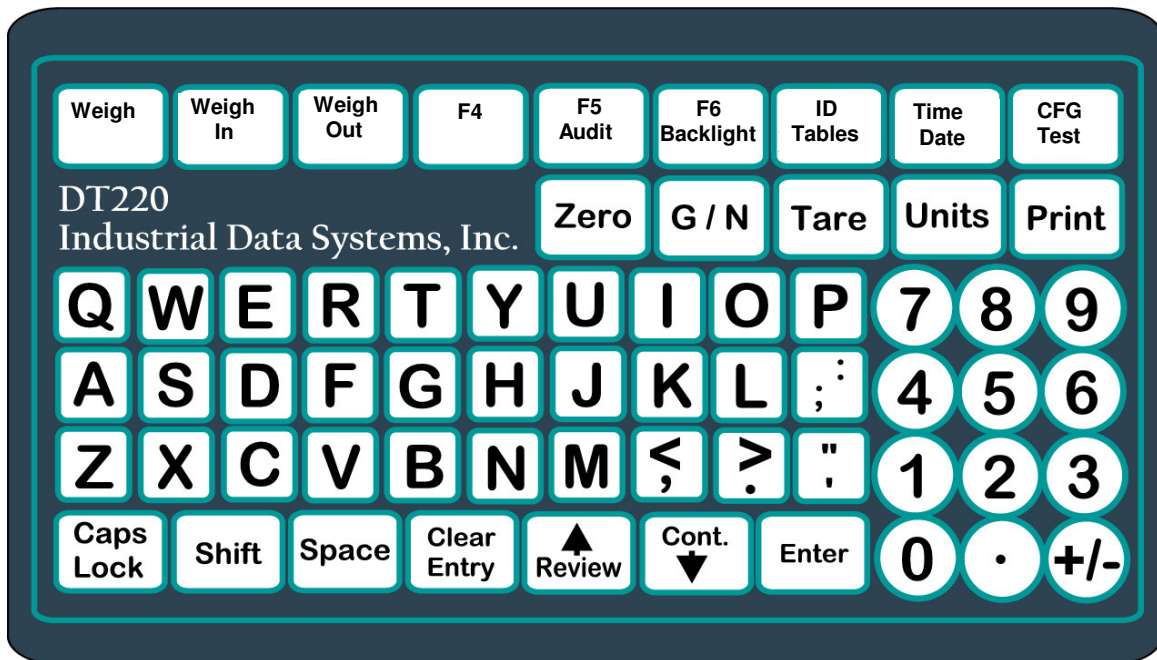
Operation of Function Keys

The function keys are located on the 1st & 2nd rows on the DT220's keypad.

Zero

Press the ZERO key to zero the scale. The following conditions must be met for the ZERO key to function:

- The gross weight is within the configured zero acquisition range: 1% to 100% of full scale.
- The scale is stable (not in motion).

Gross/Net

Press the Gross/Net key to alternate between Gross and Gross/Tare/Net display modes.

Tare

AUTO TARE:
Press the TARE key when the scale is in a stable condition (no motion) and NOT a negative weight. The DT220 reads the weight on the scale and stores it in the tare register. The DT220 switches to Gross/Tare/Net mode and displays the weights.

KEYBOARD TARE:
Use the numeric keys to enter a tare weight (keyboard entry will be displayed). Press the TARE key. The DT220 stores the entered weight in the tare register and switches to Gross/Tare/Net display mode and displays the weights.

CLEAR TARE:
While the scale is stable and displaying zero press the TARE key the tare weight is cleared to zero and the DT220 switches to the GROSS mode.

Press the numeric zero (0) key. Press the TARE key. The tare weight is cleared to zero and the DT220 switches to the GROSS mode.

Units

Press the UNITS key to toggle from primary units and alternate units.

Print

Press the PRINT key to print weight data. If the DT220 is in Gross display mode Page format 1 is printed. If in Gross/Tare/Net mode page format 2 is printed.

Weigh / Weigh-In / Weigh-Out

The Weigh/Weigh-In/Weigh-out program uses the database (ID) memory for single step weighing and two step weigh-in / weigh-out transactions. Vehicle ID records can be created "on the fly" using the Weigh or Weigh-In functions. Use the ID TABLES function key to create Product and Customer ID records before weighing if they are needed.

Weigh

To perform single-step weigh transactions press the **Weigh** key. The display prompts "Enter Vehicle ID:" enter up to 15 characters for the Vehicle ID and then press the **Enter** key. **NOTE:** The **Units** key can be used to change the units any time during the next step and will be displayed on the top of the screen.

The DT220 program displays "Weigh (lb or kg)" at the top of the screen and Vehicle ID, Customer ID, Product ID and tare data below. The Customer ID is highlighted press the **Enter** key to accept the current ID or key in an ID to change the Customer ID and **Enter**.

 The Product ID is then highlighted press the **Enter** key to accept the current ID or key in an ID to change the Product ID and **Enter**.

The Tare weight is then highlighted press the **Enter** key to accept the current tare weight or key in a new tare weight and **Enter**. **M-Tare** will be printed for Memory tares only obtained from a weigh-in weigh-out process and **KB-Tare** will be printed for keyboard tare entries.

The DT220 then highlights "Continue" press the **Enter** key to continue and print a weigh ticket or the **Review** key to scroll back to make any corrections.

The DT220 reads a valid gross weight from the scale, calculates the net weight, updates ID totals, and then sends the weigh data (page 3) to the printer.

NOTE: If the Vehicle ID is not found in memory the display prompts "Vehicle NOT found" "Press Enter key to make new". Press **Enter** to create the ID or press **Clear Entry** to exit. A new vehicle ID with a stored keyboard tare can be entered without printing a ticket by depressing the tare key after entering the tare value.

Weigh-In

Press the **Weigh-In** key. The display prompts "Enter Vehicle ID:". Enter up to 15 characters for the vehicle ID and then press the **Enter** key. **NOTE:** The **Units** key can be used to change the units any time during the next step and will be displayed on the top of the screen.

"Weigh-In (lb or kg)" is displayed at the top of the screen and Customer ID is highlighted press the **Enter** key to accept the current ID or key in an ID to change the Customer ID and **Enter**.

The Product ID is highlighted press the **Enter** key to accept the current ID or key in an ID to change the Product ID and **Enter**.

The DT220 highlights "Continue" press the **Enter** key to continue and print a weigh in ticket or the **Review** key to scroll back to make any corrections. The gross weight is stored in the Vehicle ID's weigh-in register and the DT220 sends weigh-in data (page 4) to the printer.

NOTE: If the ID has been weighed in but not weighed out then "Double Weigh-In. Press Enter to continue" is displayed. Press the **Enter** key to over-ride the previous weigh-in or press the **Clear Entry** key to exit without changing the previous weigh-in data.

Weigh-Out

Press the **Weigh-Out** key. The DT220 will display "Weigh-Out" at the top of the screen and "Enter Vehicle ID:" at the bottom of the screen. Enter up to 15 characters for the vehicle ID and then press the **Enter** key.

The DT220 displays the weigh-in Customer and Product IDs and highlights "Continue" press the **Enter** key to accept the current Customer and Product ID and print a weigh-out ticket. The DT220 recalls the vehicle ID data from memory, calculates the gross, tare and net weights, totals the net weight and sends the weigh-out data (page 5) to the printer.

NOTE: Use the **Review** key to scroll back to make any corrections or to enter the customer and product IDs on weigh-out. The Customer and Product IDs do not have to be entered on weigh-in they can be entered during the weigh-out process if your application requires.

NOTE: If the ID has been weighed-in and weighed out and the weigh-out key used again for that ID before using the weigh-in key then "ERROR: no Weigh-in" will be displayed. Press Enter to exit. Only a complete weigh-in & weigh-out cycle is allowed. After a weigh-in weigh-out cycle has been completed the Weigh key can be used with the memory tare from the in/out process. M-Tare will be printed only for tares obtained from a completed weigh-in weigh-out. All other tares are considered a keyboard tare.

NOTE: The **Units** key can be used to change the units from primary to alternate any time after the Vehicle ID has been entered on Weigh or Weigh In only. The last unit of measure that a vehicle was weighed with will be the default for that ID until changed.

All reports are in primary units.

Manage Database ID Tables

Press the **ID Tables** function key to access the database management functions. The
display prompts with the following menu: ID Tables 1-6 and record count.

