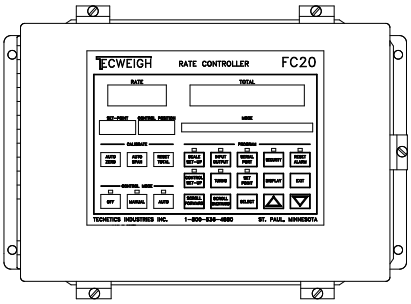
TECWEIGH®
Tecnetics Industries, Inc.

OPERATION MANUAL

Conveyor Scales
Models: WY10, WY10HD, WY15, WY20, WY25

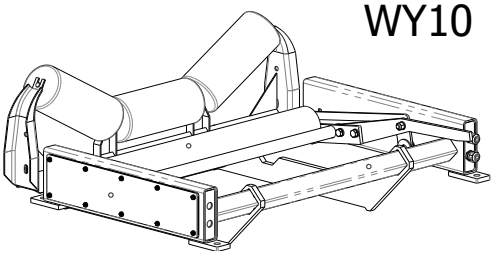
Rate Processor
Model: FC20
Firmware Version 8.00

MP410 main PCB

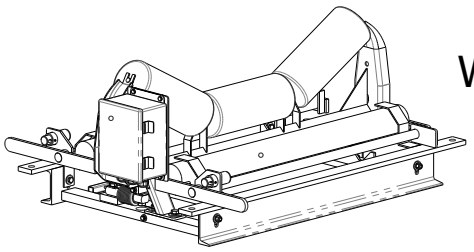


FC20 RATE CONTROLLER

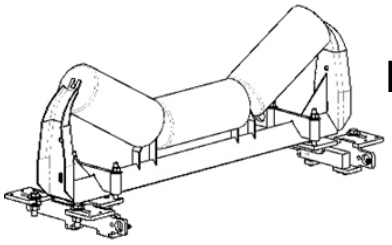
Signal Conditioner
Models: SC300 (WY15 & WY25)
SC400 (WY10, WY10HD & WY20)



WY10



WY15



HY15

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P/N 21011110 [Last update, June 19, 2012]

TABLE OF CONTENTS

CHAPTER 1 - SAFETY

This symbol is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

This symbol is intended to alert the user of the presence of dangerous voltages within the electrical enclosure that may be of sufficient magnitude to constitute a risk of electric shock.

1.01 The Manual

This entire manual should be read thoroughly to gain the proper knowledge of how the system works and how to operate it safely. Also be sure to read the safety instructions and warnings. Failure to heed these safety instructions and warnings could result in serious personal injury or death.

1.02 Lifting Equipment

The scale includes a minimum of four mounting holes located in the four corners of the scale's main carriage. It is recommended that these holes be used when lifting the equipment. The use of a crane or forklift with a spreader bar is recommended. Use caution at all times when rigging or hoisting the scale. Mishandling can damage the equipment and/or cause injury to personnel.

It is not recommended that the equipment be lifted manually, but if the equipment must be lifted manually a minimum of two people should be used. At no time should manual lifting or installation be attempted on conveyor scales designed for 48" or wider belts.

1.03 Transporting Equipment

Tecweigh scales are commonly used on portable belt conveyors. Use caution at all times when transporting, rigging, or hoisting the scale carriages. Mishandling can cause scale damage and/or injury to personnel. Remove the calibration weights during transport to prevent damage to the scale and also to prevent the weights from falling out.

1.04 Electrical Codes

WARNING! – DANGER! Follow all local electrical and safety codes as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA). Improper wiring or improper grounding could cause serious personal injury or death. Disconnect and lock out all power from the scale before servicing. Only authorized service technicians should have access to the inside of the electrical enclosures. This includes the signal conditioner enclosure on the scale

and the FC20 processor enclosure. Even with the equipment's power disconnected, live voltage can be present inside the FC20's enclosure.

1.05 Hazardous Environments

WARNING! The standard scale is not "explosion-proof". The standard scale must not be operated in an environment where conditions exist that could cause an explosion of dust or gas. Specially built explosion proof scales, signal conditioner enclosures, and speed sensors are available from **Tecnetics** for use in hazardous environments.

1.06 Scale Over-Loading

WARNING! Excessive loading on the scale could result in damage to the scale, conveyor, or cause injury to personnel. Information that applies to your specific application is available in Section 12 of this manual. An increase in maximum rate and/or a reduction of belt speed could result in overloading the scale. Additionally, increasing the idler center-to-center distance (refer to Section 7.02.5), which increases the loading on the weigh idler, can also result in overloading the scale.

1.07 Environment

The equipment is designed to operate in wet or dry environments, within a temperature range of 32-104 degrees Fahrenheit (0-40 degrees Celsius), and a relative humidity less than 80%. Although the equipment will operate outside this temperature range the accuracy of the equipment *might* be affected. If the equipment is to be stored for an extended period of time, keep it in a cool dry area and do not expose the shipping crate or pallet to the weather unless care is taken to protect it from exposure to rain.

1.08 Printed Circuit Board (PCB) Precautions

Disconnect and lock out all power to the scale before servicing. When handling PCBs, always use a commercially available grounding wrist strap to prevent electrostatic discharge, which can destroy electronic components. Store unused PCBs in electrostatic protection bags made for that purpose.

1.09 Welding Precautions

Do not do electrical welding on or near the scale carriage, electrical enclosures, load cells or LVDT's, or signal wiring. Electrical current passing through the PCBs will destroy them, as can electromagnetic radiation. If welding near the scale is absolutely necessary, place the ground clamp as close to the welding area as possible.

CHAPTER 2 - INTRODUCTION

2.00 Tecnetics Industries, Inc. and Tecweigh.

Tecnetics Industries, Inc., is the legal name for Tecnetics. Tecweigh is the product brand name. They are frequently used interchangeably in this manual and within the company.

2.01 Contacting Tecnetics Industries, Inc.

When contacting Tecweigh service about a FC20 or signal conditioner (SC), please have the serial number and model number available. Their location and how they are identified is as follows:

Inside the enclosure on the printed circuit board (PCB) there are two hand printed numbers, a serial number and model number. The serial number identifies both who owns the unit and the date it was shipped. The model number indicates the design revision of the processor's components. Be sure to disconnect and lock out all power before opening any enclosures.

Examples of model numbers:

MP410-00-00

A 410 series MP (Main Processor) on its initial hardware version (-00) and initial firmware version (-00).

SC300-02-01

A 300 series SC (Signal Conditioner) on its second hardware version (-02) and first firmware version (-01).

Tecnetics (Tecweigh) Service Department contact information:

Phone: 651-777-4780 (General number).
651-233-1946 (Service Department)
651-233-1976 (Parts)
FAX: 651-777-5582
Email: svobodac@tecweigh.com (Service Department)
Tecweigh web site: www.tecweigh.com

2.02 Wording Conventions in this Manual

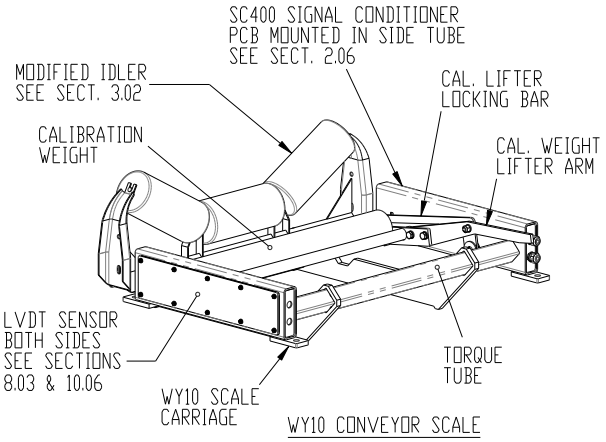
This manual uses two specific wording conventions to help identify the two most important components of the processor; the Parameter table and the faceplate KEYS.

First letter **C**apitalized	In this manual, a Parameter will always appear with its first letter **C**apitalized and will also be spelled as it appears in the processor's Parameter table. That is, if a Parameter is truncated in a processor display, it will also be truncated in the manual.
ALL CAPITALIZED	When referring to the pushbutton KEYS and other features on the face of the processor, all the letters are CAPATIALIZED. Examples: AUTO ZERO, AUTO SPAN, or MODE window.

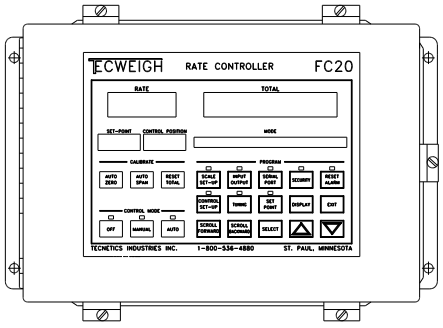
2.03 Basic Operation

A **Tecweigh** conveyor scale assembly typically consists of the WYxx scale, the scale mounted signal conditioner (SC), the speed sensor, and the FC20 RATE controller (FC20). Refer to the following drawing. A material pre-feeder is normally provided by the client (see Section 2.04 below). The primary function of the scale is to continuously measure the material weight on the belt at any particular instant in time. The scale transmits this weight signal (and also the belt speed) to the SC which electronically conditions these signals for use by the FC20. This conditioning function also allows the FC20 to be mounted remotely from the scale when required. Once configured, the FC20 has the ability to convert these signals from the SC to a material flow RATE and then compare that to a user entered Rate Set Point. The FC20 then outputs a 4-20 ma control signal, displayed as a percent (CONTROL POSITION), for control of the material pre-feeder (however, see Section 6.01 for alternate control methods). Adjustments are continuously made to the CONTROL POSITION based upon comparisons of RATE to SET POINT. When the measured RATE and SET POINT are equal, the FC20 will not change the CONTROL POSITION. However, whenever any upsets in material feed are sensed (a change in RATE), the FC20 will increase or decrease the CONTROL POSITION as required, until the RATE and SET POINT are once again equal. This method of control is commonly referred to as PID control (**P**roportional-**I**ntegral-**D**erivative).

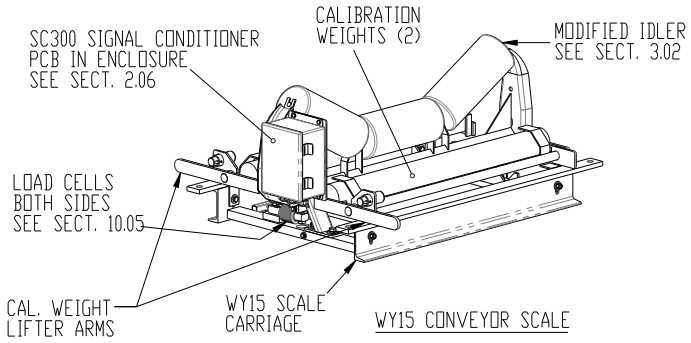
IMPORTANT: To achieve an ideal environment for the FC20, it is critical that the pre-feeder provide an even flow of material over the scale. A constantly varying feed rate will cause the FC20 to make continuous corrections to the CONTROL POSITION (hunting) and the SETPOINT might never be achieved. If an ideal environment cannot be attained, then paying special attention to the tuning of the FC20's parameters to suit the less than ideal environment might be necessary. Contact **Tecweigh's** Service Department (Section 2.01) for assistance if problems arise that cannot be resolved.



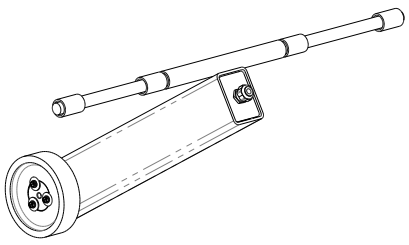
WY10 CONVEYOR SCALE



FC20 RATE CONTROLLER
(ONE PER SCALE)



WY15 CONVEYOR SCALE


STANDARD SS12
SPEED SENSOR WHEEL
AND MOUNTING HARDWARE
SEE SECT. 3.4

2.04 Pre-Feeder

Pre-feeders can either be a controlled (variable feed) such as conveyors, rotary vanes, screw feeders, vibratory feeders, etc., or uncontrolled (constant feed) such as gravity feed, manually set gates, etc. With a controlled pre-feeder, the CONTROL POSITION output from the FC20 can be used to control the material feed. With an uncontrolled pre-feeder, the conveyor upon which the **Tecweigh** scale is mounted must be variable speed and the CONTROL POSITION output from the FC20 can be used to control its speed.

2.05 Conveyor Scale (WY10/WY10HD/WY15/WY20/WY25)

A **Tecweigh** conveyor scale typically consists of a carriage, load cell(s) (or LVDT(s)) for sensing weight, a belt speed sensor, a signal conditioner, and a weight processor (FC20 or WP20). Most are also equipped with self storing calibration weight(s) and a mechanism for easy manipulation. Additional scale information is provided in chapter 3.

2.06 Modular Conveyor Scales (HY15 & HY25)

A Tecweigh modular conveyor scale typically consists of a left and right module including load cell, a tail pulley speed sensor, a signal conditioner enclosure, and a weight processor (WP20, FC20, or WPLD). Specific modular scale information is provided in section 3.03.

2.07 Weigh Belt Feeders (WF10/WF14/WF16/WF18)

A **Tecweigh** weigh belt feeder (WBF) is a complete weighing and conveying mechanism that consists of the head and tail pulleys, a drive motor, a belt tensioner, a belt speed sensor, the belt, one or more weighing idlers, and the material weight sensing load cells or LVDTs. A **Tecweigh** WBF is also normally equipped with a self storing calibration weight(s) and a mechanism for easy operation.

2.08 Signal Conditioner (SC)

Material weight and belt speed signals are sent from the scale to the signal conditioner (SC), which is normally mounted on the scale carriage. The signal conditioner has two functions: first, it collects and conditions the material weight and belt speed signals, and, secondly, it detects problems at the scale such as faulty weight or speed sensors. The weight, speed, and scale status information is continuously sent to the FC20 via the standard RS485 communications protocol.

2.09 FC20 Rate Controller

The FC20 RATE controller (FC20) is where the calculations are performed and the results displayed for the scale system. Settings are stored in the FC20 such as belt length, calibration weight, units of measure, and any other desired options. At the very basic level, it receives belt speed and material weight data from the signal conditioner and displays the calculated RATE. The FC20 also displays a continuously updated TOTAL based on that rate. While displaying the RATE and TOTAL, the FC20 also interprets status information from the signal conditioner and displays status messages in the MODE window when appropriate. When in AUTO mode, it also continuously measures the difference (error) between the RATE and the user input SET POINT and responds accordingly by changing the CONTROL POSITION output.

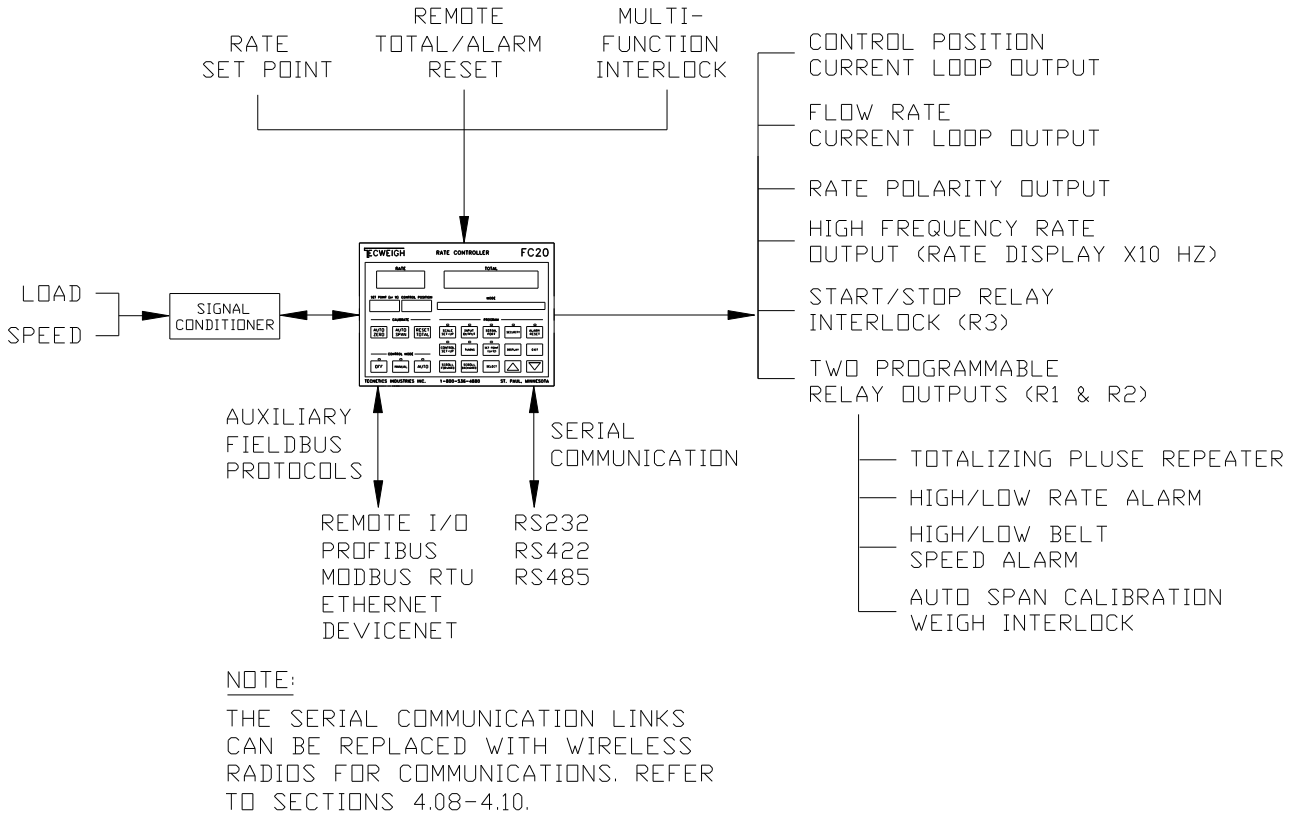
However, the FC20 can do more than RATE control, RATE display, TOTAL display, belt speed, and scale status. Various analog, relay, and serial inputs and outputs (I/O), allow control and

monitoring of the FC20's primary functions. Depending on the I/O used, the user can also remotely link to the FC20 via a programmable logic controller (PLC) or other plant controllers. Furthermore, up to 16 FC20's can be daisy chained on one EIA-485 serial bus for full plant automation.

Five optional add-on fieldbus communication cards are also available for the FC20 processor. They are: Remote I/O, Profibus, Modbus RTU, Ethernet, and Device Net. These devices allow the user to remotely initiate actions (like AUTO ZERO), and also retrieve data (like RATE and TOTAL).

Refer to the following visual representation for a quick reference to the I/O functions available with the FC20.

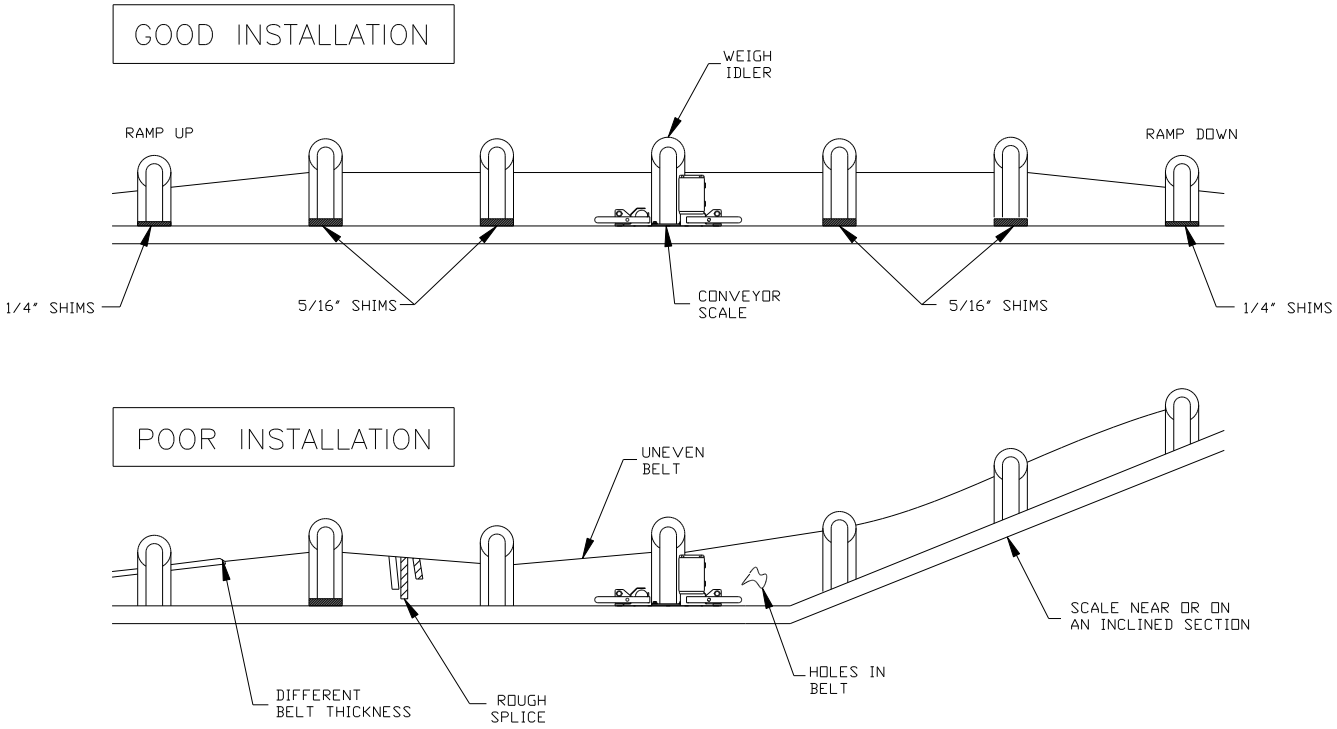
2.10 I/O Quick Reference Guide



CHAPTER 3 – SCALE INSTALLATION

3.01 Proper Installation

Proper scale installation is critical to attaining high accuracy and repeatability. A properly mounted scale should be located on a rigid, horizontal conveyor. If the conveyor is at an incline, assure it is not so steep that material rolls back on itself causing it to be weighed twice. The belt and idlers should move smoothly and the scale should be mounted in an area free of extreme temperature, wind, and vibration. The shimming and aligning of the idlers surrounding the scale is extremely critical, because the weigh area must be slightly raised above the other idlers as indicated below.



Avoid the following!

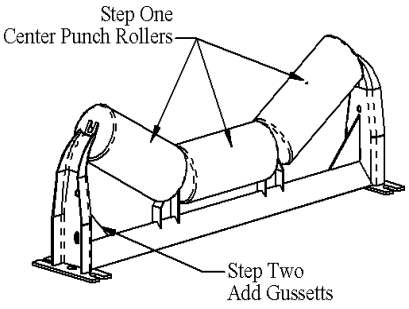
- Badly worn belts and splices
- Joined belts with different thickness
- Poor belt training or alignment
- Wind, temperature, or vibration extremes
- Material build-up on the belt, idlers or calibration weights
- Loosely mounted unstable conveyor
- Idlers with steep trough angles
- High belt tension
- Steep conveyors allowing material to roll back
- Belt skirting or other interference near the scale

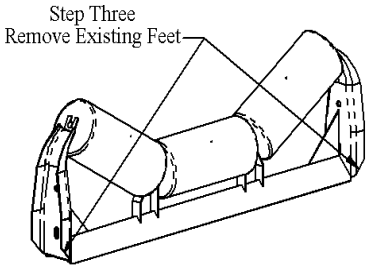
3.02 Idler Preparation

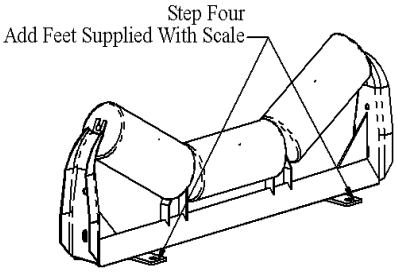
After finding a suitable location for the scale, reduce the conveyor belt tension. Raise the belt so it is supported at least one foot above the idler where the scale will be located and also one foot above the three idlers before and after the scale. Note, if you are installing a dual-idler scale (model WY20 or WY25), follow the same instructions as for the single-idler scale (model WY10 and WY15) and just repeat the instructions for both idlers. Short conveyors might only have two idlers on one or both sides of the scale, but this is not recommended because accuracy might suffer. If this is the case, consult the **Tecweigh** Service Department (Section 2.01) for advice.

DO NOT WELD ON OR NEAR THE SCALE!!! (See Section 1.08).

1) Mark the center of each roller on the scale idler, three idlers before the scale, and three after.
2) Remove the idler where the scale will be located--this will be used as the weigh idler.
3) Remove the weigh idler's factory mounting pads.
4) Center the weigh idler on the unpainted scale mounting pads and mark the location on idler.
5) Remove the idler and the unpainted mounting pads from the scale.
6) Weld the unpainted mounting pads to the idler at the previously marked locations.
7) Weld a reinforcement gusset in each corner of the weigh idler.
8) Paint the weigh idler for corrosion prevention.

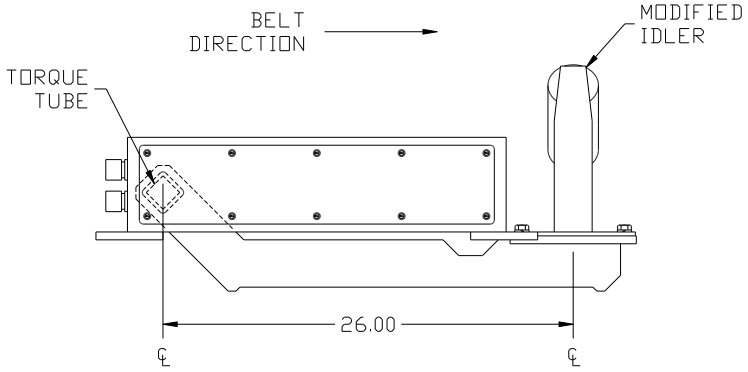




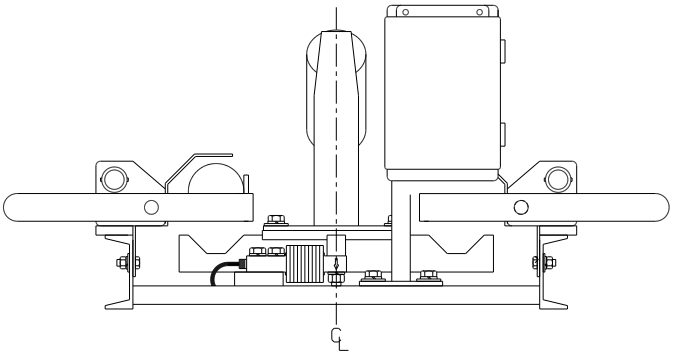


Finish by priming and painting to prevent rusting.

With the weigh idler modification complete, mount the idler on the scale using the four ½" bolts provided. Center the idler on the scale as indicated below.



WY10 Scale Carriage



WY15 Scale Carriage

3.03 Scale Mounting

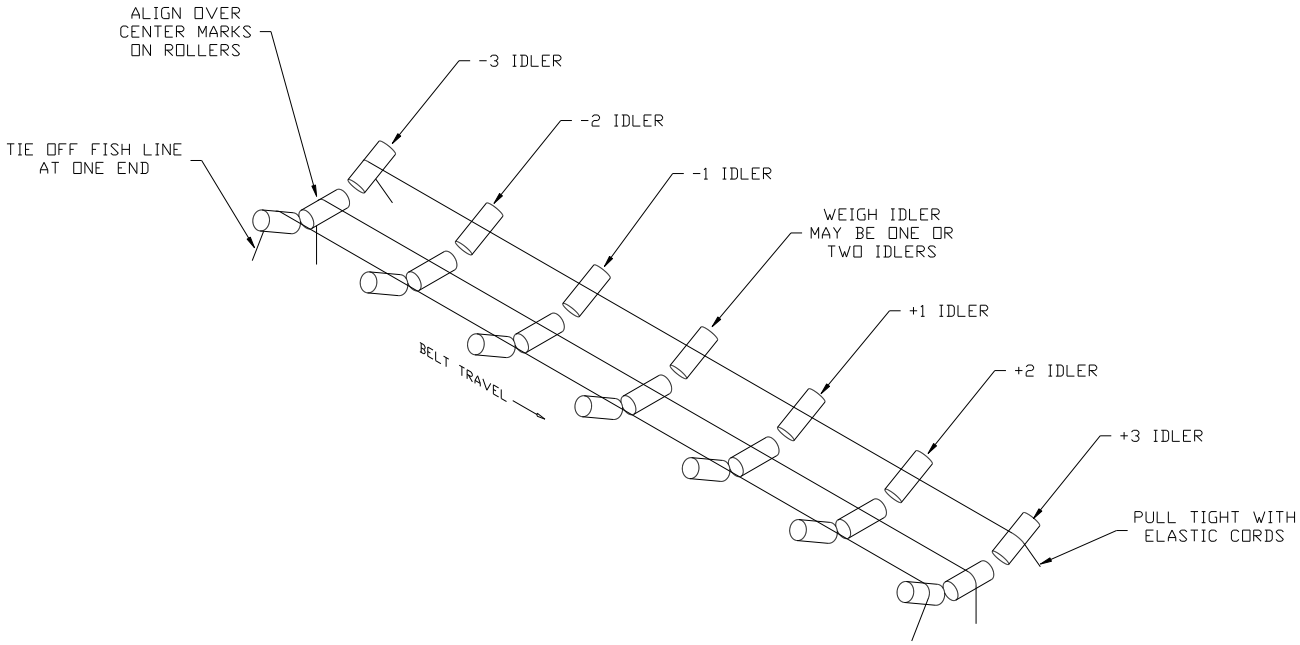
Place the scale carriage with the modified idler on the conveyor stringers. Center and align the scale between the stringers and mark the location of the mounting holes. Alternatively, the dimensions from the dimension drawings in Section 11 can be used for marking hole locations, but using the scale as a template is preferred. Slide the scale out of the way and drill the four mounting holes. Place the scale over the holes, but do not tighten the bolts yet.

Now align the weigh idler with the three idlers on either side of the scale using the fish line and shims provided. Perform the instructions following and refer to the diagram below.

1) Loosen the three idlers before and after the scale.
2) Shim the +3 and -3 idlers up 3/8 of an inch, center them on the stringer, and re-tighten the bolts.
3) Stretch three fish lines across the idlers centered on the +/- 3 roller center marks.
4) Use elastic cords or some weight to hold the fish line in place on each end.
5) Lower the calibration weight on the scale so the idler is at its normal running height.
6) Shim the scale feet leaving a 1/16 inch gap between weigh idler and fish line.
7) Use thin shims under the scale if necessary so it does not rock or pivot while laying flat.
8) Tighten the scale carriage bolts.
9) Shim and tighten +/- 1 and +/- 2 idlers with a 1/16 inch gap between the fish line and the roller center.

The idler alignment is very important! Before proceeding, verify that the fish line is exactly over the center marks on the rollers and there is exactly a 1/16 inch gap between all the rollers and the fish line. Also verify that the idlers are exactly square with the stringers.

Remove the 1/8 inch (leave 1/4 inch) of shim from the +/- 3 idlers and tighten them down. Re-tension and align the belt so that it tracks in the center of the idlers. Make sure all of the rollers are turning freely and are securely bolted down.



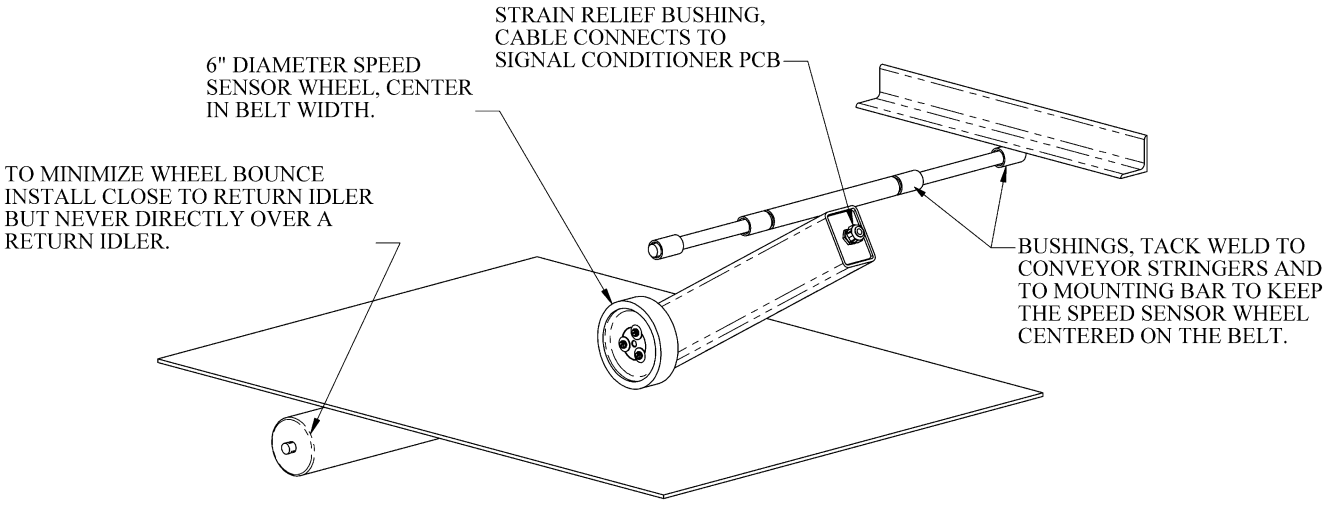
IMPORTANT!!! On the **WY15** and **WY25** scale models remove the safety plates on both ends of the idler mounting bar. These safety plates prevent overloading of the load cells during shipment. If using a portable conveyor, always use the safety plates during transportation. Refer to the diagram in Section 10.05.

3.04 Speed Sensor Installation

The standard SS12 speed sensor:

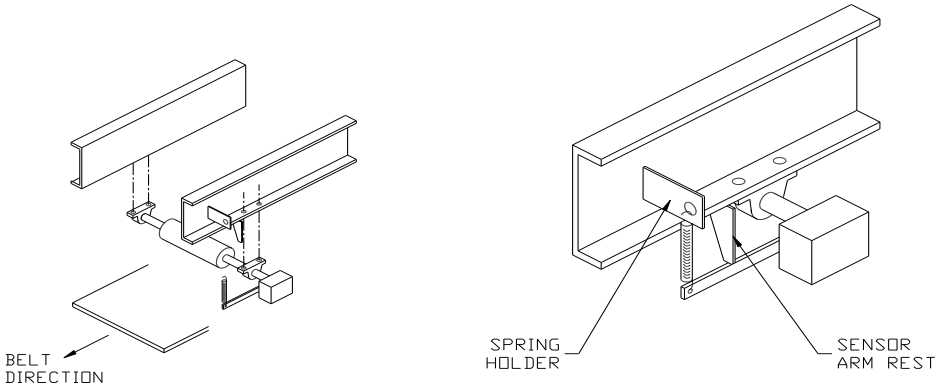
Mount the speed sensor assembly so that it is aligned exactly with the belt. If it is not straight, it will bounce and wear down the wheel or belt. Position the wheel so that it is at least 6 to 12 inches from a return idler.

1) Weld two of the supplied pieces of pipe to the conveyor stringers.
2) Slide the spacers (other pieces of pipe) and the speed sensor assembly onto the pivot arm.
3) Tack weld the spacers so the speed sensor is loosely constrained, but can still swing freely.



