

MAGUIRE PRODUCTS INC.

GRAVIMETRIC FEEDER®

MAGUIRE

Model MGF+®
Touchscreen Controller

GRAVIMETRIC FEEDER

INSTRUCTION MANUAL

Use this space to record information about your Maguire Machines:

[illegible]

Notes:

Maguire MGF+

This document is the Original Instructions manual of the Maguire MGF+.

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To every person concerned with use and maintenance of the Maguire MGF+ it is recommended to read thoroughly these operating instructions. Maguire Products Inc. accepts no responsibility or liability for damage or malfunction of the equipment arising from non-observance of these operating instructions.

To avoid errors and to ensure trouble-free operation, it is essential that these operating instructions are read and understood by all personnel who are to use the equipment.

Should you have problems or difficulties with the equipment, please contact Maguire Products Inc. or your local Maguire distributor.

Manufacturer's Contact Information

Maguire Products Inc.
11 Crozerville Road
Aston, PA. 19014

Phone: 610.459.4300

Fax: 610.459.2700

Website: <http://www.maguire.com>

Email: info@maguire.com

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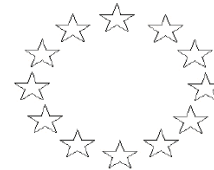
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DECLARATION OF CONFORMITY



2006/42/EC Machinery Directive

2014/30/EU EMC Directive



Name of manufacturer or supplier

Maguire Products Inc.

Full postal address including country of origin

11 Crozerville Road, Aston, Pennsylvania 19014, USA

Description of product

Name, type or model, batch or serial number

Model:

Serial Number:

Standards used, including number, title, issue date and other relative documents

EN4414 (2010); EN11201 (2010); EN12100 (2010); EN13849-1 (2015); EN13850 (2015); EN13857 (2008)

EN14119 (2013); EN14120 (2015); EN60204-1 (AC:2010) and EN61310 (2008)

Name of Responsible Person within the EU - Mr Paul Edmondson Director

Full postal address if different from manufacturers

Maguire Europe Sales Limited, Unit F, Vanguard, Tame Park, Tamworth, Staffs, B77 5DY, UK

Declaration

I declare that as the manufacturer, the above information in relation to the supply / manufacture of this product, is in conformity with the stated standards and other related documents following the provisions of the above Directives and their amendments.

Responsible Person: Mr Steve Maguire

Signature

Position

Signature
President

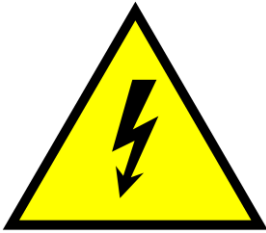


ORIGINAL

Date



Safety Notifications



HAZARD - ELECTRICAL

Only qualified electrical technicians should make electrical connections. Disconnect and lockout power supply before servicing Blender.

Disconnect electric before opening or servicing. Use Power Lockout Tagout.



CAUTION - Always wear safety glasses when using this equipment.



HAZARD - AUTOMATIC STARTUP

WARNING - Feeders may start automatically without warning.



HAZARD - ROTATING AUGER

The auger is driven with substantial Torque. Never place your hand in the MGF+ while the auger is rotating. **SERIOUS INJURY WILL RESULT** ALWAYS keep fingers clear of rotating shaft and auger. NEVER use your fingers to clear an obstruction. NEVER touch a rotating shaft or auger.

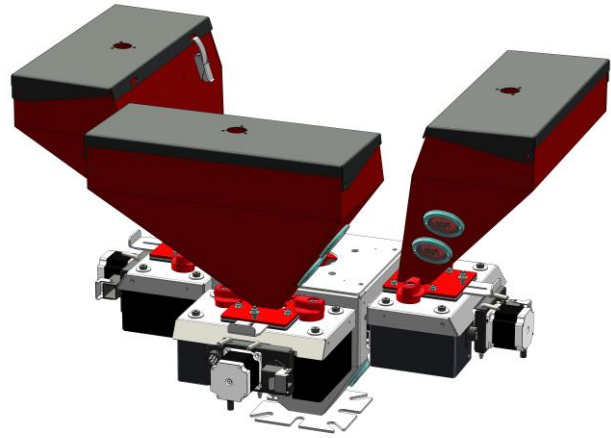
Maguire MGF+ Features

MGF+ Gravimetric Feeder

Throughput capacity:

Injection molding –
Up to 120.0 lb/hr
(54 kg/hr) per component

Extrusion –
Up to 360.0 lb/hr
(165 kg/hr)



Full function gravimetric feeder for the price of a volumetric model.

Standard features:

4 Modes of Operation

Cyclical, Continuous, Intrusion, Extrusion
Following.

Reduces Input Error

The easiest setup procedure in the industry: enter let-down ratio and either shot weight or lb/hr output and press start. Feeder automatically adjusts to screw recovery time and extruder output.

Fine Metering Resolution

100 rpm Stepper Motor advances at 200 increments per revolution. In combination with digital control, the 200-step rotation achieves fine metering resolution of $\pm 0.2\%$.

Automatic Re-calibration Ensures Continuous Accuracy

Automatic adjustments guarantee that feed rate is held to within $\pm 0.2\%$ of desired let-down ratio.

Dual Load Cells

Balanced load readings improve accuracy.

Torque-limiting Drive Coupling

Protects drive motor in case of jammed auger.

Easy-to-Use Microprocessor Controller Saves Time

User-friendly controller has intuitive setup procedure.

Communications

Allows data collection and automated control.

USB Port

Allows data download, data printout and software update capability.

Detailed Material Usage Documentation

Microprocessor control allows data collection via G2 and Maguire Tracker networking software, or directly using MLAN protocol via Ethernet or Modbus TCP.

Eliminates Downtime Associated with Color Change

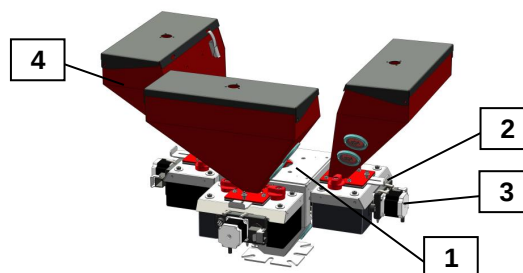
Feeder automatically re-calibrates to new color, so no additional setup required. Spare hoppers available for faster color changes.

Exclusive 5-Year Warranty

Assembly and Installation Instructions

The MGF+ consists of these assemblies:

1. The MGF+ Mounting Bin
2. The Load Cell Assembly (1 per feeder)
3. The Auger Tube Assembly (1 per feeder)
4. The Hopper Assembly (1 per feeder)



Power Requirements

MGF+ Model	Voltage (60 hz)	FLA	Voltage (50 hz)	FLA
MGF-3/4/8	110/1/60	2.0	230/1/50	2.0

Secure voltage supply cable per the requirements of EN 60204-1, Clause 13.4.2.

MOUNT THE MGF+ BIN

1. The MGF+ BIN mounts directly to the throat under your current natural material hopper.

MOUNT THE MGF+ CONTROLLER to the BIN

2. Mount the MGF CONTROLLER onto the BIN using the two provided bolts on the front of the BIN.

MOUNT THE HMI SCREEN INTERFACE

3. Mount the HMI SCREEN INTERFACE onto the stand that is included with the MGF+. This stand can be placed with a 10' radius of the MGF+.

HANG THE LOAD CELL ASSEMBLIES

4. Hang the Load Cell Assembly from the openings on the MGF+ bin. Up to 4 MGF units can be installed. Unused openings are covered by a cover plate.

INSTALL AUGER TUBE ASSEMBLIES

5. Insert each Auger Tube Assembly into a Load Cell Assembly and hang onto the two shoulder bolts.

INSTALL HOPPER ASSEMBLY

6. Place each hopper assembly onto a load cell assembly and secure with the red rotating hold-down knobs.

PLUG IN ALL CORDS

7. Each feeder requires a motor cable and load cell cable and may have an optional loader cable (if equipped). The MGF+ controller will have cables for up to 3 stations and will be numbered on the controller. Plug each pair of motor and load cell cables into the designated station. Station 1 is located to the left of the Controller, Station 2 is located to the right of the controller and station 3 is on the opposite side of the controller.



8. Plug the black power cable into a standard 120-volt (EURO, 230 VAC) outlet.

CONNECT SIGNAL CABLE

9. Standard equipped for **contact closure** applications only, your controller will be equipped with the supplied cable lead and 5-pin connector. You will also have a 20' length of cable with a mating 5-pin connector. This cable will connect to the MGF+ controller using the connector, and the open end will be wired to your equipment. The open-end wires should be wired to the screw signal. Must be voltage-free contact closure. When the screw is retracting, contacts will close and then open at the end of the retract. This 5-pin connector is also used with an extrusion following 0-10 volt signal. **See the MGF+ wiring diagram on page 47.**
10. If optionally ordered with 24 to 120 VDC or VAC plug the "SIGNAL" (gray) cord will be plugged into outlet that is energized only when the screw is turning. Signal voltage can be from 24 to 120 VDC or VAC. The screw signal on-time can not be less than 1 second. INJECTION time or CLAMP CLOSE time are options.

Description of Controls

1. **POWER ON / OFF SWITCH** - Turns power on or off protected by by an integrated 1 amp fuse.



2. **START / STOP on-screen button** - This on-screen button starts and stops the MGF Feeders.



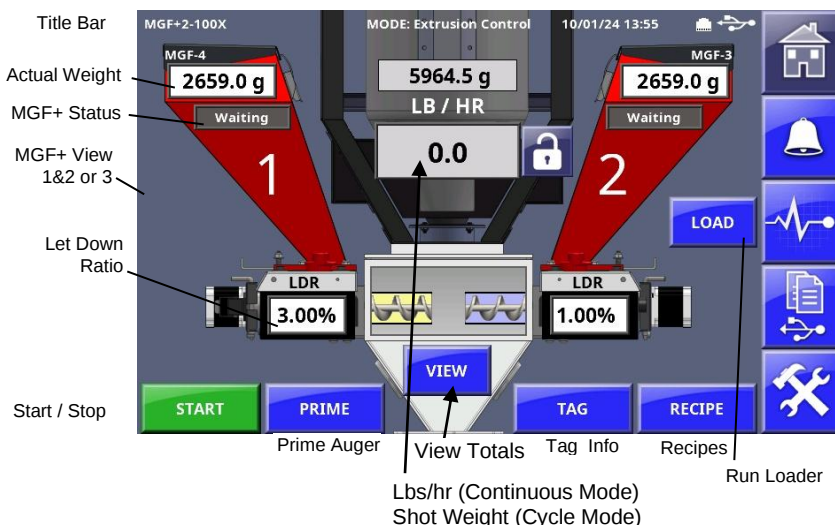
Touchscreen Overview

Home Screen

The Home Screen contains several fields and buttons:

Title Bar - Located across the top of the screen, the title bar displays Model, ID, current operating mode, date and time, Ethernet and USB status.

MGF+ View - The MGF+ View button rotates the view of the MGF+ stations.



Actual Weight – The actual weight of material currently in the hopper.

Mode – Displays current configuration. Cycle, Continuous or Extrusion Following mode.

Recipe – Screen to set, save and load preconfigured MGF+ settings.

Tag – Screen to set material tag information. Operator, Recipe and Work Order tags. Used in communications.

Shot Weight or Rate – Displayed setting based on selected Mode. Metering Rate or Shot Weight. See page 11.

Load – On/Off button (if enabled) activates the loader. See page 29.

Prime – Primes and calibrates the MGF+ Motor Factor for each MGF (Also see page 17 for Rate Calibration).

Start / Stop Button – Main Start / Stop Control Button of the MGF.

Let Down Ratio (LDR) – Let Down Ratio, Percent. See page 11.

View – Totals Screen to view, clear or save totals to USB. See page 42.

Injection / Recovery – Cycle Mode only. Displays the state of the cycle, recovery (yellow) or injection (green) when applicable. Displays at the center bottom of the screen.  

Navigation Menu - Located along the right side of the screen, these buttons allow quick navigation to frequently used and top-level screens. The middle three buttons are soft buttons that can be changed or removed.



Home Screen

Pressing the Home Screen button from any other screen will return the operator to the main Home Screen.



Alarm and Event

Alarm and Event Log displays a history of alarms and other events with a date and time stamps and description.



Live Diagnostics

Live Diagnostics displays a cycle summary of detailed diagnostics information scrollable back through a history of cycles printable to USB.



Print Center

A menu screen of print related options including Totals, Parameters, Alarm History, Events, Cycle History, Diagnostics.



Setup

Password protected area to access the MGF+ settings. See page 24.

Setup Instructions

Model Selection - Models are preset at the factory.

Press		Display will prompt for a password.	Then press:	
Press	97531	Display will show Current Model and Model Selections.		
Press	MGF+ Series for models that use gravity feed natural.	Select MGF+1 if you have 1 feeder. Select MGF+2 if you have 2 feeders. Select MGF+3 if you have 3 feeders.		
Press	100 Series for MGF+ units equipped with a Maguire LIW Hopper.	Select MGF+1-100 if you have 1 feeder. Select MGF+2-100 if you have 2 feeders. Select MGF+3-100 if you have 3 feeders.		
Press	100 Series for MGF+ units equipped with an LIW Hopper and Extrusion Control.	Select MGF+1-100X if you have 1 feeder. Select MGF+2-100X if you have 2 feeders. Select MGF+3-100X if you have 3 feeders.		
Press		After selecting the appropriate model.		
Press		Confirm to save the changes.		

