SAFETY, INSTALLATION, OPERATION AND MAINTENANCE MANUAL

Loss-in-Weight FEEDER CONTROL with Color User Interface
## Revision History

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INTRODUCTION

The Genetix Loss-in-Weight Feeder controller is intended to control cyclic Loss-in-Weight feeders. It is designed to meter and control the feedrate out of a hopper, by means of continually weighing the hopper and calculating the feedrate as weight lost over time.

In addition it can control the refilling of the hopper when it gets to a specific low weight point. While the hopper is being re-filled it is not possible to measure the feedrate from the hopper, so a volumetric model of the feeder properties is used. This volumetric model is updated and maintained during normal feeding.

In addition, the Genetix Loss-in-Weight Feeder control has the ability to control a variety of auxiliary devices, such as:

- Refill gates (valves)
- Refill feeders
- Hopper agitators
- Hopper vibrators

Also, the Genetix controllers support a high degree of connectivity for use with Industrial Networks or other forms of serial communication.

The nature of Loss-in-Weight control leads to complexity; the domain of operational parameters is very large. Hopper weights can vary from a few pounds to several tons, and feedrate can vary from perhaps grams per hour to many tons per hour. To simplify the configuration of the control, automated setup and monitoring procedures have been included so that typical feeders are relatively easy to set up. However, it is also possible to configure the controls for very complex or sophisticated control with proper adjustment of the parameters.

The central module for all Genetix controllers is the Genetix Core Module (“GCM”) which contains all the basic feeder control and connections for the standard I/O and peripheral equipment. This is a standalone device and can operate with no User Interface (i.e. as a “blackbox”). Alternatively the GCM may be connected to one of the available Merrick User Interface assemblies (including wireless options), providing the user direct interaction with the feeder.

The following sections in this Manual will instruct you in the proper configuration and use of the Genetix Loss-in-Weight Feeder Controller and the Color User Interface.
SAFETY

The Genetix Controller is used for the control of process weighing equipment. As such, it is normally responsible for the control of a process and is not intended as a motor control device. To insure personnel safety please read the following instructions and precautions carefully.

In General

Observe all standard precautions that pertain to moving machinery.

Observe all standard precautions that pertain to electrical drives and electrical controls.

Pay particular attentions to special notes and precautions that appear throughout this manual.

Please read and become familiar with this entire manual before attempting service or repair of the Genetix Controller. If you have any questions or problems, please call the Merrick Customer Support Department for assistance.

Electrical Precautions

Before undertaking work on the electrical system, the drives, or the Controller, insure power is disconnected and locked out. Work should never be performed on the Controller with power on the unit.

Verify that all grounds called for on the wiring diagrams are in place and are securely connected. Proper grounding not only helps ensure your personal safety, but is also necessary for the proper operation of the controller.

If it is necessary to work in or near areas of live high voltage, always keep one hand clear of the machine, the cabinet, or any other conductors to avoid the possibility of electrical shock traveling across your chest.

NEVER undertake any electrical work in areas with wet or flooded standing areas.

NEVER impair or disable the function of a fuse or a circuit breaker.

CAUTION: IF PERSONNEL ARE IN DOUBT ABOUT ANY PROCEDURE CONTACT THE MERRICK CUSTOMER SUPPORT DEPARTMENT.

Technical Support

Merrick provides customer technical and spare part support 24 hours a day, seven days a week. Our normal business hours are Monday through Friday 7:30 AM until 4:30 PM Central Time. During normal hours call 1-888 MERRICK (637-7425) and ask for service. The call will be routed to the next available phone support technician.

After normal hours and on holidays and weekends, technical assistance is available by calling 1-888 MERRICK extension 7878. Follow the instructions and be sure to enter the area code and the phone extension where you can be reached. Someone will return your call as soon as possible.

When you call Merrick for Technical Support, please have your machine serial number or a controller serial number. This information will better help us to serve you.
OPERATION

Color User Interface

The Genetix Color User Interface assembly is one of many User Interface options for the Genetix controller. It consists of a 5.7” (145mm) color graphic LCD screen with integral touchpanel. Context appropriate “soft” keys are shown on the different screens that allow the user to make selections, enter parameters, etc.

The Genetix Color User Interface is unique in that it can be connected to several Genetix Control Modules (up to 32 “GCM’s”). With one User Interface it is possible to monitor and/or control up to 32 Merrick feeders. Note: Different types of feeders may be connected (through their respective GCM’s) to a single Color User Interface. Thus it is possible to monitor any type of Merrick feeder or combination of Merrick feeders with one User Interface.

There are typically two lines of process information shown on the Main Screen (see above), and these may be configured by the user. The text in the upper right corner shows the current feeder control mode (if enabled). The text in the upper left is the “friendly” name of the feeder, which may be set by the user. Any feeder connected to the Color display may be selected for display on the Main Screen.

The user interacts with the controller through a multi-level menu system that is designed such that parameters are easy to find and change. The most commonly accessed features are found at the top of menus, and only those menus that are relevant to the specific feeder application are visible.
Navigation through the menu system is by means of the touchpanel. To enter the menu system, the user presses the “Menu/Esc” key.

To select an item from a displayed menu, the user navigates up or down the list with the Scroll Up/Scroll Down arrow keys until the item desired is highlighted. Most menus also “autoscroll” if you hold down either the up arrow or down arrow. Once highlighted, the item is selected by pressing the “Enter” key.

Moving up one menu level, or aborting an operation is accomplished by pressing the Menu/Esc key. Ultimately, if you continue to press the Menu/Esc key, you will arrive back at the Main Screen.

The right arrow on the Main Screen allows you to scroll through some additional screens. The next screen after the Main Screen is a graph (i.e. “trend”) screen which the user can configure to continually chart different data. The next is a special graph screen typically only used during initial startup and tuning called the “LIW Dynamics” screen. The last screen is a Feeder Summary screen which shows some summary data for all feeders that the color display is connected to.

Note: The LIW Dynamics screen is only visible if enabled (see Main Menu > Display Settings > Graph Setup > LIW Dynamics).

The Feeder Summary screen is only visible if more than one GCM is configured (see Main Menu > Advanced Setup > Configuration > Number of GCM’s).
**Numeric Entry**

Various numeric parameters are set and/or changed using the common Numeric Data Entry screen. An example is shown below:

To enter or change a value, you simply enter the new value with the numeric keys, using the decimal point key as appropriate. To change the sign of the number, press the +/- key. To clear the number and start over, press the clear key ("C"). To abort the operation press the Menu/Esc key.

Once the desired number is displayed, press the Enter key to accept. Note that there is limit checking on these parameters; the limits being shown in the left portion of the display. If the Min or Max limit is exceeded, the value will be limited appropriately. You will see an error message and the value will change to the Min or Max value as appropriate. You may either accept this value or enter a new value that is within the limits.
Entering Passwords

Several areas of the Menu system require entry of a Password, for security. These passwords are 4 digit numbers and have factory default settings. They can be changed by the user and you should do this for extra security (see Main Menu > Advanced Setup > Passwords). In addition the password security can be turned off by setting the respective password to all zeroes (“0000”). Once thus set, that password will no longer be requested.

When you are asked for a password, you must enter the correct code, from left to right, using the numeric keys. Once a digit is set, you use the Right arrow to move to the next digit, at which time the previous digit is obscured by a star (*) (see below). Once all digits are set, press the Enter key to proceed.
Menu System

When you first enter the Menu system by pressing the Enter key, you will see the following Main Menu:

Feeder Control…
Calibration…
Warnings…
Faults…
Display Settings…
Basic Setup…
Advanced Setup…
Reset Totals…
DNA Key…
Diagnostics…

Note: Not all the of the above entries will necessarily appear in the menu, depending on how the controller is configured (see Advanced Set-up > Configuration).

Feeder Control
(Main Menu)

Note: The items presented in the Feeder Control menu will vary depending on the current control method and source. Also “Feeder Control” only appears in the Main Menu if “Feeder Control” is configured (see Main Menu > Advanced Set-up > Configuration).

The following is a list of all Feeder Control items and their functions:

Start [Stop] Feeder…
Setpoint…
Start [Stop] Fill…
Start [Stop] Cleanout…
Start [Stop] Feeder

If Local control has been selected for the control Source (see Main Menu > Advanced Set-up > Feeder Control > Source), this menu item allows you to start and stop the feeder. If the feeder is not running, this item will read “Start Feeder”. If the feeder has already been started, this item will read “Stop Feeder”.

If either “Network” or “Remote” have been selected as the control source, then you will not have local control over starting and stopping, and this menu item will read “Remote Start/Stop”.

If “Manual” has been selected (see Main Menu > Advanced Set-up > Feeder Control > Control) then this will allow you to start and stop the feeder with few restrictions. This mode is normally used only for maintenance or initial set-up of the feeder.

Setpoint

If Local control has been selected for the control Source (see Main Menu > Advanced Set-up > Feeder Control > Source), this menu item allows you to enter and/or change the current Setpoint. Highlighting this item and pressing the Enter key will bring up the Numeric Data Entry screen allowing you to enter the desired setpoint. This value is entered in units of Feedrate if the control method has been selected as “Rate Control” or units of percent if in Manual (“Open Loop”) (see Main Menu > Advanced Set-up > Feeder Control > Method). If in Manual control (see above), this value will be entered in percent.

If either “Network” or “Remote” have been selected as the control source, then you will not have local control over Setpoint, and this menu item will display the current Setpoint (as received from the Remote source). You may not select the item to change it.

Start [Stop] Fill

If allowed, this menu item will allow you to manually start or stop a Fill cycle. If you have a Fill Gate (or other fill device) configured (see Main Menu > Advanced Setup > Configuration > Fill Gate) it will control the operation of the fill device. If you start a Fill, and you have a Fill Gate configured, it will automatically terminate when the hopper weight reaches the Fill Weight. While filling, this menu item will read “Stop Fill”. If you want to manually stop the Fill cycle, select this item and press the Enter key. If you do not have a Fill Gate configured, the feeder will remain in Fill mode until manually sopped.

Note: If manually starting a Fill cycle is not allowed (due to current operating mode), this menu item will read “Fill Unavailable”. These controls are only available if the Control Source is set to “Local”.

Start [Stop] Cleanout

If allowed, this menu item will allow you to manually start or stop a Cleanout cycle. This will cause the Feeder to run, at the current set-point, until considered empty, i.e. until the weight falls below a certain weight, and then for a set time period longer (see Main Menu > Basic Setup > Design Capacities > Empty Weight and Main Menu > Advanced Setup > Feeder Control > Numeric Data).
Note: If manually starting a Cleanout cycle is not allowed (due to current operating mode), this menu item will read “Cleanout Unavailable”. These controls are only available if the Control Source is set to “Local”.

Calibration
(Main Menu)
Selecting this item from the Main menu will present a screen asking you to enter a Password. The default factory setting for the Calibration password is “1234”. Upon successful entry of the password, you will be presented with the following list of options:

<table>
<thead>
<tr>
<th>Zero Procedure…</th>
<th>↑</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Procedure…</td>
<td></td>
</tr>
<tr>
<td>Material Test…</td>
<td></td>
</tr>
<tr>
<td>ECal Procedure…</td>
<td></td>
</tr>
<tr>
<td>ECal Factor…</td>
<td></td>
</tr>
<tr>
<td>Feeder Dynamics…</td>
<td></td>
</tr>
<tr>
<td>Numeric Data…</td>
<td>↓</td>
</tr>
</tbody>
</table>

Zero Procedure
(Main Menu > Calibration > Zero Procedure)
This procedure “zeroes” the feeder calibration, accounting for all the dead load represented by the feeder itself, the scale, etc. Selection of this procedure from the above menu presents a screen that advises you to “Verify No cal weight is on Scale”, and the current status of the test (0.0%).

From this screen, you simply press the Enter key to start the procedure, or the Menu/Esc key to cancel. Once the procedure is started, the percentage indicator will begin to increment, and the horizontal progress bar at the bottom of the screen will fill from left to right.

Once the procedure is complete (100.0%), a new screen will be displayed with the following data:

- Diff: 00.00%
- Curr: 00.00 lb (or kg)
- New: 00.00 lb (or kg)

Press to Accept test
Press “Menu/Esc” to reject test
The percentage difference (“Diff”) is shown on the first line, and represents the difference between the current Zero Load, and the results of this procedure, relative to Design Load.

The current Zero Load (“Curr”) is shown on the next line.

The new Zero Load (“New” is shown on the third line. This value will become the current Zero Load if the results of this procedure are accepted.

To accept the results of this procedure, press the Enter key. If you do not wish to accept the results, and leave the zero value un-changed, press the Menu/Esc key.

Whichever key is pressed at this point, you will be returned to the Zero Procedure start screen so that you may easily run another procedure if desired. It is recommended that you run more than one test to verify that the feeder is repeatable.

**Weight Procedure**

*Main Menu > Calibration > Weight Procedure*

This is one of the available procedures that “span” the feeder calibration, or set its Scale Factor. Scale Factor is the parameter that relates counts from the Load Cell A/D (analog to digital) converter to weight units (i.e. lb or kg). Scale Factor will vary from feeder to feeder, depending on load cell size, etc.

The Weight Procedure requires the placement of certified test weights directly to the scale suspension, usually as provided by Merrick. For assistance with correct use of Test Weights refer to the feeder Instruction Manual and/or the mechanical drawings provided by Merrick.

Selection of this procedure from the above menu presents the following screen
Note that there are two options when running a Weight calibration. Typically a Weight procedure follows a Zero procedure (see above), so that the hopper is empty and the only weight applied is that of the Test weight(s). However, if you wish to run a Weight procedure at some future point, when there is possibly material in the hopper (i.e. Hopper Weight is not equal to zero), it is possible to establish a "temporary zero" before applying weights. This is the default option, and is initiated by pressing the Enter key as shown in the above screen. At this point, there should be NO test weights on the scale. The temporary zero will be set at whatever weight is present at this point.

If you wish to skip the “temporary zero” process, you can press the Right arrow key and the test will proceed without measuring the present weight.

The next screen advises you to verify that the correct Calibration weights are applied to the feeder and the current status of the test (0.0%). The value of the Test Weights is shown and should be verified. To change this value see Main Menu > Calibration > Numeric Data > Test Weights.

From this screen, you simply press the Enter key to start the procedure, or the Menu/Esc key to cancel. Once the procedure is started, the percentage indicator will begin to increment, and the horizontal progress bar at the bottom of the screen will fill from left to right.

Once the procedure is complete (100.0%), a new screen will be displayed with the following data:

- Diff: 00.00%
- Curr: 10000.00
- New: 10000.00
Press to Accept test
Press “Menu/Esc” to reject test

The percentage difference ("Diff") is shown on the first line, and represents the difference between the current Scale Factor, and the results of this procedure, relative to the current Scale Factor.

The current Scale Factor ("Curr") is shown on the next line.

The new Scale Factor ("New" is shown on the third line. This value will become the current Scale Factor if the results of this procedure are accepted.

To accept the results of this procedure, press the Enter key. If you do not wish to accept the results, and leave the Scale Factor value un-changed, press the Menu/Esc key.

Whichever key is pressed at this point, you will be returned to the Weight Procedure start screen so that you may easily run another procedure if desired. It is recommended that you run more than one test to verify that the feeder is repeatable.

