ADP-020B
Asphalt Drum Mix Controller
User's Manual

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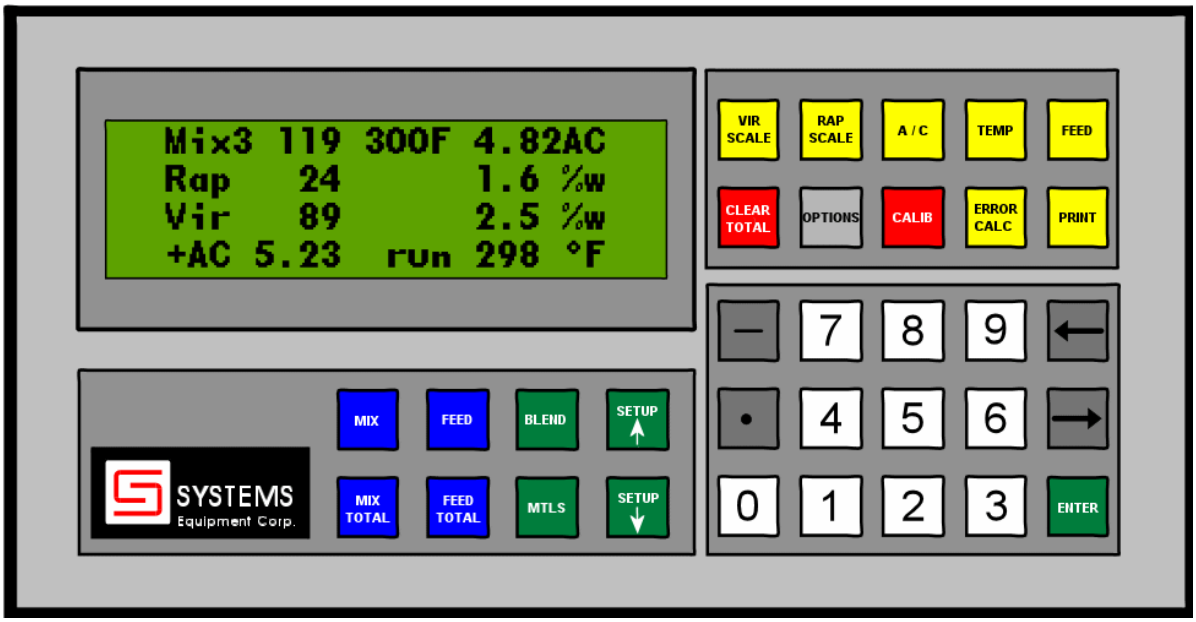
Introduction

The ADP-020B asphalt drum mix controller is designed to proportion and control the aggregate delivery rate, measure temperature compensate, and control the liquid asphalt flow rate so that the asphalt blend is accurately interlocked to the measured aggregate flow. A printer interface is included to allow production data logging.

The equipment provided includes a data terminal, a signal processor, and a hardware interface. All components are industrial grade and designed specifically for use in the asphalt industry.



The data terminal has a 4 line by 20-character vacuum fluorescent alphanumeric data display for high visibility in all ambient light conditions. A color-organized keypad is used for data entry and control. The entire terminal is sealed against moisture and dirt contamination to a rating of NEMA 12.

The signal processor consists of a single printed circuit card containing the microprocessor, stored program and interface drivers. The stored program (software) is derived from the time tested software used on SYSTEMS ADP-100 process control computer systems.

Connection of the plant sensors and controls to the signal processor is made through the hardware interface. Optical or transformer isolation is used as needed to safely isolate the processor from the electrically harsh plant environment.

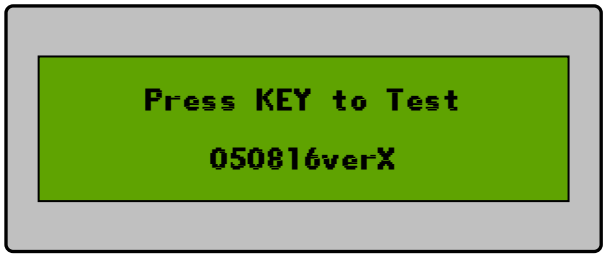
An IBM®-compatible printer interface is provided. This interface allows real time data logging of key process variables.

Key Features

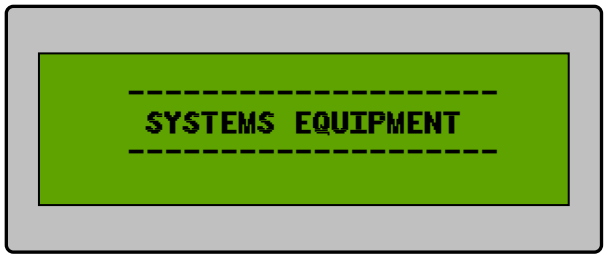
- Integral virgin and optional recycle aggregate totalizer(s) connect directly to users belt scale load cell(s).
- Interlock and speed sensing is measured either directly from a speed sensor or indirectly from the line frequency. Totalizer has an auto zero feature and assisted calibration procedure.
- Liquid asphalt rate is measured by pulse input from a volumetric meter. The rate is corrected for the asphalt temperature as read automatically or as entered by the user. An assisted calibration procedure is provided.
- The asphalt pumping rate is automatically controlled to maintain the desired asphalt blend. Control signal and injection valve operation are all properly delayed in time to mimic actual process delays.
- Up to 5 aggregate feeders can be controlled. Feeder rates are controlled according to one of nine (9) user entered blend formulas and the target production rate. Feeder rates are displayed in TPH and percent aggregate blends. An assisted calibration procedure is provided.
- An additive option is available--the option controls a volumetric additive feeder and allows the use of tachometer feedback for improved control accuracy.

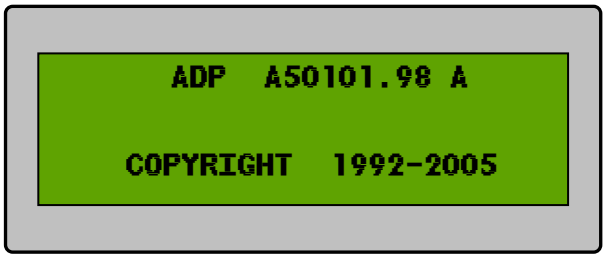
On Power Up

During the first 10 seconds, the display will flash a checkered screen on and off twice. The following screen will be displayed. This screen is used to troubleshoot key malfunctions. (Please see Keypad Test section for more details on using this function.) *Note: If the display is too dim or too bright,* ***hold*** *the minus* — *key, while pressing the right arrow* → *to increase contrast or while pressing the* ← *left arrow key to decrease contrast. Contrast can be altered at anytime on any screen.*

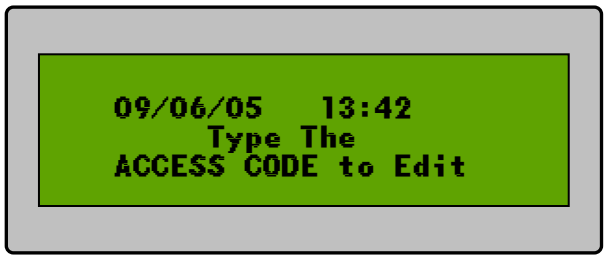


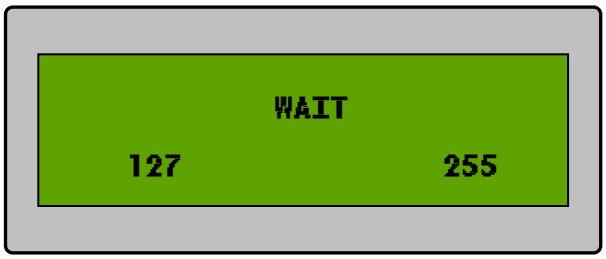
If no key is pressed, the manufacturer identification will then be displayed together with a copyright notice and the software version installed. No user interaction is required during this initialization period.





The current date and time will be displayed. Date and time are only needed by the recordation option so errors shown need not be corrected unless data logging is in use.



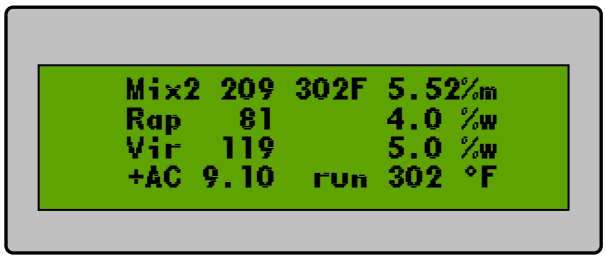


Typing the access code (.00) will allow the user to enter new date and time information.
Pressing the blue MIX display key when done will display the results just entered.

Pressing any of the display keys will exit the date/time display. There is a brief wait while initialization is finalized and then the MIX information screen will be displayed and all plant control functions will become active.

MIX Information Display

Pressing the blue MIX display key will bring up the MIX information display. The data shown on this display is updated every second.



The top line of the display shows the word MIX followed by the formula number (1 through 9) currently in use together with values of the MIX rate in TPH at the point in time of asphalt injection, the mix temperature, and the current asphalt blend. The descriptor for the asphalt blend will flash %a and AC or %m and AC indicating that the asphalt blend is calculated on the basis of total Aggregate (ie: %aAC) or total mix (ie: %mAC).

The mix rate will be zero and no asphalt will be added whenever the aggregate rate at the point in time of normal asphalt injection is less than the user set aggregate scale Threshold level. Only when this rate exceeds this threshold level will asphalt be injected.

The formula number will not be displayed for systems configured to control less than 2 feeders.

There will be no Temperature display if mix temperature interface module (module 15) is not installed.