LIW Setup – For Model MGF+1, MGF+2, MGF+3-100

Press		Display will prompt for a password. (default: 22222)	Then press:	
Press		Display will show the System Configuration categories.		
Press	LIW Setup			
Press		To save the Changes.		

Select Mode of Operation – Cycle, Intrusion, Continuous or Extrusion Following

Press



Display will prompt for a password. (default: 22222)

Then press:



Press



Display will show the System Configuration categories.

Press

Mode of Operation

Select the Mode of Operation:
Cycle, Intrusion, Continuous or Extrusion Following

Select Cycle

for injection molding, where the MGF+ augers switch on and off with each cycle based on recovery time learned from the contact closure signal. In Cycle Mode enter the **SHOT WEIGHT** of the part on the main screen. Then set the **LDR** (Let Down Ratio) on the main screen for each MGF. In CYCLE mode your MGF+ will dispense the calculated rate (shot weight x LDR) during the length of screw recover time.

Select Intrusion

In Intrusion Mode the MGF+ will dispense it's LDR of the part across two signals. Also see the IPC parameter (Setup, MGF Configuration, Parameters, Signal).

Select Continuous

for extrusion, where the MGF+ auger runs continuously. In this mode enter the **LBS (or KILOS) / HOUR** of the extruder on the main screen. Next set the **LDR** (Let Down Ratio) for each MGF on the main screen. In CONTINUOUS mode your MGF+ will run continuously at the calculated rate (lbs/hr x LDR). Auger speed will adjust automatically to maintain dispense rate.

Extrusion Following

for extrusion, where the MGF auger runs continuously by following the 0-10 volt reference voltage of the extruder screw. In this mode the first step is to set the XMO parameter. Setting XMO will automatically calculate extruder throughput on the main screen based on a 0-10 volt reference. See page 35 for XMO. Next set the **LDR** (Let Down Ratio) on the main screen. In Extrusion Following mode your MGF will run continuously at the calculated rate (lbs/hr x LDR). Auger speed will adjust automatically to maintain dispense rate.

Auto Stop:

Continuous and Extrusion Following Only - When enabled, feeders will automatically start and stop using the extruders contact closure signal. See wiring diagram.

Press



To save the Changes.

Select Units – Grams, Kilograms or Pounds

Press		Display will prompt for a password . (default: 22222)	Then press:	
Press		Display will show the System Configuration categories.		
Press	Preferences	Display will show the System Preferences categories.		
Press	Weight Units	Select the Weight Units: Grams, Kilograms or Pounds.		
Press		To save the Changes.		

Set Date and Time

Press		Display will prompt for a password . (default: 22222)	Then press:	
Press		Display will show the System Configuration categories.		
Press	Preferences	Display will show the System Preferences categories.		
Press	Date and Time	Using the keypad, set the date, time and date format.		
Press		To save the Changes.		

Rate Calibration

A rate calibration can be done by running a Prime on the Home Screen. The following instructions accomplishes the same procedure. A Prime or rate calibration should be done after a material change, or when the model is changed (auger size change). A prime or rate calibration will reset the flow rate grams per revolution of the current material.

Press		Display will prompt for a password. (admin default: 22222)	Then press:	
Press	MGF+ Configuration		Display will show the System Configuration categories.	
Press	Calibration Routines		Display will show available calibration routines.	
Press	Calibrate Motor Rate		The display will show the currently selected component, the current flow rate of that component in grams per revolution and the current bin weight.	
Select			Select the component to calibrate using the arrows.	
Press			To calibrate a new flow rate press START. The display will show a warning to make sure the slide gate is open before running a rate calibration. Press START again to begin the calibration. The motor will run for 30 seconds and calculate a new flow rate. When complete, use the arrow button to navigate to the next component to calibrate. When finished, press EXIT.	

Scale Calibration - Calibrate Load-Cells

Periodic zero and full calibration ensures that the MGF+ is weighing correctly. Calibration is also necessary if a load cell is replaced or if the controller is replaced. Before doing a calibration, you will need a known weight that can be rested on top of the hopper lid. The known weight must weigh approximately 4000 grams and you must know exactly how many grams it weighs. This weight in grams will be entered into the MGF. Confirm the following:

- Confirm** **the material hopper is EMPTY.**
- Confirm** **the load cell connector is plugged into the side of the controller.**
- Confirm** **the LOADER material hose is connected to the hopper lid.**

How to Calibrate Load-Cells:

Press		Display will prompt for a password. (admin default: 22222)	Then press:	
Press	MGF+ Configuration	Display will show the MGF+ Configuration categories.		
Press	Calibration Routines	Display will show 2 calibration routines, Calibrate Motor Rate, Calibrate Load-Cells.		
Press	Calibrate Load-Cells	Display will show the Zero/Full Weight Calibration Screen		
Select	Component number	Select the component to calibrate using the arrows.		
				
Confirm	Material Hopper is empty, load-cell connector is plugged in and Loader material hose is connected to the hopper lid.			
Press	ZERO	Display will show: Zero Calibration Successful Current Weight should now show 0 grams. (slight deviation from zero is acceptable)		
Press	FULL	Display will show: Enter known weight then press ENTER. Using the keypad, enter the weight in grams of your calibration weight, then press the ENTER button.		
Place calibration weight on top of hopper lid. For best accuracy, center the weight on the hopper lid.				
Press	CONTINUE	Display will show: Full Calibration Successful		
Press	EXIT	To exit the load-cell calibration screen.		

Start Up Procedure for Cycle Mode Models MGF+1, MGF+2, MGF+3

Turn POWER ON:

The display will show the Home Screen.

Cycle Mode will display Shot Weight.

To adjust your shot weight, follow these instructions:



Press field	SHOT/WT 	The display will show the Shot Weight in 10ths of Grams, Kilograms or Pounds (see Preferences, Weight Units). Use the keypad to enter the shot weight.	
Press		Saves and loads new setting and return to Home.	
Press		Cancel the new setting, revert to original settings and returns to the Home Screen.	

LDR – Let Down Ratio - To adjust this value, follow these instructions:

Press field	LDR (Let Down Ratio) Select MGF 	Display will show the Let Down Ratio for each component. Use the arrow buttons to select the MGF component and adjust the current LDR setting using the keypad.	
Press		To save and load the new LDR setting, return to Home.	
Press		To cancel the new setting, revert to original settings and returns to the Home Screen.	
Press		To start the MGF+. The Feeders will run during screw recovery time.	

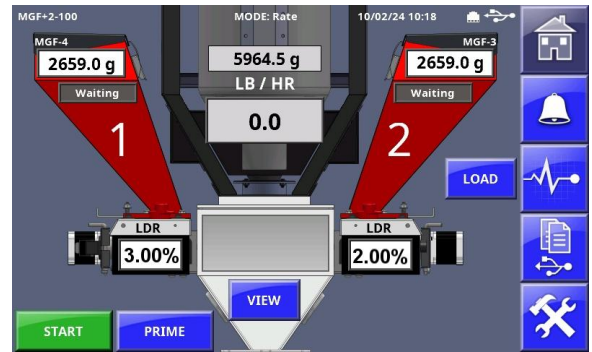
Start Up Procedure for Continuous Mode Models MGF+1, MGF+2, MGF+3

Turn POWER ON:

The display will show the Home Screen.

Continuous Mode will show lbs/kg per hour.

To adjust your throughput, follow these instructions:



Press	Throughput field 	Display will show the keypad. Use the keypad to set the throughput in KG/HR or LB/HR.	
Press		To save and load the new throughput setting, return to Home.	
Press		To cancel the new setting, revert to original settings and returns to the Home Screen.	

LDR – Let Down Ratio - To adjust this value, follow these instructions:

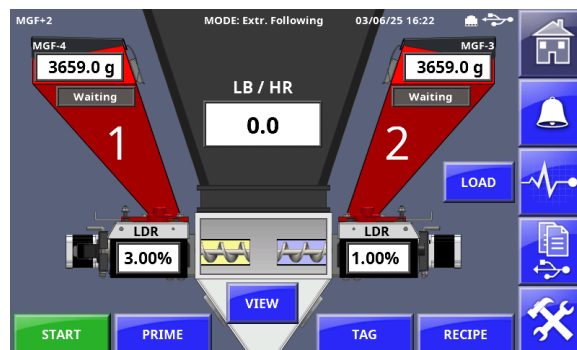
Press field	LDR (Let Down Ratio) Select MGF 	Display will show the Let Down Ratio for each component. Use the arrow buttons to select the MGF component and adjust the current LDR setting using the keypad.	
Press		To save and load the new LDR setting, return to Home.	
Press		To cancel the new setting, revert to original settings and returns to the Home Screen.	
Press		To start the MGF+.	

Start Up Procedure for Extrusion Following Mode Models MGF+1, MGF+2, MGF+3

Turn POWER ON:

The display will show the Home Screen.

Extrusion Following Mode will show LB or KG per hour.



NOTE: Extrusion following will require a 0-10 volt DC signal from the extruder. See wiring diagram on page 47.

Adjust the XMO (Extruders Max Output) parameter.

Press		Display will prompt for a password. (admin default: 22222)	Then press:	
Press	MGF+ Configuration		Display will show the MGF+ Configuration categories.	
Press	Parameters		Display will show parameter categories.	
Press	Extrusion		Display will show extrusion parameters.	
Press	XMO		Enter the extruder's max output in LB/HR or KG/HR at 10 volts.	
Press		To save the XMO parameter and return the home screen.		

LDR – Let Down Ratio - To adjust this value, follow these instructions:

Press field	LDR (Let Down Ratio) Select MGF 	Display will show the Let Down Ratio for each component. Use the arrow buttons to select the MGF component and adjust the current LDR setting using the keypad. 
Press		To save and load the new LDR setting, return to Home.
Press		To cancel the new setting, revert to original settings and return to the Home Screen.
Press		To start the MGF+. XMO will automatically calculate extruder throughput on the main screen based on a 0–10 volt reference. See page 35 for more information on XMO.

Prime and Rate Calibration

It may be necessary to prime the auger prior to running. Prime will allow the MGF+ to run without a signal from the process machine. Run time is automatically limited to 30 seconds and will also calibrate the flow rate at the same time. To Prime, follow these instructions:

Press		Display will show pop-up dialog box with the message: Warning: Make sure Slide gate is open before running the prime.
Press		to proceed with the prime.
		cancels prime.
	During the prime a pop-up dialog box will display: PRIME ON: with a 30-second countdown timer. Prime can be cancelled by pressing the red X.	
Press		When prime is complete, the message will display: PRIME COMPLETE. CALIBRATION SUCCEEDED or CALIBRATION FAILED. If the calibration was successful, press the green check to return to the Home screen. If the calibration fails, read Manual Rate Calibration below.  <u>Manual Rate Calibration</u> NOTE If the calibration fails and your material is heavier or lighter than average, you can manually enter the Motor Factor using the following procedure and calculation. 1. Read Hopper Weight - You will perform the prime routine again but this time, before running the prime, read the weight of the hopper (top of red hopper). 2. Press PRIME. After the 30-second prime, read the hopper weight again. 3. Subtract the second reading of weight from the first reading. This is the loss-in-weight over 30 seconds. 4. Multiple this weight by 2 then divide by the prime RPM (prime RPM is 20 for the MGF-4 and MGF-8. Prime RPM is 40 for the MGF-3). 5. Enter the PRIME RPM into the MTF parameter. Setup, MGF+ Configuration, Parameters, Motor Configuration, MTF.

Manual Rate Calibration example using an MGF-4:

Pre-prime weight of hopper: 2520

Weight of hopper after prime: 2460

Loss-in-weight: 60

$60 \times 2 = 120$ (loss-in-weight over one minute)

$120 / 20 \text{ rpm} = 6$

Enter the value 6 into the Motor Factor.

To access the Motor Factor, press Setup, MGF+

Configuration, Parameters, Motor Configuration, MTF

When the MGF+ settings are adjusted, a rate calibration is performed (or manually entered), and the MGF+ is primed with material, it is ready for operation. Press the START button run the MGF.

**START**

Alarms and Troubleshooting

NO METERING - ALARM CODE:48

This alarm indicates that no loss in weight has been detected during the last several cycles. After clearing the alarm, metering will continue, however the alarm will not re appear until after you have remedied the problem.

The following conditions are required to generate the NO METERING ALARM

- a. Before this alarm is checked, the system needed to have been running for at least 24 seconds.
- b. If the MGF+ is in continuous or extrusion follow mode, the target rate needs to be more than 7.5 g/min.
- c. If the MGF+ is in cycle mode, the target rate needs to be more than 2 grams / cycle.

If the above conditions (a and (b or c)) are met, then the MGF+ will compare the current bin weight with a captured value from 24 seconds ago.

- d. If the MGF+ is in continuous or extrusion following mode, the difference between the two weights need to greater than 10 times the target rate.
- e. If the MGF+ is in cycle mode, the difference between the two weights needs to be greater than 5 times the target rate.