**Material Test**

*(Main Menu > Calibration > Material Test)*

When you select this procedure you will see another screen as follows:

<table>
<thead>
<tr>
<th>GCM Total</th>
<th>↑</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Total</td>
<td></td>
</tr>
<tr>
<td>Run Procedure…</td>
<td>↓</td>
</tr>
</tbody>
</table>

The purpose of a Material Test is to run a quantity of material through the feeder and weight that quantity on a reference scale for comparison. The reference scale must be in known good condition and have an accuracy better than the desired accuracy of the Genetix. For example, if the Genetix controlled feeder is to have an accuracy of +/- 0.25%, the reference scale should have an accuracy of +/- 0.10%.

Note: Running a proper material test is complicated and can be very expensive, but is arguably the best way to calibrate your scale (or feeder). If you would like assistance organizing a well-run test, please contact the Merrick Customer Support department.

To run a Material Test procedure, first reset the Sub-Total totalizer (see Main Menu > Reset Totals > Reset Sub-Total). Then run a quantity of material through the feeder that has either been pre-weighed or can be post-weighed on the reference scale.

Go to the Material test screen and the material will be totalized on the first line that says “GCM Total”.

After the material has been weighed on the reference scale, that total should be entered by highlighting the line that reads “Actual Total” and entering the actual total.

Once both values are present, highlight the line that reads “Run Procedure” and press the Enter key. A new screen will be displayed with the following data:
The percentage difference ("Diff") is shown on the first line, and represents the difference between the current Scale Factor, and the results of this procedure, relative to the current Scale Factor.

The current Scale Factor ("Curr") is shown on the next line.

The new Scale Factor ("New" is shown on the third line. This value will become the current Scale Factor if the results of this procedure are accepted.

To accept the results of this procedure, press the Enter key. If you do not wish to accept the results, and leave the Scale Factor value un-changed, press the Menu/Esc key.

Whichever key is pressed at this point, you will be returned to the Material Test screen so that you may easily run another procedure if desired. It is recommended that you run more than one test to verify that the feeder is repeatable.

Note: It is also possible to use the Material Test procedure to directly affect a change to the Calibration by entering numbers for both parameters that you select. You may enter arbitrary values for both “GCM Total” and “Actual Total” and run the procedure.

The error displayed is calculated as follows:
Error, % = \( \frac{(GCM \ Total - \ Actual \ Total)}{Actual \ Total} \times 100\% \)

So, if for example you believe the Genetix is reading 1% low, you can correct it directly by selecting appropriate numbers and running the Material Test procedure. In this example a set of numbers can be selected by entering a GCM total that is exactly 1% lower than the Actual total, for example GCM Total = 198, Actual Total = 200. (Note: All numbers must be greater than 100).

After you run the procedure and accept the results the Genetix should now agree with your reference.

**ECal Procedure**

*(Main Menu > Calibration > ECal Procedure)*

This procedure allows you to “span” the feeder calibration without having to use weights or any other kind of load. Instead a calibration is performed based on the electrical signal that should be present under a given load. Before performing this procedure this value must be calculated ahead of time and entered in the Genetix controller (see *Main Menu > Calibration > Numeric Data > ECal Value*).

To perform this procedure, select it from the menu by pressing the Enter key.

**ECal Factor**

*(Main Menu > Calibration > ECal Factor)*

This procedure will calculate and store a new ECal Value (see *Main Menu > Calibration > Numeric Data > ECal Value*) and should only be performed after an
accurate Material Test (see Main Menu > Calibration > Material Test) or Weight Procedure (see Main Menu > Calibration > Weight Procedure). Once the test is complete, and accepted, a change is made to the ECal Value; it does not change the calibration of the feeder.

It is performed exactly like an ECal Procedure. The feeder does not need to be running.

Feeder Dynamics
(Main Menu > Calibration > Feeder Dynamics)

This procedure assists with initial settings for some important filters. During this procedure the feeder must be running (while empty), with no extraordinary disturbances present while in process. Before performing this procedure, the mechanical installation must be complete, and it must be safe to run the feeder.

To run this procedure you must first do or verify the following:

1. Enter at least the following Design parameters correctly, i.e.
   - Engineering Units selection (Main Menu > Basic Setup > Units)
   - Design Weight (Main Menu > Basic Setup > Design Capacities)
   - Design Feedrate (Main Menu > Basic Setup > Design Capacities)
   - Fill Weight (Main Menu > Basic Setup > Design Capacities)
   - Heel Weight (Main Menu > Basic Setup > Design Capacities)
   - Low Setpoint Limit (Main Menu > Advanced Setup > Limits)

2. Set or verify the following Configuration switches
   - Feeder control is ON ("Y") (Main Menu > Advanced Setup > Configuration > Feeder Control)
   - Feeder Control is Manual (Main Menu > Advanced Setup > Feeder Control > Control)
   - Reversible is OFF ("N") (Main Menu > Advanced Setup > Feeder Control > Settings)
   - AutoStart is OFF (Main Menu > Advanced Setup > Feeder Control > Settings)
   - RP Start/Stop in Local is OFF (Main Menu > Advanced Setup > Feeder Control > Settings)
   - Lock Source is OFF (Main Menu > Advanced Setup > Feeder Control > Settings). Allows the user to change between Closed Loop and Open Loop control. Can be set to ON later, if desired.
   - Lock Method is OFF (Main Menu > Advanced Setup > Feeder Control > Settings). Allows the user to change between Local, Remote and Network control. Can be set to ON later, if desired.
• Use FeedFactor in Fill is OFF (Main Menu > Advanced Setup > Feeder Peripherals > Fill Gate > Settings). Initial setting; may be turned ON later
• Learn FeedFactors is OFF (Main Menu > Advanced Setup > Feeder Control > Settings). Initial setting; may be turned ON later
• Use Fill Preact is OFF (Main Menu > Advanced Setup > Feeder Peripherals > Fill Gate > Settings). Initial setting; may be turned ON later
• Learn Fill Preact is OFF (Main Menu > Advanced Setup > Feeder Peripherals > Fill Gate > Settings). Initial setting; may be turned ON later
• Fill Gate Control is set correctly according to your refill procedure (Main Menu > Advanced Setup > Feeder Control > Settings). Set to ON if the Genetix controls the refill process automatically (i.e. with a valve).
• AutoPID is ON (Main Menu > Advanced Setup > Feeder Control > Settings)
• Auto Filter Allowed is ON (Main Menu > Advanced Setup > Feeder Control > Settings). Initial setting; usually turned OFF after commissioning.

3. Run a Zero Procedure (Main Menu > Calibration > Zero Procedure)
4. Run a Weight Procedure (Main Menu > Calibration > Weight Procedure)
5. Start the feeder, while empty, in Manual at 50% (Main Menu > Feeder Control)
6. Run the Feeder Dynamics procedure by selecting this option from the Calibration menu.

This procedure will increase specific filter settings, in steps, until a consistent Signal Quality of at least 50% is maintained. A failure will occur if the max filter values are reached. This usually means that there are mechanical or electrical problems or the Design Feedrate is outrageously low relative to the Design Weight.

Numeric Data
(Main Menu > Calibration > Numeric Data)
In this menu you will find the following parameters that relate to the Calibration procedures. Most of these parameters must be correctly set before any Calibration procedures are performed.

Test Weight
(Main Menu > Calibration > Numeric Data)
This is usually the total value of the test weights applied to the scale during a Weight Procedure (see Calibration > Weight Procedure). If multiple weights are used, the sum of all weights should be entered here. The units are those of weight (lb, kg) and the test weights should be stamped with their correct value by the factory.
Note: Removable brackets, pegs, etc. that are used to hang the test weights must be included in the sum. Normally all such pieces will be stamped with their correct weight by the factory.

**ECal LC1 Value**

*(Main Menu > Calibration > Numeric Data)*

This is the calculated output of the weighing mechanism in mV/V (millivolts per volt) at Design Weight, for loadcell number 1. This can be difficult to calculate accurately and will usually be done by Merrick. However, in general, it can be calculated as follows

\[ \text{ECal, mV/V} = \frac{\text{Wd} \times \text{SLc}}{\text{WLc}} \]

Where

- \( \text{Wd} = \) Design Weight (i.e. lb or kg)
- \( \text{SLc} = \) Actual output of loadcell (or loadcells) at rated capacity (mV/V)
- \( \text{WLc} = \) Total rated capacity of loadcell (or loadcells) (i.e. lb or kg)

Design Weight (Wd) and Loadcell capacity (WLc) must have the same units (i.e. lb or kg).

When performing this calculation, it is important to use the actual output of the loadcell (SLc) as certified by the manufacturer, as this can be very different than the nominal output. Contact the Merrick Customer Support department for assistance if required.

**Warnings**

Warnings are logical conditions that may occur of which you wish to be notified. Warnings are informational only and will not affect the process. Any Logical Input or Output can be used to trigger a Warning. To set a Logical I/O point as a Warning, see *Main Menu > Advanced Setup > Digital I/O > Warnings/Faults*.

If any Warning occurs, you will see a Warning icon on the bottom of the Main Screen, like this:

![Warning Icon](image)

Selecting “Warnings” from the Main Menu will present a screen that shows a list of all Logical Inputs and Logical Outputs that have had their “Warning” property set. You may also press the Warning icon (shown above) to jump right to this screen. Next to each input or output, you will see one of the following labels,

<table>
<thead>
<tr>
<th>Label</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;blank&gt;</td>
<td>No Warning has occurred (since last</td>
</tr>
</tbody>
</table>
If a Logical I/O point shows the label “Warn-Off”, that means that condition did occur but is no longer present. You may scroll to that item, select it and then press the key shown below to reset just the highlighted warning.

If a Logical I/O point shows the label “Warn-ON”, then this means the condition is still present and it may not be Reset. The logical condition must no longer be present before a Warning can be reset.

When all Warnings have been reset, the Warning icon will disappear from the main display.

Note: You may reset all Warnings by pressing the button shown below.

Of course, only logical conditions that are currently in the “Warn-Off” state will be reset.

**Faults**

Faults are logical conditions that may occur and which will stop the feeder. Any Logical Input or Output can be set to trigger a Fault. To set a Logical I/O point as a Fault, see *Main Menu > Advanced Setup > Digital I/O > Warnings/Faults*. Note: you should use careful judgement in setting Faults; if they occur, they will cause the feeder to stop.

If any Fault occurs, you will see the Fault icon on the bottom of the Main screen, like this:

Selecting “Faults” from the Main menu will present a screen that shows a list of all Logical Inputs and Logical Outputs that have had their “Fault” property set. You may also press the Fault icon (shown above) to jump right to this screen. Next to each input or output, you will see one of the following labels,

<table>
<thead>
<tr>
<th>Label</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;blank&gt;</td>
<td>No Fault has occurred (since last reset)</td>
</tr>
<tr>
<td>“Fault-Off”</td>
<td>Fault occurred, but is not now present (may be reset)</td>
</tr>
</tbody>
</table>
“Fault-ON”  Fault occurred and is still present

If a Logical I/O point shows the label “Fault-Off”, that means that condition did occur but is no longer present. You may scroll to that item, select it and then press the key shown below to reset.

If a Logical I/O point shows the label “Fault-ON”, then this means the condition is still present and it may not be Reset. The logical condition must no longer be present before a Fault can be reset.

When all Faults have been reset, the Fault icon will disappear from the main display.
Note: You may reset all Faults by pressing the button shown below.

Of course, only logical conditions that are currently in the “Fault-Off” state will be reset.

Display Settings
These settings determine what is displayed on the main screen, and to a certain extent how it is displayed.

| Upper… | ↑ |
| Lower… |
| Damping… |
| Graph Setup… | ↓ |

Upper
(Main Menu > Display Settings)
This item allows you to select what variable is displayed on the upper line of the main screen. You may select from the following list
| Hopper Weight | ↑ |
| Feedrate      |  |
| Drive Demand (CV) |  |
| Grand Total   |  |
| Sub-Total     |  |
| Time          |  |
| Setpoint      |  |
| FeedFactor    |  |
| Signal Quality| ↓ |

**Lower**

*(Main Menu > Display Settings)*

This item allows you to select what variable is displayed on the lower line of the main screen. You may select from the same list as above.

Note: While at the main screen, it is also possible to simply touch the screen in the vicinity of the upper line or the lower line and jump to the Display Settings menu for that line on the display. The variable to be displayed on that line can then be selected from the list as above.

**Damping**

These parameters allow you to “damp” (i.e. “smooth) the displayed values, causing the display to be more stable and therefore more readable. The variables that may thus be damped are selectable from the following list:

| Feedrate | ↑ |
| Weight   | ↓ |

The Weight damping parameter is settable from 0 to 100, where 0 is no damping, and 100 is maximum. Note: Damping is not linear, so a setting of 10 is much greater than 1, and should usually be sufficient. Too much damping will cause the display to respond so slowly that process changes may not be visible.

Feedrate damping is settable from 0 to 255, and behaves more linearly.

Damping affects the specific displayed value, and the value presented as an Analog output (if configured), but does not affect the process.
Graph Setup

These parameters allow you to configure the Graph (one of the screens available as you press the Right arrow key from the Main screen). You may select what variables to plot, the scale for each variable, and the plot update time.

| Sample Period | ↑  |
| Track Scaling… |   |
| LIW Dynamics   | ↓  |

Sample Period

This sets the time interval, in seconds, between data points plotted on the Graph screen. All tracks are plotted with the interval set here.

Track Scaling

Through the use of Track Scaling, you may select a different plot scale for each track.

The default data plotted for a Loss-in-Weight Feeder are:
- Hopper Weight (Track 1)
- Feedrate (Track 3)
- Setpoint (Track 4)
- Drv Demand (CV) (Track 5)

In addition the following data are displayed at the bottom of the Graph screen,
- Total
- Sub-Total
- FeedFactor
- Signal Quality

To scale a Track differently, select “Track Scaling” and then scroll to the Track parameters for the Track you wish to scale. You must first enable Track Scaling to be able to change the scaling parameters. The data for that Track will be scaled to the graph screen between the Min and Max value selected.

All of the track data displayed on the graph screen are retained in memory, and are not lost if you navigate away from the Graph screen and then back.

LIW Dynamics

The Loss-in-Weight Dynamics screen is a special graph that can be very useful when setting up a Loss-in-Weight feeder for the first time or subsequent tuning. To display this graph, you must enable it by setting this parameter to “Y”. Once
enabled, the LIW Dynamics graph will show up in the rotation of the Main Screen as you press the right arrow.

The data plotted on the LIW Dynamics screen are:
- Hopper Weight
- Raw Loss
- FeedFactor
- Quality

Note: The data displayed on the LIW Dynamics graph are not retained in memory and will be lost if you navigate away from this screen. Each time you navigate to this screen, plotting begins from that time.

Note: The time interval for plotting the data on the LIW Dynamics screen is calculated based on Feeder parameters and may not be changed by the user. This time interval will likely be different than the plot interval on the main graph screen and is displayed at the bottom of the LIW Dynamics screen for reference.

After initial setup and tuning, you can disable the LIW Dynamics screen by setting this parameter to “N”.

**Basic Setup**

These are the basic parameters for all LIW applications. Selecting this item from the Main menu will present a screen asking you to enter a Password. The default factory setting is “5678”. Upon successful entry of the password, you will be presented with the following list of parameters:

<table>
<thead>
<tr>
<th>Units…</th>
<th>↑</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decimal Points…</td>
<td></td>
</tr>
<tr>
<td>Design Capacities…</td>
<td>↓</td>
</tr>
</tbody>
</table>

These parameters must be set correctly before any other settings. If you later change any of the above, other settings (i.e. Limits) may not behave correctly and also need to be reset.