      1 Vehicle
      2 Customer
      3 Product
      4 Transaction
      5 ID5
      6 ID6
      7 Count ID records (maximum id record capacity with 32MB card is 8,188.

Table 1 = Vehicle records with default fields of Customer and Product.
Table 2 = Customer records with default fields of Name, Address, City, State & Zip.
Table 3 = Product records with default field of Name.
Table 4 = Transaction records used to record each transaction or ticket.
Tables 5 & 6 = Can be named and configured as additional ID tables if needed.
Selection 7 = Count ID records, displays the amount of ID records and the name for each
table along with the total count of all tables and unused (available) remaining in memory.

Use the **Review** and **Cont.** keys or the numeric keypad to move the pointer to an ID table
name and then press the **Enter** key to access the ID table menu.

The display prompts with the ID table menu:

      1 Make New ID
      2 Scan ID's
      3 Display ID
      4 Edit ID
      5 Print ID
      6 Print ID Report
      7 Erase ID
      8 Erase All ID's

Use the **Review** and **Cont.** keys or the numeric keypad to move the pointer to a data table
function and then press the **Enter** key to access the data table menu.

Make new ID

The display prompts "Enter Nnnn ID:" where Nnnn is the data table name. Enter up to 15
characters for the ID then press the **Enter** key. The DT220 creates the new ID record,
saves it to MMC storage, and then executes the Edit ID function for further editing of ID
variable fields.

Scan ID's

The display lists the ID keys in alphabetical order along with some additional field values. Press the **Cont.** key to move down the ID list.

Display ID

The display prompts "Enter Nnnn ID:" where Nnnn is the data table name. Enter an ID number then press the **Enter** key. The DT220 displays the ID's data. Use the **Cont.** and **Review** keys or the numeric keypad to move the pointer up or down to display all the fields of the ID record that may not appear due to the 8 line display capacity.

Edit ID

The display prompts "Enter Nnnn ID:" where Nnnn is the data table name. Enter an ID number then press the **Enter** key. The edit menu lists the record's field names on the left side of the screen and the field values on right side of the screen. Use the **Cont.** and **Review** keys or the numeric keypad to move the pointer to a field that you want to edit and then press the **Enter** key. The display prompts: Enter NNNN: VVVV where NNNN is the field name and VVVV is the current value for the field. Enter a new value for the field and press the **Enter** key to complete the entry. **NOTE** see the Configure Parameters section of this manual for enabling and disabling the ability to edit tables and registers.

Print ID

The display prompts "Enter Nnnn ID:" where Nnnn is the data table name. Enter an ID number then press the **Enter** key. The information data for that ID record is sent to the port that is configured as the printer port. All reports are in primary units.

Print ID Table Report & Reset Total, Subtotal & Count

This function is used to print all of the ID records in a table and the option to reset the totals and counts for each ID within the table. All reports are in primary units.

The display prompts "Print Table ID n Report:" (where n is the data table number 1-6)
"Clear Totals (reg1) : N "
"Clear Subtot (reg2) : N "
"Clear Count (reg3) : N "   "Continue"

Press the **Enter** key to keep the data and move to the next selection or key in a **Y** and **Enter** to clear the data for the weight totals, weight subtotals or the count for each ID within the table. When "Continue" is highlighted press the **Enter** key to start printing the table report. The report is printed to the port that is configured as the printer port.

Erase ID

The display prompts "Enter Nnnn ID:" where Nnnn is the data table name. Enter an ID number then press the **Enter** key.   The ID record is erased from memory.

Erase All ID's

The display prompts "Erase ALL Nnnnn data: Press ENTER" where Nnnnn is the table name. Press the Enter key. All the records of the data table are erased.

Configure Parameters

Press the **Shift** key and then the **CFG/Test** key (Function Key 9) to access the Configuration Parameters. The following menu is displayed:

    1   Scale Parameters
    2   Calibrate
    3   Com & Printer Ports
    4   Event Monitor
    5   ID Database
    6   PagePrinter
    7   Registers
    8   Meter Select
    9   Passwords
    10 System Initialize

Use the **Review** and **Cont.** keys or the numeric keypad to move the pointer to a configuration menu item and then press the **Enter** key.

Press the Clear Entry key to exit configuration mode. The display prompts:
    Press P to program changes into ROM
    Press X to discard changes
Press P or X to save or discard changes.

Scale Parameters

The scale parameters configure DT220 for the weigh platform or load cell that it is connected to.

    1 A/D speed   xxx   Filter xx
    2 Full Scale   xxxxxx
    3 Overload Wt xxxxxx
    4 Count by: xxxx   Alt: xxxx
    5 Units Pri: uuuu   Alt: uuuu
    6 Zero xxx% delay xx   band xx
    7 Motion delay xx band xx blanks=y/n
    8 P.O. Zero = Y

Some of the following parameters are entered in terms of "graduations". The full-scale graduations can be found by dividing the full-scale weight by the count-by weight. For example, if the scale is configured for 500.00lb x 0.05lb, the full-scale graduations is 500.00/0.05 = 10,000 graduations to full scale.

The numbers in parenthesis are the default factory settings.

Note: Jumper TB3 pin 7 to TB6 pin 7 (Function Lock Jumper) to enable scale configuration and calibration. Jumper enabled as default from the factory RED wire. Remove to lock configuration after calibration.

Scale Parameter 1.1: A/D speed (120 samples/second)

The (optional) A/D "Load Cell Module" can operate at speeds from 30 samples/second to 960 samples/second. The default of 120 samples/second bi-polar is optimal for most applications. Speeds of 480 and 960 are for special applications only (consult factory).

Scale Parameter 1.2: Digital Filter   (12)

The digital filter removes scale vibrations and other noise signals from the weight display. The filter range is between 0 and 20. A setting of 0 provides no filtering; a setting of 20 provides maximum filtering. The higher the filter number, the longer the settle time of the weight display. For example:

Filter Setting	Settle Time @ 120s/s
3	0.3 sec
6	0.6 sec
9	1.2 sec
12	2.5 sec
15	5.0 sec

Use the smallest filter setting that provides satisfactory display stability.

Scale Parameter 2:   Full Scale Graduations   (10,000)

Enter the number of graduations at full scale. The full-scale graduations are calculated using the count-by, decimal position, and full-scale weight.

Full Scale Graduations = Full Scale Weight / count-by.

For example, if Full Scale Weight = 600.0 and count-by = 0.2 then Full Scale Graduations = 600.0 / 0.2 = 3000.

Scale Parameter 3: Overload Graduations   (10,200)

Enter the number of graduations at which the scale is in overload status. The DT220 displays "Error: Over Weight" when the scale weight exceeds overload.   For example, if the Full Scale Graduations is 10,000 grads and the scale is rated for 2% overload, then Overload Graduations = 10,000 + (10,000 x 0.02) = 10,200.

Scale Parameter 4.1: Count-by   (1)

Enter the primary units count-by. For example, if the scale is configured for:
        100 kg x 0.02kg then enter 0.02

Scale Parameter 4.2: Alternate Count-by   (0.5)

Enter the alternate units count-by.

Scale Parameter 5.1: Primary Units Type   (lb)

The scale is calibrated in the primary units. The **Units** key is used to toggle the weight display between primary units and alternate units. Select the primary units from the displayed list.

Scale Parameter 5.2 Alternate Units Type   (kg)

The alternate units are displayed (and printed) using the **Units** key to toggle between the primary and alternate units. Select the alternate units from the displayed list.

Scale Parameter 5.3   Alt Units Conversion Factor   (45,360)

The DT220 calculates the alternate weight by multiplying the primary weight by the conversion factor and then dividing by 100,000.   The following table lists some common conversions.

Alternate Units Conversion Factor Table

Conversion	Conversion Factor	Conv. Fact. x 100,000
lb to kg	0.45359 kg/lb	45,359
kg to lb	2.20462 lb/kg	220,462
lb to ton	0.0005 Ton/lb	50
kg to tonne	0.001 tonne/kg	100
gram to oz	0.352739 oz/gram	352,739
oz to gram	28.3495 gram/oz	2,834,950
lb to lb kb to kg Etc.	1	100,000

Enter the conversion factor x 100,000 for the configured alternate units.

Scale Parameter 6.1: Push Button Zero Percent   (100)

Enter the percent of full-scale capacity that can be acquired as the zero point with the ZERO key.   1 = 1%, 2 = 2%, ... 100 = 100%.