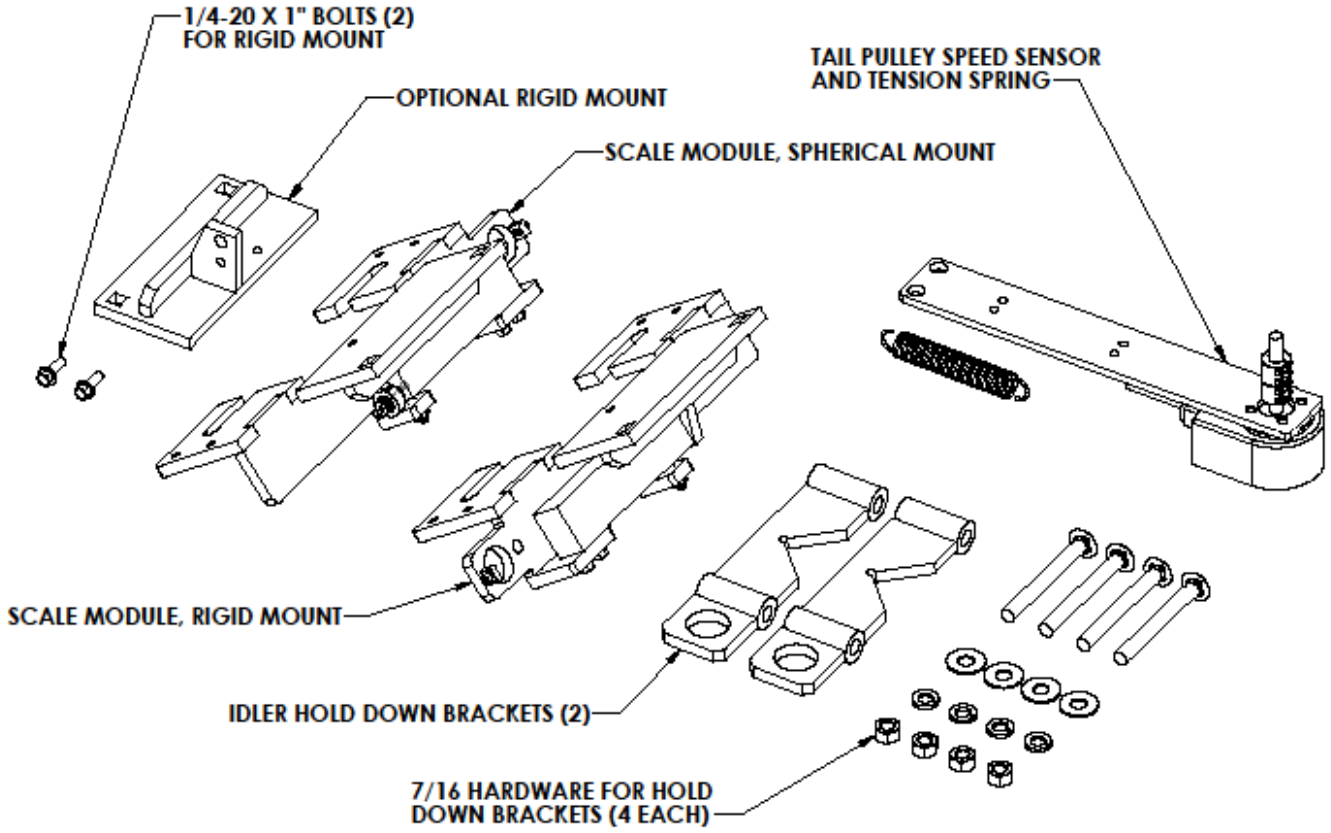
The heavy duty SS11 speed sensor:

Since most brands and styles of conveyors are constructed differently it's not possible to give specific installation instructions for the SS11 heavy duty speed sensor. However, four holes will need to be drilled for the bearing bolt holes. Also, one bracket will need to formed and welded, on which to clip the spring, and a second bracket to hold the speed sensor arm horizontal.



3.05 Modular Scale Description, HY Models

The HY15 is different from our other scales in that it a modular design. It does not have a single rigid frame that an idler can be mounted on before scale installation. Instead it is a left and right hand module that needs to be mounted on the conveyor structure and then the idler is mounted between the modules. An HY15 is supplied with the components shown below.



An HY15 scale can be mounted in series creating a dual idler scale, an HY25. An HY25 would include a second scale that would be identical to the first, but with out the signal conditioner enclosure. See XXX for mechanical drawings of the HY15 and HY25.

3.06 Idler Preparation, HY Models

After finding a suitable location for the scale, reduce the conveyor belt tension. Raise the belt so it is supported at least one foot above the idler where the scale will be located and also one foot above the two idlers before and after the scale. Note, if you are installing a dual-idler scale (model HY25), follow the same instructions as for the single-idler scale (model HY15) and just repeat the instructions for both idlers.

DO NOT WELD ON OR NEAR THE SCALE!!!

1) Mark the center of each roller on the scale idler, two idlers before the scale, and two after (see below).
2) Remove the idler where the scale will be located--this will be used as the weigh idler.
3) Weld a reinforcement gusset in each corner of the weigh idler.
4) Remove the weigh idler's factory mounting pads.
5) Paint the weigh idler for corrosion prevention.

3.07 Scale Mounting, HY Models

The HY design utilized a asymmetric design in that the left and right mounts are slightly different. One side incorporates a rigid mount that bolts directly to the load cell. The other side uses a spherical rod end bearing to allow some flex in the mounting structure while minimizing drift and inaccuracies associated weak or flexing structures.

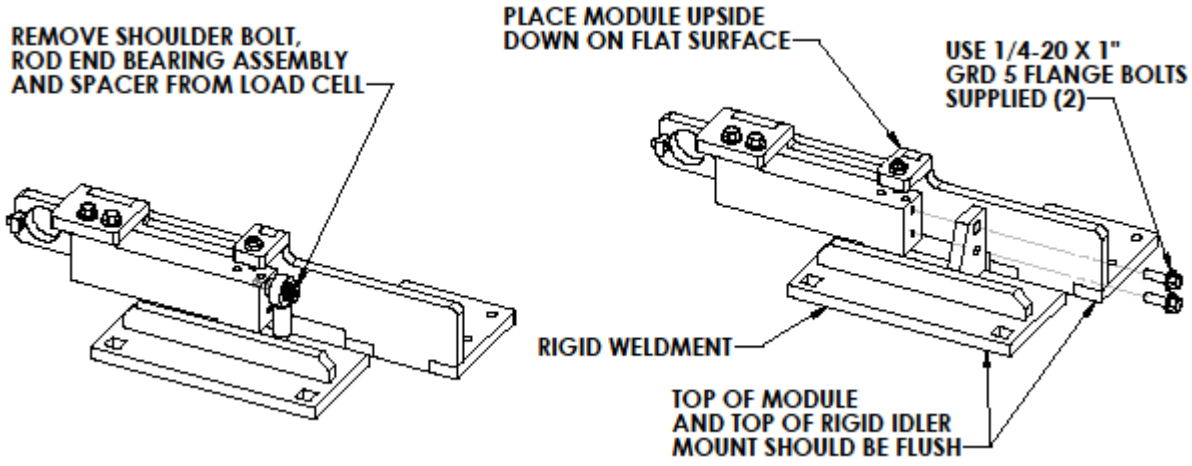
Although this benefit can be great in many applications it is not always the appropriate mount to be used. The following list highlights applications that won't benefit from the spherical bearing mount, and the symmetrical rigid mount that is also supplied should be used.

The spherical bearing mount may be detrimental in these application

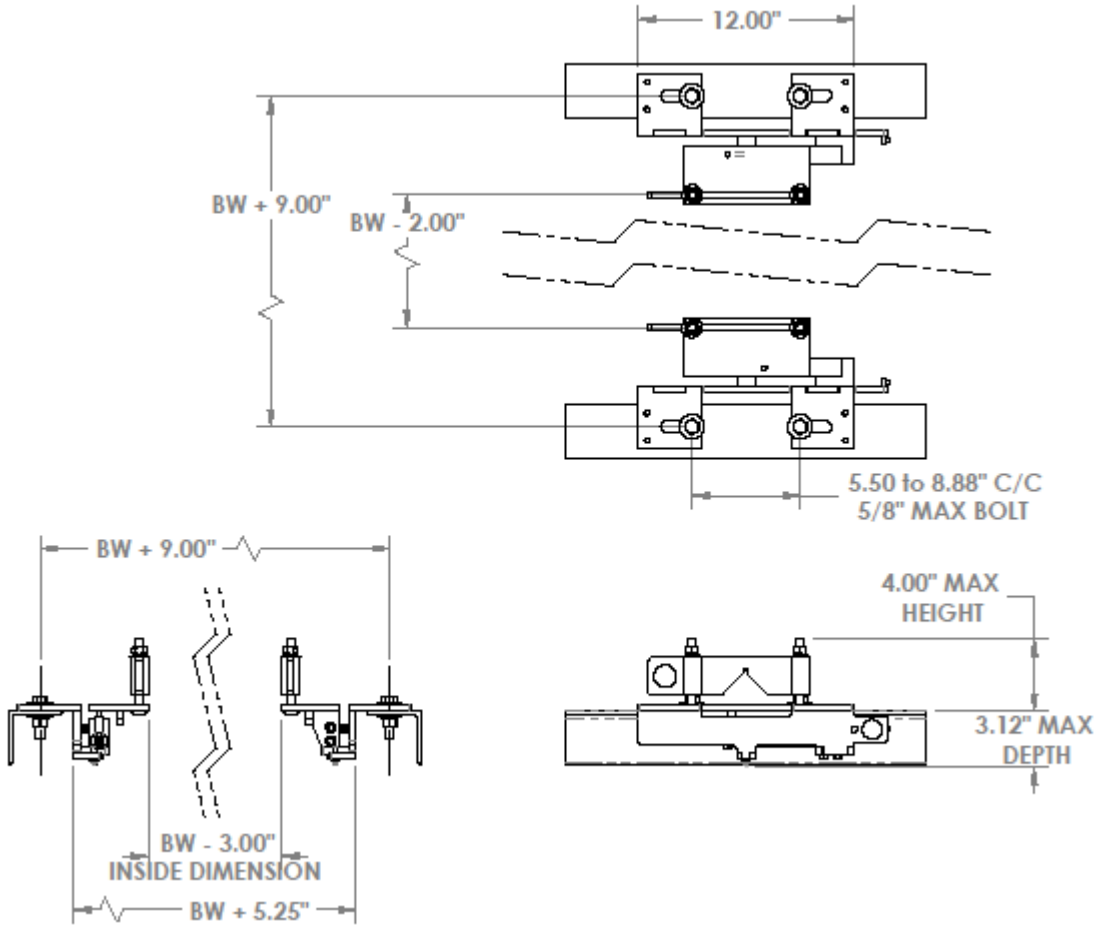
- Applications with over 150lbs per foot of belt load. (500Kg per meter)
- Non-top mounted CEMA idlers.
- Flat carrier idlers or rollers.
- Belt speeds over 600 FPM.
- Belt widths over 48" (1200mm).

Consult our factory for unique applications. The HY15 modular scale is very adaptable.

If the application requires a symmetrical rigid mount simply remove the shoulder bolt from the rod end bearing to disassemble. Then use the two bolts supplied with the rigid mount to attach it to the end of the load cell. See below.



Because the HY modular scale is in two separate assemblies they need to be mounted parallel and square with each other. On a standard top mounted CEMA idler conveyor the left and right modules should bolt directly into the same mounting holes of the weighing idler.



Mount the modules directly across from each other using a square or common reference point. The mounts should also be centered between the closest idlers on either side of the weighing idler(s). Once centered and squared tighten down the mounting bolts for the left and right modules.

You can now place the modified idler on top of the mounting pads. Make sure the belt direction of the idler is correct. Assemble the idler hold down clamps with the carriage bolts and hardware supplied. Only finger tighten at this point. Loosen the mounting bolts on the end of the load cells with the rigid mount on them. Just enough to allow the mounting pad to settle and come into full contact with the inverted angle of the CEMA idler.

For HY25 dual idler installations repeat this process for the second idler.

Note that if the structure is truly flat and square the idler(s) that have now been mounted on the modular scale assemblies is approximately 1/8" higher than the adjacent idlers. This is not always the case but the following instructions are based on this assumption. Adjustments and shim size references may need to be different in your specific application.

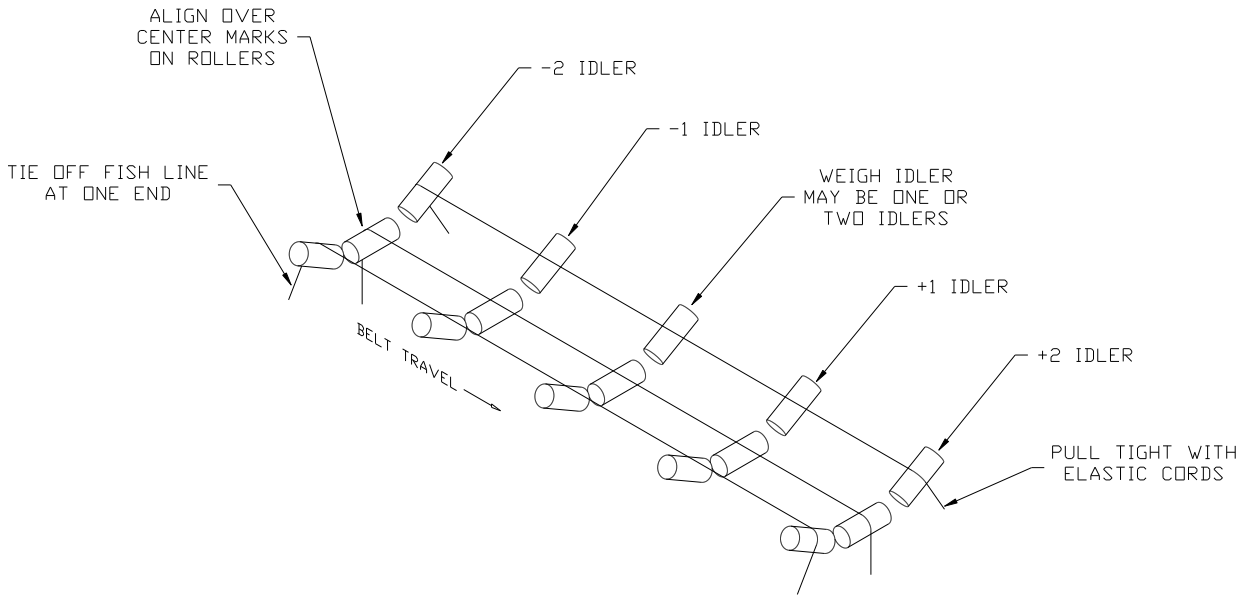
Now align the weigh idler with the three idlers on either side of the scale using the fish line and shims provided. Perform the instructions following and refer to the diagram below.

1) Loosen the two idlers before and after the scale.
2) Shim the +2 and -2 idlers up 3/16 of an inch, center them on the stringer, and re-tighten the bolts.

3) Stretch three fish lines across the idlers centered on the +/- 2 roller center marks.
4) Use elastic cords and/or weight to hold the fish line in place.
5) Measure with a shim the distance between the weigh idler and the fish line on the weigh idlers. It should be 1/16 inch gap between weigh idler and fish line.
6) If modification to the weighing idler height to attain 1/16" gap is necessary now would be the time to shim the HY15 modules or change the 3/16 shim on the +2 and -2 idlers.
7) Shim and tighten the +/- 1 idlers with a 1/16 inch gap between the fish line and the roller centers.
8) Drop the +2 and -2 idlers approximately 1/8" by removing shims.

The idler alignment is very important! Before proceeding, verify that the fish line is exactly over the center marks on the rollers and there is exactly a 1/16 inch gap between the fish line and the weighing idler(s) and adjacent idlers. Also verify that the idlers are exactly square with the stringers.

Remove 1/8 inches (leave 1/4 inch) of shim from the +/- 2 idlers and tighten them down. Re-tension and align the belt so that it tracks in the center of the idlers. Make sure all of the rollers are turning freely and are securely bolted down.

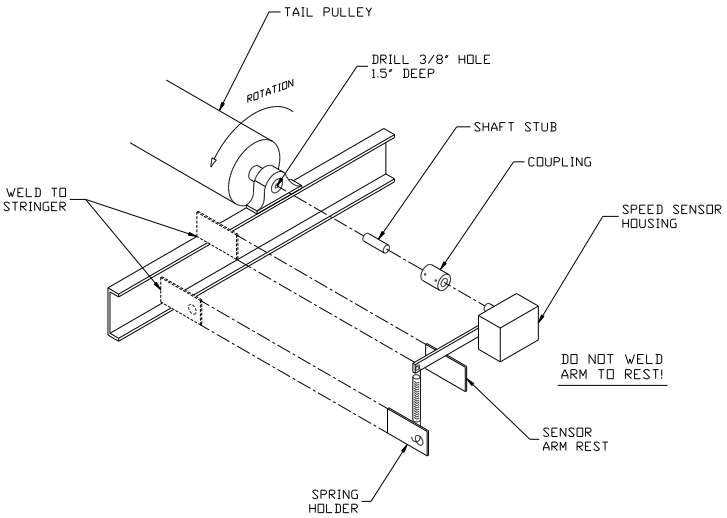


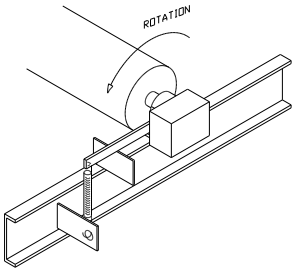
3.08 Speed Sensor Installation, HY Models

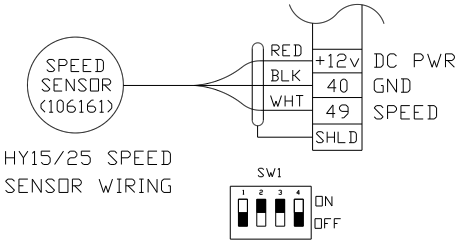
The HY15 and HY25 standard RL200 speed sensor:
Since most brands and styles of conveyors are shaped differently it is difficult to give specific installation instructions for the speed sensor. As indicated diagram below, you will need to drill a hole in the tail pulley shaft and insert a smaller shaft stub that the speed sensor will couple to. You will also need to form two brackets that are required to hold the speed sensor in place. The rotation of the tail pulley is critical for correct orientation of the speed sensor. The speed sensor should rotate in a way that it pushes against the sensor arm rest NOT pull on the spring.

1) Drill a 3/8" diameter hole exactly in the center of the tail pulley or any live shaft 1/2" deep.

2) Insert shaft stub and weld in place. Stub should protrude about 1" from the shaft face.
3) Hold the speed sensor up to the shaft to form an arm rest and spring holder.
4) Place the arm rest and spring holder in a suitable location and weld to the stringer.
5) Tighten the coupling onto the shaft stub.
6) Slide speed sensor shaft into the coupling and tighten.
7) Attach spring to speed sensor arm and spring holder.
8) Run conveyor. Speed sensor should have minimal amount of wobble.
9) Run required length of electrical cable to scale.





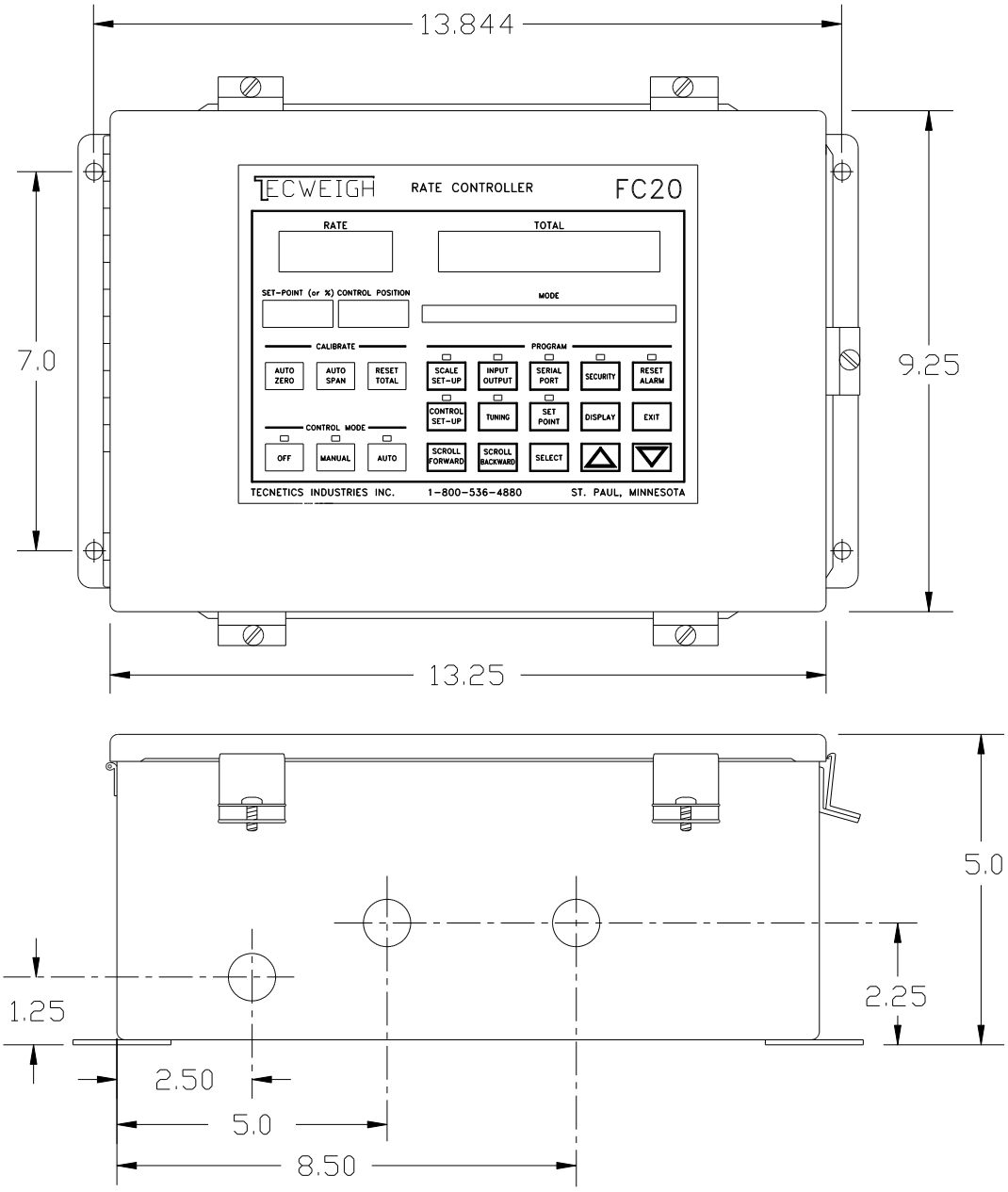


See Section 3.04 for other speed sensor options that might be included with the HY15 or HY25 scale.

3.09 FC20 Rate Controller Installation

Mount the FC20 in a reasonably clean area away from severe heat and isolated from vibration. Avoid areas of bright sunlight since the lighted displays might be difficult to read in those circumstances. When outdoor installation is necessary, the FC20 should be mounted under a "roof" or "dog house" to provide rain and snow protection as well as shade. Be sure to provide room for the enclosure door to swing out. The FC20 can be located up to 4000 feet from the scale. For longer distances, however, one person will be required at the processor and one person

at the scale (to lower the calibration weight when required and/or when calibrating the LVDT's). Refer to the mounting dimensions in the figure below. Refer to section 4.1 for FC20 wiring information and diagrams.



CHAPTER 4 – SYSTEM WIRING

4.00 Wiring precautions.

The following is a list of important precautions that should be observed during field wiring.

- Wiring should be compliant with all applicable electrical codes.
- Input power must be 100 to 240 VAC, 47-63 HZ, 60 watts.
- Only apply input power after assuring all wiring is correct.
- The electrical power source must be of utility quality and specification.
- Never splice wires. Replace short wires with one continuous length.
- **Always** run power wiring and signal wiring in **separate** conduits.
- Ground shield wires at only one location, usually the FC20.
- To prevent possible shorts, tape all shielded wire ends and keep the wiring neat.
- Use properly sized water tight compression fittings on cables entering the enclosure.
- **Do not** connect any wires to terminals designated as unused.
- Pay particular attention to proper grounding as depicted in the wiring diagrams.

4.01 Wiring the FC20 Rate Controller

If the equipment at hand has been custom built by **Tecweigh**, you should find a custom "as built" field wiring diagram in the back of this manual. If it should happen to not be there, call the **Tecweigh** Service Department (section 2.01) to obtain a copy. For further wiring information, refer to the basic field wiring diagrams shown in section 4.2. Some FC20 outputs can also be inter-connected with client supplied devices, consult the field wiring diagrams provided with those specific devices for further information. Section 7.05 explains the Parameter settings required to enable the features of the outputs used.

Scale to FC20 wiring

Communications between the signal conditioner (SC) on the scale carriage and the FC20 is accomplished using the industry standard RS485 communications protocol. At both ends, terminal 10 is signal common, terminal 29 is 30 VDC power, and terminals 20 and 22 are A and B channels of the communications signal. Use 18 gauge, two twisted pair, shielded cable between the FC20 and the signal conditioner. Belden #1063A cable or equivalent is recommended (25 ft. is normally provided by **Tecweigh** on new installations, additional cable can be obtained through **Tecweigh**). If ordered direct from a Belden distributor, #1063A cable has a standard color code of black and white for each twisted pair; one pair marked "1" the other pair marked "2". The two numbers are difficult to see in the field, so **Tecweigh** instead stocks #1063A cable with red/black and blue/yellow twisted pairs, which helps eliminate errors when field wiring the scale. **Tecweigh's** field wiring diagram uses this color code, but if the #1063A is not ordered through **Tecweigh,** it will be the dual black and white pairs.

IMPORTANT – Regardless of the brand of the two twisted pairs cable used, it is very critical that one twisted pair be used for power (+DC & COM (also designated 29 and 10)) and the other twisted pair be used for communications (RS485 A & B (also designated 20 and 22)).

Relay outputs (DO1-C1, DO2-C2)

Two configurable relays provide dry contacts for a remote totalizer, high/low RATE alarm, high/low speed alarm, or a calibration weight lifter interlock. A third relay is used for remote start/stop of the conveyor or pre-feeding device. The relay contacts are SPST and should not be

used to control more than 250 VA. When a relay is used as a totalizing pulse relay, limit the frequency of operation to 6 pulses per second for reliable operation. Note that even though the relays are rated for up to 250 VA, it is highly recommended that electrical noise emitted from the relays be minimized to assure problem free operation of the processor. When possible, it is recommended that 24 VDC (10.4 amps max.) be used to drive external loads. When higher voltage or loads need to be driven, it is recommended that an interposing relay be installed between the WP20 output relay and the load. Two variations of how to wire an interposing relay are shown in Sections 4.12 & 13.

Refer to section 7.05 for relay configuration parameters.

4-20 ma current loop outputs (A1+A1-, A2+A2-, A3+A3-, A4+A4-)

The FC20 provides a 4-20 ma (or 0-20 ma) output proportional to the RATE, and two 4-20 ma (or 0-20 ma) RATE control (CONTROL POSITION) outputs. The RATE output (terminals A2+ & A2-) is typically used for driving chart recorders, displays, data loggers, and similar client provided devices. The RATE control outputs (terminals A1+ & A1- and A3+ & A3-) are used to control the material flow RATE and other client provided devices. Use a single shielded twisted pair cable for the current loop wiring. Belden #8760 or its equivalent is recommended (it can be obtained through **Tecweigh**). Refer to section 7.05 for the configuration of these current outputs.

WARNING: **THE 4-20 MA OUTPUTS ARE ACTIVE!, that is, A DC VOLTAGE IS PRESENT AT THE TERMINALS. ENSURE THAT THE OUTPUTS ARE CONNECTED TO PASSIVE LOADS (resistive only) OR DAMAGE WILL RESULT!**

In most control applications, current loop isolation is essential to eliminate induced noise interference and ground loops (when more than one load is in the loop). In earlier model FC20's the current outputs were non-isolated**,** consequently, these FC20's required external current (signal) isolators for loop isolation. However, the latest model FC20'S have built-in isolation.

Note that if more than one load is driven by an output, all loads in the loop must be isolated except the last one. Proper shield grounding is also essential. The maximum load that can be driven by any single current loop output is 750 ohms, with a maximum voltage of 18.5 VDC. Refer to the figure in section 4.05 for an example of proper current loop wiring.

HFR output (HFR(4)-CM(10))

The High Frequency Rate (HFR) output provides a square wave signal with a frequency equal to 10 times the calculated RATE. It can be used to drive remote RATE displays and other client provided devices that are capable of accepting this kind of frequency input signal. The minimum output frequency is 10 Hz and the HFR max current draw is 60 mA. Refer to Section 7.05.44 for information on the HFR Damping Parameter.

HFR Polarity output (POL(2)-CM(10))

The HFR Polarity output outputs approximately 5 Vdc when the RATE is positive and approximately 0 Vdc when the RATE is **negative**. If the RATE is zero, 5 Vdc will still be present at the terminals. 5 Vdc will always be present at the terminals in Simulation mode.

Serial ports, RS-232, RS-422/RS-485

For RS-232, two RJ-25 modular jack ports are available plus a selectable output (RS-232 or RS-422/485) at terminals 90-93. RS-422/RS-485 is available at terminals 90-93 only. All these ports are capable of sending and receiving data and also receiving commands. Refer to Section 4.03 for a wiring diagram and Section 9 for operational information.

TOTAL remote reset (T1-CM)

When terminal DI2 (T1) is momentarily shorted to terminal CM (10), the TOTAL is reset to zero **or** the ALARM is reset depending on the configuration. See Section 7.05.63 for configuration. See Section 4.02 for wiring

Auto enable/Run enable/External alarm input (DI1(T3)-CM(10))

When the FC20 is configured as Auto Enable and the connection between terminals DI1 (T3) and CM (10) is open, the FC20 will not be allowed to make corrections to the feed RATE, which effectively puts it in Manual Mode. When configured as Run Enable, having this input open will put the FC20 in Off Mode, shutting down the feed RATE altogether. This assumes a relay output is being used for the Run interlock for the conveyor or pre-feeder. When configured as an External Alarm, closing this connection momentarily will cause an alarm condition to exist until it is RESET. NOTE: these three functions do not permanently change the operating modes of the FC20, it only mimics these modes when the input is changed. Jumper J23 shorts DI1 (T3) to CM (10) which effectively deactivates the interlock when not in use; remove the jumper to use the interlock feature.

Remote DC input (AI1+-AI1-)

The FC20 has the ability to receive either a 0(4)-20 miliamp (ma) or 0(1)-5 vDC remote setpoint input signal. When the 0(4)-20 ma signal is used, jumper J12 on the FC20 must be installed, when a 0(1)-5 vDC signal is used, the jumper must be removed. Jumper J12 is located in the center of the PCB and two inches up from the bottom. The FC20 comes with the jumper installed (0(4)-20 ma setup). A master/slave setup can be achieved when the 0(4)-20 ma RATE output of a **Tecweigh** WP20 weigh controller is connected to this input.

4.02 Load Cell Wiring (WY15 and WY25)

The **Tecweigh** “standard” color code for wiring strain gauge load cells has changed from time to time because of load cell availability. The following is a cross reference for the different load cell manufacturers that have been used and their color codes.

Load Cell Model	CI-LC22	SB1 or LC	CB6-XX-T
Signal -	red	white	white
Signal +	white	green	green
Excitation -	black	black	black
Excitation +	green	red	red

The SB1 and CB6 models are used on standard wiring diagrams in the manual.

When installed, be certain the arrow on the load cell(s) is pointing down.

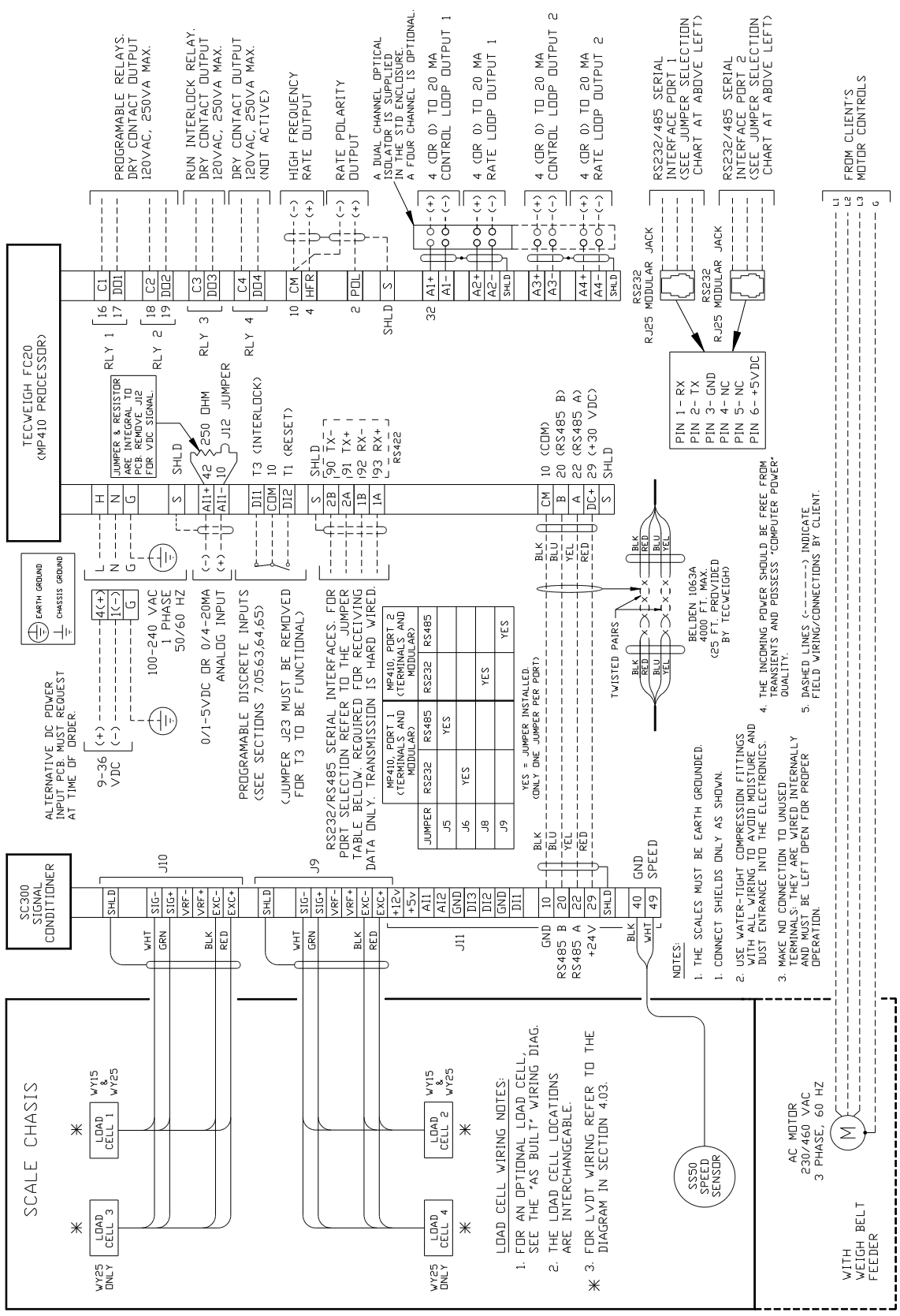
4.02.1 Load Cell Wiring (HY15 & HY25)

Load Cell Model	SP4	C1-40
Signal -	red	red
Signal +	white	white
Excitation -	black	black
Excitation +	green	green
Vref (sense) -	blue	brown
Vref (sense) +	orange	blue
Shield	yellow	yellow

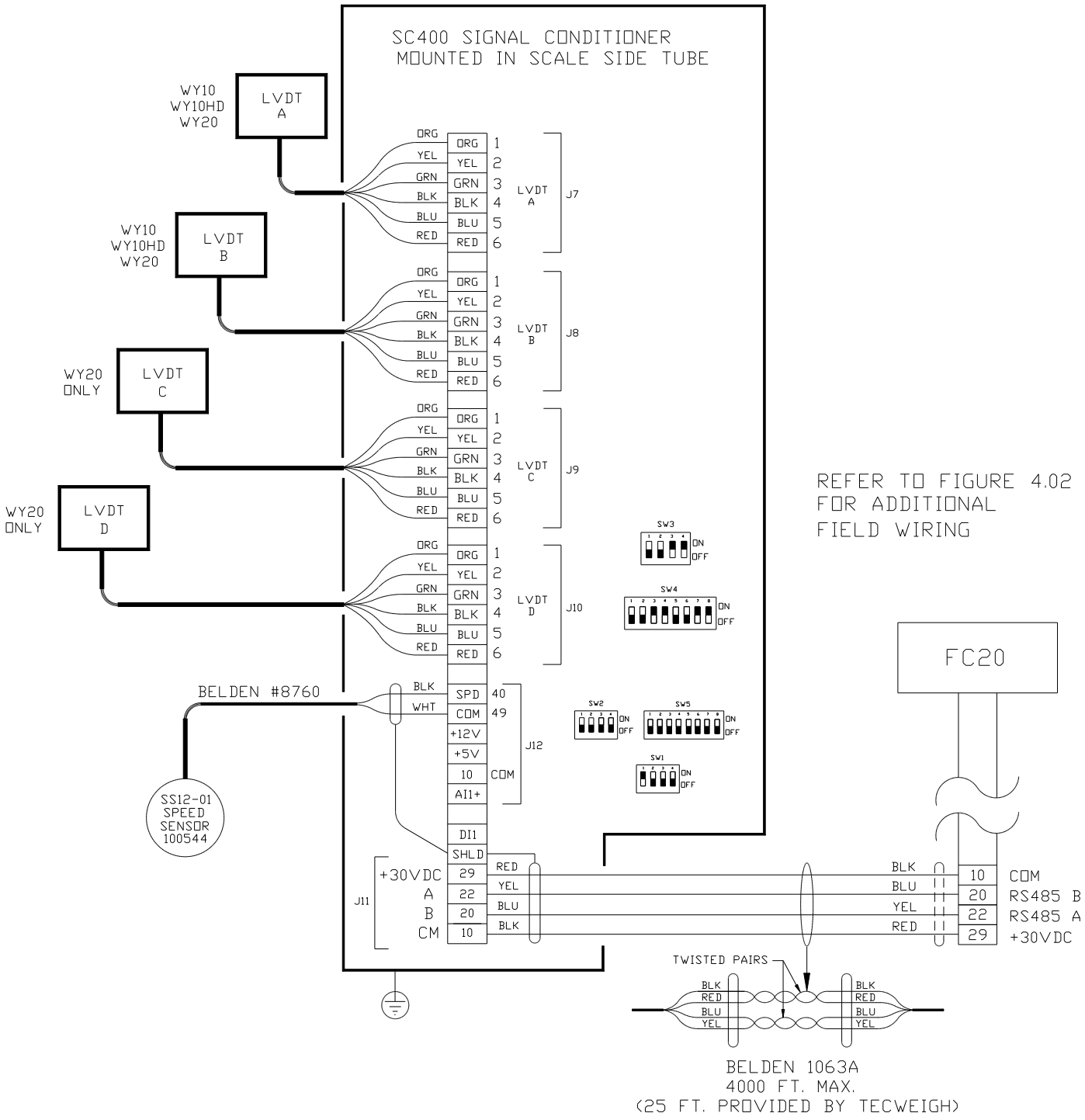
NOTE 1: Remove jumpers J7, and J8 from the SC300 PCB when using any six wire load cell.