**Units**

*(Main Menu > Basic Set-up)*

This parameter refers to the Units in which data are displayed. There are imperial and metric units for the following data: Weight (i.e. lb/ft, kg/m); Feedrate (i.e. lb/min, lb/h, TN/h, kg/min, kg/h, t/h); Totals (i.e. TN, kg, t). The most common combinations of the above units are presented in groups. You should select the group that best suits your needs.

Note: Careful consideration should be given to Units, so that the proper selection can be made. Changing the Units at a later date can be a complicated task, requiring many data to be re-entered, for example Limits.
Decimal Points

(Main Menu > Basic Set-up)

These parameters select the number of digits to the right of the decimal point for the following data: Weight/Load; Totals; Feedrate. The maximum number of decimal places for any of these data is four. They may be set individually and will determine the precision with which the data are displayed or entered. For example if the units of Weight have been set to kilograms (kg), and the number of decimal places to 3, then weight data will be displayed to the nearest gram.

Note: The number of decimal points you select for any specific value has no effect on the internal precision of the controller, it is for display purposes only.

Design Capacities

(Main Menu > Basic Set-up)

When you select this item, the following basic feeder design parameters are listed with their current settings:

Design Weight
This parameter represents the Net Weight that the feeder has been designed for in normal operation. Typically it is set at the maximum net weight expected. It is set in Weight units (i.e. lb, kg), and with the number of decimal places specified.

Design Feedrate
This parameter represents the feedrate that the feeder has been designed for in normal operation. Typically this is specified by the buyer. It is set in Rate units (i.e. lb/min, lb/h, TN/h, kg/min, kg/h, t/h), and with the number of decimal places specified.

Fill Weight
This is the weight to which the hopper should be refilled during a fill procedure.

Heel Weight
This is the point (expressed in units of weight) at which the hopper should be refilled. It should be set to something greater than zero, such that the discharge device is still discharging material (i.e. has not run empty), yet low enough that most of the material has been discharged. Other things to consider when setting the Heel Weight:

- It should be low enough to allow most of the material to be discharged, resulting in less frequent refill cycles.
- If the material is floodable, it may have to be higher than usual to keep the remaining material from being pushed out of the discharge device when new material is introduced during refilling.

Empty Weight
The Empty Weight value is used to determine when the hopper is empty, or cannot be emptied any further. It is expressed in weight units and can range from 0 to the Design Weight. The parameter is used in the Cleanout state, to determine when the hopper is empty.
**Advanced Setup**

*Main Menu > Advanced Setup*

These are the more advanced settings for all LIW applications. These settings are typically configured at the factory (by Merrick), and so it is possible you may not need to change them.

Selecting this item from the Main menu will present a screen asking you to enter a Password. The default factory setting is “3010”. Upon successful entry of the password, you will be presented with the following list:

```
Feeder Control… ↑
Limits…
Load Cells…
Process Control…
Analog I/O…
Digital I/O…
Totalizer…
Feeder Peripherals…
Communications…
Date & Time…
Passwords…
GCM Name…
Direct Param Edit…
Configuration… ↓
```

Note: Some of the above items may not appear, depending on the Configuration settings (see *Main Menu > Advanced Setup > Configuration*)

Selection of one of the entries from the above list will present further selections in each category as shown below

**Feeder Control**

*Main Menu > Advanced Setup > Feeder Control*
Note: This item will appear in the menu only if Feeder Control is enabled (see Main Menu > Advanced Setup > Configuration > Feeder Control).

Selecting this menu item, you will be presented with the following menu:

<table>
<thead>
<tr>
<th>Control…</th>
<th>↑</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source…</td>
<td></td>
</tr>
<tr>
<td>Method…</td>
<td></td>
</tr>
<tr>
<td>Settings…</td>
<td>↓</td>
</tr>
</tbody>
</table>

**Control**

This refers to whether feeder control is to be automatic (uses feedback to control), or manual (Drive Demand is manually entered). The two choices for this setting are:

<table>
<thead>
<tr>
<th>Manual</th>
<th>↑</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto</td>
<td>↓</td>
</tr>
</tbody>
</table>

**Manual**

With this control option selected, you must enter the desired Feeder Drive Demand from the keypad. This is signal is sent directly to the feeder speed control device, and there is no attempt to control it. This mode is generally used for maintenance purposes as it allows you to control the speed in a straightforward manner, and most safeguards (i.e. “Faults”) are disabled.

Once you set Control for “Manual”, the Feeder Control menu (see Main Menu > Feeder Control) is used to start and stop the feeder and set the speed.

**Auto**

With this control option selected various forms of automatic control become available, such as Feedrate control. These functions all involve some sort of feedback and therefore control the process variable based on control method (see below).

**Source**

This refers to the source from which the setpoint (control variable) will be obtained. The choices for this setting are:
Local

“Local” refers to control from the User Interface. Once you set the control source to Local, the Feeder Control menu (see Main Menu > Feeder Control) is used to start and stop the feeder and enter the setpoint.

Remote (Analog)

“Remote (Analog)” refers to control from an outside source as follows:

Setpoint is determined from an analog signal. Note: An analog input must be mapped to the appropriate control variable (see Main Menu > Advanced Setup > Analog I/O > Inputs > Function).

Feeder Start/Stop is controlled by the Logical input “Run Permission”. Typically this is mapped to a Physical input for remote control (see Main Menu > Advanced Setup > Digital I/O).

Network (Serial)

“Network (Serial)” refers to control from an outside source as follows:

Setpoint is determined from a Network source (i.e. PLC). Typically the setpoint will be written to the CIT (Common Interface Table) via communications.

Feeder Start/Stop is controlled by the Logical input “Run Permission”. Typically this is mapped to a Network input for remote control, but it could be a Physical input instead (see Main Menu > Advanced Setup > Digital I/O).

Note: Network control is a complex topic and is dependent on the network being used (i.e. Ethernet, Profibus, etc.), the PLC being used and the level of control desired. For assistance, please refer to www.merrick-inc.com/mct, or contact Merrick Customer Support.

Method

This refers to the method of control, or what the controlled variable is to be. The choices for this setting are:

Rate Control

Open Loop
**Rate Control**

If set for “Rate Control”, feedrate is the controlled variable. The controller will attempt to maintain a feedrate setpoint.

**Open Loop**

If set for “Open Loop” the setpoint is mapped directly to Feeder Drive Demand, with no attempt at control.

**Settings**

These are settings that enable/disable or control various functions relative to Feeder Control. The settings are:

<table>
<thead>
<tr>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reversible</td>
</tr>
<tr>
<td>AutoStart</td>
</tr>
<tr>
<td>Lock Method</td>
</tr>
<tr>
<td>Lock Source</td>
</tr>
<tr>
<td>RP Start/Stop in Local</td>
</tr>
<tr>
<td>Clamp Setpoint to Limits</td>
</tr>
<tr>
<td>Clamp Demand to Limits</td>
</tr>
<tr>
<td>Learn FeedFactors</td>
</tr>
<tr>
<td>AutoPID</td>
</tr>
<tr>
<td>Auto Filter Allowed</td>
</tr>
<tr>
<td>Numeric Data…</td>
</tr>
</tbody>
</table>

**Reversible**

If feeder is reversible, that is it is connected to a control device that can reverse the feeder direction through inputs, this should be turned on (set to “Y”). This will enable certain additional Logic Inputs and Logical Outputs that can be used to run the feeder in forward or reverse.

**AutoStart**

If this feature is enabled, the feeder will start anytime the Logical input “Run Permission” is on. If this is mapped to a Physical input and that Physical input is on after a reset, the feeder will start automatically. This is not generally recommended, but available.
Lock Method
If this is turned on you will not be able to change the Feeder Control method (see Main Menu > Advanced Setup > Feeder Control > Method). This is to protect the process from inadvertent changes that might cause a setpoint change.

Lock Source
If this is turned on you will not be able to change the Feeder Control source (see Main Menu > Advanced Setup > Feeder Control > Source). This is to protect the process from inadvertent changes that might cause a setpoint change.

RP Start/Stop in Local
If enabled, this feature allows the Logical input “Run Permission” to start and stop the feeder when the Feeder Control source is set to “Local”. This can be dangerous as the Feeder can be remotely started.

Clamp SetP to Limits
If this feature is enabled, the setpoint (i.e. Feedrate) will be “clamped” to its Limits, which are settable (see Main Menu > Advanced Setup > Limits). This means no value outside of the limits will be accepted, regardless of source, and the resultant value will be set to the appropriate limit. This can be used for example to set the maximum rate that a feeder is allowed to run, or the minimum.

Clamp Dem to Limits
If this feature is enabled, the Drive Demand will will be “clamped” to its Limits, which are settable (see Main Menu > Advanced Setup > Limits). This means no value outside of the limits will be generated, and the resultant value will be set to the appropriate limit.

Learn FeedFactors
Learn Feedfactors allows for automatic adjustment of the FeedFactors used during a Fill cycle, Low FeedFactor (FeedFactor at low weight, near the Heel Weight) and High FeedFactor (FeedFactor at high weight, near the Fill Weight). These parameters are only used if “Use FeedFactor in Fill” is enabled (see Main Menu > Advanced Setup > Feeder Peripherals > Fill Gate > Settings > Use FeedFactors in Fill).

AutoPID
Enables/disables automatic calculation of PID parameters, based on FeedFactor and filter times. If Auto Filter Allowed is enabled (see below), it is recommended that AutoPID also be enabled, as filter times can change dynamically.

Auto Filter Allowed
Enables/disables dynamic calculation of filter parameters, based on feeder performance. Used in conjunction with “Auto Filter Factor” (see Main Menu > Advanced Setup > Process Control > Filters).
Numeric Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse Delay</td>
<td>↑</td>
</tr>
<tr>
<td>Max Clean Time</td>
<td></td>
</tr>
<tr>
<td>Clean Extra Time</td>
<td>↓</td>
</tr>
</tbody>
</table>

**Reverse Delay**
This is the minimum time, set in seconds, allowed when switching direction of the Feeder motor direction. If an attempt is made to reverse too quickly, it will not be allowed until this time has elapsed.

**Max Clean Time**
This is the maximum time allowed to complete the Cleanout cycle. If the weight in the hopper does not reach the Empty weight in this allowed time, the Logical Output “Slow Cleanout” is set.

**Clean Extra Time**
During a Cleanout cycle, the Feeder will run until the weight reaches the Empty weight (see Main Menu > Basic Setup > Design Capacities > Empty Weight), and then for set period longer. This parameter, set in seconds, can be used to reasonably assure that the feeder is completely emptied.

**Limits**
(Main Menu > Advanced Setup > Limits)
Limits provide alarm functionality for selected process parameters. If the actual value moves outside of the limits set here, Logical outputs are set and/or clamping can take place. All Limits have “Delay” settings to prevent nuisance alarms if the process variable only momentarily exceeds its Limit. The process values that may have Limits set are:

<table>
<thead>
<tr>
<th>Parameter</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedrate…</td>
<td>↑</td>
</tr>
<tr>
<td>Weight…</td>
<td></td>
</tr>
<tr>
<td>Setpoint…</td>
<td></td>
</tr>
<tr>
<td>Drive Demand…</td>
<td>↓</td>
</tr>
</tbody>
</table>
Feedrate
The following settings are available for Feedrate limits:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Feedrate</td>
<td>↑</td>
</tr>
<tr>
<td>Low Feedrate</td>
<td></td>
</tr>
<tr>
<td>High Feedrate Delay</td>
<td></td>
</tr>
<tr>
<td>Low Feedrate Delay</td>
<td></td>
</tr>
<tr>
<td>High Absolute Deviation</td>
<td></td>
</tr>
<tr>
<td>Low Absolute Deviation</td>
<td></td>
</tr>
<tr>
<td>High Relative Deviation</td>
<td></td>
</tr>
<tr>
<td>Low Relative Deviation</td>
<td></td>
</tr>
<tr>
<td>High Deviation Delay</td>
<td></td>
</tr>
<tr>
<td>Low Deviation Delay</td>
<td>↓</td>
</tr>
</tbody>
</table>

**High Feedrate**
If the actual feedrate exceeds this limit for duration longer than the High Feedrate Delay value (see below) then the logical output “High Feedrate” is set. Note that this setting is independent of setpoint, and will activate anytime the limit is exceeded, even if the intended rate is higher than the limit. This limit is set in units of feedrate.

**Low Feedrate**
If the actual feedrate drops below this limit for duration longer than the Low Feedrate Delay value (see below) then the logical output “Low Feedrate” is set. This limit is set in units of feedrate.

Note this limit is only active under the following conditions:
- Feeder Control is enabled (see Main Menu > Advanced Setup > Configuration > Feeder Control) and the feeder is commanded to run.
- No calibration routine is running.

**High Feedrate Delay**
This value provides a delay for the High Feedrate limit, in order to prevent nuisance alarms. The feedrate must remain above the limit value for duration as long as this delay value for the logical output to be set. This delay value is set in seconds.
Low Feedrate Delay
This value provides a delay for the Low Feedrate limit, in order to prevent nuisance alarms. The feedrate must remain below the limit value for duration as long as this delay value for the logical output to be set. This delay value is set in seconds.

Note: The following feedrate limits will appear in the menu only if Feeder Control is enabled (see Main Menu > Advanced Setup > Configuration > Feeder Control).

High Absolute Deviation
If the actual feedrate exceeds the setpoint by this amount for duration longer than the High Deviation Delay value (see below) then the logical output “High Deviation” is set. This limit is set in units of feedrate.

Low Absolute Deviation
If the actual feedrate drops below the setpoint by this amount for duration longer than the Low Deviation Delay value (see below) then the logical output “Low Deviation” is set. This limit is set in units of feedrate.

High Relative Deviation
If the actual feedrate exceeds the setpoint by this percentage for duration longer than the High Deviation Delay value (see below) then the logical output “High Deviation” is set. This limit is set in units of percent.

Low Relative Deviation
If the actual feedrate drops below the setpoint by this percentage for duration longer than the Low Deviation Delay value (see below) then the logical output “Low Deviation” is set. This limit is set in units of percent.

Note: The actual deviation allowed at any given time is calculated as the greater of the High Absolute or the High Relative deviation for High Deviation alarms. It is the lesser of the Low Absolute or the Low Relative for Low Deviation alarms.

High Deviation Delay
This value provides a delay for the High Deviation limits, in order to prevent nuisance alarms. The feedrate must remain above the limit value for duration as long as this delay value for the logical output to be set. This delay value is set in seconds.

Low Deviation Delay
This value provides a delay for the Low Deviation limits, in order to prevent nuisance alarms. The feedrate must remain below the limit value for duration as long as this delay value for the logical output to be set. This delay value is set in seconds.
Weight
The following settings are available for Weight limits:

| High Weight | ↑ |
| Low Weight |   |
| High Weight Delay |   |
| Low Weight Delay | ↓ |

**High Weight**
If the actual weight exceeds this limit for duration longer than the High Weight Delay value (see below) then the logical output “High Weight” is set. This limit is set in units of weight.