Scale Parameter 6.2: Zero Tracking Delay   (0)

The automatic zero tracking function removes small deviations from zero. The DT220 adjusts the zero setting by approximately $1/30^{th}$ of a display digit per delay interval. The delay interval is the number effective A/D conversions between adjustments.

Scale Parameter 6.3: Zero tracking band (12)

The zero tracking band is the maximum displacement from zero wherein zero tracking is active. In order for zero tracking to be active, the following conditions must be met:

- Scale weight is within Zero Track Band.
- Scale is stable (no motion)
- Zero Track Band is greater than 0 (zero).

The zero tracking bands are entered in units of ¼ dd, i.e.. For a band of:

½ display division enter 2	½ x 4 = 2.
2 display divisions enter 8	2 x 4 = 8.
4.5 display divisions enter 18	4.5 x 4 = 18

Scale Parameter 7.1: Motion Detection Delay (6)

Motion detection delay is used by the motion detection function to determine if the scale is in motion (not stable). Enter the amount of time (in tenths of a second) that the scale must be stable for motion status to be false (scale status = stable).

Example: 0 = disables motion detection.
                 2 = 0.2 second delay before motion = false (stable = true).
                 15 = 1.5 second delay.
                 30 = 3.0 second delay.

Scale Parameter 7.2: Motion Detection Band (6)

The motion band is used by the motion detection function to determine if the scale is in motion (not stable). If the amount of change between display updates (parameter 2) is greater than the motion band, a MOTION status is generated (unstable condition). The motion band is entered in units of ¼ dd, i.e.. For a motion band of:

½ display division enter 2	½ x 4 = 2.
2 display divisions enter 8	2 x 4 = 8.
4.5 display divisions enter 18	4.5 x 4 = 18.

Scale Parameter 7.3: Display Blanking During Motion (No)

When display blanking is enabled, the weight display is blanked (turned off) when the scale is in motion (not stable). Enter a 1 (yes) to enable display blanking, enter a 0 (no) to disable display blanking.

Scale Parameter 8: Power-On Zero (N [disabled])

The power-on zero function zero's the scale when power is turned on to the DT220.

Position the pointer to selection 8 and press the **Enter** switch to toggle the Power-On Zero function on (Y) or off (N).

Calibrate

There are 5 calibration selections.

>   1 Deadload first
>   2 Span first
>   3 Deadload only
>   4 Multi-point calib
>   5 Adjust Gain (tweek)

Use the **Review (↑)** and **Cont. (↓)** keys or the numeric keypad to move the pointer to a menu item and then press the **Enter** key.

NOTE: Set the Scale Parameters and save into memory before calibrating the scale.

Calibrate 1: Deadload first

This function calibrates the scale by reading the deadload first and then reading the span. Best results are obtained when the DT220 and load cells have reached thermal equilibrium (power applied for approximately 30 to 120 minutes depending on load cell size).

1. The DT220 prompts "Press ENTER to read deadload". Remove all weight from the scale. Press the **Enter** key. The DT220 reads the scale's deadload weight. NOTE: press the **Cont.** key to skip deadload read.

2. The DT220 display prompts "Enter calibration weight:".   Place the calibration weight on the scale. Enter the calibration weight using the numeric keypad. Press the **Enter** key. The DT220 reads the calibration weight.

Calibrate 2: Span First

This function calibrates the scale by reading the span first and then reading the deadload. Best results are obtained when the DT220 and load cells have reached thermal equilibrium (power applied for approximately 30 to 120 minutes depending on load cell size). The deadload must be greater than approx. 1% of scale capacity. If it is not, then calibrate deadload first.

1.   The DT220 display prompts "Enter calibration weight:".   Place the calibration weight on the scale. Enter the calibration weight using the numeric keypad. Press the **Enter** key. The DT220 reads the calibration weight.

2. The DT220 prompts "Press ENTER to read deadload". Remove all weight from the scale. Press the **Enter** key. The DT220 reads the scale's deadload weight.

Calibrate 3: Deadload Only

Use this function to re-calibrate the deadload weight without affecting the span calibration. The display prompts "Press ENTER to read deadload". Press the **Enter** key to read a new deadload.

Calibrate 4: Multi-point calibration

Use this function to calibrate the scale using up to 5 calibration points to 'linearize' the load cell. Best results are obtained when the DT220 and load cells have reached thermal equilibrium (power applied for approximately 30 to 120 minutes depending on load cell size).

1. The DT220 prompts "Press ENTER to read deadload". Remove all weight from the scale. Press the **Enter** key to obtain the deadload weight. Press the **Cont.** key to continue without reading a new deadload weight.

2. The DT220 prompts "Calibration point 1" and "Enter calibration weight:". Place the first calibration weight on the scale. Enter the calibration weight using the numeric keypad.   Press the **Enter** key. The DT220 reads the calibration weight.

3. The DT220 prompts "Calibration point 2" and "Enter calibration weight:" Place the second calibration weight on the scale. Enter the calibration weight using the numeric keypad. Press the **Enter** key.

4. Repeat step 3 for up to 5 calibration points. Press the **Clear Entry** key to complete calibration if less than 5 calibration points are used.

• Use the **Cont.** key ($\downarrow$) to continue to the next calibration point if the current point has already been calibrated.

Calibrate 5: Adjust Gain Calibration

Use this function to make small adjustments to the span calibration factor. Zero the scale and then place a known weight on the scale.

1. The DT220 displays the adjustment **Count**, the weight on the scale and an indication of "center of digit". The center of digit displays -25, -0, +0, or +25. The center of digit occurs when the display toggles between -0 and +0.

2. Use the **Cont.($\downarrow$)** and **Review($\uparrow$)** keys to lower or raise the calibration factor. The calibration factor is increased or decreased by the **Count** amount. The **Count** can be changed by using the numeric keypad:

$$
\begin{array}{ll}
1 = \quad 1 & \quad 4 = \ 1,000 \\
2 = \quad 10 & \quad 5 = 10,000 \\
3 = \ \ 100 &
\end{array}
$$

3. Press the **Enter** key or **Clear Entry** key to exit the Adjust Gain Calibration function.

Adjust Gain – 5 Point Linearization

If 5 point Linearization is enabled the gain adjust procedure begins with the display of the first calibration factor and it's calibration point. Press the Enter key to begin calibration of point 1. Use the **Cont.(↓)** and **Review(↑)** keys to lower or raise the calibration factor. Press the **Enter** key to advance to the next calibration point. Press the **Clear Entry** key to exit gain calibration adjust.

Com & Printer Ports (Bauds up to 115.2k)

Com & Printer Ports provides 4 selections:
> 1 Com Port 1 (Used for external meter serial input & printer output)
> 2 Com Port 2 (Used for continuous string output & remote network input)
> 3 Com Port 3 (Used for Printer/PC/PLC output & barcode scanners)
> 4 Printer Select (Used to select the printer port Parallel port is included)

The DT220 is equipped with 3 bi-directional serial communication (Com) ports. The baud rate and format can be set independently for each Com port. Com 1 or 3 are normally used to output weight data and database reports to a printer. Com port 2 is normally used for continuous output of weight data, multi-unit networking, remote display and remote control input. Use the pointer to select a port to configure and then press the **Enter** key.

Com Ports 1, 2, and 3

Communication between serial devices requires that both devices have the same baud rate (transmission speed), data bit length, and parity. The com port configuration allows the selection of baud rate and mode (bit length and parity).

Com port 2 has an 2 additional parameters: Station ID and TX Format.

The Station ID configures Com port 2 for continuous transmission of scale data or as a network buss or for single station remote control.