If the above condition (d or e) fails, then a counter is incremented

If the above condition (d or e) passes, then the counter is reset to 0.

If the counter gets incremented past 3, then the NO METERING alarm is triggered.

In cycle mode, the NO METERING alarm is checked only at the start of every cycle.

In continuous or extrusion following mode, the NO METERING alarm is checked every RTU update.

LOADING TOO SLOWLY - ALARM CODE:49

If the loading feature is enabled and it takes more than LAT (Loader Alarm Time) seconds to fill the bin to LHF (Loader High Level) grams then this alarm is triggered.

PRIME ALARM - ALARM CODE:50

This alarm indicates that the 60-second Prime cycle time has ended. The Prime function is used to prime the feeder and is accessible from the main menu. It operates by running the feeder auger for one minute to prime the feeder then alarms to alert the operator that the prime cycle has ended.

LOW WEIGHT ALARM - ALARM CODE:51

If the bin weight falls below the LWA (Low Weight Alarm) setting (Default 400g) then this alarm will be triggered. If the bin weight rises above the LWA parameter, then the alarm will shut off.

OVER WEIGHT LIMIT ALARM - ALARM CODE:52

This alarm indicates that the weight being read by the load cells exceeds the capacity of the cells. The cells are 10 Kilos each, 20 Kilos total, about 44 pounds. The hopper holds about 1/5 cubic foot, about 10 pounds. The weight of the hopper when empty is about 8.2 pounds.

MOTOR CAPACITY EXCEEDED - ALARM CODE:53

This alarm indicates that the calculated rate exceeds capacity.

The following variables effect the motor off-time calculation

MTF (Motor Factor)

LDR (Let Down Ratio)

PHR (Per Hour Rate) (continuous and extr. Follow only)

SHT (Shot Weight) (cycle mode only)

RATE ADJ

If the target rate calculates out to less than a step every 2 ms, then this alarm is triggered.

The following variables effect the motor step time calculation

MTF (Motor Factor)

RPM (Maximum RPM)

SPR (Steps per Revolution)

LDR (Let Down Ratio)

PHR (Per Hour Rate) (continuous and extr. Follow only)

SHT (Shot Weight) (cycle mode only)

RATE ADJ

BIN REMOVED - ALARM CODE:54

This alarm indicates that the hopper is not installed on the load cells. When this alarm is active, the MGF+ will not allow the auger to run and will not allow the loader to load material. Alarm is triggered if the bin weight falls below the NBW (Negative Bin Weight) grams.

MAX ADJUST RATE - ALARM CODE:55

Indicates Motor factor is too low which causes the MGF+ to dispense too much material over time, causing the rate adjust limit to reach 3.000. When the MGF+ makes a correction, the RATE ADJ value is re-calculated to compensate for the accumulated error. If the new RATE ADJ rises above the UBE (Upper Boundary Error) (Defaulted to 300 = 3.00), then this alarm is triggered. Doing a prime calibration is recommended and this will set your motor factor and rest rate adjust to 1.000.

MIN ADJUST RATE - ALARM CODE:56

Indicates Motor factor is too high which causes the MGF+ to dispense too little material over time, causing the rate adjust limit to reach .3000. When the MGF+ makes a correction, the RATE ADJ value is re-calculated to compensate for the accumulated error. If the new RATE ADJ falls below the LBE (Lower Boundary Error) (Defaulted to 30 = 0.30), then this alarm is triggered. Doing a prime calibration is recommended and this will set your motor factor and rest rate adjust to 1.000.

LIW TIMED OUT - ALARM CODE:57

When the MGF+ is configured to poll a Maguire LIW for Steady State Rate (LIW Mode), this alarm is generated when the MGF+ cannot poll the Steady State Rate from the LIW.

LOADCELL ERROR - ALARM CODE:58

This error is generated if there is no response from the internal analog-to-digital converter system that provides a digital measurement from the loadcells. If this error is generated, it may indicate damage to the A-to-D converter. If you receive this error, please contact technical support.

TROUBLESHOOTING CONTROLLER PROBLEMS

If you have problems, the more information you can provide us about what caused the problem, the more we can do to improve our product so that these problems cannot, and do not, occur in the future. In some cases, we may NOT be able to duplicate YOUR particular problem in our testing facility. Describe the problem as CAREFULLY and as completely as possible to help us locate and correct any design weakness that might be responsible for the problems you are having.

TROUBLESHOOTING LOSS OF COLOR

1. Check that color supply is adequate.
2. Confirm that the motor is turning. Check proper connection of the motor plug.
3. Check that the drive coupling is not slipping and is securely attached to the motor shaft. The connecting tube between the motor coupling and the auger coupling is designed to slip under high torque. If excessive loading has caused it to slip, it may have become worn, or loose, or moved out of correct position.

Setup Overview – MGF+ Configuration, System Configuration

Setup is a password protected area of the MGF+ for making configuration changes.

	Setup – Settings and Options Menus		
	▶ MGF+ Configuration - MGF+ specific configuration settings		
	▶ Parameters - Controller Operation Parameters - See page 35		
	▶ Components – Select component to view/adjust Motor Settings • MTF – Motor Factor (grams / revolution) • SPR – Steps per Revolution • RPM – Maximum RPM • PMR – Prime Motor Rate Error Correction • LBE – Lower Boundary Error • UBE – Upper Boundary Error • ATP – Adjustment Trip Point (grams) • ADJ – Adjustment Limit • ECT – Error Count Tracking • RTU – Run-Time Update (seconds) Load Cell Settings • KDF – Stable Weight • LCZ – Load-cell Zero • LCL – Load-cell Calibration Low • LCH – Load-cell Calibration High • LCT – Load-cell Tolerance Loader Options • LLF – Loader Low Level (grams) • LHF – Loader High Level (grams) • LAT – Loader Alarm Time (seconds) • STL – Settle Time (seconds) Weight Settings • BFS – Bin-fill Settle (seconds) • FUL – Full Bin Weight (grams) • NBW – Negative Bin Weight (grams) Alarm Options • LWA – Low Weight Alarm (seconds) • NMA – No Metering Alarm		
	▶ Report Options • PRT – Report Interval (minutes)		
	▶ Signal Options • SFT – Signal Filter Threshold (seconds) • IPC – Injection Color Percent (percent) • ISP – Injection Screw Time Percent (percent) • TAT – Target Adjust Threshold (grams/second)		
	▶ Manual Operations - Manual operations of devices – Loaders, Motors, Alarm		

		►	Calibration Routines • Calibrate Motor Rate – Calibration of Flow Rate of Material • Calibrate Load-Cells – Zero and Full Weight Calibration of Load Cells
		►	Components • Component Setup • Component Types • Motor Setup • Component Setpoints • Loader Setup
		►	Operating Options • Volumetric – Enable or disable Volumetric Mode. See page 28
		►	Specialized Operations (enable/disable options) • Show Recipes – Show the Recipes button on Home screen (on/off) • Clear View Totals – Enables Clear button on View Totals screen. • Show Tag Information – Show the Tag button on Home screen (on/off)

		►	System Configuration System specific configuration settings
		►	Mode of Operation - Set the MGF+ Mode to Cycle, Intrusion, Continuous or Extrusion Following. When in Cycle Mode selection of Cycle Update: Start of Cycle or End of Cycle. When in Continuous or Extrusion Following: Enable or Disable Auto Start. See page: 11. When in Intrusion, also see IPC parameter.
		►	Preferences
		►	Date and Time - See page 13.
		►	Language - Language selection.
		►	Menu Bar Options - menu button preferences
		►	Operator Access – Limited access for operators. enable/disable. See page 28.
		►	Weight Units - pounds, ounces, grams kilograms. See page 27
		►	Change Passwords - Change Admin and Operator passwords. See page 27.
		►	Screen Options - Screen saver, brightness, calibration, options
		►	Communications - See page 34
		►	MLAN I.D. Number - Set MGF+ identification number.
		►	Modbus Server - enable/disable Modbus TCP.
		►	TCP/IP Configuration - Sets IP address, Subnet mask, gateway.
		►	Print Center - See page 30.
		►	Print Totals - Prints totals to USB Flash Drive.
		►	Print Alarm History - Prints alarm history to USB Flash Drive
		►	Print Cycle History - Prints cycle report to USB Flash Drive
		►	Print All - Prints all above reports to USB Flash Drive
		►	Print Totals Interval – Enable/disable print totals to USB, set interval. PRT, minutes.
		►	Print Parameters - Prints the parameter table to USB Flash Drive
		►	Print Cycle History - Prints cycle report to USB Flash Drive
		►	Print Cycle Options - Prints Cycle report to USB Flash Drive
		►	Diagnostics
		►	System Information - Firmware, bootloader, I/O versions
		►	Load-Cell Diagnostics - Loadcell raw counts
		►	Alarm and Event Log - Alarms and Events displayed and printable
		►	Live Diagnostics - Live Cycle diagnostic report, printable history

		▶	Resets
		▶	User Settings - Save / Restore User entered Settings
		▶	Restore Factory Defaults - Restores factory loaded settings. See page 42
		▶	Clear Totals Now – Resets Totals to zero on all components.
		▶	Factory Access - Factory Access Only
		▶	Firmware Updates - Reads USB drive for updates, selects and updates firmware. Contact Maguire Products Inc. for updates.

Changing Passwords

Access to the controller is limited by one or two passwords. Access to Setup information is restricted by an Admin Password (default password is: 22222). If Operator Access is enabled, access to commonly used functions are further restricted with the Operator Password. If security is important and restricted access is desired, it is important to change the passwords.

Press		Display will prompt for a password. (admin default: 22222)	Then press:	
Press	System Configuration	Display will show the System Configuration categories.		
Press	Preferences	Display will show System Preferences categories.		
Press	Change Passwords	Display will show three options, Change Admin Password, Change Operator Password and Enable Password Mask. Select the password you wish to change. Check Enable Password Mask to hide the password and show the asterisk instead of the password numbers when entering a password.		
Enter	the new password	then enter the password again to confirm.		
Press		To save the changes or press the red X to cancel and exit.		

Weight Units

Changes the displayed units for the Per Hour Rate and on-screen totals. Select Pounds, Grams or Kilograms.

Press		Display will prompt for a password. (admin default: 22222)	Then press:	
Press	System Configuration	Display will show the System Configuration categories.		
Press	Preferences	Display will show System Preferences categories.		
Press	Weight Units	Select Pounds, Grams or Kilograms		
Press		To save the changes or press the red X to cancel and exit.		

Operator Access

When enabled Operator Access will password protect access to specific MGF+ functions selected by the admin user. Selected functions are password protected by the operator password. Unselected functions are restricted to admin password only. Default Operator Access password is: 11111. Also see Changing Password.

Press		Display will prompt for a password. (admin default: 22222)	Then press:	
Press	System Configuration	Display will show the System Configuration categories.		
Press	Preferences	Display will show System Preferences categories.		
Press	Operator Access	Display will show the Operator Access screen. Select these options to allow operator password protected access: LDR, Loader, Prime, Tag, Screen Saver, View Totals, Side Bar, Manual Operations, Calibration, Timed Operation. Unselected options will be restricted to admin password only.		
Press		To save the changes or press the red X to cancel and exit.		

Volumetric Mode

Volumetric operation can be used in the event of a load cell failure. When power is turned off this mode is always reset to OFF. With this mode ON, the load cells are completely ignored. The unit functions like a volumetric feeder and error correction and rate recalibration does not take place. Since load cell readings are ignored, this flag allows operation even if the load cells become damaged. Dispense times will be based entirely on the last known rate adjustment. IF the metering rate is not correct see Rate Adjustment Reset on page 42.

Press		Display will prompt for a password. (admin default: 22222)	Then press:	
Press	MGF+ Configuration	Display will show the MGF+ Configuration categories.		
Press	Operating Operations	Display will show Operating Operations.		
Press	Volumetric Mode	Enable/Disable on all Components.		
Press		To save the changes or press the red X to cancel and exit.		

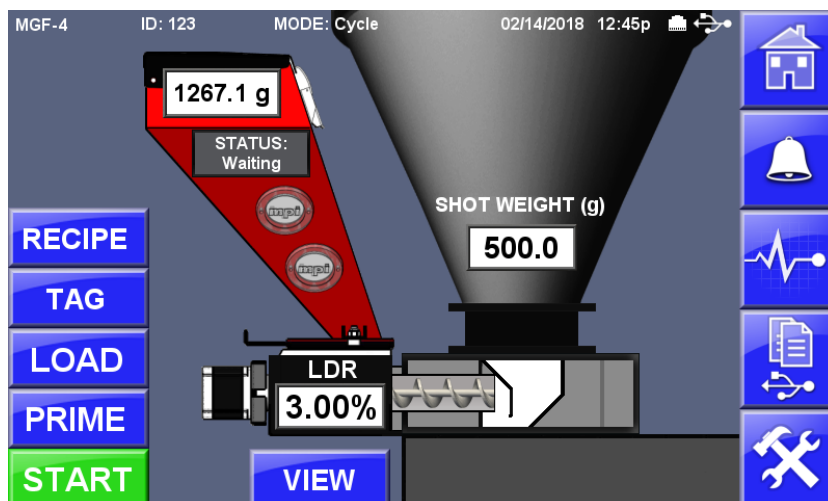
Loader Control

When Loader Control is enabled, the MGF+ can control a loader wired to the LOADER port on the side of the MGF+ controller to maintain a supply of material in the MGF+ hopper. See AGL Loader wiring diagram on page 45.

