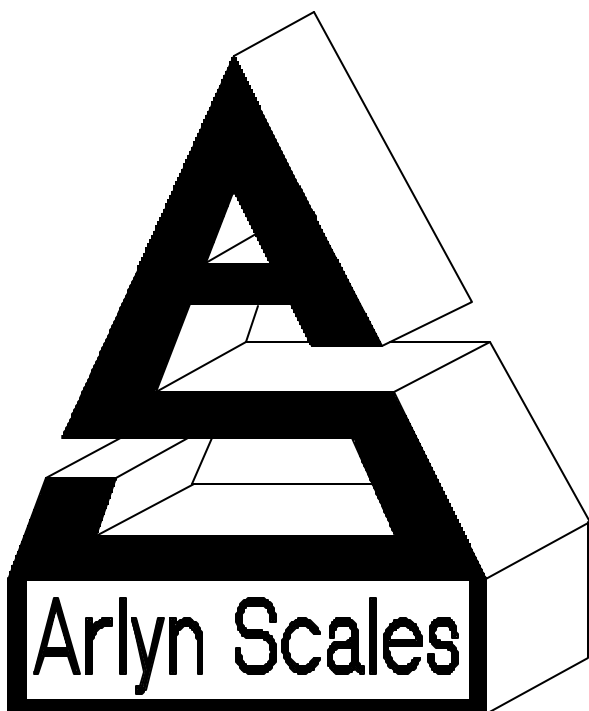


Digital Scales

Series 3200 /5200/ 6200 / 8200

Options Manual



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Introduction

This manual will cover the operation and setup of all of the options available for your scale. It is important to note that some described menu items will be missing if that option was not installed in your specific scale. All of the options listed may be installed in any scale and may run concurrently. Any of the options may be installed later at the factory if it wasn't installed at time of purchase. Call our service department for details.

Contents

Introduction	2
Contents	2
RS232 Communications Port	3
Configuring the Port	3
Perform Test Print	3
Loop Back Test	3
Print Stream Mode	3
Printing at Stability Using Motion Detection	3
Print Frame Definitions	4
Defining and Editing Print Frames	4
Print Frame Functions	5
Print Frame Design Examples	5
Text Definitions	6
Changing Printer Fonts	6
External Command Interface	7
The * Command, Keyboard Emulation	8
The ! Command, Remote Entry Commands	8
The @ Command, Interactive Commands	8
Tips on Interfacing RS232	9
Time and Date	9
Analog Output	10
Analog Setup Menu	10
Setpoint Controller	10
Output Specifications and Notes	10
Creating Setpoints and Formulas	10
Weight Averaging	12
Push Button Operation	12
Continuous Operation	12
Configuring the Weight Average Option	12
Multiple Platform Operation	13
Battery Pack Operation	13
Description	13
The Main Power Toggle Switch	13
The Front Panel On/Off Switch	13
Auto Shutoff Setup	13
Statistical Package	14
Statistical Menu	14
The Setup Screen, Configuring the Statistical Package.	14
Adding a Reading to the Collection	14
Output Connector and Pin Diagram	15

RS232 Communications Port

The RS232 option is a fully capable, bi-directional communications port. The port can be configured to operate at a variety of baud rates and the output data frames are definable by the user. The printing of a frame can be initiated by pressing the print button, by an external command, upon reaching a setpoint, or continuously when the print stream mode is activated. The communications port also contains an extensive external command interface allowing key presses, adding and editing memory slots and even scale calibration to be controlled from external equipment.

Configuring the Port

Baud rate and other parameters can be configured through the Port Configuration screen that can be accessed under menu SETUP MENU/OPTION SETUPS/RS232/PORT CONFIG .The options are shown below.

BAUD RATE	Settable to 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 31250 or 38400 bits per second.
DATA BITS	Seven or Eight
STOP BITS	One or Two
PARITY	Even, odd or none
ECHO	On or off. When echo is enabled the scale will echo each character the scale receives back to the user.

Perform Test Print

As an aid to port configuration we have included a “perform test print” function to the RS232 menu. Executing this will cause the string “Your RS232 port is working fine!”, a carriage return and a line feed to be output from the port. To access this function go to the menu SETUP MENU/OPTION SETUPS/RS232/PERFORM TEST PRINT.

Loop Back Test

You may also test the operation of the RS232 port by performing a loop back test. On the output connector, TX and RX (transmitted and received data) need to be shorted together. When you perform the test, the scale sends data and reads it back through its own port, where it is compared and the results are show.

Print Stream Mode

Print stream mode will continuously print the currently active print frame at fixed time intervals. Stream mode can be configured using menu SETUP MENU/OPTION SETUPS/RS232/PRINT STREAM. The lower menu selection ENB will enable or disable print stream mode, and TIME will be the number of seconds between the beginning of each print frame. Time settings of .5 to 1638 seconds (27.3 minutes) can be entered. Avoid using time values of less than .5 seconds as it may slow down or lock up the scale.

When stream mode is enabled, use the print button or the external *P command to start or stop the printing process.

Printing at Stability Using Motion Detection

All Arlyn digital indicators have the capability of detecting motion and using it to control printed outputs. This can be useful in many applications. For example, if you wanted to print labels for several items, you could simply place each item on the platform, and when the scale gets a stable reading it will print the label automatically. Both the motion detect and printing at stability are fully configurable through their respective setup screens.