**Low Weight**
If the actual weight drops below this limit for duration longer than the Low Weight Delay value (see below) then the logical output “Low Weight” is set. This limit is set in units of weight.

Note this limit is only active under the following conditions:
- Feeder Control is enabled (see Main Menu > Advanced Setup > Configuration > Feeder Control) and the feeder is commanded to run.
- No calibration routine is running.
- The Feeder is not in “Cleanout”

**High Weight Delay**
This value provides a delay for the High Weight limit, in order to prevent nuisance alarms. The weight must remain above the limit value for duration as long as this delay value for the logical output to be set. This delay value is set in seconds.

**Low Weight Delay**
This value provides a delay for the Low Weight limit, in order to prevent nuisance alarms. The weight must remain below the limit value for duration as long as this delay value for the logical output to be set. This delay value is set in seconds.

Setpoint
The following settings are available for Setpoint limits:

Note: The following setpoint limits will appear in the menu only if Feeder Control is enabled (see Main Menu > Advanced Setup > Configuration > Feeder Control).
Max Rate Setpoint
This is the maximum allowed setpoint, and the logical output “High Setpoint” will be set if it is exceeded for longer than the duration set by the limit “Max Rate SP Delay” (see below). This limit is set in units of feedrate.

Note also that if setpoint clamping is enabled (see Main Menu > Advanced Setup > Feeder Control > Settings), the setpoint used by the controller will be clamped to this limit value even if it exceeded. However, in this case the logical output “High Setpoint” will still be set.

Min Rate Setpoint
This is the minimum allowed setpoint, and the logical output “Low Setpoint” will be set if the setpoint drops below this limit for longer than the duration set by the limit “Min Rate SP Delay” (see below). This limit is set in units of feedrate.

Note also that if setpoint clamping is enabled (see Main Menu > Advanced Setup > Feeder Control > Settings), the setpoint used by the controller will be clamped to this limit value even if it drops below. However, in this case the logical output “Low Setpoint” will still be set.

Max Rate SP Delay
This value provides a delay for the High Rate Setpoint limit, in order to prevent nuisance alarms. The feedrate setpoint must remain above the limit value for duration as long as this delay value for the logical output to be set. This delay value is set in seconds.

Min Rate SP Delay
This value provides a delay for the Low Rate Setpoint limit, in order to prevent nuisance alarms. The feedrate setpoint must remain below the limit value for duration as long as this delay value for the logical output to be set. This delay value is set in seconds.

Drive Demand
The following settings are available for Drive Demand limits:

Note: The following setpoint limits will appear in the menu only if Feeder Control is enabled (see Main Menu > Advanced Setup > Configuration > Feeder Control ).
Max Drive Demand

If the actual drive demand (i.e. controlled variable, or “CV”) exceeds this limit for duration longer than the Max Drive Demand Delay value (see below) then the logical output “High PID CV” is set. This limit is set in units of percent.

Note also that if drive demand clamping is enabled (see Main Menu > Advanced Setup > Feeder Control > Settings), the drive demand generated by the controller will be clamped to this limit value even if the PID calculation yields a larger value. However, in this case the logical output “High PID CV” will still be set.

Min Drive Demand

If the actual drive demand drops below this limit for duration longer than the Min Drive Delay value (see below) then the logical output “Low PID CV” is set. This limit is set in units of percent.

Note this limit is only active under the following conditions:

- Feeder Control is enabled (see Main Menu > Advanced Setup > Configuration > Feeder Control) and the feeder is commanded to run.

Note also that if drive demand clamping is enabled (see Main Menu > Advanced Setup > Feeder Control > Settings), the drive demand generated by the controller will be clamped to this limit value even if the PID calculation yields a smaller value. However, in this case the logical output “Low PID CV” will still be set.

Max Drive Demand Delay

This value provides a delay for the Max Drive Demand limit, in order to prevent nuisance alarms. The drive demand must remain above the limit value for duration as long as this delay value for the logical output to be set. This delay value is set in seconds.

Min Drive Demand Delay

This value provides a delay for the Min Drive Demand limit, in order to prevent nuisance alarms. The drive demand must remain below the limit value for duration as long as this delay value for the logical output to be set. This delay value is set in seconds.
Load Cells

(Main Menu > Advanced Setup > Load Cells)

Selecting this menu item, you will be presented with the following menu:

<table>
<thead>
<tr>
<th>Function…</th>
<th>↑</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numeric Data…</td>
<td>↓</td>
</tr>
</tbody>
</table>

**Function**

The following menu lists all the available functions for the load cell functionality.

<table>
<thead>
<tr>
<th>First Only</th>
<th>↑</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Input</td>
<td></td>
</tr>
<tr>
<td>From Network</td>
<td>↓</td>
</tr>
</tbody>
</table>

**First Only**

Only one load cell, or group of load cells in parallel, is connected and they are connected to Load Cell Channel 1 on the GCM. This is the most basic level of functionality with no special features.

**Analog Input**

Load information is generated by an analog input. Note that the load value must be calibrated using an analog input calibration procedure. Negative load values on the analog input are not allowed and are replaced with zero.

This setting is most commonly used when there is a weight transmitter available with a high level (i.e. 4-20mA) analog output representing weight.

**From Network**

Load information is written to the GCM by means of communications. Note that the load value must be written as a floating point number in engineering units.

This setting can be used when there are no load cells but there is a signal available from the Network that represents weight.
Numeric Data

The following menu lists numeric settings that affect load cell functionality.

<table>
<thead>
<tr>
<th>Scale Factor 1</th>
<th>↑</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero Load 1</td>
<td>↓</td>
</tr>
</tbody>
</table>

Scale Factor 1

This is the calibration factor associated with load cell 1. This value is basically the number of A/D counts associated with one unit of weight, and is typically the result of a calibration procedure. It is not normally entered by the user, but may be done if it is known.

Zero Load 1

This is the zero load (i.e. when hopper is empty) associated with load cell 1. This value is the average empty weight as observed by the load cell, and is typically the result of a zero procedure. It is not normally entered by the user, but may be done if it is known. This value is in units of weight.

Note: If the feeder is re-calibrated then this value may change.

Process Control

(Main Menu > Advanced Setup > Process Control)

Note: This entire menu will not appear unless Feeder Control is enabled (see Main Menu > Advanced Setup > Configuration).

Selecting this menu item, you will be presented with the following menu:

<table>
<thead>
<tr>
<th>PID…</th>
<th>↑</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accel/Decel…</td>
<td></td>
</tr>
<tr>
<td>Filters…</td>
<td></td>
</tr>
<tr>
<td>Stability Params…</td>
<td></td>
</tr>
<tr>
<td>Fill Control…</td>
<td></td>
</tr>
<tr>
<td>Cleanout Control…</td>
<td></td>
</tr>
<tr>
<td>FeedFactor…</td>
<td>↓</td>
</tr>
</tbody>
</table>
PID

Selection of this menu item shows you the list of parameters that are the settings for conventional PID (Proportional plus Integral plus Derivative) control and their current value. PID is the control action that enables the Genetix to maintain the desired setpoint, by constantly striving to minimize the deviation between the setpoint and the process variable (i.e. Feedrate). The PID algorithm uses the deviation to calculate a new Drive Demand to bring the feeder to the setpoint.

A complete description of how PID control action works is beyond the scope of this Manual, but a brief description of each term is provided below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportional Gain</td>
<td>The Proportional Gain (or sensitivity) is the closed loop gain, expressed in percent (%). This setting affects all three PID components (Proportional, Integral and Derivative). The higher the value of Proportional Gain, the harder the controller will react to a deviation from setpoint. Note: Proportional control by itself can result in stable control, but the feeder will likely always be offset from the setpoint. Too much Gain and the control action will oscillate. Too little Gain and the control action may be very slow to respond. Note: The Gain parameter can be changed automatically if Automatic PID tuning is turned on (see Main Menu &gt; Advanced Setup &gt; Feeder Control &gt; Settings &gt; AutoPID)</td>
</tr>
<tr>
<td>Integral</td>
<td>The PID Integral component uses the accumulated (integrated) deviation over time to adjust the Drive Demand signal. The Integral parameter, expressed in units of s⁻¹ (i.e. 1/s) determines how fast the accumulation takes place. The Integral function will, over time, make the deviation go to zero, assuming everything else is in steady state. Essentially this means that the longer time passes with the feeder not at setpoint, the larger the sum of the deviation becomes over time, and the more control action that is applied to the Drive Demand signal. The Integral function may be disabled by setting this parameter to zero, but this is not recommended as it will usually result in very poor control, or a feeder that never comes to setpoint.</td>
</tr>
<tr>
<td>Derivative</td>
<td>The PID Derivative component uses the rate of change (the trend) of the deviation to adjust the Drive Demand signal. The Derivative parameter, expressed in seconds determines the sensitivity to trend changes. The Derivative function will react earliest to deviations.</td>
</tr>
</tbody>
</table>
The Derivative function can be disabled by setting this parameter to zero, but this is not recommended as it will usually result in poor control. However, only a little Derivative action is typically required, so this setting is normally fairly low.

Note: The effects of all three of the above terms are combined to produce the total change to the Drive Demand signal. Thus, they all interact to some degree. Settings for all three parameters will vary from feeder to feeder and will also depend on the nature of your process.

**Accel/Decel**

Selection of this menu item shows you the settings that allow you to control how rapidly the Drive Demand signal is allowed to change, and therefore provide a certain amount of dynamic output protection. These parameters are set in percent/second (%/s). For example, a setting of 100 allows the Drive Demand signal to change from 0 to maximum in 1 second.

Max Accel
Max Decel

Note: Setting these parameters too low can defeat the settings of the PID control and result in very slow response. Normally the factory settings should produce reasonable results.

Also note that many drives (especially Variable Frequency Drives or Inverters) have their own settings for Acceleration and Deceleration and these should always be verified as part of the feeder setup process. Again, if the drive Accel/Decel parameters are set too low, this can defeat the settings of the PID control.

**Filters**

Filters are a means of averaging certain process data to improve the smoothness of the control or to compensate for “noisy” data. The averaging is performed by means of a sliding average, and the extent of the averaging can be set by the number of “slots”. The following process parameters have filtering available. They are described along with their effects on the control system.

Auto Filter Factor
Weight
Loss
PID Rate
Setpoint

**Auto Filter Factor**
This factor controls how much adjustment is made automatically to certain filter settings. Baseline averaging and loss filter settings are established when you run the Feeder Dynamics procedure (see Main Menu > Calibration > Feeder Dynamics). Actual Loss and PID Rate, and Weight (below) are multiplied by Auto Filter Factor at the start of Fill, if Auto Filter Allowed is enabled (see Main Menu > Advanced Setup > Feeder Control > Settings > Auto Filter Allowed). The value will increase or decrease based on gathered Signal Quality statistics. It is then clamped between 0.2 and 5. The purpose is to keep Signal Quality at a reasonable level.

Note: This parameter is only visible if “Auto Filter Allowed” is enabled (see Main Menu > Advanced Setup > Feeder Control > Settings > Auto Filter Allowed)

**Weight**

Number of data points used to calculate the Average Weight from Net Weight. Will be overwritten (and cannot be changed manually) if Auto Filter Allowed is turned on (see Main Menu > Advanced Setup > Feeder Control > Settings > Auto Filter Allowed). The range for this parameter is 0 to 255.

**Loss**

Number of data points used to calculate the Average Loss (weight lost per unit time). Will be overwritten (and cannot be changed manually) if Auto Filter Allowed is turned on (see Main Menu > Advanced Setup > Feeder Control > Settings > Auto Filter Allowed). The range for this parameter is 0 to 255.

**PID Rate**

Number of data points used to average the Raw Loss (weight lost per unit time) to be used by the PID controller. Will be overwritten (and cannot be changed manually) if Auto Filter Allowed is turned on (see Main Menu > Advanced Setup > Feeder Control > Settings > Auto Filter Allowed). The range for this parameter is 0 to 255.

**Setpoint**

In some cases the setpoint signal as received from the remote system is unusable because it is too noisy. Therefore it also possible to average the setpoint before it goes to the PID control algorithm. This is also a sliding average, settable between 0 and 32 slots.

### Stability Params

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Samples</td>
<td>↑</td>
</tr>
<tr>
<td>Allowable Span</td>
<td></td>
</tr>
<tr>
<td>Feedrate Span Samples</td>
<td></td>
</tr>
<tr>
<td>Max Feedrate Span</td>
<td>↓</td>
</tr>
</tbody>
</table>
No. of Samples (see below)

Allowable Span

The above parameters are used in Zero and Weight Calibration procedures and Dynamic Tuning (see Main Menu > Calibration > Feeder Dynamics) to determine weight stability. The Net weight may not change more than Allowable Span for No. of Samples for the signal to be considered (by the controller) to be stable.

Feedrate Span Samples (see below)

Max Feedrate Span

The above parameters are used in Dynamic Tuning (see Main Menu > Calibration > Feeder Dynamics) and feeder control to assess the credibility of the PID Rate samples and to determine Signal Quality. The spread over the last Feedrate Span Samples is calculated and compared to Max Feedrate Span. If it is greater, Quality is Zero and the PID rate value in considered not credible). If it is less, Quality is calculated based Max Feedrate Span and actual spread.

FeedFactor

<table>
<thead>
<tr>
<th>FeedFactor</th>
<th>↑</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum FF</td>
<td></td>
</tr>
<tr>
<td>Minimum FF</td>
<td></td>
</tr>
<tr>
<td>Max Step Allowed</td>
<td></td>
</tr>
<tr>
<td>FF Apply %</td>
<td></td>
</tr>
<tr>
<td>Hi FF Hold off Time</td>
<td></td>
</tr>
<tr>
<td>HiFF Stop %</td>
<td></td>
</tr>
<tr>
<td>LoFF Start %</td>
<td></td>
</tr>
<tr>
<td>Fill FF Max Adjust</td>
<td></td>
</tr>
<tr>
<td>Fill FF Max Step</td>
<td>↓</td>
</tr>
</tbody>
</table>
FeedFactor

Nominal Drive Demand (CV) required for feeding at Design Feedrate (see Main Menu > Basic Setup > Design Capacities > Design Feedrate). This value will be continuously updated when Signal Quality is high. It is used to set CV when Signal Quality is low. A value less than 100% means that the feeder is capable of feeding more than Design Feedrate. A value greater than 100% indicates that the Feeder is not capable of delivering the Design Feedrate. Typically a Feeder is designed so that it can deliver Design Feedrate at approximately 85% Drive Demand allowing some margin to ensure full capacity.

Maximum FF (see below)
Minimum FF (see below)

Upper and lower absolute limits for FeedFactor. Default 200% and 20%, respectively. These are suitable starting values. When the FeedFactor behavior is known, the limits can be tightened. This would prevent adapting to a partially blocked feeder. The associated logical outputs, High FeedFactor and Low FeedFactor could be set to qualify warnings, indicating problems with feeder efficiency.

Max Step Allowed

Max allowed change in FeedFactor per sample, in percent. Controls how aggressively FeedFactor is updated when Signal Quality is high (see above). Values are typically less than 0.5%. This is a strategy parameter. A low value will make the FeedFactor change slowly, avoiding reaction to short-term control action.

FF Apply %

Damping of the FeedFactor update. Together with Signal Quality, this parameter controls how aggressively FeedFactor is updated. This is a stability related parameter. The longer the filter time, the lower the value.

