OPERATION MANUAL

Conveyor Scales

Model: WY10, WY10HD, WY15, WY20, WY25

Weigh Belt Feeders

Model: WF10, WF14, WF16, WF18v

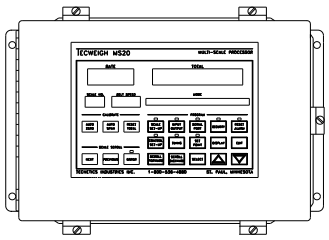
Rate Processor

Model: MS20 Multi-Scale Controller Version 2.00 firmware

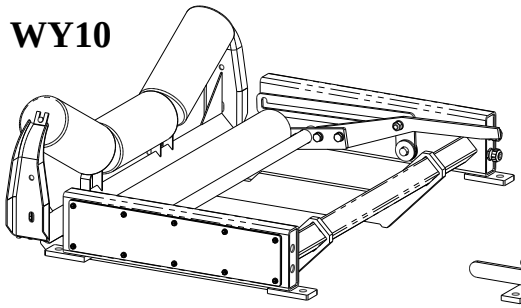
Signal Conditioner

Model: SC300 (WY15, WY25 & WFXX)
SC400 (WY10, WY10HD & WY20)

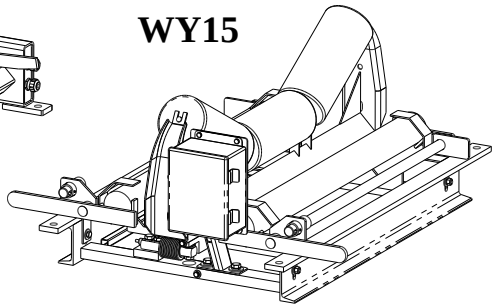
MS20 RATE CONTROLLER

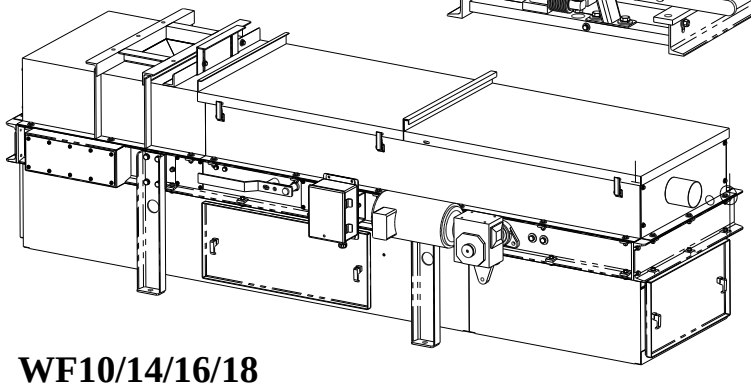


WY10



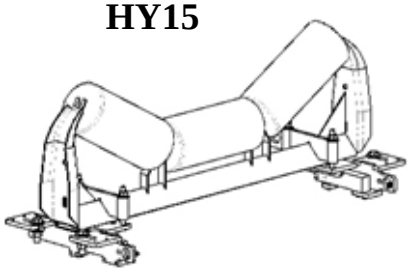
WY15





WF10/14/16/18

HY15



Tecnetics Industries Inc.
Manufacturer of
Tecweigh Products
1201 N Birch Lake Boulevard
Saint Paul, MN 55110
Ph (651) 777-4780
Fax (651) 777-5582
www.tecweigh.com

P/N 21092200 [Last Update, November 11, 2010]

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 (Section 7.04.5), 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 could 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 the elements.

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 MS20 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:

MP420-01-03
A 420 series MP (Main Processor) on its initial hardware version (-01) and third firmware version (-03).

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 the processor's 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

The installation of the MS20 Multi-Scale weighing system is unique because one, two, three, or four scales can be connected to the MS20 using a RS485 "daisy chain" communications system. The MS20 can communicate with and poll up to four scales and calculate the RATE and TOTAL for each of them. This would be equivalent of having up to four individual WP20s (single scale processors). The MS20 can display data for only one scale at a time. The scale for which the data is displayed is termed the "focus" scale throughout this manual.

A **Tecweigh** Multi-Scale installation typically consists of, a) up to four conveyor belt scales or weigh belt feeders, b) a SC300 (load cell(s)) or SC400 (LVDT(s)) signal conditioner (SC), and c) the MS20 multi-scale controller. The function of the scale(s) is to continuously measure the material weight on the belt and send the data to the SC. A sensing device also measures the belt speed and concurrently sends its signal to the SC card. The SC converts these weight and belt speed signals into transmittable RS485 signals and sends them to the MS20. The MS20 calculates a RATE and TOTAL for the focus scale from these signals and displays the values in the RATE and TOTAL windows, along with the SCALE NO. and BELT SPEED..

Each of the scales or weigh belt feeders connected to the MS20 have there own unique Station ID (address), A to P, and also scale numbers, 1 to 4. The MS20 continuously polls each address on the RS485 "daisy chain" one after another, and each SC responds with its own weight data, belt speed data, and scale status information. If there is a scale data error for the focus scale, a message appears in the MODE window. If a scale data error exits for any non-focus scale, the LED above the SCALE ERROR key is lit.

2.04 Conveyor Scales (WY10/WY10HD/WY15/WY20/WY25)

A conveyor scale consists of the scale carriage, load cells or LVDTs for sensing weight, and a belt speed sensor. **Tecweigh** equipment is also equipped with a self storing calibration weight(s) and a mechanism for easy operation. The scale is discussed further in Chapter 3.

2.05 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.

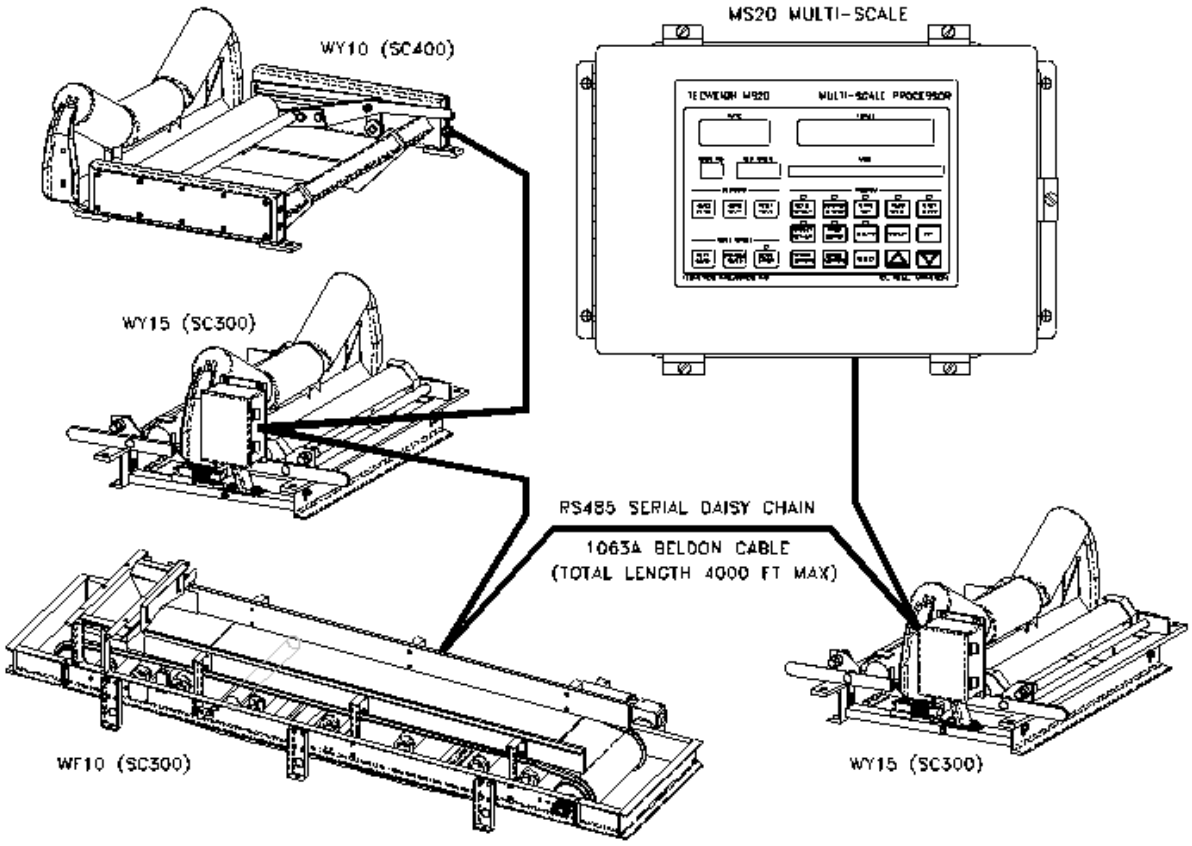
2.06 Weigh Belt Feeders (WF10/WF14/WF16/WF18)

A 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. WBFs are discussed further in Section 3.02.

2.07 Signal Conditioners (SC300 & SC400)

Material weight and belt speed signals are sent to the signal conditioner (SC) that normally is mounted on the scale carriage. The SC has two functions; first, it collects and electronically conditions the material weight and belt speed signals; and secondly, it detects problems at the scale such as a faulty weight or speed sensor.

The MS20 constantly polls the SCs, which are addressable so the MS20 can identify which scale the data originated from. During each poll, the weight, speed, and scale status, are sent to the MS20 via the RS485 communications link. The MS20 must be at the end of the "daisy chain" as is shown in the following figure.



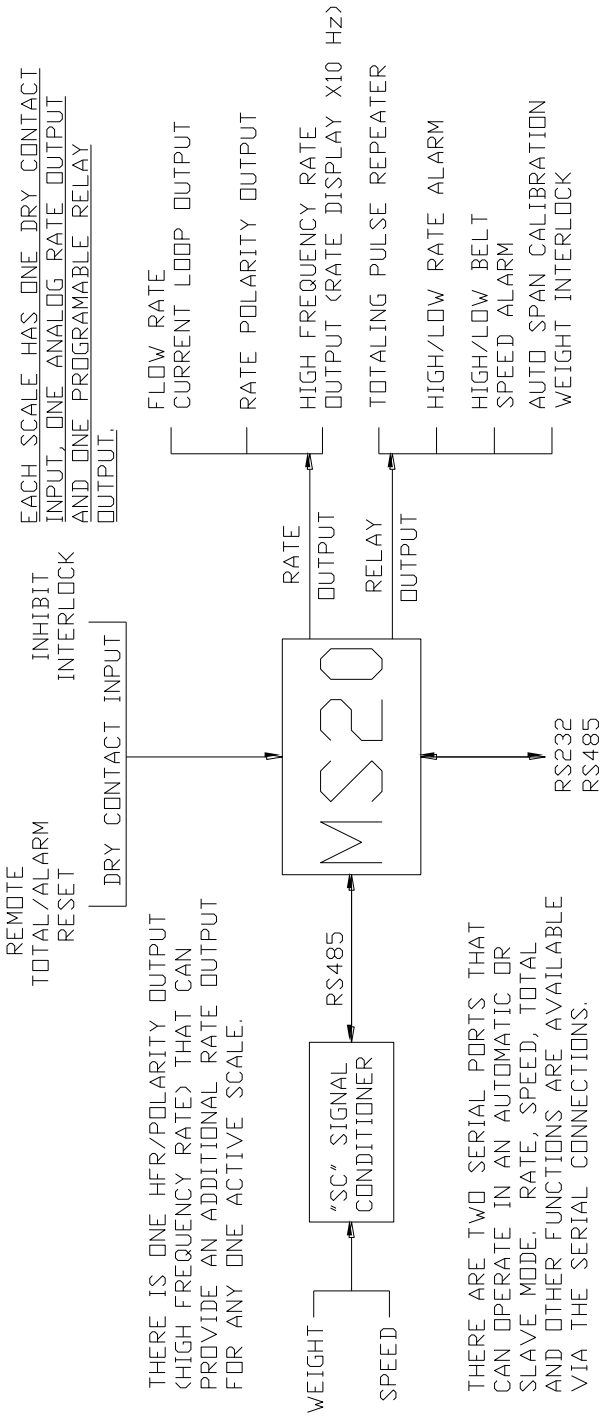
2.08 MS20 Multi-Scale Controller

The MS20 controller constantly polls all signal conditioners connected to the RS485 communications link and uses the information obtained to calculate the RATE, TOTAL, BELT SPEED, and other diagnostic information for each scale. The information obtained for the focus scale (Section 2.03, paragraph 1) is then displayed in the display windows of the MS20. Parameters such as belt length, calibration weight, unit of measure, and other desired information are pre-determined and stored in the MS20. The MS20 continuously updates the TOTALs internally for all scales based upon the RATEs calculated. While displaying the RATE, TOTAL, and BELT SPEED, for the focus scale, the MS20 will also indicate a scale error, if one exits, in the MODE window. It also will concurrently indicate scale errors, if any exit, for the non-focus scales by illuminating the LED above the SCALE ERROR key.

Various analog, digital (discrete), and serial inputs and outputs (I/O) permit control and monitoring of the MS20's primary functions. Depending upon the I/O used, the user can also remotely link to the MS20 using a Programmable Logic Controller (PLC) or other plant control equipment. Furthermore, up to four MS20's (with four devices connected to each MS20) can be daisy chained on one RS485 serial bus for full plant automation. Any combination of **Tecweigh** processors can be daisy chained for automation, because the MS20, WP20, and FC20, all have identical serial communication protocols. In total, up to 16 **Tecweigh** scales can be on one RS485 serial communications link

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

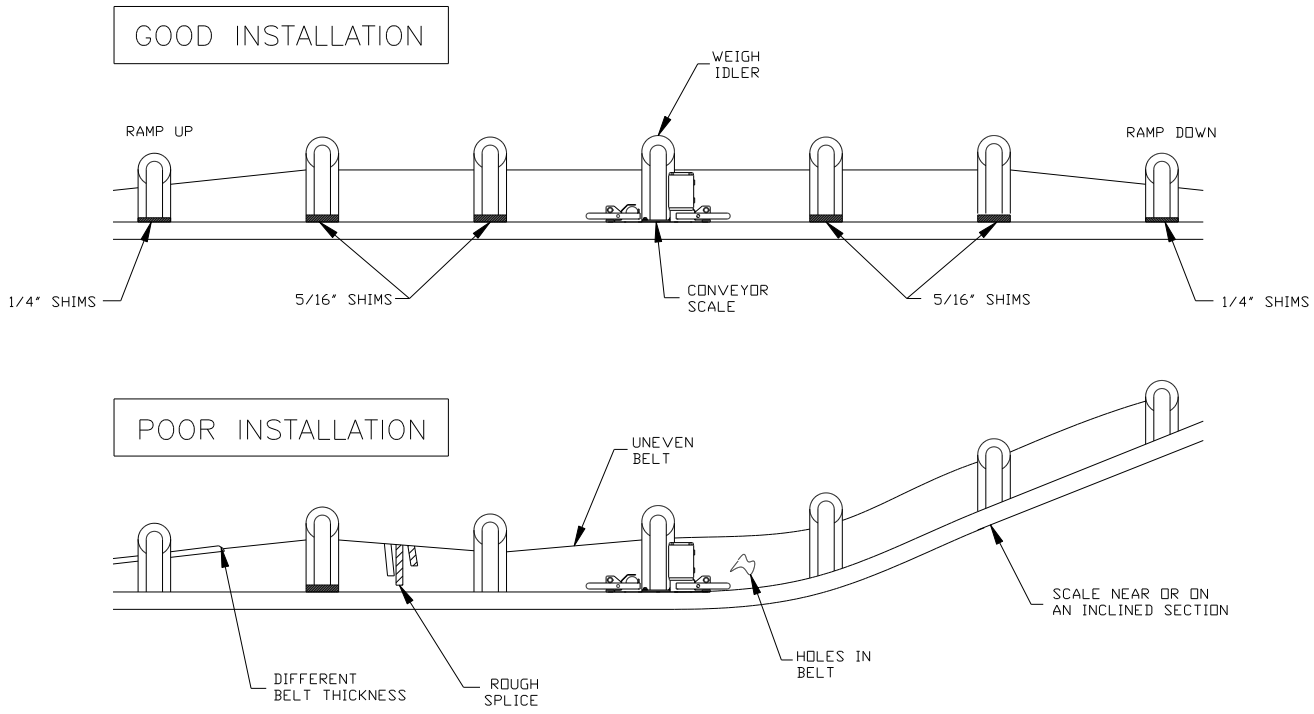
2.09 I/O Quick Reference



CHAPTER 3 - INSTALLATION

3.01 Scale Installation

Proper scale installation is critical for 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.