The motion detect indicator looks like a small circle and it is located just to the right of the Zero Indicator / Bar Graph located on the bottom of the display.

The Motion Detect Setup Screen

This screen can be accessed in the platform setup menu, which is off the main menu. There are three settable options on it. The first two are for the motion detect setup. To modify them, use the left and right arrow keys to line up on the appropriate entry in the horizontal menu located at the bottom of the screen, and then press ENTER. These menu items are as follows:

ACTV: Activates or deactivates motion detection: This must be set to Active for printing at stability to work.

MOTN: Sets the number of "d" units that the scale needs to be stable within to qualify as a "steady reading".

A "d" unit is the value of the rightmost digit on your display, which is the scale's resolution. For example, a 100lb capacity scale's "d" unit is .02lb, for a 50lb scale it is .01lb. It is the scale's lowest displayed resolution and it should be printed on the capacity label under the main display.

TIME: This works along with MOTN to detect a stable reading. The reading must be stable within the selected number of "d" units for this length of time (in seconds) in order to be considered a stable reading. This allows motion detect to be configured for many situations to compensate for background vibrations or any other factor that would adversely affect scale readings.

The Print At Stability Setup Screen

Follow the menu tree down this path to locate this setup screen:

SETUP MENU / OPTION SETUPS / RS232 / PRINT AT STABILITY.

There are three settings that control this function:

ACTV: This will activate or deactivate this function. Select ACTV from the horizontal menu on the bottom of the screen, and then press ENTER to change this setting.

PCT: This is the percent of full scale capacity, which, if the scale reading falls below, will not automatically print. For example, a 100lb full capacity scale set to 1% will not automatically print when there is less than 1 lb on the platform. In most applications there is no purpose to generating a print after removing weight from the platform. This percent can be set to two decimal places.

NEG: By setting this to "YES", the automated print will work on both sides of zero. When set to "NO" it will only work with positive weights.

Print Frame Definitions

A print frame is a list of up to ten functions for the scale to perform each time a print request is received. The list is executed in the same order as shown is shown. A function can either be an item to be printed or a command for the scale. Currently there is only one command and it is the CHAIN command. All other functions are items to be printed. If more than ten functions are needed, as when defining print frames for complex labels, the CHAIN command can be used to chain to another print frame definition.

Each print frame requires two memory slots. You can define as many frames as you like up to the number of free memory slots available.

Each frame has a description associated with it. Descriptions are useful when you have many print frames defined, as when you have multiple labels etc.

Only one frame can be active at any one time. Whenever the scale receives a print request, the currently activated frame will be printed. The active frame is showed in the list with a check mark next to it.

Defining and Editing Print Frames

Go to the menu SETUP MENU/OPTION SETUPS/RS232/PRINT FRAMES.

To activate, edit or delete a frame, use the arrow keys to line up on the desired frame and ACTV, EDIT or DEL on the lower menu and then press ENTER.

To define a new frame, use the arrow keys to select NEW on the lower menu and press ENTER. A new frame entry will be added to the list. Use the arrow keys to line up on it and on EDIT in the lower menu. Pressing ENTER will bring you to the frame editing screen. The screen will show "None defined" as there are no functions defined yet. For this example we will make a simple data frame that will print the weight, followed by CR and an LF. Line up on NEW on the lower menu and then press ENTER to add a function. The function NULL will be added to the list. We want to change this to the WEIGHT function. Press the right arrow key to line up on FNC+ on the lower menu. Press ENTER twice to select the WEIGHT function. To add a CR to this function, use the right arrow key to line up on CR on the lower menu and then press ENTER. You will then see a check mark under the column "C". To turn on the LF, press the right arrow once more to line up on LF and then press ENTER. This completes the definition.

If you wish to change the description of this new frame, use the arrow keys to line up on DESC on the lower menu and then press ENTER. Its current description will be loaded into the text-editing screen. Change it as desired and then press MENU to return to the frame editing screen. To use this new frame press MENU to back out to the frame list. Use the arrow keys to line up on the new frame and also ACTV on the lower menu. Press ENTER and a check mark will show on the new frame showing that it is activated.

The lower menu items on the frame editing screens are outlined below.

- DESC Allows you to change the description of this frame.
- NEW Adds a new default function (NULL) to the function list.
- INS Will insert a new function (NULL) before the currently selected function line.
- DEL Will delete the currently selected function line.
- FNC+/- Will change the function of the current line. Available functions and their explanations are outlined below.
- SRC On many of the functions you need to specify the source of the data. For example the WEIGHT function must know what platform (on multiple platform scales) the reading should come from. SRC will step through all available platforms. For a TEXDEF function, it will step through all the available text definitions. For a CHAIN function it will show a list of other frames that you can chain to. For ASCII you can enter the decimal value of the ASCII code. For ChFont, using SRC will enable you to step through all available choices.
- CR Will include a carriage return at the end of the current function.
- LF Will include a line feed at the end of the current function.
- SP Allows you to print space(s) at the end of the current function. When activated a “?” will show up in the function list on the current line and allow you to enter a number. The number of spaces must be between 0 and 15.
- TEST This will allow you to quickly test the print frame without having to return to the scale’s normal operating mode.