Hi FF Hold off Time (see below)
Hi FF Stop % (see below)
Lo FF Start % (see below)
Fill FF Max Adjust (see below)
Fill FF Max Step (see below)

All these parameters are related to FeedFactor adjustments when filling. The purpose is to counteract feedrate perturbations after the Fill cycle is completed which could be caused by head pressure effects on the feeding device. By assessing the FeedFactor before and after filling, it is possible to exit the fill cycle with a good CV, avoiding the inherent control action delay incurred by post-filling stabilization time.

The settings switch Use FeedFactor in Fill (see Main Menu > Advanced Setup > Feeder Peripherals > Fill Gate > Settings > Use FeedFactors in Fill) enables adjustment of the FeedFactor, and Learn Feedfactors (see Main Menu > Advanced Setup > Feeder Control > Settings > Learn FeedFactors) allows for automatic adjustment of the underlying parameters, Low FeedFactor (FeedFactor at low weight, near the Heel Weight) and High FeedFactor (FeedFactor at high weight, near the Fill Weight).
Note: The Fill Gate settings will only appear in the Feeder Peripherals menu if a Fill Gate is configured (see Main Menu > Advanced Setup > Configuration > Fill Gate).

When Use FeedFactor in Fill is turned on, the FeedFactor is adjusted during the Fill cycle, based on the hopper weight. The adjustment is limited according to Fill FF Max Adjust. The FeedFactor is used, together with the Feedrate Setpoint, to control the CV during fill cycle. The effect is that CV will change during the fill cycle (while the discharge rate cannot be measured or controlled), assuming that FeedFactor at low weight and FeedFactor at high weight have different values. The CV, then, directly after fill is completed, will ideally produce the correct feedrate.

When Learn Feedfactors is turned on, the governing parameters used for FeedFactor adjustment will be automatically updated. The High FeedFactor is sampled after Hi FF Hold off Time after resumption of normal feeding. The sampling goes on until the hopper weight is below Hi FF Stop %. The percentage is based on the active hopper weight span (Fill Weight – Heel Weight). If Hi FF Stop % is reached before Hi FF Hold off Time is up, no sampling takes place. The Low FeedFactor is sampled from Lo FF Start % until the Heel Weight is reached. Also here the percentage is based on the active hopper weight. If a fill cycle is started by means of a Start Fill command before the Lo FF Start % weight is reached, no sampling takes place. If both FeedFactors were successfully sampled, the underlying parameters are updated. The cycle-to-cycle changes are limited to Fill FF Max Step.

Analog I/O
(Main Menu > Advanced Setup > Analog I/O)

This menu allows you to map the physical Analog Inputs and Analog Outputs to specific logical functions, and to set certain properties for those IO. Physical inputs are those that exist on the installed hardware. Physical inputs accept analog information (such as current or voltage) from external sources, and physical outputs present similar information. The exact number of physical Analog IO points and their form depends on the installed hardware and the Configuration settings (see Main Menu > Advanced Setup > Configuration). Selecting this menu item, you will be presented with the following menu:

```
Inputs…
 Outputs…
```

Inputs
(Main Menu > Advanced Setup > Analog I/O > Inputs)

Selecting Inputs from the Analog I/O menu will present you with the following menu:
Analog In 1
Selection of one of the Analog Inputs above will allow the following settings to be configured:

| Function… | ↑ |
| Calibration… | ↓ |
| Numeric Data… | ↓ |

**Function**
This setting allows you to what process value will be received by this physical input. The options are:

| Feedrate SP | ↑ |
| Oloop SP | ↓ |
| Weight | ↓ |
| Available | ↓ |

**Feedrate SP**
If you select this parameter, the analog input received will be mapped to a value representing the desired feedrate (i.e. the Feedrate setpoint). This will be used to control the feeder if the Feeder Control Method is “Rate Control” (see Main Menu > Advanced Setup > Feeder Control > Method), and the Feeder Control Source is “Remote Analog” (see Main Menu > Advanced Setup > Feeder Control > Source). The data will be scaled according to the Calibration of this analog input and the parameters under Numeric Data (see below).

**Oloop SP**
If you select this parameter, the analog input received will be mapped directly to the Drive Demand output, bypassing all closed loop control. This will be used to control the feeder if the Feeder Control Method is “Open Loop” (see Main Menu > Advanced Setup > Feeder Control > Method), and
the Feeder Control Source is “Remote Analog” (see Main Menu > Advanced Setup > Feeder Control > Source). The data will be scaled according to the Calibration of this analog input and the parameters under Numeric Data (see below).

Weight
If you select this parameter, the analog input received will be mapped to a value representing the actual net hopper weight. This might be useful if the weight is being measured by a sensor that transmits an analog output. The data will be scaled according to the Calibration of this analog input and the parameters under Numeric Data (see below).

Available
Selecting this parameter allows you to read the analog input via a network or serial connection. It is not used by the GCM application. The value will appear in a register in floating point format, which will be scaled according to the Calibration of this analog input and the parameters under Numeric Data (see below).

Note, the name of the register used is GLO.AnaInHijack, the number of which will be dependent on the GCM firmware version. Contact Merrick Customer Support for assistance if necessary.

Calibration
This menu allows you to calibrate the physical analog input for the signal to which it is connected. The options are:

| Snap Low Current | ↑ |
| Snap High Current | ↓ |

Snap Low Current
This allows you to set the GCM for the lowest value that the analog signal will present. You should be connected to the analog signal and have it sending its lowest value. If you select this menu item you will go to a screen that shows the live value of the analog signal. Pressing the Enter key at this point will accept this value as the input to scale to the low end. You must press the Enter key again to confirm.

Snap High Current
This allows you to set the GCM for the highest value that the analog signal will present. You should be connected to the analog signal and have it sending its highest value. If you select this menu item you will go to a screen that shows the live value of the analog signal. Pressing the Enter key at this
point will accept this value as the input to scale to the high end. You must press the Enter key again to confirm.

**Numeric Data**

This menu contains numeric parameters that allow you to scale the analog input to the process value it represents. The parameters are:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High mA</td>
<td>↑</td>
</tr>
<tr>
<td>Full Scale</td>
<td></td>
</tr>
<tr>
<td>Low mA</td>
<td>↓</td>
</tr>
<tr>
<td>Zero</td>
<td></td>
</tr>
</tbody>
</table>

Selecting any of the above parameters brings up the Numeric Data Entry screen that allows you to assign or edit the numeric value.

**High mA**

This is the value that represents the maximum analog signal that will be received. If an analog input calibration has been performed then this value will have been assigned automatically by that process. Alternatively it may be entered directly here.

**Full Scale**

This is the maximum process value that will be assigned to the maximum analog input value. The Full Scale value is entered in engineering units representing the process value. For example if the analog input function is set to Feedrate Setpoint, then this value would be set in units of rate (i.e. lb/min, kg/min).

**Low mA**

This is the value that represents the minimum analog signal that will be received. If an analog input calibration has been performed then this value will have been assigned automatically by that process. Alternatively it may be entered directly here.

**Zero**

This is the minimum process value that will be assigned to the minimum analog input value. The Zero value is entered in engineering units representing the process value. For example if the analog input function is set to Feedrate Setpoint, then this value would be set in units of rate (i.e. lb/min, kg/min).

**Analog In 2**

For this analog input to be present in the menu, a second Expansion Analog Card must be enabled (see Main Menu > Advanced Setup > Configuration > Expansion Analog Card 1 ).

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If present this analog input can be configured exactly as Analog Input 1, above.

**Analog In 3**

For this analog input to be present in the menu, a third Expansion Analog Card must be enabled (see *Main Menu > Advanced Setup > Configuration > Expansion Analog Card 2*).

If present this analog input can be configured exactly as Analog Input 1, above.

**Outputs**

(*Main Menu > Advanced Setup > Analog I/O > Outputs*)

Selecting Outputs from the Analog I/O menu will present you with the following menu:

| Analog Out 1… | ↑ |
| Analog Out 2… |
| Analog Out 3… |
| Analog Out 4… |
| Analog Out 5… |
| Analog Out 6… | ↓ |

**Analog Out 1**

Selection of one of the Analog Outputs above will allow the following settings to be configured:

| Function… | ↑ |
| Numeric Data… | ↓ |

**Function**

This setting allows you to what process value will be transmitted by this physical analog output. The options are:
Drive Demand

This output is used to set the desired speed of the feeder, via the motor speed control (i.e. VFD or SCR drive).

Feedrate

This output transmits the actual feedrate, i.e. to an analog rate meter or chart recorder.

Weight

This output transmits the actual net weight in the hopper.

Setpoint

This output transmits the actual setpoint. Note that this setpoint may be received from several sources (i.e. Local, Network, Remote Analog, etc.).

Available

Selecting this parameter allows you to write a value to the analog output via a network or serial connection, which will then be sent out the physical analog output. It is not used by the GCM application. The value is written to a register in floating point format, which will be scaled according to the parameters under Numeric Data (see below).

Note the name of the register used is GLO.AnaOutHijack, the number of which will be dependent on the GCM firmware version. Contact Merrick Customer Support for assistance if necessary.

Numeric Data

This menu contains numeric parameters that allow you to scale the analog output to the process value it represents. The parameters are:
Selecting any of the above parameters brings up the Numeric Data Entry screen that allows you to assign or edit the numeric value.

**High mA**
This is the value that represents the maximum analog signal that will be sent. It is entered in mA (milliamperes). Note the range is nominally 4-20mA, but it is possible to enter numbers outside this range if the connected device cannot be calibrated.

**Full Scale**
This is the maximum process value that will be assigned to the maximum analog output value. The Full Scale value is entered in engineering units representing the process value. For example if the analog output function is set to Feedrate, then this value would be set in units of rate (i.e. lb/min, kg/min).

**Low mA**
This is the value that represents the minimum analog signal that will be sent. It is entered in mA (milliamperes). Note the range is nominally 4-20mA, but it is possible to enter numbers outside this range if the connected device cannot be calibrated.

**Zero**
This is the minimum process value that will be assigned to the minimum analog output value. The Zero value is entered in engineering units representing the process value. For example if the analog output function is set to Feedrate, then this value would be set in units of rate (i.e. lb/min, kg/min).

**Digital I/O**
*(Main Menu > Advanced Setup > Digital I/O)*
This menu allows you to map the physical Digital Inputs and Digital Outputs to specific logical functions, and to set certain properties for those IO. Physical inputs are those that exist on the installed hardware. Physical inputs accept digital information (such as contact closures) from external sources, and physical outputs present similar information. The exact number of physical IO points and their form depends on the installed hardware and the Configuration settings (see *Main Menu > Advanced Setup > Configuration*).
Logical inputs are events that occur within the Genetix controller that typically cause some action to take place. An example of a Logical input for a feeder would be “Run Permission”, which is required to make the feeder run. For this permission to come from an outside source, this Logical input must be mapped to a Physical input, and then that physical input connected to the external source.

Logical outputs are events that happen within the Genetix controller that are usually the result of some action or process. An example of a Logical output for a feeder would be “Running”, which indicates that the feeder is actually running. For an outside source to be informed of this event, this Logical output must be mapped to a Physical output, and then the Physical output connected to the outside source.

Note: Mapping of Digital I/O and settings will normally take place at the Merrick factory based on your specific requirements and wiring details. Changes should be made carefully, as there is generally external equipment involved that may start, stop, open, close, etc. unexpectedly. No changes should be made unless all equipment is secure and no personnel are at risk.

If you have any doubts about this process, contact the Merrick Customer Service department for assistance.

When you select “Digital I/O” you will be presented with another menu as follows:

| Inputs… | ↑ |
| Outputs… | ↓ |
| Warnings/Faults… | |
| Forces… | |
| Inverted IO… | |

**Inputs**

This menu item allows you to map the Logical Inputs to the available physical inputs. One Physical input may be mapped to multiple Logical inputs, allowing one external physical event to trigger many internal logical events.

Selecting “Inputs” will present you with a list of all the current Logical Inputs, along with the Physical input they are currently mapped to, if any.

Selecting a Logical input from the list, by pressing the Enter key, brings up the list of available Physical inputs to which they may be mapped. Again, note that the list of Physical inputs will depend on installed hardware and Configuration settings.

Note there are “special” Physical inputs that are used that don’t actually represent hardware. In some cases it is desired to turn a logical function permanently on or permanently off. Two special physical inputs are available for this, “Always On”, and “Always Off”.

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The list of all possible Logical inputs varies by application and so is not presented here. Also, the Configuration settings will cause specific Logical inputs to appear or disappear from this menu. Consult the Appendices to this Manual, or contact the Merrick Customer Service department for assistance.

**Outputs**

This menu allows you to map the Physical outputs to the Logical outputs. One Logical Output may be mapped to multiple Physical outputs, allowing one internal event to be sent to multiple external processes.

Selecting “Outputs” will present you with a list of all the current Physical outputs, along with the Logical output they are currently mapped to, if any. Again, note that the list of Physical outputs will depend on installed hardware and Configuration settings.

Selecting a Physical output from the list, by pressing the Enter key, brings up the list of available Logical outputs to which they may be mapped.

Note there are “special” Logical outputs available. In some cases it is desired to turn a Physical output permanently on or permanently off. Two special Logical outputs are available for this, “Always On”, and “Always Off”.

The list of all Logical outputs varies by application and so is not presented here. Also, the Configuration settings will cause specific Logical outputs to appear or disappear from this menu. Consult the Appendices to this Manual, or contact the Merrick Customer Service department for assistance.

**Warnings/Faults**

This menu item allows you to set a specific property for any Logical input or Logical output.

Setting an input or output to “Warning” causes an annunciation (display) whenever that logical event occurs. Warnings are displayed (see Main Menu > Warnings), but cause no further action.

Setting an input or output to “Fault” causes the feeder to “trip” (stop) and an annunciation. The feeder cannot resume until the fault condition is cleared (see Main Menu > Warnings).

Selecting “Warnings/Faults” shows the following menu

| Logical Inputs… | ↑ |
| Logical Outputs… | ↓ |

Select one of the above items to show the desired list. Select a Logical I/O point from the list by pressing the Enter key, and you will see the following options:
By selecting one of the above items, you may set the Logical I/O property as described above.

**Forces**

Physical I/O points may be forced to be On or to be Off. An I/O point thus set will be permanently set to that state overriding all other conditions. For example, if a Logical output is mapped to a Physical output and the Physical output is forced to be On, the physical state of the output will be on ("energized"), regardless of the state of the Logical output which is unaffected and may be On or Off depending on the process or other conditions.

However, if a Physical input is mapped to a Logical input and the Physical input is forced On, then the resulting Logical input will also be turned On. Likewise if a Physical input is forced Off, then it will be off and all Logical inputs mapped to it will be off, regardless of the physical state of the Physical input.

Any Physical I/O point that is forced On or Off will remain so until reset with this menu.

If you select “Forces” you will be presented with the following menu:

| Physical Inputs… | ↑ |
| Physical Outputs… | ↓ |

Select one of the above items to show the respective list. Select a Physical I/O point from the list by pressing the Enter key, and you will see the following options:

| None | ↑ |
| Force OFF | ↓ |

By selecting one of the above items, you may set the Physical I/O property as described above.

Note: Obviously the ability to force Physical I/O On or Off is a powerful tool, but risky. Changes should be made carefully, as there is generally external equipment
involved that may start, stop, open, close, etc. unexpectedly. No changes should be made unless all equipment is secure and no personnel are at risk.