<u>Avoid the following!</u>

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

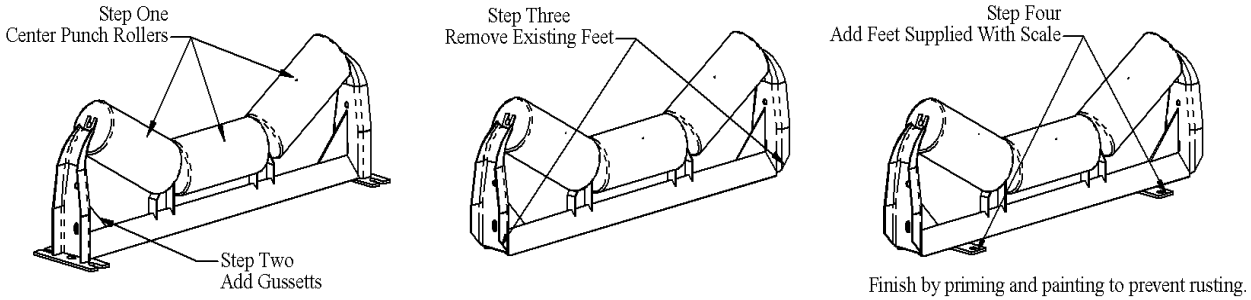
3.01.1 Idler Preparation

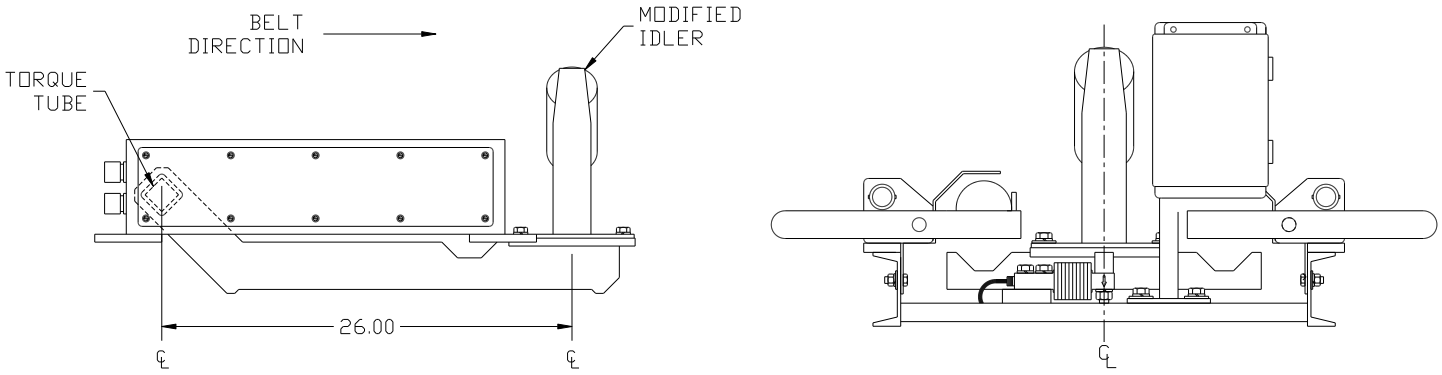
After finding a suitable location for the scale, reduce the conveyor belt tension. Raise the belt so it is supported at least one foot above the idler where the scale will be located and also one foot above the three idlers before and after the scale. Note, if you are installing a dual-idler scale (model 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 should occur, consult the **Tecweigh** service department for advice (Section 2.01).

DO NOT WELD ON OR NEAR THE SCALE!!!

1) Mark the center of each roller on the scale idler, three idlers before the scale, and three after (see below).
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 the 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.





3.01.2 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, you can use the dimension drawings in Section 11 for marking hole locations, but using the scale as a template is

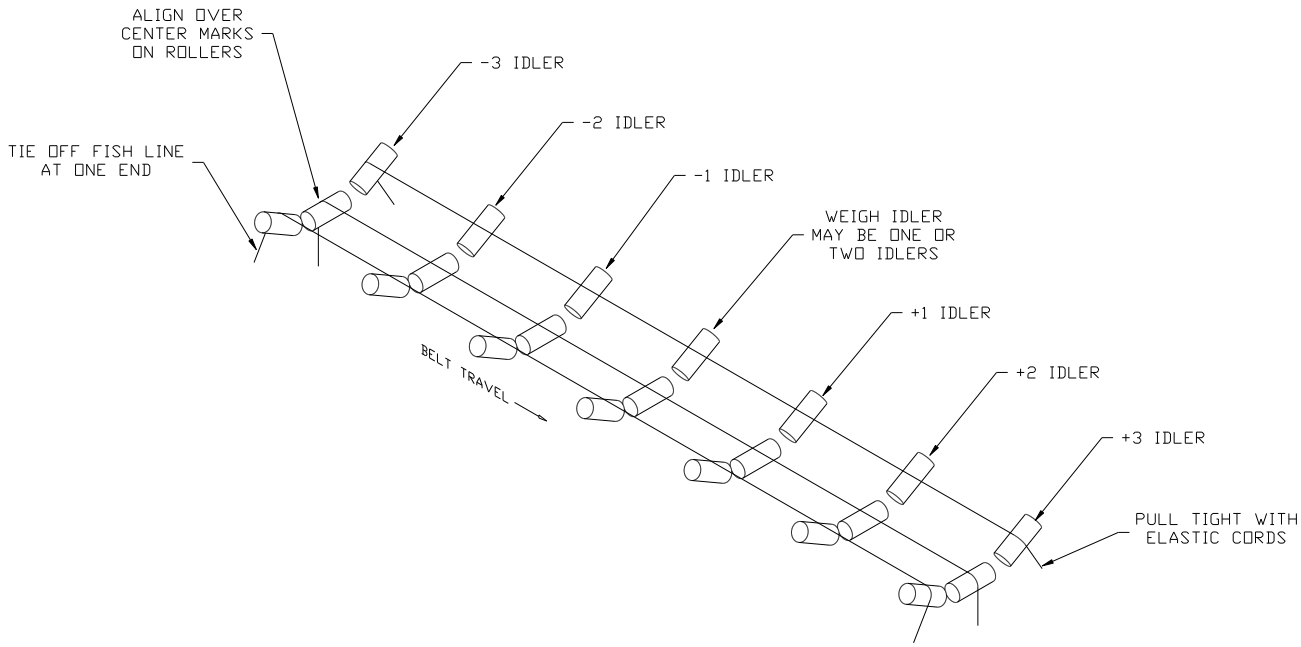
preferred. Slide the scale out of the way and drill the four mounting holes. Place the scale over the holes, but do not tighten the bolts yet.

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

1) Loosen the three idlers before and after the scale.
1) 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 to hold the fish line in place at 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 the +/- 1 and +/- 2 idlers with a 1/16 inch gap between the fish line and the roller centers.

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 fish line. Also verify that the idlers are exactly square with the stringers.

Remove 1/8 inches (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.

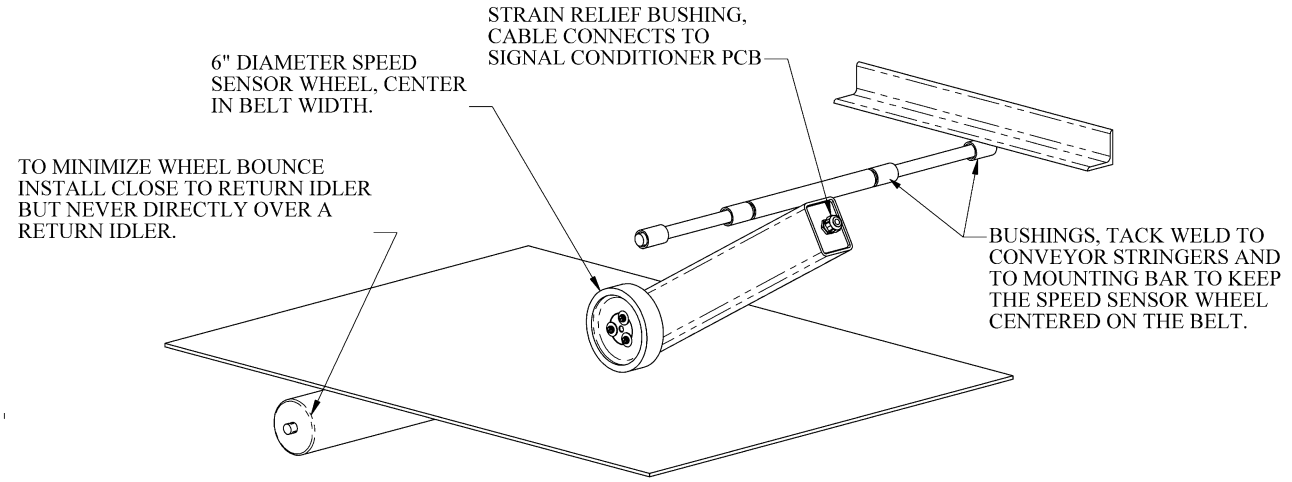


IMPORTANT!!! On the **WY15** and **WY20** scale models, remove the two safety plates on both ends of the idler mounting bar. These plates prevent overloading of the load cells during shipment. When using a portable conveyor, use the safety plates during transportation. Refer to the diagram in Section 10.05.

3.01.3 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 might 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.

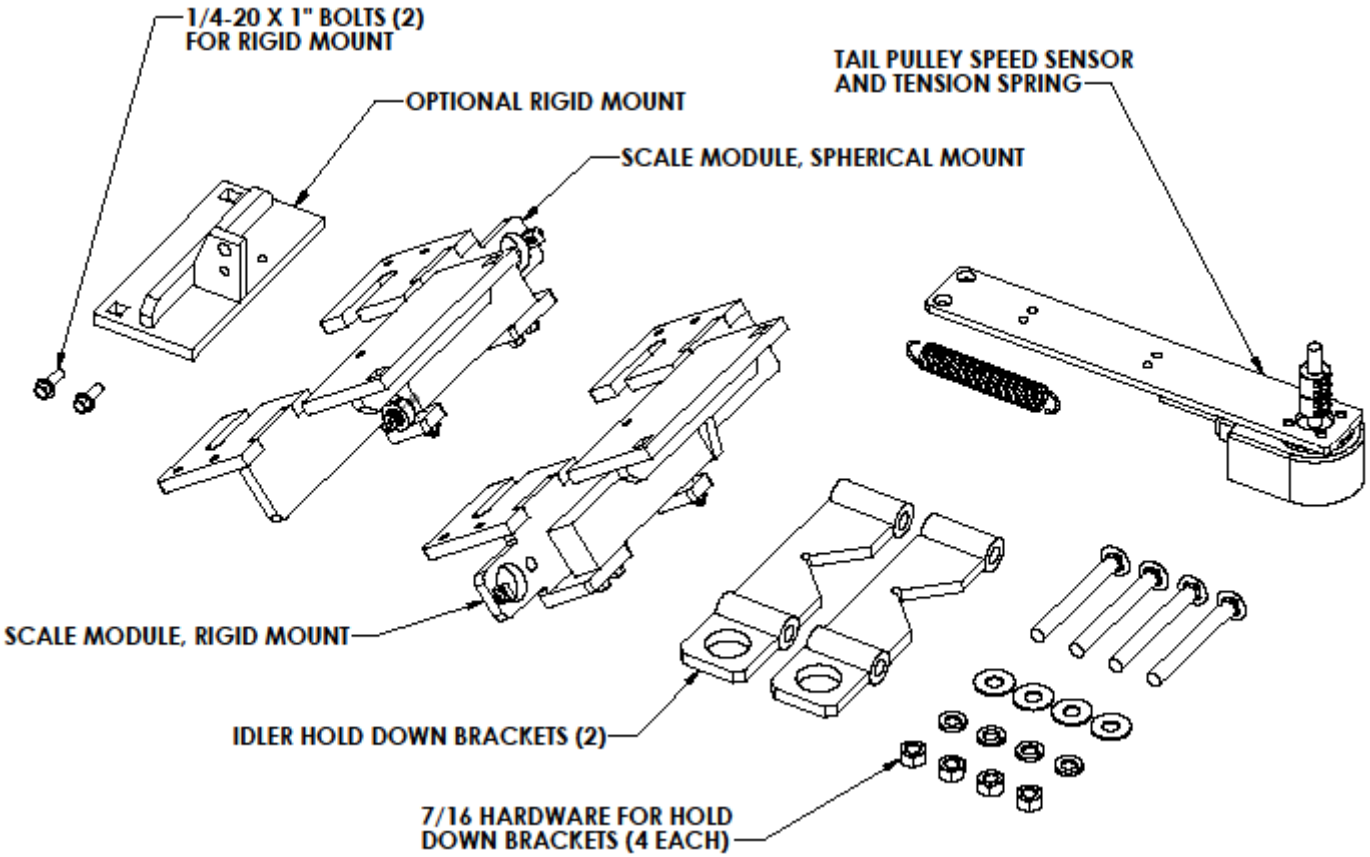
1) Weld two of the supplied pieces of pipe to the conveyor stringers.
2) Slide the spacers (other pieces of pipe) and speed sensor assembly onto the pivot arm.
3) Tack weld the spacers so the speed sensor is loosely constrained, but can still swing freely.



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 be formed and welded, on which to clip the spring, and a second bracket to hold the speed sensor arm horizontal.

3.02 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.

3.03 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.

3.04 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.