The second line displays the current filtered (damped), recycle belt scale in TPH and the user entered percent moisture in this aggregate. If there is no recycle scale, the total mix produced will be displayed.

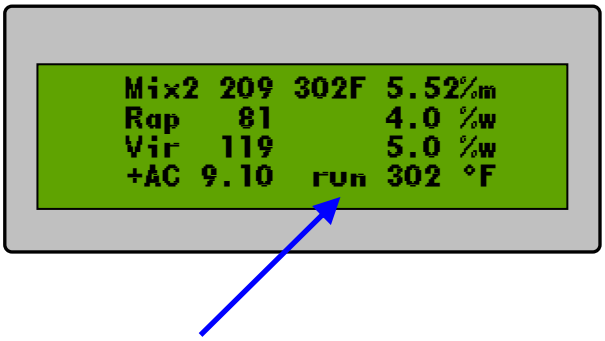
The third line displays the current filtered (damped), virgin belt rate in TPH and the user entered percent moisture in this aggregate. A belt scale status message may be displayed immediately to the right of the rate display. When the belt scale conveyor is not running, the status message will be "off." In auto zero, the status message will alternately flash "auto" and "zero".

NOTE

If the aggregate scale is ON, but continuously less than the user set Threshold value, the system will assume the scale is empty and should be reading zero TPH. After 2 minutes, the system will slowly adjust the scale reading toward this zero rate and will display the auto zero message. When aggregate crosses the scale and the rate exceeds the user set Threshold value the auto zero feature will be disabled and the 2-minute time-out will be reset.

The fourth line displays the status of the liquid asphalt. Displayed on the left is the current rate in TPH. On the right is the current asphalt temperature. If the asphalt temperature interface module (module 14) is not installed, the temperature must be manually entered by the user from the yellow calibration procedure TEMPerature. The necessary temperature correction for the asphalt meter is made based on this displayed temperature. In the center of the fourth line is a display of the asphalt valve position and the process status. The following possible messages may be displayed.

FLASHING ALTERNATELY	MESSAGES
div div div div	Asphalt DIVERTed back to storage tank
HOLD HOLD div div	Asphalt DIVERTed back to storage tank; process on HOLD (stopped)
HOLD HOLD err run	Asphalt should be in the DIVERT position, but the valve limit switch indicates that it is in the run position consequently in error; Process on HOLD
err run err run	Asphalt should be in the DIVERT position, but the valve limit switch indicates that it is in the run position consequently in error
run run run run	Asphalt is being pumped to the drum—the process is in the run mode
div err div err	Asphalt should be in the RUN position, but the valve limit switch indicates it is in the divert position and consequently in error



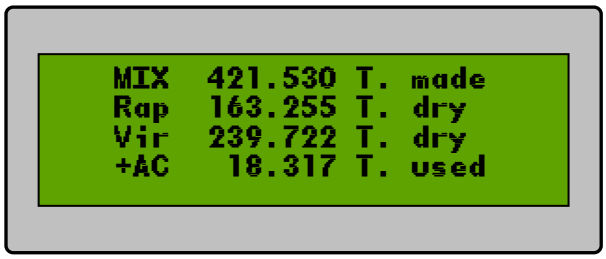
IMPORTANT NOTE

The status messages flash to indicate that the processor is continuously updating measurements and control values. If the status message becomes stationary (ie: does not flash), a problem has occurred in the processor and the unit should be momentarily powered down to clear the fault. This indicates an abnormal problem and even if the unit returns to normal operation, the factory service department should be contacted.

Pressing any other display key will select that display.

MIX TOTAL Information Display

Pressing the blue MIX TOTAL key will bring up information on the total tons of all mixes produced, aggregate weighed, and asphalt used. All totals shown are updated every second.



The first line of the display shows the amount of total mix made at that time in the process where the liquid asphalt is added. This total includes all aggregates weighed by the aggregate scales and all added asphalt. It does not include any materials that may be added or lost elsewhere.

With the optional Rap (or lime) Scale, the second line displays the total recycle aggregate dry tonnage (corrected for moisture content) that has crossed the aggregate belt scale. The totalizer only accumulates whenever the damped scale rate exceeds the user set Threshold level.

The third line displays the total virgin aggregate dry tonnage (corrected for moisture content) that has crossed the aggregate belt scale. The totalizer only accumulates whenever the damped scale rate exceeds the user set Threshold level.

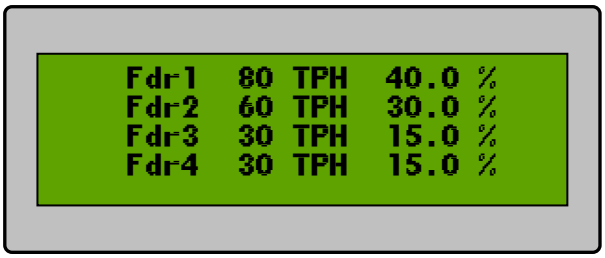
The fourth line displays the total asphalt that has been pumped to the drum. Diverted asphalt is not totalized.

> NOTE
>
> All totals may be cleared to zero with the red CLEAR TOTAL key and procedure.

Pressing any other display key will select that display.

FEED Display

Pressing the blue FEED display key will bring up information on the feeder TPH rates and corresponding percent aggregate blends. Each feeder blend is shown as a percent of the combined total output of all feeders. All rates and blends are updated every second.



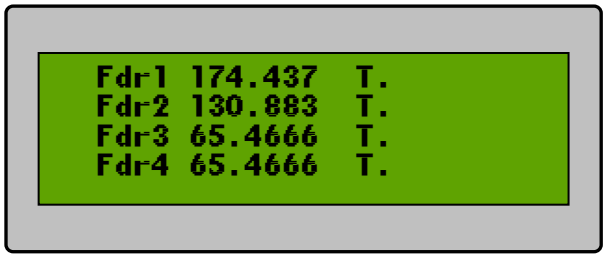
There are no feedbin mounted tachometers or individual feeder belt scales used with this controller. Therefore, the rates shown on the display are not the measured outputs of the feeders, but are the calculated feeder outputs corresponding to the current controller output signal based on the current feeder calibration values. If the feeders are incorrectly calibrated, malfunctioning, or controlled by some other source—the displayed rates, blends, and totals calculated from those rates will be incorrect.

The feeders are not started and stopped by the controller in a timed sequence—all control outputs for feeders with a non zero desired blend will be ON whenever the target rate is non zero, and the process is not in a motors off - HOLD condition. Manual start/stop and control operators are present in some configurations and can be used to affect some operator desired on/off timed sequence. The feeder rate, blend, and total values displayed and logged to the printer are based on the controllers anticipated output and do not show the effect of the manual override of the controlled output.

> NOTE
>
> A two (2) page display will be utiltized for systems configured for 5 feeders.

FEED TOTAL Display

Pressing the blue FEED TOTAL display key will bring up a display of the total aggregate delivered by each feeder. The totals shown are derived from the controller output rate signal and are updated every second.



NOTE

The cautions given in the FEED display section regarding the validity of the rate indication also apply to the total indication. These limitations, cautions, and considerations must be especially observed if the displayed totals are used to evaluate or adjust the feeder calibration span values.

Done properly, feeder calibrations are based on the DRY output from the feeders. When calibrated in dry TPH or dry T, the totals shown on the FEED TOTAL display will be in dry T.

NOTE

All totals may be cleared to zero with the red CLEAR TOTAL key and procedure.

Controller assisted feeder calibration can be entered directly from this display using the red CALIBration key and subsequent procedure.

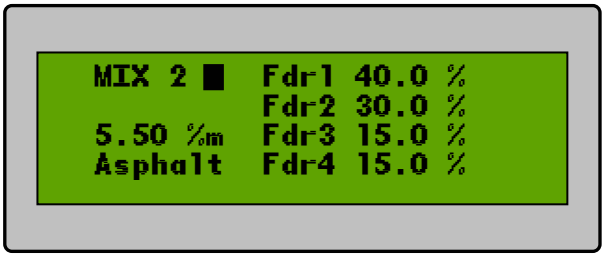
Pressing any other display key will select that display.

NOTE

A two (2) page display will be utiltized for systems configured for 5 feeders.

BLEND Display/Edit

Pressing the green BLEND key will bring up a display of the current mix formula and its target asphalt blend and target aggregate blends for each feeder. The flashing cursor marks the number of the mix formula being displayed. Mix numbers 1 through 9 are available. Keying a different mix number will bring up the display of the target asphalt content and aggregate blends for that formula number.



The target asphalt blend is the desired asphalt content of the final mix as a percent, by weight, of final mix (%mAC), or as a percent, by weight, of the total aggregates (%aAC) as selected by the user in the OPTIONS display.

Aggregate blends shown are feeder rates, as a percent of the target aggregate rate set by the user in the green SETUP display screen. The display of each blend value calculated in this manner is followed by the percent sign (%). The combined blend does not necessarily need to add to 100%. If other than 100%, the combined aggregate rate delivered will be different by similar amount from the user entered target rate.

> **NOTE**
>
> When used, feeder 1 can be blended as a percent of targets or can be interlocked to the virgin scale (see OPTIONS display description). When interlocked to the virgin scale, the display of the blend value for feeder 1 is followed by the percent sign and a lower case "v" for virgin scale (%v). In this case, feeder 1 will continuously adjust to maintain an output equal to the specified percentage of the aggregate measured by the virgin scale.

Target blends may be changed by the operator at any time. To edit the displayed data, the user must first enter the access code (.00). The flashing cursor is positioned next to the value that can be changed. Pressing any display key will exit the edit mode. Changing a blend in a formula not currently in use will have no effect on production in process. Changing blends on a formula currently in use will be effective immediately.