Print Frame Functions

You can add up to ten functions to each frame. The functions are executed in the order they are defined in the list. You can add a CR (carriage return), LF (line feed) or trailing spaces to most functions. This is useful when designing labels. If a CHAIN function is encountered, the scale will ignore any further functions in the current frame and immediately chain to the next frame.

Function List

- NULL Does nothing, but allows CR, LF and spaces to be printed.
- WEIGHT Prints a six digit weight value. It will be net or gross depending on mode. Use SRC to select the platform.
- NETWGT Prints a six digit weight reading corrected for tare. Use SRC to select the platform.
- GRSWGTS Prints a six digit weight value ignoring any active tare weight. Use SRC to select the platform.
- NGTEXT Prints “NET” or “GROSS” depending on mode. This is meant to be used with the weight function. Use SRC to select the platform.
- PLATTOT Prints a gross total reading of all active platforms.
- COUNT Prints the current piece count. Use SRC to select the platform.
- ACCUM Prints the value in the parts counting accumulate register. Use SRC to select the platform.
- CNTACC Prints a total of the current piece count plus the part count in the accumulate register. Use SRC to select the platform.
- TIME12 Prints the current time in 12 hour format.. (when the time and date option is installed)
- TIME24 Prints the current time in 24 hour format.. (when the time and date option is installed)
- DAY Prints out the current day of the week. (when the time and date option is installed)
- DATE Prints the current date in the format mm/dd/yyyy. (when the time and date option is installed)
- SCADES Prints the 14 character scale description as entered in the system menu.
- SCAID# Prints the scale ID number as entered in the system menu.
- WEIGH# Prints the auto-incrementing weigh number who’s starting value was entered in the system menu. This number will increment each time a frame is printed.
- TEXDEF Prints a 14 character text string that was entered as a text definition. Use SRC to select the text definition.
- UNITXT Prints a 3 character indication of the currently selected units conversion (lb, kg, oz etc).
- TARDES Prints the 14 character description of the current active tare weight.
- SMPDES Prints the 14 character description of the current active sample weight (parts counting).
- ASCII Will send a single ASCII character to the port. Among other things this is useful to send ESC sequences to the printer to change fonts etc. Use SRC to enter the ASCII code.
- CHFONT Change Font. Works only with EPSON compatible printers. Use SRC to select the font.. See explanation below.
- CHPNT Change Point size. Use SRC to toggle through the choices 16,20,24,30,36,40,42,48,52,56,60,64
- CHAIN Will end the current frame and initiate another. Use SRC to select the next frame. Avoid chaining to the same frame, as this will cause endless looping.

Print Frame Design Examples

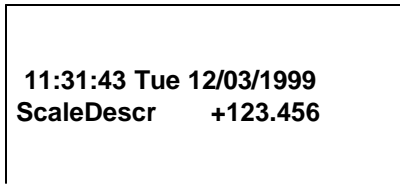
The first example is a simple print frame that will print the weight followed by a carriage return and a line feed.

FUNCTN	SOURCE	C L SP
Weight	Plat#001	☒ 0

The next example shows a more complex definition. Here we will design a five line label.
 Line 1 and line 2 will be blank (used for spacing the label vertically).
 Line 3 will show the time in 12hr format, followed by 1 space,
 Line 4 shows day of the week with 1 trailing space.
 Line 5 shows the date followed by a carriage return and a line feed.
 Line 6 will show the scale's text description (as programmed through the system menu) followed by 3 spaces.
 Line 7 shows the weight followed by a carriage return and a line feed.
 Line #8 will be blank (again used for spacing the label vertically).

FUNCTN	SOURCE	C L SP	Comments
Null		☒ 0	Two blank lines. Note the check marks on C and L.
Null		☒ 0	
Time12		1	Line #3, the time and 1 space
Day		1	Day of week and one space
Date		☒ 0	Date followed by a CR and LF
SCADES		3	Line #4, The scales description followed by 3 spaces
Weight	Plat#001	☒ 0	The weight followed by a CR and LF
Null		☒ 0	Two blank lines. Note the check marks on C and L.

The label would look like:



Remember that there are only 10 functions allowed per print frame, and we used nearly all of them in this example. If you needed more you could define a second print frame and use a CHAIN function at the end of first frame to chain to the second frame.

Text Definitions

Sometimes it is desirable to include text when printing a label. Each text definition allows you to define a 14 character text string. To access text definitions, go to the menu SETUP MENU/OPTION SETUPS/RS232/TEXT DEFINITIONS. A list of current text definitions is shown and you can NEW, EDT or DEL them in the usual way. ACTV is not used here.

Changing Printer Fonts

If you have an EPSON compatible printer, you can use the ChFont print frame function to change to one of four fonts, turn double wide on/off, double height on/off, italics on/of, letter quality/draft, bold on/off and printer reset. Not all point sizes or other functions are available on all fonts. Also, not all fonts are available on all printers. Please consult your printer's instruction manual for details. The ChPnt print frame function allows you to scale the font size up and down.

The scale will send the appropriate "Escape Codes" to the printer to perform these functions. ChFont and ChPnt are only meant to be a short-cuts to reduce the frame size. You could also perform font/point switching and many other printer functions by using the ASCII function.