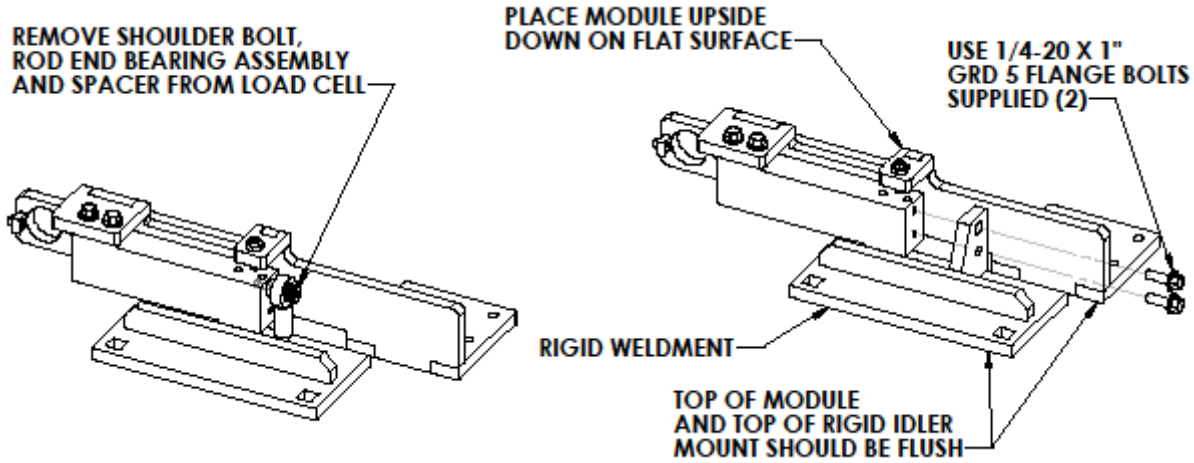
Although this benefit can be great in many applications it is not always the appropriate mount to be used. The following list highlights applications that won't benefit from the spherical bearing mount, and the symmetrical rigid mount that is also supplied should be used.

The spherical bearing mount may be detrimental in these application

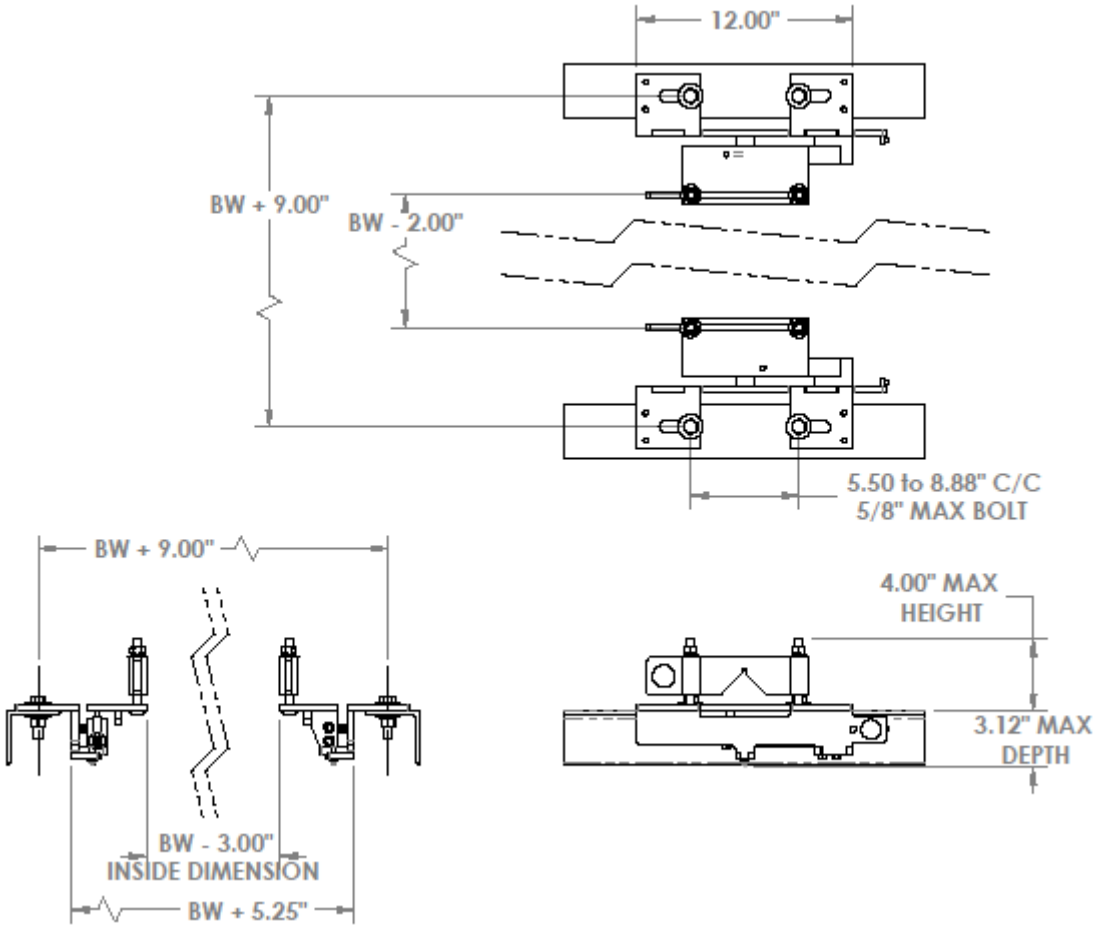
- Applications with over 150lbs per foot of belt load. (500Kg per meter)
- Non-top mounted CEMA idlers.
- Flat carrier idlers or rollers.
- Belt speeds over 600 FPM.
- Belt widths over 48" (1200mm).

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.

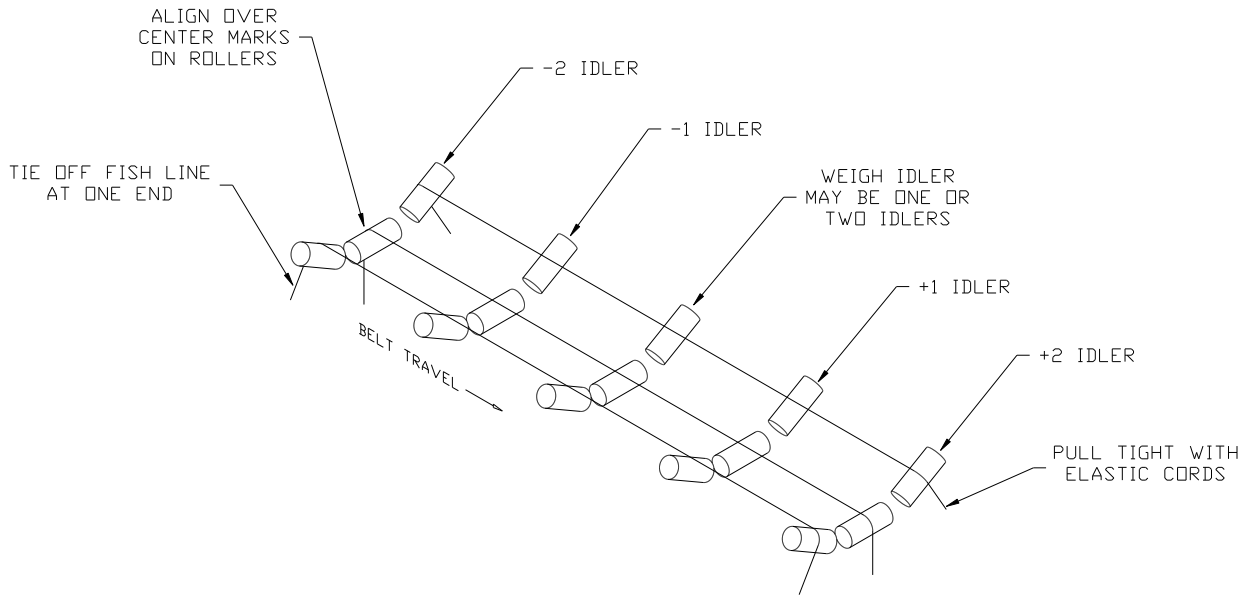
Now align the weigh idler with the three idlers on either side of the scale using the fish line and shims provided. Perform the instructions following and refer to the diagram below.

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.

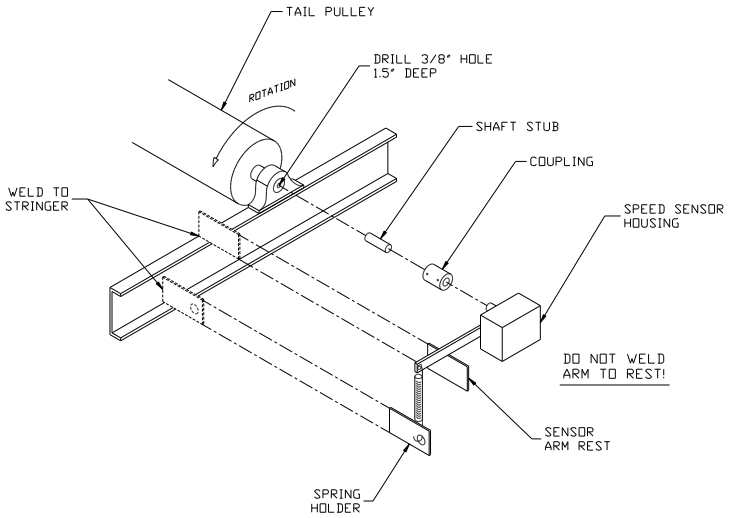


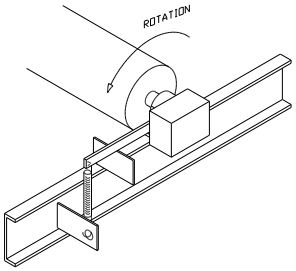
3.05 Speed Sensor Installation, HY Models

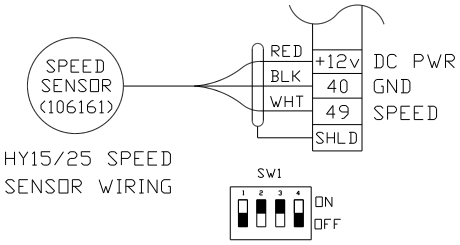
The HY15 and HY25 standard RL200 speed sensor:
Since most brands and styles of conveyors are shaped differently it is difficult to give specific installation instructions for the speed sensor. As indicated diagram below, you will need to drill a hole in the tail pulley shaft and insert a smaller shaft 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.

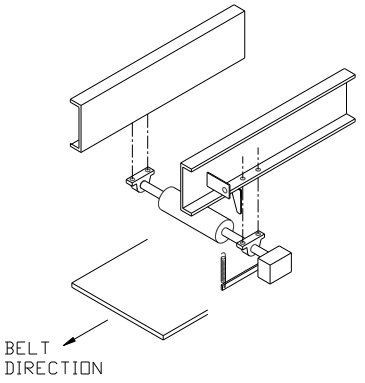
9) Run required length of electrical cable to scale.

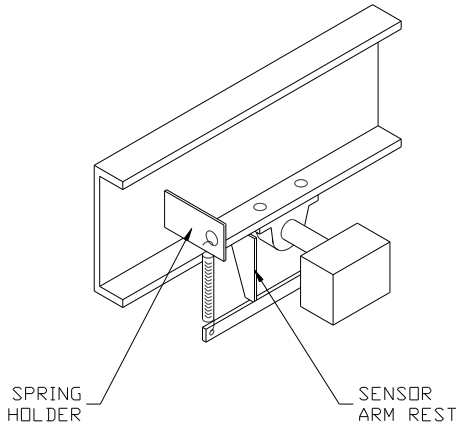






See Section 3.04 for other speed sensor options that might be included with the HY15 or HY25 scale.





3.06 Weigh Belt Feeder Installation

Proper weigh belt feeder (WBF) installation is critical for attaining high scale accuracy and repeatability. To properly mount a WBF it should be located on a rigid, horizontal mounting surface. All WBFs are assumed to be conveying material horizontally unless the specific application at hand is non-horizontal and which has been taken into account. If the WBF 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 operate smoothly and the scale should be mounted in an area free of temperature, wind, and vibration extremes.

The mounting surface of the WBF should be level and strong enough to support both the weigh of the equipment and the material being conveyed. When initially placing the equipment, it will be necessary to level the conveyor by shimming the mounting feet. Place a level across the side rails, from side to side, and insure the WBF frame is true. If not, shim the appropriate mounting feet. On WBFs that are over 10' long (with 6 or more mounting legs) it might be necessary to run a string-line down the length of the side channels and take a number of level checks, side to side, down the length of the unit.

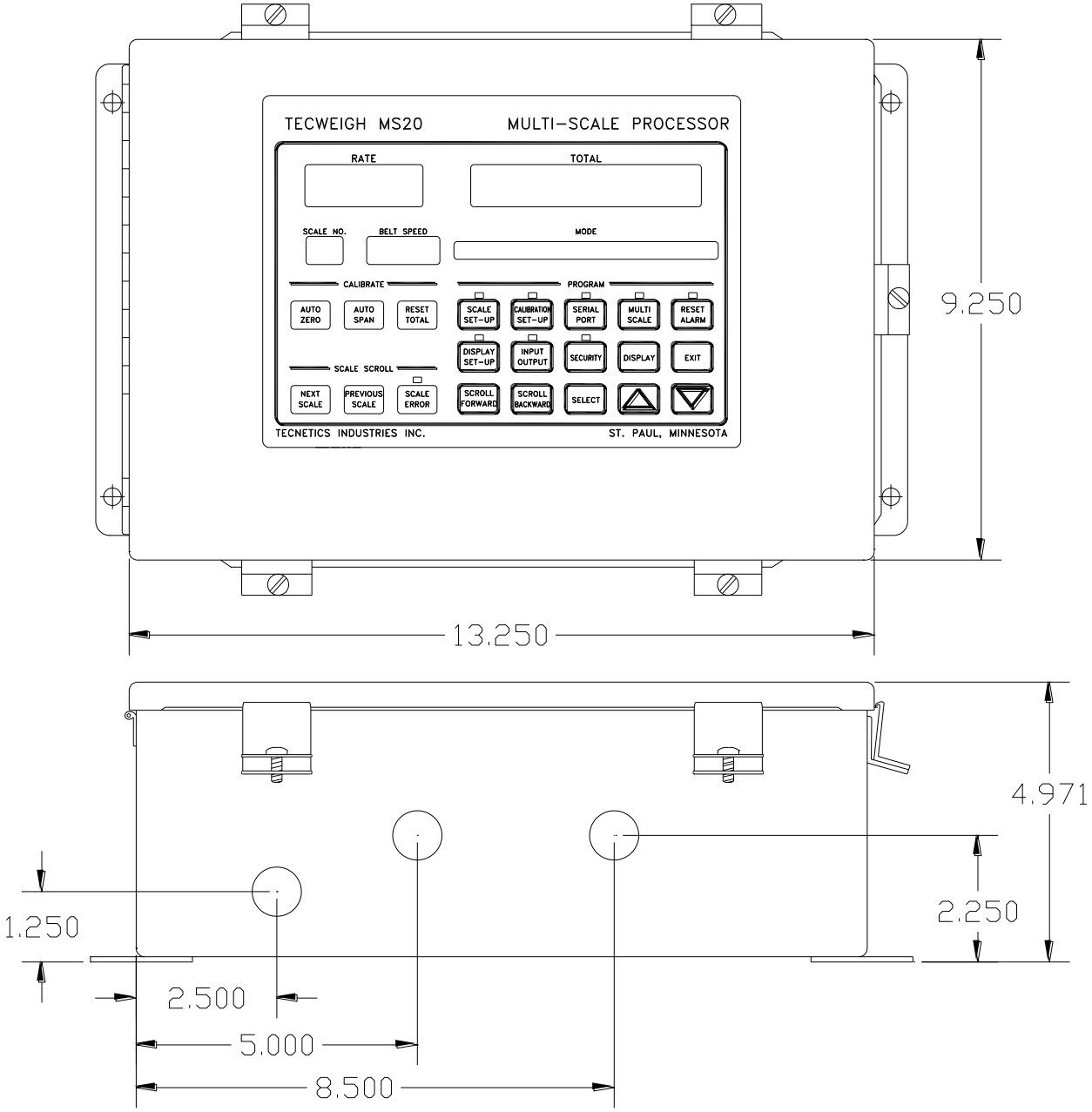
Every WBF is equipped with idler adjustments built into the carrying idlers mounting pocket. They are provided on the weigh idler and the adjacent (+/- 1) idlers. These three idlers, the weigh idler(s) and the two adjacent idlers, are the most critical idlers on the WBF. They should be slightly (1/32" to 1/8") above any other idler on the carrying side of the WBF. The weigh idler(s) should be in line with the +/-1 idlers. By placing a fish line on the outside edges of the critical idlers, this alignment should be maintained to within +/- 1/16".