Enabling Loader Control

To enable Loader Control, touch the red MGF+ hopper on the screen then press Loader Setup, then Loader Control. Enter the admin password (default: 22222) or the operator password (if enabled). Select stations 1, 2 or 3 and enable or disable each station. Touch the green check to save and exit to go back to the home screen.

When enabled, the LOAD button will appear on the Home Screen. The load button will manually load the hopper. Press to toggle on, press again to toggle off.



Loading is controlled by 4 parameters:

LLF	Loader Low Level (Low Weight) – whole grams Factory Default - MGF-4: 00500, MGF-8: 00500 Weight of hopper that triggers the loader to turn on, whole grams
LHF	Loader High Level (High Weight) – whole grams Factory Default - MGF-4: 02000, MGF-8: 02000 Weight of hopper that triggers the loader to turn off, whole grams
LAT	Loader Alarm Timeout (Time Out) – whole seconds Factory Default - MGF-4: 00120, MGF-8: 00120 if the loader runs for this many seconds, the loader running too slowly alarm is tripped
STL	Loader Settle Time (Settle Time) – Seconds Factory Default - MGF-4: 00010, MGF-8: 00010 Number of seconds after loader finished before correction accumulators are readjusted and error checking resumes. Whole seconds

Loader related alarms:

LOADING TOO SLOWLY - ALARM CODE:49

If the loading feature is enabled and it takes more than LAT (Loader Alarm Time) seconds to fill the bin to LHF (Loader High Level) grams then this alarm is triggered.

Print Center



The Print Center enables access to print specific reports to USB including Totals, Parameters, Alarm History, Alarms and Events, Cycle History, Print All reports. The Print Center can be access from the home screen using the Print Center button. Additional configuration options are available with Setup (Setup > System Configuration > Print Center). Additional Option include automatic printout of cycle diagnostics and the format of that diagnostic report as well as format options for the Cycle History report.

Print Totals

Accessible from three locations, Print Center on navigation bar, under Setup (System Configuration, Print Center) and from the VIEW (totals) button on the home screen. This report outputs the current accumulated totals since the last clear of totals.

	DATE	TIME
CURRENT	08/30/18	21:00:46
LAST PRINTED	08/30/18	20:44:13
LAST CLEARED	08/30/18	20:52:52
TOTALS:	GRAND	
CYCLES	0	
TOTAL	1245 grams	
MGF TSC ID# 001	WO 00000	RECIPE 00000 OP 000

Print Alarm History and Print Events and Alarms

Accessible from two locations, Print Center on navigation bar and under Setup (System Configuration, Print Center). The Print Events and Alarms outputs the last 4096 alarm and event logs generated by the MGF. Print Alarm History excludes events and only outputs alarms. Each log entry is accompanied by the date, time and specific alarm or events description.

Print Cycle History

Cycle History is the last 250 cycles of the MGF+ (Cycle Mode only). The Cycle Report outputs a cycle log for each completed cycle and includes: Date/Time, MGF+ ID number, Work Order #, Recipe #, Operator #, current settings (LDR, Per Hour Rate), current hopper content weight, on-time, dispensed weight, rate adjustment, target, total weight dispensed in 10ths of grams, error %, cycle count (cycle mode) refill of the hopper count, and signal indicator with a signal count in seconds.

Print Parameters

The MGF+ is controlled by a set of internal parameters. Most of the parameters are configured from factory to optimal default parameters but can be changed to optimize operation to conditions. A full parameter report can be printed to USB from the Print Center.

Example of a Parameters Report:

```
FIRMWARE: R0827A
GRAVIMETRIC FEEDER ID# 000   WO 000000   RECIPE 00000   OP 000   MODEL 50
IP ADDRESS:192.168.0.1   SUBNET:255.255.255.0   GATEWAY:0.0.0.0
MODE: CYCLE
```

GENERAL PARAMETERS

NAME	RAM	ROM
LDR	500	200
SHT	500	200
PHR	2	200
FUL	3500	3500
PRT	1	0
KDF	6	6
LCZ	583	583
MTF	136	75
XCV	2	0
XRC	40	40
XAL	5	5
XUL	200	200
XMO	1000	1000
LBE	30	30
UBE	300	300
NBW	100	100
LWA	400	400
ATP	50002	51005
RTU	305	305
ADJ	3005	3005
LLF	500	500
LHF	2000	2000
LAT	120	120
STL	10	10
NWA	100	100
XMR	0	0

To the left is an example of a parameters report. This report prints the current parameter settings loaded into RAM (those that are currently in use) as well as parameters in ROM (factory defaults), current firmware version, MGF+ model, current mode of operation, and communications specific settings (ID#, IP address, subnet, gateway). Also available is work order number, recipe number and operator number which are set via the MLAN protocol and Modbus.

Cycle Print Options

When enabled, Cycle Print outputs a cycle diagnostic report to USB. Below are the output reports produced during the preset time interval. These reports display a date / time stamp, the MGF+ ID number, Work Order #, Operator #, and Recipe #, the current settings, current hopper content weight, on-time, dispensed weight, rate adjustment, target, total weight dispensed in 10ths of grams, error %, cycle count (cycle mode) refill of the hopper count, and signal indicator with a signal count in seconds.

Interval Report in Cycle Mode				Interval Report in Continuous Mode			
03/14/25 10:59:42 SERIAL #: 0				03/14/25 11:01:22 SERIAL #: 0			
MGF+ TSC ID# 001 WO 00000 RECIPE 00000 OP 000				MGF+ TSC ID# 001 WO 00000 RECIPE 00000 OP 000			
COMP. 1 COMP. 2				COMP. 1 COMP. 2			
LDR:	4.00%	1.00%		LDR:	4.00%	1.00%	
SHOT WT:	300.0g	300.0g		LBS/HR:	300.0	300.0	
WEIGHT:	1620.8	899.7		WEIGHT:	1510.1	873.1	
AVG. DISP:	11.64	2.98		AVG. DISP:	90.90	22.14	
TARGET:	12.00	3.00		TARGET:	90.72	22.68	
ERROR:	+0.3 (05)	+0.1 (05)		ERROR:	+1.6 (05)	+0.2 (05)	
RPM:	49.978	54.796		RPM:	38.053	41.728	
RATE ADJ:	1.1025	0.7218		RATE ADJ:	1.1025	0.7218	
ACC. WT:	11.64	35.86		ACC. WT:	62.21	14.88	
ACC. CT:	1	12		ACC. TM:	0:42	0:42	
TOT. WT:	185589	50435		TOT. WT:	409.48	111.26	
TOT. CT:	15468	15468		REFILL CT:	15470	15470	
RUN:	ON			RUN:	ON		
SIGNAL:	ON						
SIG ON:	6.04s						

Interval Report Description

Date, Time, MGF+ Serial Number.

MGF+ TSC ID# - WO - RECIPE - OP

Maguire Gravimetric Feeder Touchscreen Controller, ID# is the identification number of the MGF. WO (Work Order), RECIPE (Recipe Number), and OP (Operator Number) are for tracking of material usage. These TAGS may be entered by the operator on the home screen (TAG button) or downloaded via MLAN or Modbus TCP communication.

LDR – Let Down Ratio - Percentage

Let Down Ratio percentage entered in the LDR field at the time of the printout.

WEIGHT – Current material weight in hopper - grams

The current weight reading of material in the hopper at the end of the dispense cycle in Cycle Mode or the current weight at the time of the printout in Continuous Mode. This is the total weight of the additive that remains in the hopper.

AVG. DISP – Average Dispense - grams

The average dispense since the last rate error correction has occurred, or since the hopper was last refilled. For Cycle Mode it is the accumulated weight dispensed, divided by the accumulated cycles count. For Continuous Mode it is the average

TARGET – Target dispense - grams

In cycle mode this is the amount in grams that the feeder is targeting to dispense based on your entries of color percent, (LDR), and SHOT WEIGHT. Shot weight times LDR (percent of color) will give you the target dispense.

ERROR – Rate correction - grams

The total error that has occurred to this point, since the last rate correction or since the hopper was last filled. In this example, we have metered 1.9 grams more than we want, since the last correction. This is the "total" error. not one cycle, but all cycle errors combined. The (3) is the trip point. If total error exceeds 3 grams, then a recalculation of rate will occur.

SIG ON – Signal ON - seconds

The length of the screw return time that was recorded on this cycle. This number is used to determine how fast we need to run the auger to meter the required color uniformly over this time period.

SHOT WT – Shot Weight - grams

The Gram weight number that you enter to tell the software how large a shot is being molded. It will include runners, and all parts if this is a multi-cavity mold. In this example, $69 \times 5\% = 3.45$ grams, shown above as the TARGET weight.

RPM – Motor Speed - milliseconds

On models using our 24-volt DC motor, we control motor speed by pulsing the motor every second for a portion of that second. In this example, we will pulse the motor for 171 milliseconds, and then leave it off for the balance of the second, which is 829 ms off. The software adjusts this number based on the learned metering rate coupled with the machine screw ON TIME. As On-Time varies, this number will also adjust.

On models using a stepper motor, the off time between steps is adjusted to vary the metering rate.

RATE ADJ - Metering Rate Adjustment - factor

We begin all metering rate calculations using certain assumptions. We do not know the bulk density of the color being metered, and we do not know the exact flow characteristics of the pellets which, together, will change the gram weight metered per revolution of the auger. We start with a standard formula that assumes certain base numbers for these values. In the formula we also have a factor, a multiplier, that starts with a value of 1.0000. At this value, it has no effect. As we learn of an error in the dispense rate, we adjust this factor. In this example, we have adjusted it from 1.0000 downward to 0.8145, which tells us that either the bulk density is higher than our standard assumption, or the pellets flow better than our standard assumption. In any case, the software uses this number to keep the metering rate exactly correct, based on actual dispense rate learned from the loss-in-weight load cell readings over time. This is the number that you will see adjust as the unit learns the exactly correct metering rate.

ACC. WT – Accumulated Weight since last rate correction - grams

The accumulated weight since the last correction, or the last hopper refill.

ACC. CT – Accumulated Cycle Count since last rate correction - count

The cycle count since the last correction, or the last hopper refill. These two values, (accumulated) WEIGHT and CYCLE Count, are used to check on how close we are to our target. The ERROR is based on these numbers as compared to what we would expect if we run at a Perfect rate. TARGET per cycle times CYCLE CT is compared to (accumulated) WEIGHT, and the difference is the ERROR.

TOT. WT – Total Accumulated Weight - grams

The total weight dispensed since the last time this value was cleared to zero. This can be used to track total usage in your plant.

TOT. CT – Total Cycle Count - count

The total cycle count since last cleared to zero. This number also are useful for keeping print-out pages in order, and to reference cycles by number when highlighting problems or questions. These last two numbers are for convenience only. They do not enter into control calculations.

Enabling automatic USB printout of Print Cycle Diagnostics

How to enable automatic printout of Cycle Diagnostics to USB: Press Setup (enter password), System Configuration, Print Center, Print Cycle Options. Toggle OFF button to ON for Print Cycle Diagnostics. To print as a CSV file (comma separated value) select that option. Select Include Header to include a descriptive column header above each column.

Print Cycle Diagnostics – When ON, after each full dispense cycle, this sends a Cycle-by-Cycle printout to a file named MGFCYCLE.TXT to an inserted USB flash drive.

Print Cycle History – Prints diagnostic data of the last 250 cycles to USB. Can be printed as fixed width plain text file or as a CSV file with or without the column headers (titles).

Print Totals Interval - Enables automatic print of totals to USB at a specified interval (see PRT parameter).

Communications

Communications with the MGF+ use Modbus TCP or the Maguire MLAN Protocol and allow control of settings and parameters as well as data and totals collection from the MGF.

TCP/IP Configuration Set the MGF+ TCP/IP Settings

Used to set the IP Address, Network Mask and Default Gateway. Press the Enable/Disable DHCP to toggle between DHCP and static IP Address. The MAC address of this MGF+ controller is displayed on this screen. To set a Static IP Address, use the keypad to enter the static IP address you wish to assign the controller. Use leading zeros when necessary. When you are finished entering the network information, press the green check to save settings or press X to discard the changes.

Modbus TCP Enable or disable the Modbus TCP

Use this screen to enable or disable Modbus TCP. Modbus register tables can be requested from Maguire Products Inc. or by visiting www.maguire.com.

MLAN I.D. Number Sets the MGF's Identification Number

Select this option to enter an identification number for this feeder. If you are using MLAN communications to automatically gather data, then each controller must have a unique address. Valid numbers are 001 to 254. All MLAN communication commands (MLAN Protocol) use this I.D. number. For more information on communications, contact Maguire Products, Inc. or see the Maguire MLAN Protocol manual available online at www.maguire.com. Modbus does not use the I.D. Number.