The following is a summary of the escape codes sent to the printer by the various sub-functions of ChFont;

Bold On	ESC E	<27 69>	Bold printing ON
Bold Off	ESC F	<27 70>	Bold printing OFF
Ital On	ESC 4	<27 52>	Italics ON
Ital Off	ESC 5	<27 53>	Italics OFF
Draft	ESC x 1	<27 120 1>	Select draft quality print
Let Qual	ESC x 0	<27 120 0>	Select letter quality print
Roman	ESC k 0	<27 107 0>	Select Roman font
Sans Ser	ESC k 1	<27 107 1>	Select Sans Serif font
Courier	ESC k 2	<27 107 2>	Select Courier font

Prestige	ESC k 3	<27 107 3>	Select Prestige font
Script	ESC k 4	<27 107 4>	Select Script font
Reset	ESC @	<27 64>	Initialize printer
DblW On	ESC W 1	<27 87 1>	Double width printing ON
DblW Off	ESC W 0	<27 87 0>	Double width printing OFF
DblH On	ESC w 1	<27 119 1>	Double height printing ON
DblH Off	ESC w 0	<27 119 0>	Double height printing OFF
ChPnt	ESC X 1 n 0	<27 88 1 n 0>	Select height in points. n = # of points

External Command Interface

The external command interface allows the user to control the scale and manipulate memory data through the RS232 interface. There are three basic command types, these are:

- 1) The * Command (Keyboard Emulation). This allows you to simulate key presses remotely.
- 2) The ! Command (Remote Entry). Allows you to add, edit and delete memory contents like tares and parts counting samples.
- 3) The @ Command (Interactive Command). Allows you to operate the scale interactively whereby you send commands to the scale and the scale responds with text messages guiding you through various operations.

It should be noted that the command list described below is the **proposed list of commands**. As our scale continues to develop, commands are added as each firmware revision comes out. The revision in which the command was added is shown just to the right of the command in parenthesis. If (X) is indicated it means that the command has not been implemented yet and is slated for future release. To check the revision number of your scale, watch the Arlyn Logo splash-screen when you first turn on your scale. Firmware upgrades can be purchased and installed in your indicator. Contact our service department for details.

Print Request Response Time

When the scale receives a print request (*P) there is a small time delay while the scale computes and formats its output frame. For any frame function that outputs weight or parts count the response time is typically 100 milliseconds (1/10th second). For almost all other frame functions the response is almost immediate.

External Command Limitations

It is important that when sending repeated print requests (*P) to the scale that you wait for the scale to completely transmit its print frame, and then wait a small amount of time before sending the next request. If the scale receives a print request while it is still transmitting, the scale could actually lock up requiring a power off reset. Also, it is advisable to wait a small amount of time after the output frame is complete to give the scale a chance to do its own "housekeeping chores". To immediately send another print request directly after a transmission could bog down the scale's displayed update rate and keyboard response.

Command String Parameters

All command strings sent to the scale require a carriage return (hereafter called CR) to be sent at the end of the command string. A CR is ASCII code 13.

Keyboard emulation commands (* commands) do not require a CR and the key press will be initiated right after the command is received.

Many of the command strings require parameters. These are described below.

<descr> Any command that changes the contents of a memory slot will require a fourteen character description. This description should exactly match the description of the item in question. The description must be 14 characters in length and spaces should be used for any unused characters just as they are used in the scale's setup menus. For example "Tare #001" and "Plat #001" are valid descriptions. Descriptions are case sensitive so format your output appropriately.

If the scale can not find the description in memory, the message "Error 2: Description not found. Aborting." Will be sent followed by a CR. The operation is then aborted.

<value> Some commands require numeric input. All numbers should be 9 characters in length with a decimal point at character five. Valid values, for example, are 0123.4500 and 0001.0000. Use leading zeros as necessary to keep the spacing correct.

If the scale receives a number in an incorrect format it will send the message "Error 3: Illegal numeric format. Aborting." Followed by a CR. The operation is then aborted.

Command Abort Any command can be aborted at any time by sending a caret (^) character which is ASCII code 94. The scale will respond by sending the text "Command aborted" followed by a CR (ASCII code 13).

Illegal Command If any text is received by the scale that isn't in a correct command format , the scale will respond with "Error 1: Illegal command." followed by a CR. The command is then aborted.

The * Command, Keyboard Emulation

A number of external commands can be sent to the scale to simulate keyboard presses. These commands are listed below. Each command must be prefixed the a * character and no CR is required.

- *P or *1 - Print Key (5.000)
- *C or *3 - Units Key (5.000)
- *Z or *0 - Zero Key (5.000)
- *N or *9 - Net/Gross Key (5.000)
- *T or *7 - Tare Key (5.000)
- *U or *8 - Up Arrow Key (5.008)
- *D or *2 - Down Arrow Key (5.008)
- *L or *4 - Left Arrow Key (5.008)
- *R or *6 - Right Arrow Key (5.008)
- *. - Decimal Point (5.008)
- *O - On/Off Key, will take the scale in and out of Ready Mode (5.008)
- *M or *5 - Menu/Back Key (5.008)
- *E - Enter Key (5.008)

Care must be taken when sending key commands via RS232 as some keys will perform different functions depending on the scale's operating mode.