Avoid the following!

- Badly worn belts and/or splices.
- Joined belts with different thicknesses.
- Poor belt training or alignment.
- Wind, temperature, or vibration extremes.
- Material build-up on the belt, idlers, or calibration weights.
- Idlers with steep trough angles.
- A loosely mounted or unstable weigh belt feeder.
- High belt tension.
- Steep conveyors that allow material to roll back upon itself.
- Poorly adjusted belt skirting or other interference near the scale.

3.07 MS20 Multi-Scale Processor Installation

Mount the MS20 in a reasonably clean area away from severe heat and isolated from vibration. Avoid areas of bright sunlight since the lighted displays might become difficult to read. Where outdoor installation is necessary, the MS20 should be mounted under a “roof” or “dog house” to provide rain and snow protection as well as shade. Be sure to allow room for the enclosure door to swing out. The MS20 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). The mounting dimensions are shown in the following figure. Refer to Section 4.1 for MS20 wiring diagrams and information.



CHAPTER 4 - SYSTEM WIRING

4.00 Wiring Precautions

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

- Only apply input power after assuring all wiring is correct.
- Wiring should be compliant with all applicable electrical codes.
- Input power must be 100 to 240 VAC, 47-63 HZ, 60 watts minimum.
- 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 MS20.
- 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 MS20 Multi-Scale Controller Wiring

If equipment at hand has been custom built by **Tecweigh,** you will find an "as built" wiring diagram at 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. Refer to sections 4.03 to 4.13 for more typical field wiring diagrams. Some MS20 outputs can also be inter-connected with client supplied devices, such as a totalizer or recorder. Consult the field wiring diagrams provided with those specific devices for further information. Section 7.04 defines the Parameter settings required to enable the features of the outputs used.

4.01.1 Scales to MS20 wiring

Communications between the signal conditioner (SC) on the scale carriages and the MS20 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 MS20 and the signal conditioners. 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)).

4.01.2 Terminating resistors (TR)s

Communications line "daisy chaining" necessitates the use of terminating resistors (TR)s, therefore, the issue needs to be discussed here. TRs are 100-120 ohm resistors installed across terminals A and B at the very ends (only at the ends) of a daisy chain. Their function is to absorb signal "bounce" or "echoes" or "reflections". Their use is not always necessary, but when long cable runs are used, it becomes critical that they be properly installed at the ends of the daisy chains. The Tecnetics SC300 (load cell), and SC400 (LVDT) signal conditioner PCBs each have a TR across their communication ports. The MP400 main processor has a TR across the scale communications port, and also across each of the two RS485 ports (used for serial communications). On all three, jumpers exist on the PCBs to take the TR out of the circuit when it's not used (a shunt). On the SC300 the jumper is J4, and on the SC400 the jumper is J2. On the MP400, the scale communications jumper is J4, for the two RS485 serial communications ports they are J11 and J12. If the daisy chain of a particular application looks like the one shown in Section 2.06, then a TR would be used at the WY10 and the MS20 ends. If the MS20 happens to be in the center of the daisy chain, then a TR would be at the end of each chain and none at the MS20. Refer to the figures in Section 10 for the TR jumper locations on the PCBs.

4.01.3 Discrete inputs

The MS20 has a configurable discrete input dedicated to each scale. Scales 1-4 are dedicated to corresponding discrete inputs 1-4 (DI1 through DI4). Each input can be configured to be a remote TOTAL reset, an alarm relay reset, or an interlock. When configured as a TOTAL reset or alarm relay reset, connecting a DI terminal to terminal COM, will either reset the TOTAL to zero or reset an existing alarm condition. When configured as a run interlock, the DI terminal must be connected to COM in order for the MS20 to totalize for that scale, opening or disconnecting the DI terminal from COM will inhibit totalizing. See Section 4.03 for a wiring diagram, and Section 7.07.32 for the configuration Parameter.

4.01.4 Relay Outputs

A configurable single-pole-single-throw (SPST) relay is provided for each of the four potential scales. Each relay can be configured for any of the following functions; a remote totalizer, high/low RATE alarm, high/low BELT SPEED alarm, or as a calibration weight lifter interlock. Scales 1-4 are dedicated to corresponding relays 1-4. The relays 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 amps max.) be used to drive external loads. When higher voltage loads need to be driven, it is recommended that an interposing relay be installed between the MS20 output relay and the load. Two variations of how to wire an interposing relay are shown in sections 4.12 & 13.

Refer to Sections 7.07.33-39 for the relay configuration parameters.

4.01.5 4-20 ma RATE current loop output

The MS20 provides a 4-20 ma (or 0-20 ma) current loop output for each scale which is proportional to the RATE. Scales 1-4 are dedicated to corresponding outputs 1-4. These RATE current loop outputs can be used for driving chart recorders, displays, data loggers, and similar 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 Sections 7.07.27-31 for the configuration of the current loop outputs.

WARNING: **THE CURRENT LOOP OUTPUT IS ACTIVE! THAT MEANS A DC VOLTAGE IS PRESENT AT THE TERMINALS. ENSURE THAT THE LOOP IS CONNECTED TO A PASSIVE LOAD (resistive only) OR DAMAGE WILL RESULT!**

In most systems applications, **current loop isolation is essential** to eliminate induced noise interference, and also to eliminate ground loops (when more than one load is in the loop). The current loop outputs at the PCB are **non-isolated.** Consequently, the MS20 requires current loop (signal) isolators for loop isolation (these can be purchased through **Tecweigh**). Note that if more than one load is driven by a loop, for proper loop operation, all loads in the loop must be isolated except the last one. Proper shield grounding is also essential. The maximum load resistance that can be driven by any single current loop output is approximately 750 ohms, with a maximum voltage of 18.5 Vdc. Refer to the figure in section 4.07 for an example of proper current loop wiring.

4.01.6 HFR output

The High Frequency Rate (HFR) output provides a square wave signal with a frequency equal to 10 times the calculated RATE. This output can be only used for one selected scale, and 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 7.10.57 & 58 for the HFR Parameters.

4.01.7 HFR Polarity output

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.

4.01.8 Serial ports

For RS-232, two RJ-25 modular jack ports are available plus a selectable output (RS-232 or RS-485) at terminals 90-93. 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 serial communication information.

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.

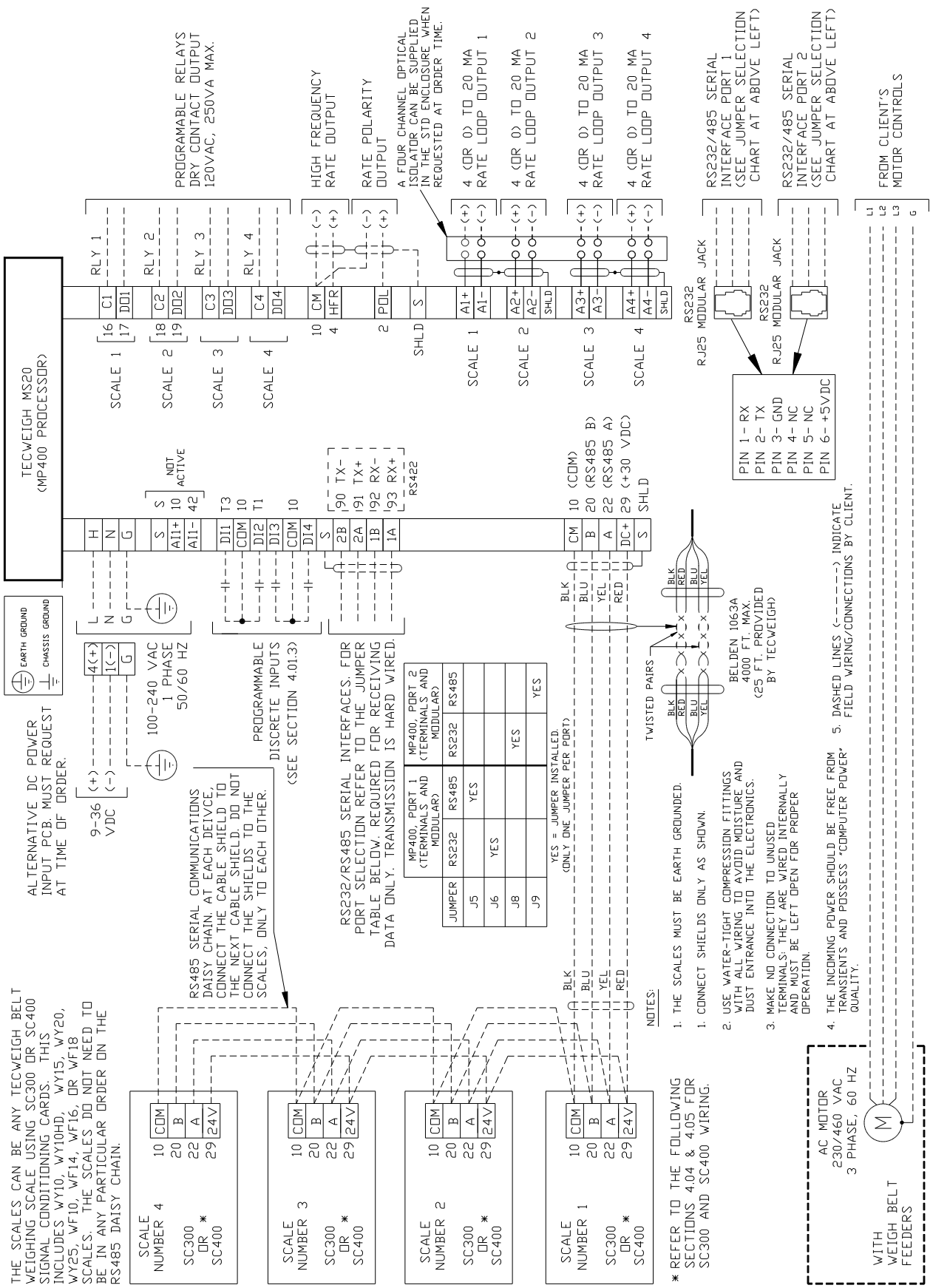
4.02.1 Load Cell Wiring (HY15 & HY25)

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

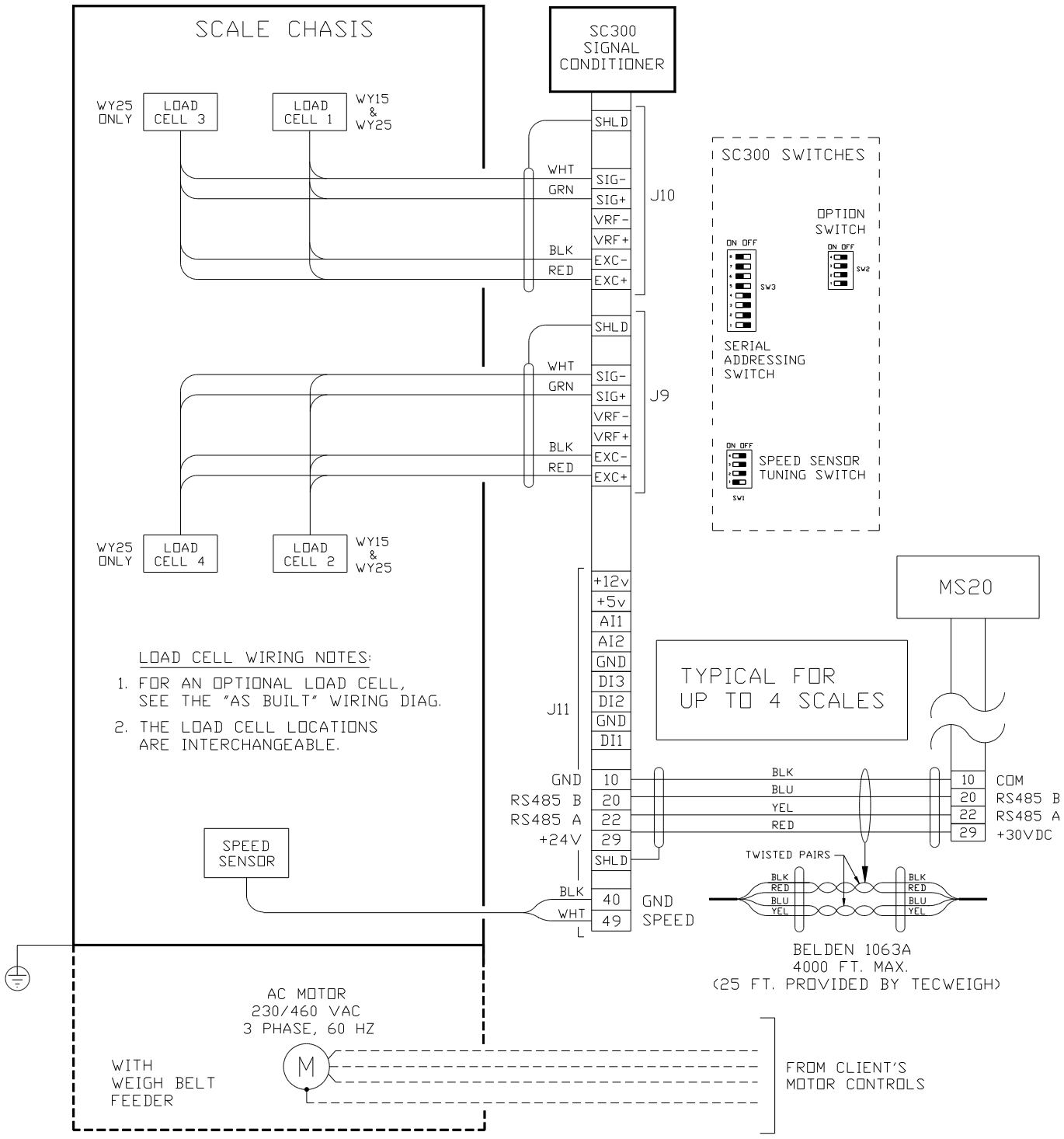
NOTE 1: Remove jumpers J7, and J8 from the SC300 PCB when using any six wire load cell.