NOTE 2: All load cell cables have a shield that needs to be connected to the shield terminal.

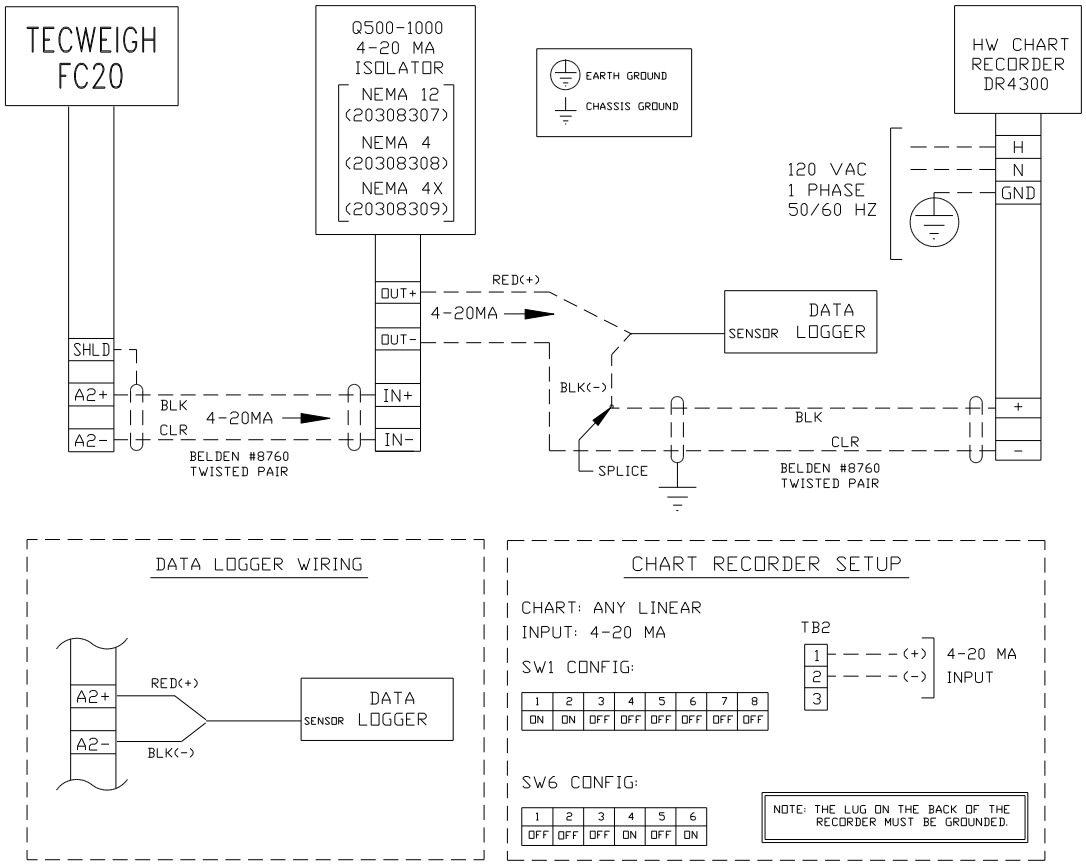
4.03 WY15 and WY25 Scale Wiring (w/load cells).



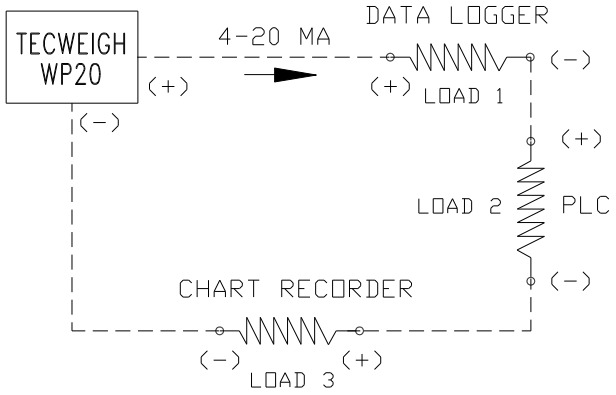
4.04 WY10, WY10HD and WY20 Scale Wiring (LVDTs).



4.05 Chart Recorder & Data Logger using the 4-20 ma output.



FIELD CONNECTIONS FOR A DATA LOGGER &/OR CHART RECORDER
UTILIZING THE 4-20 MA RATE OUTPUT FROM THE FC20,
WHEN THE RECORDING DEVICES USE A 4-20 MA INPUT.

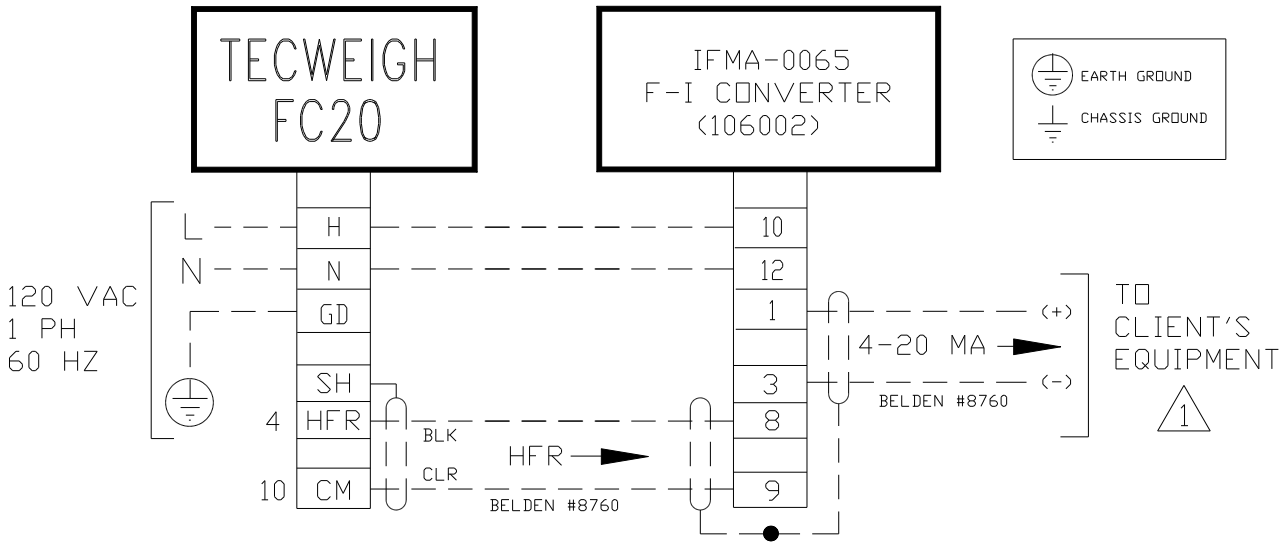


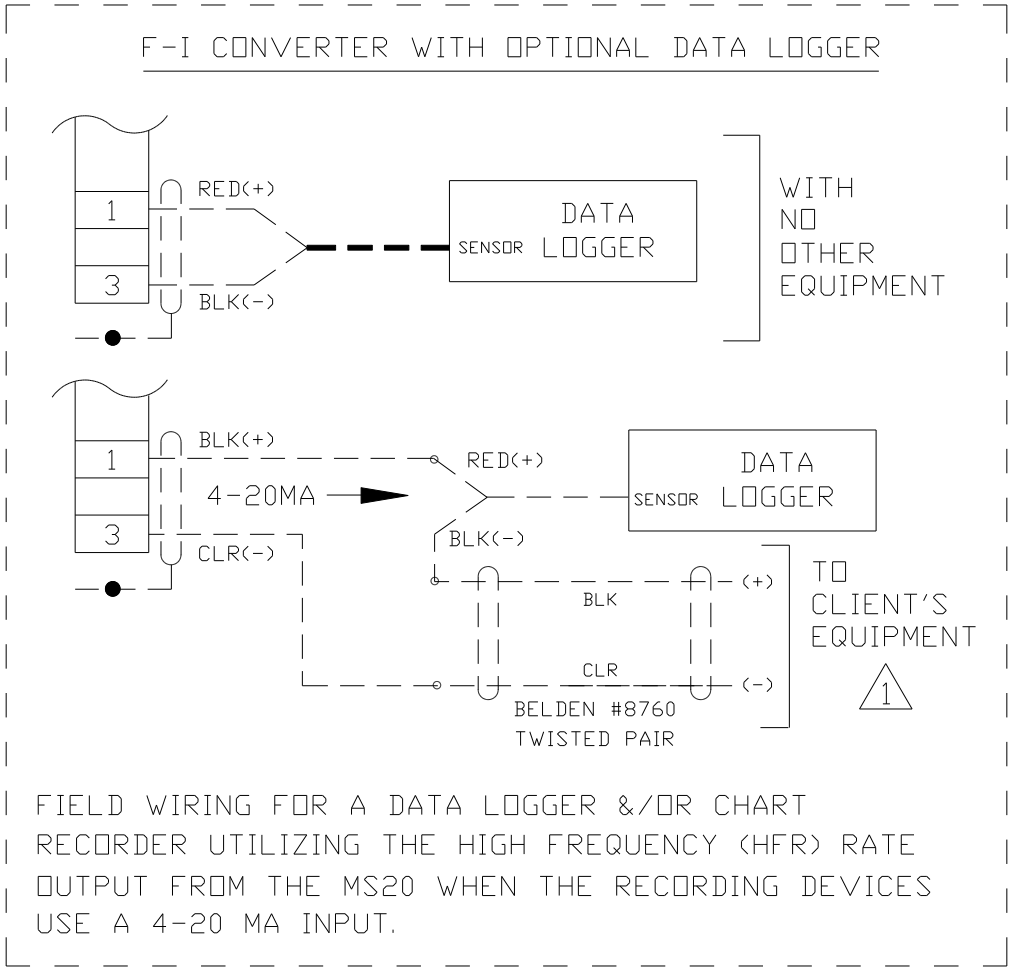
IMPORTANT NOTES:

1. EVERY LOAD MUST BE ISOLATED, EXCEPT THE LAST ONE.
2. THE TOTAL LOAD RESISTANCE, LOAD 1 + LOAD 2 + LOAD 3, MUST BE LESS THAN APPROXIMATELY 750 OHMS.

TYPICAL WIRING FOR A 4-20 MA CURRENT
LOOP WITH MULTIPLE LOAD DEVICES

4.06 Chart Recorder & Data Logger using the HFR output.

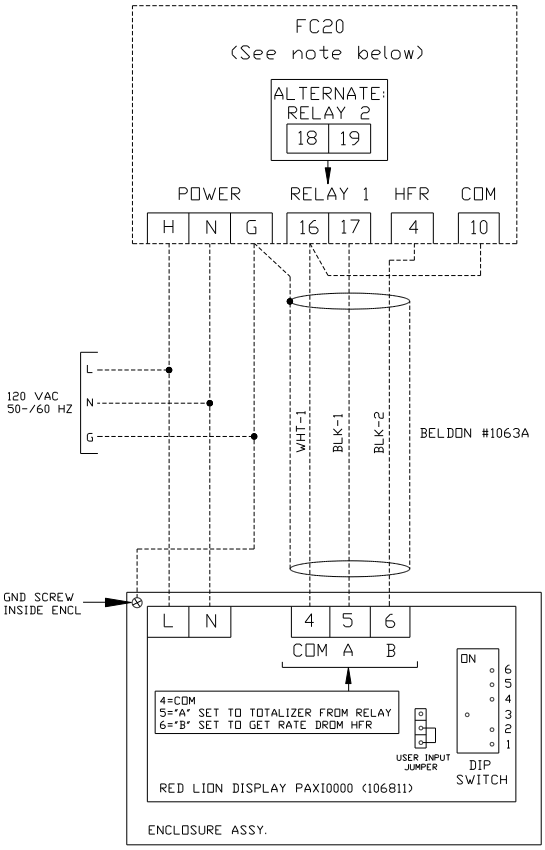




NOTE:

1 REFER TO THE PREVIOUS FIGURE FOR WIRING OF MULTIPLE DEVICES ON A SINGLE 4-20 MA LOOP.

4.07 Remote RATE/TOTAL Display.

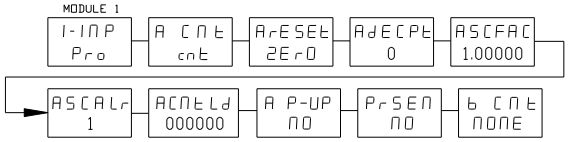


CHANNEL A: TOTALIZER:

1.) IMPORTANT: SET DIP SWITCH 3 TO "ON" (LOW FREQ) (MOVE THE SWITCH TO THE LEFT).

2.) GO TO CONFIGURATION "MODULE 1" IN THE PARAMETER MENU (PAR).

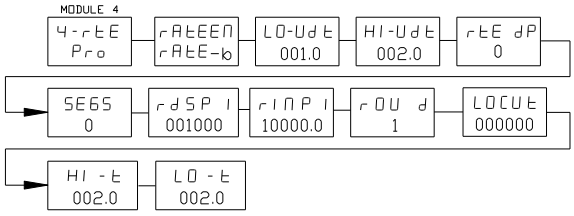
TYPICAL SETUP:



CHANNEL B: RATE:

1.) GO TO CONFIGURATION "MODULE 4" IN THE PARAMETER MENU (PAR).

TYPICAL SETUP:

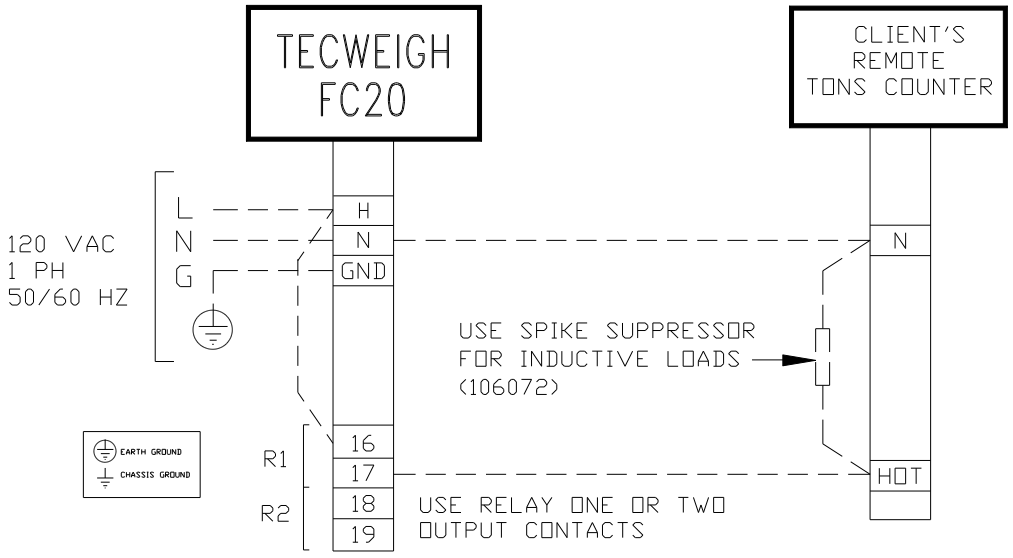


NOTE: CONFIGURE THE FC20 RELAY 1 PARAMETER AS:

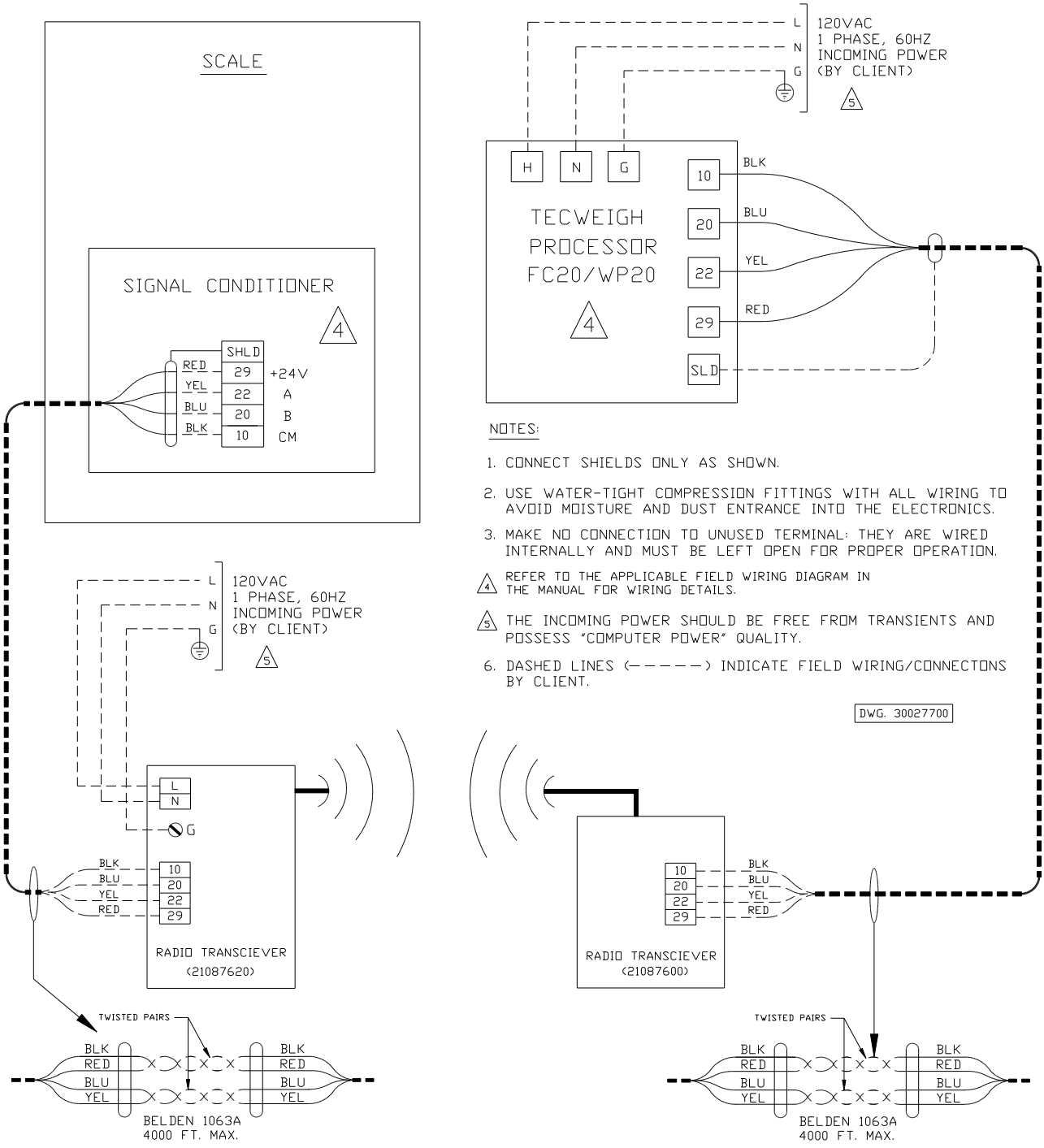
RLY 1 func: TPR
RLY 1 lgc: N.O.
RLY 1 pls: 0.10
RLY 1 TS: 1 (or as required)

EARTH GROUND
CHASSIS GROUND

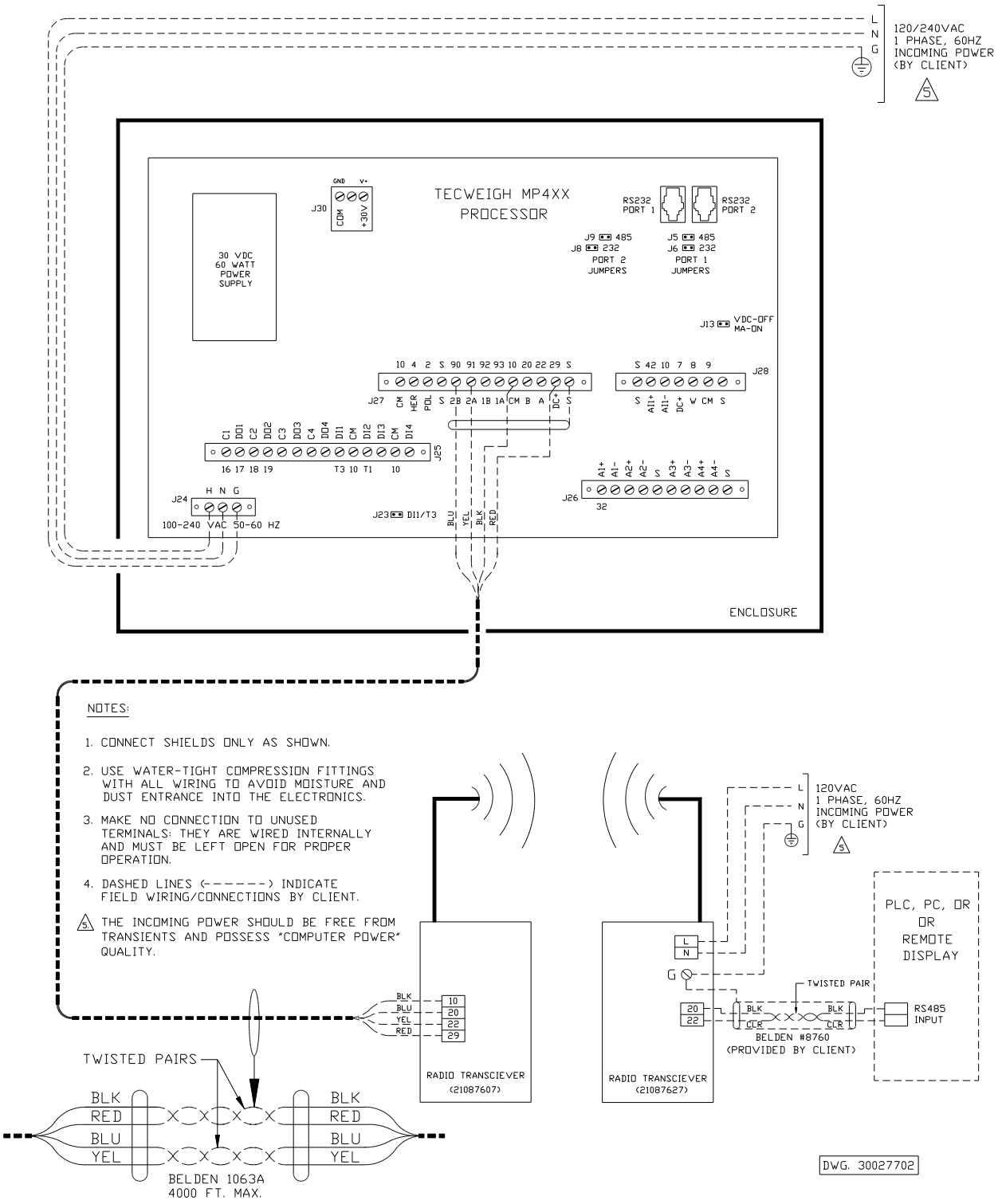
4.08 Remote Tons Counter.



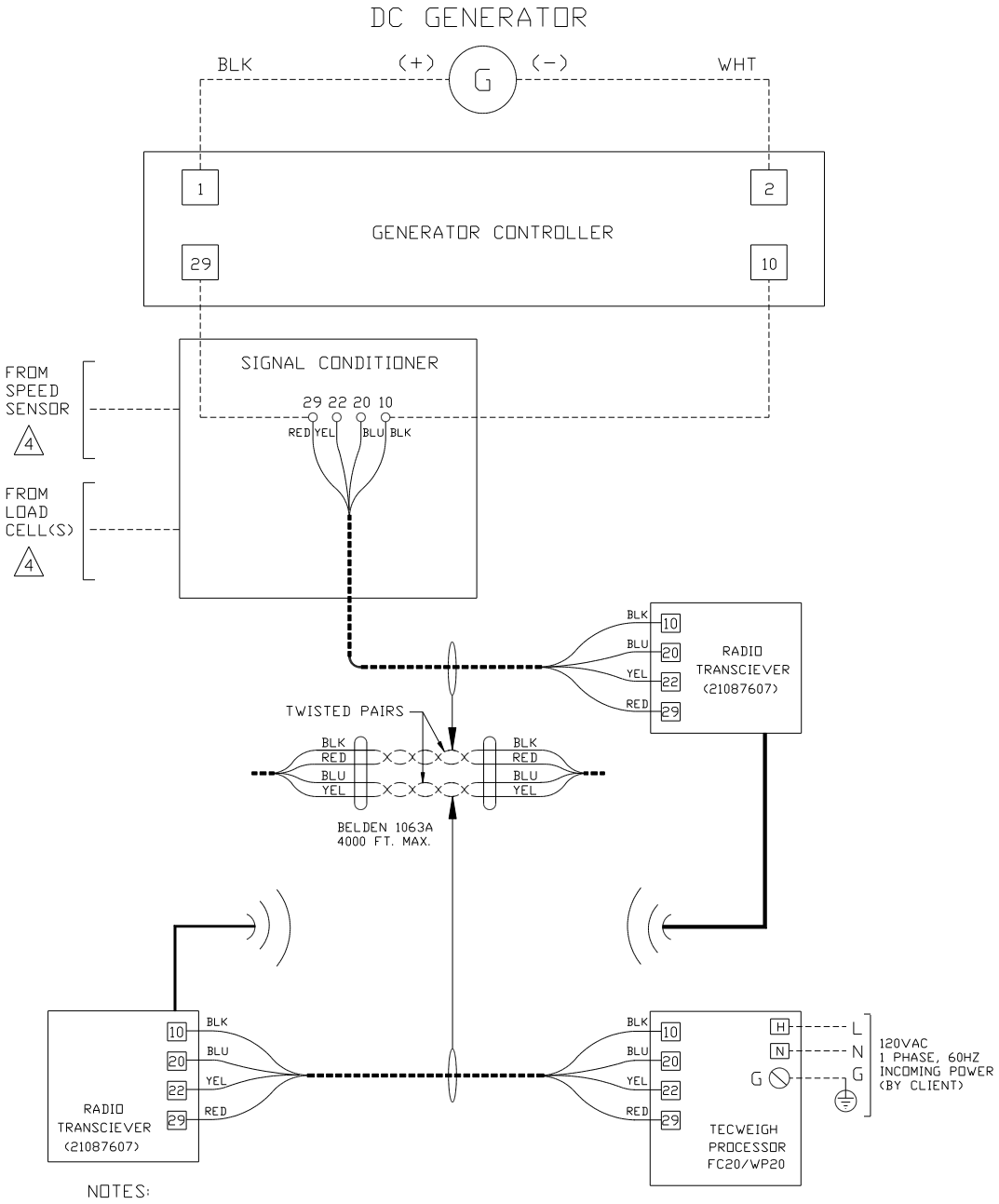
4.09 Radio Transceivers, Local Scale, Remote Processor.



4.10 Radio Transceivers, Local Processor, Remote PLC, PC, or Remote Display.



4.11 Radio Transceivers, Local DC Generator, Remote Processor.



NOTES:

1. FOR PROPER OPERATION OF THE SYSEM, THE BATTERIES MUST BE IN THE CIRCUIT AT ALL TIMES. DO NOT REMOVE.

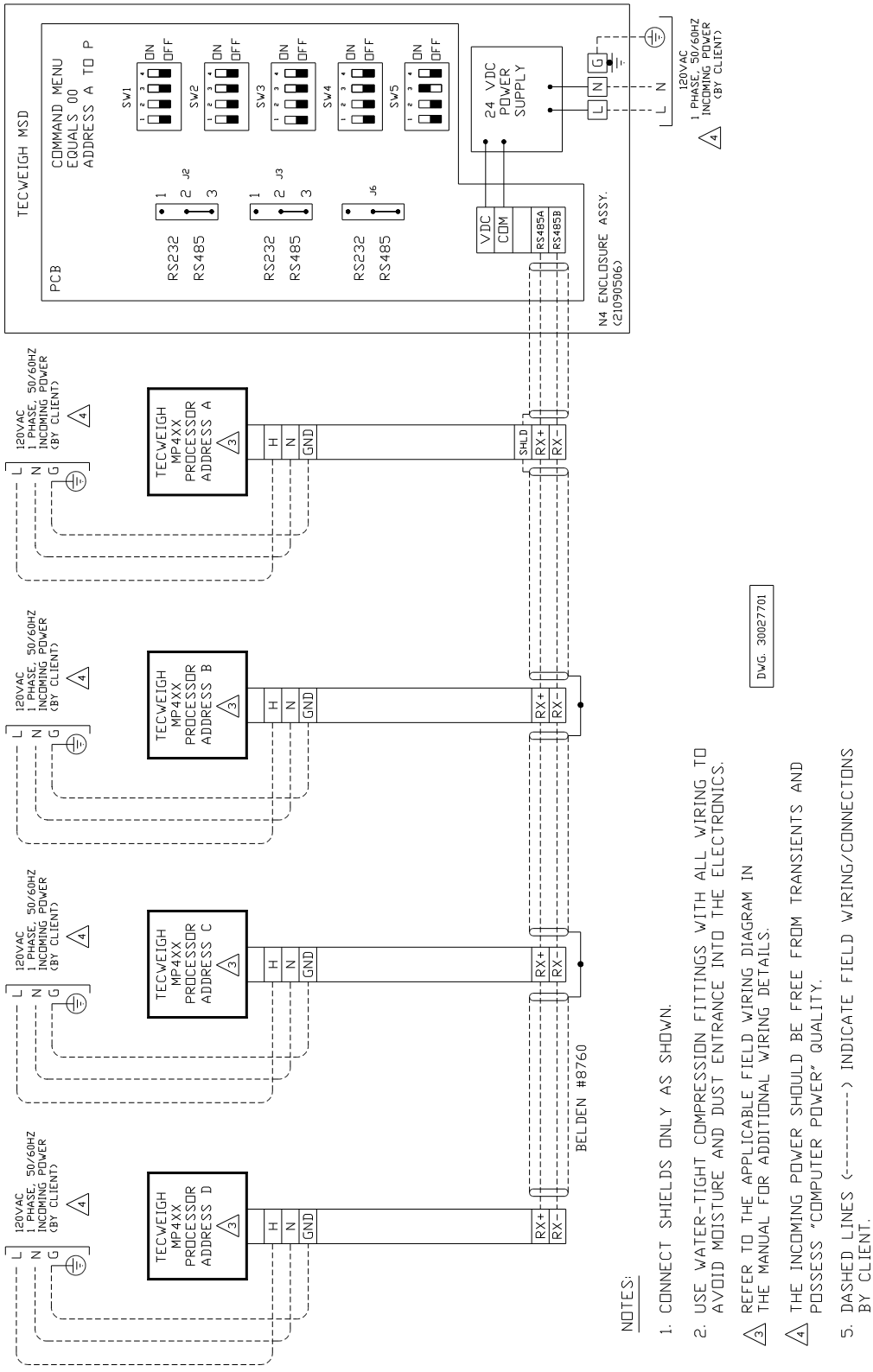
2. WITHOUT THE GENERATOR RUNNING, FULLY CHARGED BATTERIES WILL PROVIDE POWER FOR APPROXIMATELY 5 HOURS FOR INITIAL SET-UP AND MAINTENANCE.

3. TO MAINTAIN BATTERY LIFE, IT IS RECOMMENDED THAT EVERY 1 TO 2 MONTHS THE SCALE ELECTRONICS AND RADIO BE POWERED BY THE BATTERIES ONLY FOR A FEW HOURS.

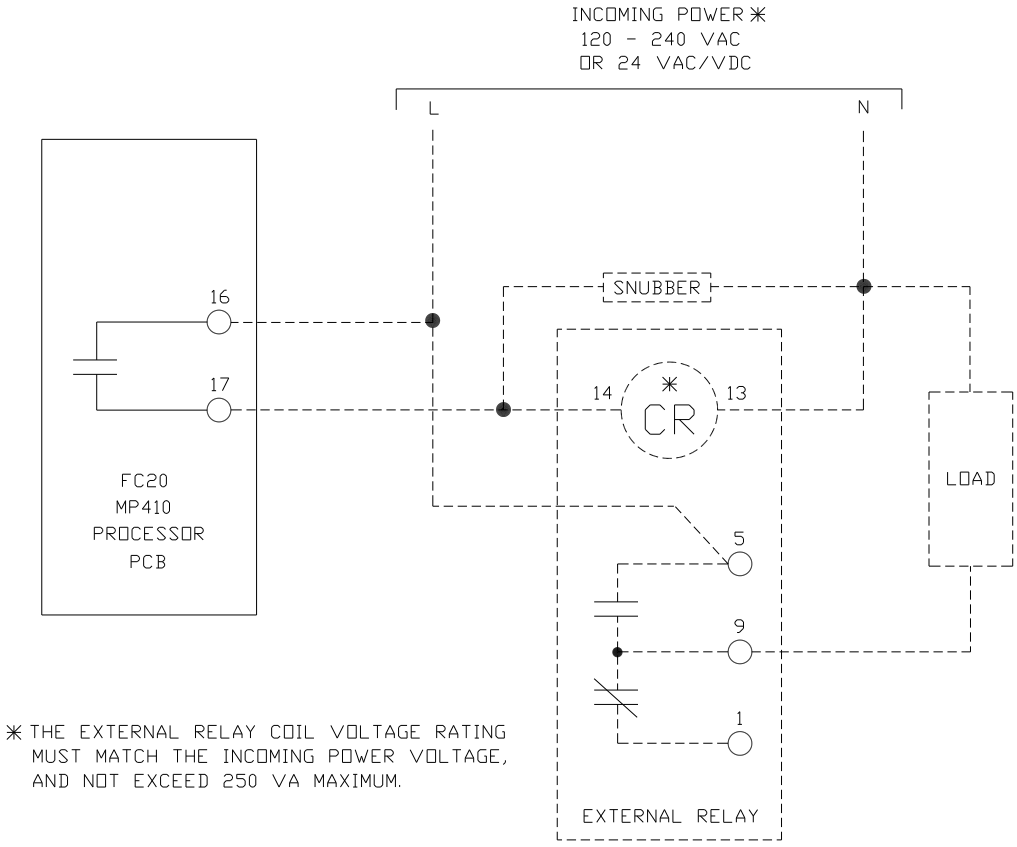
△4 REFER TO THE DEDICATED FIELD WIRING DIAGRAM IN THE MANUAL FOR WIRING DETAILS.