- Enter a 0 to enable continuous transmission of TX 2 data. Enter a station ID (1 to 254) for multi-drop network configuration
- Enter 255 for single station remote control

The TX Continuous Format has 4 built in weight meter formats. The DT220 can also transmit the data in any of the DT220 registers to make a custom data string (selection 5 enter register number to transmit registers 1-4 are dedicated and con not be used).
> 1 AND
> 2 Condec
> 3 Weightronix
> 4 Ohas
> 5 5 …. 208 DT220 register data

1 - AND: \<status\>, \<mode\>, \<polarity\>\<weight\>\<units\>\<terminate\>

Status:	OL (overload), ST (stable), US (unstable, in motion)
Mode:	GS (gross mode), NT (net mode)
Polarity:	+ (positive weight), - (negative weight)
Weight:	7 characters data, NOT zero blanked, with decimal point
Units:	lb, kg, t (ton), tn (tonne), g\<sp\> (gram), oz
Terminate:	lf, cr (line feed, carriage return)

2 - CONDEC: \<stx\>\<polarity\>\<weight\>\<units\>\<mode\>\>status\>\<terminate\>

Polarity:	space (positive weight), - (negative weight)
Weight:	7 characters, zero blanked, with decimal point
Units:	L (lb), K (kg), T (ton), G (gram), O (oz)
Mode:	G (gross mode), N (net mode)
Status:	\<space\> (valid weight), M (motion), O (over wt), I(invalid)
Terminate:	lf, cr (line feed, carriage return)

3 - WEIGHTRONIX: \<mode1\>\<mode2\>\<polarity\>\<weight\>\<space\>\<units\>\<term\>

Mode1:	space (gross mode), 0 (zero if net mode)
Mode2:	G (gross mode), N (net mode)
Polarity:	+ (positive weight), - (negative weight)
Weight:	6 characters, NOT zero blanked, with decimal point
Units:	lb, kg, oz, g \<space\>(gram), t\<space\> (ton), tn (tonne)
Terminate:	lf, cr (line feed, carriage return)

4 - OHAS: \<polarity\>\<weight\>\<space\>\<units\>\<2 spaces\>\<mode\>\<status\>\<term\>

Polarity:	space (positive weight), - (negative weight)
Weight:	7 digits, zero blanked, with decimal point
Units:	lb, kg, oz, g \<space\>(gram), t\<space\> (ton), tn (tonne)
Mode:	G (gross mode), N (net mode)
Status:	\<space\> (valid weight), M (motion), O (over wt), I(invalid)
Terminate:	lf, cr (line feed, carriage return)

5 - Transmits the contents of DT220 registers.
Data entered into a text register can include other register data. Example of register 128 (Text1) emulating a Condec format without the polarity or status in Gross mode with lbs units. Set TX Continuous Format setting to 128 and configure text register 128 to:
\<A2\>\<F81\>GL\<A10\>\<A13\> this = stx, 7 chars of gross wt, G, L, lf, cr

\<Rreg no\> =   buffer register data, minimum size (zero blanked no spaces)
\<Freg no\> =   buffer data, 7 character field, zero blanked, right justified.
\<Iprint item\> = Embed print item
\<Axx\> = Embed ACSII code

Printer Select

The printer select provides 4 selections:

             1 Com Port 1
             2 Com Port 2
             3 Com Port 3
             4 Printer Select

Use the pointer to select a port to configure and then press the **Enter** key.

The display prompts "End of print character: xx" where xx is the current value of the EOP character. The end of print character is sent to the printer at the end of a print transmission. If your printer requires a special character to release the paper or to form feed the paper, enter the code here. The ASCII chart in the appendix lists the ASCII codes and their numeric values. Enter a 0 (zero) if no end of print character is required. .

The display prompts "Auto cr after lf: x where x is Y or N. Some printers require a line feed character (lf) to advance the paper and some printers advance the paper with only a carriage return character (cr).

   Enter a Y to automatically add a line feed after a carriage return.
   Enter an N to NOT add a line feed after a carriage return.

Event Monitor

The Event Monitor selection presents the following menu:

             1 Setpoints
             2 Timers
             3 Keyboard
             4 Scale Basic Fn Edit
             5 Scale Basic debug: x
             6 Display Update Rate: xx
             7 TTL input enable: x
             8 Clock adjust: xxx

The event monitors scan for events and can be used to execute scale basic functions when an event occurs.

Setpoints

The DT220 can monitor up to 15 setpoints. Each setpoint has 3 parameters: the upper register number, the lower register number, and the function number. Use the **Cont. (↓)** and **Review (↑)** keys to position the edit block to a parameter value. Use the numeric keypad to enter a new value. Press the **Enter** key to complete the entry. Press the **Clear Entry** key to exit setpoint data entry.

Timers

There are 9 timers that can be used to trigger a function after a time interval. Each timer has 2 parameters: Time (x0.1sec) and Function number. Use the **Cont.(↓)** and **Review(↑)** keys to position the edit block to a parameter value. Use the numeric keypad to enter a new value. Press the **Enter** key to complete the entry. Press the **Clear Entry** key to exit timer data entry.

Keyboard

The keyboard event functions determine what actions take place when a key is pressed. The Power on start function activates a function when power is applied to the indicator. Use the **Cont.(↓)** and **Review(↑)** keys to position the pointer to a parameter value. Press the **Enter** key. Use the numeric keypad to enter a new value. Press the **Enter** key to complete the entry. Press the **Clear Entry** key to exit timer data entry.

Scale Basic Fn Editor

Use the Scale Basic Function Editor to create or modify Scale Basic functions. The display prompts: "Edit function number:". Enter a function number to edit and press the **Enter** key. The display shows the numeric codes in the scale basic function. Use the **Cont.(↓)** and **Review(↑)** keys to position the edit block to a code position. Use the numeric keypad to enter a new value. Press the **Enter** key to complete the entry. Press the **Clear Entry** key to exit Scale Basic Fn Editor.

Scale Basic Debug Mode: (N)

The Debug mode is used to 'debug' scale basic functions. Enter 'Y' to activate debug mode, enter a 'N' to disable debug mode. When debug mode is enabled Scale Basic functions execute a 'single step' at a time

Display Update Rate (2)

Enter the time between display updates (in tenths of a second). An update rate of 1 causes a 0.1 second delay between display updates, a rate of 200 causes a 20 second delay between updates. NOTE: motion detection is calculated using the weight values of the display rate. If the update rate is 50, the motion calculation is based on weight readings sampled at 5second intervals.

Enable TTL Inputs   (Y)

Enter a Y to use TTL inputs 1-4 to activate scale basic functions 1 - 4. For example, grounding TB3 pin 1 (TTL input 1) activates scale basic function 1.

Enter an 'N' to disable the TTL inputs.

Clock Adjust (0)

The clock adjust parameter adds or subtracts seconds / day from the time of day clock. Enter a positive number to add seconds or a negative number to subtract seconds / day form the time of day clock.

ID Database

Use the ID Database menu to configure the DT220's built in database. Selections 1..6 are used to configure the 6 database tables available in the DT220. Selection 7 provides a means of setting the printer ticket and transaction sequence number. Selection 8 provides a means of resetting the ID tables to default. Selection 9 is to rebuild a corrupted database.

Database Tables (selection 1..6)

The display provides the following menu for each table:

         1 Table Name: Nnnnnnn
         2 Edit Table Options
         3 Edit Numeric Register Names
         4 Edit Text Register Names

The Table Name is used in prompts and printing to identify the ID table being worked on. The default table names are:

         Table 1: Vehicle
         Table 2: Customer
         Table 3: Product
         Table 4: Transaction
         Table 5: ID5
         Table 6: ID6

The Edit Table Options menu has the following selections and functions.

Disable table edit	: Y/N
Disable numeric register edit 1&2	: Y/N
Disable numeric register edit 3&4	: Y/N
Disable numeric register edit 5&6	: Y/N
Disable text register edit 2&3	: Y/N
Disable text register edit 4&5	: Y/N
Auto erase ID records	: Y/N

Disable table edit, if "Y" (yes) is selected the table will become read only disabling the ability to edit/change any of the table values from the keyboard using the ID Tables key (Totals, Subtotals, Tare, Weigh-in weight etc;) default = N

Disable numeric register edit 1&2, 3&4 and 5&6, if "Y" (yes) is selected the corresponding set of registers will become read only disabling the ability to edit/change any of the values from the keyboard using the ID Tables key.

> Numeric ID registers 1&2
> Tables 1, 2 and 3 numeric ID registers 1&2 are used for Total and Subtotals
> Table 4 numeric ID registers 1&2 are used for the sequence number and gross
> Table 5 and 6 numeric ID registers 1&2 are not used in the standard program

> Numeric ID registers 3&4
> Tables 1, 2 and 3 numeric ID registers 3&4 are used for Total and Subtotals
> Table 4 numeric ID registers 1&2 are used for the sequence number and gross
> Table 5 and 6 numeric ID registers 1&2 are not used in the standard program

> Text ID registers 2&3
> Table 1 (Vehicle) = Customer and Product
> Table 2 (Customer) = Name and Address
> Table 3 (Product) = Name, register 3 is not used in the standard program
> Table 4 (Transaction) = Truck and customer
> Tables 5 and 6 the text registers are not used in the standard program

> ID text registers 4&5
> Table 1 (Vehicle) = Not used in the standard program
> Table 2 (Customer) = City and State
> Table 3 (Product) = Not used in the standard program
> Table 4 (Transaction) = Product and transaction time and date
> Tables 5 and 6 the text registers are not used in the standard program

Auto Erase ID Records is used in some applications to determine if an ID record should be erased after being used or be retained in memory for later use.