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

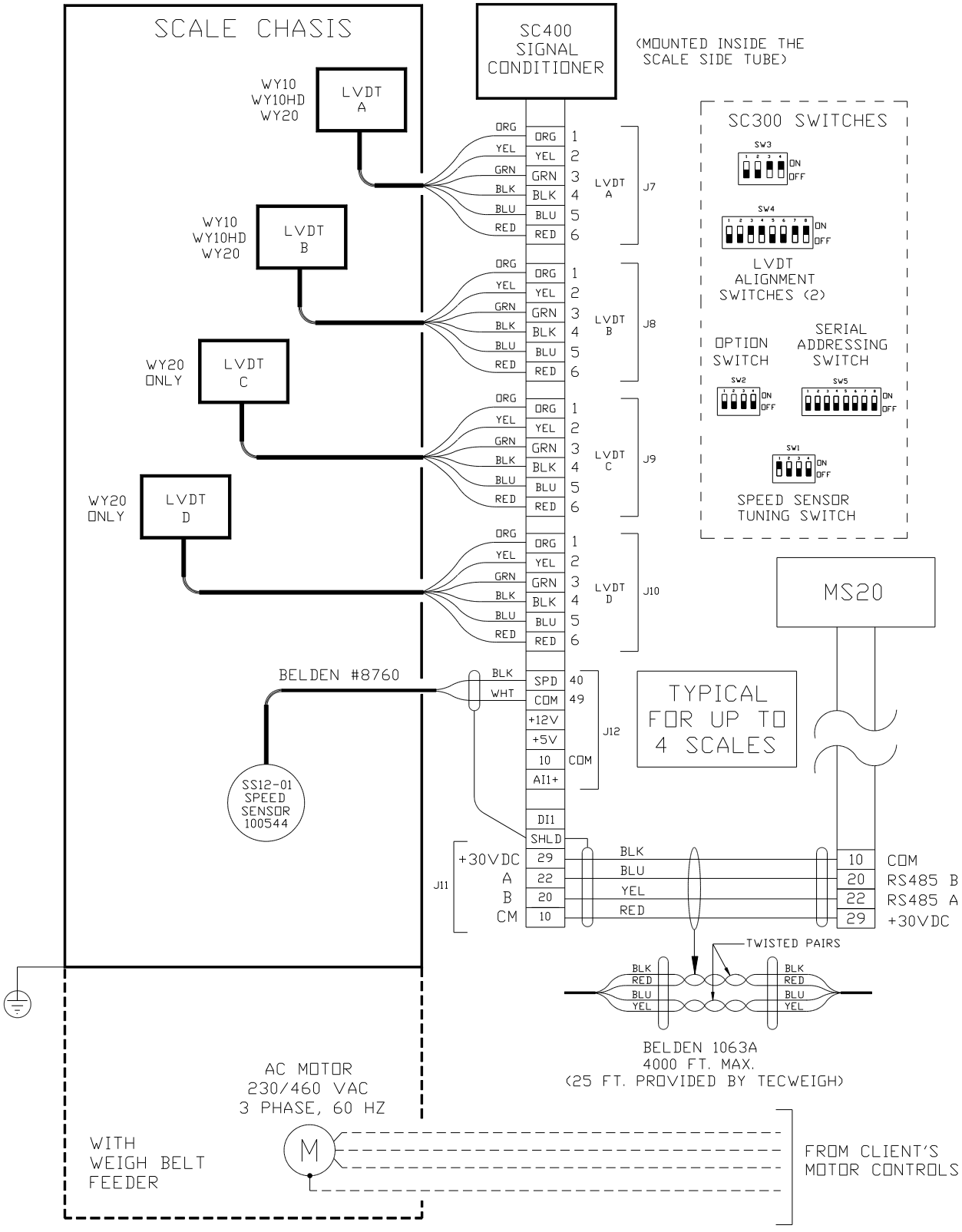
4.03 MS20 Generalized Wiring Diagram



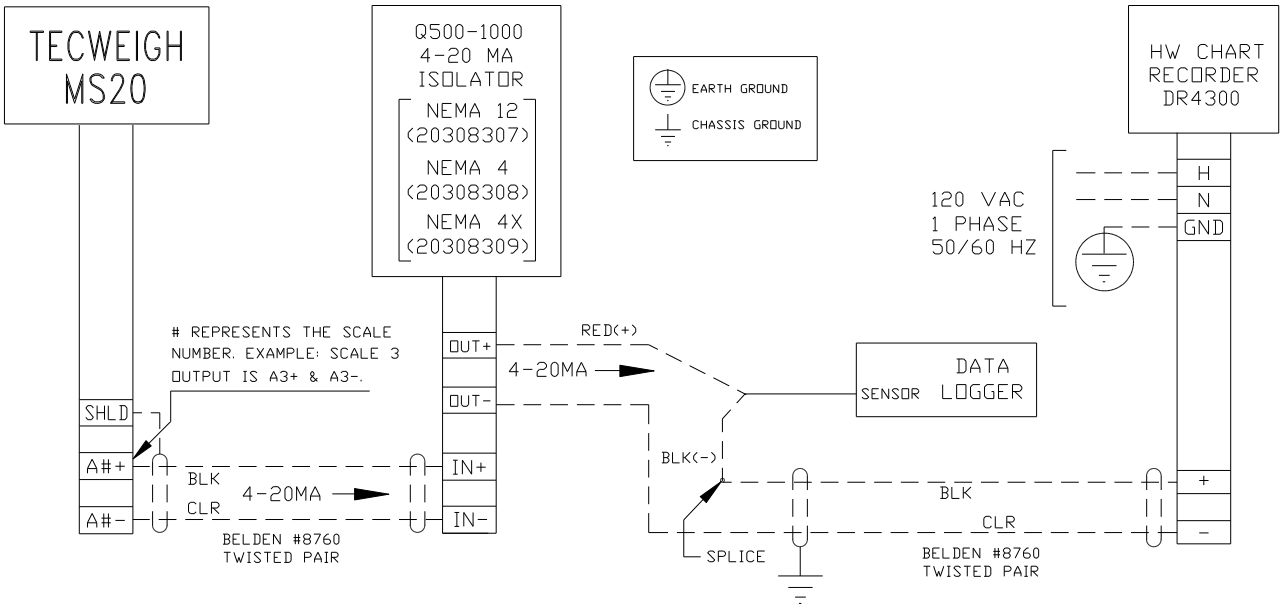
4.04 Load Cell wiring to SC300 (WY15, WY25)

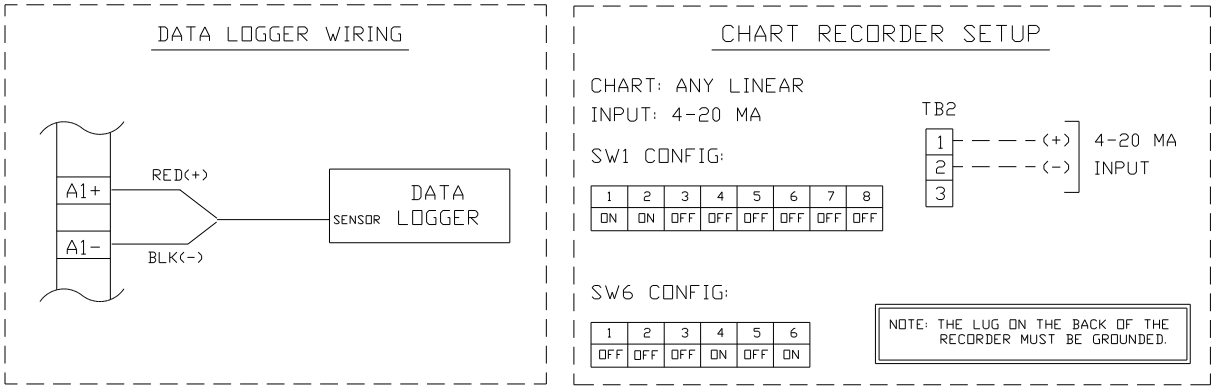


4.05 LVDT wiring to SC400 (WY10, WY20, WY10HD)

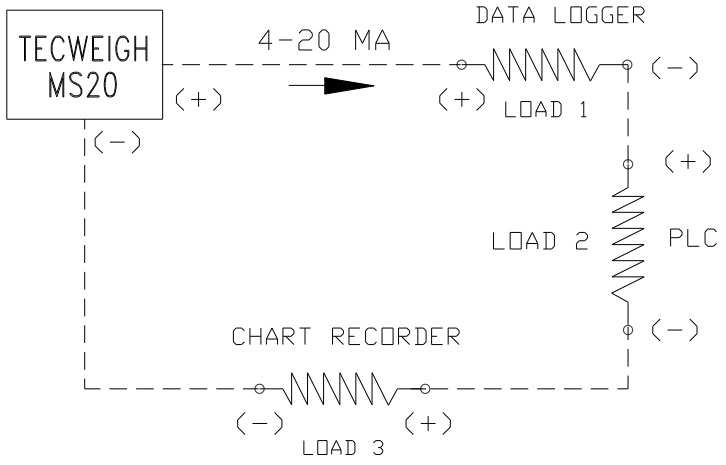


4.06 Chart Recorder & Data Logger (4-20 ma outputs) Wiring





FIELD WIRING FOR A DATA LOGGER &/OR CHART RECORDER UTILIZING THE MS20 4-20 MA RATE OUTPUT. (THE RECORDING DEVICES MUST ACCEPT A 4-20 MA INPUT).

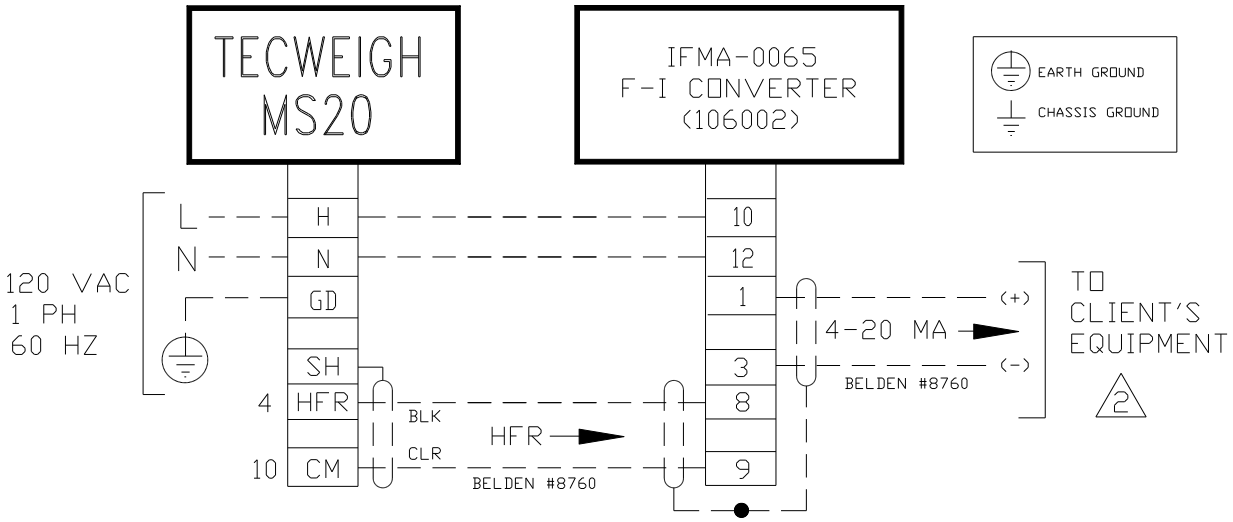


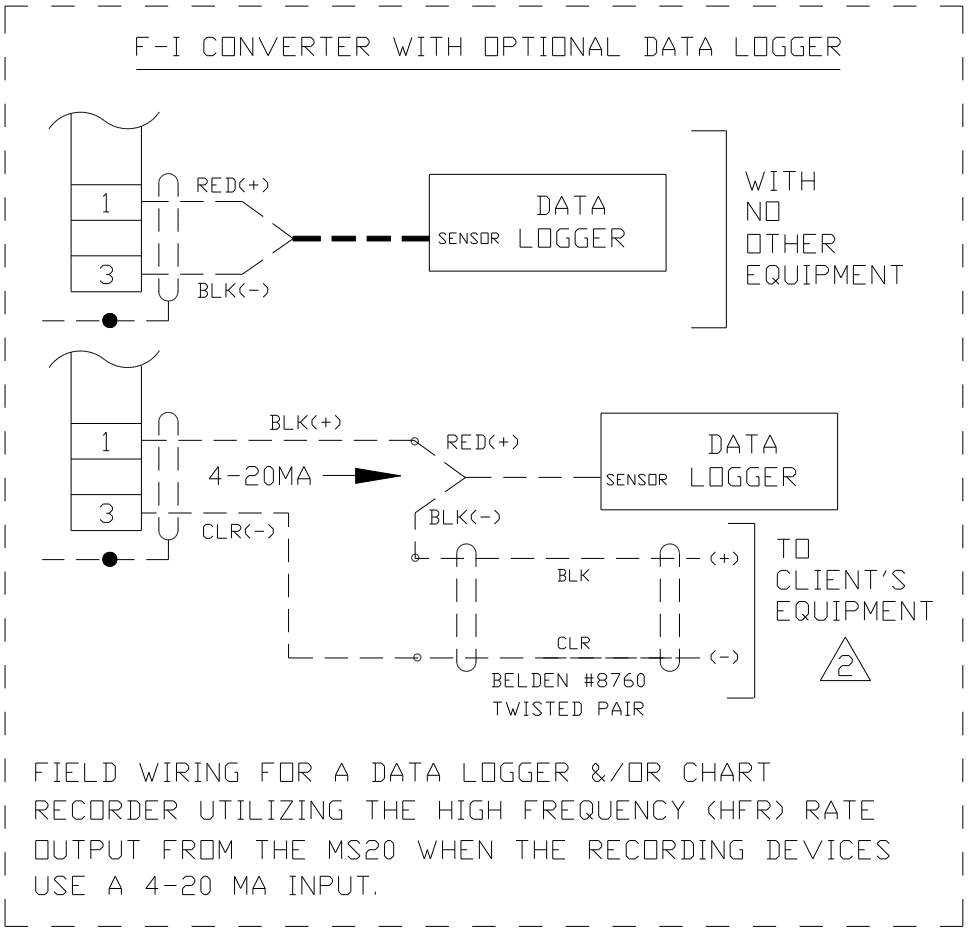
IMPORTANT NOTES:

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.

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

4.07 Chart Recorder & Data Logger (HFR)





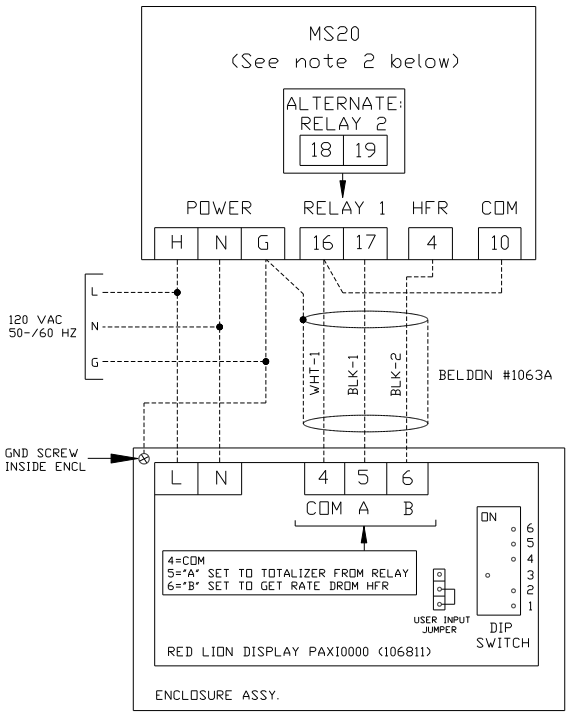
FIELD WIRING FOR A DATA LOGGER &/OR CHART RECORDER UTILIZING THE HIGH FREQUENCY (HFR) RATE OUTPUT FROM THE MS20 WHEN THE RECORDING DEVICES USE A 4-20 MA INPUT.

NOTES:

1. THE MS20 HAS ONLY ONE HFR RATE OUTPUT. TO SELECT WHICH SCALE USES IT, REFER TO THE HFR OWNER PARAMETER (SECTION 7.10.58).