Parameters

All Maguire MGF+ controllers operate according to certain internal parameters. Because customer requirements vary widely, parameters are accessible to refine operation. In most cases, these parameters will never need to be changed. Some parameters values that are routinely adjusted are accessible from the main display.

LDR	Let Down Ratio	NWA	No Weight Adjustment
SHT	Shot Weight	XMR	Extruder Minimum Rate
PHR	Per Hour Rate	SPR	Steps Per Revolution
FUL	Full Bin Weight	RPM	Maximum Revolutions Per Minute
PRT	Report Interval	PMR	Prime Motor Rate
KDF	Stable Weight	LCT	Load Cell Tolerance
LCZ	Load-cell Zero	BFS	Bin Full Settle
MTF	Motor Factor	RCP	Recipe Number
XCV	Extruder Voltage	WKO	Work Order Number
XMO	Extruder Max Output	OPR	Operator Number
LBE	Lower Boundary Error	NMA	No Meter Alarm
UBE	Upper Boundary Error	LIW	LIW Polling Rate
NBW	Negative Bin Weight	RAP	Rate Adjust Percentage
LWA	Low Weight Alarm	LLC	LIW Lower Cap
ATP	Adjustment Trip Point	TAT	Target Adjust Threshold
RTU	Run Time Update	XFT	Extrusion Voltage Filter
ADJ	Adjustment Limit	LCL	Loadcell Low
LLF	Loader Low Level	LCH	Loadcell High
LHF	Loader High Level	HRT	High Rate Trip Point
LAT	Loader Alarm Timeout	ECT	Error Count Tracking
STL	Loader Settle Time	IPC	Injection Color Percent
		ISP	Injection Screw Time Percent

LDR	Let Down Ratio – Percent Factory Default - MGF-4: 00200, MGF-8: 00200 Percentage of SHOT WEIGHT or PER HOUR RATE in 1/100 th percent
SHT	Shot Weight – Grams Factory Default - MGF-4: 00200, MGF-8: 00200 Shot weight dispensed during cycle mode in whole grams
PHR	Per Hour Rate – Counts Per Hour Factory Default - MGF-4: 00200, MGF-8: 00200 Value used to hold LB / HR or KG / HR depending on US / METRIC flag in whole units
FUL	Full Bin Weight – Grams Factory Default - MGF-4: 10000, MGF-8: 10000 Weight of bin (hopper) when full, in whole grams.
PRT	Report Interval – Seconds Factory Default - MGF-4: 00000, MGF-8: 00000 Used to generate reports while running, in whole seconds.
KDF	Stable Weight – Number Factory Default - MGF-4: 00200, MGF-8: 00200 Used in load-cell calibration routine. Difference between raw count updates use to get a stable reading. raw counts
LCZ	Load-cell Zero – Number Factory Default - MGF-4: 20000, MGF-8: 20000 Lowest possible raw count value from loadcells for zero calibration. raw counts

MTF	Motor Factor – model dependent Factory Default – MGF-3: 00050, MGF-4: 00300, MGF-8: 01250 Grams Per revolution – 0.5 (3/8" auger MGF-3), 3.00 (1/2" auger MGF-4), 12.50 (1" auger MGF-8) Implied decimal after 3 rd digit in parameter.
XCV	Extruder Voltage – Volts Factory Default - MGF-4: 00000, MGF-8: 00000 Current incoming voltage. Used in extrusion following, 1/100 volt. Automatic adjustment occurs to throughput based on XMO parameter.
XMO	Extruder Max Output – Pounds or Kilograms / hour – 01000 Factory Default - MGF-4: 01000, MGF-8: 01000 For Extrusion Following, this parameter stores the maximum extruder throughput based off of the XCV parameter at the maximum 10 volts. A manual entry of extruder throughput on the main screen will automatically set the XMO parameter and will be scaled from the current incoming voltage. Example: Incoming voltage is 5 volts. An Entry of 300 lbs. will set XMO to 00600 (lbs or kg). Entering a 1 in the first digit (1xxxx) will only allow changes to extruder throughput on main screen while in program mode (password protected).
LBE	Lower Boundary Error – Number Factory Default - MGF-4: 00030, MGF-8: 00030 Error rate lower limit in 1/100 th number
UBE	Upper Boundary Error – Number Factory Default - MGF-4: 00300, MGF-8: 00300 Error rate upper limit in 1/100 th number
NBW	Negative Bin Weight – whole grams Factory Default - MGF-4: 00100, MGF-8: 00100 Negative weight read from the bin (hopper), which will disable loader, whole grams
LWA	Low Weight Alarm – whole grams Factory Default - MGF-4: 00400, MGF-8: 00400 (0 = disabled) Weight of hopper that triggers the low weight alarm
ATP	Adjustment Trip Point – grams Factory Default - MGF-4: 00005, MGF-8: 00005 The fourth and fifth digits are the accumulative gram error that will force a readjustment of motor speed (5 grams default).
RTU	Run-Time Update – intervals, seconds Factory Default - MGF-4: 00201, MGF-8: 00201 This parameter holds two values; the first three digits are the successive number weight readings that must be above (+) or below (-) the ATP parameter value before making an adjustment to the motor off-time. The 4 th and 5 th digits are amount of adjustment in seconds that will be made. Controlled by ADJ parameter.
ADJ	Adjustment Limit – Percent Factory Default - MGF-4: 03005, MGF-8: 03005 Adjustment threshold and percentage when learning rate. This parameter holds two values. The 2 nd and 3 rd digits represent two things, percentage threshold (default 30%) and percentage adjustment (also 30%). If actual is equal to or greater than the threshold value, adjustments will be made by this amount (30% by default). If actual is less than this value, the adjustment will be made by the amount represented in the 4 th and 5 th digits (10% by default).
LLF	Loader Low Level – whole grams Factory Default - MGF-4: 00500, MGF-8: 00500 Weight of hopper that triggers the loader to turn on, whole grams
LHF	Loader High Level – whole grams Factory Default - MGF-4: 02000, MGF-8: 02000 Weight of hopper that triggers the loader to turn off, whole grams
LAT	Loader Alarm Timeout – whole seconds Factory Default - MGF-4: 00120, MGF-8: 00120

	if the loader runs for this many seconds, the loader running too slowly alarm is tripped
STL	Loader Settle Time – Seconds Factory Default - MGF-4: 00010, MGF-8: 00010 Number of seconds after loader finished before correction accumulators are readjusted and error checking resumes. Whole seconds
NWA	No Weight Adjustment – Grams Factory Default - MGF-4: 00100, MGF-8: 00100 If the material in the hopper goes below this value in grams, stop making adjustments to error correction.
XMR	Extruder Minimum Rate – Grams/Second Factory Default - MGF-4: 00000, MGF-8: 00000 For Extrusion control only – When a value is specified, this is the minimum rate (grams per second) that the MGF+ will run when the extruder slows down.
SPR	Steps Per Revolution – Number - DO NOT CHANGE THIS PARAMETER Factory Default - MGF-4: 06400, MGF-8: 06400 Stepper motor micro steps per revolution. With a current MGF+ motor, there are 200 step per revolution and 32 hardwired micro steps or 6400 (200 x 32).
RPM	Maximum Revolutions Per Minute - Number - DO NOT CHANGE THIS PARAMETER Factory Default - MGF-4: 00100, MGF-8: 00100 Software defined maximum number of revolutions per minute based on hardware capabilities.
PMR	Prime Motor Rate Factory Default - MGF-4: 00020, MGF-8: 00020 Software defined maximum number of revolutions per minute when running the Prime Function. A slower speed is used during PRIME to prevent overfills.
LCT	Load Cell Tolerance - GEN5 only. GEN6 does not use this parameter. Factory Default - MGF-4: 00505, MGF-8: 00505 This parameter has 2 parts, xxx.yy. The left three digits (xxx) are the number of sequential raw count readings before snapping to the new value (00505 = 5 sequential readings). The right two digits (yy) are the difference between 2 sequential raw count readings (00505 = 5 raw counts) if the latest raw count reading is less than yy, then continue to use the previous reading however, if xxx readings in a row are the same value, then use to the latest reading.
BFS	Bin Full Settle - stepper motor only Factory Default - MGF-4: 00020, MGF-8: 00020 If the bin weight spikes $\pm$ BFS grams beyond the target rate, then LOAD will appear and error correction is halted until the bin weight settles again.
RCP	Recipe Number - Number Factory Default - MGF-4: 00000, MGF-8: 00000 Recording purposes only, set the MGFs recipe number returned in the MLAN commands. This field stores a 5-digit number 00000-99999.
WKO	Work Order Number - Number Factory Default - MGF-4: 00000, MGF-8: 00000 Recording purposes only, set the work order number returned in the MLAN commands. This field stores a 5-digit number 00000-99999.
OPR	Operator Number - Number Factory Default - MGF-4: 00000, MGF-8: 00000 Recording purposes only, sets the operator number returned in the MLAN commands. This field stores a 5-digit number 00000-99999.

NMA	No Metering Alarm - Continuous mode only Factory Default - MGF-4: 33500, MGF-8: 33500 This parameter has 3 parts: x.y.zzz Leftmost digit (x) is the number of times the rate is below the threshold before the alarm is turned on (33500 = 3 counts). Second digit from the left (y) is the number of times the rate is above the threshold before the alarm is turned off (33500 = 3 counts). The rightmost 3 digits (zzz) are the percentage of target rate (1/10th of a percent) (33500 = 50.0%).
LIW	LIW Polling Rate - LIW Mode only Factory Default - MGF-4: 00010, MGF-8: 00010 The number of seconds between each poll of the LIW's steady rate. Faster rates may cause issues with the ethernet stack. Slower rates may cause issues with the MGF+ detecting changes in the LIW's steady rate.
RAP	Rate Adjust Percentage - Extrusion Following Only Factory Default - MGF-4: 10050, MGF-8: 10050 This parameter has 2 parts, xx.yyy The leftmost two digits (xx) are the number of seconds between each rate adjustment check (10050 = 10 seconds). The three rightmost digits (yyy) are the lower threshold in grams per minute (10050 = 5.0 g/m). If the target g/m rate falls below the yyy threshold, the time between rate adjustment checks will change to xx. If the target g/m rate rise back above yyy threshold, the time between rate adjustment checks will revert back to its original setting.
LLC	LIW Lower Cap Factory Default - MGF-4: 00010, MGF-8: 00010 Used for MLAN commands and LIW polling for continuous mode only. Stored as 1/10th LBS or KGS per hour (depending on the weight units setting) (00010 = 1.0 lb/hr). When a new target rate is received, it is checked against the LLC parameter. If the rate is equal to or below LLC, then the PHR parameter will snap to zero.
TAT	Target Adjust Threshold - Cycle mode only Factory Default - MGF-4: 00025, MGF-8: 00025 Stored as 1/100th grams per second (00025 = 0.25 g/s) When a cycle starts, the target grams per second rate (Shot weight / cycle time) is checked against TAT. If the rate is below TAT, then the running motor time is halved, and the target motor speed is doubled. This will continue until the target rate is above TAT. Example: TAT = 00025 (0.25 g/s) Shot Weight = 9 grams Cycle Time = 88 seconds this will result in a target rate of 0.102 g/s Before the cycle starts, the MGF+ will see that the rate is below 0.25 g/s and adjust the run time and motor speed to compensate for this. When the MGF+ runs it will have targeted a 0.409 g/s rate over a 22 second period.
XFT	Extrusion Voltage Filter Factory Default: 02003 Used for filtering incoming extrusion voltage. The parameter is separated into 2 parts: vvv.ff vvv = cap to zero voltage in 1/100th of a voltage ff = fluctuation filter in 1/100th of a voltage. NOTE: ff is capped at 0.50V or xxx50
LCL LCH	Loadcell Low - Loadcell High LCL factory defaulted: 00040. LCH factory defaulted: 00080. LCL and LCH are used for full weight loadcell calibration. The LCL and LCH parameters ensure that the calibrated weight falls with a reasonable slope. If the full weight slope is outside the LCL and LCH defined slopes, then an error message: '*** BAD LOAD-CELL ***' will be displayed.