Edit numeric register names

Each ID record has 8 numeric registers. Use this function to name the registers in an ID table. If a register is NOT named, it does not display in database maintenance functions and it is not printed in database reports.

Edit text register names

Each ID record has 8 text registers. Use this function to name the registers in an ID table. If a register is NOT named, it does not display in database maintenance functions and it is not printed in database reports.

ID Data Base Tables Selection 7- 9

Sequence Number, Selection 7 provides a means of setting the printer ticket and transaction sequence number.

Reset Database to default, Selection 8 provides a means of resetting the ID tables to default.

Rebuild Database, Selection 9 is to rebuild a corrupted database.
Press the number 9 (Rebuild data base) and ENTER. The display will show, "Rebuild DataBase Index, press ENTER to continue" press ENTER. Rebuilding will be displayed while the unit is rebuilding and ****** will also be displayed.
WAIT FOR THE REBUILD PROCESS TO COMPLETE
The display will return back the CFG ID table menu when completed
Press the CLEAR ENTRY key 2 times to return to the weighing mode.

PagePrinter

Use this function to modify print formats to meet your print requirements. The DT220 has 8 Pages of formats that are used for generating print data onto a form. Each page has 16 rows that are used to define items to be printed. Each row has the following fields:

      Line   the line number to print the item on
      Col   the column number to print the item on
      Item   the item to be printed

Print format design requires you to become familiar with the **Page List** and the DT220's **Register List**. The **Page List** describes how each page is used. The **Register List** describes what items can printed.

Use the print format worksheets to design new print formats. The PRINT FORMAT DESIGN EXAMPLE illustrates how a print format is designed. A list of the default print formats is found in DEFAULT PRINT FORMATS

Page List

Page	DESCRIPTION
Page 1	Prints when the DT220 is in the GROSS weight mode.
Page 2	Prints when the DT220 is in the NET weight mode.
Page 3	Prints the single step Weigh key data.
Page 4	Prints Weigh-In key data.
Page 5	Prints Weigh-out key data.
Page 6	Available for user defined functions.
Page 7	Available for user defined functions.
Page 8	Available for user defined functions.

Register List

Registers List		
1-31	Reg 1...31	Numeric Registers 1..31
32-39	Id1r1...8	ID Table 1 numeric registers 1 to 8
40-47	Id2r1...8	ID Table 2 numeric registers 1 to 8
48-55	Id3r1...8	ID Table 3 numeric registers 1 to 8
56-63	Id4r1...8	ID Table 4 numeric registers 1 to 8
64-71	Id5r1...8	ID Table 5 numeric registers 1 to 8
72-79	Id6r1...8	ID Table 6 numeric registers 1 to 8
128/159	Text 1…32	Text Registers 1..32
160	Id1key	ID Table 1 key register
161-167	Id1t2...8	ID Table 1 text registers 2 to 8
168	Id2key	ID Table 2 key register
169-175	Id22...8	ID Table 2 text registers 2 to 8
176	Id3key	ID Table 3 key register
177-183	Id3t2...8	ID Table 3 text registers 2 to 8
184	Id4key	ID Table 4 key register
185-192	Id4t2...8	ID Table 4 text registers 2 to 8
193	Id5key	ID Table 5 key register
194-200	Id5t2...8	ID Table 5 text registers 2 to 8
201	Id6key	ID Table 6 key register
202-208	Id6t2...8	ID Table 6 text registers 2 to 8
81	Primary Gross	Gross weight on the scale primary units
82	Primary Tare	Tare weight primary units
83	Primary Net	Net weight on the scale primary units
84	Alt Gross	Gross weight in alternate units
85	Alt Tare	Tare weight in alternate units
86	Alt Net	Net weight in alternate units
87	Sequence	Sequence number
91	Displayed Gross	Gross weight on the scale primary or alt units
92	Displayed Tare	Tare weight on the scale primary or alt units
93	Displayed Net	Net weight on the scale primary or alt units

210	Time\date	Time and Date
211	Time	Time
212	Date	Date
213	Stime	Stored time
214	Sdate	Stored date
255	Exit	Setpoint always trips

Print Format Design Example

EXAMPLE PRINT:

```
                    11111111112222222222333333333334
COLUMN     1234567890123456789012345678901234567890
LINE

  1
  2
  3            GROSS    54785 LB
  4            TARE     12451 LB
  5            NET      42243 LB
  6
  7         TIME 03:45 PM   DATE 05 AUG 1999
```

EXAMPLE FORMAT DESIGN WORKSHEET:

Page:1	Item Description	Line No.	Column	Item No.
E1	Gross Weight	3	4	91
E2	Tare Weight	4	4	92
E3	Net Weight	5	4	93
E4	Time and Date	7	1	210
E5	End of Print	0	0	0

NOTE: A zero in the Line No column terminates printing. Use zero only after all required information has been entered. The maximum number of entries is 16. If the 16th entry is used, a line number 0 is not required.

Default Print Formats

The print formats (PAGES) are initialized to the following factory settings when the DT220 is initialized.

Page 1	Item Description	Line No.	Column	Item No.
E1	Gross Weight	1	5	91
E2	Time and Date	2	5	210
E3	End of Print	0	0	0

Page 2	Item Description	Line No.	Column	Item No.
E1	Gross Wt.	1	5	91
E2	Tare Weight	2	5	92
E3	Net Weight	3	5	93
E4	Time and Date	4	5	210
E5	End of Print	0	0	0

Page 3	Item Description	Line No.	Column	Item No.
E1	ID Table 1 Key	1	1	160
E2	ID Table 1 Text reg. 2	2	1	161
E3	ID Table 1 Text reg. 3	3	1	162
E4	Gross Weight	4	5	91
E5	Tare Weight	5	5	92
E6	Net Weight	6	5	93
E7	Time and Date	7	5	210
E8	End of Print	0	0	0

Page 4	Item Description	Line No.	Column	Item No.
E1	Text register 31	1	1	157
E2	ID Table 1 Key	2	1	160
E2	Gross Weight	3	5	91
E3	Time and Date	4	1	210
E4	End of Print	0	0	0

Page 5	Item Description	Line No.	Column	Item No.
E1	Text register 32	1	1	158
E2	ID Table 1 Key	2	1	160
E3	ID Table 1 Text reg. 2	3	1	161
E4	ID Table 1 Text reg. 3	4	1	162
E5	Gross Weight	5	5	91
E6	Tare Weight	6	5	92
E7	Net Weight	7	5	93
E8	Time and Date	8	5	210
E9	End of Print	0	0	0

Format Design Worksheets

Page	Item Description	Line No.	Column	Item No.
E1				
E2				
E3				
E4				
E5				
E6				
E7				
E8				
E9				
E10				
E11				
E12				
E13				
E14				
E15				
E16				

Page	Item Description	Line No.	Column	Item No.
E1				
E2				
E3				
E4				
E5				
E6				
E7				
E8				
E9				
E10				
E11				
E12				
E13				
E14				
E15				
E16				

Registers

There are 79 general-purpose 12 digit numeric registers. There are 80 general-purpose 40 character text registers. Use the Registers configuration function to set the initial value of any general-purpose register. Registers can be used as print items and command codes.

Meter Select

The DT220 can use an internal A/D converter to obtain scale weights or an external weight indicator connected to Com Port 1. Use the Meter Select function to select from the following list:

        1   Internal A/D – Analog Input option must be installed

        External Meter type:
              2 Condec
              3 AND / General
              4 Cardinal 738
              5 WI 110
              6 Toledo 8142

Selection 1 uses the internal A/D converter. Selections 2-6 use Com Port 1 to obtain the scale weight from an external weight meter. Set the DT220 Scale Parameters 2-5 to match weight meter settings.

Passwords

Use this function to enter password data. The DT220 provides 3 security passwords that can be entered to protect configuration data. Password 1 is used to protect database management functions. Password 2 is used to protect I/O port configuration, setpoint, and event monitor data. Password 3 and the Function Lock Jumper inside the DT220 is used to protect calibration and scale configuration data.