DWG. 30027703

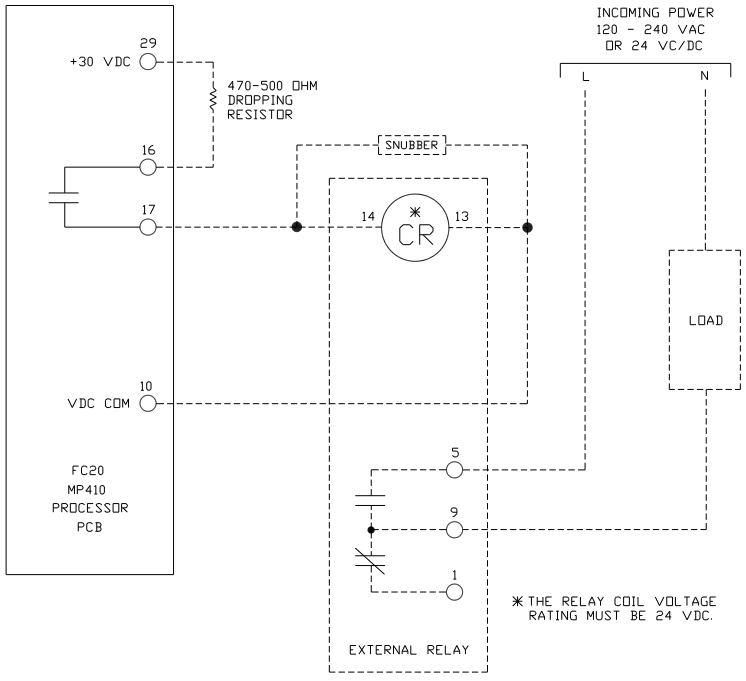
4.12 Multiple Processors to Tecweigh Multi-Scale Display (MSD).



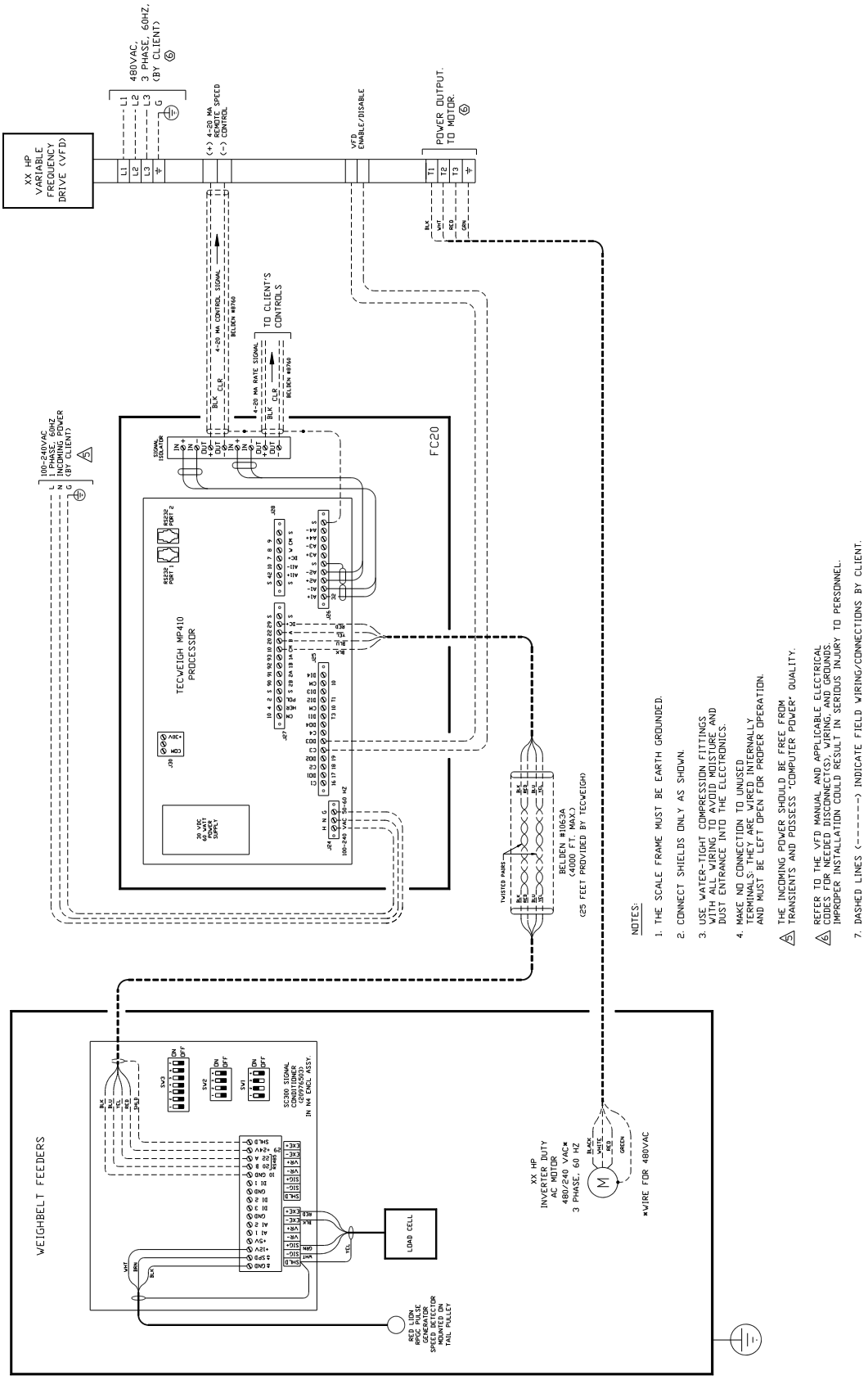
4.13 Interposing Relay Wiring, External 120 vac power.



4.14 Interposing Relay Wiring, Internal 30 vdc power.



4.15 FC20 to Variable Frequency Drive (VFD) wiring.



CHAPTER 5 – USER INTERFACE

5.01 Display Area

At this point, the scale should be installed and the FC20 mounted and wired. Now power up the system. The FC20 display windows should light up with information. Since the FC20 has not yet been configured, disregard any error messages or incorrect values on the displays.

The diagram below shows the FC20 user interface front panel. There are five windows that display information, along with 21 pushbutton keys. The following describes the window displays:

RATE window - Displays the material flow RATE over the belt scale.

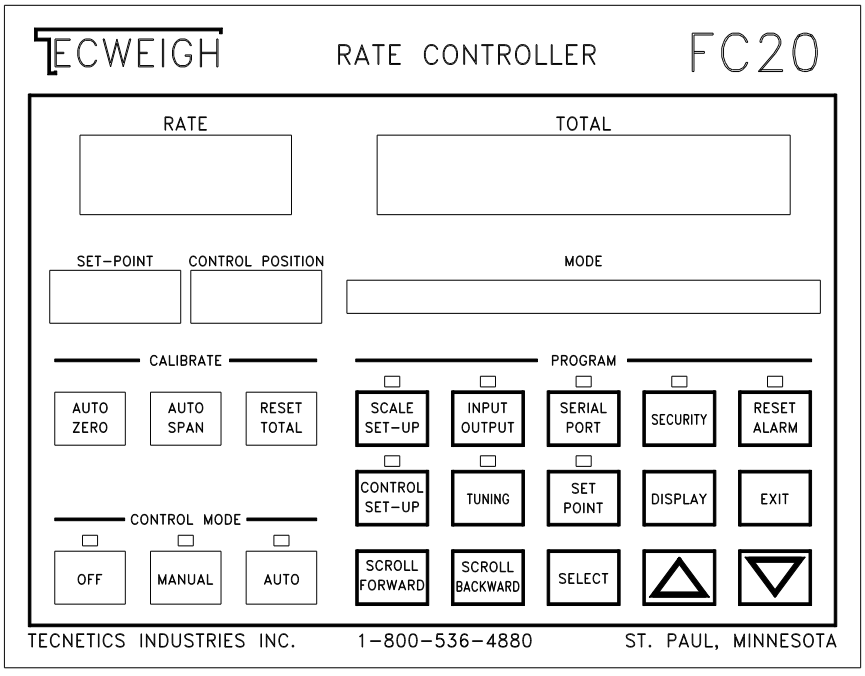
MODE window - There are three different modes in which the FC20 can run. Only certain information is displayed in each mode and only certain functions are available.

1) Run mode - displays the RATE units of measure, BELT SPEED, and SCALE STATUS.
2) Program mode - displays settings such as BELT SPEED, RELAY OPTIONS, etc.
3) Simulation mode – displays all Program Mode settings when running at a simulated RATE

TOTAL window - Displays the TOTAL weight of material that has passed over the scale since the last time the TOTAL was reset to zero.

SET-POINT window – Displays the rate SET POINT the FC20 will maintain by changing the CONTROL POSITION output. The decimal point position for this display will automatically match the decimal point position on the RATE display.

CONTROL POSITION window – The CONTROL POSITION output is displayed as a percent of full scale to tenths of a percent. It represents the percentage of full speed in which the feeder will operate.



5.02 Pushbutton Key Definitions, Parameter Entry

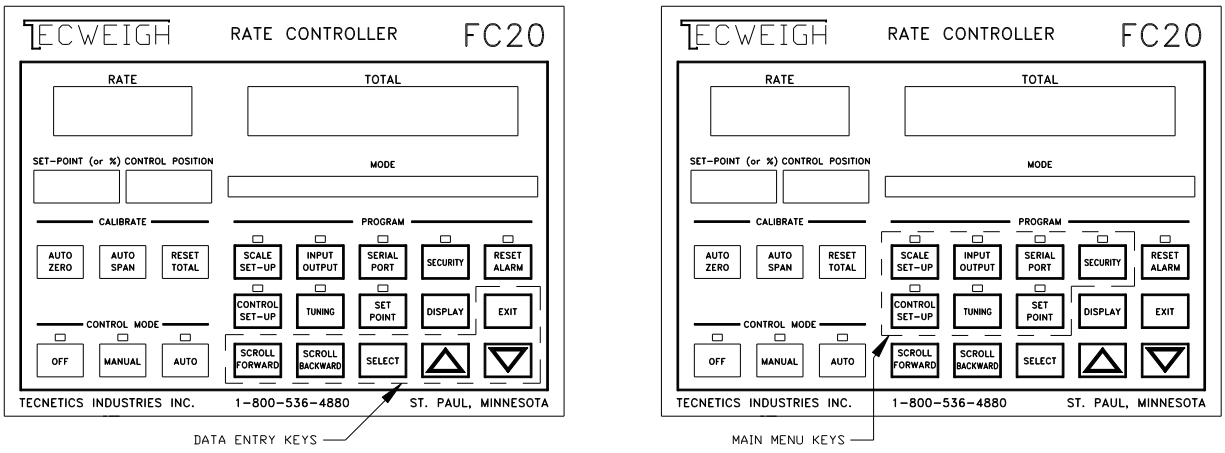
Parameters, Main Menu Keys

The FC20 is configured by accessing 7 main menus. Each menu consists of viewable Parameters, with most of them being editable. Menus are opened by pressing their corresponding MENU key on the front panel. An LED will illuminate indicating to the user that the menu is open and ready to be accessed. Refer to the figure below at the right.

Menus - Accessed using seven lighted PROGRAM BUTTONS. See the MAIN MENU keys below right.

Parameters - Accessed by the SCROLL FORWARD and SCROLL BACKWARD keys.

Parameter values - Modified by the SELECT and up/down ARROW keys.



The Data Entry Keys

SCROLL FORWARD and SCROLL BACKWARD – Once a MENU key has been pressed, locate a menu item simply by pressing the SCROLL FORWARD or SCROLL BACKWARD key until the menu item appears in the MODE window. All menu items display their current values. Note that not all the menu items will appear, they might be skipped over because their functions are not applicable as a result of other menu item settings.

SELECT - After the desired menu item is located by using the SCROLL FORWARD/BACKWARD key(s), use the SELECT key to highlight the menu item's editable Parameter. This will enable the Parameter to be modified. The editable Parameter can be a word or a number. If it is a number, pushing the SELECT key moves the enabler horizontally across the digits. The enabled digit flashes for recognition. Always press the SELECT key to stop the Parameter or digit from blinking before advancing to the next Parameter or exiting the menu.

ARROWS, Increment and Decrement - Once the desired Parameter has been located (SCROLL F/B), and enabled (SELECT), use the up ARROW or the down ARROW to increase or decrease a number's value. If the Parameter is a word, this action will scan through the list of alternatives for that specific Parameter. Changes to the menu items are saved by pushing the SELECT key, which also causes the Parameter to stop flashing.

EXIT – This key is used to EXIT program mode and return to normal operation. It is not necessary to EXIT to change from one menu to another. Exiting the program mode accepts any changed values. Menus can be accessed from one to another without losing their internal positions.

5.03 The Calibrate Keys

AUTO ZERO - Initially calibrates the scale to read zero when there is no material running on the belt. An AUTO ZERO calibration may also need to be done after setup to compensate for material build-up, a change in belt tension, or other effects that cause a non-zero RATE when the belt is empty. Refer to Section 8.04 for AUTO ZERO calibration procedures. This key can be locked out, see Parameter 77.

AUTO SPAN - Calibrates the scale to a known weight using calibration weights or a calibration chain. See Section 8.04 for AUTO SPAN calibration. This key can be locked out, see Parameter 78.

RESET TOTAL - Resets the TOTAL to zero**. Note that once reset, the previous value cannot be recovered.** This button can also be used to cancel an AUTO ZERO or AUTO SPAN calibration procedure already in progress. This key can be locked out, see Parameter 79.

5.04 The Display Key

While in run mode, momentarily pressing the DISPLAY key allows toggling between the RATE units of measure and the present belt SPEED.

5.05 The Control Mode Keys

Usually the output contact of relay 3 is connected to the enable/disable input of a variable frequency drive (VFD) to control the off/on of the weigh belt drive motor. Relay outputs 1 or 2 can also be used for this purpose.

On the FC20 display, three keys are positioned at the lower left under the heading CONTROL MODE, and are designated OFF, MANUAL, and AUTO. They are used to control the FC20 relay output.

The operation of the three keys is as follows:

OFF – When this key is pressed, the relay output connected to the VFD is de-energized and the feeder is stopped.

MANUAL – When this key is pressed, the relay output connected to the VFD is energized, thereby enabling it to drive the weighbelt feeder drive motor. To attain the desired belt speed, the 4-20 ma CONTROL POSTION output then needs to be adjusted accordingly, using the UP and/or DOWN ARROWS at the lower right of the FC20 display.

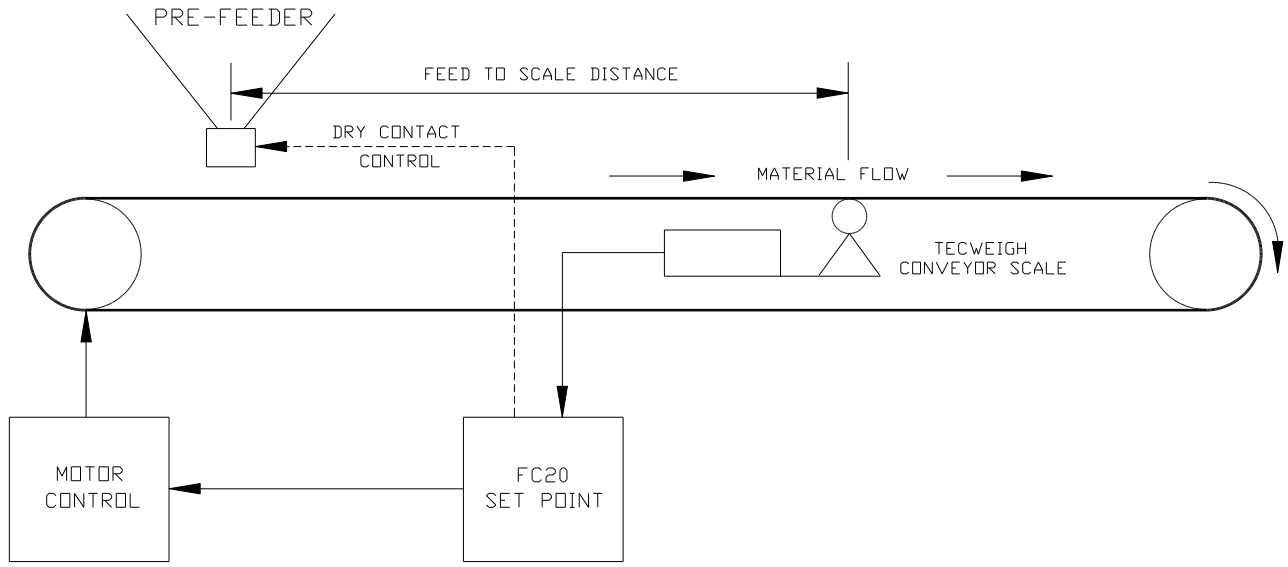
AUTO – When this key is pressed, the relay output connected to the weighbelt feeder VFD enable/disable input is energized, and the FC20 will automatically adjust the 4-20 ma CONTROL POSITION output, and thereby the belt speed, in order to attain the previously entered RATE SETPOINT.

Refer to Section 6.02 for a more in depth discussion of these keys.

CHAPTER 6 - OPERATION

6.01 System Operation

The **Tecweigh** FC20 Rate Controller is intended to operate in conjunction with **Tecweigh** conveyor scales or **Tecweigh** weigh belt feeders. It will display direct readings of SET POINT, CONTROL POSTITION, RATE, and TOTAL. Additionally, it will automatically maintain a material feed RATE based upon a local or remotely entered SET POINT. It does this by sending a 4(or 0) to 20ma signal and/or a dry relay contact output to control either the conveyor belt speed or a pre-feeder. The CONTROL POSTITION window will display (in percent) the value of this 4(or 0)-20 ma output control signal. Refer to the following figure.



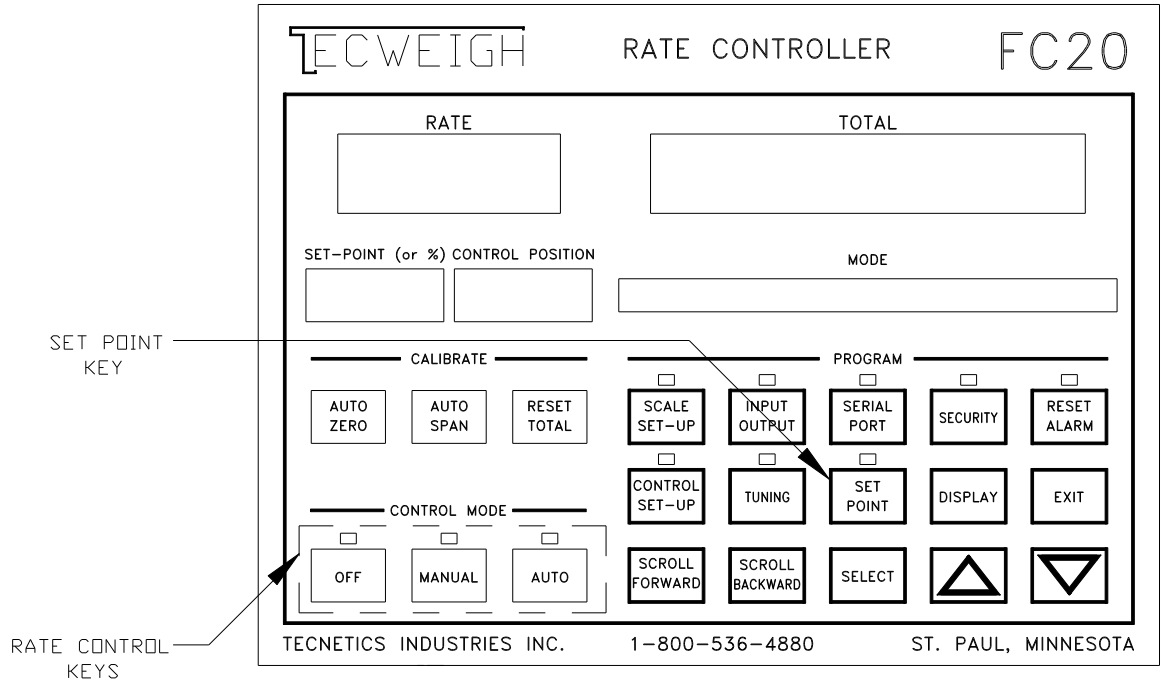
As belt material flows over the conveyor scale, the FC20 continuously compares the flow RATE to the SET POINT. Any difference that occurs between these two quantities is referred to as the "error". The CONTROL POSITION output is then increased or decreased to correct this error. Large errors will yield large corrections in output and small errors will yield small corrections. Consequently, a smooth flow of material over the scale is desired, otherwise oscillations above and below the SET POINT (hunting) might occur. When the material flow RATE again equals the SET POINT, the 4(0)-20 ma output value will be maintained until an error reoccurs. This method of control is commonly referred to as a PID control (**P**roportional-**I**ntegral-**D**erivative)

Systems that include long conveyors, surge bins, and other conditions which might make it difficult for the FC20 to maintain the RATE, will require special attention to the FC20 Parameter Settings. For instance, the FC20 uses a unique control delay function (Feed to Scale) which accounts for the distance between the material feed point and the actual point where it is weighed (feed to scale distance). This feature allows the process to stabilize after corrections have been made, thereby preventing the FC20 from hunting. By using the Feed to Scale Parameter (Section 7.04.24) and by monitoring the conveyor belt speed, the FC20 can automatically determine when to start taking a new RATE sample. The amount of time that the sampling lasts is controlled using the Sample Time Parameter (Section 7.04.25). Once the Sample Time expires, a change is made to the CONTROL POSITION output based upon the average RATE during the Sample Time. Thus, the actual control delay consists of two functions, first the Feed to Scale time delay must elapse, and then the Sample Time duration, before a change is made. The result of this time

delay process is that variable speed conveyors, or pre-feed devices on constant speed conveyors, can be used to control the feed RATE process.

Output interfaces from the FC20 also offer the ability to monitor production by utilizing printers, PC's, and other remote client provided devices. Additionally, RS232, RS422 (half duplex), or RS485 serial interface ports permit remote control from PLC's or computers, thereby aiding plant automation.

The FC20 also has other built-in functions for other RATE control applications/problems . If you should happen to have a unique application, contact **Tecnetics Industries Sales** to discuss it. More likely than not a satisfactory solution will be found. (Refer to section 2.01 for contact information).



6.02 CONTROL MODE Keys

The FC20 has three CONTROL MODEs of operation, OFF, MANUAL, and AUTO. Each of these modes can be selected by pressing their respective CONTROL MODE key located on the lower left front panel display. A small LED will illuminate above the selected key, meaning the mode is active. Each CONTROL MODE is described in the following paragraphs. Refer to the figure above for key locations. These keys can be locked out. See Parameter 80.

OFF - This CONTROL MODE is used to shut down the entire feed RATE process, either by stopping the conveyor belt or turning off the pre-feeder. When in the OFF mode, the CONTROL POSITION will remain at its most recent setting. However, when turning to the AUTO or MANUAL modes that could change, depending on how the parameters were initially configured.

MANUAL – This CONTROL MODE is used to manually adjust the CONTROL POSITION output. Using the up and down ARROW keys, the CONTROL POSITION output can be changed. This MODE is quite useful during start-up and calibration procedures.

AUTO – This CONTROL MODE utilizes the automatic RATE control (PID) function along with the SETPOINT. In this MODE the changes to the CONTROL POSITION are performed by the FC20. The up and down ARROWS are not functional in this mode.

The FC20 also provides a relay dry contact output (relay 3) that can be used as a remote **run** interlock. In the OFF mode, this output can be used to **disable** the material feed. When in the MANUAL or AUTO modes, the output can be used to **enable** the material feed. Examples of this **run** contact function are: 1) to enable/disable a variable frequency drive (VFD) via a run enable input to the VFD, 2) turn a motor starter on or off, or 3) energize or de-energize a pre-feeder. The relay contacts are rated at 250 VA max. (Example: 120 vac x 2.1 amps = 250VA). Do not supply more than 120 vac across any relay contact output.

6.03 SET POINT Key

The FC20's SET POINT key is used to select the desired feed RATE only in the AUTO CONTROL MODE. There are three modes of SET POINT functionality, Local, Remote, and % Remote. Refer to section 7.04.29 for information on selecting the desired mode. The SET POINT is displayed in the SET POINT (or %) window, and the units of measure, that is, tons per hour, pounds per minute, etc., is displayed in the MODE window. The SET POINT decimal point location will be the same as the RATE decimal point location. That is, if the RATE display uses a decimal point location of XXX.X, that same location will automatically be reflected in the SET POINT display. If it is changed in the RATE display, it will be automatically changed in the SET POINT display. As an example, if the RATE display shows 100.0 and the units of measure are "tons per hour", the SET POINT would then be XXX.X "tons per hour". The SET POINT **value** is determined by the specific application. Pressing the SET POINT key allows the operator to edit the SET POINT in any of the three modes. When the key is pressed, the mode display will read **set point: XXX.X.** When the desired SET POINT has been entered, press the EXIT key to return to normal control. SET POINTs can be entered at any time, even while a process is running. This key can be locked out. See Parameter 81.

The following are descriptions of each of the three SET POINT modes:

Local - When the Local SET POINT mode is selected, the FC20 operates as a single loop PID controller. The FC20 will strive to attain a RATE that matches the SET POINT.

Remote – Some processes require the FC20 to receive a SET POINT signal from a remote device such as a PLC. When the Remote SET POINT mode is selected, the FC20 is enabled to receive remote analog or serial SET POINT signals. Refer to sections 7.03.30, 31, & 32, and 7.08.72, for information on selecting/configuring and scaling analog or serial SET POINT inputs. When the FC20 receives a remote SET POINT signal, it is sent directly to the SET POINT display. The SET POINT is calibrated to units of measurement as determined by the FC20's configuration, that is, tons per hour, pounds per minute, etc.

% Remote - The % Remote mode is mainly used for material blending applications. For example, in some processes one or more ingredients are required to be a percentage of the main ingredient. This kind of control is often referred to as "ratio" or "master/slave" control. When the % Remote SET POINT mode is selected, the FC20 is enabled to receive a remote analog or serial signal from a remote process and output a CONTROL POSITION signal that attains a RATE which is a percentage of the input signal. Refer to section 6.06 for a discussion of this application.

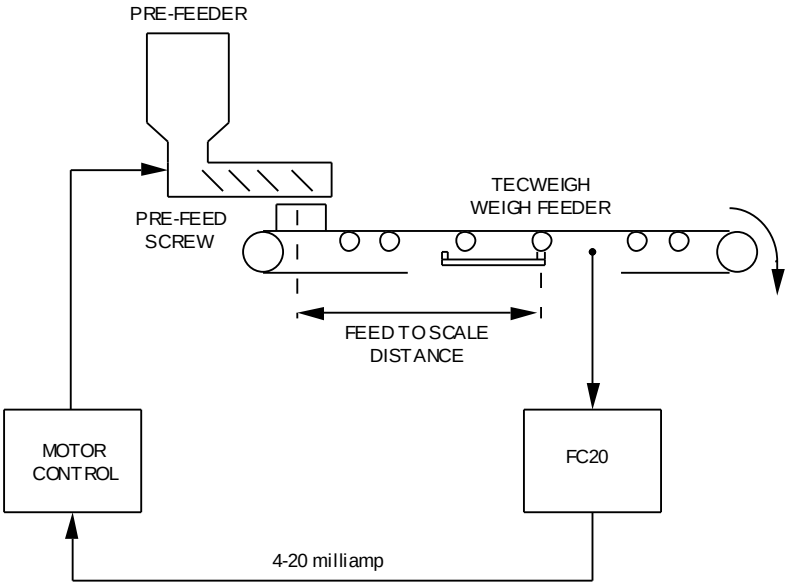
6.04 Single Loop Control

Single loop RATE control is the simplest form of RATE control. Refer to the figure below. The Local SET POINT is entered manually into the FC20 using the SET POINT key. Refer to the previous paragraph for entry instructions. **Remote** SET POINT input signals will be ignored in this mode.

The following setup must be performed for single loop RATE control using Local SETPOINT:

SET-UP MENU:

feed to scale: XXX.XX	Distance from pre-feed to scale weigh idler (feet or meters).
sample time: XX	Rate sample time (typically 10 seconds).
min output: XXX.X %	Normally set to 10%. Do not set to 00.0% when controlling conveyor belt speed.
max output: XXX.X %	Normally set to 100% (20 ma).
set point type: LOCAL	Enables the Local SET POINT to represent tons per hour, pounds per minute, etc.



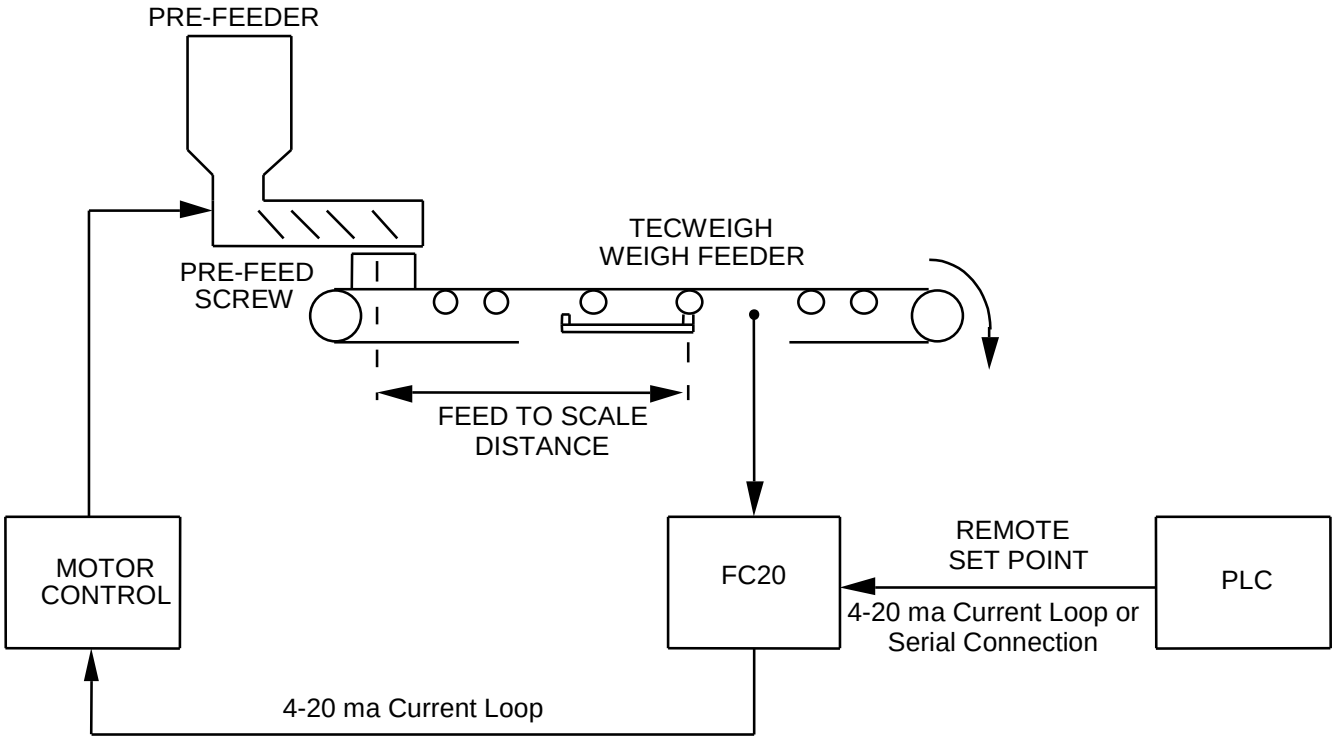
6.05 Single Loop Control using Remote Set Point

Single loop RATE control using a Remote SET POINT provides for a follower type control system. Refer to the following figure. When Remote SET POINT signals are received, they are immediately transferred to the SET POINT display. The units of measure, that is, tons per hour, pounds per minute, etc., are displayed in the MODE window. The Remote SET POINT signal usually originates from a PLC or computer as an analog signal (4(0)-20ma, 1(0)-5vdc, etc.) or as a serial signal (RS232, RS485). Once the Remote SET POINT signal is scaled (analog only), the SET POINT display will directly follow the incoming Remote SET POINT signal. Several FC20 RATE control systems can be linked to one Remote SET POINT signal, which can aid in plant automation. The Local SET POINT menu is disabled when the Remote SET POINT mode is being used.

The following setup must be performed for single loop RATE control using Remote SET POINT:

SET-UP MENU:

Feed to Scale: XXX.XX	Distance from pre-feed to scale weigh idler (feet or meters).
Sample Time: XX	Rate sample time (typically 10 seconds).
Min Output: XXX.X %	Normally set to 10%. Do not set to 00.0% when controlling conveyor belt speed.
Max Output: XXX.X %	Normally set to 100% (20 ma).
Setpoint Type: REMOTE	Enables the Remote SET POINT to represent tons per hour, pounds per minute, etc.
Remote Set Pnt: Analog/Digital	Select the Remote SET POINT type, Analog, if using 4(0) to 20 ma or 1(0) to 5 vdc, Digital, if using the serial port.
Setpoint Zero: XXXX	Used to zero the Remote SET POINT signal (Analog only).
Setpoint Span: XXXXX	Used to calibrate the full scale Remote SET POINT signal. (Analog only).



6.06 Ratio (Master/Slave) Control

Some applications require a feed RATE that is a percentage of a remote process. This is commonly termed a "ratio control", where the local process is a ratio (or percentage) of the remote process. It is also sometimes termed a "master/slave control", where the remote process is the "master" and the local process is the "slave". When the FC20 is in the % Remote mode, it is capable of performing this function. The signal coming from the remote process to the local process can be either analog (4-20ma) or serial. Refer to sections 7.03.30, 31, & 32, and 7.08.72, for information on selecting/configuring and scaling (analog only) analog and serial inputs.

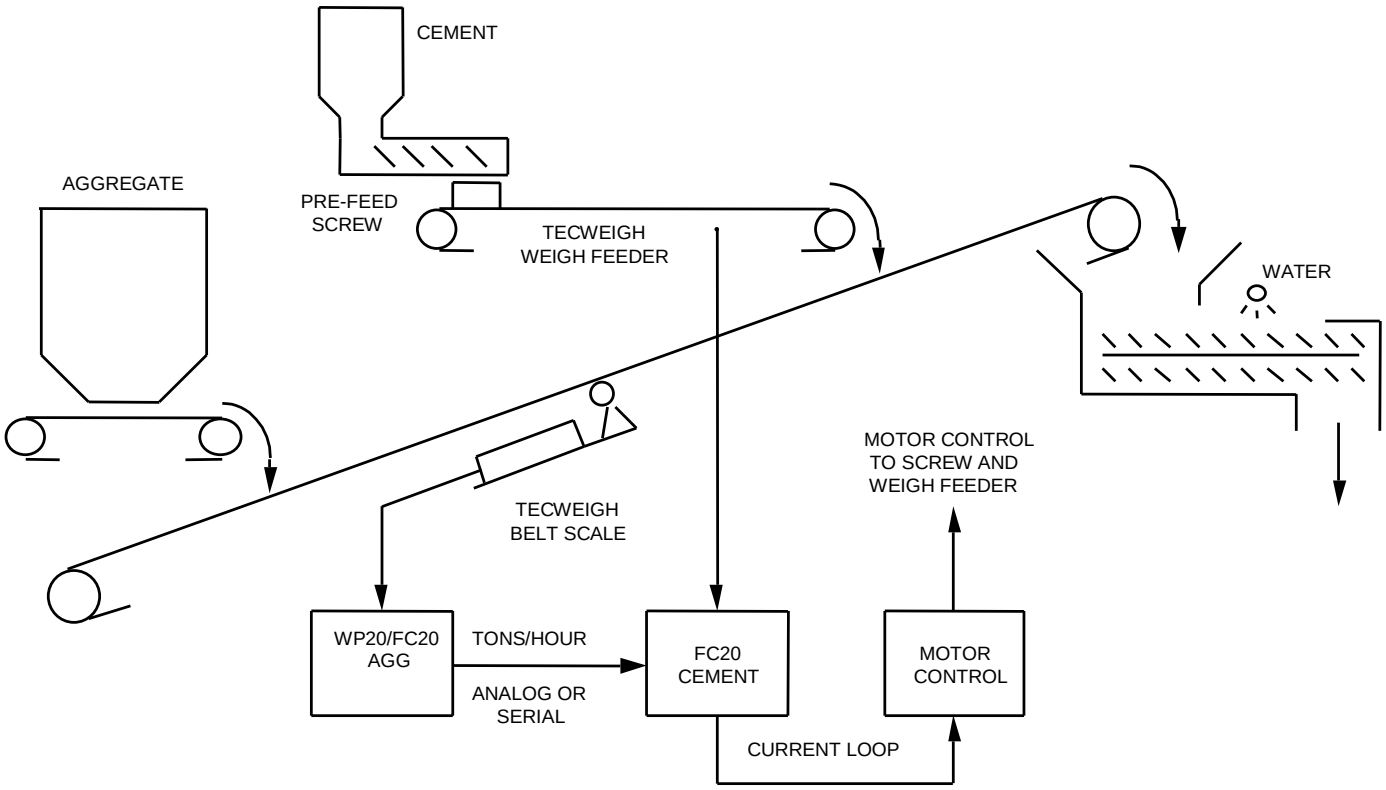
The remote signal, as received, is continuously re-calculated using the desired ratio (percent) value that was previously entered via the SETPOINT key, i.e. 50 for 50%. The resultant value is applied as the SET POINT. In this % Remote mode only, the **displayed** SET POINT in the SET POINT window is actually the selected ratio (percentage) that was previously entered manually. The **actual** SET POINT value can be displayed by pressing the DISPLAY key twice. While pressing the key, the Units of Measure, Belt Speed, and **actual** SET POINT, will scroll through the MODE window.