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

4.08 Remote Rate/Total Display

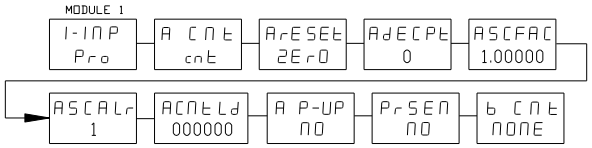


RED LION DISPLAY CHANNEL A: TOTALIZER:

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).

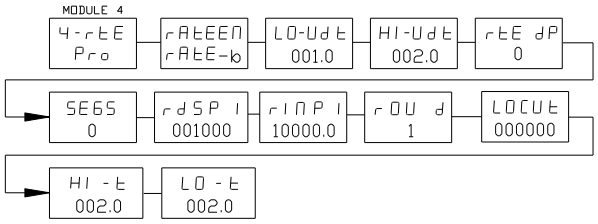
TYPICAL SETUP:



RED LION DISPLAY CHANNEL B: RATE:

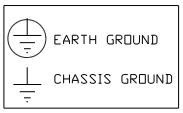
1.) GO TO CONFIGURATION "MODULE 4" IN THE PARAMETER MENU (PAR).

TYPICAL SETUP:

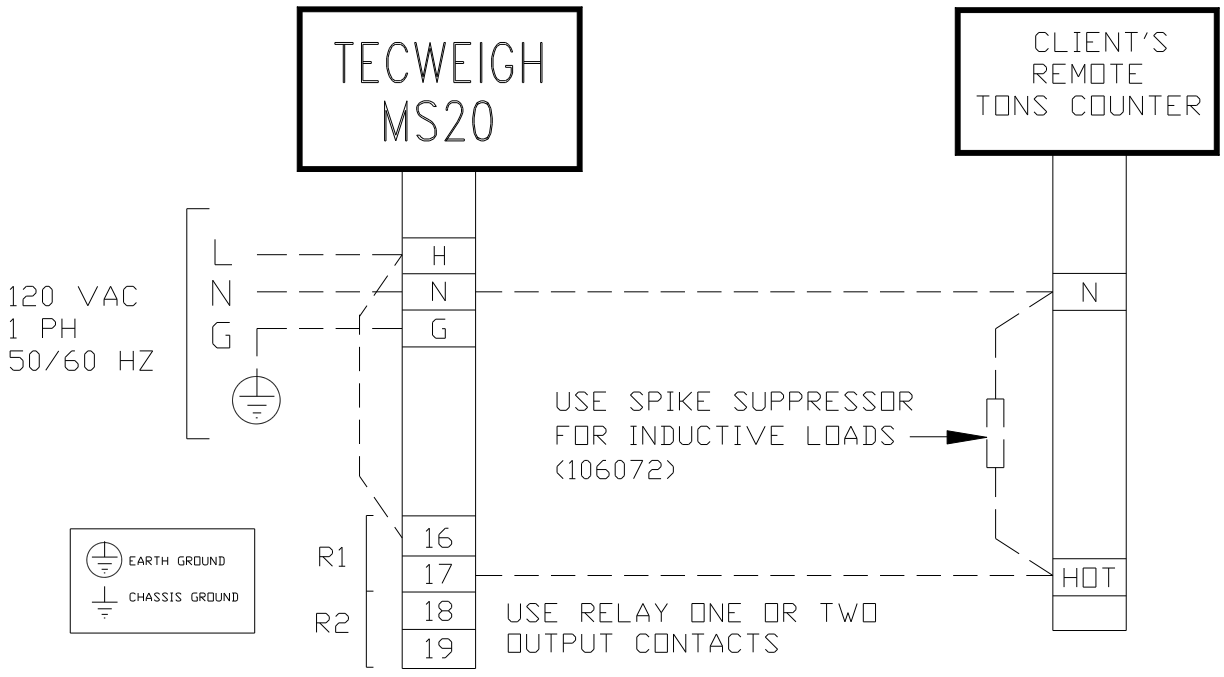


1. THE MS20 HAS ONLY ONE HFR RATE OUTPUT. TO SELECT WHICH SCALE USES IT, REFER TO THE HFR OWNER PARAMETER (SECTION 7.10.58).
2. CONFIGURE THE RELAY THAT IS USED FOR TOTALIZING AS FOLLOWS: (SEE SECTION 7.07).

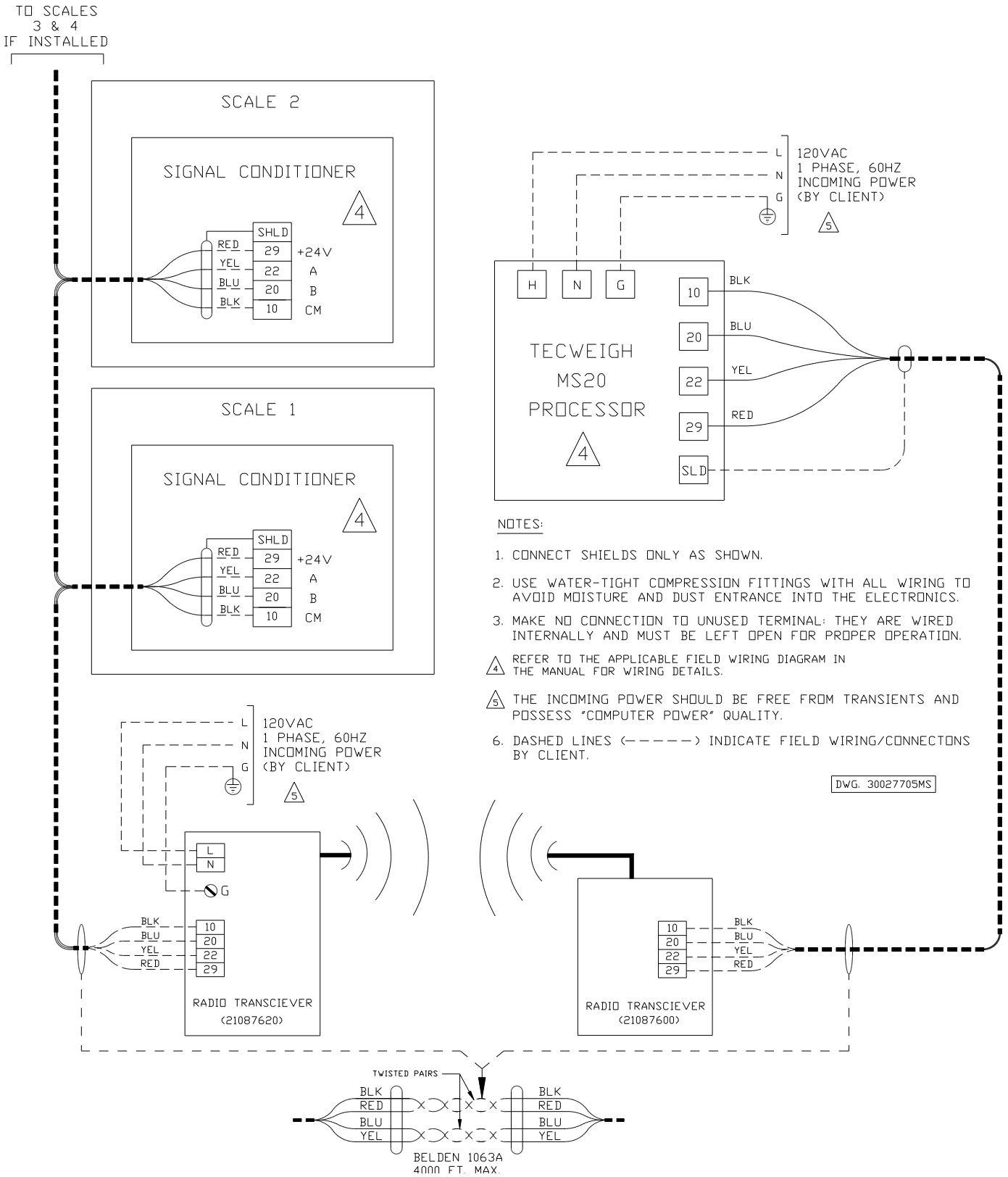
   RLY x func: TPR
   RLY x lgc: N.O.
   RLY x pls: 0.10
   RLY x TS: 1 (or as required)



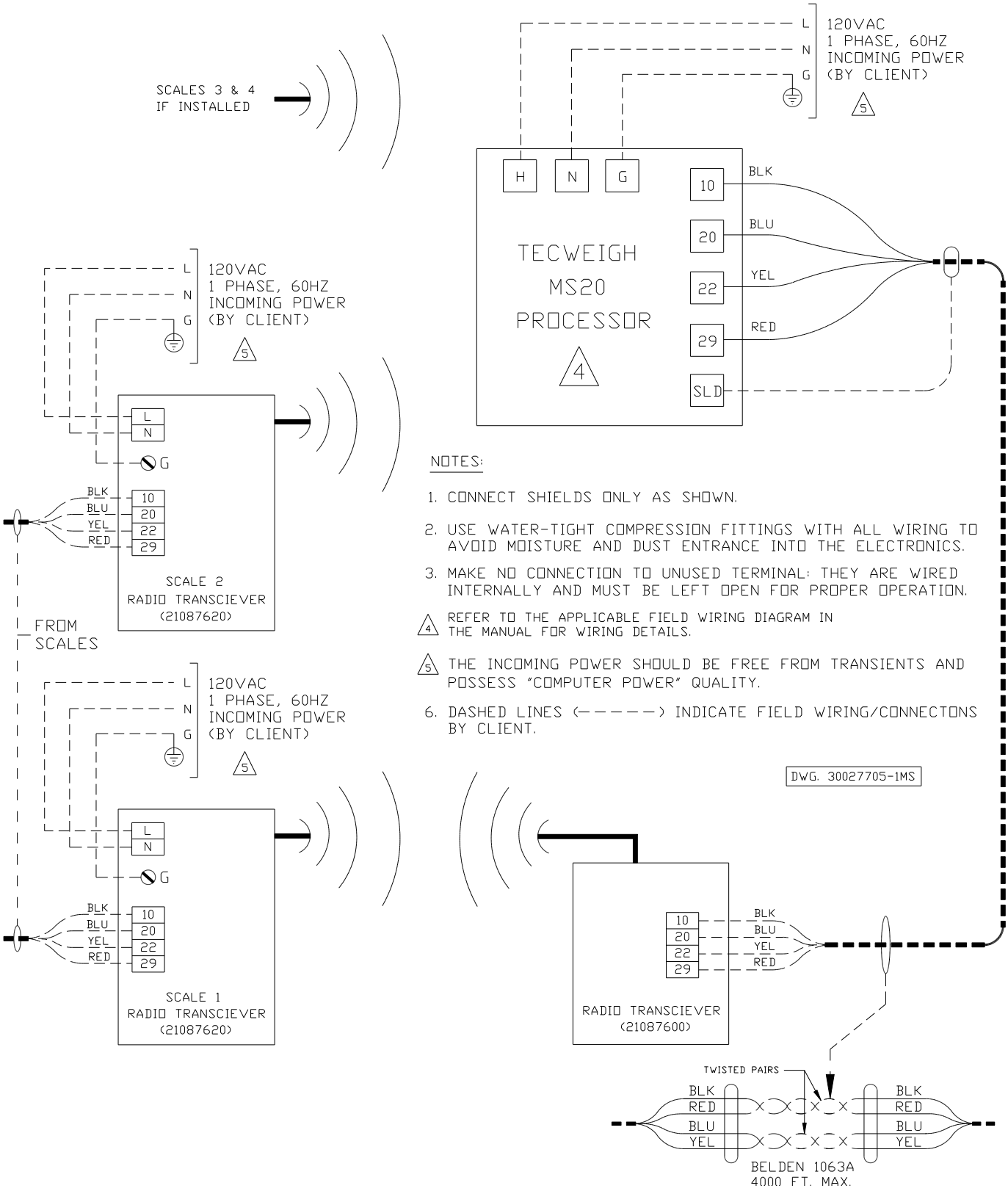
4.09 Remote Tons Counter



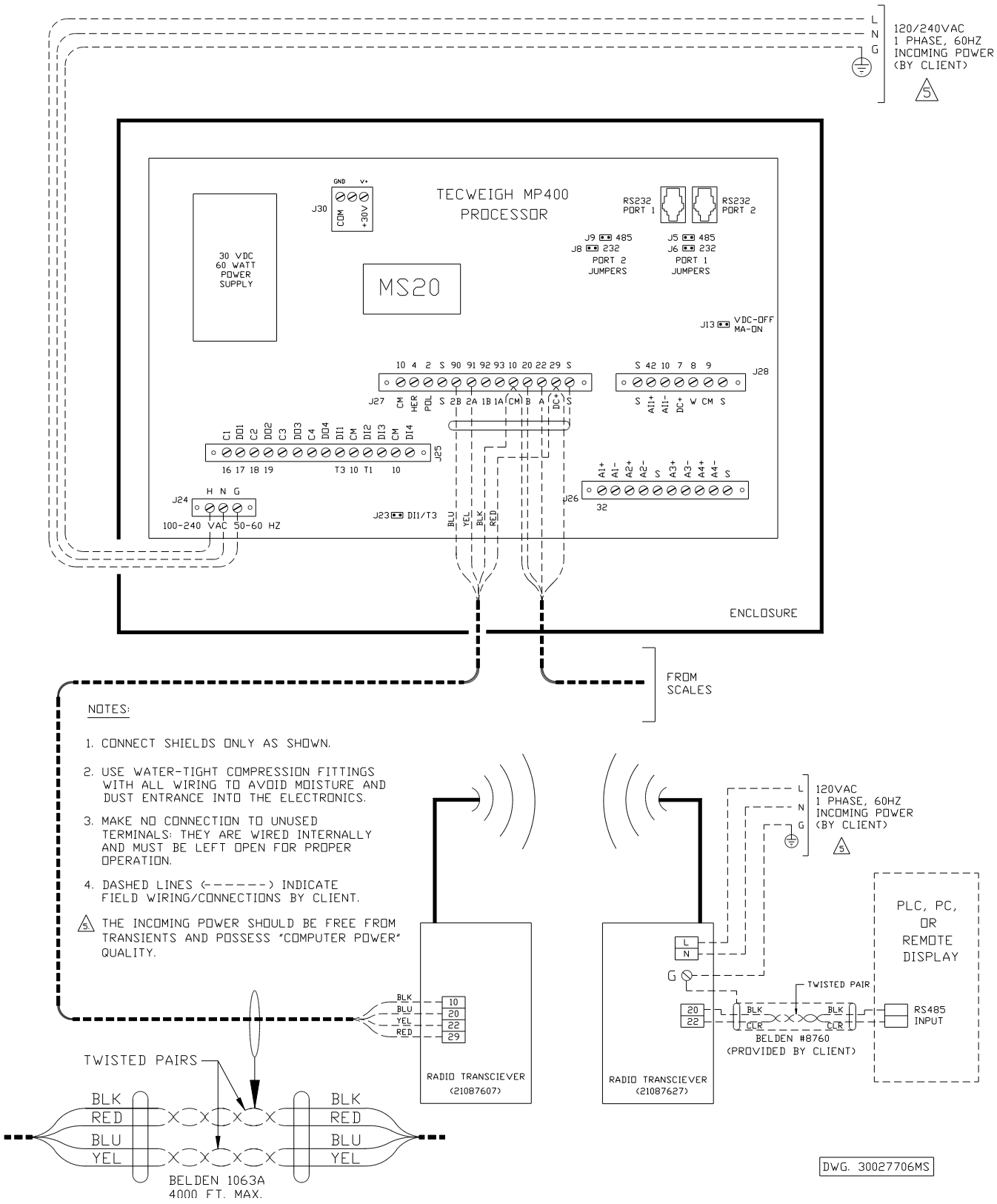
4.10 Radio Transceivers, Local Scales, Single Radio, Remote Processor.