Note: Jumper TB3 pin 7 to TB6 pin 7 (Function Lock Jumper) to enable scale configuration and calibration. Factory default setting is enabled (jumper in place).

IMPORTANT NOTE: Write down the passwords and put them in a safe place. If you loose or forget a password, you can't access the protected functions. Call your scale dealer or IDS.

System Initialize

The System Initialize function presents the following menu:
        1 System initialize, save Cal
        2 System initialize
        3 Database initialize
        4 System & Database initialize
        5 Download New Firmware (Used by the factory only)

System initialize, save Cal.

Use this function to reset DT220 parameters to factory default values. Calibration factors are NOT changed.

System initialize

Use this function to reset DT220 parameters to factory default values. CALIBRATION FACTORS WILL BE ERASED.

Database initialize

Use this function to erase all ID records.

System & Database initialize

Use this function to reset DT220 parameters to factory default values and erase all ID records.

Download New Firmware

Use this function to update DT220 firmware. This function should be used by an authorized IDS dealer or the factory only.

Set Time and Date

When the DT220 is in idle mode (not configuration mode) press the **Shift** key and then the function **Time Date** key use 24 hour time to set the hour, i.e. if it is 3:40 pm enter 15 for the hour. Use the **Cont.(↓)** and **Review(↑)** keys to position the edit block to a time value. Use the numeric keypad to enter a new value. Press the **Enter** key to complete the entry. Position the edit block to Set Time and then press the **Enter** key to set the clock.

Press Function key **Time Date** to display time and date for 10 seconds. Press the **Shift** key and then **Function F4** key to display time in large character format.

NOTE: The clock speed can be adjusted in the **Event Monitor section of the configuration menu.**

Backlight Adjust

Press the **Shift** key and then Function **F6 Backlight** key when the DT220 is in idle mode (not configuration mode). The display prompts:

>   *** Backlight Adjust ***
>
>   I –   Increase intensity
>   D – Decrease intensity

Press the 'I' and 'D' keys to increase or decrease the LCD display backlight intensity. Each press increases or decreases the backlight intensity.

NOTE: There is a small access hole in the rear of the unit used to adjust the LCD pixel intensity by turning a trim pot located inside of the enclosure. If the display looks faded or too dark use the trim pot to make the necessary adjustments.

Diagnostic Tests

The DIAGNOSTIC TESTS are accessed using Func. 9 (test/config.) key. The display presents the following menu:

1. Audit Number Display
2. Register Data Display
3. Memory Display
4. Com 1 test
5. Com 2 test
6. Com 3 test
7. A/D test
8. MMC test
9. TTL input test
10. Pulse count test
11. Keyboard test

Use the **Review** (↑) and **Cont.** (↓) keys or the numeric keypad to move the pointer to a menu item and then press the **Enter** key.

Display Calibration Audit Numbers (Shift key then F5 key)

Press the **Shift** key then the **F5 Audit** key to view the scale audit number, application number, configuration number and the software revision ID number. The audit numbers can also be accessed via the **CFG Test** key selection 1.

The DT220 provides a Scale audit number an application audit number and a configuration number. They are used to indicate changes to calibration data, application data and configuration data. They can be used in place of mechanical seals by some regulatory agencies.

The scale and configuration audit numbers increment each time a scale parameter or calibration parameter is changed (deadload or weight conversion factor). The configuration audit number increments each time any configuration setting has been changed. The scale, application and configuration audit numbers increment each time new firmware has been loaded.

If physical seals are used, then remove the internal function lock jumper TB3 terminal 7 to TB6 terminal 7 before sealing. Calibration parameters cannot be accessed when the function lock jumper is removed. Enter Password will be displayed when locked and there is no password to disable the function lock from the keypad. See TTL Input Test for TTL input 7 Lock function status.

Register Data Display

Use this function to view register names and contents. Use the **Review** (↑) and **Cont.** (↓) keys or the numeric keypad to move the pointer to a register. Press the **Clear Entry** key to exit register display.

Memory Display

The display prompts "Memory Address: xxxx". Enter a memory address and press the **Enter** key. The DT220 displays a block of memory. Use the **Review** (↑) and **Cont. (↓)** keys or the numeric keypad to view other memory blocks. Press the **Clear Entry** key to exit memory display.

Com 1, 2, and 3 Tests

This test displays and transmits serial data on communications ports 1, 2 & 3. Press the **Enter** key to transmit a test string of "1234567890ABCDEF" any received will display automatically. If all data being received or transmitted is unintelligible, the baud rate or data formats are probably incorrect. If nothing is displayed on the display, then check the following:

1.   Cabling between the communicating units.
2.   Make sure the sending unit is actually sending data.
Press the CLEAR key to exit diagnostic the test and return to the menu.

A/D Test

This test displays the raw count data being read from the A/D converter. The speed and filter settings will be displayed along with the average, high average, low average, deviation, peak deviation & drift. Press the **Enter** key to reset the values.

If no data is being displayed, the A/D converter is "locked up". Turn power off and then on and re-activate the test. Check load cell wiring for reversed signal or excitation signals.

MMC Test

Use this function to display ID Database sectors.

TTL Input Test

Use this to test TTL inputs 1-7. The display will show the binary values 1,2,4,8,16,32,64 for the TTL ports 1-7. When shorted to ground the display will show 0 for the corresponding input. **NOTE**: TTL input 7 is the **calibration function lock** a 0 indicates the lock is disabled and access to the scale configuration parameters are not restricted.

Pulse Input Test

Use this to test pulse counts on input 6. Every time TTL 6 is shorted to ground the counter will increment.

Keyboard Test

Use this to test the keys on the keyboard. The character will display when the key is pressed.

Troubleshooting

The following table describes the probable causes to some problems you may encounter. Most problems can be resolved by using the information provided in the table.

Problems And Probable Causes

Problem	Probable Causes
Printer does not print (Serial Ports)	* Cable connection problem or invalid pin connections. * Baud rate and format on serial port does not match printer. * Check the printer port configuration selected in the DT220. * COM 1 CTS/RTS pins 7 & 8 if CTS is not wired to RTS on the printer then jumper pins 7&8 together on COM 1. * Transmitter/receiver IC damaged
Continuous output does not update	* "TX CONTINUOUS" disabled in configuration * Cable connection problem or invalid pin connections. * Baud rate and format on serial port 2 does not match receiver.
Input port 1 not working	* Baud rate and format on serial port 1 does not match host. *Cable connection problem or invalid pin connections.
Input port 2 not working	* Baud rate and format on serial port 2 does not match host. * Cable connection problem or invalid pin connections.
Invalid weight display or weight fluctuating	* Invalid calibration parameters. * Load cell or load cell input cable problems.

Hardware and Wiring

This section describes installation and wiring information for the interface ports. There are three bi-directional serial ports, one parallel printer port, 7 TTL inputs and 8 TTL outputs. In addition, there is an optional load cell input port.

TB1 - TTL Output 1- 6, gnd

Pin #	Signal Name
1	TTL output 1
2	TTL output 2
3	TTL output 3
4	TTL output 4
5	TTL output 5
6	TTL output 6
7	Ground (GND)

TB2 - TTL Output 8 & 9, gnd, +5V

Pin #	Signal Name
1	TTL output 7
2	TTL output 8
3	Ground (GND)
4	Ground (GND)
5	Ground (GND)
6	+5V
7	+5V

TB3 - TTL Input 1 – 7 (TTL Input 7 = Cal Function Lock)

Pin #	Signal Name
1	TTL input 1
2	TTL input 2
3	TTL input 3
4	TTL input 4
5	TTL input 5
6	TTL input 6
7	TTL input 7 (Function Lock) Jump to ground to unlock

Com Port 1 – J10 and TB6

The serial communication port 1 has a 9 pin 'D' connector at the back of the DT220.
NOTE: Com port 1 ground is NOT isolated from the DT220 circuit ground.

Com Port 1 'D' Connector

Pin #	Signal Name
1	
2	RS232 RXD (receive data)
3	RS232 TXD (transmit data))
4	
5	Ground (GND)
6	Current Loop Transmit
7	RS232 RTS (request to send)
8	RS232 CTS (clear to send)
9	

Com Port 1 TB6

Pin #	Signal Name
1	+5R (360 ohm to +5V)
2	Current Loop TX
3	CL receive R+ (360 ohm res)
4	CL receive +
5	CL receive -
6	+5V
7	GND (Function Lock) Jump to TB3 –7 to unlock

Com Port 2 – J11 and TB6

The serial communication port 2 has a 9 pin 'D' connector at the back of the DT220.
NOTE: Com port 2 RS232 ground is isolated from the DT220 circuit ground.