The remote signal (analog or serial) can originate from a PLC or PC, but it can also originate from a **Tecweigh** WP20 or another FC20. The signal from the **Tecweigh** devices can be from either their 4-20 ma rate outputs or their serial outputs. If serial, it must be in Set Point format (see section 9.02, command 20). If the remote process also requires a rate control for proper blending, another FC20 can perform that function. IMPORTANT: When the system is using a **Tecweigh** WP20 or FC20 for the remote process, the Units, Rate DP, and Station ID Parameters, must match between the remote (master) WP20 or FC20 and all local FC20 (slave) controllers.

Two examples follow:

Example 1, if the remote signal represents 150 tons/hour and the **displayed** SET POINT is 50 (manually entered), the resultant **actual** rate SET POINT value would be 75 tons/hour (0.50 x 150 = 75). As stated above, the **actual** SET POINT value (75 ton/hr) can be displayed by pressing the DISPLAY key twice. As the remote input signal value varies, the FC20 will always maintain the SET POINT based upon the pre-selected ratio (percentage).

Example 2 (refer to the following figure), a concrete blending system proportions the flow of Portland cement as an additive to an aggregate flow. The aggregate weight is continuously measured as it passes over a **Tecweigh** conveyor belt scale. The resultant RATE signal is transmitted to a FC20 which continuously controls the flow of cement in order to maintain a pre-specified ratio of cement to aggregate. The FC20 controls the flow of cement by adjusting the speed of a screw feeder which feeds cement onto a secondary **Tecweigh** conveyor belt scale. This cement flow is continuously weighed and the resultant weight signal sent back to the FC20 as a cement flow feedback signal (PID loop).



The following setup must be performed for ratio (master/slave) control:

SET-UP MENU:

Feed to Scale: XXX.XX	Distance from pre-feed to scale weigh idler (feet or meters).
Sample Time: XX	Rate sample time (typically 10 seconds).
Min Output: XXX.X %	Normally set to 10%. Do not set to 00.0% when controlling conveyor belt speed.
Max Output: XXX.X %	Normally set to 100% (20 ma).
Setpoint Type: REMOTE%	The local SET POINT is displayed as a percentage, 0.0-100.0%.
Remote Set Pnt: Analog/Digital	Selects the remote set point type, ANALOG for 4-20ma or 0-5 Vdc, DIGITAL if using the serial port.
Setpoint Zero: XXXX	Used to zero the Remote SET POINT signal (Analog only).
Setpoint Span: XXXXX	Used to calibrate the full scale Remote SET POINT signal.

6.07 RESET ALARM

The FC20 is equipped with configurable High/Low alarms. Relays 1 and 2 can be configured so their output contacts open or close during an alarm condition. See Section 7.05.45-59 for the relay Parameters.

SET POINT High and Low Alarms can represent out of tolerance bands for either RATE or SPEED. A programmable "delay on operate" function is also available to filter out spurious signals or to aid in start-up sequences.

The run alarm conditions will appear in the MODE window as follows:

1.	RATE ALARM	indicates either a high or low RATE condition.
2.	SPEED ALARM	indicates either a high or low SPEED condition.
3.	EXTERNAL ALARM	indicates an external alarm condition. (A configurable function of the Terminal 3 (Section 7.05.61-62) input).

When using the Rate Alarm function, the FC20 has the ability to set a tolerance band around the rate SET POINT. For example, the operator can program the FC20 to ALARM when the actual feed rate deviates 10 % above or 20 % below the rate SET POINT. The LED located just above the RESET ALARM key will flash during any of the above alarms.

The Alarm Output mode, located in the Control Set-Up Menu, is used to hold the CONTROL POSITION to a pre-selected percentage during any valid alarm condition. The operator acknowledges the alarm by pressing the RESET ALARM key. This extinguishes the LED and the MODE display resumes to the pre-alarm state. The condition that created the alarm must resume a non-alarm status before it can be recognized as a new alarm condition.

The FC20 has a Terminal 1 input which is configurable (Section 7.05.60). It can be configured to either remotely reset the TOTAL display or to reset an ALARM condition. Connecting this input to Terminal 10 (COM) will activate the Reset function.

CHAPTER 7 – PARAMETER TABLE

7.01 Factory Settings

For easy reference, chapter 12.01 has a summary table of all the FC20 Parameter values that were entered at the factory. Every application will require some customization of the factory Parameter settings. It is critical for a successful installation not to rely entirely on the factory settings! Learn about each Parameter and enter the value that best suits your application. Usually not all Parameters require setting for the particular application or desired options. Additionally, it is recommended that the scale be properly calibrated before the optional outputs are enabled. If you have an older board, some Parameters might be different. Consult the **Tecweigh** Service Department (Section 2.01) for assistance in this case or if other questions arise. After customizing the Parameters for your particular installation, copy or write down the values for future reference

7.02 Parameter Definitions, General

The entire Parameter table (Section 12.02) is consecutively numbered. This sequencing provides easy reference if it should become necessary to contact the **Tecweigh** Service Department (Section 2.01) for consultation.

The following Section 7 paragraph headings reference the actual keys on the FC20 and the Parameters that are accessible in that menu. The paragraphs are:

7.03 – SCALE SET-UP

7.04 – CONTROL SET-UP

7.05 – INPUT OUTPUT

7.06 – TUNING

7.07 – SERIAL PORT

7.08 – SET POINT (or %)

7.09 - SECURITY

7.03 Scale Set-Up Menu Parameters

The Scale Set-up Menu contains parameters which refer to the actual weighing and calibration functions of the FC20. Parameters such as Cal Wt, Wgh Span, and Cal Factor, are critical to the accuracy of the weighing system. Other functions, such as decimal points and damping, mainly refer to display options. Listed below are all of the menu items which will appear in the Scale Set-up Menu.

1) **Units:** - Select the desired Units of Measure for the RATE display. The TOTAL display will use the weight portion of the RATE units selected (pounds (KG) or tons (tonnes)). If any English units are selected, then all setup must be done using English units and similarly for Metric units. Once set up, however, the RATE units can be changed at any time and the Cal Wt (or Cal Chain), Weigh Span, and Belt Length, units will be converted automatically. It is not recommended this be done frequently, however, because the error will increase.

English Units		*Metric Units*	
TONS/HR	tons per hour	TONNES/HR	tonnes per hour
TONS/MIN	tons per minute	TONNES/MIN	tonnes per minute
PPH x 1000	pounds per hour x 1000	KG/HR	kilograms per hour
LBS/HR	pounds per hour	KG/MIN	kilograms per minute
LBS/MIN	pounds per minute		

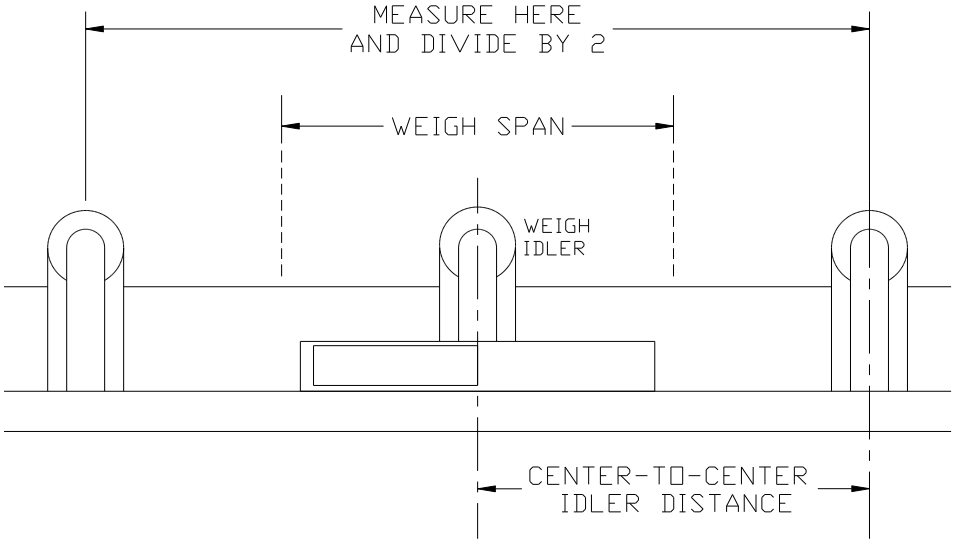
2) Cal Factor: - The Calibration Factor accounts for physical differences between scale types. Select the appropriate value for the scale model at hand, or select 0.03 if a calibration chain will be used instead of the calibration weight supplied with the scale.

WY10	.27	WY20	.54
WY10HD	.54	WY25	.36
WY10SHD	.70	WF10	.27/.36 (See 11.02.4)
WY15	.36	WF18	.36
HY15	.36	HY25	.36

3) Cal Wt: - Enter the exact value of the calibration weight. If you are using one that originated at the factory, this value is stamped on its end (in pounds). Enter the value in pounds when using English units or in kilograms when using Metric units (KG = 0.453 X LBS.). Set this Parameter to zero when using a calibration chain instead of the factory supplied calibration weight.

4) Cal Chn: - Enter the weight per length of the calibration chain if one is being used in place of the factory supplied calibration weight. To determine this value, weigh the chain (in pounds or kilograms) and measure its length (in feet or meters). Be sure to use only English or Metric units. Then divide the weight by the length (weight/length) and enter the resultant value.

5) Wgh Span: -.The Weigh Span is the length of belt directly over the scale from the idler before the scale to the idler after the scale, divided by 2. The units are inches if using English units or meters if using Metric units. See the following figure.

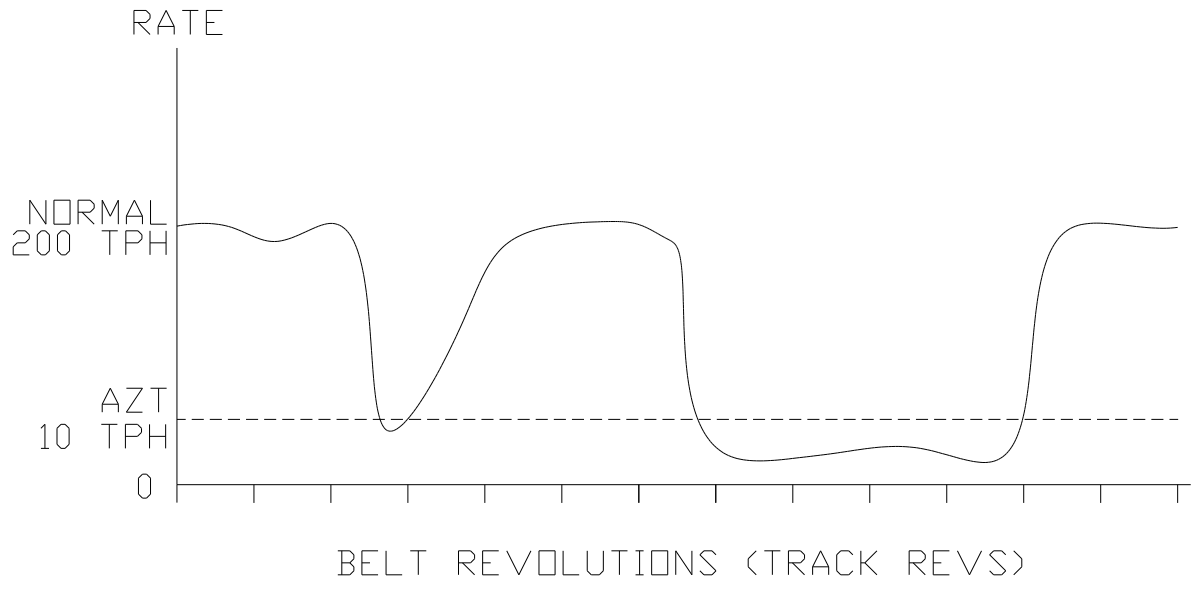


6) Blt Len: - Enter the exact length of the conveyor **belt** in feet if using English units or in meters if using Metric units. Do not enter the conveyor length! Enter the entire belt length as if it was cut and stretched out flat on the ground.

7) P/P Wt: - The pre/post weight is used for a material test calibration procedure. If this is a first time set up, let it remain equal to zero. During calibration, material will be dispensed into a truck and weighed on a stationary scale. The stationary scale weight will then be entered as the P/P Wt Parameter. The FC20 TOTAL and the stationary scale weight total will be compared and the result used as a tuning adjustment. This is discussed further in Section 8, Calibration.

8) AZT: - Auto Zero Tracking or AZT compensates for material build-up or other conditions that cause the rate to fluctuate from zero even when the belt is empty. The AZT value is a RATE. When the actual RATE falls below the AZT rate, the FC20 provides two options. The first option simply forces the displayed RATE to be zero (even though it may not be exactly zero) and stops the totalizer. The second option actually performs an Auto Zero calibration when the RATE falls below the AZT rate. Set AZT = 0 to disable it or set AZT to about 5% of the normal running rate if you wish to enable the feature. If you typically run at low rates it is recommended that you leave the AZT disabled. ***Let AZT=0 when you are first setting up the system to avoid complications and confusion.***

9) Trck Revs: - Track revs is directly related to AZT. If Track Revs = 0, and AZT is enabled, the displayed RATE will be forced to zero when the actual RATE falls below AZT (option one). If Track Revs is not zero, the FC20 will show a RATE of zero <u>and</u> do an Auto Zero calibration if the RATE falls below AZT for longer than the number of belt revolutions in Track Revs (option two). Refer to the following graph. Assume the normal running rate is 200 tons per hour, AZT is set to 10 tons per hour, and Track Revs is set to two belt revolutions. When the RATE falls below AZT for less than two belt revolutions, as indicated by the first dip, the RATE display is forced to zero.



If the RATE falls below AZT for more than two belt revolutions, an Auto Zero is performed and what used to be about five tons per hour is now zero tons per hour. This can happen when material sticks to the belt, effectively making it heavier. To use this feature, enter a value for Track Revs that allows at least 5 minutes of tracking before the AUTO ZERO begins, to allow time for the conveyor belt to empty completely.

Note, when AZT is enabled, each time the RATE falls below the AZT Rate, the "zero tracking" message appears in the MODE display as a notice only. Pressing any key will remove the message, or it will disappear automatically when the RATE again rises above the AZT value.

10) Zero Revs: - When AUTO ZERO is pressed, the FC20 will zero the scale. Enter the number of belt revolutions to be used for an Auto Zero cycle. Generally, the more time (more belt revolutions) allowed the more accurate the results will be. As the Auto Zero cycle is being performed, the FC20 spends time learning about the belt splices and other inconsistencies in the system. Enter a value that allows at least 2 minutes of run time. Auto Zero is discussed further in Section 8, Calibration.

11) Span Revs: - When AUTO SPAN is pressed, the FC20 will re-span the scale using calibration weights or a calibration chain. Enter the number of belt revolutions used for an Auto Span cycle. Generally, the more time (more belt revolutions) allowed, the more accurate the results it will be. Enter a value that allows at least 2 minutes of run time. Auto Span is discussed further in the Section 8, Calibration.

12) Rate DP: - Enter the desired decimal point position for the RATE window. Set to Ones when the maximum RATE will be greater than 100, set to Tens when the maximum RATE will be less than 100, and set to Hunds when the maximum operating RATE will be less than 10. The decimal point positioning for various positions will appear as:

Ones	0000
Tens	00.0
Hunds	0.00

If the RATE exceeds what will fit in the display, a series of dashes will appear in the RATE window and looks like ---- .

13) Rate Damp: - Enter the damping factor for the RATE display. Damping makes the RATE display more stable so the numbers do not change faster than they can be read. The higher the Damping Factor the more stable the reading. RATE damping does not affect the TOTAL or the accuracy of the system. Note that the higher the damping, the slower the RATE display will update after changes occur in the actual RATE. A typical value for Rate Damp is 30. Set to zero to turn off damping.

14) Speed DP: - Enter the decimal point position for the belt SPEED display. Set to Ones when the maximum belt SPEED will be greater than 100, set to Tens when the maximum belt SPEED will be less than 100, and set to Hunds when the maximum belt SPEED will be less than 10. The decimal point positioning for various positions will appear as:

Ones	0000
Tens	00.0
Hunds	0.00

If the SPEED exceeds what fits in the display, a series of dashes will appear in the SPEED window and looks like ------- .

15) Speed Damp: - Enter the damping factor for the belt SPEED display. Damping simply makes the SPEED display more stable so the numbers do not change faster than can be read. A higher setting allows for a more stable reading. SPEED damping does not effect the RATE, TOTAL, or accuracy of the system. Note, however, that when damping is high, the displayed SPEED will update slowly when changes in the actual speed occur. Set to zero to turn off damping. Typical value for Speed Damp is 30.

16) Speed Spn: - Speed Spn is used to calibrate the belt SPEED if the FC20 displayed SPEED does not equal the tested or calculated belt SPEED. Increase Speed Spn to increase the SPEED value or decrease it to decrease the SPEED value.

17) Total DP: - Enter the desired decimal point position for the TOTAL window. Higher RATES make decimal positioning unnecessary, because the TOTAL will increment at one or more units at a time. The decimal point positioning for various positions will appear as:

Ones	00000000
Tens	000000.0
Hunds	00000.00
Thous	0000.000

If the TOTAL exceeds the display size, a series of dashes will appear in the TOTAL window and will look like -------- .

18) Down Count: - The Down Count enables or disables down counting of the TOTAL display. When set to Down Count - NO, the totalizer will not count down (backwards) when the RATE display is indicating negative. When set to NO, the AZT Parameter must be set to 0000 for proper operation. The selections are:

YES - enables down counting.
NO - disables down counting.

19) ASC: - After the FC20 calculates the RATE, it multiplies that number by the ASC (Auto Span Correction) factor before displaying it in the RATE window. In an ideal setup, ASC would remain 1.000, which means that no correction is being made to the RATE. However, every system requires some tuning. After calibrating the scale (discussed in Section 8) the ASC value can be manually increased or decreased to finely tune the displayed RATE. Alternatively, a material test can be done (Section 8.05) and the proper ASC value will be computed automatically. For example, if the tested material weight ends up being 1.06 times the TOTAL, the ASC value will be changed to 1.06 times the previous ASC value. From that point on, the FC20 will calculate the RATE and then multiply it by the new ASC before displaying it. Note that the typical range of values for ASC should be between 0.900 and 1.100. If the system requires an ASC value outside that range, consult Section 10, Troubleshooting.

20) Load Counts: - For technical trouble shooting purposes, the FC20 can display raw counts from the weight sensors (load cells or LVDTs). The counts with the calibration weight up should be low, and the counts with the calibration weight down should be high. The raw counts with the calibration weight lifted, compared to the Zero Counts, indicates if the scale is in calibration. The low/high range varies from system to system, but it should be consistent from day to day for the same system. This value is mainly used when consulting with the **Tecweigh** Service Department (Section 2.01).

21) Zero Counts: - This Parameter is not editable. For technical trouble shooting purposes, this Parameter displays the Load Counts that the processor is using as a zero reference. This viewable Parameter is calculated during the Auto Zero procedure. It is mainly used when consulting with the **Tecweigh** Service Department (Section 2.01).

22) Span Counts: - This Parameter is not editable. For technical trouble shooting purposes, this Parameter displays the Load Counts that the processor is using as a span reference. This viewable Parameter is calculated during the Auto Span procedure. This value is mainly used when consulting with the **Tecweigh** Service Department (Section 2.01).

23) Span Detect: - During an AUTO SPAN, the processor waits for a change in the load cell signal before initiating the procedure. This Parameter represents that change in load cell signal that is a requirement to start the AUTO SPAN procedure. The factory setting should be adequate unless a calibration weight change is made in the field. As a reference, this Parameter entry should be approximately 70% of the total change in Load Counts between the calibration weight being up and down.

7.04 Control Set-Up Menu Parameters

The Control Set-up menu is used to program the FC20 for feed rate control applications. Some of the settings might need fine tuning after the system has been run. The "feed to scale" entry along with the "sample time" entry will accommodate these applications. The control output is selectable from either a 0(4)-20ma signal or a contact closure as needed. Local, Remote or % Remote SET POINTs provide for single loop control or master SET POINT type applications. Remote analog SET POINTs can be scaled to represent actual tons per hour, pounds per minute, etc. The following are descriptions of the program modes located in the Control Set Up menu.

24) Feed to Scale: XXX.XX – This is the distance from the pre-feeder to the scale carriage weigh idler and is critical to maintaining SET POINT. Enter the distance from the exact center of material feed to the exact center of the belt scale weigh idler or idlers. This entry is used by the FC20 to allow fed material to reach the weigh idler before corrections are made. If the distance entered is too low, the FC20 will make decisions before it detects what its last correction produced. This causes wide variations in RATE making it difficult to maintain a SET POINT. If the distance is set too high, it will slow down the control response. The acceptable digits range and format are as follows: 000.00 - 999.99 feet or 000.00 - 304.79 meters

25) Sample Time: XX - Selects the time delay (0 - 99 seconds) after the feed to scale distance has elapsed. The FC20 will make corrective actions based upon the average RATE during the sample time duration. A longer sample time yields a more accurate RATE sample. It is recommended that this Parameter be set between 5 and 10 seconds. Note that this function will decrease control loop response.

26) Min Output: XXX.X % - Used to preset the minimum control output limit. The CONTROL POSITION display indicates the control output in percent. This output is continually adjusting the RATE, consequently the Minimum Output must be set to a value other than zero. If a zero RATE condition were to occur, the FC20 would be unable to respond to errors in RATE, and might perform PID calculations incorrectly.

27) Max Output: XXX.X % - Used to preset the maximum control output limit. The CONTROL POSITION display located on the front panel indicates the control output in percent.

28) Alarm Output: XXX.X % - The Alarm Output function is used to hold the CONTROL POSITION to a pre-selected percentage, when a RATE, SPEED, or an external ALARM condition occurs. For example, if the Alarm Output is set to 25 %, and an alarm condition occurs, the CONTROL POSITION display will be held at 25 %. The CONTROL POSITION will return to its previous automatic state if either one of the following conditions are met, 1) the alarm returns to a "safe condition", or 2) the operator presses the "RESET ALARM" key. An Alarm Output setting of 000.0 % disables the Alarm Output function. (Related to parameter 64).

29) Setpoint Type: - This parameter selects the function modes for the FC20's SET POINT. The selections available are Local, Remote, and % Remote.

Local: In this function mode the displayed SET POINT represents actual tons/hour, pounds/minute, etc. For example, if the units are set at Tons/Hour and a SET POINT of 250 is

displayed, the FC20 will continually adjust the CONTROL POSITION in order to maintain the RATE at 250 tons/hr. Note that the SET POINT (or %) display will automatically acquire the same decimal point setting as the Rate DP (Parameter 12) setting. The SETPOINT value is entered using the SETPOINT key.

Remote: In this function mode the local SET POINT will be disabled and only a SET POINT received remotely will be displayed in the SET POINT display. Note that either an analog or digital (serial) SETPOINT input signal can be selected. The displayed SETPOINT value will represent the actual RATE in tons/hour, pounds/minute, etc. When using the **analog** remote SET POINT, it must be initially scaled to the correct range and units. The digital (serial) remote SETPOINT does not requiring scaling. The following is an example of how to accomplish the analog setpoint scaling procedure:

If the units of measure is in Tons Per Hour (TPH) and the remote SET POINT is to be scaled to display a range of 0 to 150 TPH, complete the following:

1) Set the remote signal to its minimum value, i.e. 1 Vdc, 4 mA, etc.
2) Press the CONTROL SET-UP key to open the Control Set-Up Menu.
3) Press the SCROLL FORWARD key 5 times to locate the Setpoint Type Parameter and change it to read Setpoint Type: REMOTE.
4). Press the SCROLL FORWARD key 2 times to advance to the Setpoint Zero Parameter.
5) Adjust the Setpoint Zero value up until the SET POINT display indicates a number greater than zero. Then lower the Setpoint Zero until the display indicates 00000.
6) Set the remote signal to its full scale value, i.e. 5 Vdc, 20 mA, etc.
7) Press the SCROLL FORWARD key 1 time to advance to the Setpoint Span Parameter.
8) Adjust the Setpoint Span value until the SET POINT display reads 150.
9). Press the EXIT key (this action also automatically saves the new data).

Once the analog remote SET POINT signal is scaled, the SET POINT display will directly follow the remote signal and display the actual SET POINT in TPH. No additional Parameter set up is required for the digital (serial) mode of operation. Refer to Section 9 for additional information on serial communications.

% Remote: In this function mode the SET POINT will be **displayed** as a percentage (0-100%). This mode is mainly used when multiple materials must be blended based upon a remote master SET POINT. Note that either an analog or digital (serial) SETPOINT input signal can be selected. When using an **analog** remote SET POINT, it must initially be scaled to the correct units and range. The digital (serial) SET POINT does not requiring scaling. Refer to the previous paragraph for how to accomplish the analog SET POINT scaling procedure. No additional Parameter set up is required for the digital (serial) mode of operation. Refer to Section 6.06 for more information on ratio (master/slave) control and Section 9 for serial communications details.

30) Remote Set Pnt: Only active when Parameter 29 is set to Remote or % Remote, this Parameter selects the kind of remote SET POINT signal, analog or digital (serial), that will be received. When set to Analog, either a 0(4)-20 miliamps (mA) or 0(1)-5 Vdc signal can be received. If the signal is mA, install jumper J12. Refer to the "Remote DC input" paragraph in section 4.01 for further information on DC inputs. Selecting Digital (serial) will permit a remote SET POINT to be accepted at the FC20's serial port.

The following two parameters are used when scaling the remote SET POINT **analog** signal. Refer to the scaling example above.

31) Setpoint Zero: XXXXX - Active only when Parameter 29 is set to Remote or % Remote, this Parameter is used to zero the minimum value of the analog remote SET POINT. Refer to the example above for scaling analog SET POINTs.

32) Setpoint Span: XXXXX - Active only when Parameter 29 is set to Remote or % Remote, this Parameter is used to set the full scale value of the analog remote SET POINT. Refer to the example above for scaling analog SET POINTs.

33) Start Ctl Pos: - This Parameter works in conjunction with the following Parameter, Ctl Above Rate. These two Parameters are useful when the loading on the belt will be interrupted and, in normal operation, the CONTROL POSITION would go to the allowable maximum in an effort to attain the RATE dictated by the SET POINT. This Parameter sets the value the CONTROL POSITION will rise to when the RATE dips below the acceptable RATE. That default RATE is controlled by the Ctl Above Rate Parameter. To disable it set it to 0000.

34) Ctl Above Rate: - This Parameter works in conjunction with the preceding Parameter, Start Ctl Pos. These two Parameters are useful when the loading on the belt will be interrupted and, in normal operation, the CONTROL POSITION would go to the allowable maximum in an effort to attain the RATE dictated by the SET POINT. PID calculations are suspended when the RATE goes below this setting. At any point during automatic operation, if the actual RATE should fall below the RATE specified by this Parameter, the CONTROL POSITION will go to the setting determined by the Start Ctl Pos Parameter. The CONTROL POSITION will be maintained until the actual RATE exceeds this Parameter value. To disable it set it to 0000.

7.05 Input Output Menu Parameters

The Input Output Menu is used to set-up and calibrate the FC20's I/O capabilities. For example, relay outputs can be programmed to operate as HIGH and LOW alarms. Other applications might require remote reset capabilities or a PLC interface. This section lists all the I/O functions in the FC20 for remote interface, except for the serial port.

35) Simulation: - When in Simulation mode, the FC20 produces an artificial RATE, SPEED, and TOTAL. These values can be very useful when calibrating auxiliary equipment such as a chart recorder or a remote display. Note that the scales do **not** need to be connected for the Simulation mode to work. The selections are Simulation OFF or ON.

When ON, the Simulated values are:

SPEED = 376 feet per minute.
RATE = the value entered in the Sim Rate Parameter (Parameter #36 following).
TOTAL = the calculated and displayed value based on the Sim Rate (increments up).

When Simulation is set to ON, the pre-existing TOTAL value (display) is stored in memory and recalled and re-displayed when Simulation is set to Off.

36) Sim Rate: - Sets the simulated RATE used when the Simulation Parameter is set to ON.

37) Ctl mA Zero: - This Parameter sets the minimum current value for outputs A1+/- and A3+/-. Note that the Ctl mA Zero setting **does not** represent the actual current. The actual current value is determined by connecting a mili-ammeter to the physical output and reading the current value. Increasing the Ctl mA Zero setting will increase the output current and decreasing the setting will decrease the current output. For a 0 mA minimum setting, this Parameter should be set to 00.0. For a 4 mA minimum setting, this Parameter should be set to 04.0.

38) Ctl mA Span: - This Parameter sets the maximum current value of outputs A1+/- and A3+/-. Note that the Ctl mA Span setting **does not** represent the actual current. The actual current value is determined by connecting a mili-ammeter to the physical output and reading the current value. Increasing the Ctl mA Span setting will increase the output current and decreasing the setting will decrease the current output.

39) Rate Base mA: - Enter the RATE current loop output value desired at outputs A2+/- and A4+/- when the RATE equals zero. Remote auxiliary devices such as a chart recorder or display will typically use 4 mA to represent zero RATE. The default value is 4 ma.

40) Rate at 20 mA: - This Parameter sets the RATE that corresponds to a current output of 20 mA at terminals A2+/- and A4+/-. This RATE should be a minimum of 10% higher than the maximum RATE expected. If the actual RATE were to exceed this Parameter's value, the current output will remain at 20 mA. For example, if the maximum RATE is 200 tons/hr, enter 220 for this Parameter.

41) Rate mA LTrim: - This Parameter allows fine tuning of the Rate Base mA output Parameter (#39). A milliamp range ammeter will need to be connected to the output terminals (A2+/-, A4+/-) for this adjustment. Increase the number to increase the current and decrease the number to decrease the current.

42) Rate mA HTrim: - This Parameter allows fine tuning of the Rate at 20mA output Parameter (#40). A milliamp range ammeter will need to be connected to the output terminals for this adjustment. Increase the number to increase the current and decrease the number to decrease the current.

43) Rate mA Damp – Enter the damping factor for the RATE current loop if used. The damping factor smoothes the current signal. Like RATE and SPEED damping, current loop damping does not affect system accuracy. With high damping, however, the RATE current loop output signal will lag behind the actual RATE. A typical value for mA Damp is 30.

44) HFR Damp – Enter the damping factor for the **H**igh **F**requency **R**ate (HFR) output if used. The damping factor smoothes the HFR signal, but does not affect accuracy. With high damping, however, the HFR signal will lag behind the actual RATE. It is typical to set the HFR Damp setting the same as the Rate Damp setting (Section 7.03.13) .

45) RLY 1 Func - Relay 1 can perform five different functions. Select the function desired.

TPR - Total Pulse Repeater, relay 1 is activated in increments of the TOTAL.
HLRA - High/Low Rate Alarm, relay 1 is activated when the RATE is outside a specified range.
HLSA - High/Low Speed Alarm, relay 1 is activated when the SPEED is outside a specified range.
SPAN - Auto Span output, relay 1 is activated during an Auto Span to lower or raise the calibration weight(s).
RUN - Run output, relay 1 contact is activated when the CONTROL MODE is in Manual or Auto

Note: the following six relay Parameters only appear when its above associated relay function is selected.

TPR uses RLY 1 Pls and TS.
HLRA and HLSA use RLY 1 Low, High, and Delay.
HLRA also uses RLY 1 Set pnt.
SPAN does not use any other Parameter.

46) RLY 1 Pls - When TPR is selected, enter the duration of the relay pulse, in seconds, that drives the remote totalizer. The relay must be closed for at least 0.10 seconds, but the option exists for keeping it closed longer, as long as that does not conflict with the following RLY 1 TS Parameter (the relay cannot be closed longer than the time between pulses, because that would be the equivalent of a continuous on). Start with 0.10 seconds and increase the value if the remote totalizer does not respond to the shorter pulse.

47) RLY 1 TS - When TPR is selected, enter the frequency of the relay pulse or the "total scaling". For example, set RLY 1 TS to 1.00 to close the relay every 1 ton, or set it to 0.01 to close it every 0.01 tons. Note, however, that if RLY 1 TS is set too low and the RATE is too high, there will not be enough time to close and open the relay. It is best to set it so the relay closes once every few seconds.

48) RLY 1 Set pnt: - When HLRA is selected, it is necessary to select whether the RATE high and low alarm settings will use actual RATE values (tons/hr, etc) or use percent RATE values. If actual RATE is desired, select Direct, if percent RATE is desired, select Percent. The alarm set point values are entered using the following RLY 1 Low and RLY 1 High Parameters. For example, an alarm condition (relay 1 contact closure) will occur if RLY 1 Set pnt is set to Percent, RLY 1 Low and RLY 1 High are set to 10.00 (%), and the actual RATE deviates by more than 10% above or below the RATE alarm set points.

49) RLY 1 Low: - When HLRA is selected, enter the desired low RATE alarm value (00.00) (actual value or in percent, see RLY 1 Set pnt).

When HLSA is selected, enter the desired low SPEED alarm value (00.00).

50) RLY 1 High: - When HLRA is selected, enter the desired high RATE alarm value (00.00) (actual value or in percent, see RLY 1 Set pnt).

When HLSA is selected, enter the desired high SPEED alarm value (00.00).

51) RLY 1 Delay - When HLRA or HLSA are selected, enter the time delay, in seconds, that a high or low RATE or SPEED alarm condition can exist before the alarm relay activates. For example, setting the delay to 10 seconds will allow the rate to fall below RLY 1 Low for 10 seconds before the alarm is activated. The delay eliminates false or nuisance alarms when the RATE or SPEED momentarily go outside the preset boundaries.

52) RLY 1 Lgc – The relay's "normal" state can either be de-energized (N.O.) or energized (N.C.) state.

N.O. – Normally open or de-energized state.
N.C. – Normally closed or energized state.

53) RLY 2 Func - Relay 2 can perform four different functions. Select the function desired.

TPR - Total Pulse Repeater – relay 2 contact is closed in increments of the TOTAL.
HLRA - High/Low Rate Alarm – relay 2 contact is closed when the RATE is outside a specified range.
HLSA - High/Low Speed Alarm – relay 2 contact is closed when the SPEED is outside a specified range.
SPAN - Auto Span output – relay 2 contact is closed or opened during an Auto Span to lower or raise the calibration weight.

RUN - Run output, relay 2 contact is activated when the CONTROL MODE is in Manual or Auto.

Note: the following six relay Parameters only appear when its above associated relay function is selected.
TPR uses RLY 2 Pls and TS.
HLRA and HLSA use RLY 2 Low, High, and Delay.
HLRA also uses RLY 2 Set pnt.
SPAN does not use any other Parameter.

54) RLY 2 Pls - When TPR is selected, enter the duration of the relay pulse, in seconds, that drives the remote totalizer. The relay must be closed for at least 0.10 seconds, but the option is available for keeping it closed longer if it does not conflict with the following RLY 2 TS Parameter. Start with 0.10 seconds and then increase the value if the remote totalizer does not sense the shorter pulse. Note that the relay cannot be closed longer than the time between pulses, because the contact output will then be the equivalent of a continuous on.

55) RLY 2 TS – When TPR is selected, enter the frequency of the relay pulse or the "total scaling". For example, set RLY 2 TS to 1.00 to close the relay every 1 ton, or set it to 0.01 to close it every 0.01 tons. Note, however, that if RLY 2 TS is set too low and the RATE is too high, there will not be enough time to close and open the relay. It is best to set it so the relay closes once every few seconds.