If you have any doubts about this process, contact the Merrick Customer Service department for assistance.

**Inverted I/O**

Physical I/O points may also be inverted. This simply reverses the logical function of any particular input or output. For example if a Physical output is mapped to a Logical output and the Physical output is inverted, then when the Logical output is On, the Physical output will be Off, and vice versa.

If you select “Inverted I/O” you will be presented with the following menu:

```
Physical Inputs…
Physical Outputs…
```

Select one of the above items to show the respective list. Select a Physical I/O point from the list by pressing the Enter key, and you will see the following options:

```
None
Invert
```

By selecting one of the above items, you may set the Physical I/O property as described above.

**Totalizer**

(Main Menu > Advanced Setup > Totalizer)

Selecting this menu item, you will be presented with the following menu:

```
Weight per EMT Pulse
EMT Pulse Length
```

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Weight per EMT Pulse

This is the value for one pulse of the EMT (external mechanical totalizer) output. The units are those of Weight (i.e. lb or kg). The lower limit is 0.01 and the upper limit is 100,000.

Pulse Length

This is the “on” time in seconds for each pulse that is sent to the EMT (external mechanical totalizer) output. This is settable to allow longer pulses for mechanical totalizers versus electronic. The “off” time will never be less than the “on” time, but may be longer depending on the actual rate of pulses.

Also note that output pulses are buffered so that none are lost. If the Pulse Length and/or the rate of pulses are high enough, its possible that the external totalizer will not be able to keep up with the internal totalizers. However, it will “catch up” and no pulses should be lost. The rate of pulses will depend on the setting for “Weight per EMT Pulse” (see above) and the actual feedrate.

The minimum setting for this parameter is 0.01 seconds and the maximum is 5.0 seconds.

Feeder Peripherals

(Main Menu > Advanced Setup > Feeder Peripherals)

Note: This menu item will only appear if at least one of the following feeder peripherals is enabled (see Main Menu > Advanced Setup > Configuration).

Selection of this menu item will present you with a list of peripheral devices that have been configured, and allow you to set certain parameters that control their functionality.

Only those devices that have been enabled will appear in this menu.

Drive Feedback…

Fill Gate…

Drive Feedback

Note: To enable this item, see Main Menu > Advanced Setup > Configuration > Drive Feedback

Many feeder drives (i.e. VFD, PWM, SCR) have extra digital outputs that can help diagnose drive related problems. By enabling the Genetix “Drive Feedback” feature, additional GCM inputs and outputs are turned on that can be used to improve overall feeder diagnostics by including drive diagnostics. See below for the menu of settings and parameters and descriptions of the I/O functionality.
Settings

The following settings are available for Drive Feedback:

- **Overld Connected**
- **AtSpd Connected**

**Overld Connected**
This is a switch (Y/N) that tells the Genetix that the drive has an overload output and that is connected to a GCM input, which has been mapped to the Logical input “Fdr Drv Overld.”

**AtSpd Connected**
This is a switch (Y/N) that tells the Genetix that the drive has an “At Speed” output and that is connected to a GCM input, which has been mapped to the Logical input “Fdr Drive AtSp”.

Numeric Data

The following parameters are available for Drive Feedback:

- **Overld On Delay**
- **Not at Spd On Delay**

**Overld On Delay**
A time delay, in seconds, between the time the “Fdr Drv Overld” input comes on and the output “Fdr Drive Ovld” comes on. This timer and the output are active even if the drive is not enabled (commanded to run).

**Not at Spd On Delay**
The elapsed time, in seconds, allowed for the drive to come up to speed, once enabled (commanded to run). The “Fdr Drive AtSp” must come on within this set time to prevent the output “Fdr Drive NAS” from turning on.

**Fill Gate**
Note: To enable this item, see Main Menu > Advanced Setup > Configuration > Fill Gate

The following settings control the
Settings

The following settings are available for automatic Fill control:

<table>
<thead>
<tr>
<th>Settings</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Use FeedFactor in Fill</td>
<td>↑</td>
</tr>
<tr>
<td>Use Fill Preact</td>
<td></td>
</tr>
<tr>
<td>Learn Fill Preact</td>
<td>↓</td>
</tr>
</tbody>
</table>

Use FeedFactor in Fill

Controls whether FeedFactors are used to set the Drive Demand (CV) while in a Fill cycle (see Main Menu > Advanced Setup > Process Control > FeedFactor for more information).

Use Fill Preact (see below)

Learn Fill Preact (see below)

These parameters affect whether Fill Preact is used during an automatic Fill cycle, and how it is automatically adjusted. These parameters are only meaningful if “Fill Gate” is configured (see Main Menu > Advanced Setup > Configuration > Fill Gate). See corresponding Numeric Data below for additional information.

Numeric Data

The following parameters are available for automatic Fill control:

<table>
<thead>
<tr>
<th>Numeric Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Fill Time</td>
<td>↑</td>
</tr>
<tr>
<td>Fill Preact</td>
<td></td>
</tr>
<tr>
<td>Max Fill Preact</td>
<td></td>
</tr>
<tr>
<td>Min Fill Preact</td>
<td></td>
</tr>
<tr>
<td>Max Fill Preact Change</td>
<td>↓</td>
</tr>
</tbody>
</table>

Max Fill Time

This is the maximum time allowed for a Fill cycle. If a Fill cycle has not completed by the time this timer has expired, the Logical Output “Slow Fill” is
set, and Feedrate indication switches from an inferred to a Raw Loss based value (i.e. based on the rate of material being discharged).

**Fill Preact** (see below)

**Max Fill Preact** (see below)

**Min Fill Preact** (see below)

**Max Fill Preact Change** (see below)

“Fill Preact” is the early fill gate shut-off in weight units, sometimes called “in-flight compensation”. This amount is deducted from the Fill Weight and will be used to shut the Fill Gate (or turn the filling device off) early, allowing whatever material is still entering the Feeder to complete the Fill process. This parameter has no effect if a Fill Gate is not configured (see Main Menu > Advanced Setup > Configuration > Fill Gate). “Fill Preact” is automatically updated if “Learn Fill Preact” switch is enabled. It is used only if “Use Fill Preact” is enabled. “Fill Preact” is limited between “Max Fill Preact” and “Min Fill Preact”. “Max Fill Preact Change” is how much “Fill Preact” is allowed to change each Fill cycle. A positive value makes the Fill Gate output turn off before the Fill Weight is reached (i.e. early).

**Communications**

(Main Menu > Advanced Setup > Communications)

Selecting this menu item, you will be presented with a list of all the available serial communications ports. Each is individually configurable for any of the available communications protocols. The minimum list of available ports will like this:

<table>
<thead>
<tr>
<th>GCM Port 0 (USB)…</th>
<th>↑</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCM Port 1…</td>
<td></td>
</tr>
<tr>
<td>GCM Port 2…</td>
<td></td>
</tr>
<tr>
<td>Integrity Check…</td>
<td>↓</td>
</tr>
</tbody>
</table>

Note: “Integrity Check” will only appear in this menu if Integrity Checking is enabled (see Main Menu > Advanced Setup > Configuration > Integrity Check).

When you select any of the above ports you will be presented with another menu like this:
Protocol
There are several different serial protocols available for different kinds of communications tasks. Each is listed below with a brief description of its intended use. Note, not all protocols are available on all ports.

Note: A complete discussion of these protocols details of how to use them for communications with the Genetix controllers is beyond the scope of this Manual. If you require assistance, contact the Merrick Customer Support department or see www.merrick-inc.com/mct

UI Protocol
This is a special protocol developed by Merrick for communications between a User Interface and the GCM board. If you have a Merrick User Interface
connected to a serial port, then that port must be set to “UI Protocol”. This is a binary protocol.

Note: If you change this setting via the User Interface, then you may lose communication and not be able to change it back. Make sure you know which port (if any) is connected to the User Interface and don’t inadvertently change its settings.

**ScaleNet**

This is a protocol developed by Merrick for the exchange of information between a computer and the Genetix controller. It is a “Master/Slave” protocol wherein the master requests information or an action and the slave responds. Typically the master is a computer (PC), and the slave is the Genetix controller. It is also possible to use this protocol in a “multi-drop” configuration (i.e. RS-422/RS-485) that allows one master to talk to several slaves (i.e multiple Genetix controllers). Through ScaleNet, you may have access to all parameter data in the Genetix controllers. ScaleNet is an ASCII protocol.

The ScaleNet protocol, although proprietary to Merrick, is published and can be used to develop your own communications interface through programming. The details of this protocol and programming examples are beyond the scope of this manual, but if you require assistance contact the Merrick Customer Support department.

Note: WinMerik® is a program developed by Merrick that runs on a PC and uses the ScaleNet protocol to get parameter data for either logging or archival purposes. If you intend to use WinMerik you must set the appropriate port’s protocol to “ScaleNet”. For more information on the WinMerik application, contact the Merrick Customer Support department.

**DF1**

DF1 is an Allen-Bradley protocol primarily used to communicate with Allen Bradley devices such as PLC’s and DeviceNet interfaces (DNI’s). It exposes a standardized Common Interface Table (CIT), compatible with the A-B “Common Interface File” (CIF) specification. PCCC functions 1 (PLC2 Unprotected Read, 485CIF Read), 8 (PLC2 Unprotected Write, 485CIF Write) and 6 (PLC-2 Diagnostic Status) are supported.

**Modbus RTU**

Genetix controllers support the Modbus RTU communications protocols. They will act as slaves, supporting the Modbus functions 3 (Read Holding Registers) and 16 (Preset Multiple Registers). Function 8, sub function 0 (Return Query Data) is also supported. The master is assumed to maintain a cyclic conversation with the controller, which exposes the Merrick Common Interface Table (CIT), making it possible monitor and supervise the Genetix controller completely.

This protocol is commonly used to interface Genetix controllers with a variety of industrial networks, often with the use of protocol converters. Modbus RTU is a binary protocol.
**Modbus ASCII**

Genetix controllers also support the Modbus protocols as above, in its ASCII form.

**Modbus TCP**

This protocol is again the Modbus protocol, supported in the Genetix as above, encapsulated in TCP/IP format and transported over Ethernet networks. Use of this protocol requires an optional Ethernet converter.

**Monitor**

Monitor is a special protocol developed by Merrick primarily for test and diagnostic purposes. With it, any PC equipped with terminal emulation software can connect to a Genetix controller and receive a tremendous amount of data for diagnostic purposes.

Note: The terminal emulator must be capable of, and set for VT-52 emulation

**None**

Selecting “None” for a communications protocol effectively shuts off that port, disabling all communications functions.

**Baudrate**

This is the communications data rate in bits per second. Master and slave devices must have the same setting for communications to take place. Baudrate must be selected from one of the following settings: 2400, 4800, 9600, 19200, 38400, 57600, 115200, and 230400.

**Parity**

Parity provides basic error detection for serial communications. Master and slave devices must have the same setting for communications to take place. Parity must be selected from one of the following settings: None, Odd, Even.

**Data bits**

This is the number of data bits used to represent one byte of data. Master and slave devices must have the same setting for communications to take place. Data bits must be selected from one of the following settings: 7, 8.

**Stop Bits**

This is the number of stop bits used at the end of the data. Master and slave devices must have the same setting for communications to take place. Stop bits must be selected from one of the following settings: 1, 2.
**Numeric Data**

These are various numeric parameters that support or modify serial communications. Not all the parameters in this list will appear depending on the protocol selected.

<table>
<thead>
<tr>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Address</td>
</tr>
<tr>
<td>Start Code</td>
</tr>
<tr>
<td>End Code</td>
</tr>
<tr>
<td>Communication Timeout</td>
</tr>
<tr>
<td>Comm Data Mapping</td>
</tr>
<tr>
<td>Write Protection</td>
</tr>
<tr>
<td>Byte (Word) Order</td>
</tr>
<tr>
<td>Integer/Frac FP</td>
</tr>
<tr>
<td>Register Tag 1</td>
</tr>
<tr>
<td>Register Tag 2</td>
</tr>
<tr>
<td>Register Tag 3</td>
</tr>
<tr>
<td>Register Tag 4</td>
</tr>
<tr>
<td>Register Tag 5</td>
</tr>
<tr>
<td>Use LRC</td>
</tr>
</tbody>
</table>

**Unit Address**

The Unit Address is a number that uniquely identifies the controller. It is typically embedded in communications telegrams so that each GCM knows who is to respond to which telegram. The lowest address is always one (1), and the highest depends on the protocol selected. The default address is 1, but this may change if there are multiple controllers connected to one network or serial communications bus (i.e. RS-485).

If multiple Genetix GCM’s are connected to one Genetix Color User Interface, each connected GCM must have a sequential Unit Address, starting at one (1).

If multiple Genetix GCM’s are connected to one network protocol converter, each GCM must have a unique Unit Address, but they need not necessarily start at one (1), although this is typically the case.
The Unit Address is port and protocol specific. For example, it is possible to have a Unit Address on port 1 that is different from the Unit Address on port 2, along with different protocols.

Selecting this parameter from the Numeric Data menu will bring up the Numeric Data Entry screen that will allow you to enter the desired Unit Address. This should be done after selecting the correct protocol (see above).

Start Code
Some protocols use Start Codes and End Codes to identify the beginning and end of a telegram. The Start Code parameter will only appear in the Numeric Data list if “ScaleNet” has been selected as the protocol. The default value for this is 10, and this should probably not be changed. Certain Merrick applications (i.e. WinMerik®) expect this parameter to be set to 10.

Selecting this parameter from the Numeric Data menu will bring up the Numeric Data Entry screen that will allow you to enter the desired Start Code. This should be done after selecting the correct protocol (see above).

End Code
Some protocols use Start Codes and End Codes to identify the beginning and end of a telegram. The End Code parameter will only appear in the Numeric Data list if “ScaleNet” has been selected as the protocol. The default value for this is 13, and this should probably not be changed. Certain Merrick applications (i.e. WinMerik®) expect this parameter to be set to 13.

Selecting this parameter from the Numeric Data menu will bring up the Numeric Data Entry screen that will allow you to enter the desired Start Code. This should be done after selecting the correct protocol (see above).

Communication Timeout
This is the maximum amount of time that the GCM will wait for a valid incoming telegram (message). If a valid telegram is not received within this time period, a communications timeout error will occur, and an appropriate logical output will be set (i.e. “Port x Timeout”). This value is set in seconds. A value of zero (0) will effectively disable this parameter and a timeout error will never occur.

This parameter is valid and will appear in the Numeric Data menu only if one of the following protocols is selected:

- UI Protocol
- ScaleNet
- DF1
- Modbus RTU
- Modbus ASCII
- Modbus TCP
Selecting this parameter from the Numeric Data menu will bring up the Numeric Data Entry screen that will allow you to enter the desired Timeout period. This should be done after selecting the correct protocol (see above).

Comm Data Mapping

There are two Common Interface Tables (CIT’s) available for communications use, “Small” and “Large”. They represent a data structure containing some fixed elements and some that you can configure. The small data map (CIT) is exactly the same as previous Merrick controllers (i.e. MC³) to maintain compatibility. The large data map exposes some additional data and can be used in more complex systems. For a complete description of the CIT, please see our website at www.merrick-inc.com/mct

This parameter is valid and will appear in the Numeric Data menu only if one of the following protocols is selected:

- ScaleNet
- DF1
- Modbus RTU
- Modbus ASCII
- Modbus TCP

Selecting this parameter from the Numeric Data menu will bring up a screen that will allow you to select either the small (default) or large data map. This should be done after selecting the correct protocol (see above).