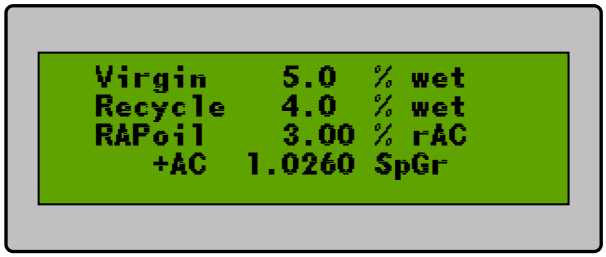
> **NOTE**
>
> The green ENTER key must be pressed after keying in a new value. If the ENTER key is not pressed, the original value will not be changed.

Pressing any other display key will select that display.

> **NOTE**
>
> A two (2) page display will be utiltized for systems configured for 5 feeders.

MTLS Materials (MTLS) Display/Edit

Pressing the green MTLS (material parameters) key will bring up a display of the current aggregate moisture compensation and specific gravity of the asphalt at 60F temperature. For systems with optional recycle, values for the percent of reclaimable oil and the recycle moisture will also be displayed.



Values may be changed by the operator at any time. To edit the displayed data, the user must first enter the edit code (.00). The flashing cursor is positioned next to the value that the user can change. The cursor may be moved without altering displayed values using the left and right arrow keys. New values may be keyed in or edit may be exited by pressing any display key.

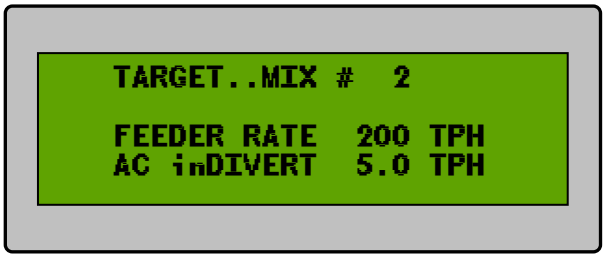
> **NOTE**
>
> The green ENTER key must be pressed after keying in a new value. If the ENTER key is not pressed, the original value will not be changed.
>
> All parameters may be changed at any time. The new values will be used immediately.

Pressing any other display key will exit the edit mode. The cursor will disappear and the values shown will be the values in use.

Pressing any other display key will select that display.

SETUP Display/Edit

Pressing either green SETUP key will display the current mix formula number in use, the current target aggregate delivery rate, and the re-circulate rate for the asphalt when its control valve is in the DIVERT (re-circulate) position. The mix formula number will not be displayed for systems configured to control less than 2 feeders. The aggregate target rate will not be displayed for systems configured to control no feeders or for systems configured with feeder 1 only where that feeder rate is optionally specified as a percent of the virgin scale. (See also the OPTION display description)



While viewing this display, each press of the SETUP (up arrow) key will increase the target aggregate delivery rate by 5 TPH. Each press of the SETUP (down arrow) key will decrease the target aggregate delivery rate by 5 TPH.
All displayed values may be changed by the user at any time. The flashing cursor is positioned next to the value that the user can change. The cursor may be moved without altering displayed values using the left and right arrow keys.

NOTE

The green ENTER key must be pressed after keying in a new value. If the ENTER key is not pressed, the original value will not be changed. All values will become effective immediately on pressing the enter key for that value.

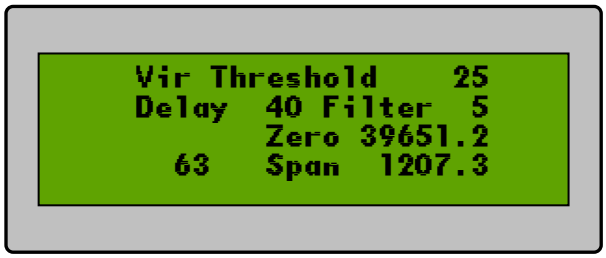
All parameters may be changed at any time. A new mix number and it's asphalt blend or target aggregate rate will be used immediately; a new inDIVERT rate will become effective only during DIVERT.

A target aggregate rate of 0 TPH will cause the feeders to stop immediately. A non zero target aggregate rate will cause each feeder with a non zero target blend to start immediately and to run at a rate that should provide its target blend percentage of the total aggregate rate.

Pressing any other display key will select that display.

VIR SCALE VIRGIN SCALE Calibration Display / Edit

Pressing the yellow Virgin Scale key will bring up a display of the belt scales Threshold value, a display of the scale to point of asphalt injection process time delay, the filtering applied to the rate signal, and the current zero and span values for the belt virgin scale amplifier. For troubleshooting purposes, the belt speed in pulses per second output of the belt scale speed sensor is shown in the lower left corner. The data shown on this display is updated every second.



The values for the process Threshold, delay Time to AC, filtering, scale ZERO and scale SPAN may be edited by the user at any time. To edit these displayed values the user must first enter the edit access code (.00). The flashing cursor is positioned next to the value that the user can change. The cursor may be moved without altering displayed values using the left and right arrow keys. New values may be keyed in or edit may be exited by pressing any display key.

NOTE

The green ENTER key must be pressed after keying in a new value. If the ENTER key is not pressed, the original value will not be changed.

The values may be changed at any time and will become effective immediately. It is suggested that the process delay Time to AC be changed while the process is running, but with the AC pump off.

Pressing any other display key will exit the edit mode. The cursor will disappear and the values shown will be the values in use.

Pressing any other display key will select that display.

NOTE

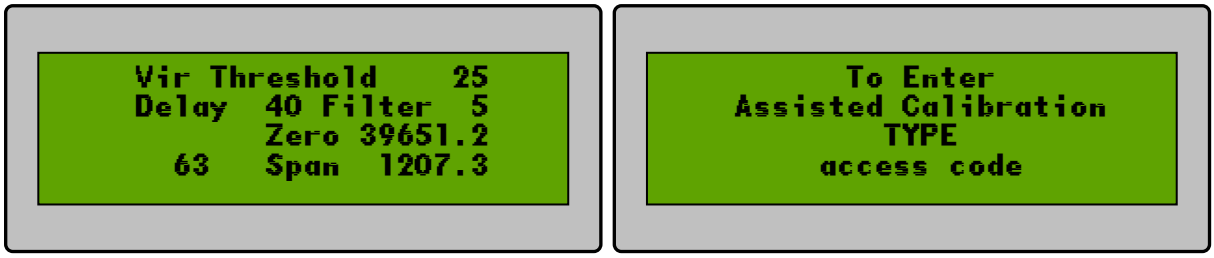
The scale ZERO value will automatically be changed by the auto zero routine, or by the user as necessary to maintain a zero rate reading with an empty belt. The user may notice that the ZERO value changes from time to time.

The scale SPAN value is its calibration value, is expected to be constant, and should not need to be changed unless something has altered the mechanical configuration of the scale system.

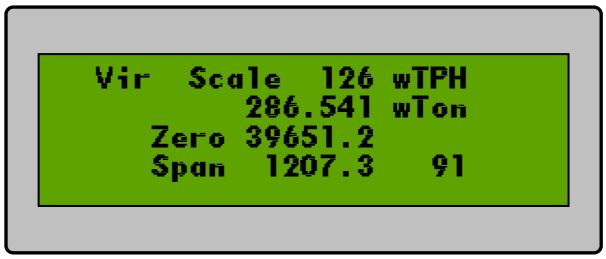
- The filtered aggregate scale rate is totalized only when it exceeds the threshold value.
- The dry aggregate scale is filtered (ie: damped or smoothed) at all times. The value of the filtering used equals the time required for the displayed rate to change by 63% of the actual rate change. Higher numbers yield greater filtering; lower numbers provide a more instantaneous response.
- Asphalt inject will only be allowed when the time delayed aggregate rate exceeds the threshold value.

VIR SCALE CALIB VIRGIN SCALE Calibration Assist

Pressing the yellow Virgin Scale key brings up the aggregate scale calibration display. A controller assisted procedure for establishing the correct zero and span values is available by subsequently pressing the red CALIBrate key and then entering the access code (.00).



The first line of the Virgin Scale Calibrate Assist screen displays the current undamped scale rate in wet TPH. Line two shows the total accumulated wet Tons that have crossed the scale. This total can be cleared with the red CLEAR TOTAL procedure. The current zero and span values are also shown for reference purposes; the zero and span values cannot be directly edited from this screen.



When the scale is properly zeroed, and the scale is empty, the displayed rate will appear to have a zero average value and the wet TON total will not accumulate to ever larger (either + or -) values.

When the scale SPAN value is correct and test weights are applied to the scale the average displayed rate will be the expected previously measured/calibrated rate for those test weights and the tons accumulated in 6 minutes (1/10 hour) will be equal to 1/10 the test weight rate.

When the scale SPAN value is correct and an aggregate sample is run across the scale into a truck, the displayed wTON accumulation will equal the actual net truck weight.

MANUAL ZERO ADJUST

To correct the zero value, key and follow the red CLEAR TOTALs procedure from any screen. Allow the scale to run empty for 5 to 10 complete belt revolutions. Key the access code (.00) and the cursor will appear next to the wTPH rate value. ENTER a value of 0 for the displayed rate. This entry calculates and installs a zero value that reduces the scale output by an amount equal to the average output since the totals were cleared. Repeat this procedure if necessary.