The ! Command, Remote Entry Commands

Tares

- NEW (X) !TN <descr> <value> <CR>
- EDIT (X) !TE <descr> <new descr> <value> <CR>
- DELETE (X) !TD <descr> <CR>
- ACTIVATE (X) !TA <descr> <CR>
- CLEAR (X) !TC simply clears the active tare.
- ACQUIRE (X) !TQ <descr> adds new tare and becomes interactive for acq

Samples

- NEW (X) !SN <descr> <value> <CR>
- EDIT (X) !SE <descr> <new descr> <value> <CR>
- DELETE (X) !SD <descr> <CR>
- ACTIVATE (X) !SA <descr> <CR>
- CLEAR (X) !SC <CR> simply clears the active sample.
- ACQUIRE (X) !SQ <descr> <sample size> <CR> adds new sample and becomes interactive for acq

Print Frames

- NEW (5.021) !FN <descr> <CR>
- LINE EDIT (5.021) !FL<14 chr src descr> <1 chr line n# 0-9> <2 chr function code> <2 chr arg1> <3 chr arg2>
- <CR y/n> <LF y/n> <2chr # spaces> <CR>
- DELETE (5.021) !FD <descr> <CR>
- ACTIVATE (X) !FA <descr> <CR>

Text Definitions

- NEW (5.021) !XN <descr> <CR>

The @ Command, Interactive Commands

Remote Span Calibration (5.010)

Your scale can be span calibrated remotely using this function. The command format is

@CS <descr> <calibration weight value> <CR>

To do this procedure you will need a calibrated weight of a known value. For this example we will calibrate the scale's primary platform whose description is "Plat #001" with a 10 lb weight, the procedure is described below.

You send "@CSPlat #001 0010.0000<CR>"
Scale responds "Remove all weight from the platform and then send a CR."<CR>
You remove the weight from the platform and send a CR.
Scale responds "Place the calibrated weight on the platform and then send a CR."<CR>
You place the calibrated weight in the center of the platform and then send a CR.
Scale responds "Remove all weight from the platform and then send a CR."<CR>
You remove the weight from the platform and then send a CR.
Scale responds "Operation Complete."<CR>

The scale will then remote calibrate itself and return to the weighing mode. You may have to press the ZERO key (or remote zero key) to get the scale to indicate properly.

Future Interactive Commands

TARE-READ VALUE (X) @TV <descr> <CR> (sends <value> <CR> or NOT FOUND <CR>)
TARE-READ ALL (X) @TA <CR> (sends for each <descr> <value> <CR>. Sends END <CR> and end of list)
SAMPLE-READ VALUE (X) @SV <descr> <CR> (sends <value> <CR> or NOT FOUND <CR>)
SAMPLE-READ ALL (X) @SA <CR> (sends each <descr> <value> <CR>. Sends END <CR> and end of list)

Tips on Interfacing RS232

RS232 transmission and reception takes place over a three wire cable, one for transmitted data, one for received data and one for ground. When wiring these lines to a standard RS232 25 pin D connector, the transmitted data line should be tied to pin 3, received data to pin 2 and ground to pin 7. For 9 pin connectors, the transmitted data line should be tied to pin 2, received data to pin 3 and ground to pin 5. In some situations, computers and other equipment require handshaking lines to work properly. Many times this can be shut off to work with a three wire system. If not, you can wire the connector to "trick" the computer etc. to work properly. This involves shorting the RS232 RTS and CTS line together and shorting the DTR and DSR lines together. For 25 pin connectors short pins 4 and 5 for RTS/CTS and pins 6 and 20 for DTR/DSR. For 9 pin connectors short pins 4 and 6 for RTS/CTS and pins 7 and 8 for DTR/DSR.

Shown below is a simple program written in BASIC that will open a com port at 1200 baud and then drop into a never ending loop that will input frames of information and print them on the computer's screen.

```
10 REM A simple example of a scale to com port interface
20 OPEN "COM1:1200,N,8,1,CS,DS" AS #1
50 REM Never ending loop
52 REM Send a print request to the scale
55 PRINT #1,"*P"
59 REM Input scale's transmitted frame
60 INPUT #1,FRAME$
69 REM display the results on the computer screen
70 PRINT FRAME$
75 REM Small time delay (at least 100ms, see External Command Limitations above)
80 FOR X=1 TO 20000
85 NEXT X
90 GOTO 50
```

Time and Date

When your scale is equipped with the time and date option you can get time and date and day of week readouts on the screen or use them in RS232 output frames. The time can be printed in either 12 or 24 hour format. Consult the section on Print Frame Functions for details. The screens for setting the date and time can be found under the menu SETUP MENU/OPTION SETUPS.

Analog Output

This option is a fully configurable analog output port that can be configured for voltage or current loop outputs. The factory has preset the output to be in one of three ranges, 0-5VDC, 0-10VDC or 0-24ma. The output follows the display and its gain is based on the platform's programmed overload point. For example, in the case of a 100lb scale whose output is configured as 0-5VDC, 0lb=0VDC, 25lb=1.25VDC, 50lb=2.5VDC and so on.

The starting and ending voltages (or currents), can be configured by the user. For example the output's starting and ending points can be set 1-5VDC or 4ma to 20ma. Further, there is an option allowing negative displayed numbers to be output for cases where a reading below zero needs to be monitored. As an example, a 100lb scale is setup with its starting voltage at 2.5 and ending voltage at 5, giving the output of -100lb=0VDC, -50lb=1.25VDC, 0lb=2.5VDC, 50lb=3.75VDC and 100lb=5VDC.