Write Protection

This parameter allows you to protect certain data in the data map from being overwritten. The write protection property should be set when a register is tagged for monitoring only. When writing to words that are write protected, the corresponding Tag n W value changes accordingly, but the corresponding MC³ register (Tag n R Value) is unaffected. This is useful for testing data transfers to the GCM before they are implemented, or when you need to change a variable only at certain instances. Individual data may be write-protected or not. Typical values for this parameter are:
<table>
<thead>
<tr>
<th>Value</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>4095 (0xFFF)</td>
<td>All values write protected</td>
</tr>
<tr>
<td>3071 (0xBFF)</td>
<td>All values except Primary Setpoint write protected.</td>
</tr>
<tr>
<td>0000 (0x000)</td>
<td>No values write protected</td>
</tr>
</tbody>
</table>

This parameter is valid and will appear in the Numeric Data menu only if one of the following protocols is selected:
- ScaleNet
- DF1
- Modbus RTU
- Modbus ASCII
- Modbus TCP

Selecting this parameter from the Numeric Data menu will bring up the Numeric Data Entry screen that will allow you to enter the desired Write Protection value. This should be done after selecting the correct protocol (see above).

Note that this parameter can also be changed via communications, using the data map. This can be useful if only certain data needs to be written and/or only at certain times.

For additional assistance contact the Merrick Customer Support department or see our website [www.merrick-inc.com/mct](http://www.merrick-inc.com/mct)

**Word Order**

The Word Order Bit, when set, reverses the order of the two words that contains value information. To correctly transfer floating-point values to and from some PLC’s these bits may have to be set. Typical values are 4095 (0xFFF) for Siemens S5 & S7, Allen-Bradley PLC-5 and SLC PLC’s, and 0 for the Modicon and Allen-Bradley ControlLogix family of PLC’s.

This parameter is valid and will appear in the Numeric Data menu only if one of the following protocols is selected:
- ScaleNet
- DF1
- Modbus RTU
- Modbus ASCII
• Modbus TCP

Selecting this parameter from the Numeric Data menu will bring up the Numeric Data Entry screen that will allow you to enter the desired Word Order value. This should be done after selecting the correct protocol (see above). Valid values are 0 to 4095 (0xFFF).

Note that this parameter can also be changed via communications, using the data map. For additional assistance contact the Merrick Customer Support department or see our website www.merrick-inc.com/mct

Integer/Frac FP

The Integer/Fraction bits are used when the device using the data (i.e. the PLC) does not support floating-point numbers. With the corresponding Word Order bit cleared, the first word will carry the Integer part, and the second the fractional part, multiplied with 10000. (4 implied decimal places). Note that for a negative value, both the integer and fractional parts are negative. The range for each part is -32768 to 32767.

This parameter is valid and will appear in the Numeric Data menu only if one of the following protocols is selected:

• ScaleNet
• DF1
• Modbus RTU
• Modbus ASCII
• Modbus TCP

Selecting this parameter from the Numeric Data menu will bring up the Numeric Data Entry screen that will allow you to enter the desired Integer/Frac FP value. This should be done after selecting the correct protocol (see above). Valid values are 0 to 4095 (0xFFF).

Note that this parameter can also be changed via communications, using the data map.

For additional assistance contact the Merrick Customer Support department or see our website www.merrick-inc.com/mct

Register Tag 1

This is a register location (i.e. register number) in the GCM to be tagged for reading and/or writing. Registers are memory locations containing various data; almost any parameter in the GCM can be accessed by tagging it. Up to 5 registers can be accessed in this manner, through the small data map (CIT). The large data map exposes more data but in a different manner.

This parameter is valid and will appear in the Numeric Data menu only if one of the following protocols is selected:

• ScaleNet
- DF1
- Modbus RTU
- Modbus ASCII
- Modbus TCP

Selecting this parameter from the Numeric Data menu will bring up the Numeric Data Entry screen that will allow you to enter the desired register number to be tagged. This should be done after selecting the correct protocol (see above).

Note: In order to select the register number corresponding to the data you want to access, you will need a register list for your GCM application. Contact the Merrick Customer Support department for assistance.

Register Tag 2
See Register Tag 1, above.

Register Tag 3
See Register Tag 1, above.

Register Tag 4
See Register Tag 1, above.

Register Tag 5
See Register Tag 1, above.

Use LRC
If DF-1 is the selected protocol, you have the option of using either LRC (Longitudinal Redundancy Check) or CRC (Cyclic Redundancy Check) error checking. CRC is the most common, and is the default. Some older PLC’s can only accommodate LRC, however.

If you are using an Allen-Bradley DNI (DeviceNet Interface), this parameter should be set to CRC.

Selecting this parameter from the Numeric Data menu will bring up a screen that will allow you to select either CRC or LRC error checking. This should be done after selecting the correct protocol (see above).

Integrity Check
For this item to appear in the Comms menu, it must be enabled (see Main Menu > Advanced Setup > Configuration > Integrity Check)
Source

Determines what is used to verify that the remote device (Master) is actively communicating. There are 7 alternatives:

<table>
<thead>
<tr>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forgiveness Timeout</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Port 0 Comms Timeout</th>
<th>🔄</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port 1 Comms Timeout</td>
<td></td>
</tr>
<tr>
<td>Port 2 Comms Timeout</td>
<td></td>
</tr>
<tr>
<td>Port 0 Toggle Bit Timeout</td>
<td></td>
</tr>
<tr>
<td>Port 1 Toggle Bit Timeout</td>
<td></td>
</tr>
<tr>
<td>Port 2 Toggle Bit Timeout</td>
<td></td>
</tr>
<tr>
<td>LogInp Toggle Bit Timeout</td>
<td>📢</td>
</tr>
</tbody>
</table>

**Port 0 Comms Timeout**

No valid communications telegrams have been received on port 0 (USB), within the Forgiveness Timeout period.

**Port 1 Comms Timeout**

No valid communications telegrams have been received on port 1 (RS232/RS485), within the Timeout period.

**Port 2 Comms Timeout**

No valid communications telegrams have been received on port 2 (RS232/RS485), within the Timeout period.

**Port 0 Toggle Bit Timeout**

The toggle bit has not changed state on port 0 (USB). The toggle bit is received in CIT control word (word 44), bit 7, and echoed on CIT status word (word 16) bit 7. The Master is assumed to invert this bit on a regular basis. If it does not within the Forgiveness Timeout period, it is assumed to be lost.

**Port 1 Toggle Bit Timeout**

The toggle bit has not changed state on port 1 (RS232/RS485).

**Port 2 Toggle Bit Timeout**

The toggle bit has not changed state on port 2 (RS232/RS485).
LogInp Toggle Bit Timeout
The Logical Input Master Toggle has not changed state. Master Toggle is echoed to Logical Output Toggle In Echo. The Master is assumed to invert this input on a regular basis. If it does not within the Forgiveness Timeout period, it is assumed to be lost.

Forgiveness Timeout
Max allowed Master inactivity time before the Master is assumed to be lost and Master Lost Logical Output goes on. Set in seconds

Date & Time
(Main Menu > Advanced Setup > Date & Time)
Selecting this menu item, you will be presented with the following menu:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hour</td>
<td>↑</td>
</tr>
<tr>
<td>Minute</td>
<td></td>
</tr>
<tr>
<td>Day</td>
<td></td>
</tr>
<tr>
<td>Month</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>↓</td>
</tr>
</tbody>
</table>

Selection of any of the above items brings up the Numeric Data Entry screen allowing the user to set that particular parameter. All parameters are limited appropriately. These data are normally set at the factory, according to the local time zone.

Passwords
(Main Menu > Advanced Setup > Passwords)
Selecting this menu item, you will be presented with the following menu:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Calibration</td>
<td>↑</td>
</tr>
<tr>
<td>Basic Setup</td>
<td></td>
</tr>
<tr>
<td>Advanced Setup</td>
<td></td>
</tr>
<tr>
<td>Direct Param Edit</td>
<td>↓</td>
</tr>
</tbody>
</table>

Selection of any of the first three above items brings up the Numeric Data Entry screen allowing the user to change that particular password. All passwords are 4 digit numbers, settable from “0000” to “9999”. Setting all four digits of any password to zero defeats that password (disables security) for those menus requiring that password.
Note: If you select the “Direct Param Edit” password from the above list, you will be asked to enter this password before being allowed to change it.

**GCM Name**

Each Genetix GCM is allowed to have a unique “friendly” name. This name will be displayed in the top left corner of the User Interface, and may also be used in certain communications modes (i.e. Bluetooth) to identify the feeder you wish to talk to.

The maximum number of characters for this name is 15 and may consist of any alphabetic (upper or lower case) or numeric character, plus some special characters. You may use this name to identify the feeder any way you wish, but the name should be unique at your plant.

To edit the GCM name, select this menu item from the “Advanced Setup” menu to be presented with a screen that looks like this:

![GCM Name Screen](image)

The current name is displayed with the cursor position highlighted. You simply scroll to the correct character with the left/right arrow keys, and then increment/decrement that character with the up/down arrow keys. The value shown (i.e. “Val[66]”) is the decimal ASCII code. The characters in the name are limited to ASCII 32 (space) to 122 (“z”). Note, if you are using Bluetooth, do not embed a space within the name, as this is not allowed by the Bluetooth protocol. All other characters are allowed. If you wish to change an existing name and remove characters from the end, you may erase them by entering a space.

The following may help you enter a name:

- Special characters range from ASCII 32 to 47, 58 to 64, and 91 to 96
- Numbers range from ASCII 48 to 57
Uppercase characters range from ASCII 65 to 90

Lowercase characters range from ASCII 97 to 122

Note that if you have an Extended Communications Card configured (see Main menu > Advanced Setup > Configuration > Expansion Comm Bd ) and are using Bluetooth, the GCM name you enter here becomes the Bluetooth “friendly name”. When power is cycled on the GCM, the current name is written to the Expansion Comm Board (“XDC”). When a Bluetooth scan is performed this is the name that will appear to the scanning device. It is not possible to edit the Bluetooth name directly; you must edit the GCM name, then cycle power.

Direct Param Edit

(Main Menu > Advanced Setup > Direct Param Edit)

Note: This menu item allows you direct editing ability for all the parameters in the Genetix controller with very few constraints. It is for the advanced user or Service Technician only.

Selecting this menu item, you will be presented with a screen asking you for a password. Upon successful entry of the password, you will be presented with a screen like this,

![Direct Param Entry Screen](image)

You may enter the register number you wish to change (upper left corner), by incrementing or decrementing using the up/down arrow keys. and pressing the Enter key. Once the register number is entered (18 as shown above), the cursor will move to the current value, allowing you to edit it. Press the screen in the area of the value and it will bring up the Numeric Data Entry screen, allowing you to edit the value. In order to do this properly, you will probably need a list of registers, which can be provided by Merrick if necessary.
Note: Directly entering register values is very risky, as it is possible to enter a value that will render your Genetix controller inoperative. Again, it is for the advanced user or Service Technician only.

Configuration

(Main Menu > Advanced Setup > Configuration)

This section allows you to configure the Genetix controller for your specific application. By enabling or disabling certain features, you can tailor the control to your feeder and application. Also as you enable or disable features, the User Interface menu system is re-configured automatically making certain items visible or invisible. All features are enabled by setting to yes (“Y”) or disabled by setting to no (“N”).

Selecting this menu item, you will be presented with the following menu:

| Feeder Control | ↑ |
| Load Cell 1    |   |
| Fill Gate      |   |
| DNA Key        |   |
| Expansion IO Bd 1 |   |
| Expansion IO Bd 2 |   |
| Network IO     |   |
| Programmable IO |   |
| Expansion Analog Card 1 |   |
| Expansion Analog Card 2 |   |
| Expansion Comm Bd |   |
| Disable Outs in Cal |   |
| Drive Feedback |   |
| Old XIO        |   |
| Integrity Check |  ↓ |
| Number of GCMs |   |

Each item above also shows its current setting (“Y/N”)
Feeder Control

If this feature is not enabled (is set for “N”), the Genetix cannot function as a feeder, but only as a weigher. To function as a feeder, i.e. to control Feedrate, you must turn this feature on.

Load Cell 1

Turn this feature on if you have one or more load cells connected to GCM Load Cell Channel 1. This is the lower of the two load cell connectors on the GCM board. Note: It is possible to have more than one load cell connected in parallel to a single load cell channel, but load cells connected like this cannot be resolved independently. All load cells connected to a single channel are treated as one.

DNA Key

Some Genetix controllers are provided with a DNA Key interface that allows certain data to be transferred to a removable memory device (called a “DNA Key”). For example, you may save all the parameters from a particular controller. These then might be later transferred back to the controller, in case of inadvertent re-programming, or to another controller. The “DNA Key” becomes visible in the Main Menu when this feature is enabled.

To take advantage of DNA Key functionality, this feature must be enabled.

Expansion IO Bd 1

Expansion IO boards provide the Genetix controller with additional digital inputs and outputs. To inform the Genetix that these additional IO points exist, and are therefore accessible to the controller, this feature must be enabled.

Expansion IO Bd 2

See Expansion IO Bd 1 (above)

Network IO

Network I/O are “virtual” physical inputs and outputs that are accessible from an outside source (i.e. Network) connected to a serial port on the GCM. Network inputs are settable from the Network, and network outputs are readable from the Network.

A Network input may have multiple Logical inputs mapped to it and takes on all other aspects of Genetix Physical inputs. For example they may be forced and/or inverted (see Main Menu > Advanced Setup > Digital I/O > Forces, Inverted I/O).

Multiple Network outputs may be mapped to a Genetix Logical output, and likewise take on all other aspects of Genetix Physical outputs. For example they may be forced and/or inverted (see Main Menu > Advanced Setup > Digital I/O > Forces, Inverted I/O).

The use of Network I/O is fairly sophisticated and generally done with the assistance of Merrick. The PLC programming required to interface with Genetix
Network I/O is beyond the scope of this Manual. If you require assistance, please contact the Merrick Customer Support department.

To enable Network I/O you must set this Configuration parameter to “Y”. Otherwise Network I/O will not appear in the list of Physical I/O.

Note: If Network inputs points are mapped, and then Network I/O is disabled (i.e. Configuration is set to “N”), the inputs will be ignored and read as if Off.

**Programmable IO**

Programmable I/O points are Logical I/O points that can take on the characteristics of both inputs and outputs. They have no inherent logical functionality, but are generally used to “connect” inputs to outputs. For example one Physical input may be mapped to multiple Programmable I/O points, each of which may in turn be mapped to multiple Physical outputs. In this example, if the Physical input turns on, all the Physical outputs so mapped would also turn on.

Because Programmable I/O points are Logical I/O, they can also be set for Warning or Fault (see Main Menu > Advanced Setup > Digital I/O > Warnings/Faults).

The use of Programmable I/O is fairly sophisticated and generally done with the assistance of Merrick. Many things are possible, beyond the simple example shown above; however a complete discussion is beyond the scope of this Manual. If you require assistance, please contact the Merrick Customer Support department.

To enable Programmable I/O you must set this Configuration parameter to “Y”. Otherwise Programmable I/O will not appear in the list of Logical I/O.