SPAN CALIBRATION by TEST WEIGHTS

To correct the SPAN value to known test weights, the scale must first be accurately zeroed. Apply the test weights to the scale. Select the Virgin Scale CALIBration display and CLEAR TOTALs; the timer in the lower right corner will start timing from 0 seconds. Allow the scale to run for 6 minutes (360 seconds). Just before 6 minutes, key the first two digits of the access code (.0). At exactly 6 minutes, key the last 0 of this code and the display and timer will freeze. The edit cursor will appear next to the rate display. Use the right arrow to advance the cursor to the wTON display value. ENTER a value equal to the test weight equivalent rate divided by 10(ie: tons in 1/10 hour). This entry causes the SPAN calibration value to be adjusted by an amount to compensate for the observed error. Repeat this procedure as necessary.

SPAN CALIBRATION by WEIGHED LOAD

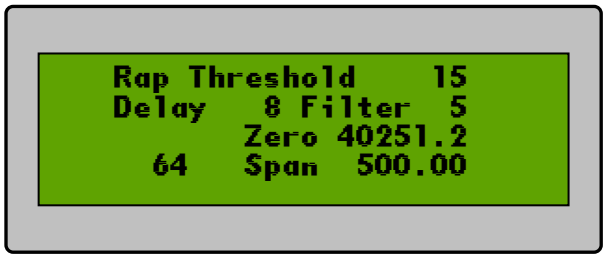
To calibrate the scale by weighed load sample, the scale must first be accurately zeroed. Select the Virgin Scale CALIBration display and CLEAR TOTALs. Run 15 to 20 tons of aggregate across the scale into a truck. Compare the net truck weight to the displayed accumulated tons. Key the access code (.00) if out of tolerance and a span correction is required. The cursor will appear next to the displayed rate. Use the right arrow to advance the cursor to the displayed total. ENTER the actual truck net weight; this causes the span to be adjusted by an amount to compensate the observed error. Press the red CALIBrate display key to repeat the test.

When calibration is complete, press any other display key several times to exit this procedure.

> ✎ NOTE
>
> Re-calibration is only necessary when the results of a calibration test are in error by an amount exceeding the tolerance of the governing specification. The yellow ERROR CALC procedure may be of help in calculating these errors.

RAP (OR LIME) SCALE Calibration Display /Edit

Pressing the yellow Rap (or lime) Scale key will bring up a display of the belt scales Threshold value, a display of the scale to point of asphalt injection process time delay, the filtering applied to the rate signal, and the current zero and span values for the belt rap (or lime) scale amplifier. For troubleshooting purposes, the belt speed in pulses per second output of the belt scale speed sensor is shown in the lower left corner. The data shown on this display is updated every second.



The values for the process Threshold, delay Time to AC, filtering, scale ZERO and scale SPAN may be edited by the user at any time. To edit these displayed values the user must first enter the edit access code (.00). The flashing cursor is positioned next to the value that the user can change. The cursor may be moved without altering displayed values using the left and right arrow keys. New values may be keyed in or edit may be exited by pressing any display key.

NOTE

The green ENTER key must be pressed after keying in a new value. If the ENTER key is not pressed, the original value will not be changed.

The values may be changed at any time and will become effective immediately. It is suggested that the process delay Time to AC be only changed while the process is but with the AC pump off.

Pressing any other display key will exit the edit mode. The cursor will disappear and the values shown will be the values in use.

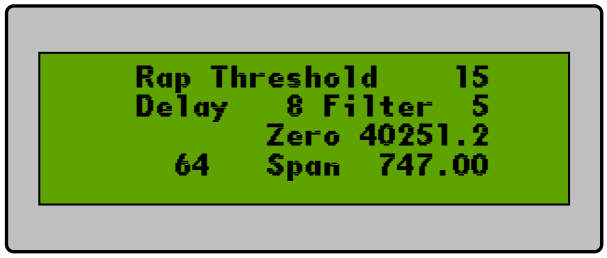
Pressing any other display key will select that display.

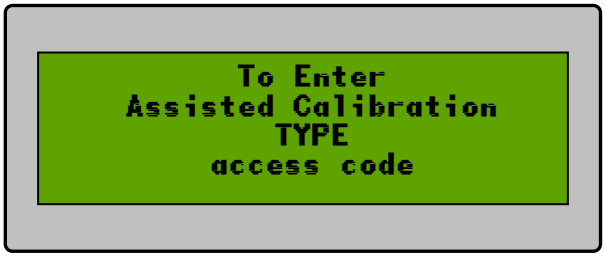
> ✎ NOTE
>
> The scale ZERO value will automatically be changed by the auto zero routine or by the user as necessary to maintain a zero rate reading with an empty belt. The user may notice that the ZERO value changes from time to time.
>
> The scale SPAN value is its calibration value, is expected to be constant, and should not need to be changed unless something has altered the mechanical configuration of the scale system.

The filtered aggregate scale rate is totalized only when it exceeds the threshold value.
The dry aggregate scale is filtered (ie: damped or smoothed) at all times. The value of the filtering used equals the time required for the displayed rate to change by 63% of the actual rate change. Higher numbers yield greater filtering; lower numbers provide a more instantaneous response.
Asphalt inject will only be allowed when the time delayed aggregate rate exceeds the threshold value.

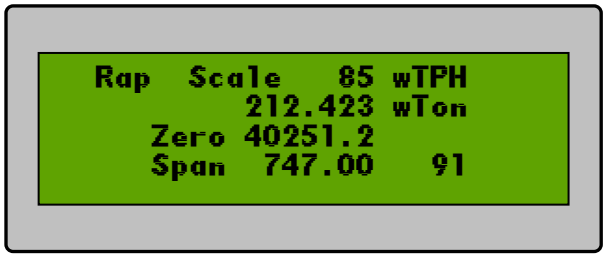
RAP (OR LIME) SCALE Calibration Assist

Pressing the yellow Rap (or lime) scale key brings up the aggregate scale calibration display. A controller-assisted procedure for establishing the correct zero and span values is available by subsequently pressing the red CALIBrate key and then entering the access code (.00).





The first line of the Recycle Scale Calibrate Assist screen displays the current undamped scale rate in wet TPH. Line two shows the total accumulated wet Tons that have crossed the scale. This total can be cleared with the red CLEAR TOTAL procedure. The current zero and span values are also shown for reference purposes; the zero and span values cannot be directly edited from this screen.



When the scale is properly zeroed, and the scale is empty, the displayed rate will appear to have a zero average value and the wet TON total will not accumulate to ever larger (either + or -) values.

When the scale SPAN value is correct and test weights are applied to the scale, the average displayed rate will be the expected previously measured/calibrated rate for those test weights and the tons accumulated in 6 minutes (1/10 hour) will be equal to 1/10 the test weight rate.

When the scale SPAN value is correct and an aggregate sample is run across the scale into a truck, the displayed wTON accumulation will equal the actual net truck weight.

MANUAL ZERO ADJUST

To correct the zero value, key and follow the red CLEAR TOTALs procedure from any screen. Allow the scale to run empty for 5 to 10 complete belt revolutions. Key the access code (.00) and the cursor will appear next to the wTPH rate value. ENTER a value of 0 for the displayed rate. This entry calculates and installs a zero value that reduces the scale output by an amount equal to the average output since the totals were cleared. Repeat this procedure if necessary.

SPAN CALIBRATION by TEST WEIGHTS

To correct the SPAN value to known test weights, the scale must first be accurately zeroed. Apply the test weights to the scale. Select the Rap (or lime) scale CALIBration display and CLEAR TOTALs; the timer in the lower right corner will start timing from 0 seconds. Allow the scale to run for 6 minutes (360 seconds). Just before 6 minutes, key the first two digits of the access code (.0). At exactly 6 minutes, key the last 0 of this code and the display and timer will freeze. The edit cursor will appear next to the rate display. Use the right arrow to advance the cursor to the wTON display value. ENTER a value equal to the test weight equivalent rate divided by 10 (ie: tons in 1/10 hour). This entry causes the SPAN calibration value to be adjusted by an amount to compensate for the observed error. Repeat this procedure as necessary.

SPAN CALIBRATION by WEIGHED LOAD

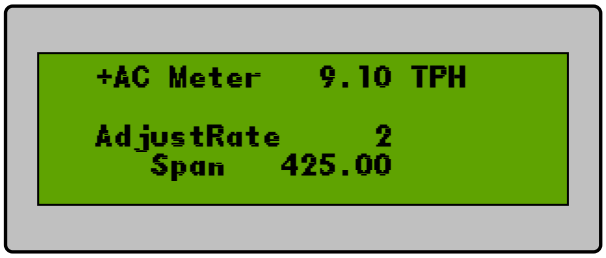
To calibrate the scale by weighed load sample, the scale must first be accurately zeroed. Select the Recycle Scale CALIBration display and CLEAR TOTALs. Run 15 to 20 tons of aggregate across the scale into a truck. Compare the net truck weight to the displayed accumulation tons. Key the access code (.00) if out of tolerance and a span correction is required. The cursor will appear next to the displayed rate. Use the right arrow to advance the cursor to the displayed total. ENTER the actual truck net weight; this causes the span to be adjusted by an amount to compensate the observed error. Press the red CALIBrate display key to repeat the test.

When calibration is complete, press any other display key several times to exit this procedure.

> **NOTE**
>
> Re-calibration is only necessary when the results of a calibration test are in error by an amount exceeding the tolerance of the governing specification. The yellow ERROR CALC procedure may be of help in calculating these errors.

A/C Calibration Display

Pressing the yellow A/C key will bring up a display of the current asphalt rate in TPH and the asphalt pump and meter calibration values. The asphalt rate display is updated every second.



The following paragraph applies only to potentiometrically controlled variable speed pumps.

The pump calibration value "Max rate" is the volumetric calibration value for the pump expressed in GPH at full speed. If the AUTO-BLEND interlock is not energized (module #11), the asphalt meter signal is read and displayed. It is not used to determine the pump speed—pump speed is determined solely by the desired rate and the pump volumetric calibration. If the AUTO-BLEND interlock is energized, the pump speed is automatically adjusted so that the desired asphalt rate equals the metered and displayed asphalt rate.