56) RLY 2 Set pnt: - When HLRA is selected, it is necessary to select whether the RATE high and low alarm settings will use actual RATE values (tons/hr, etc) or use percent RATE values. If actual RATE is desired, select Direct, if percent RATE is desired, select Percent. The alarm set point values are entered using the following RLY 2 Low and RLY 2 High Parameters. For example, an alarm condition (relay 2 contact closure) will occur if RLY 2 Set pnt is set to Percent, RLY 2 Low and RLY 2 High are set to 10.00 (%), and the actual RATE deviates by more than 10% above or below the RATE alarm set points.

57) RLY 2 Low: - When HLRA is selected, enter the desired low RATE alarm value (00.00) (actual value or in percent, see RLY 2 Set pnt).

When HLSA is selected, enter the desired low SPEED alarm value (00.00).

58) RLY 2 High: - When HLRA is selected, enter the desired high RATE alarm value (00.00) (actual value or in percent, see RLY 2 Set pnt).

When HLSA is selected, enter the desired high SPEED alarm value (00.00).

59) RLY 2 Delay - When HLRA or HLSA are selected, enter the time delay, in seconds, that a high or low RATE or SPEED alarm condition can exist before the alarm relay closes. For example, setting the delay to 10 seconds will allow the rate to fall below RLY 2 Low for 10 seconds before the alarm is activated. The delay eliminates false or nuisance alarms when the RATE or SPEED momentarily go outside the preset boundaries.

60) RLY 2 Lgc – The relay's "normal" state can either be de-energized (N.O.) or energized (N.C.) state.

N.O. – Normally open or de-energized state.
N.C. – Normally closed or energized state.

61) RLY 3 Func: - This is a run interlock relay and is not programmable. It is used as a dedicated run interlock relay for the conveyor or pre-feeding equipment.

62) RLY 3 Lgc – The relay's "normal" state can either be de-energized (N.O.) or energized (N.C.) state.

N.O. – Normally open or de-energized state.
N.C. – Normally closed or energized state.

63) T1 func: - This Parameter selects the function of the terminal T1 (DI2) input. The selections are: Reset Total and Reset Alarm. If Reset Total is selected, this input can be used to remotely reset the TOTAL display. If Reset Alarm is selected, then T1 can be used to remotely reset the alarm conditions, (RATE or SPEED high/low alarms or external alarms). When terminal T1 (DI2) is momentarily connected to terminal 10 (CM), the programmed function will be activated.

64) T3 func: - This Parameter selects the function of the terminal T3 (DI1) input when the system is in AUTO mode. The selections are: **Auto Enable, Run Enable,** and **Ext Alarm**. Note that jumper J23 on the PCB must be removed in order to remotely control the process using this input. (J23 is located at bottom-center on the MP400 PCB). The external control must be a non-powered (dry) contact.

When **Auto Enable** is selected, the T3 input can be used to remotely disable the control loop by disconnecting it from terminal 10 (CM). In effect, the system is put in manual mode where the feed RATE is no longer controlled by the PID function. Instead, the CONTROL POSITION will remain static at its last setting until T3 (DI1) and 10 (CM) are reconnected. While the input is open the message "AUTO ENABLE OPEN" appears.

When **Run Enable** is selected, disconnecting T3 (DI1) from terminal 10 (CM) will cause a complete shut down of the material feed and the RATE control (PID). Note that run RLY 3 must be wired to the material feed equipment in order to shut it down. While the input is open the message "RUN ENABLE OPEN" appears in the MODE window. When the terminals are reconnected the system will revert back to AUTO run mode.

When **Ext Alarm** is selected, connecting terminal T3 (DI1) to terminal 10 (CM) will cause the FC20 to go into an alarm condition where the CONTROL POSITION will revert to the value previously entered into the Alarm Output XXX.X % Parameter (Parameter 28). While the input is closed, the message "EXTERNAL ALARM" appears in the Mode window.

65) T3 delay: xx – This Parameter provides a delay in seconds (00 to 99), before the selection in the T3 func Parameter is performed. For example, T3 is selected to be Ext Alarm, and the time delay is set to 10. When terminals T3 (DI1) and 10 (CM) are **connected**, the FC20 will perform the Ext Alarm function after a period of 10 seconds has elapsed.

7.06 Tuning Menu Parameters

The Tuning Menu is used to configure the FC20 in order to maintain the selected SET POINT. Normally the FC20 is set to Automatic tuning. Selection of this function will delegate the "fine tuning" of the PID parameters to the FC20, which will accomplish that task using internally performed calculations.

The FC20 incorporates PID algorithms (calculations) to accomplish RATE control. PID represents **P**roportional/**I**ntegral/**D**erivative. These are mathematical concepts that are used to calculate a new output, as required, to achieve and maintain the SET POINT. **P**roportional, makes its contribution by calculating the percent error between RATE and SET POINT. It then adjusts the control output by this same percent error. In some cases, the proportional contribution might not be able to make extremely small adjustments, thus creating offset. **I**ntegral is used to correct these small errors when the RATE is near the SET POINT. Integral uses a "sum error" calculation and continuously adds to or subtracts from the control output until SET POINT is achieved. **D**erivative only responds to how quickly errors are being produced. If a sharp RATE change is detected, Derivative will give a "kick" to the control output. Slow changes in error are basically ignored by the Derivative function.

Using the results of these continuous PID calculations, the FC20's CONTROL POSITION output is adjusted up or down when a "deviation" or "error" is determined to exist between the SET POINT and the RATE. A FC20 output can also control the pre-feeder or conveyor belt speed, and thereby the RATE.

66) Tuning 1: - This Parameter selects the tuning mode of the PID control. The selections are: Automatic and Manual. When set to Automatic, the Proportional, Integral, and Derivative Parameters do not require adjustments, since the FC20 is capable of performing the PID tuning itself, based upon internal pre-determined data suitable for most installations. When set to Manual, PID tuning can be done manually using the PID values listed below. It is recommended that Automatic Tuning be tried first, if the results are not satisfactory, then manual adjustments might be required. The intent of this approach is to provide the most appropriate control output response for the application.

67) Tuning 2: A second Control Position output is available for special applications. It follows Tuning 1.

68) Proportional: X.XXXX This Parameter is adjustable from 0.0000 to 2.0000, with the default being 1.0000. The Proportional Parameter setting determines the amount of error percentage to be applied to the CONTROL POSITION output. Increasing this setting will increase the amount of error percentage applied based upon the percentage of error. If it is set to high, the Rate might tend to continuously overshoot SET POINT, above and below. If set to low, the controller will take too long to achieve SET POINT. Some amount of "trial and error" will be required to satisfy this Parameter.

69) Integral: X.XXXX This Parameter is adjustable from 0.0000 to 2.0000, with the default being 0.1000. The Integral Parameter is used to correct offset conditions caused by the Proportional Parameter of the controller. The Proportional contribution to the control output alone will never satisfy SET POINT, as there will always be some "error" between the SET POINT and the actual RATE. The Integral Parameter corrects this condition. The Integral Parameter sums errors between the SET POINT and RATE over time and then applies it to the CONTROL POSITION output. Increasing the Integral setting will increase the amount of time it takes to correct any errors that Proportional cannot eliminate. Decreasing the setting will decrease the time duration. Note that if it is set to low, oscillations might occur. Some amount of "trial and error" will be required to satisfy this Parameter.

70) Derivative: X.XXXX This Parameter is adjustable from 0.0000 to 1.0000, with the default being 0.0050. The Derivative Parameter provides its contribution by responding only to the rate of change in errors. A rapid change in error between SET POINT and RATE yields high contributions from the Derivative Parameter. As the rate of change of error decreases, the Derivative contribution will drop off to zero. Increasing the Derivative setting will increase its contribution to the CONTROL POSITION output. Some amount of "trial and error" will be required to satisfy this Parameter.

7.07 Serial Port Menu Parameters (ref. Section 9)

71) Station ID – When using the FC20's serial communications features with multiple scales, each scale must have a unique Station ID (or address). Station ID's are designated A to P. Select a different station ID from A to P for each scale. Normally the FC20 is Station A.

72) Parity - When using the serial communication features on the FC20, select the same parity as the remotely connected communications device. The selections are None, Odd, or Even.

73) Baud Rate – When using the FC20's serial communications features, select the same Baud Rate as the remotely connected communications device. The selections are: 300, 600, 1200, 2400, 4800, 9600, or 19200.

74) Command Menu – The FC20 can send data to a remote device via the serial port, either automatically (every $1/10^{th}$ second) or upon request (manually). If it's to be done automatically, the desired data must be pre-selected using the Command Menu listed in Section 9.02 (Commands 01 through 22).

If a remote device will request that data be sent, the Command Menu must be set to 00 (manual). Refer to Section 9.03 for details on how to remotely request data from the FC20.

75) Protocol Menu – When making a remote request for data from the FC20 via the serial port, there are two different **Tecweigh** Protocols that can be used. The selections are Tec Std and Tec Old. Tec Std provides more secure communications, and Tec Old provides historical commands for older processors. New users should use Tec Std, and older existing installations should use Tec Old. The request for data formats are the same for either protocol. Refer to Section 9.04 for further details.

Field-bus Protocol Cards

The following four commands will only appear in the Parameter table if there is a field-bus protocol card installed in the Anybus header located next to the MP400 display board ribbon cable header. These individual and separately installed cards allow communications using the Modbus, Profibus, Ethernet, DeviceNet, or A-B Remote I/O communications protocols.

76) Data Fmt – The numerical information within the field-bus protocol card will always be 32 bits of data, but is selectable between integer and floating point. The selections are:

Long – 32 bit long integer.
Float – 32 bit floating point.

77) IPAdd – Used for the field-bus interface card for identifying the processor's IP address.

78) NMask – Used for the field-bus interface card for identifying the processor's IP mask if utilized.

79) RIO Rack – Used for the A-B Remote I/O field-bus interface card for identifying the processor's memory utilization. (Presently not supported).

7.08 Set Point Menu Parameters

80) Setpoint: - This Parameter sets the material feed RATE desired for the system. Pressing the SET POINT (or %) key on the FC20 will open the Setpoint Menu in the MODE window. The SET POINT (or %) **display** will automatically be updated when changes are made to the Setpoint Parameter. Note that the SET POINT (or %) display will automatically acquire the same decimal point setting as the Rate DP (Parameter 12) setting. There are three possible Setpoint Parameter displays in the MODE window.

When Setpoint Type (Parameter 29) is set to Local, the desired Set Point can be entered into the Setpoint Parameter (Parameter 76).

When Setpoint Type (Parameter 29) is set to Remote, Setpoint (Parameter 76) will display "sp from remote" in the MODE window.

When Setpoint Type (Parameter 29) is set to %Remote, Setpoint (Parameter 76) will display %Setpoint in the MODE window.

7.09 Security Menu Parameters

81) Lock Auto Zero: - Select YES to protect the AUTO ZERO key from unauthorized use.

82) Lock Auto Span: - Select YES to protect the AUTO SPAN key from unauthorized use.

83) Lock Reset: - Select YES to protect the RESET key from unauthorized use.

84) Lock Rate Cntl: - Select YES to protect the three CONTROL MODE keys (OFF, MANUAL, AUTO), from unauthorized use.

85) Lock Set Point: - Select YES to protect the SET POINT key from unauthorized use.

86) Lock Code – A Lock Code can be entered to prevent unauthorized personnel from entering any of the Parameter Menus. This feature, combined with the key locks above, give a high level of security to the FC20. When a Lock Code is entered, an ENTER LOCK CODE message appears in the MODE window, presenting an opportunity to enter the code. Once the Parameter menu has been accessed, all the menus can be entered without re-entering the code until the EXIT key is pressed. 00000 disables the Lock Code, which is also the default setting, and no buttons are then locked out

87) Parameters – The four following Parameter selections allow the user's Parameter Table to be saved to and retrieved from memory, thereby allowing its restoration if it is inadvertently erased or corrupted due to a battery failure or an electrical spike. It also allows the retrieval of the default Parameter Table when necessary.

No Change - when selected, nothing will change.

Store Now - when selected, all the user's Parameters will be saved to flash memory along with the last calibration data. This needs to be done whenever there is a change to any Parameter or calibration. Upon exiting the Program Mode, the MODE window will display PARAMETERS SAVED.

Defaults - before proceeding refer to Section 10.08 for a detailed discussion of the defaulting procedure.

Get Users - when selected, all the user's parameter values that were previously entered will be retrieved. Upon exiting Program Mode, the MODE window will display MEMORY RESTORED.

It is highly recommended that once the system is calibrated and working properly and as desired, the user's Parameter Table be immediately saved to memory using the Store Now Parameter.

Note: if it's not possible to enter any Parameter, it usually means that the firmware has been corrupted and needs to be returned to **Tecweigh** to be "reflashed". Contact **Tecweigh** Service (Section 2.01) for assistance.

CHAPTER 8 - CALIBRATION

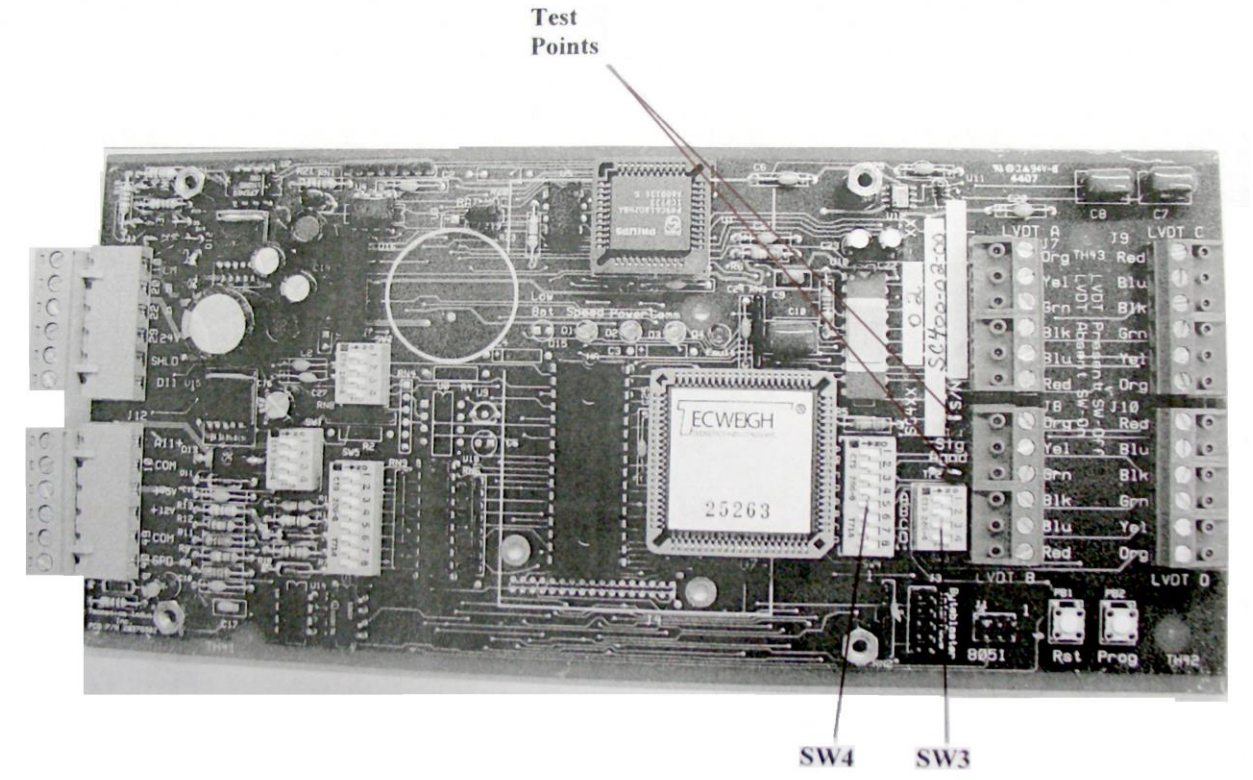
8.01 Apply Power to the System

Assuming that all the entered Parameters are correct and all the equipment is installed properly, the scale must now be calibrated. Without calibration, the scale will only approximate the RATE. First, however, on scales with LVDT(s) (**L**inear **V**oltage **D**ifferential **T**ransformer), a procedure needs to be performed to verify that the LVDTs are in alignment. Use the following section to verify (and re-align if necessary) the LVDT alignment.

Now turn on the conveyor, power up the FC20, make sure the belt is clean, and let the entire system run for at least half an hour (longer in colder environments) so it attains temperature stability. If the FC20 displays a "Scale Data Error", there's a communications problem between the scale (signal conditioner) and the FC20. This problem must be corrected before continuing. Consult Section 10.07, "scale data error", for troubleshooting tips.

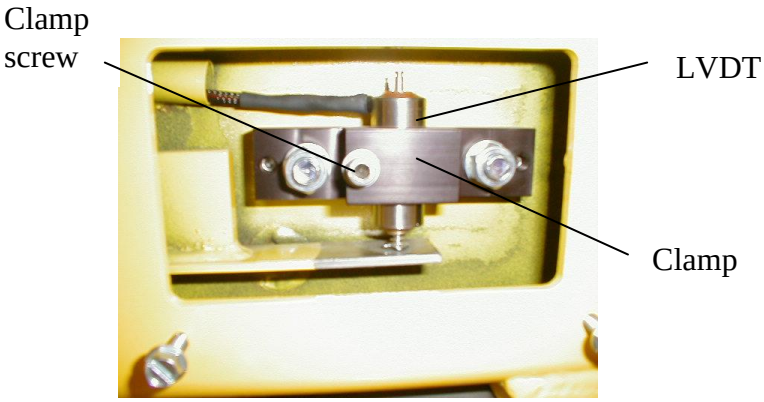
8.02 LVDT Alignment for Scales with a SC400 Signal Conditioner (WY10, WY10HD, WY20 scales Only)

The WY10 and WY10HD have two LVDTs, while the WY20 has four LVDTs. Alignment of the LVDTs is critical for scale accuracy. The LVDTs were aligned at the factory, but it must be verified that they are still in alignment after shipping and installation. Turn the belt off, leave the MS20 on and remove both side covers from the scale. On the SC400 PCB, DIP switches SW3 and SW4 are used in the alignment procedure (see the figure below). First verify that SW3 and SW4 are set to the positions shown on the first or second lines in the following chart depending on the particular scale at hand. Next, to verify proper alignment, connect a DC voltmeter across the test points (again see the figure). If the voltage is 2.50 +/- 0.02 VDC, the LVDTs are sufficiently aligned and move on to the next section, however, if the voltage is outside the stated range, continue as follows.



The LVDTs are aligned one at a time. The goal is to attain 2.50 +/- 0.02 VDC across the test points for each LVDT. First, set SW3 and SW4 to the positions shown in the chart at line three, "Aligning LVDT "A" Only". Next, loosen the clamp screw slightly (see the following figure) to loosen the LVDT and slide the LVDT up or down until the voltmeter reading is 2.50 +/- 0.02 VDC. DO NOT POUND ON THE LVDT! Now do the same procedure for LVDT B (and then C and D for a WY20 scale). After the alignment is complete, the switches should be reset back to line one or two in the chart depending on the scale at hand.

SW3 and SW4, LVDT Selection and Alignment Switches												
	SW3				SW4							
	Pos 1	Pos 2	Pos 3	Pos 4	Pos 1	Pos 2	Pos 3	Pos 4	Pos 5	Pos 6	Pos 7	Pos 8
LVDT "A" and "B", WY10, WY10HD	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON
LVDT "A" "B" "C" and "D", WY20	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Aligning LVDT "A" Only	OFF	ON	ON	ON	OFF	ON	ON	ON	OFF	ON	ON	ON
Aligning LVDT "B" Only	ON	OFF	ON	ON	ON	OFF	ON	ON	ON	OFF	ON	ON
Aligning LVDT "C" Only	ON	ON	OFF	ON	ON	ON	OFF	ON	ON	ON	OFF	ON
Aligning LVDT "D" Only	ON	ON	ON	OFF	ON	ON	ON	OFF	ON	ON	ON	OFF



8.03 Scale Calibration

Assuming all entered Parameters are correct, the scale is installed properly, and scales with LVDTs are in alignment, the scale can now be calibrated. Without calibration, the scale will only approximate the RATE. Also assure that the belt is empty and clean. **Note that an AUTO ZERO must always be done before an AUTO SPAN.**

8.03.1 Auto Zero

AUTO ZERO is the first calibration step to perform. This is defined as the FC20 displaying zero RATE when the belt is empty. With the conveyor running, press and hold the AUTO ZERO button for five seconds. First the message "HOLD TO ZERO" appears in the MODE window then the message "AUTO ZERO WAIT". The FC20 will now do an AUTO ZERO for as many belt revolutions as are specified in the Zero Revs Parameter (Section 7.03.10). A proper AUTO ZERO should take a minimum of two minutes to complete, because the FC20 must "learn" what an empty belt and zero-RATE "feels like". When finished, the MODE window should revert back to Units of Measure (typically Tons/Hour), and the RATE should go to zero and remain there. An AUTO ZERO can be cancelled at any time by pressing EXIT. If the message "AUTO ZERO ERROR" appears during an AUTO ZERO, refer to Section 10 for troubleshooting tips. Note that the RATE might wander above and below zero to some extent. After calibration is complete, refer to Section 7.03.8 for AZT settings to eliminate the "zero bounce".

8.03.2 Auto Span

AUTO SPAN is the next calibration step to perform. This procedure calibrates the scale using a known weight, so the FC20 can accurately determine the material weight as it passes over the weigh idler. With the conveyor running, press and hold the AUTO SPAN button for five seconds. First the message "HOLD TO SPAN" appears in the MODE window then the message "LOWER CAL WEIGHT". At this time lower the calibration weight(s). The AUTO SPAN procedure will begin when the calibration weight is sensed by the FC20. See Section 7.03.23 for information on the Span Detect Parameter. The display in the MODE window should then change to "AUTO SPAN WAIT". A proper AUTO SPAN should take a minimum of two minutes to complete. If, after lowering the cal weight(s), the "AUTO SPAN WAIT" message does not appear, press and hold the AUTO SPAN button again for a few seconds. This action will override the previous attempt and manually start the AUTO SPAN.

When the AUTO SPAN is complete, the message "RAISE CAL WEIGHT" will appear. **Before raising the cal weight(s) allow the RATE settle to a steady value.** When the cal weight(s) are then raised, the RATE display should return to ZERO and the calibration is complete. Totalizing will not resume until the calibration weight is raised. An AUTO SPAN can be cancelled at any time by pressing EXIT.

Note 1: An AUTO ZERO can be performed without doing another AUTO SPAN, so as to re-zero the belt due to zero drift. Zero drift can be caused by material build-up, variation of belt tension, or changes in the environment surrounding the scale.

Note 2: If the AUTO SPAN had to be started manually, the Span Detect Parameter (Section 7.03.23) needs to be changed so the next AUTO SPAN request proceeds to completion. Change this Parameter **after** the calibration procedure has been completed. To determine the new Span Detect value, subtract the Zero Count (Section 7.03.21) from the Span Count (Section 7.03.22), and calculate 70% (multiply by 0.7) of the difference and enter it as the new Span Detect value.

The scale calibration is now complete. The scale must now be checked for accuracy. The following calculation **value** (or very close to it) is what you should see in the RATE window:

$$\frac{(?) \quad (?) \quad \text{(total of one or both cal weights)}}{\textbf{Cal Factor x Belt Speed x Cal Weight}} = \textbf{Rate (tons/hr.)}$$

Weigh Span

(refer to the Parameter Table (Sec. 12.02) for known field data).

To verify the scale's repeatability, lower the cal weight(s) to see if the scale returns to the RATE value that was displayed after performing the AUTO SPAN. Repeating this procedure several times will assure that the scale is performing properly.

8.03.3 The Material (Pre/Post) Test

To attain a more precise scale measurement, a material (or pre/post) test must be performed as follows:

Make sure the calibration weight is raised. While in RUN Mode, press and hold the RESET TOTAL key for five seconds to clear the TOTAL display. Weigh and record an empty truck or container on a certified scale and then run a load of material into it using the conveyor. Try to run at a typical running rate and do not perform this test in the rain as the water weight will add to the material weight. The total load size should be about 10% of the normal running rate. Example: normal RATE = 450 TPH, test load = 45 tons.

Now weigh the full truck or container and subtract the empty container weight leaving only the material weight. In Program Mode go to the P/P Wt Parameter (Section 7.03.7) and enter the test material weight. When Program Mode is exited, the FC20 will automatically compare the material test total to the total that it calculated and then modify the ASC Parameter (Section 7.03.19) accordingly. P/P Wt is automatically set to zero after the test is done.

The calculation is:

(Post) Actual Weight/(Pre) FC20 Scale Weight x ASC = New ASC.

If, after the material test, it is shown that the FC20 displayed RATE is not exactly correct, manually adjust the ASC Parameter up or down to compensate. Also, if an alternate method of calibration such as a calibration chain is being used, simply adjust the ASC parameter until the displayed RATE is correct.

Now that the system has been fully calibrated, it is important to save all the acquired information to the non-volatile RAM in the microprocessor. To do this, simply go to the Params Parameter (Section 7.03.83), select STORE NOW, and then exit the Parameter Table. Upon exiting, the Mode window will display "PARAMS SAVED". Every time a Parameter is changed or the scale is re-AUTO ZEROed, this same procedure must be done again to save a fresh copy of the Parameter Table and calibration information.

8.04 Running the System

Now the system is ready to run. With the calibration weight(s) up, the RATE should read zero. Reset the TOTAL display by pressing and holding the RESET TOTAL key for five seconds. Begin running material on the belt. The RATE should increase and the TOTAL should begin to increment. Press the DISPLAY key momentarily to toggle between the RATE units of measure and the present belt SPEED. Turn the belt off and the ZERO BELT SPEED message should appear. Resume running material and the ZERO BELT SPEED message should disappear and the RATE units or SPEED display should reappear. Press the SELECT key to display the firmware version.

Refer to Section 10.01 for the definitions of any messages that appear in the MODE window. If the system is determined to be running properly, auxiliary equipment such as a recorder can now be added. Consult Section 4 for wiring information. Refer to Section 7.03 for configuration information to enable the FC20 to interface with auxiliary equipment. Consult Section 9 for complete instructions on using the Serial Communication features.

CHAPTER 9 – SERIAL COMMUNICATIONS

9.01 Overview

The FC20's RS232C and RS485 serial communications interfaces allow remote computers and PLC's to access RATE, TOTAL, SPEED, and Status data, in addition to requesting basic calibration functions. The FC20 can be configured to send data either automatically (every 1/10 second fixed) or upon request (manually). If sending data automatically, only one unit can be used per serial link. The automatic mode is commonly used for sending Rate and/or Total to display devices. When requesting data manually, 16 units can be multi-dropped on one serial link and each unit is identified using capital letters A to P. The characters used are ASCII. Wire the serial communications per Section 4. Configure the Parameters per Section 7.03.71-75.

Note: When setting up serial communications the message "FRAMING ERROR" might appear in the MODE window. This indicates that a Parameter setting is incorrect. Assure that all serial communications related Parameters are correct for the system -- Station ID, Parity, Baud Rate, Command Menu, and Protocol (See Sections 7.03.71-75).
Important: The plant remote equipment must also be operating with the exact same serial communications settings (mutually compatible) for the system to operate properly.

9.02 Automatic Transmission

When a Command Menu Parameter (selected from the following table) other than 00 is entered into the FC20, it will send the selected data automatically every 1/10 second. For example, if the Command Menu is set to 04, the FC20 will transmit the RATE and TOTAL every 1/10 second.

Command Menu	Data Transmitted
00	(Used for manual data transmission only, see section 9.03)
01	RATE
02	TOTAL
03	SPEED
04	RATE, TOTAL
05	RATE, SPEED
06	Average RATE
07	Average SPEED
08	Average RATE, TOTAL
09	Average RATE, Average SPEED
10	Status
11	RATE, Status
12	TOTAL, Status
13	SPEED, Status
14	RATE, Status, TOTAL
15	RATE, Status, SPEED
16	Average RATE, Status
17	Average SPEED, Status
18	Average RATE, Status, TOTAL
19	Average RATE, Status, Average SPEED
20	Transmits RATE in SETPOINT format: [Station ID][Ctrl S][Rate][CR]
21	Transmits SETPOINT (not in setpoint format)
22	Transmits SETPOINT in SETPOINT format: [Station ID][Ctrl S][Setpoint][CR]

Data sent from the FC20 in automatic (or manual) modes will be in the following format:

[Station ID] [Data Value(s)] [Carriage Return]

The station ID is a single ASCII character from A to P specifying the unit address.

When Status is sent, it is a single ASCII character defined as follows:

P	Positive RATE (normal operation, positive RATE)
N	Negative RATE
Z	AUTO ZERO in progress
T	Auto Tracking in progress
S	AUTO SPAN in progress
A	Alarm condition
E	Weigh processor error (SCALE DATA ERROR, etc.)
L	Low Battery

Example 1: Station K has a RATE of 450 and the Command Menu parameter is 01 (RATE):

[Station ID] [RATE] [Carriage Return]

K (one character) 0450 (four characters) ^M (one character)

Example 2: Station C has a SPEED of 375 and the Command Menu parameter is 03 (SPEED):

[Station ID] [SPEED] [Carriage Return]

C (one character) 0375(four characters) ^M (one character)

Example 3: Station A has a RATE of 103.8, the TOTAL is 399.75, and the Command Menu parameter is 14 (RATE, Status, TOTAL):

[Station ID] [RATE Status TOTAL]
A (one character) 1038 (four characters) P (one character) 00039975 (eight characters)

[Carriage Return]

^M (one character)

9.03 Manual Transmission

If the Command Menu Parameter is set to 00 in the FC20, it will only send data after a request is made from an external device. The same data is available and is returned in the same format using ASCII characters as outlined in the above section for Automatic Transmission. The data request must be sent in the format ([Station ID] [Command parameter] [Carriage Return]) and as defined below:

[Station ID] A to P (one character)
[Command parameter] (from the list in sec. 9.2, (01 to 19) (two characters)
[Carriage Return] ^M (one character)

Example: A request for RATE and TOTAL is sent to Station A:

[Station ID] [Rate, Total] [Carriage Return]

A (one character) 04 (two characters) ^M (one character)

Note that the FC20 has a 16 command input buffer.

9.04 Tecweigh Protocol

There are two different approaches that serial users can employ for the following Remote Rate Control Command Section (9.05) and Remote Calibration Section (9.06).

The Protocol Parameter (Section 7.07.71) permits two selections, they are TEC STD and TEC OLD. The differences between these two styles, detailed in section 9.05 and 9.06 following, gives the user more secure communications when set to TEC STD, and historical commands when set to TEC OLD. Users with existing installations should use the TEC OLD version to avoid programming changes, and new installations should use the new TEC STD version for a higher level of security to prevent false commands from being accepted by the FC20.

9.05 Remote Rate Control Commands (see preceding section 9.04)

There are three commands that can be sent to the FC20 for Rate Control. Note that no data is returned after the commands are sent. The characters are ASCII. Use the following format to send the FC20 Rate Control commands: [Station ID] [Command] [Carriage Return]

TEC STD

Command	Action
=O	Sets the Rate Control Mode to Off
=M	Sets the Rate Control Mode to Manual
=A	Sets the Rate Control Mode to Auto

Example: To set the Rate Control Mode to Manual at Station G, send the following commands:

[Station ID]	[Command]	[Carriage Return]
G (one character)	=M (two characters)	^M (one character)

TEC OLD

Command	Action
34	Sets the Rate Control Mode to Off
35	Sets the Rate Control Mode to Manual
36	Sets the Rate Control Mode to Auto

Example: To set the Rate Control Mode to Manual at Station G, send the following commands:

[Station ID]	[Command]	[Carriage Return]
G (one character)	35 (two characters)	^M (one character)

The SET POINT can also be remotely sent to the FC20 by sending the command in the following format: [Station ID] [Ctrl-S] [Set Point] [Carriage Return]. The transmitted SET POINT data must include all 4 digits.

Example: To send a SET POINT of 25.0 to Station N, where the SET POINT display is indicating a decimal point of XXX.X, send the following command:

[Station ID]	[Control]	[Command]	[Carriage Return]
G (one character)	^S	0250 (four characters)	^M (one character)

9.06 Remote Calibration Commands (see preceding section 9.04)

There are four commands that can be sent to the FC20 for Remote Calibration. Note that no data is returned after calibration commands are sent. The characters are ASCII. Use the following format to send the FC20 Remote Calibration commands: [Station ID] [Command] [Carriage Return].

TEC STD

Command	Action
=R	Resets the TOTAL display
=Z	Starts an AUTO ZERO Cycle
=S	Starts an AUTO SPAN Cycle
=C	Cancels an AUTO ZERO or AUTO SPAN Cycle

Example: To start an AUTO SPAN cycle at Station G, send the following command:

[Station ID]	[Command]	[Carriage Return]
G (one character)	=S (two characters)	^M (one character)

TEC OLD

Command	Action
30	Resets the TOTAL display
31	Starts an AUTO ZERO Cycle
32	Starts an AUTO SPAN Cycle
33	Cancels an AUTO or AUTO SPAN Cycle

Example: To start an AUTO SPAN cycle at Station G, send the following command:

[Station ID]	[Command]	[Carriage Return]
G (one character)	32 (two characters)	^M (one character)

Be careful not to send serial commands when there is someone working at that station. Serial Communications should only be done after the station is completely set up, calibrated, and in Run Mode. Sending commands while in Program Mode could cause conflicts and corrupt data. The FC20 ignores commands that it does not recognize and only detects and acknowledges a framing error.

CHAPTER 10 – TROUBLESHOOTING

10.01 Status Messages

Every time the MS20 is powered up it immediately performs two functions.

The first function is a scan to determine if an optional plug-in field-bus communications interface card is installed. The following message will be displayed:

"SCANNING FOR BUSCARD"

The second function is a test of the RAM and flash memory "chips". The word "chip" is a commonly used substitute word for **I**ntegrated **C**ircuit (IC). RAM stands for **R**andom **A**ccess **M**emory, which is a type of memory that will loose its information when unpowered. Flash memory is a type of memory that will retain its information when unpowered. These tests are performed to assure that no information has been "scrambled", lost, or corrupted. When these tests are complete, one of the following messages will appear in the MODE window:

"SELF TEST – RAM PASS"	The memory is OK. No changes have occurred.
"RAM BAD, FLASH RESTORE"	The RAM memory is corrupt. The FC20 has restored the Parameter Table from flash memory**.**
"RAM/FLASH BAD, DEFAULTS"	Both the RAM and flash memory are corrupt. The FC20 has restored the Parameter Table from the default memory. (User determined Parameters will need to be re-entered. Refer to per Sections 7 and 12).

The MODE window can display many different messages that either indicate a potential problem or convey status information. Some of them have already been discussed as needed throughout this manual. The following discussion expands on some of those messages and also includes messages that have not yet been discussed. The following discussion assumes that how to navigate through the menus and KEYPAD use is understood. Refer to Section 5 if not.

"AUTO ZERO ERROR"

or

"AUTO SPAN ERROR"

These messages indicate an abnormal condition during calibration. Press the EXIT key to clear the message and then perform another AUTO ZERO. After an AUTO ZERO has been successful, do another AUTO SPAN.

Possible causes of the message:

- Rocks (or material) were jammed under the weigh idler.
- The cal weight was lowered for an AUTO ZERO, when it should have been raised.
- The cal weight was raised for an AUTO SPAN, when it should have been lowered.
- The conveyor had material running on it during calibration.
- The load cell(s) or LVDT(s) are damaged.
- The belt skirting was touching the weigh idler or the belt near the scale.
- The Parameters for Weigh Span, Cal Weight, etc. are incorrect.
- The Load Count Parameter does not increase when the calibration weight is lowered.

Additional explanations:

An AUTO ZERO must be done before an AUTO SPAN! If the Load Count Parameter (Section 7.03.20) does not meet the given criteria, then the load cell(s) or LVDT(s) might be damaged, or there might be a problem with the signal conditioner. Refer to Sections 10.5 or 10.6 for load cell or LVDT testing and replacement. Also note that if an AUTO ZERO or AUTO SPAN is started and the belt is stopped, the belt will not complete the required number of belt revolutions.