Com Port 2 'D' Connector

Pin #	Signal Name
1	
2	RS232 RXD (receive data)
3	RS232 TXD (transmit data))
4	+5R (360 ohm to +5V)
5	Ground (GND) (isolated)
6	
7	+5R (360 ohm to +5V)
8	
9	

Com Port 2   TB5

Pin #	Signal Name
1	485 RX+
2	485 RX-
3	485 TX+
4	485 TX-
5	+5V (isolated)
6	GND (isolated)
7	GND (isolated)

Com Port 3 – J9 and TB4

The serial communication port 3 has a 9 pin 'D' connector at the back of the DT220.
NOTE: Com port 3 RS232 ground is isolated from the DT220 circuit ground.

Com Port 3 'D' Connector

Pin #	Signal Name
1	
2	RS232 RXD (receive data)
3	RS232 TXD (transmit data)
4	
5	Ground (GND)
6	
7	
8	RS232 CTS (clear to send)
9	

Com Port 3   TB4

Pin #	Signal Name
1	+5R (360 ohm to +5V)
2	Current Loop TX
3	CL receive R+
4	CL receive +
5	CL receive -
6	+5V
7	GND

Parallel Printer Port – 25 pin D connector J2

Pin #	Signal Name
1	Strobe Output
2	TTL Output 1 (Printer Data 1)
3	TTL Output 2 (Printer Data 2)
4	TTL Output 3 (Printer Data 3)
5	TTL Output 4 (Printer Data 4)
6	TTL Output 5 (Printer Data 5)
7	TTL Output 6 (Printer Data 6)
8	TTL Output 7 (Printer Data 7)
9	TTL Output 8 (Printer Data 8)
10	
11	Busy (input)
18-25	Ground (GND)

Load Cell Terminal Block

The load cell terminal block is located on the (optional 0113 PCB) plug-in the Analog Input card inside the DT220. The Sense +/- inputs are jumped to Excitation +/- outputs disabled from the factory. If remote sense is to be used remove or cut the jumpers located on the bottom of the card/PCB.

Pin #	Signal Name
1	+ Signal
2	- Signal
3	+ Excitation
4	+ Sense (Disabled default)
5	- Sense (Disabled default)
6	- Excitation
7	Analog ground

Keyboard Connector

MMC

LOAD CELL
1
2
3
4
5
6
7

A/D

Power Supply

Display Connector
1
20

Display Backlight Connector
+

Com 2
1
2
3
4
5
6
7

Remove JP1 for floating ground

TTL Out
TB1
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

TTL Out
TB2
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

TTL In
TB3
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Jump TB3 terminal 7 to TB6 terminal 7 to disable Calibration LOCK Remove to enable LOCK

TB4
Com 3
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | **TB6**

Com 1
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

JP1   **Fuse**

Com 3

Com 1
Com 2

Parallel Printer Port

PC Kbd
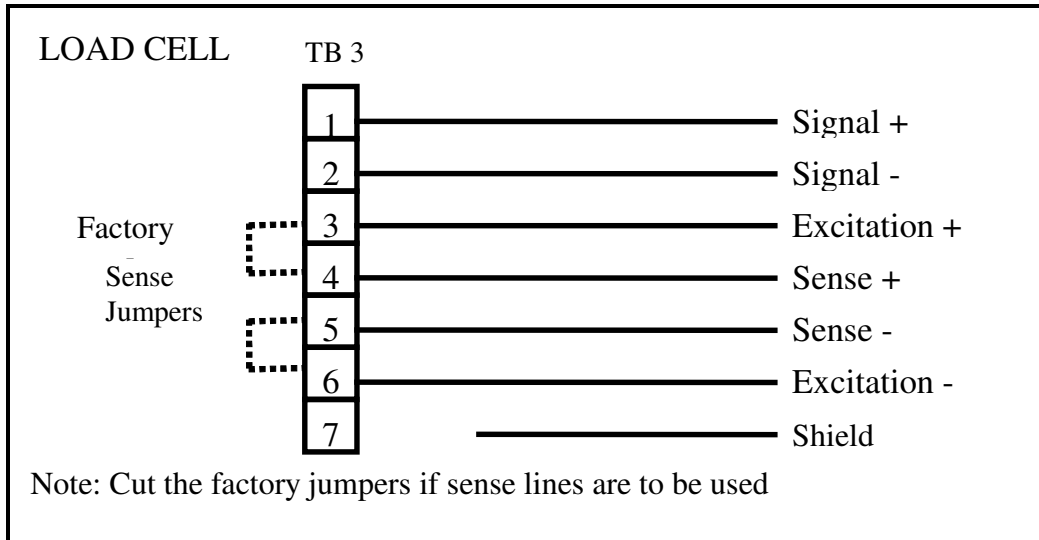
Trim pot to adjust display pixel intensity

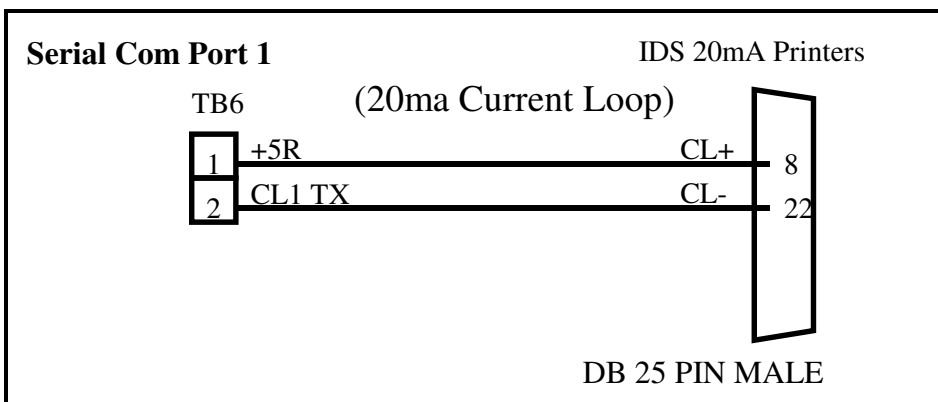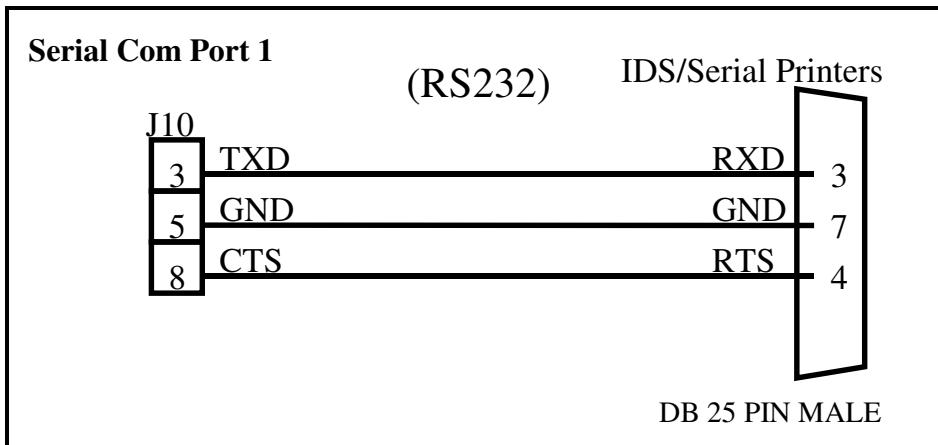## P.C. Board Diagram - Connectors, Jumpers, and Switches

NOTE: Jumper TB3 pin 7 to ground (TB6 pin 7) to enable scale configuration and calibration. Remove the jumper if the unit is to be sealed by Weights & Measurement authorities after calibration.