The following paragraph applies only to pumps whose output is controlled by Increase/Decrease outputs.

The pump control calibration "Adjust Rate" is shown on line 3. This is a user entered value that should always be greater than the actual change in pumping rate observed for each second of INCREASE/or (DECREASE) control. If the installed value is too small, the control will overshoot its target value and "hunt." If the installed value is too large, the control response will be slow and done in unnecessarily small increments.

The "span" calibration value is the asphalt meter signal calibration given in pulses per volumetric gallon of asphalt. When combined with the displayed values of asphalt temperature and density this signal becomes asphalt rate in TPH.

The values for Max rate and span may be edited by the user at any time. To edit these displayed values the user must first enter the edit access code (.00). The flashing cursor is positioned next to the value that the user can change. The cursor may be moved without altering displayed values using the left and right arrow keys. New values may be keyed in or edit may be exited by pressing any display key.

NOTE

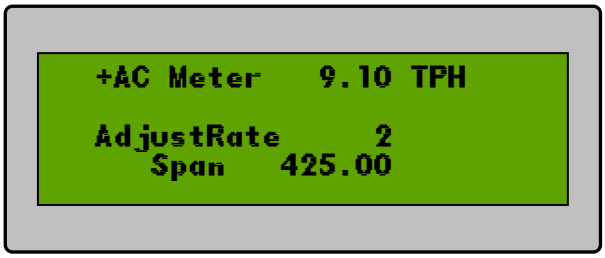
The green ENTER key must be pressed after keying in a new value. If the ENTER key is not pressed, the original value will not be changed.

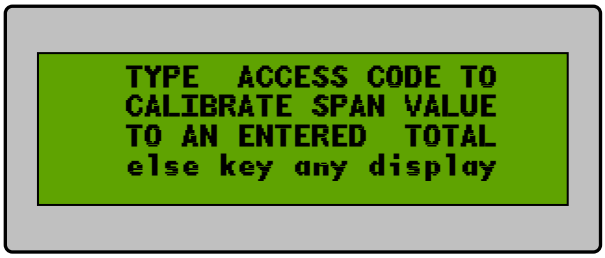
Pressing any other display key will exit the edit mode. The cursor will disappear and the values shown will be the values in use.

Pressing any other display key will select that display.

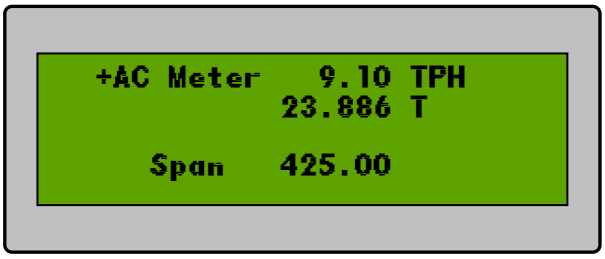
A/C Calibration Assist

Pressing the yellow A/C key brings up the asphalt pump and meter calibration display. A controller assisted procedure for establishing the meter calibration span in ppg is available by subsequently pressing the red CALIBrate key and then entering the access code (.00).





The first line of the asphalt calibration assist screen displays the current metered asphalt rate in TPH. The total tons of asphalt pumped while the divert valve was in the RUN position, and since the totals were last cleared by the user is shown on line 2. The meter calibration is shown on line 4. The procedure is designed to assist with calibration by weighed load sample.



SPAN CALIBRATION by WEIGHED LOAD

To calibrate the asphalt meter by weighed load sample the asphalt line to the mixer must be rerouted so as to deliver asphalt safely to a tanker or distributor truck. The desired asphalt flow rate for the test should be established through the green SETUP keys or manually as is convenient. Key in the sequence - yellow A/C, red CALIB, .00 - to view the assisted calibration display. Clear the totals using the red CLEAR TOTALS procedure. Manually cause the divert valve to switch to the RUN position; the displays asphalt totalizer will show the tons of asphalt being delivered to the tanker. When sufficient material has been pumped, divert the asphalt; the asphalt totalizer will stop accumulating. Compare the net truck weight to the displayed accumulated tons. Key the access code if a span correction is required. The cursor will appear next to the displayed total tons. ENTER the actual truck net weight; this causes the span to be adjusted by an amount to compensate the observed error. Press the red CALIBrate display key to repeat the test.

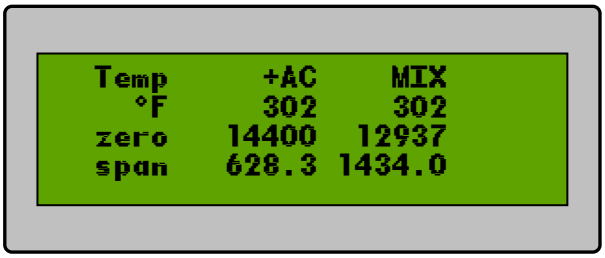
When calibration is complete, press any other display key several times to exit this procedure.

> ✎ NOTE
>
> Re-calibration is only necessary when the results of a calibration test are in error by an amount exceeding the tolerance of the governing specification. The yellow ERROR CALC procedure may be of help in calculating these errors.

Only the asphalt meter span calibration is affected by this assist procedure. For those systems requiring a value for "Max Rate" this rate should be calculated from the known or observed maximum pump rate. While in divert, setting target asphalt re-circulate rate to 99 TPH will cause the pump to be driven to its maximum rate. The horn will beep and the asphalt rate shown on the blue MIX display screen will flash as an indication that the pump can not run at the requested rate. This flashing rate, when converted to GPH, is the pump Max rate calibration value.

TEMP TEMPerature Calibration Display

Pressing the yellow TEMPerature key brings up a display of the current asphalt and mix temperatures. The HARDWARE OPTIONS section of this manual describes the hardware options available. Asphalt temperature may be sensed automatically or manually entered. Mix temperature may be sensed automatically or may not be available. The display shows the current temperatures, calibration zero, and span values for both the asphalt and mix temperatures. An "na" indicates that the displayed value is not available or does not apply.



The zero and span calibration values and the asphalt temperature, if manually entered, may be edited by the user at any time. To edit these displayed values, the user must first enter the edit access code (.00). The flashing cursor is positioned next to the value that the user can change. The cursor may be moved without altering displayed values using the left and right arrow keys. New values may be keyed in or edit may be exited by pressing any display key.

NOTE

The green ENTER key must be pressed after keying in a new value. If the ENTER key is not pressed the original value will not be changed.

Pressing any other display key will exit the edit mode. The cursor will disappear and the values shown will be the values in use.

Pressing any other display key will select that display.

NOTE

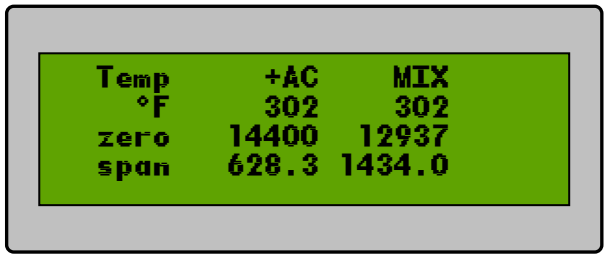
Most temperature interface components are accurately calibrated at the factory and the factory recommended zero and span settings are often adequate. If greater accuracy or re-calibration is required, the zero value should be changed to affect the low end of the usable temperature scale and the span value to affect the high or operating end of the temperature scale. An assist procedure (red CALIB key) is available to facilitate span corrections.

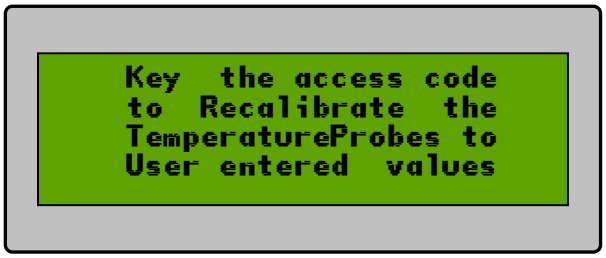
NOTE

Mix temperature is not available for systems configured with 5 feeders.

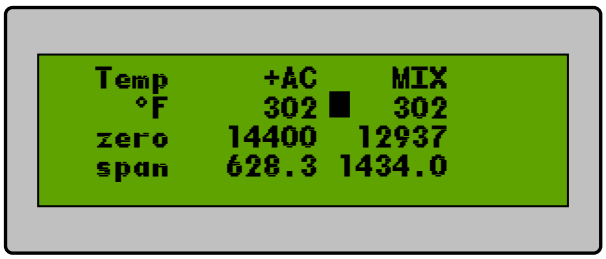
TEMP CALIB TEMPerature Calibration Assist

Pressing the yellow TEMPerature key brings up the display of temperature calibration values. A controller-assisted procedure for establishing the correct span value at normal operating temperature is available by subsequently pressing the red CALIBrate key and then entering the access code (.00).





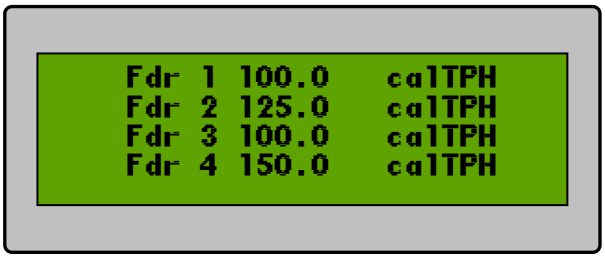
The automatically sensed asphalt and mix temperatures are displayed. The right and left arrow keys may be used to position the displayed cursor next to the temperature value that is to be corrected. ENTERing the actual temperature will cause the appropriate span value to be adjusted as required to obtain accurate readings.