"AUTO ZERO (WAIT)"

or

"AUTO SPAN (WAIT)"

These messages indicate that an AUTO ZERO or AUTO SPAN calibration is in progress. An AUTO ZERO or AUTO SPAN can be initiated manually, remotely through the serial port, or automatically by the AZT Parameter (Section 7.03.8). It will perform according to the Zero Revs Parameter (Section 7.03.10) and Span Revs Parameter (Section 7.03.11). The respective message will remain viewable until the corresponding cycle is completed or until the EXIT KEY is pressed.

"FRAMING ERROR"

This message indicates an incorrect serial communications Parameter setting when using the serial communications function. Assure that all serial communications related Parameters are correct for the system -- Station ID, Parity, Baud Rate, Command Menu, and Protocol (Sections 6.02.41-45). **Important: The plant remote equipment must also be operating with the exact same serial communications settings (mutually compatible) for the system to operate properly**

"INTERLOCK OPEN"

Terminals 3 (DI1) and 10 (CM) (Section 7.5.61) must be electrically connected (closed) for normal FC20 operation. This is easily accomplished by installing a jumper on the pins at J23, which is located at the bottom center of the PCB. It can also be accomplished by installing a jumper wire across terminals T3 & 10. If the interlock is not shorted the RATE, TOTAL, and all outputs are disabled. Verify that there is a jumper on J23 and also check the dedicated field wiring diagram (normally at the end of the manual) to determine if remote equipment is controlling the interlock circuit.

"LOAD ERROR"

<u>WY15 and WY25 scales</u>:

For the WY15 (1 load cell) and the WY25 (2 load cells) scales, this message indicates either a faulty load cell signal or the weight on the load cell(s) exceeds their capacity. Check the Load Count Parameter (Section 7.03.20) to make sure the load counts increase when the calibration weight is lowered. Other possible causes of this message are:

- The load cell(s) are installed with the arrow pointing up rather than down.
- A load cell is incorrectly wired to the terminals. Refer to the load cell wire color code.
- A load cell wire(s) is damaged or broken.
- A loose terminal strip(s) or terminal screw(s).
- A load cell is physically damaged.
- A load cell has been overstressed and permanently damaged.
- Material is jammed near the load cell.

Refer to Section 10.05 for load cell testing and replacement if necessary. See Section 4.03 for wiring.

WY10 and WY20 scales:
For the WY10 (1 LVDT) and the WY20 (2 LVDTs) scales, this message indicates a faulty LVDT signal. Check the Load Count parameter (Section 7.03.20) to make sure the load counts increase when the calibration weight is lowered.

Other possible causes of this message are:

- A LVDT is incorrectly wired to the terminals. Refer to the LVDT wire color code.
- A LVDT wire(s) is damaged or broken.
- A loose terminal strip(s) or terminal screw(s).
- A LVDT(s) is not properly aligned (Section 8.02).
- A LVDT spring(s) is broken or off center
- A LVDT(s) center plunger is stuck
- A LVDT(s) has a pit in the surface of the deflection arm.

Refer to Section 10.06 for LVDT testing and replacement if necessary. See Section 4.04 for wiring.

"LOW POWER"

This message indicates insufficient power to the signal conditioner. Possible causes of the message are:

- **AC** power to the FC20 is less than 100 VAC on the **AC** power version.
- **DC** power to the FC20 is less than 9 VDC on the **DC** power version.
- The FC20 (AC power version) is not producing +30 VDC across terminals 10 and 29.
- The FC20 (DC power version) is not producing +28 VDC across terminals 10 and 29.
- The power/signal cable between the FC20 and the SC is longer than 4000 feet.
- Attached devices, such as a chart recorder, are drawing more than 1 amp total.
- There is a break or short in the cable between the MS20 and the.

Refer to Sections 10.02 and 10.03 for more comprehensive electrical troubleshooting.

"SCALE DATA ERROR"

This message indicates a communications problem between the FC20 and the scale (signal conditioner (SC)).

Possible causes of the message are:

- Terminals 20 and 22 are wired backwards (reverse wired).
- The FC20 (**AC** power version) is not producing +30 VDC across terminals 10 and 29.
- The FC20 (**DC** power version) is not producing +28 VDC across terminals 10 and 29.
- The cable distance between the FC20 and the SC is longer than 4000 feet.
- There is a break or short in the cable between the FC20 and the SC
- Either the processor or SC or both have been damaged by a power surge or lightening.

"SELT TEST"

This message always appears when power is first applied to the FC20. The FC20 performs a quick self-diagnostic routine and then the message disappears. This message might also appear if terminals are shorted or if there is excessive power use by attached auxiliary equipment. It also could appear if the FC20 power or communications wiring is too close to other devices or wiring (high voltage power wiring, high voltage motor wiring, 120 vac, etc.)

"ZERO BELT SPEED"

This message indicates that, 1) the belt is simply not moving, 2) the belt is moving, but a speed signal is not being generated, or, 3) the signal conditioner is defective. If the belt is moving, make sure the green LED labeled "speed" on the SC is blinking. Note that it might appear to be solid on if it is blinking rapidly. If it is not blinking, possible causes are a defective speed sensor or circuit, the signal conditioner has failed, or there is no DC power. If the message appears even when the belt is moving, check for the following adverse conditions:

- The speed sensor wheel is not turning freely, replace it if that condition exists.
- A broken or shorted cable from the speed sensor to the signal conditioner.
- Loose terminal connections.
- No +30 VDC power (+28 VDC on DC models) across terminals 29 (DC) and 10 (CM) on the signal conditioner..
- If power does exist, the speed signal is present, and the message persists, replace the signal conditioner..

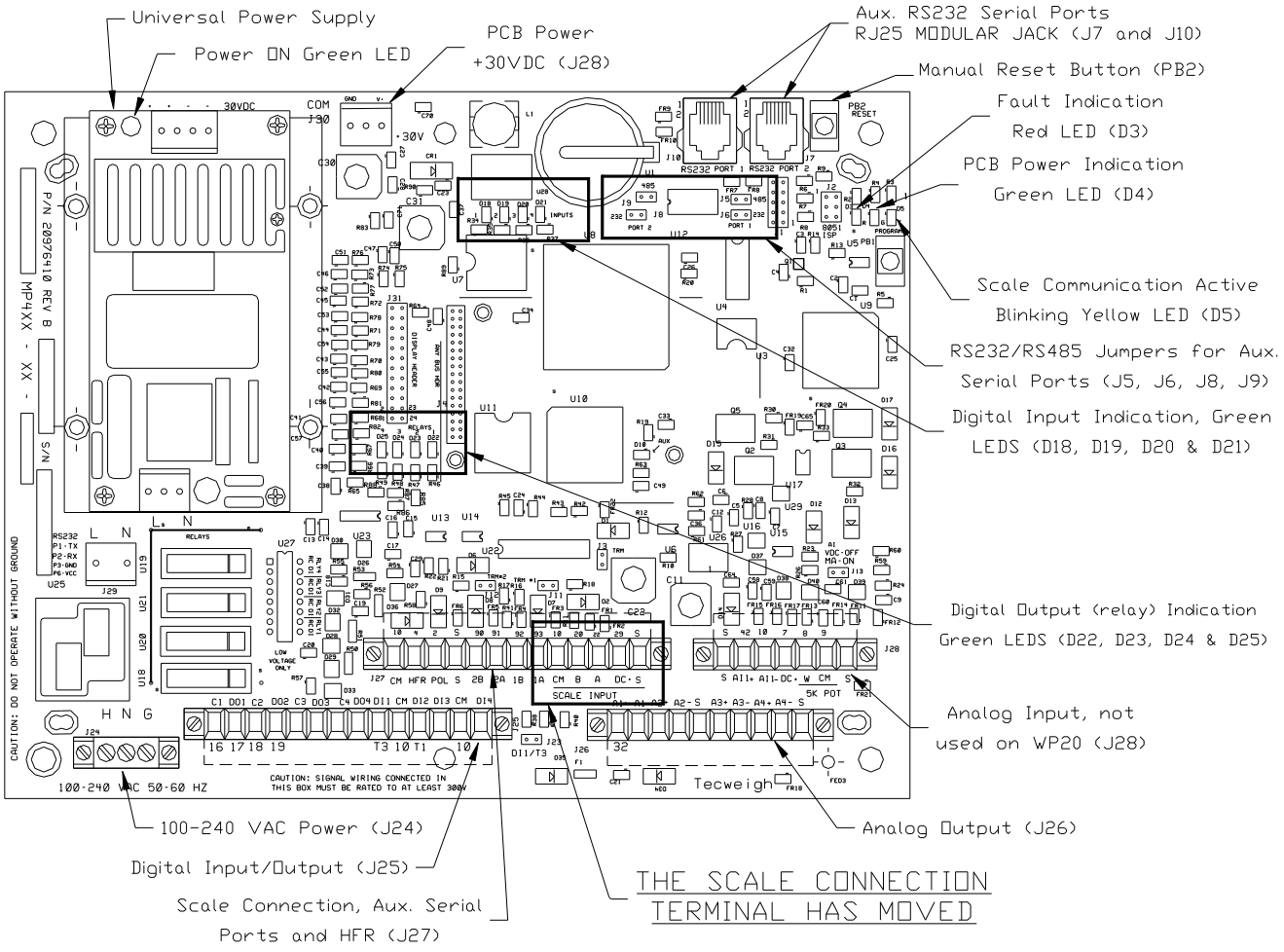
"-----"

This message indicates that the RATE or TOTAL values are too large to fit the display, or the TOTAL is a negative number. Move the decimal position to the right using the Rate DP Parameter (Section 7.03.12) or the Total DP Parameter (Section 7.03.17). Also note that the TOTAL will need to be RESET when the value reaches its upper limit.

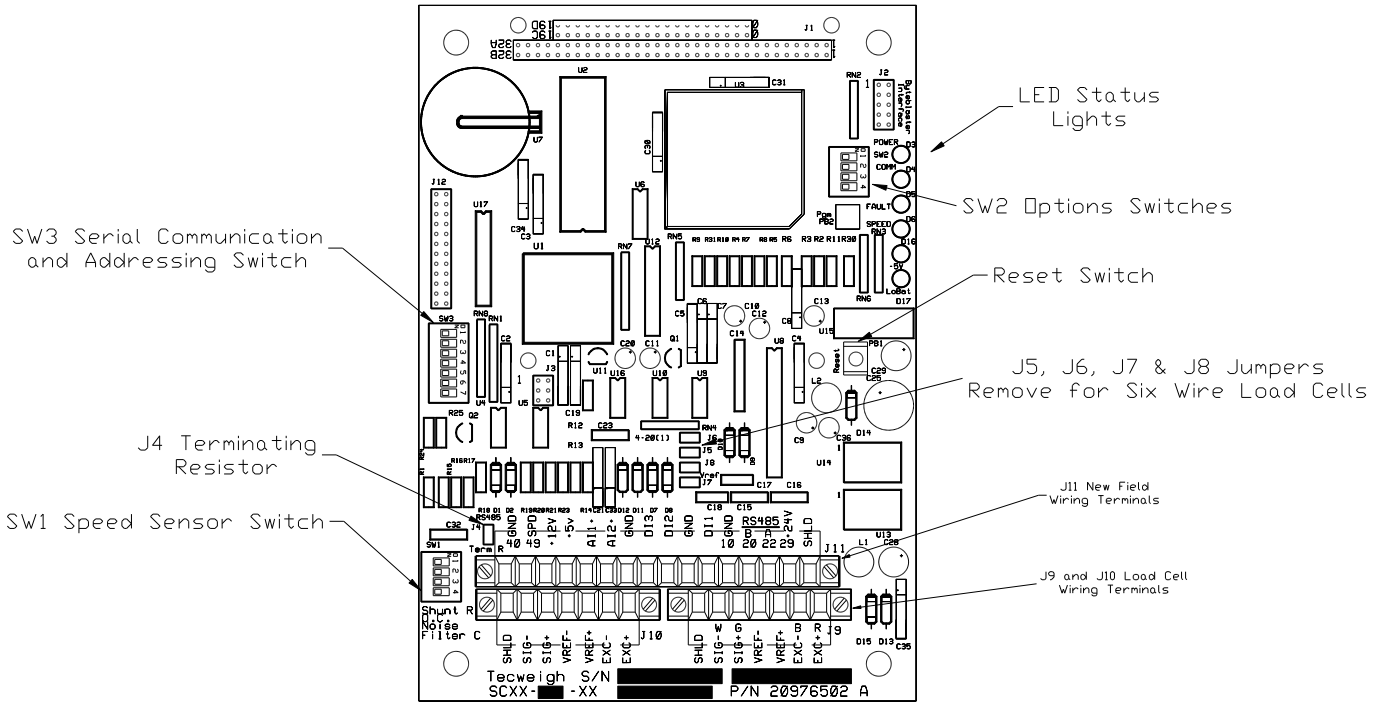
10.02 Electrical Troubleshooting

This section provides methods for diagnosing lower level electrical problems. If this is a first time installation, verify that it is wired correctly and that all the wires are secure in their terminals. For reference for the following paragraphs, the following three figures show the layout of the MP410 PCB and the SC300 and SC400 signal conditioner PCB's.

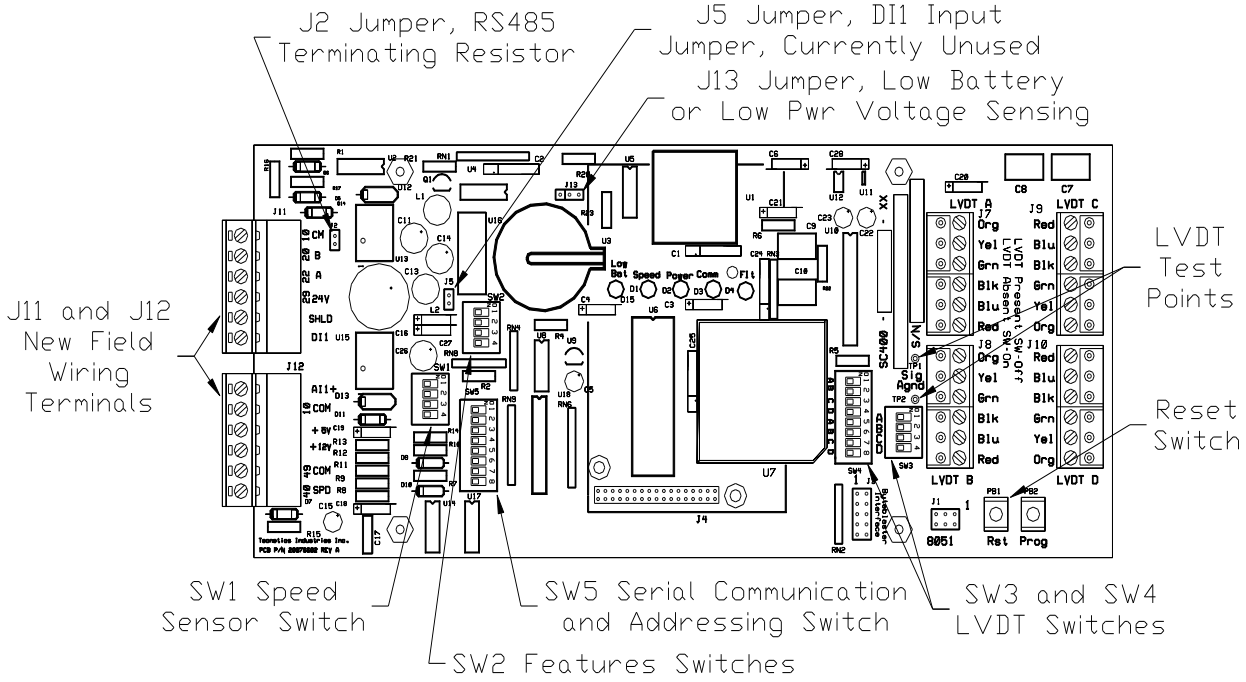
MP410 Main Processor PCB



SC300 PCB
(WY15 and WY25)



SC400 PCB
(WY10 and WY20)



Display failure…

There are two display failure scenarios: it does not light up at all, or it does light up but is acting abnormally.

If it does not light up at all, first observe the green and red **L**ight **E**mitting **D**iodes (LED)s on the FC20 printed circuit board (PCB). The green LED indicates sufficient power to the PCB and the red LED indicates PCB failure. If the green LED is off or the red LED is on, verify that the DC power supply is working properly as follows: On PCB model MP400 the DC power supply converts the incoming 100-240 VAC to +30 VDC. Verify that the input voltage is at least 100 VAC and that there is +30 VDC at the power supply output (terminals 10 (-) and 29 (+)). Also verify that the ribbon cable between the PCB and the display is installed correctly and is intact

If the display lights up but portions of it appear vacant or flash uncontrollably, it is likely that the ribbon cable that connects the display board to the printed circuit board is damaged, or the display board itself is damaged.

If any of these conditions are found to exist, or the problem cannot be pinpointed, contact the **Tecweigh** Service Department (Section 2.01) for assistance.

Scale communications failure…

During normal operation a yellow LED on the FC20 printed circuit board (PCB) blinks every $1/5^{th}$ second, indicating that communications with the SC300 or SC400 signal conditioner (SC) at the scale is normal. If the yellow LED is off, or if it only blinks sporadically, verify that there is +30 VDC across terminals 10 (-) and 29 (+) on the PCB. This is also the DC power for the SC at the scale.

If +30 VDC does not exist across those terminals, disconnect the incoming power and check for continuity across self resetting fuse F1 on the PCB. F1 is a tiny white rectangle located at the very bottom of the PCB and just right of center. If continuity does not exist, contact the **Tecweigh** Service Department (Section 2.01) for assistance.

If +30 VDC is present, next verify that there is also +30 VDC at the SC (terminals 10 (-) and 29 (+)), if not, replace the cable between the FC20 and the SC.

If +30 VDC does exist at the SC, check the LEDs on the SC. The green LED indicates sufficient power to the PCB, the red LED indicates insufficient power or PCB failure. As on the FC20 PCB, the yellow LED blinks every $1/5^{th}$ second during normal operation on the SC's. If it is not blinking and +30 VDC exists, replacement of the SC is indicated. Contact the **Tecweigh** Service or Parts Departments (Section 2.01) for assistance.

Other electrical problems…

Electrical "noise" from external electrical equipment such as variable frequency drives (VFD)s and/or large motors can interfere with FC20 and signal conditioner (SC) operation. The following are things that can be done to help prevent this problem:

- Assure that the FC20 is on its own electrical circuit and verify that terminal G is **earth** grounded.
- Use dual twisted pair shielded cable from the FC20 to the SC. Belden #1063A is recommended (See section 4.01.1).
- Connect shield wires to the FC20 only, not to the SC.
- Do not mount the scale or the FC20 near equipment that is a source of electrical "noise", or remove the "noise" source as much as is practical. This includes, but is not limited to, motors, VFDs, SCRs, and high voltage power electrical cabling.

- Do not run power or communication wires near equipment that is a source of electrical "noise". This includes not only 240/480 VAC motor wires, but also 120 VAC wires.
- Always take static precautions when handling PCB's (grounded wrist straps, static bags, etc.)(See Section 1.08).
- Never electrically weld near or on the scale or FC20, this can destroy the PCB's, load cells, or LVDTs (See Section 1.09).
- Lightening storms can destroy PCBs. This can either be caused by electromagnetic radiation or voltage spikes generated in the power conductors. If after a lightening storm the FC20 fails to work, you might need to replace both the FC20 and SC PCBs. Contact the **Tecweigh** Service or Parts Departments (Section 2.01) to determine replacement part requirements. Note that lightening strike damage is not covered under the warranty.

Speed sensor options…

Low belt speed or high electrical "noise" environments might require using some of the signal conditioner (SC300(400)) speed sensor options as defined below. Experiment with them one at a time to determine which combination results in the smoothest belt speed reading. Contact the **Tecweigh** Service Department (Section 2.01) for assistance if needed.

SW1

Pos1--ShuntR--when ON, a portion of the voltage produced by standard and heavy duty speed sensors is grounded out, which prevents damage caused by high speed belts. This switch must be ON unless a magnetic pickup, open collector, or TTL type speed sensor is used.

Pos2--O.C.--turn ON to add a pull-up resistor when using an open collector type speed sensor.

Pos3--Noise--when ON, lower level electrical "noise" is grounded out, but a stronger speed sensor signal is required.

Pos4--Filter--When ON, attempts are made to smooth the speed signal and ignore electrical "noise".

SW2

Pos1--when ON, the measured speed is multiplied times 10. Try using this option if the belt speed is less than 15 feet per minute. The scale must be recalibrated per section 8.04.

Pos2--when ON, a fixed simulated SPEED for trouble shooting is produced. The Speed value displayed on the FC20 will equal 200 times the Speed Span Parameter (Section 7.03.16). Use this option to remove the speed sensor as a potential problem when troubleshooting.

Pos3--when ON, the resistance to false belt speeds due to vibration is increased. However, lower belt speeds (less than 20 feet per minute with the standard speed sensor) might not be detected.

Pos4—when ON, decreases the resolution of the load cell signal for backwards compatibility with older FC20 main processor PCB's. Contact the **Tecweigh** Service Department (Section 2.01) for further details when using this option.

10.03 Operation Troubleshooting

If the system is performing in an acceptable manner, but it does not seem to be giving the correct RATE or TOTAL, first verify that all the Parameters are correct. Leaving Weigh Spn = 0 or Belt Len = 0 (Section 7.03.5 & 6), for example, will cause an erroneous calibration, and the displayed RATE will be incorrect. The following are some other conditions that might exist:

RATE is unsteady…

If there are large swings in the RATE display during relatively constant material flow, several causes are possible. First, check the belt SPEED and make sure that it is constant, or at least does not deviate by more than about 1%. If the belt SPEED is not constant, consult Section 10.02 for speed sensor options. Second, turn the belt off and look at the Load Count Parameter (Section 7.03.20). Assure that the Load Counts are higher with the calibration weight down than with the cal weight up. Additionally, the Load Counts should not be negative and should remain relatively steady with the belt not running and no vibration. Replace the load cells (Section 10.05) if the Load Counts are inconsistent. If the SPEED and Load Counts are steady, the RATE should also be steady unless the AUTO ZERO and AUTO SPAN were not successful. Try doing an AUTO ZERO and AUTO SPAN again and be sure to do the AUTO ZERO first (Section 8.04). Other things to consider are the AZT setting and RATE damping. First try disabling the AZT function (Section 7.03.8), and then try increasing the Rate Damp Parameter (Section 7.03.13).

Ultimately the MS20 should calculate the Rate as follows:

Rate(TPH) = (Cal Factor) x (Scale Load (lbs)) x (Belt Speed (fpm)) / (Weigh Span (in))

Since the Cal Factor and Weigh Span do not change, the only possible problems with RATE will originate from the scale load and belt SPEED. By using the calibration weight to load the scale and by simulating the belt speed, the RATE should be steady. If the rate is still unsteady, it is most likely caused by vibration or excessive electrical "noise" (See Section 10.02, paragraph "other electrical problems"). Consult the **Tecweigh** Service Department (Section 2.01) if problems persist.

Scale is inaccurate…

It is important to understand that no conveyor scale is 100% accurate. Every detail from installation through calibration contributes to overall accuracy. A very good installation on a new conveyor in a noise and vibration free environment can attain an accuracy of +/- 0.5%. A poor installation on an older and much used portable conveyor might only attain +/- 3% accuracy. Based on that range of accuracy, estimate a realistic potential accuracy for the weighing system and then proceed with searching for sources of error. Try to eliminate as many undesirable conditions as possible. If it can be verified that the RATE is consistently high or low, for finer tuning adjust the ASC Parameter (Section 7.03.19) up or down accordingly.

The following are a number of potential problems that can contribute to scale inaccuracy:

- The scale and weigh idler(s) are not aligned properly (Chapter 3).
- The weigh idler rollers do not spin freely.
- The speed sensor does not spin freely.
- The scale is subject to high vibration near a crusher or screen.
- The scale is incline mounted causing material to roll back and be weighed twice.
- The load cells or LVDTs are damaged (Section 10.05-6).
- The conveyor belt has many splices, repairs and irregularities.
- High temperature fluctuations are causing scale, conveyor, and belt deformation.

- High winds are causing fluctuations in weighing.
- Rain water increases the weight after the scale weighs it and before the truck is weighed.
- There are incorrect or invalid Parameter settings (Chapter 7).
- There was material on the belt during calibration.
- The belt speed was not calibrated properly (Section 8.03).
- A material test was not performed (Section 8.04).
- Electrical interference is causing a false speed or load signal.

The Parameter values cannot be edited…

After a power line voltage spike or a lightening strike nearby, the Parameter values can get scrambled/corrupted. An indication of this happening is when one of the digits of a Parameter cannot be changed. This kind of damage is not field repairable. Contact the **Tecweigh** Service Department (Section 2.01) for assistance.

Resetting the PCB…

If after trying other troubleshooting techniques, the equipment still does not perform up to expectations, press the reset button **on the MP400 PCB**. The reset button is a small white button at the upper right corner of the PCB. Also refer to Section 10.02 for a picture of its location. This will check for corrupt data and also recover Parameters from memory if necessary. If this has no effect, try disconnecting the power completely and after a short time delay reconnecting it.

10.04 Auxiliary Outputs Troubleshooting

Relay failure…

For each relay on the MP400 printed circuit board (PCB), a green LED also exists. When a relay is energized, its LED will illuminate, and should illuminate whether a load is connected to the relay or not. The relays will also make a clicking sound as they are energized and de-energized. If a relay is found to be non-functional per the above, replace the PCB. The relays are not field replaceable. Contact the **Tecweigh** Service or Parts Department (Section 2.01) for assistance.

If the relays seem to work properly in Simulation mode, but do not work during normal operation, consider how realistic the relay Parameters settings are. Common errors are described as follows:

The most common error made when setting up the Total Pulse Repeater (TPR) function (Sections 7.05.45,53) is to request that the relay open and close too frequently (Sections 7.05.46-47,54-55). This can cause it to remain always open or always closed.

The most common error made when setting up the relays for High/Low RATE or High/Low SPEED Alarms (Section 7.05.45,53) is that the selected limits (Sections 7.05.49-50,57-58) are not realistic. This causes the alarm condition to never exist or to exist constantly. Also check the relay time delay before energization (Sections 7.05.51,59). The alarm condition must exist for at least the length of the delay time before the relay will be energized.

Current loop output(s) are non-functional…

The FC20 has four 4(or 0) to 20 milli-amp (ma) outputs. Outputs 1 and 3 are the Control Outputs and outputs 2 and 4 are proportional to the RATE. Like outputs operate in tandum. If an output is non-functional, some testing will be required to determine the cause. First disconnect all loads and then connect a milli-ammeter to the output in question.

If it is a Control Output that is non-functional, first adjust the Ctl mA Zero Parameter (Section 7.03.36) until the milli-ammeter displays 4(or 0) ma as close as possible. Then adjust the Ctl mA Span Parameter (Section 7.03.37) until the milli-ammeter reads 20ma as close as possible. If it is not possible to do these adjustments, the MP400 printed circuit board (PCB) is defective. It is not field repairable. Contact the **Tecweigh** Service or Parts Department (Section 2.01) for assistance.

If it is a RATE output that is non-functional, first place the FC20 in Simulation Mode (Section 7.05.35) and then adjust the Simulated RATE to the value (usually 0 RATE) that corresponds to a 4 (or 0) ma output. Next adjust the Rate Base mA Parameter (Section 7.03.39) so approximately 4 (or 0) ma is displayed on the milli-ammeter. Now fine tune this value by adjusting the Rate mA LTrim Parameter (Section 7.05.41) until the milli-ammeter reads exactly 4.0 ma. Next, change the Simulated RATE to the value (usually xxx tons/hr) that corresponds to a 20 ma output. Now adjust the Rate at 20 mA Parameter (Section 7.03.40) so approximately 20 ma is displayed on the milli-ammeter. Next, adjust the Rate HTrim Parameter (Section 7.05.42) until the milli-ammeter reads exactly 20 ma. If it is not possible to do these adjustments, the PCB is defective. It is not field repairable. Contact the **Tecweigh** Service or Parts Department (Section 2.01) for assistance.

If the above adjustments were successful, return to Run Mode and re-connect the load(s) with the milli-ammeter **in series** with the load(s) (See Section 4.05). Under normal operation the Control output milli-ammeter display should vary as the CONTROL POSITION varies. The RATE output milli-ammeter display should vary in proportion to the RATE from 4 (or 0) to 20 ma. If that does not happen, next verify that the remote devices in the current loop are "passive", that is, they do not provide power to the loop. Remove or replace any that are found to be non-passive. If the output works properly with just the milli-ammeter connected, but fails with a passive load(s) connected, the load is probably too large. The maximum load permissible is approximately 750 ohms total. Try distributing the loads among the two like current outputs. If it is a single load, a current to current amplifier will be required to drive the load.

Another possible problem that could arise is that the current output is functional, but one or more loads are not functional in a multi-load loop. This problem is usually caused by the loads not being isolated. Every load in the current loop needs to be isolated except the last one (See Section 4.05). Also refer to Section 4.01, "4-20 ma current loop output".

If all of the above fails to rectify the problem, the PCB is faulty. It is not field repairable. Contact the **Tecweigh** Service or Parts Department (Section 2.01) for assistance.

HFR failure…

The High Frequency RATE (HFR) output transmits a square wave signal at a frequency equal to 10 times the calculated RATE. The HFR output requires no calibration, however it does have its own damping factor (Section 7.03.44), as does the RATE display (Section 7.03.13), and the RATE analog output (Section 7.03.43). If these three damping factors are equal, these three RATE values will be the same, however, if they are not equal, the three RATE values might not necessarily agree, as they will lead or lag each other. When using serial communications (Section 9), Command Menu item 6, Average Rate, will also be included in this lead/lag scenario. Also refer to Section 4.01, "HFR output", for additional HFR information.

If the HFR output continues to be non-functional, replace the PCB. Contact the **Tecweigh** Service or Parts Departments (Section 2.01) for assistance.

Other problems…

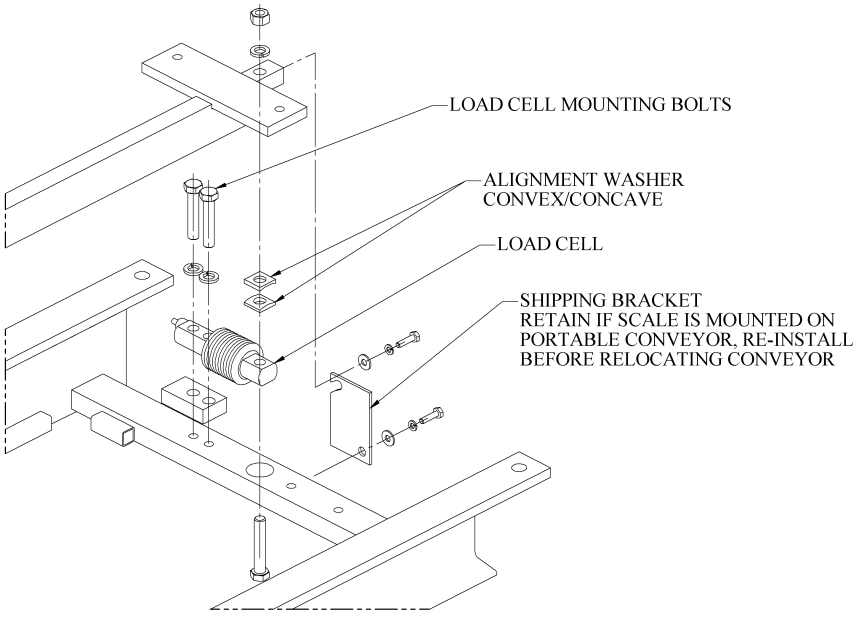
The outputs could also become disabled or not operate as expected, 1) when the T3 Interlock is open (Section 4.01, "Auto enable/Run enable/External alarm input"), 2) during an Auto Zero or Auto Span, or, 3) while the unit is in Program Mode. If everything is correct and the system is operating normally, but a remote device is not, consult the supplier of that device, otherwise, contact the **Tecweigh** Service Department (Section 2.01) for assistance.

10.05 Load Cell Testing / Replacement (WY15 & WY25 Only)

The following explains how to test a load cell(s). First stop the conveyor and disconnect power from the FC20. Then disconnect the green connector from the SC300 signal conditioner (SC) that the load cell wires are connected to. If more than one load cell is connected to the green connector, to get at accurate reading, the wires of the load cell to be tested will have to be removed from the connector. Next, using an ohmmeter, verify the following resistance values. If even one resistance value varies by more than +/- 10%, replace the load cell.

Model	CI-LC22	SB1 or LC	CB6-XX-T
Red-Black	310 Ohms	350 Ohms	400 Ohms
Red-Green	290 Ohms	280 Ohms	290 Ohms
Red-White	360 Ohms	280 Ohms	290 Ohms
Black-White	290 Ohms	280 Ohms	290 Ohms
Black-Green	390 Ohms	280 Ohms	290 Ohms
Green-White	290 Ohms	350 Ohms	350 Ohms

If it is necessary to replace a load cell, be sure to re-assemble the new load cell exactly the same way it was disassembled. Take special note of the swivel washers. The contoured faces of these washers fit together and the flat faces are on top and bottom. The safety latch is only used during transportation and installation. It should not be in place during normal use.

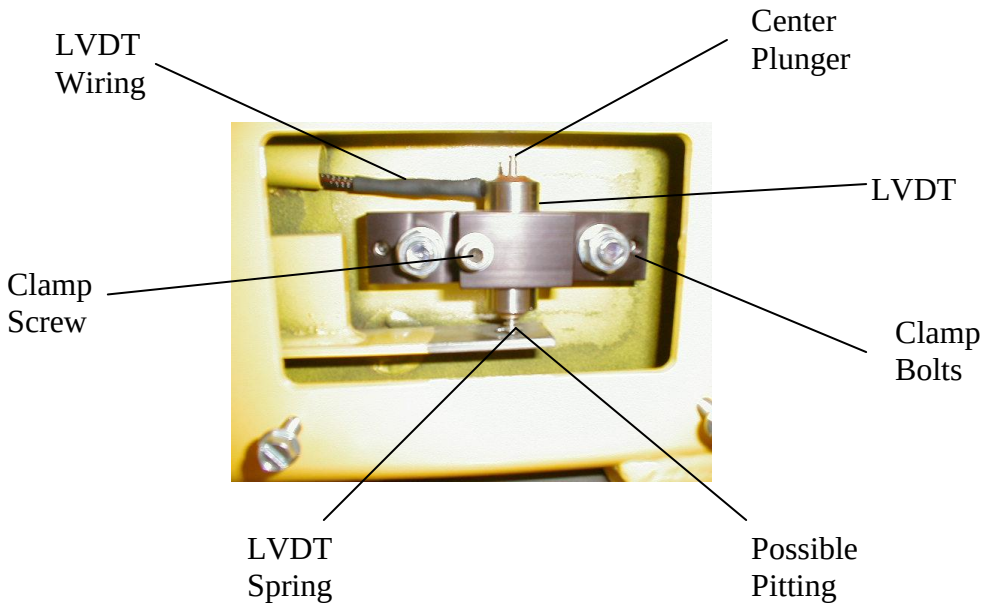


10.06 LVDT Testing / Replacement (WY10, WY10HD, WY20 Only)

The following explains how to test and replace a LVDT(s). First stop the conveyor and disconnect power from the FC20. Then remove the side cover on the scale carriage to allow access to the SC400 signal conditioner (SC). Next, disconnect the green connector from the SC that the LVDT wires are connected to. If more than one LVDT is connected to the green connector, to get an accurate reading, the wires of the LVDT to be tested must be removed from the connector. Then, using an ohmmeter, verify the following resistance values. If even one resistance value varies by more than +/- 20 %, replace that LVDT.

ORG - YEL = 70 Ω
GRN - BLK = 100 Ω
BLU - RED = 100 Ω

If replacement of a defective LVDT is necessary, use the following instructions. Refer to the following figure. First remove the LVDT wiring from the green connector. Then remove the two bolts from the LVDT clamp. Next, remove the LVDT assembly from the carriage. Now loosen the clamp screw and slide the LVDT out of the clamp. Install the new LVDT in approximately the same position, and assemble in reverse order. Re-wire it to the green connector, being careful to keep the wiring away from the deflection arm. The new LVDT(s) must be aligned (Section 8.02) and the scale re-calibrated (Section 8.03) after a LVDT has been replaced.



10.07 "scale data error" Trouble Shooting Procedure

The "scale data error" message indicates a communications problem between the **Tecweigh** FC20 and the scale's signal conditioner (SC). The following is a list of processors and SC's that apply.