HRT	High Rate Trip Point - Continuous and Extrusion Following only HRT controls the adjustment to the ATP parameter. HRT is separated into 2 parts: xx.yyy xx = new value for ATP yyy = trip point for changing ATP in grams / minute 1. If the current rate is above HRT (yyy) then adjust the ATP to HRT (xx) 2. If the current rate falls below HRT (yyy) then revert ATP back to previous setting.
ECT	Error Count Tracking ECT is used to specify the delay in error tracking when first starting as well as after an error correction is made. This parameter is broken into 2 parts: xx.yyy where xx = number of cycles (Cycle mode) yyy = number of seconds (Continuous mode)
IPC	Injection Color Percent Cycle Mode Factory Default: 00025 (25%) Percent of the color target that should be added during the injection time. Typically, material is dispensed only during screw recovery. This parameter allows for a percentage of the overall color target to be dispensed during the beginning of the cycle's injection. The injection time is controlled by the ISP parameter. This feature requires an injection signal (see MGF+ Wiring Diagram). Intrusion Mode: Factory Default: 00025 (25%) Percent of the color target that should be added during the intrusion time. Typically, material is dispensed only during screw recovery. This parameter allows for a percentage of the overall color target to be dispensed during the cycle's intrusion.
ISP	Injection Screw Time Percent – Cycle Mode only Factory Default: 10030 (enabled at 30%) This parameter has two parts. The first digit (1xxxx) enables or disables this feature. 1=enabled, 0=disabled. ISP is the Percent of Recovery Time used to calculate a time (in seconds) to dispense an amount of additive (IPC parameter) at the beginning of the overall Injection Time. This parameter uses a percentage of the recovery time (30% by default) to calculate how much time the MGF+ will dispense material during the beginning of the injection stroke.
XFT	Extrusion Voltage Filter Factory Default - MGF-3: 02003, MGF-4: 02003, MGF-8: 02003 Used for filtering incoming extrusion voltage. The parameter is separated into 2 parts: vvv.ff vvv = cap to zero voltage in 1/100th of a voltage ff = fluctuation filter in 1/100th of a voltage. NOTE: ff is capped at 0.50V or xxx50
LCL LCH	Loadcell Low - Loadcell High LCL Factory Default - MGF-3: 03000, MGF-4: 03000, MGF-8: 03000 LCH Factory Default - MGF-3: 08000, MGF-4: 08000, MGF-8: 08000 LCL and LCH are used for full weight loadcell calibration. The LCL and LCH parameters ensure that the calibrated weight falls with a reasonable slope. If the full weight slope is outside the LCL and LCH defined slopes, then an error message: '*** BAD LOAD-CELL ***' will be displayed.
HRT	High Rate Trip Point - Continuous and Extrusion Following only Factory Default - MGF-3: 10100, MGF-4: 10100, MGF-8: 10100 HRT controls the adjustment to the ATP parameter. HRT is separated into 2 parts: xx.yyy xx = new value for ATP yyy = trip point for changing ATP in grams / minute 1. If the current rate is above HRT (yyy) then adjust the ATP to HRT (xx)

2. If the current rate falls below HRT (yyy) then revert ATP back to previous setting.	
ECT	Error Count Tracking Factory Default - MGF-3: 03020, MGF-4: 03020, MGF-8: 03020 ECT is used to specify the delay in error tracking when first starting as well as after an error correction is made. This parameter is broken into 2 parts: xx.yyy where xx = number of cycles (Cycle mode) yyy = number of seconds (Continuous mode)
IPC	Injection Color Percent Cycle Mode Factory Default - MGF-3: 00025, MGF-4: 00025, MGF-8: 00025 (25%) Percent of the color target that should be added during the injection time. Typically, material is dispensed only during screw recovery. This parameter allows for a percentage of the overall color target to be dispensed during the beginning of the cycle's injection. The injection time is controlled by the ISP parameter. This feature requires an injection signal (see MGF+ Wiring Diagram). Intrusion Mode: Factory Default - MGF-3: 00025, MGF-4: 00025, MGF-8: 00025 (25%) Percent of the color target that should be added during the intrusion time. Typically, material is dispensed only during screw recovery. This parameter allows for a percentage of the overall color target to be dispensed during the cycle's intrusion.
ISP	Injection Screw Time Percent – Cycle Mode only Factory Default - MGF-3: 10030, MGF-4: 10030, MGF-8: 10030 (enabled at 30%) This parameter has two parts. The first digit (1xxxx) enables or disables this feature. 1=enabled, 0=disabled. ISP is the Percent of Recovery Time used to calculate a time (in seconds) to dispense an amount of additive (IPC parameter) at the beginning of the overall Injection Time. This parameter uses a percentage of the recovery time (30% by default) to calculate how much time the MGF+ will dispense material during the beginning of the injection stroke.
SFT	Signal Filter Threshold Factory Default - MGF-3: 00205, MGF-4: 00205, MGF-8: 00205 This parameter is broken up into 2 parts. The first 3 digits (111xx) represent the injection or intrusion signal threshold in 1/10th of seconds, the last 2 digits (xxx11) represent the recover signal threshold in 1/10th of seconds.
MTL	Motor Torque Limit Factory Default - MGF-3: 01000, MGF-4: 01000, MGF-8: 01000 This parameter is only assessable through Modbus and shouldn't be changed.
LRT	LIW Rate Threshold Factory Default - MGF-3: 00010, MGF-4: 00010, MGF-8: 00010 This parameter is used as the threshold for filling the filter with a new value.

Updating MGF+ Firmware

When the MGF+ Touchscreen Controller is turned on, the first screen displayed will show the current firmware version. If necessary, the firmware in the MGF+ can be updated using a firmware update supplied by Maguire Products. Firmware updates use the USB port located to the lower-right of the control screen. The following instructions detail how to update the MGF+ firmware. Maguire can supply the latest MGF+ firmware upon request.



**Do not turn off the controller while firmware is updating.
Doing so may corrupt the controller's firmware.**

Copy	the firmware update onto a USB flash drive in a folder named "maguire".	
Insert	USB Flash drive into the USB port on the MGF+.	
Press	 Display will prompt for password. (default: 22222)	Then press: 
Press	System Configuration	Display will show the System Configuration categories.
Press	Resets	Display will show System reset options.
Press	User Settings	Press Save User Settings to save the current configuration then press EXIT to return to the previous screen.
Press	Firmware Update	The controller will search the maguire folder on the USB drive for a firmware update file with the XUF extension.
Select	the firmware update file in the white display area on the left of the screen.	
Press	PROGRAM	To select the firmware.
Press	Confirm	To proceed with the firmware update.
The display will show progress transferring from USB to the internal flash, then it will show progress in verifying the update file. You will be prompted to remove the USB flash drive after it is copied to internal memory. Then the update will proceed. The display will show progress updating to the new firmware. When complete, the display will show: UPDATE COMPLETE Toggle power . Turn off power, then turn back on.		
Restore Settings - After the update completes and the controller reboots, repeat the steps above to enter User Settings. Press Restore User Settings to restore the saved configuration.		

Additional Firmware Update Information

Software updates can be supplied electronically, via email or by download upon request. Software updates are named according to their date of release. For instance, **MPY0212A.XUF** can be interpreted as MP=MGF+ (Plus), Y=2025 (Z=2026), 02=February, 12= day, A=the first revision for that day. During the update process detailed above, new software found on the USB flash drive is first copied to internal memory.

If the MGF+ Touchscreen ever becomes unresponsive or the MGF+ is corrupted and cannot load new firmware through the menu, new software acquired from Maguire can be renamed **MGF-PLUS-UPDATE.XUF**. This renamed software can be copied onto the USB flash drive's root directory and inserted into the USB port of the MGF+. When the MGF+ is turned on, the **MGF-PLUS-UPDATE.XUF** file will be automatically loaded into the MGF, restoring the firmware.

Rate Adjustment Reset

Used to reset the Rate Adjustment back to the default value of 1.0000. This can be helpful if changing materials and the new material has a different consistency than the original material. When reset it may help the MGF+ to re-learn the rate quicker than if it adjusted the rate from the previously learned value.

Press		Display will prompt for a password. (default: 22222)	Then press:	
Press	System Configuration	Display will show the System Configuration categories.		
Press	Resets	Display will show System Resets Options		
Press	Reset Rate Adjustment	Display will prompt for confirmation to reset rate adjust.		
Press		To confirm a rate adjust reset or press the red X to cancel and exit.		

View / Reset Totals

Note that if you are retrieving totals through the MLAN Protocol, Modbus TCP or the G2 Software, resetting totals is not recommended unless you are factoring in a reset of this value back to zero. Totals can be viewed, printed or reset from the Home Screen. Pressing the VIEW on the Home screen will display current totals, date and time, cycle count and other information. Pressing the Print to USB button from this screen will attempt to write totals to a USB flash drive into a folder named “maguire”. Pressing CLEAR will reset totals and cycle count back to zero. Totals can also be printed from the Setup menu in the Print Center.

Press		Display will display the View Totals screen.
Press		To print the totals as seen on the screen to the USB flash drive plugged into the MGF+ USB port. The file will be named MGFTOTAL.TXT and will be written into a folder named “maguire”.
Press	CLEAR	To reset the totals and cycle count to zero.

Restore Factory Defaults

The MGF+ can be restored back to factory defaults by entering Setup, System Configuration, Resets, Restore Factory Defaults. Press the green check to restore factory defaults. The controller will reboot with factory defaults. The factory default will reset setpoints, totals, cycle count and parameters to factory defaults. Restoring factory defaults will not reset the Machine ID, IP address, Modbus, model, passwords, language, mode of operation, alarm log, cycle log (Live Diagnostics).

AGL Loader Installation

1. Prior to installation of the AGL Loader, the MGF+ Controller Bar must be installed on the MGF+ Adapter Frame. The MGF+ clear material hose and aluminum cam lock must be secured to the Controller Bar for proper load cell operation.
2. Assemble the red hose and fitting that is shown in figure 1 and secure to the Controller Bar. Secure the upper u-clamp to the metal fitting as shown for proper grounding. See AGL Loader diagram for correct hose arc.
3. The other end of the red hose is connected to the vacuum generator as shown in figure 3. Secure hose with the provided hose clamp.
4. Connect the aluminum lance to the other end of the vacuum generator as shown in figure 3.
5. Press the clear material hose onto the tube located on the lid of the feeder hopper. If the tube goes on with resistance, a little water can be used to lubricate it. Do not use any other lubricant. Figure 2.
6. Connect the clear 3/8" diameter tubing to the vacuum generator as shown in figure 3, and connect the other end to the push-in fitting at the solenoid.
7. Connect the air supply to the brass 45° X 1/4" NPT fitting at the input side of the solenoid mounted on the control bar.
8. The air supply should be set and regulated at a pressure between 60 and 80 PSI.
9. Connect the feeder motor cables to the matching connectors on the controller, motor and solenoid.
10. After the MGF+ Feeder Loader is installed, the MGF+ should be re-calibrated using the procedure found on page 34.



FIGURE 1

Secure the red material hose under the supplied u-clamp as shown in figure 1. It is important that the upper u-clamp is secured to the metal fitting as shown for proper grounding. The solenoid should be affixed to the controller bar.

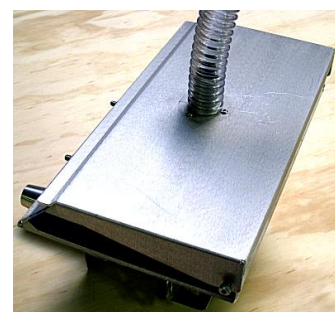


FIGURE 2

Install the end of the clear material hose to the top of the feeder lid as shown.



IMPORTANT!

It is important that the feeder assembly is properly grounded through the process equipment.



FIGURE 3

Mount vacuum aluminum lance to the vacuum generator. Attached and clamp the red hose to the vacuum generator using the included hose clamp.

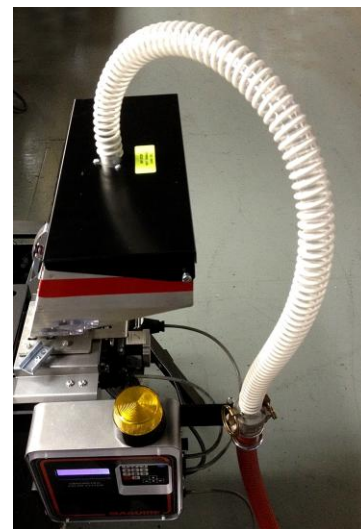


FIGURE 4

Use the natural arc of the hose to loop above the hopper to the location where the u-bolts are attached.