When calibration is complete, press any other display key several times to exit this procedure.

FEED FEEDer Calibration Display

Pressing the yellow FEEDer calibration display key brings up the feeder calibration (span) values. From this display, the user can edit the calibration values or enter the controller assisted feeder calibration procedure.



The span values shown are actually the dry TPH delivery rates of the feeders at the controllers maximum output. From these span calibrations, the controller can determine and set the percent of maximum output that will provide the feeder target TPH rate.

WARNING

The maximum output of any connected manual controller may be different and should not be confused with the maximum output generated by this controller.

The relationship between the actual feeder output and its control value is basically linear. For example, if it can be shown that a feeder is delivering 10% more material than it is displaying, then its calibration value should be increased this same 10% to make the actual and displayed values more similar.

One could calibrate a feeder in the following manner:

- Establish a formula that runs only the feeder to be tested.
- Set the belt scale moisture to the moisture of the material to be tested.
- Clear all totals.
- Run the formula (single feeder) and optionally catch the delivered material in a truck.
- Stop the formula and compare the display of the accumulated feeder output with the amount measured by the belt scale or the dry net weight in the truck.
- If there is excessive difference between the weighed and actual values, calculate and change the calibration span value for this feeder according to the following formula:

$$\text{(NEW SPAN)} = \frac{\text{(OLD SPAN) X (ACTUAL WEIGHT)}}{\text{(INDICATED WEIGHT)}}$$

To change a calibration span value key the access code (.00). The flashing cursor may be moved without altering the displayed values using the left and right arrow keys. Position the cursor next to the value to be corrected and enter the NEW SPAN value.

- Re-run the procedure as necessary.

> ✎ NOTE
>
> The green ENTER key must be pressed after keying in a new value. If the ENTER key is not pressed the original value will not be changed.

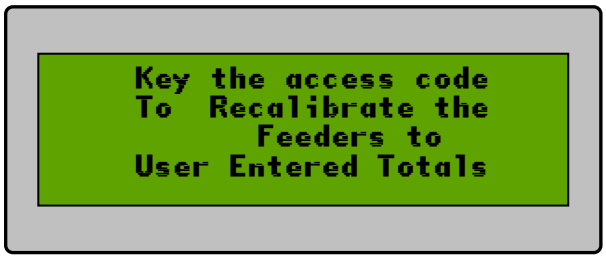
Pressing any other display key will exit the edit mode. The cursor will disappear and the values shown will be the values in use.

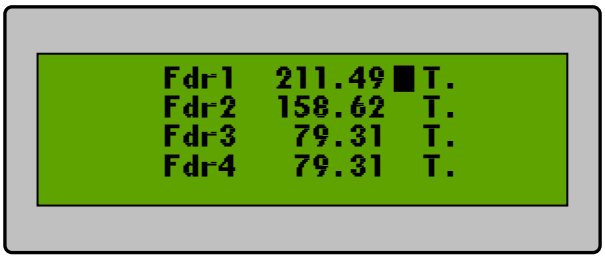
Pressing any other display key will select that display.

> ✎ NOTE
>
> A two (2) page display will be utiltized for systems configured for 5 feeders.

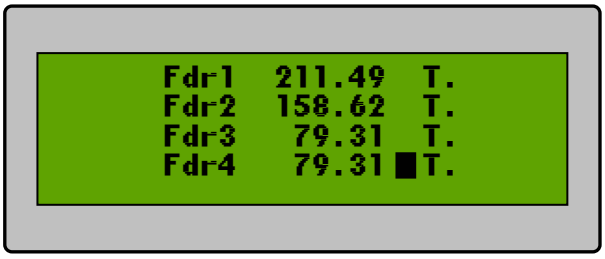
FEED CALIB FEEDer Calibration Assist

A controller assisted span re-calibration procedure is available to automate step 6 above. This assist is available either from the yellow FEEDer calibration or the blue FEEDer TOTALs displays by pressing the red CALIBrate key, and then entering the access code (.00).





A corrected total may then be entered if necessary. On exiting the assist screen, the controller will automatically calculate and install the new span according to the formula in step 6.
Press any other display key to exit this procedure.



NOTE

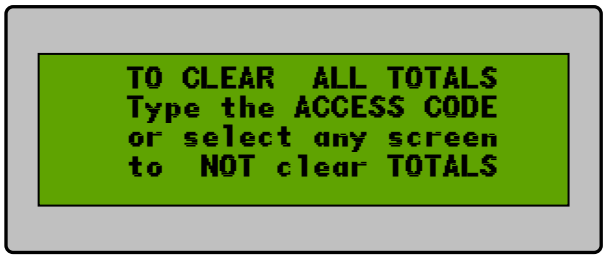
Feeders should always be re-calibrated if the feed gate position is changed or if the material in the feeder is changed. Re-calibration is only necessary when the results of a calibration test are in error by an amount exceeding the tolerance of the governing specification. The yellow ERROR CALC procedure may be of help in calculating these errors.

NOTE

A two (2) page display will be utiltized for systems configured for 5 feeders.

CLEAR TOTAL Procedure

All of the accumulated totals of materials used and mix produced are cleared (ie: reset to zero) simultaneously by this procedure.



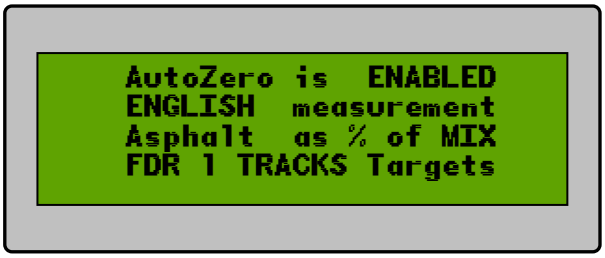
Pressing the red CLEAR TOTALs key brings up the following cautionary message:
Keying in the access code (.00) at this point will cause all totals to be reset to zero immediately and the user will then be returned to the last operating display.

Keying any display instead of the access code will return the user to the last operating display without resetting the totals to zero.

OPTIONS

Pressing the gray OPTIONS key located just to the right of the CLEAR TOTAL key will bring up an option display.

Option one allows the user to turn the belt scale AUTO ZERO feature on or off to suit individual preferences.



Option two allows the user to select between English units of measure (tons, lbs, gallons and degrees F) and Metric units (tonnes, kg, liters, and degrees C).

Changing to a different unit of measure automatically adjusts all totals, calibration values and in process variables so that no data will be lost and no re-calibration should be required.

Option three allows the user to select the basis on which asphalt is blended, either as a percent of total aggregate or as a percent of total mix.

Option four applies only to systems with a recycle belt scale and a number one feeder (Fdr1). If neither of these conditions are valid, the option will not be displayed. Option four allows the user to define feeder one as a recycle feeder whose target rate is set as a percentage of the virgin dry TPH aggregate rate as measured by the virgin scale. In this mode the volumetric output of the recycle feeder will follow, i.e. be interlocked to, the virgin scale. When this option is not selected, the rate for feeder one will be determined by its percent blend and the user set Target Rate.

WARNING!

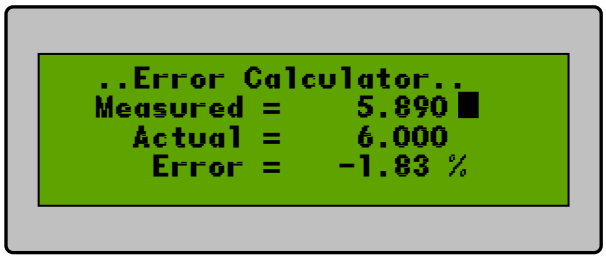
When feeder one (Fdr1) is interlocked to the virgin scale its blend is entered by the user on the BLEND display as a percent of the virgin scale rate NOT as a percent of the TARGET FEED RATE.

The option that is flashing may be changed by entering the access code (.00). The option to be changed may be selected by use of the left and right arrow keys.

Pressing any other key will return the user to the last operating display.

ERROR CALCulator

Pressing the yellow ERROR CALCulator key brings up a simple pop up style error calculator.

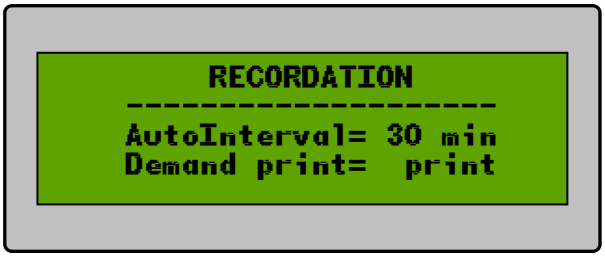


The user is allowed to enter a measured value as measured by the controller and an actual value as determined from a certified scale or other objective means. The deviation of the measured from the actual value is calculated every second and displayed as percent error. Use of this calculator assures consistency of technique.

Pressing any other display key will select that display

PRINT

Pressing the yellow PRINT key brings up the RECORDATION display. From this display, the user can ENTER the desired time interval between automatic data logging printouts of the major plant parameter.



Keying the yellow PRINT key a second time allows a manual print of major plant parameters on demand.

Setting the value of the AutoInterval to 0 minutes disables the automatic print feature.

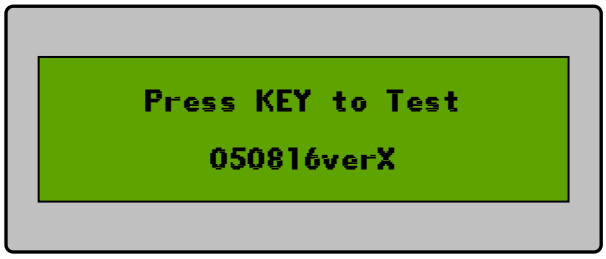
★ PRINTING TIP

At the beginning of a work interval, select demand print to get the header printed before the AutoPrint starts printing numbers without labels.