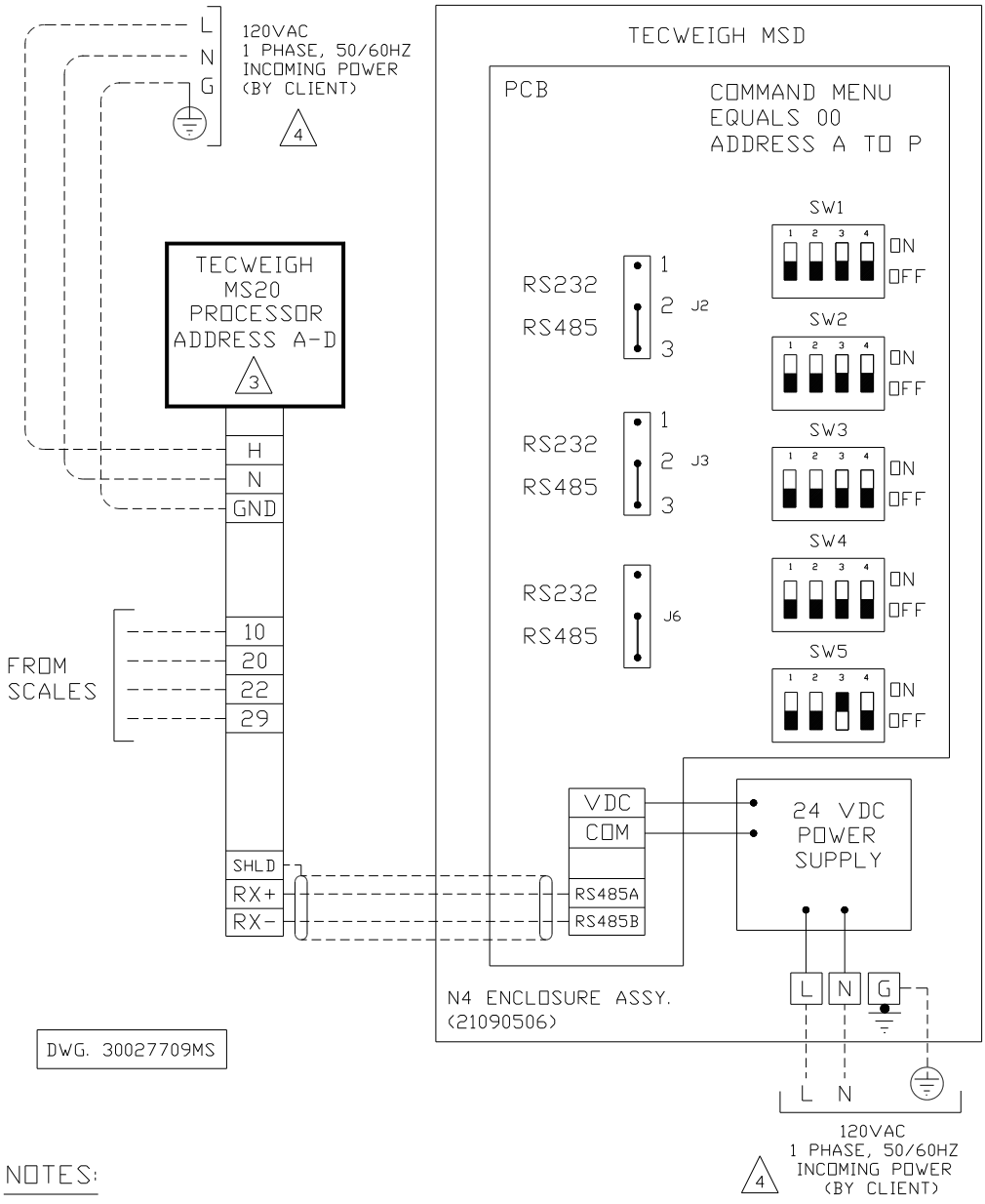
4.11 Radio Transceivers, Local Scales, Separate Radios, Remote Processor.



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



4.13 Multiple Scales to Tecweigh Multi-Scale Display (MSD).



NOTES:

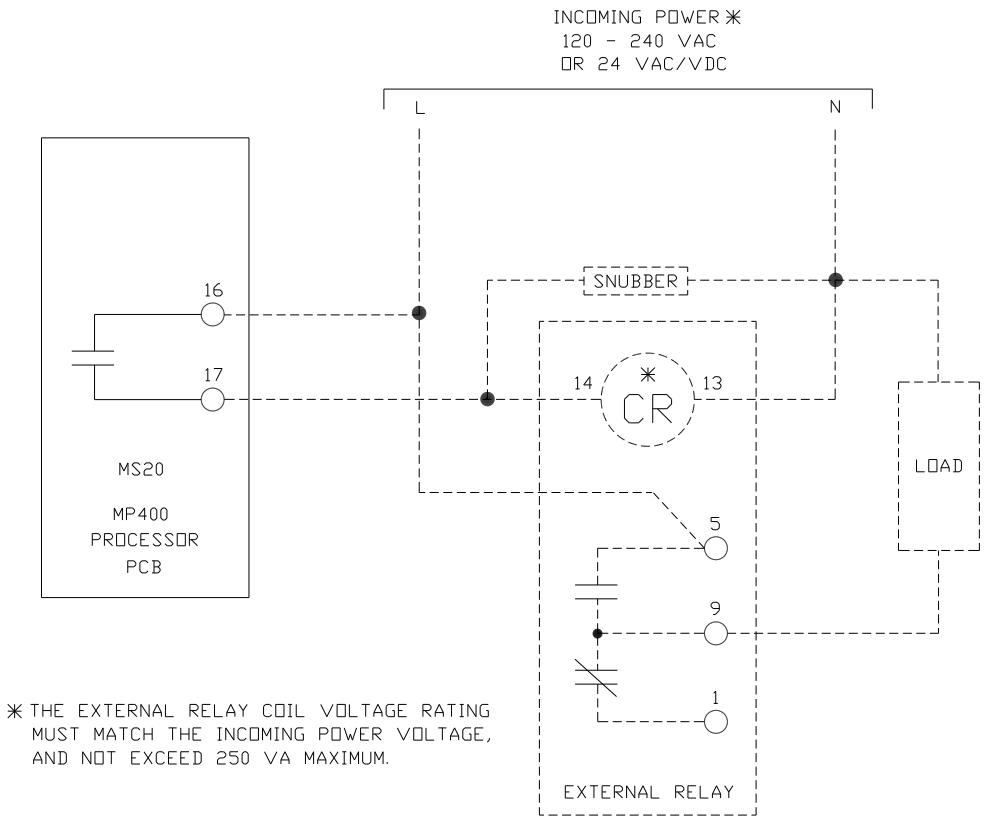
1. CONNECT SHIELDS ONLY AS SHOWN.
2. USE WATER-TIGHT COMPRESSION FITTINGS WITH ALL WIRING TO AVOID MOISTURE AND DUST ENTRANCE INTO THE ELECTRONICS.

△3 REFER TO THE APPLICABLE FIELD WIRING DIAGRAM IN THE MANUAL FOR ADDITIONAL WIRING DETAILS.

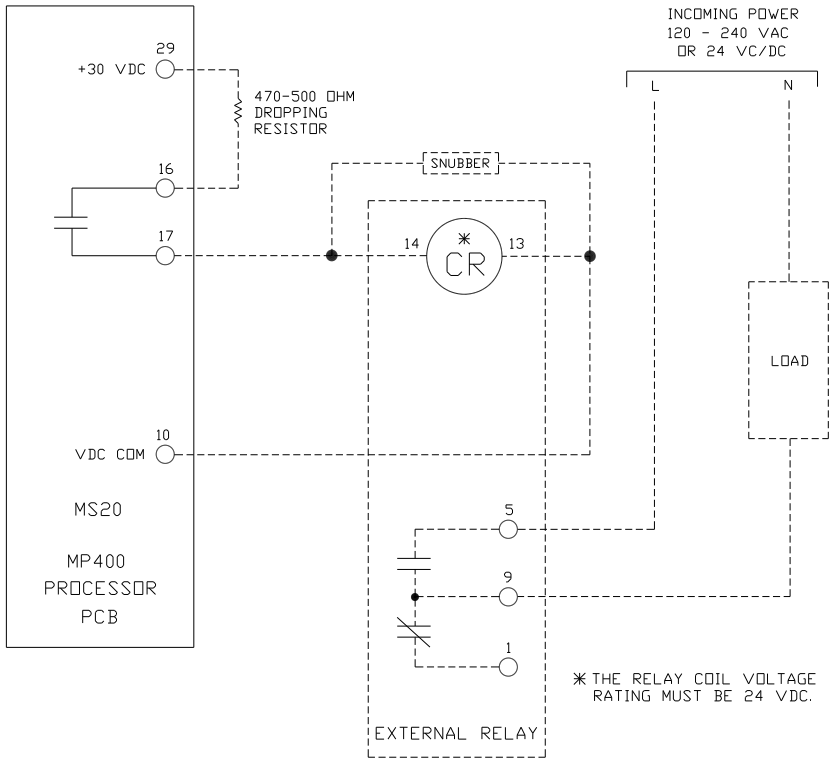
△4 THE INCOMING POWER SHOULD BE FREE FROM TRANSIENTS AND POSSESS "COMPUTER POWER" QUALITY.

5. DASHED LINES (----------) INDICATE FIELD WIRING/CONNECTONS BY CLIENT.

4.14 Interposing Relay Wiring, External 120 vac Power.



4.15 Interposing Relay Wiring, External 30 vdc Power.

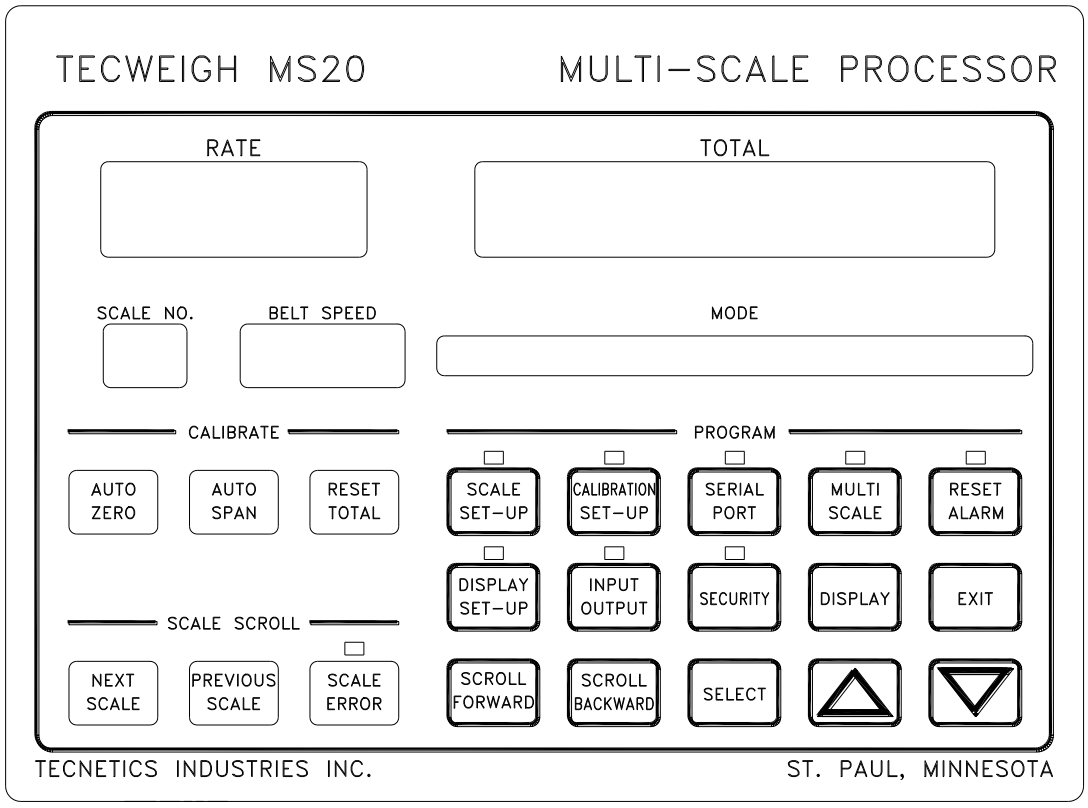


CHAPTER 5 - USER INTERFACE

5.01 The Display and the Focus Scale

At this point, the scale(s) should be installed and the **Tecweigh** MS20 mounted and wired. Now apply power to the MS20. The display windows should light up with information. Since the MS20 has not yet been configured, disregard any error messages or incorrect values on the display.

The display of the MS20 is dedicated to a single scale at any one time. The displayed scale is termed the "focus" scale throughout this manual. The focus scale's number is always displayed in the SCALE NO. window. Refer to the figure below.



5.02 The Window Displays

The following defines the various displays in the windows shown in the previous figure:

RATE -- Displays the RATE at which material is passing over the focus scale.

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

SCALE NO. -- Displays the NUMBER of the focus scale.

BELT SPEED -- Displays the BELT SPEED of the focus scale.

MODE -- There are three different modes that the MS20 can run in. In each mode only certain functions are available and only certain information is displayed as described below.

1) Run Mode -- displays the RATE, UNITS of measure, the BELT SPEED, and the SCALE STATUS messages. The MODE window displays the unit of measure or a description of the focus scale.

2) Program Mode -- displays the Parameters used to set up the processor. Parameters for the focus scale are displayed and can be edited in the MODE window. The Program mode can be entered by pressing any of the seven main menu keys.
3) Simulation Mode – in simulation mode a user determined RATE is displayed which can be used to simulate normal operation. Then, when in Program Mode, this RATE can be used to edit the Parameters that are used to calibrate the outputs.

5.03 Key Descriptions

5.03.1 The Scale Scroll Keys

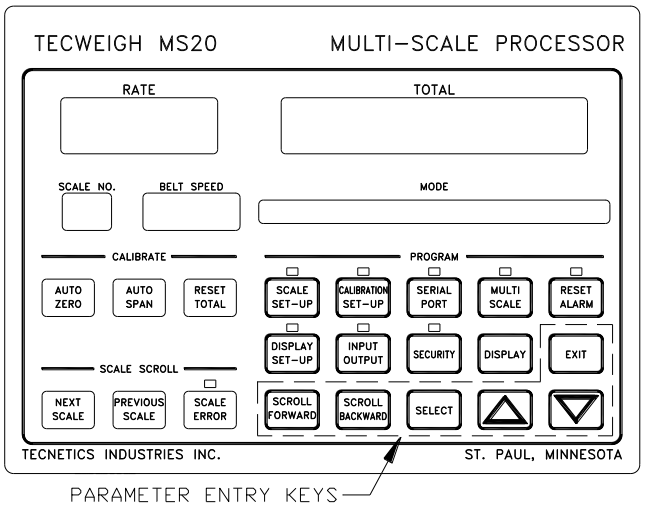
At the lower left corner of the display shown in the previous figure, there are three SCALE SCROLL keys. These keys are used to select the focus scale by scrolling through the active scales. NEXT SCALE and PREVIOUS SCALE keys are self explanatory. While scrolling, the focus scale wraps around from the last scale to the first when using the NEXT SCALE key. The reverse is true when using the PREVIOUS SCALE key.