**Expansion Analog Card 1**

Some Genetix controllers are provided with an auxiliary analog card that can either be plugged into the expansion header on the GCM as a daughtercard, or panel mounted and connected to the GCM via a cable. Each such card provides for 2 additional analog outputs, one additional analog input, and 4 additional digital inputs (dry contact). There can be a maximum of two Expansion Analog cards.

If you have such a card, this feature must be turned on to enable it. Once enabled, the additional I/O will appear in the menus.

**Expansion Analog Card 2**

If you have a second Expansion Analog card, this feature must be turned on to enable it (see above).

**Expansion Comm Bd**

Some Genetix controllers are provided with an auxiliary communications card (also called a “daughter card”) that is plugged into the expansion header on the GCM. This provides for certain special serial communications features, such as Bluetooth.
If you have such a card, this feature must be turned on to enable it.

**Disable Outs in Cal**
This option disables the external totalizer and the analog feedrate outputs while a Calibration procedure is running. This prevents other process equipment from being affected by the data that would otherwise be presented at these outputs.

To enable this feature (disable the outputs), turn this feature on.

**Drive Feedback**
In a typical LIW feeder application the Genetix controller is connected to the variable speed drive which allows it to control the feeder speed. The minimum number of signals that must be used for this connection is an analog signal that tells the drive how fast to go (called “Drive Demand”) and a digital signal that tells the drive to start (called “Feed Forward”). Also, in the case where the feeder is allowed to run backward, another digital output is available called “Feed Reverse.”

If it is desired to provide greater integration between the Genetix controller and the Drive, the “Drive Feedback” feature may be enabled and additional inputs and outputs will become available.

**Integrity Check**
Enables/Disables Communications Master Integrity Check which allows checking if a remote communications Master has been lost or is no longer communicating. This is very useful in Network communications to ensure safe handling of communications failures. The Logical Output Master Lost will turn on if no Master activity is detected for the duration of the Forgiveness Time. Typically this output is set to qualify a warning or a fault (see also Main Menu > Advanced Setup / Communications).

**Number of GCM’s**
The Genetix Color User Interface is capable of monitoring several feeders at one time with a single display. All feeders connected are continuously scanned and updated. This parameter tells the color display how many GCM’s are connected and how many therefore to scan.

Note: Each connected GCM must have a unique Unit Address set for the port that is connected to the color display (see Main Menu > Advanced Setup > Communications > Port n > Numeric Data > Unit Address). In addition the first feeder must have its Unit Address set to 1, and they must be sequence with the last feeder's Unit Address being equal to the Number of GCM’s.

The protocol for the GCM port connected to the color display must be set to “UIServer”.

The maximum number of GCM’s that may be connected to one Color User Interface is 32.
Reset Totals
Selecting this item from the Main Menu will bring up the following selections:

Reset Sub-Total…  
Reset Grand-Total…

If you select “Reset Sub-Total” from the above screen you will see a screen that shows the respective current totalizer value and asks you to confirm the reset. Press the Enter key to reset the totalizer or press the Menu/Esc key to cancel without resetting.

If you select “Reset Grand-Total from the above menu, you will be asked for a password to allow the reset. This is the same password as used for Calibration (default = “1234”). Upon successful entry of the password you will see a screen that shows the respective current totalizer value and asks you to confirm the reset. Press the Enter key to reset the totalizer or press the Menu/Esc key to cancel without resetting.

DNA Key
Selecting this item from the Main Menu will bring up the following selections:

Save to Key…  
Restore from Key…

In addition, at the bottom of the display there will be various Help messages. For example if no DNA Key is inserted into the receptacle, the message will read, “Waiting for DNA Key Insertion”

Upon insertion of a properly formatted key, the message will read, “DNA Key Inserted”, and then, “Reading Master Page”, and then “Ready”

If a key is inserted that has not been properly formatted, the message will read, “Error, can’t read!”

Note: All DNA Keys must be formatted before they can be used. This is normally done at the Merrick factory.

Once the “Ready” message is received, you may proceed to one of the options above.
Save to Key
If you select this option from the above menu, you will see a screen warning you that all data (if any) will be overwritten on the inserted DNA Key. Press the Enter key to confirm and continue, or the Menu/Esc key to abort, leaving the existing data on the DNA Key intact.

If you confirm, all of the parameters, settings, and data in the internal memory of the Genetix GCM will be saved to the key. If successful, the Help message will read,
“Writing Data”, and then,
“Successful Save”

Restore from Key
If you select this option from the above menu, you will see a screen warning you that all data in the Genetix GCM will be overwritten by the data on the present DNA Key.

Note: Once the data is written to the GCM from the DNA Key, the GCM will automatically be reset, making the new settings effective. This will cause the feeder to stop (if it was running), and may cause other process related issues. It is strongly recommended that the Restore operation only be done while the process is stopped and peripheral devices secured.

Press the Enter key to confirm and continue, or the Menu/Esc key to abort, leaving the data in the Genetix GCM intact.

If you confirm, all of the data on the present DNA Key will be written to the Genetix GCM will be overwritten, re-configuring it. If successful, the Help message will read,
“Reading data”, and then,
“Successful Restore”

Diagnostics
(Main Menu > Diagnostics)
Selection of “Diagnostics” from the Main menu presents a list of items the use can select to see specific data for diagnostics or informational purposes. The following sections are available,
Each of the above menu items displays additional screens with data relative to that particular item. Many items have multiple screens, and for those you will see “← →” in the lower right of the display. You may scroll through the available screens with the left and right arrow keys.
Appendix A
Logical Inputs

This is a list of all Logical inputs that are available in the Genetix controller. Note: Not all inputs will be visible, depending on the Configuration settings (see Main Menu > Advanced Setup > Configuration).

The following Logical inputs are always available, regardless of Configuration settings.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Enabled</td>
<td>Enable grand total update</td>
</tr>
<tr>
<td>Subtot Enabled</td>
<td>Enable sub total or volumetric total update</td>
</tr>
<tr>
<td>EMT Enabled</td>
<td>Enable EMT total update</td>
</tr>
<tr>
<td>Reset Faults</td>
<td>Reset Faults</td>
</tr>
<tr>
<td>Reset Warnings</td>
<td>Reset warnings</td>
</tr>
<tr>
<td>Reset Subtotal</td>
<td>Clear the active subtotal.</td>
</tr>
<tr>
<td>Permit Calibr</td>
<td>Calibration procedures permitted</td>
</tr>
<tr>
<td>Register Access</td>
<td>Extended register access permitted</td>
</tr>
<tr>
<td>Zero Tracking</td>
<td>Enable zero tracking</td>
</tr>
<tr>
<td>External Fault</td>
<td>External switch that can be used for indication of fault, and trip (stop) feeder.</td>
</tr>
</tbody>
</table>

Feeder related inputs. Present when “Feeder Control” is enabled (see Main Menu > Advanced Setup > Configuration > Feeder Control).

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run Permission</td>
<td>Controller auto run permission</td>
</tr>
<tr>
<td>Netw. Run Perm</td>
<td>Controller network run permission</td>
</tr>
<tr>
<td>Feeder Block</td>
<td>Unconditional feeder block. Feeder will not run in any mode</td>
</tr>
<tr>
<td>Local Lockout</td>
<td>Block from going out of Auto</td>
</tr>
<tr>
<td>Fdr Drv Fail</td>
<td>Feeder Drive Fault or Not Ready output from speed control</td>
</tr>
<tr>
<td>Start Fill</td>
<td>Start a Fill process. Only possible while running</td>
</tr>
<tr>
<td>Stop Fill</td>
<td>Stop a Fill process. Only possible while filling</td>
</tr>
<tr>
<td>Start Clean Out</td>
<td>Start a Cleanout process. Only possible while running</td>
</tr>
<tr>
<td>Stop Clean Out</td>
<td>Stop a Cleanout process. Only possible while cleaning</td>
</tr>
</tbody>
</table>

Drive Check related. Present when “Drive Feedback” is enabled (see Main Menu > Advanced Setup > Configuration > Drive Feedback).

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fdr Drive AtSp</td>
<td>Feeder drive at desired speed</td>
</tr>
<tr>
<td>Fdr Drv Overld</td>
<td>Feeder drive overload</td>
</tr>
</tbody>
</table>
Appendix B
Logical Outputs

This is a list of all Logical outputs that are available in the Genetix controller. Note: Its possible some outputs will not be visible, depending on the Configuration settings (see Main Menu > Advanced Setup > Configuration).

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warning</td>
<td>Warning</td>
</tr>
<tr>
<td>Fault</td>
<td>Fault</td>
</tr>
<tr>
<td>Running</td>
<td>Feeder is running</td>
</tr>
<tr>
<td>Feeding</td>
<td>There is a feedrate</td>
</tr>
<tr>
<td>Ready</td>
<td>Feeder is running or startable</td>
</tr>
<tr>
<td>LoadCell 1 Ovl</td>
<td>Load Cell A/D channel 1 overload</td>
</tr>
<tr>
<td>LoadCell 1 Undl</td>
<td>Load Cell A/D channel 1 underload</td>
</tr>
<tr>
<td>LC Ch1 Failure</td>
<td>Load cell A/D channel 1 failure</td>
</tr>
<tr>
<td>High Weight</td>
<td>High Weight limit</td>
</tr>
<tr>
<td>Low Weight</td>
<td>Low Weight limit</td>
</tr>
<tr>
<td>High Feedrate</td>
<td>High Feedrate limit</td>
</tr>
<tr>
<td>Low Feedrate</td>
<td>Low Feedrate limit</td>
</tr>
<tr>
<td>Cal in Progress</td>
<td>A Calibration procedure is active</td>
</tr>
<tr>
<td>HeartBeat</td>
<td>Application integrity toggle output</td>
</tr>
<tr>
<td>Parameter Fail</td>
<td>Parameter load at start-up failed or save after change failed</td>
</tr>
<tr>
<td>Port 0 Timeout</td>
<td>Communications time out, port 0 (USB)</td>
</tr>
<tr>
<td>Port 1 Timeout</td>
<td>Communications time out, port 1 (UART0)</td>
</tr>
<tr>
<td>Port 2 Timeout</td>
<td>Communications time out, port 0 (UART1)</td>
</tr>
</tbody>
</table>

Expansion Board related. Present when one or more expansion I/O boards are enabled (see Main Menu > Advanced Setup > Configuration).

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XIO 1 Failure</td>
<td>Expansion board 1 is enabled and is failing</td>
</tr>
<tr>
<td>XIO 2 Failure</td>
<td>Expansion board 2 is enabled and is failing</td>
</tr>
<tr>
<td>XADC Failure</td>
<td>Analog I/O expansion board is enabled and is failing. (Can be either of two Expansion Analog Cards)</td>
</tr>
<tr>
<td>XDC Failure</td>
<td>Communication board is enabled and is failing</td>
</tr>
</tbody>
</table>
### Feeder related outputs. Present when “Feeder Control” is enabled (see Main Menu > Advanced Setup > Configuration > Feeder Control).

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Deviation</td>
<td>Feedrate is higher than max deviation limit</td>
</tr>
<tr>
<td>Low Deviation</td>
<td>Feedrate is lower than max deviation limit</td>
</tr>
<tr>
<td>High Setpoint</td>
<td>High Setpoint limit</td>
</tr>
<tr>
<td>Low Setpoint</td>
<td>Low Setpoint limit</td>
</tr>
<tr>
<td>High PID CV</td>
<td>PID controller output at high limit</td>
</tr>
<tr>
<td>Low PID CV</td>
<td>PID controller output at low limit</td>
</tr>
<tr>
<td>High Feedfactor</td>
<td></td>
</tr>
<tr>
<td>Low Feedfactor</td>
<td></td>
</tr>
<tr>
<td>Good Feedrate</td>
<td></td>
</tr>
<tr>
<td>Feed Motor</td>
<td></td>
</tr>
<tr>
<td>Feed Forward</td>
<td></td>
</tr>
<tr>
<td>Feed Reverse</td>
<td></td>
</tr>
<tr>
<td>Fill Gate</td>
<td>This output is on when the feeder is asking to be refilled. Usually used to open a gate, or start a refill device. This output will go off when the Fill Weight is reached, or when “Stop Fill” if no Fill Gate is configured.</td>
</tr>
<tr>
<td>Slow Fill</td>
<td></td>
</tr>
<tr>
<td>Cleaning Out</td>
<td></td>
</tr>
<tr>
<td>Slow Clean Out</td>
<td></td>
</tr>
<tr>
<td>Auto State</td>
<td>Feeder state is auto</td>
</tr>
<tr>
<td>Manual State</td>
<td>Feeder state is manual</td>
</tr>
<tr>
<td>Rem Ana Setpnt</td>
<td>Remote Setpoint</td>
</tr>
<tr>
<td>In Control</td>
<td>Ready/runperm/no cal proc</td>
</tr>
<tr>
<td>Fdr Drive Fail</td>
<td>Drive fault or not ready when required</td>
</tr>
<tr>
<td>Bad Logical IO</td>
<td></td>
</tr>
</tbody>
</table>

### Drive Check related. Present when “Drive Feedback” is enabled (see Main Menu > Advanced Setup > Configuration > Drive Feedback).

<table>
<thead>
<tr>
<th>Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fdr Drive Ovld</td>
<td>Drive Overload. Time delayed version of “Fdr Drv Overld” input. Time set by “Overld On Delay” parameter in Feeder Peripherals menu.</td>
</tr>
<tr>
<td>Fdr Drive NAS</td>
<td>Drive not at speed when required. Time allowed for drive to come up to speed set by “Not at Spd On Delay” parameter in Feeder Peripherals menu.</td>
</tr>
</tbody>
</table>
Appendix C
GCM Connections

Consult your Merrick wiring diagram for additional connection information, or contact the Merrick Customer Support department for assistance.
Appendix D
GCM Specifications

**Environmental**
Maximum ambient temperature: 50°C (122°F)
Minimum ambient temperature: -10°C (14°F)

**Power**
Supply voltage: 24 VDC +/- 1V
Power consumption: 8W nominal, 12W maximum
Power dissipation: 5W nominal, 10W maximum

**Loadcell Inputs (2)**
Excitation voltage: 5 VDC
Excitation current: 300mA (max)

**Tachos (2)**
Supply voltage: 5 VDC
Supply current: 400mA, maximum (total)

**Analog Inputs**
Input impedance (Current input): 200 ohms
Input impedance (Voltage input): 100Kohms

**Analog Outputs (2)**
4-20mA, 1000 ohm maximum

**Digital Inputs (4)**
Note: Standard GCM digital inputs require external voltage sourcing, jumper selectable for 24VDC, 120 VAC, or 240 VAC.
Input impedance at 24 VDC: 7.5 KΩ
Input impedance at 120 VAC: 64 KΩ
Input impedance at 240 VAC: 120 KΩ

**Digital Outputs (4)**
Note: Standard GCM digital outputs are relays with form "C" contacts (1 NO, 1 NC).
Contact ratings: 5A, 250 VAC; 5A, 30 VDC

**EMT (external mechanical totalizer)**
Contact ratings: 120mA, 240 VAC; 120mA, 24 VDC
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<td>High Feedrate · 34, 82</td>
</tr>
<tr>
<td>High Feedrate Delay · 34</td>
</tr>
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<td>High mA · 49, 52</td>
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<thead>
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</thead>
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