Pressing any other display key will select that display.

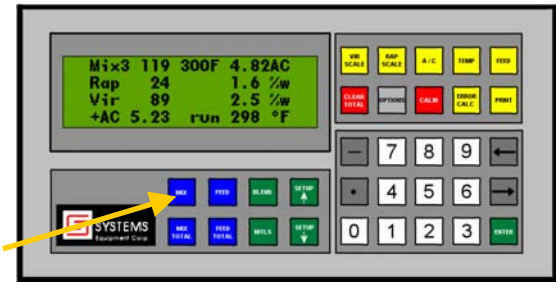
Keypad Test

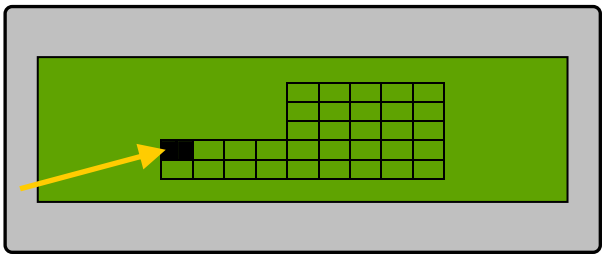
On power up, the following screen appears allowing the user to troubleshoot malfunctional keys on the keypad. Press any key to enter test.



Each square on the screen is reflective of it's corresponding key on the keypad. (Shown in the example below, if you press the Mix button, the following square will flash on the screen.) Each flash of the square when it's key is pressed, indicates that that key is functioning properly. If a square fails to flash when it's corresponding key is pressed, this typically indicates the key is faulty.

The display will return to the initialization start up display if more than 3 seconds has passed between key presses.





Display Contrast

If the display is too light or dark for desired view, the contrast can be adjusted at any time; it does not matter what function is being displayed on the screen. ***Hold*** the minus key on the keypad, while each press of the left or right arrow will alter the contrast on the screen.

Data Entry

All data is entered on the SYSTEMS keypad. This keypad consists of 33 keys. These keys are organized by function. Eight (8) operating display keys are located directly under the data display. Five (5) calibration data display keys are located in the top row to the right of the data display. Five (5) special function and calibration assistance keys are located in the next row and fifteen (15) data entry keys are located in the lower section.

Two slightly different key entry formats are utilized. Operating and data displays are selected by striking a single key while data entry, always identified by the presence of a flashing cursor, requires the operator to select the desired data field, key in the data and finally strike the ENTER key to validate the new entry.

Data Entry Format

Operating or calibration data on many displays can be changed by the operator. Edit access is gained by keying in the access code sequence (.00). Upon access to a data display, a flashing cursor will be displayed at the location where the user may enter data. This cursor is a flashing square box the size of a single character and is located at the right edge of the current data entry location. For displays with more than one data entry location, this cursor can be moved to other data locations, without changing any of the data on the screen, by using the left ← and right → arrow keys. The left arrow key moves the cursor back (or left or up) through the data list whereas the right arrow moves the cursor forward (or right or down) through the data list.

The ENTER key has special significance during data entry. When the user strikes the ENTER key, he instructs the computer to use the data value exactly as shown on the display. If a new data value has been keyed in, the new data value will be used. If the original displayed data has not been changed, keying ENTER will not change the data. WYSIWYG –What You See Is What You Get

Keying one of the display selection keys allows the user to escape directly and immediately from the current display. Any new data value in the process of being keyed but not ENTERed will NOT be used; the previous data value will be retained.

As a new data value is being keyed character by character, the left arrow  can be used to delete the previous character entry. The left arrow can be thought of as a correction arrow.

The right arrow  will function exactly as the ENTER key.

The minus sign will not be recognized unless it is the first character entry. Only one decimal point will be allowed per entry.

The user should not be intimidated by the keypad. The operation of this keypad, the ENTER key, and arrow keys is highly intuitive. The computer will not allow the entry of unrecognizable key sequences. The operator is encouraged to experiment with all the keys until he is familiar with their functions and comfortable with their use.

The user can go to any display while making mix. None of the screens will interfere with the process control. Any changes made to calibration or operational data will become effective immediately, however.

Data Range and Precision

All computations and variables stored within the computer are done in floating point. Floating point numbers have a precision of nine (9) digits and may be in the range of 10^{-36} to 10^{+36}. Even though numbers are often displayed on the screen or printed with less precision, the number is maintained in the computer with full 9 digit precision. For example:

ACTUAL VALUE	FLOATING POINT VALUE
-.0935674281	$-9.35674281 \times 10^{-2}$
0.935674281	$9.35674281 \times 10^{-1}$
9.35674281	9.35674281
93.5674281	9.35674281×10^{1}
-935.674281	$-9.35674281 \times 10^{2}$

Data Rounding

Numerical data as displayed or printed is rounded according to the following rule.

Internally, data is processed with nine (9) digits of precision. If a value is printed or displayed with less than 9 digits of precision, the absolute value of the data display is increased by one least significant displayed digit if the most significant undisplayed digit is 5 or greater.

For example, if the precision of the display of %mA/C was programmed by the manufacturer to be xx.x then:

6.50 % mA/C	is displayed:	6.5% mA/C
6.54	is:	6.5
6.55	is:	6.6
6.60	is:	6.6

In the above example, a display of 6.5% would imply a value greater than 6.45 and less than 6.55. Stated differently, a displayed value of 6.5% is a value of 6.5 +/-0.05.

Numeric Conventions

All numeric values as displayed or printed are formatted by the manufacturers program to be an appropriate number of digits with the decimal point appropriately located. The value displayed is rounded, as described in the DATA ROUNDING section of this manual. Certain conventions are rigorously followed regarding the display of values that do not 'fit' in the formatted space. They include:

FORMAT	DISPLAY	DESCRIPTION OF DISPLAY
xx.x	++++	A positive value too large to 'fit' allotted space (ie: more positive than 99.9)
xx.x	- - - -	A negative value too large to 'fit' allotted space with its sign (ie: more negative than -9.9)
xx.x	0.0	A value exactly equal to 0
xx	0	A value exactly equal to 0
xx.x	+.0	A positive non-zero number too small to display in the given format (ie: between 0 and .05)
xx	+	A positive non-zero number too small to display in the given format (ie: between 0 and .05)
xx.x	-.0	A negative non-zero number too small to display in the given format (ie: between 0 and -.05)
xx	-	A negative non-zero number too small to display in the given format (ie: between 0 and -.05)

Nomenclature

Every attempt has been made to be consistent and definitive in the descriptions used. Nomenclature that may not be familiar to the new user includes:

NOMENCLATURE	DESCRIPTION OR MEANING
AC	liquid Asphalt Cement
+AC	the AC added to the mix by the asphalt pump and metering system
%AC	AC blend as a percent of total mix
%rAC	Percent of RAP reclaimed as liquid asphalt
%mAC	Percent of total mix that is liquid asphalt
TPH	TONS per Hour (TONNES per HOUR)
wTPH	'w' signifies wet (ie: wet tons per hour; wet tones per hour)
wT or wTON	wet ton (wet tones)
%w or % wet	percent wet (ie: percent moisture)
Vir or VIR	Virgin uncoated aggregate
%v	percent of the measured virgin scale rate
Rap or RAP	Recycled Asphalt Pavement or Recycle material
pps	pulses per second
lb/g or kg/l	liquid density in pounds per gallon or kilograms per liter
sec	time measured in seconds
min	time measured in minutes
F or C	suffix specifying temperature in degrees Fahrenheit or Centigrade
na	not available
div	DIVERT (asphalt returned to storage tank)
run	RUN (asphalt delivered to mixer)
HOLD	Process interlock shows the process in on HOLD (ie: off)

Weighed Load Test Suggestions

The following suggestions are for belt scale calibrations although many of the ideas apply to asphalt meter or other calibration procedures as well.

Accurate and repeatable calibration runs are possible. They do require an understanding of and appreciation for the details of the test. The procedure is basically as follows:

1.) Run the equipment until it will respond stably and uniformly.

2.) Obtain a stable zero on the totalizer.

3.) Run aggregate across the belt scale and directly into a truck.

4.) Weigh the truck and calculate the net weight.

5.) Compare the actual truck net weight and the indicated scale total weight. If the indicated weight is not in tolerance, readjust the scale span calibration value and repeat the test starting with Step 2.

Sometimes it does not seem this simple. Pitfalls to watch for include:

In Step 1	Often equipment does not stabilize until after it has been used for a while. This may be especially true of new or rusty equipment, or moist materials. Sometimes it is necessary to "waste" or disregard several truckloads of material in order to get the most stable results. Use material that is uniform. For aggregates—this means preferably dry material with uniform moisture content and gradation. For dust or fillers—the material should be of uniform density, free flowing, and free of clumps. For liquids—this means uniform temperature and density. Liquids often must be "stirred" until uniformity is assured.
In Step 2	Do not rush at this point. If calibrating at 100 TPH, a 1 TPH zero error is 1%. This 1% is often a greater error than the maximum allowed. When repeating a test, material build up on the belt will often change the zero. The answer may not be as simple as waiting for the belt to clear, because material will again build up on the belt during the test and create an error. The system can appear to calibrate and may even repeat, but only because the "calibration" value includes an equal and offsetting error. The best solution is to select material that does not stick to the belt. In the worst case, course material may need to be pre-dried and stockpiled for this calibration. Wind is often a problem. If calibration tests are to be stable and repeatable, the scale readings cannot be erratic from any cause. Although each plant is different, a 1 TPH rate may be caused by only 1 lb. of wind pressure on the belt at the position of the weigh idler. Windscreens may help but may not protect against wind blowing directly down the belt. Top covers or tarps tied over the belt may be helpful. Calibration may have to be delayed until the wind subsides although most people recognize that this will not eliminate the errors that will be present on windy days of actual production. Remember too, that the factors that cause errors when calibrating a belt scale cause errors when calibrating feeders to the belt scale.