Analog Setup Menu

The analog setup menu can be found under menu SETUP MENU/OPTION SETUPS/ANALOG OUTPUT.

Programmable parameters are as follows:

ACTV - Will activate or deactivate the option.

TYPE - Can be set to 0-5VDC, 0-10VDC or Current Loop. The scale is ordered and factory set for this.

START - The starting voltage (or current) that will correspond to zero on the display.

END - The ending voltage (or current) that will correspond to the full-scale weight on the display.

NEGRDG - Allows negative displayed readings to affect the analog output. If disabled the output will stop at the programmed starting voltage when there is a negative number on the display. This should not be confused with a negative voltage on the output. The lowest possible voltage (or current) is zero.

Setpoint Controller

The setpoint controller gives your scale the capability to output a signal to external equipment when certain conditions are met. This is particularly useful in filling operations, either to sound alarms or to control filling machinery.

Setpoint definitions can be created, edited and deleted. Each has a text description, controlling parameters and a multi-line formula associated with it. In operation, if the displayed weight satisfies the formula, you may direct any of the outputs to switch on or off. You can create as many setpoint definitions as you like within limits of free memory. Each setpoint uses four memory slots.

Setpoint definitions can be activated or deactivated, and up to four setpoint definitions can be activated at one time. When multiple setpoints are activated, each setpoint formula is evaluated in the order it was defined. If more than one setpoint shares the same output, then it is possible for one to overwrite the other.

With a little finesse in creating formulas, simple setpoints, filling control cycles, over and under check weighing, and many other functions are possible.

Output Specifications and Notes

The setpoint controller has eight separate outputs and is expandable to sixteen. Each output is an open collector that will sink 25ma of current. Care must be taken not to exceed this value. This is sufficient to drive LEDs or sound buzzers. If higher output currents are needed then external relays need to be installed. We normally provide 117VAC, 10Amp optically isolated relays and mechanical relays should be avoided. Optical relays have some important advantages over mechanical relays, the actuation current for optical relays is about 10ma but mechanical relay coils require currents often exceeding the 25ma limit. Optical relays have no mechanical switches to wear out and more importantly they isolate the scale from the load, thus protecting it from voltage spikes. If excessive noise is coupled back to the scale it could lock up or damage its microprocessor or memory.

It should be noted that when you command an "OFF" CONDITION, the output will be grounded. In most open collector (switched ground) wiring schemes this will actuate the external light or relay. To help eliminate this confusion, each setpoint formula has a optional invert function to invert the output.

Even though the output is an open collector, it differs from the standard open collector output in that the output will assume a high condition (5VDC) when it is switched on without the need for an external pull up resistor, allowing direct connection into any TTL level input.

Creating Setpoints and Formulas

To access setpoints, go to the menu SETUPMENU/OPTION SETUPS/SETPOINT CONTROLLER. There you will see a list of all available setpoints or "None Defined" if none exist. The creation, editing and deletion of setpoints are similar to the creation

of tares and parts counting samples. To add a new setpoint definition, select NEW on the lower menu and press ENTER. A new setpoint definition will then be added to the list with a description of "SetPt #XXX". This new setpoint is deactivated and contains an empty formula list.

To edit this new setpoint, or any other one, use the UP and DOWN ARROW keys to line up on the desired setpoint, select EDIT on the lower menu and then press ENTER. The setpoint definition screen will be shown.

The Setpoint Definition Screen

The setpoint definition screen will show the description and controlling parameters for this setpoint definition.

Inv=On/Off If it is on then all outputs related to this setpoint will be inverted. This is useful when using the open collector output for the reasons stated earlier in this section.

Cycl=On/Off The cycle option is used to create an operation cycle as described earlier in this section.

Scnd=ENTER KEY This is the start condition that will initiate a cycle, if cycle is enabled. ENTER KEY is the only current start condition available.

INIT=On/Off This is the initial state of all outputs used in this definition. This would normally be off.

To change any of these options simply select the appropriate entry in the lower menu and press ENTER.

Creating and Editing Formulas

The formula is a list of up to nine lines that are evaluated and acted upon in the order they are entered.

To access the formula list select EDIT in the lower menu and then press ENTER. All of the current formula lines will be displayed or "None Defined" if there aren't any. Using the NEW and INS in the lower menu to add or insert new lines.

Each line consists of four parts. These are CMD (command), EXP (expression), VALUE and OUT. CMD is an action to take. The only two commands currently available are ON and OFF. EXP is an expression and can be < (less than), <= (less than or equal to), > (greater than) and >= (greater than or equal to). Value is the setpoint weight value and OUT is the output channel (1-8) that the CMD command will work on.

For example, a simple formula to activate the output when a certain weight is exceeded is made up of two lines as shown below:

CMD	EXP	VALUE	OUT	
Off	<	5.0	1	Start with light off
On	>=	5.0	1	On if 5 lb or greater

This can be interpreted as:

Line 1: Output #1 is off if weight is less than 5.00 lb

Line 2: Output #1 is on if weight is greater than or equal to than 5.00 lb

You will notice that every output possibility must be dealt with when creating a formula.