Processors:
MP410, MP310, MP210, WP20-02B, WP20-02A, WP20-02.

Signal conditioners:
SC400 (lvdt's), SC300 (load cells), SC200 (lvdt's), SC100 (load cells), ET20-04B (lvdt's), ET20-04A (lvdt's), ET20-04 (lvdt's), ET20-07 (load cells).

If a lightening strike is a possibility, first visually inspect both the FC20 and SC printed circuit boards (PCB) for physical damage. If damage is evident, **both** boards should be returned to **Tecweigh** for servicing. Contact the **Tecweigh** Service or Parts Departments (Section 2.01) for further instructions.

If no physical damage is evident, the next step is to check several DC voltages at terminals on the PCBs. First disconnect from the **FC20 PCB** the four wires (or the plug-in connector) that connect the FC20 to the SC. Next, measure the voltages between the following terminals on the FC20 PCB. The indicated voltages are what should be present at the terminals. Terminal 10 (CM) is common (-).

10 to 20 ---------- 2.4 +/- 0.2 vdc.
10 to 22 ---------- 2.4 +/- 0.2 vdc
10 to 29 (MP400 ac version) ------30.0 vdc
10 to 29 (MP400 dc version) ------28.0 vdc
10 to 29 (older PCBs) ----------24.5 vdc

If the voltages are not correct, the FC20 PCB is defective. If this occurs, **both** the FC20 and SC PCBs should be returned to **Tecweigh** for servicing. Contact the **Tecweigh** Service or Parts Departments (Section 2.01) for further instructions.

If the voltages are correct, reconnect the four wires (or the plug-in connector) at the FC20 PCB and disconnect the same four wires (or plug-in connector) from the SC PCB. Now measure the same voltages as before, but **at the wire ends**, using the wire colors for terminal identification. If the voltages are not correct, the cable is defective. Contact the **Tecweigh** Service or Parts Departments (Section 2.01) for a replacement.

If the voltages are correct, reconnect the four wires (or the plug-in connector) to the SC PCB, and measure the same voltages at the SC PCB **terminals.**

If the voltages are not correct, the SC PCB is defective. If this occurs, **both** the FC20 and SC PCBs should be returned for servicing. Contact the **Tecweigh** Service or Parts Departments (Section 2.01) for further instructions.

10.08 The Default Parameter

If the FC20 does not respond to any commands and the firmware appears to be "scrambled" or corrupt, re-setting the Parameter Table to its default values can be tried. The Default Parameter only applies to the **Tecweigh** MP210, MP310, and MP410 processors**.** This procedure should only be done when the FC20 processor will not respond to any other commands

IMPORTANT NOTE: Before you default the processor, make sure that all current user determined Parameters (recorded in the Parameter Table, Section 12.02, column 5) are available, so they can be replaced in the FC20 processor after defaulting.

To perform the FC20 default procedure, first press the SECURITY key. Then press the SCROLL FORWARD key 5 times so Parameters appears. Next, press the SELECT key and then the ARROW UP key 2 times so Defaults appears. Now press the EXIT key. The message "Defaults Restored" will momentarily appear in the Mode window.

The processor has now been reset to its default values.

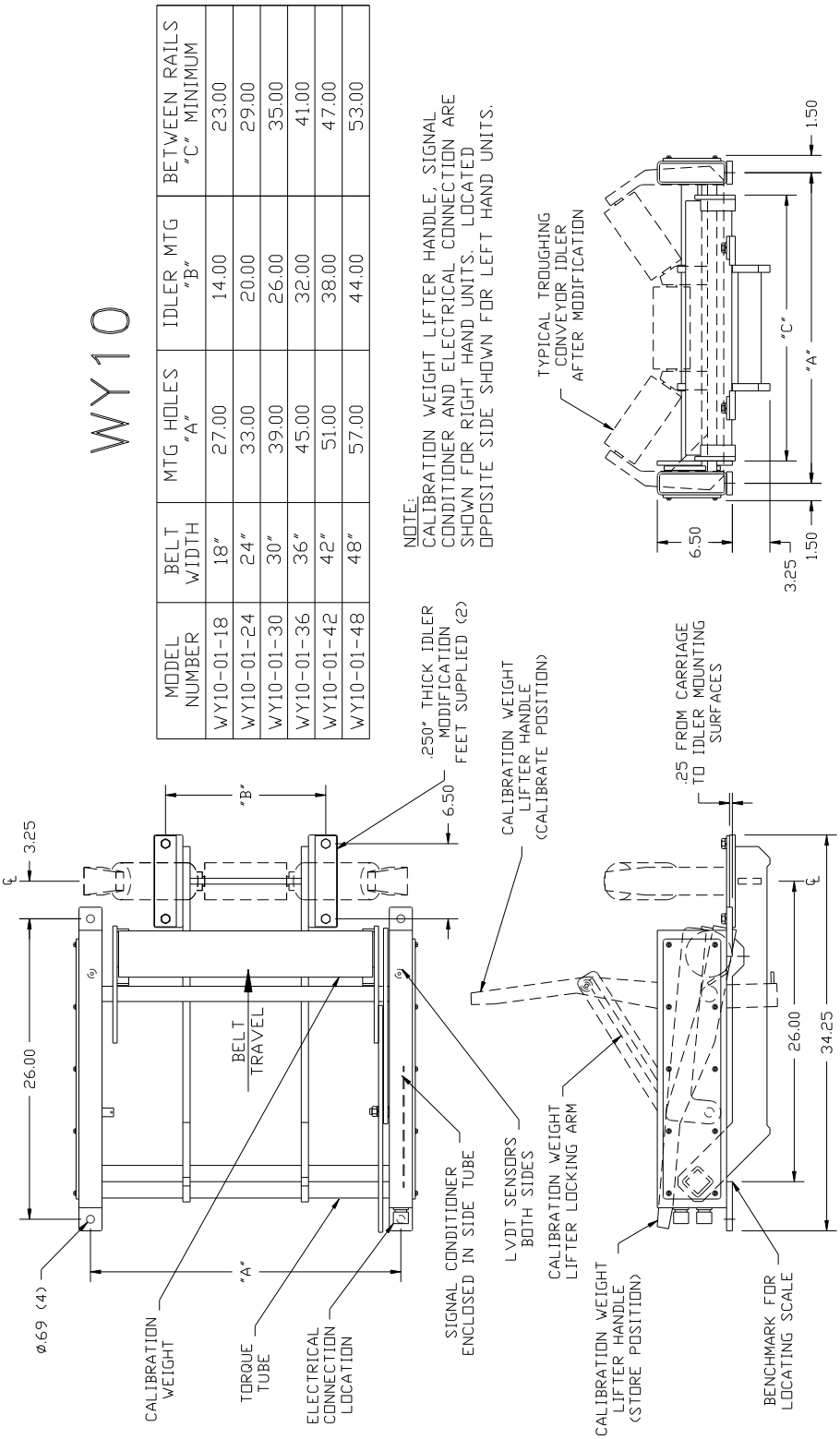
If the above default procedure **did** work, you will need to re-enter the previously saved Parameters into the processor. Refer to Chapter 7..

If the above default procedure **did not** work, a "hard boot" can be tried. This is done by removing the button battery from the board. Also remove any external power. Let it sit for about one minute so all the capacitors discharge. This will clear the onboard RAM memory. After the time has elapsed, replace the battery and re-apply power. The display ******** should appear for a few seconds, and then move on to the general display. If this procedure works, the previously saved parameters will need to re-entered into the processor. Refer to Chapter 7.

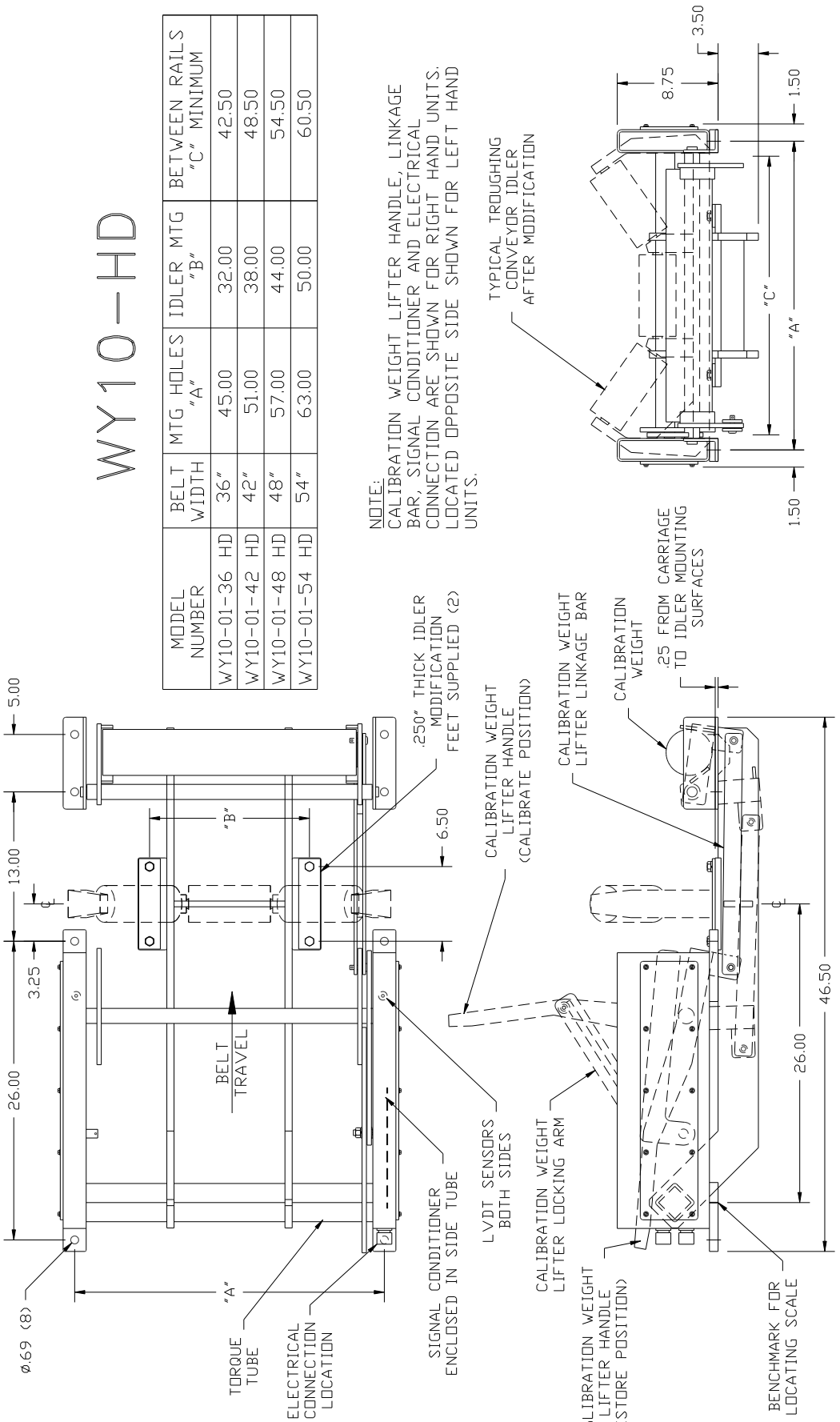
If **neither** of the above procedures worked, another Default procedure can be tried, but most likely the processor is defective and needs to be returned for servicing. Contact the **Tecweigh** Service or Parts Department (Section 2.01) for further assistance.

CHAPTER 11 - DIMENSIONS

11.01 WY10 Dimensions



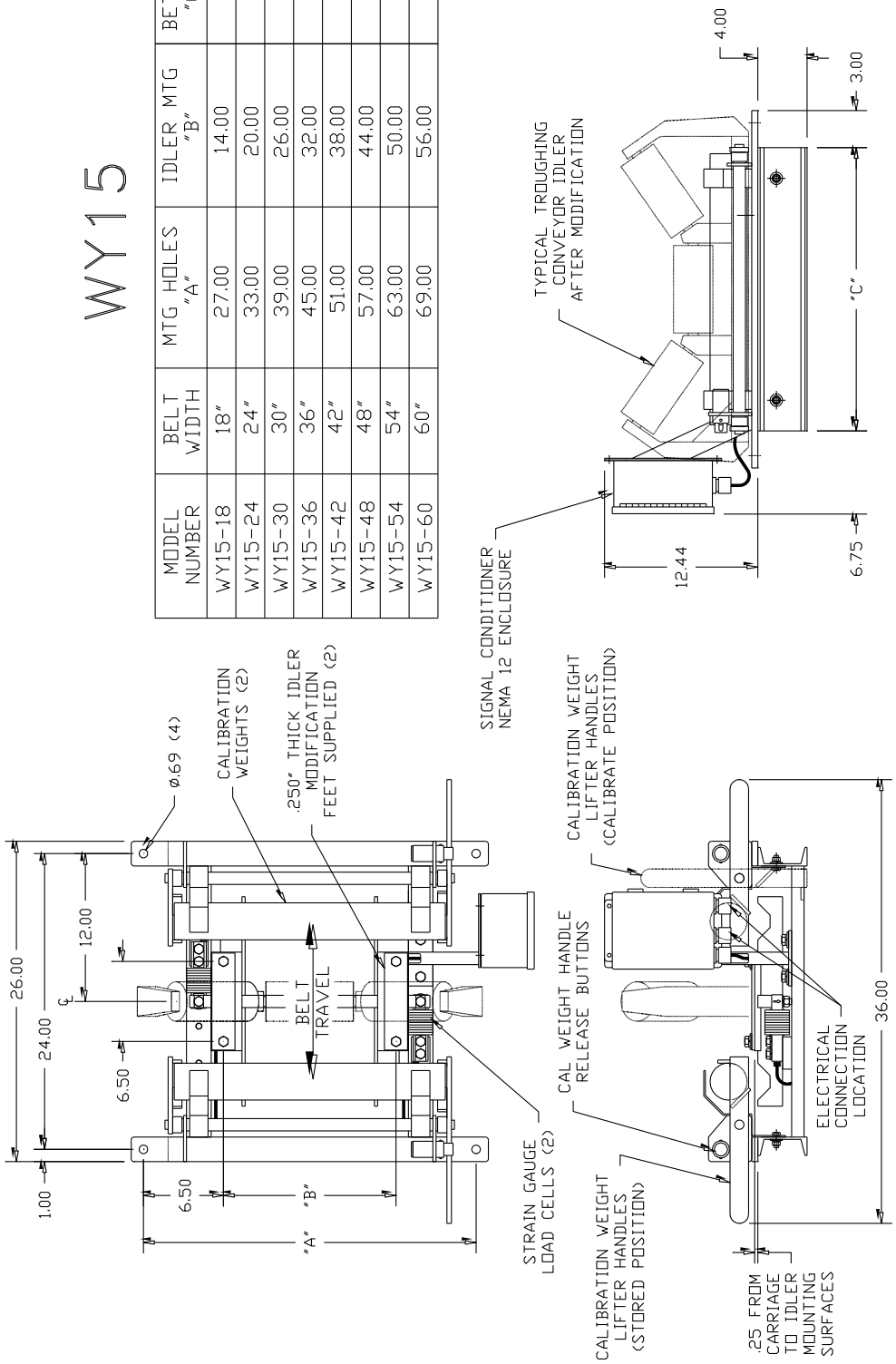
11.02 WY10-HD (Heavy Duty) Dimensions



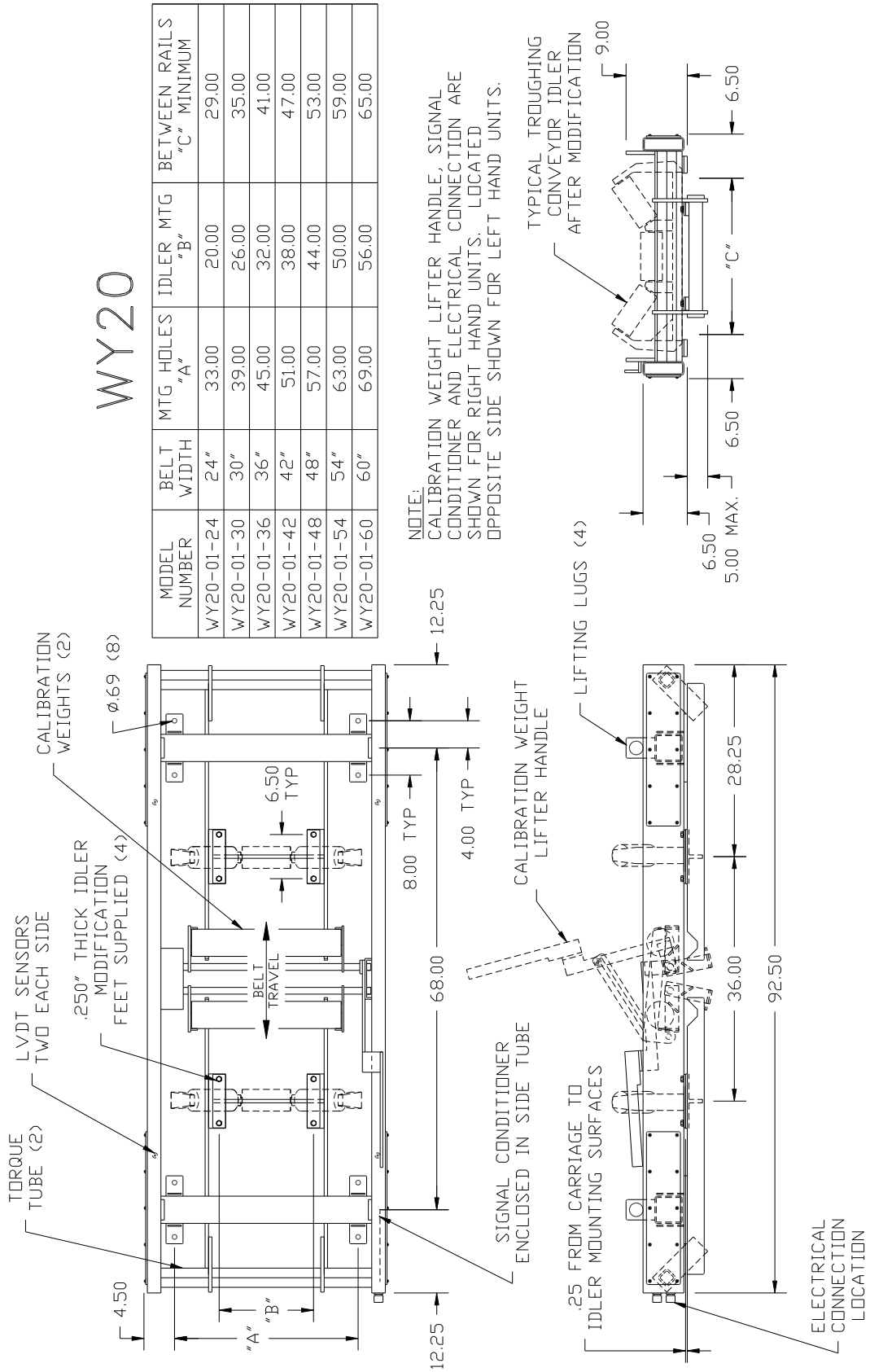
11.03 WY15 Dimensions

WY15

MODEL NUMBER	BELT WIDTH	MTG HOLES "A"	IDLER MTG "B"	BETWEEN RAILS "C" MINIMUM
WY15-18	18"	27.00	14.00	23.00
WY15-24	24"	33.00	20.00	29.00
WY15-30	30"	39.00	26.00	35.00
WY15-36	36"	45.00	32.00	41.00
WY15-42	42"	51.00	38.00	47.00
WY15-48	48"	57.00	44.00	53.00
WY15-54	54"	63.00	50.00	59.00
WY15-60	60"	69.00	56.00	65.00



11.04 WY20 Dimensions

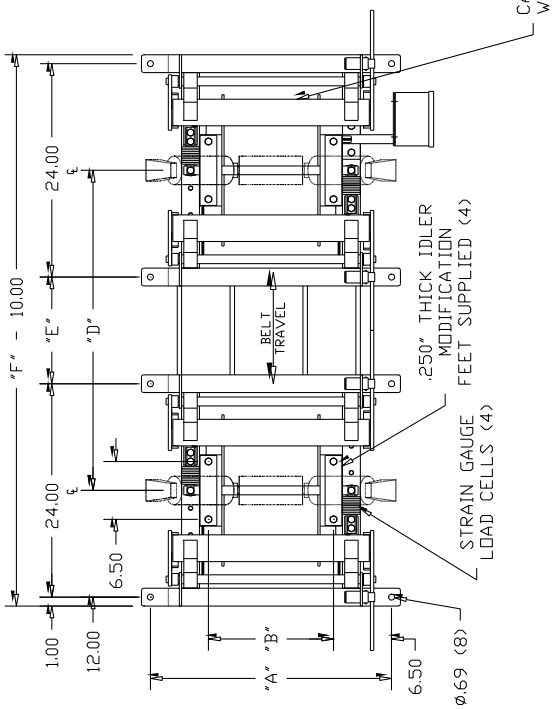


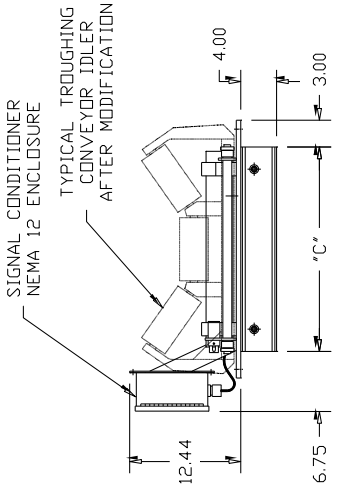
11.05 WY25 Dimensions

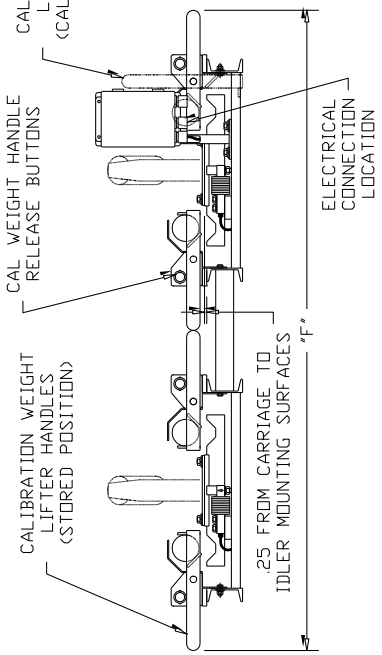
WY25

MODEL NUMBER	BELT WIDTH	MTG HOLES "A"	IDLER MTG "B"	BETWEEN RAILS "C" MINIMUM
WY25-18	18"	27.00	14.00	23.00
WY25-24	24"	33.00	20.00	29.00
WY25-30	30"	39.00	26.00	35.00
WY25-36	36"	45.00	32.00	41.00
WY25-42	42"	51.00	38.00	47.00
WY25-48	48"	57.00	44.00	53.00
WY25-54	54"	63.00	50.00	59.00
WY25-60	60"	69.00	56.00	65.00

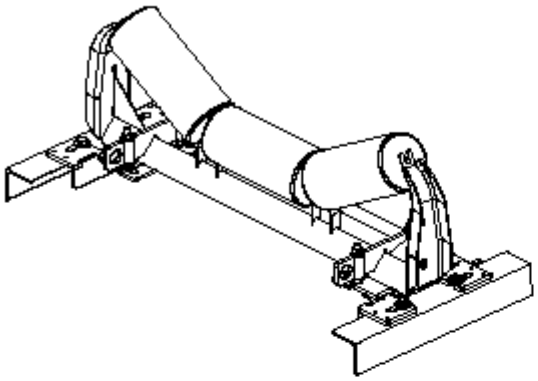
MODEL NUMBER	BELT WIDTH	IDLER SPACING "D"	MTG HOLES "E"	OVERALL LENGTH "F"
ALL	ALL	36.00	12.00	72.00
		48.00	24.00	84.00

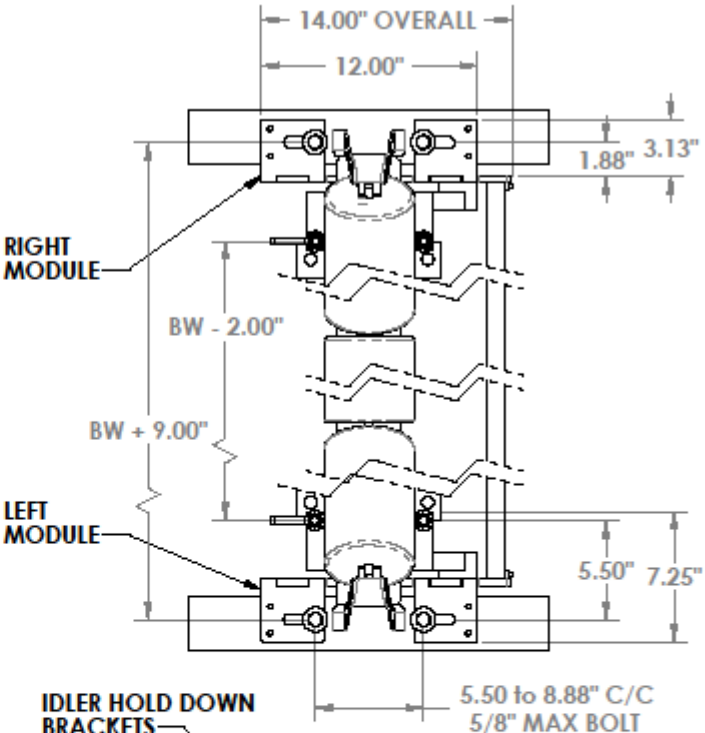


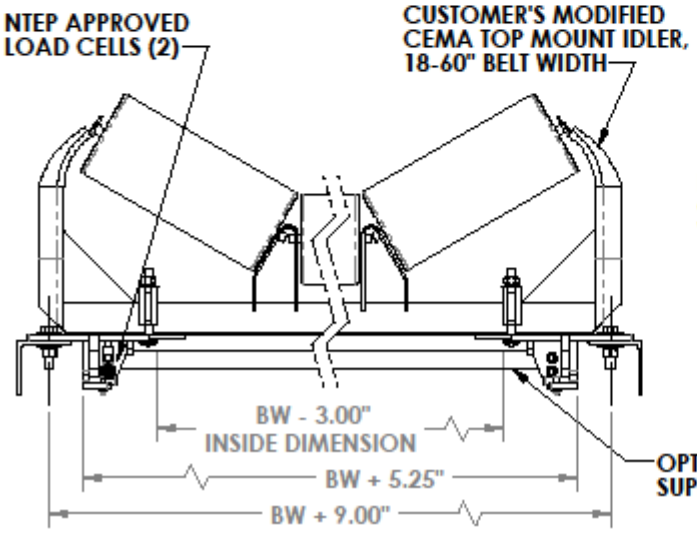


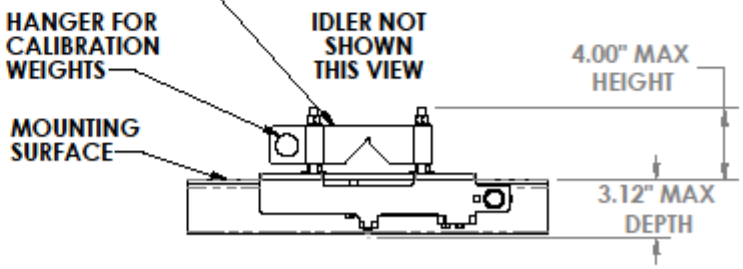


11.06 HY15 and 25 Dimensions









-CHAPTER 12-

FACTORY SETUP SHEET AND PARAMETER TABLE

12.01 FACTORY SET-UP SHEET

Job Number: _____

Customer: _____

FC20 Controller: Model: _____ , S/N:_____

Signal Conditioner: Model: _____ , S/N:_____

Scale Carriage: Model: _____ , Carriage number: _____

Date Shipped: _____ , Set-up by: _____

PRELIMINARY DATA: (order information)

Unit of measurement: _____

Feed Rate: _____ min, _____ avg, _____ max.

Belt Speed: _____ min, _____ avg, _____ max.

Belt Width: _____ , Belt Length: _____

Scale Carriage: Size: _____ , Style: _____

Factory Idler Mod: _____ , Offset Idler: _____

Speed Sensor: Model: _____ , Style: _____

FC20 supply voltage: _____

FC20 milliamp rate output: _____

SPECIAL _____

12.02 PARAMETER TABLE

Parameter		Parameter Description	Default Setting	Factory Setting	Field Setting
Scale Set-Up Menu					
1	Units	Selects unit of measure	Tons/Hr		
2	Cal Factor	Calibration value for a given scale type	0.36		
3	Cal Wt	Calibration weight value (lbs. kg)	120.00		
4	Cal Chn	Calibration chain (lbs/ft, kg/m)	0000.0		
5	Wgh Span	Weigh span length (in, m)	042.00		
6	Belt Len	Belt length (ft, m)	0050.0		
7	P/P Wt	Material test weight	0000.0		
8	AZT	Auto Zero tracking rate	000.0		
9	Trck Revs	Number of belt revolutions used by AZT	00.0		
10	Zero Revs	Number of belt revolutions used by Auto Zero	01.0		
11	Span Revs	Number of belt revolutions used by Auto Span	01.0		
12	Rate DP	Rate display decimal point setting	TENS		
13	Rate Damp	Rate display damping factor	015		
14	Speed DP	Speed display decimal point setting	TENS		
15	Speed Damp	Speed display damping factor	45		
16	Speed Spn	Speed calibration span	1.8800		
17	Total DP	Total display decimal point setting	TENS		
18	Down Count	Allow negative rates to be deducted from the total	NO		
19	ASC	Auto Span correction factor	1.0000		
20	Load Counts	Live load counts being indicated by signal conditioner	Reference		
21	Zero Counts	Load count selected during Auto Zero to represent Zero	01000		
22	Span Counts	Load count selected during Auto Span to represent Span	02000		
23	Span Detect	Change in load counts required to initiate Auto Span	00050		
Control Set-Up Menu					
24	Feed to Scale	Feed to scale distance (ft, m)	000.00		
25	Sample Time	Controller sample time (sec)	10		
26	Min Output	Minimun control output	010.0		
27	Max Output	Maximum control output	100.0		
28	Alarm Output	Alarm output control position setting	000.0		
29	Setpoint Type	Selects setpoint type, local or remote	LOCAL		
30	Remote Set Pnt	Selects remote setpoint type, analog or digital	ANALOG		
31	Setpoint Zero	Sets the low setpoint range	00000		
32	Setpoint Span	Sets the high setpoint range	1000.0		
33	Start Ctl Pos	Sets the default control position for low rates	000		
34	Ctl Above Rate	Set the rate at which the processor initiates PID functions	000.0		
Input–Output Menu					
35	Simulation	Provides artificial rate for calibrating other equipment	OFF		
36	Sim Rate	Artificial rate shown when Simulation is YES	000.0		
37	Ctl mA Zero	Sets the low control position range	04.0		
38	Ctl mA Span	Sets the high control position range	19.1		
39	Rate Base mA	Current output at zero Rate	4.00		
40	Rate at 20 mA	Rate at 20 ma Current output	1000.0		
41	Rate mA LTrim	Trims the low ma Rate output	150		
42	Rate mA HTrim	Trims the high ma rate output	050		

43	Rate mA Damp	Current output damping factor	15		
44	HFR Damp	High Frequency Rate output damping factor	15		
45	RLY 1 Func	Relay 1 output function	TPR		
46	RLY 1 Pls	Relay 1 pulse duration (sec)	0.10		
47	RLY 1 TS	Relay 1 totalizer scale	0000.0		
48	RLY 1 Set pnt	Relay 1 set point type, direct or percent	DIRECT		
49	RLY 1 Low	Relay 1 low rate alarm setpoint	0000.0		
50	RLY 1 High	Relay 1 high rate alarm setpoint	0000.0		
51	RLY 1 Delay	Relay 1 delay before alarm output (sec)	000		
52	RLY 1 Lgc	Relay 1 logic state, N.O. or N.C.	N.O.		
53	RLY 2 Func	Relay 2 output function	TPR		
54	RLY 2 Pls	Relay 2 pulse duration (sec)	0.10		
55	RLY 2 TS	Relay 2 totalizer scale	0000.0		
56	RLY 2 Set pnt	Relay 2 set point type, direct or percent	DIRECT		
57	RLY 2 Low	Relay 2 low rate alarm setpoint	0000.0		
58	RLY 2 High	Relay 2 high rate alarm setpoint	0000.0		
59	RLY 2 Delay	Relay 2 delay before alarm output (sec)	000		
60	RLY 2 Lgc	Relay 2 logic state, N.O. or N.C.	N.O.		
61	RLY 3 Func	Run interlock relay, not editable	RUN		
62	RLY 3 Lgc	Relay 3 logic state, N.O. or N.C.	N.O.		
63	T1func	Sets T1 digital input function	TOTAL		
64	T3 func	Sets T3 digital input function	AUTO ENABLE		
65	T3 delay	Sets T3 function delay (sec)	000		
Tuning Menu					
66	Tuning 1	Selects auto or manual for tuning 1	AUTO		
67	Tuning 2	Selects auto or manual for tuning 2	AUTO		
68	Proportional	Sets proportional gain for PID functions	1.0000		
69	Integral	Sets integral gain for PID functions	0.1000		
70	Derivative	Set derivative gain for PID functions	0.0050		
Serial Port Menu					
71	Station ID	Station ID (A-P)	A		
72	Parity	Serial port parity type	NONE		
73	Buud Rate	Serial port baud rate	9600		
74	Command Menu	Serial port transmitter menu	00		
75	Protocol Memu	Serial port protocol to be used for commands	TEC STD		
76	Data Fmt	Field buss data type, long integer or float	LONG		
77	IPAdd	Field buss IP address	010.000.000.016		
78	NMask	Field buss IP mask	255.255.255.000		
79	RIO Rack	Field buss Rack size for Remote I/O only (not supported)	1/4		
Set Point Menu					
80	Setpoint	Selects local rate control target setpoint	00000		
Security Menu					
81	Lock Aut Zero	Locks or unlocks the AUTO ZERO button	NO		
82	Lock Aut Span	Locks or unlocks the AUTO SPAN button	NO		
83	Lock Reset	Locks or unlocks the RESET button	NO		
84	Lock Rate Cntl	Locks or unlocks the Rate Cntl	NO		
85	Lock Set Point	Locks or unlocks the Setpoint	NO		
86	Lock Code	Security passcode	00000		
87	Parameters	Saves and restores Parameters from flash memory	NO CHANGE		

-CHAPTER 13-

WARRANTY AND SERVICE POLICIES

TECWEIGH®
Tecnetics Industries, Inc.

WARRANTY & SERVICE POLICY

CONVEYOR SCALES & WEIGH BELT FEEDERS

Statement of Limited Warranty – Tecnetics Industries, Inc.

Tecnetics Industries, Inc., Warrants this equipment against faulty components or factory defects, for a period of five (5) years beginning on the date of shipment/invoice. (Speed sensors and load cells) shall have a warranty of one (1) year. During the warranty period, any defect will be repaired or replaced without charge, providing that the equipment is returned, pre-paid and undamaged to **TECNETICS'** factory. When on site repair or replacement is required, a **Tecnetics** authorized distributor or technician can be hired to diagnose and make necessary repairs. **The Warranty will cover affected parts, but excludes travel and labor expenses.**

Terms and Conditions of Limited Warranty

Accuracy of the device may be limited by poor installation, faulty or improper conveyor equipment on which the scale is to be placed, or improper calibration methods. Warranty is therefore limited to those installations having the approval of **TECNETICS** or an authorized **TECNETICS REPRESENTATIVE**. This exclusive warranty is limited to the original user, and no other express or implied warranties shall apply. Excluded from the warranty are normal wear and tear, removal or installation of warranty parts, freight, physical abuse, or buyer caused damage including, but not limited to, such things as overloading of the system, change in belt speed, or damage resulting from over-voltage, lightning, or water entry.

WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES WHATSOEVER, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Tecnetics Industries, Inc., shall not be liable for damage to equipment, property or person due to improper installation or through attempts to utilize the goods under conditions that exceed the designated capabilities. It is the user's responsibility to determine the suitability of the equipment to his needs. Various State and Local agencies may require certain certification procedures relative to the use of this equipment. **Tecnetics** makes no assurance that this device fulfills those criteria beyond this warranty based on data sheets received from the buyer. **Tecnetics** Industries, Inc. specifically disclaims any consequential liability arising from the use of this product; maximum liability is limited to the original purchase price.