In Step 3	All of the material that crosses the belt scale must be delivered to the truck. Ideally there is a useable divert mechanism at the end of the scale conveyor that the truck can be loaded directly. All chutes between the scale and the truck should be clean before the sample is loaded, and again cleaned into the truck at the end of the sample. It is generally not accepted practice to move the scale after calibration. If it is absolutely necessary to move the scale in order to calibrate, it should at least be at the same slope as it will be in its operating position. Again, this is not an acceptable practice and should be avoided whenever possible. Special precautions must be observed if the material must be run through the drum in order to load the truck. The most successful procedure is a midstream sample. In doing this, each test must be performed in exactly the same manner. The stockpile material must be uniform and as dry as possible. A stopwatch should be used to time an exact 15 minute interval after the feeders stop at the end of a sample run. At exactly 15 minutes after the feeders stop, the drum and material hot elevator should be stopped. The silo, batcher, etc. should be completely emptied and the truck then weighed. The first test at any given rate should be done precisely but the results ignored. If everything is constant, the material remaining in the system after this run will be the same amount remaining at the end of the next actual calibration run. To the extent that this is true, the calibration is therefore accurate and repeatable. Obtain as large of a sample as possible. Accurate belt scale calibration usually requires loads of at least 15 TONS. Asphalt meter calibrations to a 1% limit require loads of 1000 gallons if weighed on a truck scale with 20 lb. grads. For meter calibrations to 0.25%, loads of 4000 gallons are required. The effect of minor imperfections in the procedure or equipment can be minimized by the use of larger loads. Belt zeroing procedures and weighed loads may have to start and stop with the belt in exactly the same position to minimize the effect of conveyor generated extraneous signals. This point should be that part of the belt revolution where there is the least belt 'noise' in the observed output.
In Step 4	All possible sources of weighing errors should be minimized. Make sure the truck is fully on the scale—split axle weighing should be avoided. Always pull the truck on the scale in the same direction. Mark the scale and insist the truck stop in identically the same location. Get a fresh tare weight for each load. Use the tare weight taken before the truck was loaded, not after the load was dumped. Try to account for and minimize fuel use. Schemes where the truck being filled is continuously being weighed may present added calibration difficulties. The zero drift for this type of scale must be insignificant over the time interval required for filling. This can be verified by observing the zero drift of an empty scale, only if the scale does not have automatic zero tracking. The loaded weight of the truck should also be stable and drift free over a time interval equal to the time required to fill. Sun, temperature, and wind variations are some of the causes of drift. A certified accurate scale, because of long-term drift, may not be suitable for this method calibration. The proper and most accurate weighing technique requires the following procedure 1.) Remove the truck from the scale and zero the scale 2.) Place the truck on the scale and read the tare weight immediately 3.) Fill the truck 4.) Remove the truck from the scale and zero the scale 5.) Place the truck on the scale and read the gross weight immediately.

In Step 5	Run at least three repetitions at the maximum production rate, three at the minimum production rate, and three at the average production rate. Expect all tests to be within the governing tolerance. If in tolerance, data cannot be obtained over the entire operating range, the scale weighbridge assembly probably needs adjustment.

In all cases, DO NOT TRUST ANYONE! Do everything yourself—check and verify everything. Double-check every calculation and every operation. If any part of or person involved with any test procedure is changed, the test should be restarted from the beginning. If anything can go wrong or if any dumb mistake can be made, it will be.

ABSOLUTE REPEATABILITY OF PROCEDURE, TECHNIQUE, AND CONDITIONS IS REQUIRED FOR REPEATABILITY OF RESULTS. RESULTS, EVEN IF IN ERROR, MUST NOT VARY BETWEEN TESTS BY MORE THAN THE ALLOWABLE ERROR BEFORE CALIBRATION VALUES IN THE ADP-020B ARE CHANGED.

Hardware Options

MIX TEMPERATURE

The mix temperature sensor signal is conditioned by I/O module #15. Modules compatible with various thermocouples, RTDs, voltage, or current signals are available. This temperature is displayed for information purposes only and is not necessary for controlling the asphalt blend.

If module #15 is not used the indicated temperature on the display and in the recordation will either be blank or the not available message "na".

ASPHALT PUMP CONTROL

This controller is compatible with asphalt pumps whose rate is controlled by 110vAC Increase/Decrease commands or by variable speed pumps with potentiometric control.

For INC/DEC control, the module selector jumper on the processor card (see appropriate schematic for jumper locations) for module #12 should be in the FIN position. Module #11 is the 220vAC output 'INCREASE' module. Module #12 is the 220vAC output 'DECREASE' module.

For potentiometric control, the module selector jumper on the processor card (see appropriate schematic for jumper locations) for module #12 should be in the FOUT position. Module #11 is then an input module that defines whether the asphalt is being controlled automatically or manually by external means. Module #12 is the appropriate ratiometric output module.

ASPHALT TEMPERATURE

The asphalt temperature sensor signal is conditioned by I/O module #14. Modules compatible with various thermocouples, RTDs, voltage, or current signals are available.

If module #14 is not used, the asphalt temperature must be entered manually in the temperature calibration display. The corresponding zero and span values are not required (ie: "na").

The asphalt temperature value displayed, whether read automatically or entered manually, will be used to temperature compensate the asphalt meter reading.

VIRGIN BELT SCALE totalizer/speed pickup/interlock

The controller can accept either conditioned rate signals from external scale totalizers on Module #0 or can accept a signal proportion to weight on Module #0 and a signal proportional to belt speed on Module #1.

When used with conditioned rate signals, the module selector jumper on the processor card for module #1 (see appropriate schematic for jumper locations) must be set in the FOUT position and no module is required in module location #1.

When used with simultaneous weight and rate signals, the module selector jumper on the processor card for Module #1 must be set in the FIN position and an appropriate speed input module is required in module location #1. Modules compatible with various speed pickups are available. If no speed pickup is utilized, a 110-volt AC a line frequency module must be employed and the 110-volt AC signal should be interlocked to the conveyor starter. With this line frequency module the controller will measure the line frequency when the conveyor is on and zero frequency when off. In all cases, the frequency measured is assumed proportional to belt speed and is used in the computation of aggregate rate. A measured frequency of zero indicates the scale is off and inhibits the scale auto zero feature, and causes a zero rate indication.

RECYCLE BELT SCALE totalizer/speed pickup/interlock

The controller can accept either conditioned rate signals from external totalizers on Module #2 or can accept a signal proportion to weight on Module #2 and a signal proportional to belt speed on Module #3. When recycle is used, the module selector jumper for Module #2 should be set to the FIN position. When recycle is not used, the module selector jumper for Module #2 should be set to the FOUT position.

When used with conditioned rate signals, the module selector jumper on the processor card for module #3 (see appropriate schematic for jumper locations) must be set in the FOUT position and no module is required in module location #3.

When used simultaneous weight and rate signals, the module selector jumper on the processor card for Module #3 must be set in the FIN position and an appropriate speed input module is required in module location #3. Modules compatible with various speed pickups are available. If no speed pickup is utilized, a 110-volt AC a line frequency module must be employed and the 110-volt AC signal should be interlocked to the conveyor starter. With this line frequency module the controller will measure the line frequency when the conveyor is on and zero frequency when off. In all cases, the frequency measured is assumed proportional to belt speed and is used in the computation of aggregate rate. A measured frequency of zero indicates the scale is off and inhibits the scale auto zero feature, and causes a zero rate indication.

ACTIVE FEEDERS

On startup, the controller automatically configures itself for the number of installed feeders. It does this by reading the module selector jumpers on the process card (see appropriate schematic for jumper locations). I/O Modules 4-5-6 and 7 are available as feeder control outputs when the corresponding module jumper is in the FOUT position. The controller will ignore modules configured with the jumper in the FIN position. Any combination or sequence of feeder modules may be used. No feeder control is recognized if IO4-IO5-IO6 and IO7 jumpers are all in the FIN position.

NOTE

Only feeder 1 can be interlocked to the virgin scale rate. This feature is sometimes desired and used with a recycle feeder.

REMOTE GALLON COUNTER

A 1 pulse per asphalt gallon output is available at module 7 when it is not used as feeder 4 and its module selector jumper is placed in the FIN position. Plug in interface switch modules for 220 volt AC or 3-60 volts DC are available.

Hardware Setup

DC Motor Controller

- Set all span calibration values to 100 TPH.
- Set the aggregate blend formula to run all feeders at equal speeds (BIN1 = 25%, BIN2 = 25%, BIN3 = 25%, BIN4 = 25%).
- With the feeders empty and the process NOT in HOLD set the target rate to 400 TPH; all feeders will now run at their maximum controlled output, (ie: 25% of 400 = 100 TPH = the feeder span value).
- Adjust each controller max speed pot for an armature output voltage of 180vdc.
- Set the target rate to 40 TPH. Adjust each controller min speed pot for an armature output voltage of no more than 18vdc. This may be a difficult adjustment. Adjust the min speed pot so the armature voltage is as close to, but not exceeding 18vdc as is practical.
- Set the target rate to 0 TPH and verify that no feeders creep. Creeping would suggest a failed controller or may require the min speed armature voltage to be set at a lower value.