Sample Cable Drawings

Load Cell

```
LOAD CELL      TB 3

              1 ───────────────────  Signal +
              2 ───────────────────  Signal -
Factory       3 ───────────────────  Excitation +
Sense         4 ───────────────────  Sense +
Jumpers       5 ───────────────────  Sense -
              6 ───────────────────  Excitation -
              7          ──────────  Shield

Note: Cut the factory jumpers if sense lines are to be used
```

IDS Printers/Serial Printers

```
Serial Com Port 1                              IDS/Serial Printers
                        (RS232)
J10
  3   TXD ──────────────────────── RXD   3
  5   GND ──────────────────────── GND   7
  8   CTS ──────────────────────── RTS   4


                                         DB 25 PIN MALE
```

```
Serial Com Port 1                          IDS 20mA Printers
TB6              (20ma Current Loop)
  1   +5R ──────────────────────── CL+   8
  2   CL1 TX ─────────────────────── CL-  22



                                         DB 25 PIN MALE
```

Parallel (Centronix) Printer

DT220 Parallel Port   PRINTER

1	STROBE -	1
2	Data 1	2
3	Data 2	3
4	Data 3	4
5	Data 4	5
6	Data 5	6
7	Data 6	7
8	Data 7	8
9	Data 8	9
11	BUSY +	1
18 - 25	Ground (GND)	16

DB-25 pin Female   **36 PIN CENTRONIX**
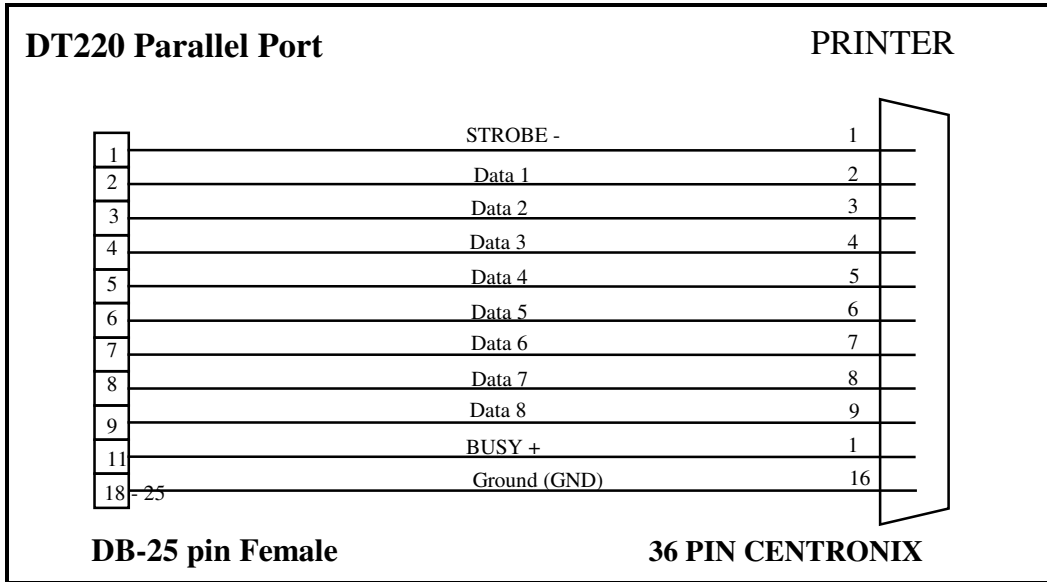
TTL Input switches

DT220 TTL Inputs

Scale Basic Function 1

Scale Basic Function 2

TB 3
1
2
3
4

Scale Basic Function 3

Scale Basic Function 4

TB 2   3

GND
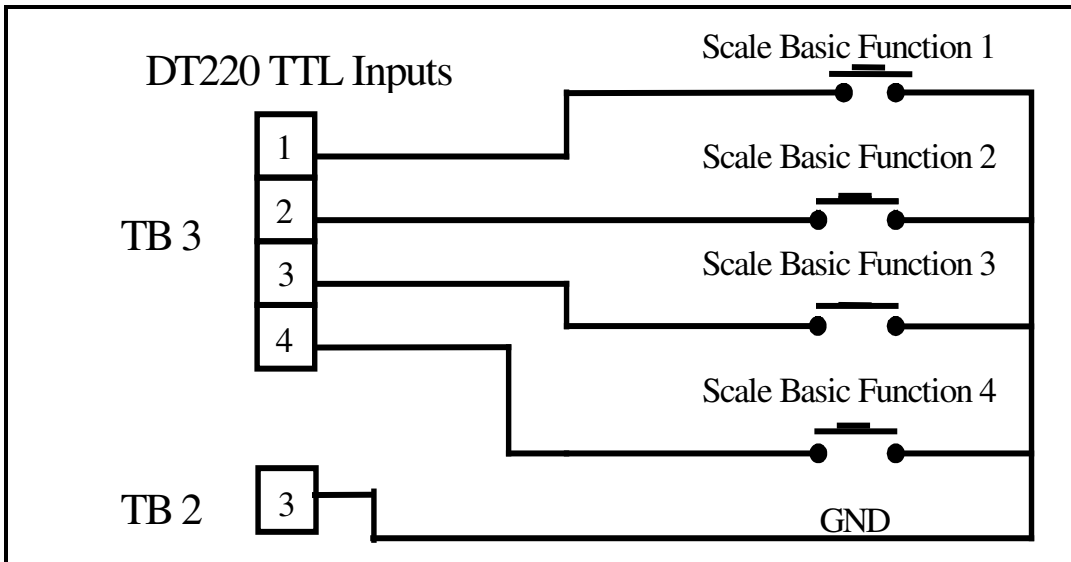
DT220 Specifications

Display	8 lines x 40 char (240x64 graphics) LCD display.
Keyboard	Sealed keyboard with tactile feel.
I/O Ports	Load Cell Interface Port.
	Serial Com port 1 - RS232 or Current Loop
	Serial Com port 2 - RS232 or RS485 (Isolated)
	Serial Com port 3 – RS232 or Current Loop (Isolated)
	Parallel Printer port
	8 TTL outputs.
	7 TTL inputs.
Display Graduations	200,000 graduations (industrial)
	10,000 hb44.
Display Increments	1, x2, x5, x10, x20, x50, x100.
Decimal Point	0 to 4 decimal places.
Internal Graduations	16,000,000.
Conversion Rate	60, 120, 240, or 480 samples/second
Signal Sensitivity	0.1 uV/graduation (min).
Signal Range	0.1 mV/V - 3.4 mV/V.
Load Cell Excitation	10 VDC (-5, +5 VDC).
Load Cell Current	240mA (8, 350 ohm Load Cells).
Auto Zero Tracking	0 to 60 grads, @1/4 grad increments.
Auto Zero Delay	0 to 25 sec, @0.1 sec increments.
Motion Detect	0 to 60 grads, @1/4 grad increments.
Motion Delay	0 to 25 sec, @0.1 sec increments.
Digital Filter	19 settings (0 to 18).
Digital Calibration	Front Panel - zero & span stored in Flash memory
Power Input	115-240 VAC 50/60 Hz.
Operating Temperature	-10 to 40 degrees centigrade.
Options	Opto-22 relay modules.
	Analog input module.
	Analog output module.
	Panel Mount Kit
	Wall Mount Enclosures
	EZLink 220 Programming/Development Kit

ASCII CHART

ASCII	DEC
Null	00
SOH	01
STX	02
ETX	03
EOT	04
ENQ	05
ACK	06
Bell	07
BS	08
HT	09
LF	10
VT	11
FF	12
CR	13
SO	14
SI	15
DLE	16
XON	17
TAPE	18
XOFF	19
DC4	20
NAK	21
SYN	22
ETB	23
CAN	24
EM	25
SUB	26
ESC	27
FS	28
GS	29
RS	30
US	31

ASCII	DEC
SP	32
!	33
"	34
#	35
$	36
%	37
&	38
'	39
(	40
)	41
*	42
+	43
,	44
-	45
.	46
/	47
0	48
1	49
2	50
3	51
4	52
5	53
6	54
7	55
8	56
9	57
:	58
;	59
>	60
=	61
>	62
?	63

ASCII	DEC
@	64
A	65
B	66
C	67
D	68
E	69
F	70
G	71
H	72
I	73
J	74
K	75
L	76
M	77
N	78
O	79
P	80
Q	81
R	82
S	83
T	84
U	85
V	86
W	87
X	88
Y	89
Z	90
[	91
\	92
]	93
^	94
<-	95

ASCII	DEC
`	96
a	97
b	98
c	99
d	100
e	101
f	102
g	103
h	104
i	105
j	106
k	107
l	108
m	109
n	110
o	111
p	112
q	113
r	114
s	115
t	116
u	117
v	118
w	119
x	120
y	121
z	122
{	123
		124
}	125
~	126
DEL	127