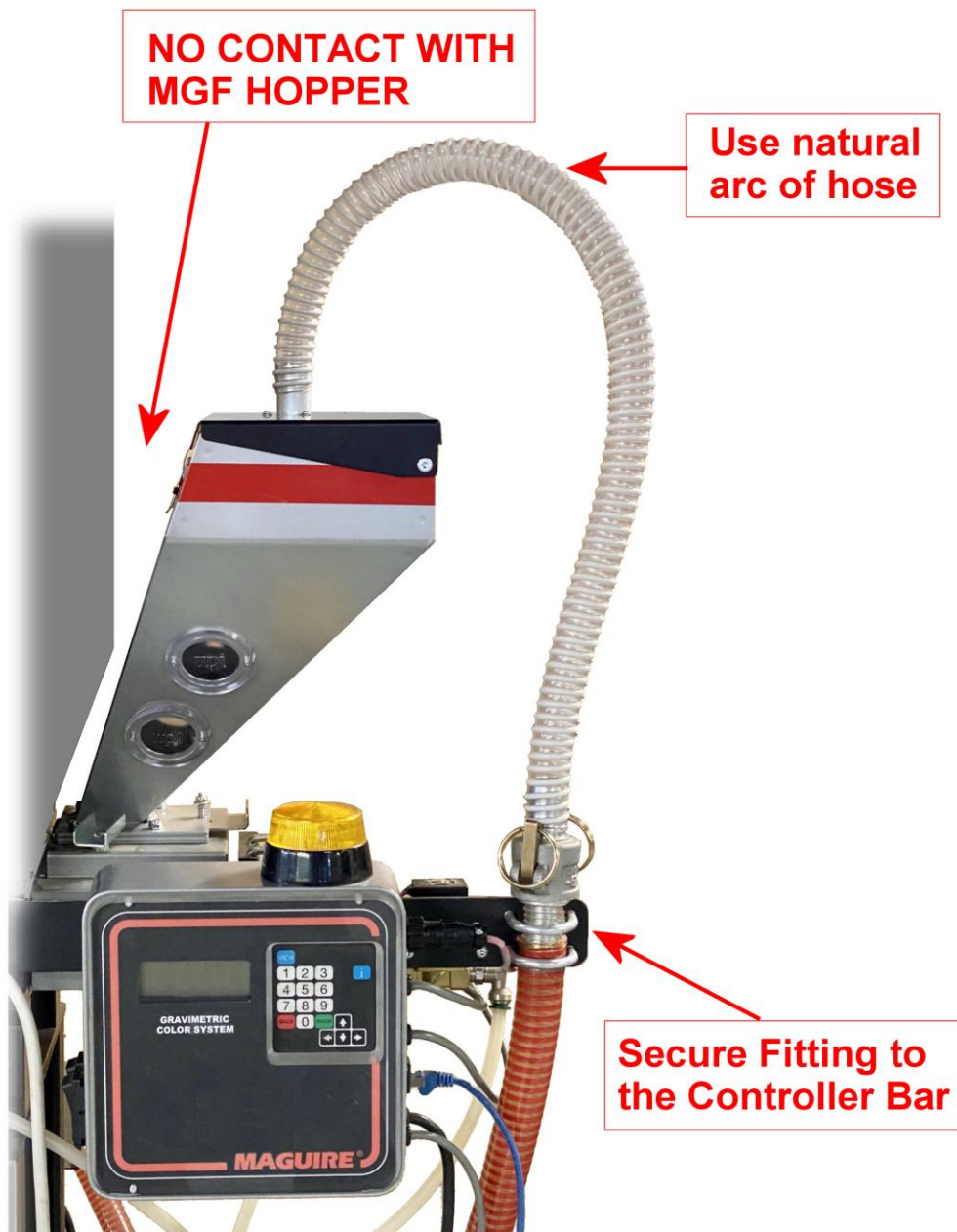
For accurate weigh readings of the load cells, it is important to follow these guidelines:

IMPORTANT!

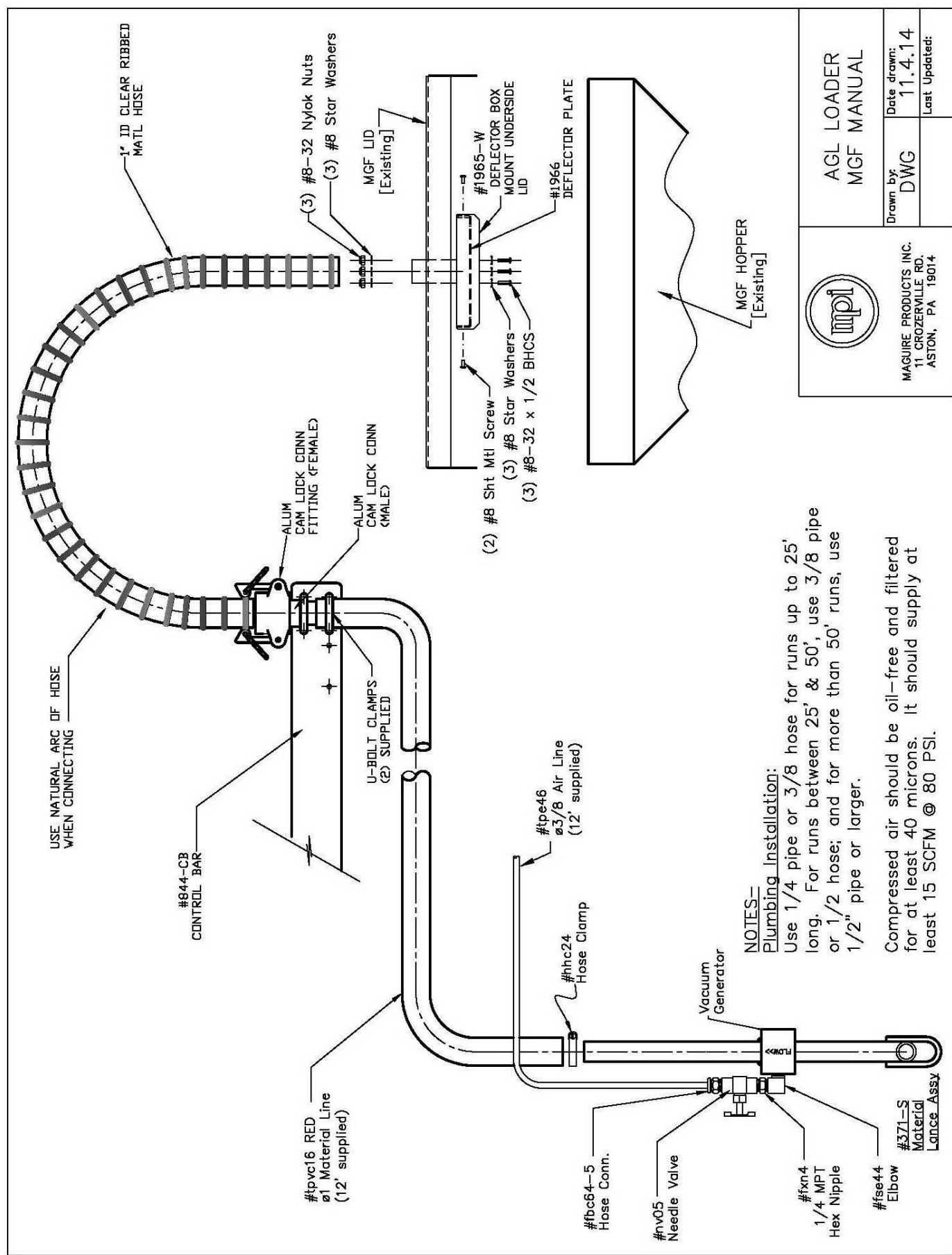
To ensure accurate weight readings nothing should make contact with the MGF+ hopper.

If an AGL loader is installed, the material hose attached to the hopper should have a gradual arc and should not have contact with anything around it.

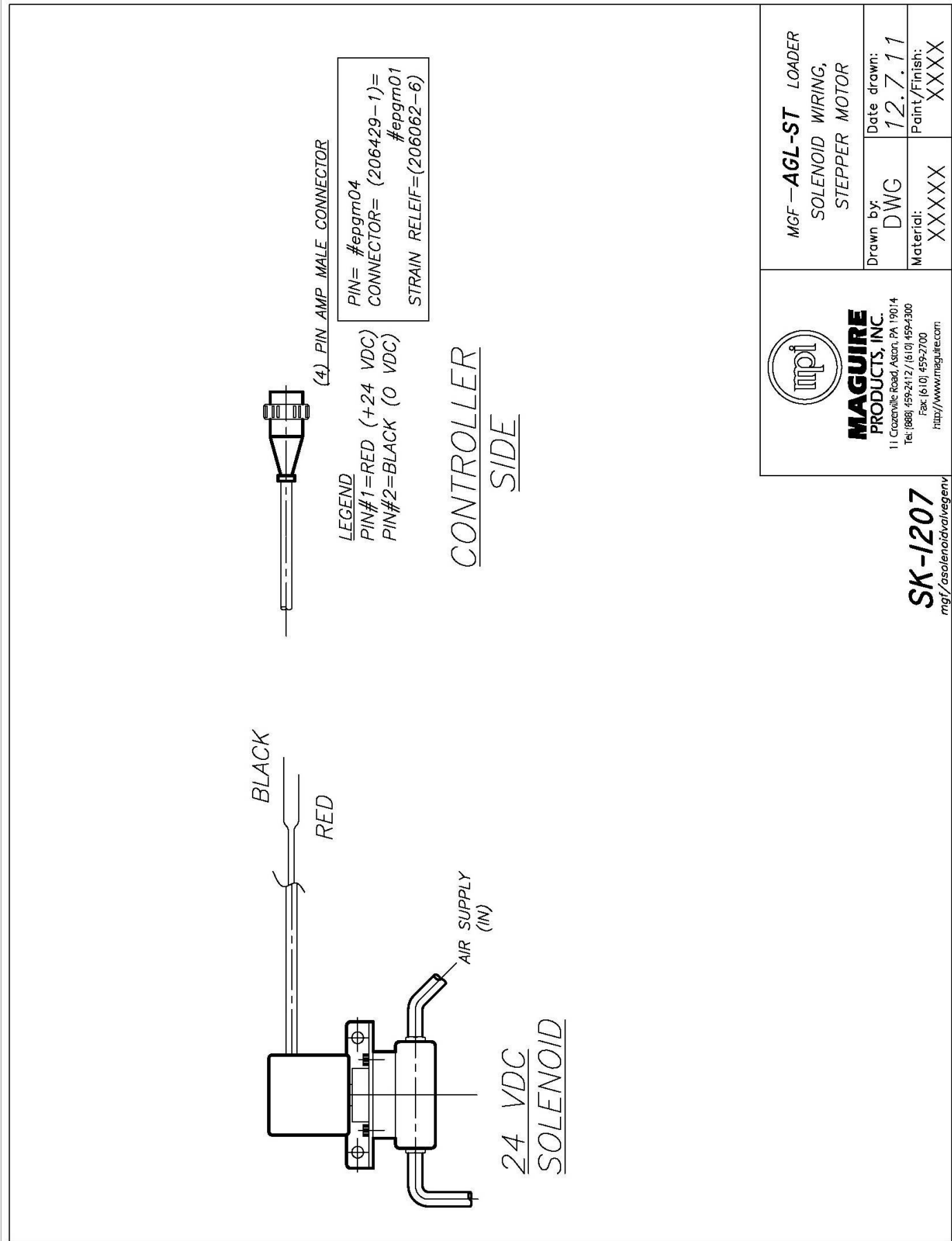
The AGL material hose quick disconnect fitting should be c-clamped to the Controller Bar and the upper c-clamp should contact the bare metal of the fitting to discharge static buildup. The lower c-clamp should secure tightly to the red hose. **Image shown not correct (MGF)**