The next example represents a much more complicated definition. The scale would have three lights connected to three outputs and operate in an UNDER / ACCEPT / OVER check weighing scenario.

There will be a red light connected to output #1 to indicate an "under" condition, a green light connected to output #2 for an "accept" condition and a yellow light connected to output #3 to show an "over" condition. We can program the red light to be on whenever the weight is less than 5lb, the green light to be on only between 5 and 5.2 lb and the yellow light to be on whenever the weight is above 5.2lb indicating an over condition. In practice, the user would start filling the container until the green light comes on.

It is less confusing to make a formula of this nature if you deal with the complete operation of one light at a time. We recommend laying the formula out on paper first and then enter it into the system.

Here it is:

CMD	EXP	VALUE	OUT	
On	>	0.00	1	Deal with "under" (red) light first
Off	>=	5.00	1	
Off	<	5.00	2	Now the "accept" (green light), to be
On	>=	5.00	2	on only between 5 and 5.2 lb
Off	>	5.20	2	
Off	<=	5.20	3	Now the "over" (yellow) light to be on
On	>	5.20	3	anytime the weight is above 5.2

When this formula is executed, the scale evaluates each line in order. This calculation is done in memory only, and the outputs are not affected until the formula is complete. The entire formula is evaluated on each and every display update, which is programmable through the system menu.

You may wonder why it is necessary to have to use an Off condition at the beginning. This was done to increase flexibility as there may be many cases where the user wants the light to start in the on state, turn off during a certain weight range and on again when above that range. You have to specify every possible condition for the output when making formulas.

This last example will show an automated filling operation using the cycle option. The goal here would be to have output #1 connected to a filling valve and the cycle starting with this valve in the off condition. The user places a box on the scale below the filling apparatus, press the ZERO key to zero out the weight of the box, press the ENTER key to start filling and have the setpoint controller switch the filling valve off when 5lb is reached. The user then removes the box from the scale and the output will remain off until the next cycle is initiated by pressing the ENTER key.

Start in the setpoint definition screen by enabling the CYCLE option and setting the INIT option to off.

Here is the formula:

CMD	EXP	VALUE	OUT	
On	<	5.00	1	Will actually go on as soon as the ENTER key is pressed.
Off	>=	5.00	1	Switch off at 5 lb and end cycle

That's all there is to it. The output will go off at 5 lb and remain off until the next cycle.

Notes on Cycling Setpoints

The cycle function is used when it is desirable to "latch" the output to a specific state when a process is complete. Consider the following examples with and without the cycle option. In both cases the setpoint is set to fill a box to 5lb and then shut off.

Cycle Off: The output is on as the box fills and the scale monitors the process. At 5lb the output switches off. The user then removes the box from the scale. When he does that, the indicated weight falls below 5 lb, the filling valve switches back on dumping material all over the platform.

Cycle On: When 5lb is reached the output switches off, and remains off until the user initiates the cycle again by pressing the ENTER key.

There are two other points concerning process cycles:

- There may only be one cycling setpoint definition active at any given time. All other activated setpoint definitions will work normally along with it.
- To abort the cycle, press the ENTER key. The output will then obtain the same state it would have taken if the process had completed normally.

Weight Averaging

The weight averaging option allows the scale to display an average weight taken from the platform over a specific time period. Readings are sampled from the platform forty times per second so a five second average would average 200 readings. Weight averaging can be setup to operate from a front panel key (the "8" key) or to operate on a continuous basis.

Push Button Operation

Pressing the "8" key will start the average. While the average is being taken, the status bar on the bottom of the screen will display "Avg" and the graph bar will show the amount of time left. When the average is completed the result is locked on the display and the text "Loc" will be shown on the status bar. While the reading is locked the UNITS, NET/GROSS and other front panel keys will still operate as normal. To release the lock simply press the "8" key again. While the average is being taken it can be aborted at any time by pressing the "8" key.

Continuous Operation

When configured for continuous operation, constant averages at the selected time interval will be taken and locked on the display. The text "Avg" will be shown on the status bar and the time progress shown on the graph line. The average key (the "8" key) is used to start and stop this process.

Configuring the Weight Average Option

The configuration parameters for the weight average option can be found in the menu SETUPMENU/OPTION SETUPS/WEIGHT AVERAGING. There are three settable options here.

ACTV Activates or deactivates weight averaging

TYPE Push button or continuous operation

TIME Average acquire time can be set from one to sixty three seconds

Multiple Platform Operation

Your scale has the capability of running up to eight input devices at any one time. Normally only one is used, a load cell, and the scale is programmed to have a single platform containing that load cell. The scale can be configured to run from multiple platforms there are only a few basic operational differences:

- 1) An extra display screen is added showing the readings from each individual platform as well as the total weight from all platforms.
- 2) The DOWN ARROW key now functions from any screen and allows you to switch between platforms. On the primary weight screens the active platform number is indicated on the bottom of the screen just to the right of the status bar (PL1, PL2 etc). On the extra platform display screen the DOWN ARROW key is used to select which platform the main keypad will effect. For example, to zero platform 2 use the DOWN ARROW to get the indicator on the right side of the screen to point at platform 2 and then press the ZERO key.
- 3) An extra menu is inserted in the menu SETUP MENU/PLATFORM SETUPS. This is a menu that shows the description of each platform and allows you select one for editing.
- 4) When taking or activating tares, parts counting samples, taking a quick sample or pressing the TARE, UNITS, NET/GROSS or ZERO key, the operation will be performed only on the currently selected platform.