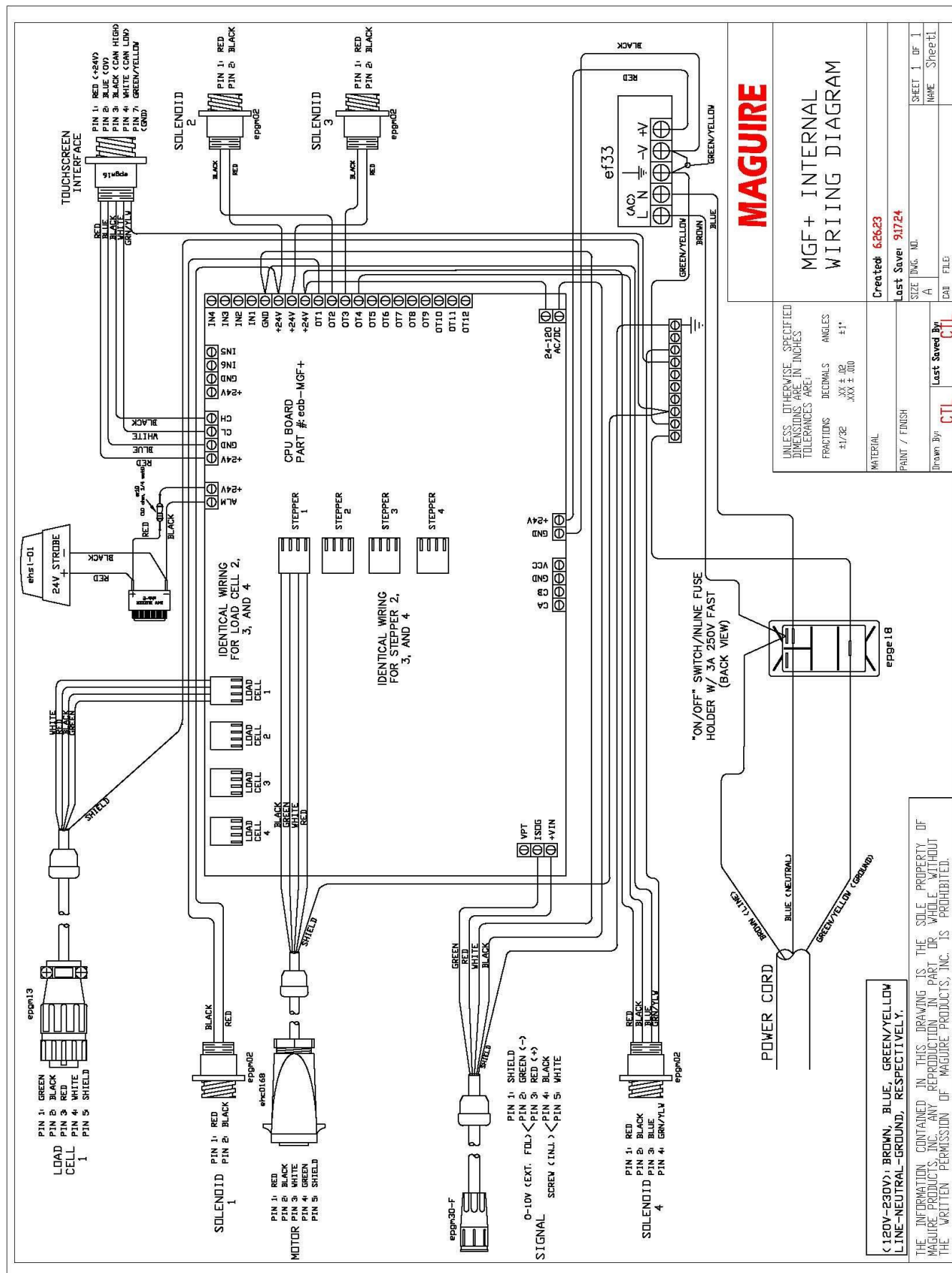
AGL Loader Diagram

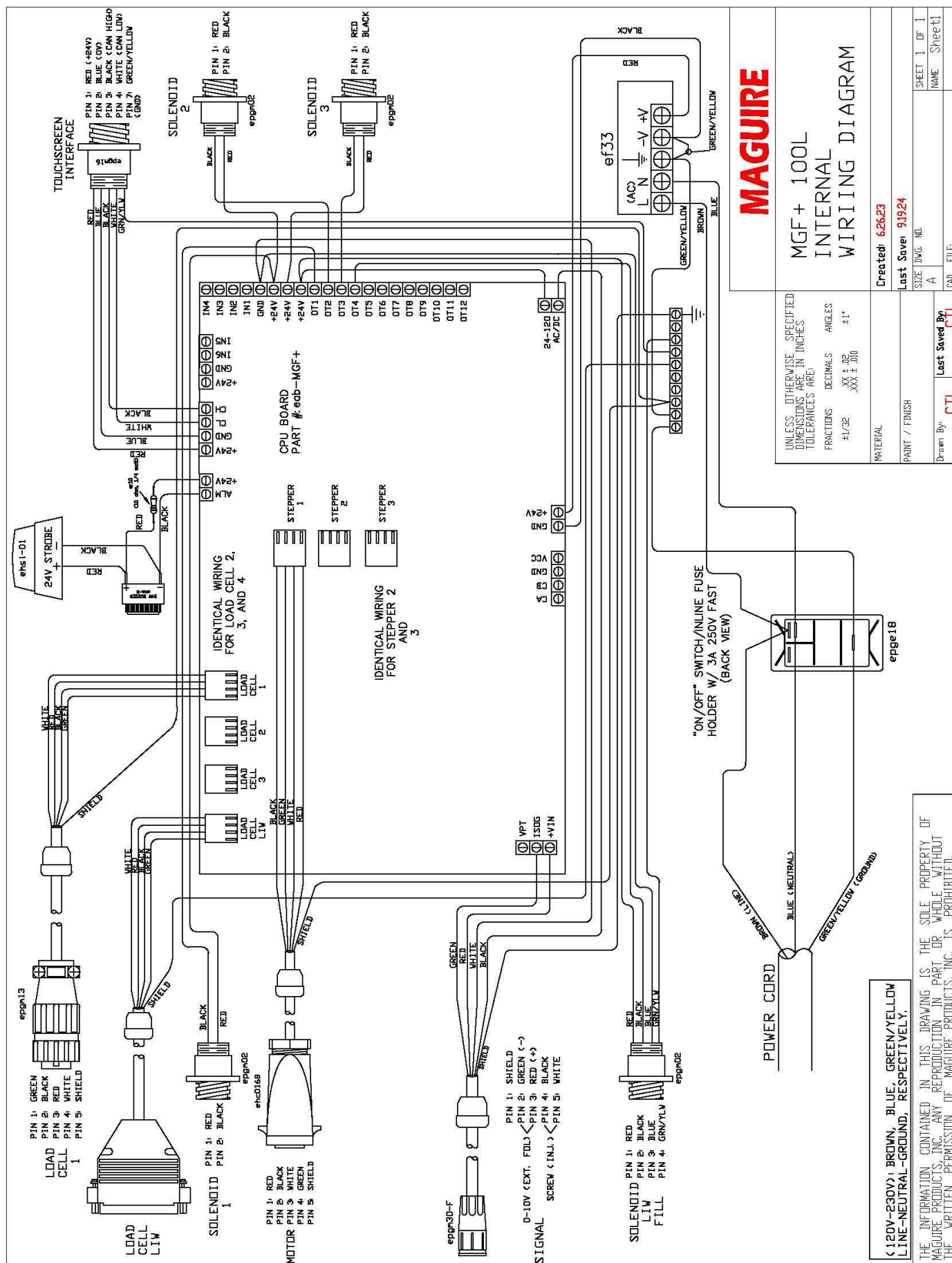


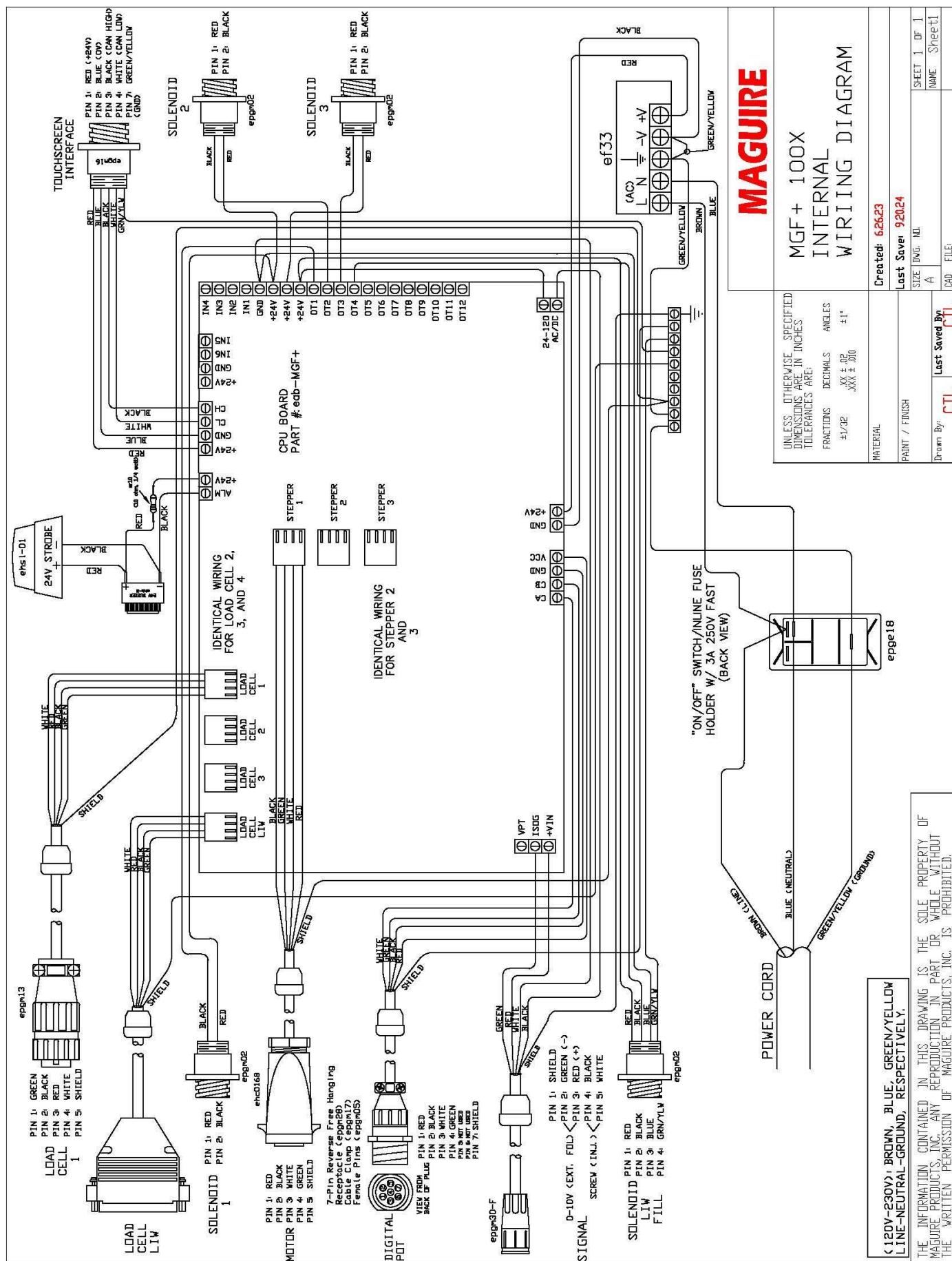
AGL Loader Solenoid Wiring Assembly



MGF+ Wiring Diagrams







Parts Diagram and Dimensions Drawing

(Forthcoming)

PRINCIPLE OF FEEDER OPERATION

The MAGUIRE GRAVIMETRIC FEEDER is a rugged industrial auger feeder designed to meter precise quantities of color concentrate very accurately into the main flow of virgin material directly above the throat of your process machine. The two 10" square steel plates, separated by 4 steel corner posts, form a sturdy, low profile adaptor assembly. This assembly is drilled with the proper bolt pattern and mounted to the throat of your process machine under the main material hopper. Natural material flows through the adaptor.

On this adaptor frame, we hang the weighing platform, which then, in turn, supports the hopper and auger assembly. To ensure accurate weight readings, the hopper assembly does not contact any stationary part. The ease of removal allows for easy clean-out of the hopper for color changes. Two butterfly latches allow easy removal of the auger / motor assembly for complete access to all areas for 100 percent cleanout.

Virgin material flow is visible through the flow chamber, which uses clear acrylic plastic windows and stainless-steel baffles. The baffles direct the flow of natural material so that color is dropped into the flow from an air space and is evenly distributed over a steady and predictable flow of natural material. This assures uniform distribution of color into the natural material. The windows provide a clear operator view of the combined flow.

The hopper holds up to 10 pounds of concentrate. Four sight glasses provide a view of the material level.

PRINCIPLE OF CONTROLLER OPERATION

The MAGUIRE Gravimetric Controller coupled with two loss in weight load cells, provides the precise speed regulation and metering control necessary to assure absolute accuracy over your color usage. Metering rate is directly related to motor speed or motor run time. Accuracy is obtained by controlling the exact degree of off-time of the motor. Feed back from the load cells confirms the actual dispense and motor off-time is then adjusted to assure perfect dispense weights over time.

Though use of a stepper motor, RPM is precisely controlled in increments of 200 steps per revolution, allowing metering to occur uniformly over the entire screw return cycle (for injection molding applications) or through continuous operation (for extrusion applications). The metering rate is constantly monitored and adjusted to maintain accuracy. Changing cycle times or fluctuations in plant voltage are automatically detected and compensated for with no effect on metering accuracy.

DECOMMISSIONING AND DISPOSAL

Decommissioning the unit: Disconnect the unit from the power supply. Disconnect the compressed air supply. Cut all Electrical cables & Pneumatic Hoses to decommission the equipment. Disposal: Remove air hoses and inspection glasses and dispose of with plastic refuse. Remove electric motor dispose of with metal. Remainder of unit dispose of with metal. Controller: Remove battery and dispose of battery with hazardous waste. Remainder of controller dispose of with electronic waste. Re-cycle any hazardous materials/substances in accordance with the Local & National regulations of the End User e.g. Lithium batteries etc, specific attention should be paid to the European RoHS & WEEE Directives; remove any 'sharps' and dispose of in accordance with Local & National regulations.

WARRANTY - Exclusive 5-Year

MAGUIRE PRODUCTS offers one of the MOST COMPREHENSIVE WARRANTIES in the plastics equipment industry. We warrant each Feeder manufactured by us to be free from defects in material and workmanship under normal use and service; our obligation under this warranty being limited to making good at our factory any Feeder which shall within FIVE (5) YEARS after delivery to the original purchaser be returned intact to us, transportation charges PREPAID, and which our examination shall disclose to our satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on our part, and MAGUIRE PRODUCTS neither assumes nor authorizes any other persons to assume for it any other liability in connection with the sale of its products.



This warranty shall not apply to any Feeder which shall have been repaired or altered outside MAGUIRE PRODUCTS factory, unless such repair or alteration was, in our judgment, not responsible for the failure; nor which has been subject to misuse, negligence or accident, incorrect wiring by others, or installation or use not in accord with instructions furnished by Maguire Products.

Our liability under this warranty will extend only to Feeders that are returned to our factory in Aston, Pennsylvania PREPAID.

It should be noted, however, that we strive to satisfy our customers in whatever manner is deemed most expedient to overcome any problems they may have in connection with our equipment.

Technical Support and Contact Information

Maguire Products Inc.

11 Crozerville Road

Aston, PA 19014

Tel: 610.459.4300

Fax: 610.459.2700

Email: info@maguire.com

Web: www.maguire.com

Maguire Europe

Tame Park

Tamworth

Staffordshire

B775DY

UK

Tel: + 44 1827 265 850

Fax: + 44 1827 265 855

Email: info@maguire-europe.com

Maguire Products Asia PTE LTD

Main Office

15 Changi North Street 1

#01-15, I-Lofts

Singapore 498765

Tel: 65 6848-7117

Fax: 65 6542-8577

E-mail: magasia@maguire-products.com.sg