Battery Pack Operation

Description

The Battery Pack Option will allow the scale to be operated in areas where no power is available. The battery pack itself is installed inside the indicator housing and is not user serviceable in any way. The only external differences are the addition of a Main Power toggle switch and power transformer connector located on the right side of the indicator housing.

To charge the pack, simply leave the scale plugged in for about four hours. The charging circuitry has a peak detect and will stop charging once the battery has reached its peak. The scale may be operating normally while charging.

The battery pack allows a scale equipped with a single load cell platform (models 620 and 820) to operate for about fifteen hours on a single charge. For scales that have multiple load cell platforms, running time is slightly shorter. A four load cell platform, like the model 320 will run for about 10 hours.

The Main Power Toggle Switch

There is a main power switch located on the right side of the indicator. Its only function is to completely remove power from the main circuit board in the event of a microprocessor program crash or any other event that causes the scale not to be able to switch itself off. This toggle switch should be left in the closed (UP) position during all normal operation.

The Front Panel On/Off Switch

The front panel On/Off switch is used to switch the scale on and off during normal operation.

To turn the scale on, simply press the button and the scale will start its initiation sequence. To turn the scale off, press and hold this button for approximately three seconds until the display blanks out and then release it.

Auto Shutoff Setup

The scale can (and should) be setup to automatically turn itself off when a programmed time has been reached and/or there is no activity on the scale. This is done through the Auto Shut-Off screen. You may also want to skip the splash screen and ready prompt on startup. You can do this in the menu SETUP MENU/SYSTEM/STARTUP PARAMETERS.

The scale's auto shutoff operation can be activated and changed in the menu SETUP MENU/ SYSTEM /AUTO SHUT-OFF. There are two options available.

ACT Activates/deactivates the auto shutoff feature.

TIME Is the time, in minutes, that the unit will shutoff due to inactivity.

Statistical Package

The Statistical Package allows you to save a large number of readings in memory for future use. Here are some of its features:

- You can transmit the entire data collection through the RS232 communications port to a printer or computer for later analysis.
- You can view a "result screen" which will show the minimum reading, the maximum reading, the average, and total.
- The data collection is held in memory even if the power is removed.
- Readings can be saved by simply pressing a key.
- Shares memory with the scale's operating system for maximum storage efficiency.
- Main screen shows when data collection is active and the number of readings collected.

Statistical Menu

This menu contains all of the functions associated with the statistical package. It is located at SETUP MENU / OPTION SETUPS / STATISTICAL.

The items in this menu are:

SETUP: This is a simple configuration screen for the statistical package.

CLEAR MEMORY: This will clear all collected data from memory.

TRANSMIT DATA: This will transmit the entire data collection through the RS232 communications port. Each collected reading is transmitted along with a carriage return (ASCII 13) and a line feed (ASCII 10). All collected readings are transmitted. Memory does not automatically clear after transmission.

VIEW RESULTS: This screen will show some basic information about the data collected. These are the minimum reading, the maximum reading, the total and average reading.

The Setup Screen, Configuring the Statistical Package.

This screen will allow you to specify if the statistical option is active or not, and also how much memory to set aside for data collection. Any time you enter this configuration screen, the data collection in memory will be erased.

There are only two configurations on this screen:

ACTIVE: Set to YES in order to enable data collection. If enabled, the top line of the main weight display will show an inverse "Data:", followed by the number of readings currently collected in memory.

SIZE: The memory set aside for data collection uses the same memory and storage techniques as the memory used by the scale's operating system for storing tares, counting samples, print frames and other data. If you aren't using the scale's memory for those other uses, you will have roughly 470 free slots available for data collection, depending on the scale's configuration. Each slot will hold 8 readings, so at maximum, 470 x 8, or 3760 readings may be collected.

To configure the memory, enter the new size through the setup screen. Size is the number of readings (maximum) that you would like to be able to store. This number will automatically be rounded up to the next multiplier of 8 (8 readings per slot). The memory is then set aside for data collection, and becomes invisible to the rest of the system. This being the case, if you configure a large memory area for data collection, you will be restricted as to the number of storage slots available for other uses.

Adding a Reading to the Collection

Simply press the ENTER key at any time while you are in the main weight screen. The current reading will be saved and the top line will show you how many readings have been collected. If the data collection memory is full, you will see a warning message at this time.

Output Connector and Pin Diagram

In most cases there will be a single cable with a 15 pin subminiature D type female connector added to the scale for interfacing to external equipment.

- 1 Setpoint #4 Output
- 2 Setpoint #5 Output / LC2 Signal +
- 3 Setpoint #6 Output / LC2 Signal -
- 4 Setpoint #7 Output / LC2 Excitation - (Analog Ground)
- 5 Setpoint #8 Output / LC2 Excitation +
- 6 Setpoint #3 Output
- 7 Setpoint #2 Output
- 8 Setpoint #1 Output
- 9 Digital Ground
- 10 +5VDC
- 11 RS232 RX Data
- 12 RS232 TX Data
- 13 Digital Ground
- 14 Analog Voltage Output
- 15 Analog Current Output