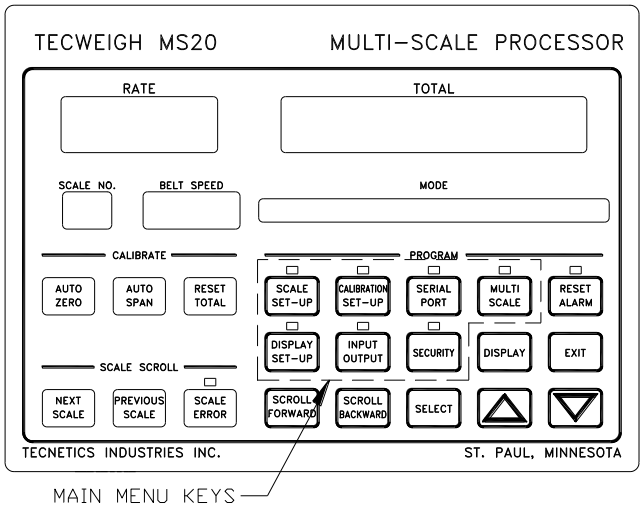
The SCALE ERROR key has a small red LED window above the key. If a non-focus scale has an error, such as a "scale data" error, this LED will illuminate. If this occurs, pressing the SCALE ERROR key will cause the focus scale to be replaced with the scale with the error, and the LED will go out. If more than one scale has an error, the LED will stay illuminated to indicate an additional scale error. When this occurs, repeatedly pressing the SCALE ERROR key will scroll the display through all the scales that have an error status.

5.03.2 The Main Menu Keys

The MS20 is programmed (configured) by accessing seven main menus. Each menu consists of Parameters, and each Parameter is viewable, with most of them being editable. A desired menu is opened by pressing its menu key on the front panel. Refer to the right hand figure below. A small red LED above the key will be lit to indicate that the menu is open and ready to be accessed.

Each scale connected to the MS20 has its own list of Parameter. However, the focus scale is the only scale with viewable Parameters**.** To view another scale's Parameter list, the program mode must be exited by depressing the EXIT key. The desired scale is then made the focus scale by using the SCALE SCROLL keys. The program mode for that scale is then re-entered by pressing the desired menu key.





5.03.3 The Parameter Entry Keys

The Parameter entry key locations are shown on the left side of the preceding figure.

SCROLL FORWARD and **SCROLL BACKWARD** – Once a menu has been entered, to locate a menu item (Parameter), press the SCROLL FORWARD or SCROLL BACKWARD keys until the Parameter appears in the MODE display. All Parameters indicate their current values. Note that not all Parameters will appear, because some are skipped over when the settings of other Parameters make them not applicable.

SELECT - After the desired Parameter is located (see above), use the SELECT key to highlight the Parameter. This will enable the Parameter to be modified. The editable Parameter can be a word or number. If it is a number, pressing the SELECT key accepts the value and highlights the next digit. 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.

While in run mode, pressing the SELECT key will cause the firmware version to be displayed.

ARROWS (Increment and Decrement) - Once the desired Parameter has been located (SCROLL), and enabled (SELECT), use the increasing (UP ARROW) key or decreasing (DOWN ARROW) key to modify the digit. If the Parameter is a word, this will scroll through a list of selections for that specific Parameter. Changes to Parameters are stored automatically when again pressing the SELECT key, which also causes the flashing of the Parameter to cease.

EXIT - The EXIT key is used to exit the program mode and return to normal operation. It is not necessary to press the EXIT key 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.

5.03.4 The Calibrate Keys

The three CALIBRATE keys, AUTO ZERO, AUTO SPAN, and RESET TOTAL, are located at the left center of the display. These three keys affect the focus scale only. Always be aware of what scale is the focus scale before changing Parameters and especially when calibrating.

AUTO ZERO - Initially calibrates the scale to read zero when there is no material running on the belt. An AUTO ZERO calibration might also need to be done after setup to compensate for material build-up, change in belt tension, or other effects that might cause a non-zero RATE when the belt is empty. Refer to Section 8.03.1 for additional information.

AUTO SPAN - Calibrates the scale to a known weight using calibration weights or a calibration chain. See Section 8.03.2 for additional information.

Important! Only one scale can be AUTO ZERO'd and AUTO SPAN'd at a time. No menus should be accessed and the focus scale should not be changed during a calibration.

RESET TOTAL – Resets only the focus scales' TOTAL to zero**.**

Important! Once reset, the previous TOTAL value cannot be recovered.

5.03.5 The RESET ALARM Key

The MS20 is equipped with four configurable relays, each of which can act as High/Low RATE or High/Low BELT SPEED alarms. When using a relay as an alarm output, the option exists to make the alarm condition latch on or not latch on. The Parameter's default setting is Latch, but it can be changed to No Latch. To change the option, go to the MULTI SCALE menu, SCROLL FORWARD to the particular Alarm Relay Parameter, press the up ARROW, change the option, and then press EXIT.

Alarm High/Low Set Points are frequently used to monitor tolerance bands for either the RATE or the BELT SPEED, and then initiate the alarm when either of these values move beyond the band limits.

The relay outputs can be configured to either close (termed normally open - N.O.) or open (termed normally closed - N.C.) when an alarm condition occurs. To change the option, go to the INPUT-OUTPUT menu, SCROLL FORWARD to the particular Rly Logic Parameter, press the up ARROW, change the option, and then press EXIT.

The relays can also be configured to operate only after a time delay. This function is frequently used to filter out spurious alarm signals or to aid in start up sequences. This function is only available under the HLRA and HLSA Parameters. To change the option, go to the INPUT-OUTPUT menu, SCROLL FORWARD to the Rly Func Parameter, press SELECT, press the up ARROW to select either HLRA or HLSA, press SELECT, SCROLL FORWARD to RLY Delay, press SELECT, use the up/down ARROWS to select the time delay value, and then press EXIT.

When an alarm condition occurs, a message will appear in the MODE window as follows:

RATE ALARM - this message indicates either a high or low RATE condition.

SPEED ALARM - this message indicates either a high or low SPEED condition.

Whenever either of these alarms occurs, the small red LED located just above the RESET ALARM key will also illuminate.

The following is only true when the Alarm Relay Parameter is set to Latch:

If an alarm condition occurs and then terminates before the RESET ALARM key is pressed, the MS20 will remain in the alarm state until the operator presses the RESET ALARM key. When the key is pressed, the relay will revert to its pre-alarm state, the small red LED above the RESET ALARM key will go out, and the Mode window display will resume its pre-alarm state. However, if the alarm condition is still present when the RESET ALARM key is pressed and there is a time delay set on the relay, the alarm will disappear for the length of time of the time delay and then re-appear.

5.03.6 The DISPLAY Key

When in run mode, pressing the DISPLAY key momentarily will cause the MODE window display to toggle between the units of measure and the scale description, if one was entered in the Desc Parameter (7.05.11), otherwise the focus scale number will appear (i.e., Scale 1).

When in a menu, the DISPLAY key mimics the SCROLL FORWARD key.

CHAPTER 6 – MULTI-SCALE SET UP

6.01 Initial Set Up

The **Tecweigh** MS20 Multi-Scale Processor was designed to operate in conjunction with **Tecweigh** conveyor belt scales and/or weigh belt feeders. However, it will also work with most other scales on the market. Up to four scales can be "daisy chained" via the RS485 communications protocol. If the installation at hand is a new processor and scales, then they will have been tested at **Tecweigh** and properly set up. When this is the case, the MS20 and scales should need little or no attention. In some cases, however, such as switching an existing scale(s) from a WP20 to the MS20, adding additional scales, or receiving a MS20 replacement part, a more detailed understanding of the MS20 and how it operates is required. The following is intended to increase that understanding.

6.02 Active Scales Parameter

The MS20 must know how many scales to poll for information on the RS485 daisy chain. To enter this information into the MS20, first press the MULTI SCALE key on the key pad. This puts the MS20 in program mode and the first Parameter to appear is Active Scales, with options 1, 2, 3 or 4 to select. If two scales were purchased from **Tecweigh** along with the MS20, then this value will appear as 2. If one or two scales already exist and will be added to the RS485 daisy chain, then the value should be changed to 3 or 4 accordingly.

NOTE: All scales connected to the RS485 chain must have a **Tecweigh** SC300 (load cell(s)) or SC400 (LVDTs) signal conditioner (SC) to interface with the MS20 Multi-Scale Processor. No other product will function properly.

6.03 Station ID

Each scale (i.e. signal conditioner) needs to be assigned its own address (A thru P) and scale number (1 thru 4). This is the Station ID. The address is used by the MS20 to identify the particular scale. The scale number is used to keep track of each scale's display. The focus scale (the displayed scale) always has its scale number displayed in the SCALE NO. window on the MS20 display.

The MS20 continuously polls the SC cards for information in chronological order starting with scale 1, then 2, then 3, then 4, and back to scale one. To enter the Station ID, press the SERIAL PORT key to enter program mode. The options A, B, C….. P, appear. The MS20 is factory set to have scales 1, 2, 3, 4 have station addresses A, B, C, D, respectively. The Station ID Parameter that is displayed is the focus scale's. It is the only Parameter in the SERIAL PORT menu that is specifically the focus scales' data.

There are two very important things to understand about the serial addressing. The first is that there is no relation between the physical location of a scale on the daisy chain and the scale number or its address. Going out from the MS20's communication cable you could have the scales in sequence (1,2,3,4) or out of sequence (4,2,3,1). The second is that the Station ID for each scale is both the identifier for the MS20 and the identifier for data collection through the auxiliary serial ports. For this reason the scales Station ID can also be, if desired, out of sequence in relation to the SCALE NO. For instance scales 1, 2, 3 and 4 could have Station IDs of F, C, P and M. Obviously Station ID's must be unique on any one RS485 daisy chain of processors.

This gives the MS20 an advantage when being added to an existing installation utilizing the auxiliary serial ports for data collection with other **Tecweigh** equipment. There would likely a

number of serial addresses used in existing PLC code which could be costly to change. Being able to randomly select the Station ID/Serial addresses for scales 1, 2, 3 and 4 will allow it to fit into any existing **Tecweigh** data collection system without having to rework existing code.

Setting the Station ID on the signal conditioner cards is straight forward. It is done via dip switch SW3 on the SC300 (load cells), and SW5 on the SC400 (LVDTs). Refer to the following dip switch setting chart. Changes made are interpreted by the micro processor every second, so no power cycle is required for an address change to take place.

SC300, RS485 Serial Addressing								SC400, RS485 Serial Addressing								
	DIP SWITCH - SW3								DIP SWITCH - SW5							
	Pos 1	Pos 2	Pos 3	Pos 4	Pos 5	Pos 6	Pos 7		Pos 1	Pos 2	Pos 3	Pos 4	Pos 5	Pos 6	Pos 7	Pos 8
Station ID "A"	OFF	OFF	OFF	OFF	OFF	OFF	ON	Station ID (serial address) "A"	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
Station ID "B"	ON	OFF	OFF	OFF	OFF	OFF	ON	Station ID (serial address) "B"	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
Station ID "C"	OFF	ON	OFF	OFF	OFF	OFF	ON	Station ID (serial address) "C"	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON
Station ID "D"	ON	ON	OFF	OFF	OFF	OFF	ON	Station ID (serial address) "D"	ON	ON	OFF	OFF	OFF	OFF	OFF	ON
Station ID (serial address) "E"	OFF	OFF	ON	OFF	OFF	OFF	ON	Station ID (serial address) "E"	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON
Station ID (serial address) "F"	ON	OFF	ON	OFF	OFF	OFF	ON	Station ID (serial address) "F"	ON	OFF	ON	OFF	OFF	OFF	OFF	ON
Station ID (serial address) "G"	OFF	ON	ON	OFF	OFF	OFF	ON	Station ID (serial address) "G"	OFF	ON	ON	OFF	OFF	OFF	OFF	ON
Station ID (serial address) "H"	ON	ON	ON	OFF	OFF	OFF	ON	Station ID (serial address) "H"	ON	ON	ON	OFF	OFF	OFF	OFF	ON
Station ID (serial address) "I"	OFF	OFF	OFF	ON	OFF	OFF	ON	Station ID (serial address) "I"	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON
Station ID (serial address) "J"	ON	OFF	OFF	ON	OFF	OFF	ON	Station ID (serial address) "J"	ON	OFF	OFF	ON	OFF	OFF	OFF	ON
Station ID (serial address) "K"	OFF	ON	OFF	ON	OFF	OFF	ON	Station ID (serial address) "K"	OFF	ON	OFF	ON	OFF	OFF	OFF	ON
Station ID (serial address) "L"	ON	ON	OFF	ON	OFF	OFF	ON	Station ID (serial address) "L"	ON	ON	OFF	ON	OFF	OFF	OFF	ON
Station ID (serial address) "M"	OFF	OFF	ON	ON	OFF	OFF	ON	Station ID (serial address) "M"	OFF	OFF	ON	ON	OFF	OFF	OFF	ON
Station ID (serial address) "N"	ON	OFF	ON	ON	OFF	OFF	ON	Station ID (serial address) "N"	ON	OFF	ON	ON	OFF	OFF	OFF	ON
Station ID (serial address) "O"	OFF	ON	ON	ON	OFF	OFF	ON	Station ID (serial address) "O"	OFF	ON	ON	ON	OFF	OFF	OFF	ON
Station ID (serial address) "P"	ON	ON	ON	ON	OFF	OFF	ON	Station ID (serial address) "P"	ON	ON	ON	ON	OFF	OFF	OFF	ON

CHAPTER 7 – THE PARAMETER TABLE

7.01 The Parameter Tables and Settings

The **Tecweigh** MS20 multi-scale controller can retain up to four separate Parameter Tables, one for each scale. The focus scale determines which Parameter table can be entered and viewed, and each Parameter Table contains all the available settings for the specific focus scale (Refer to Section 12.02). Each Parameter Table is divided into seven program menus and any desired menu can be entered by pressing the particular menu key on the key pad. While in a menu, a specific Parameter can be located by pressing the SCROLL FORWARD or SCROLL BACKWARD key. The Parameters in a menu will always appear in a fixed sequence, and all the Parameters of a menu can be viewed and edited, with the exception that some Parameters might not appear, because they are dependent upon the settings of other Parameters that might make them not relevant. Each Parameter should be studied and a value determined and entered that best meets the needs of the application at hand. Editing of all the Parameters is usually not required. For reference, Section 12.02 contains a record of the Parameter values that were entered at the factory for this particular application, however, the factory values should not be relied on entirely! All specific Parameter values that are determined on site and used in the application should be written down in the Parameter Tables for future reference. Finally, it is recommended that the scales be properly calibrated before enabling the optional outputs.

7.02 Scale Specific vs. Global Parameters

The MS20 can control up to four scales or weigh belt feeders at the same time. Consequently, Parameters that only affect a single scale are termed Scale Specific Parameters, and Parameters that affect all active scales are termed Global Parameters. Global Parameters will always appear the same regardless of which scale is the focus scale. The only exception is the Active Scales Parameter in the MULTI SCALE menu. In this case if SCALE NO. 04 is the focus scale, then the value of the Active Scales Parameter cannot be changed to a lesser value, such as 2 or 3.

The SCALE SET-UP, DISPLAY SET-UP, CALIBRATION SET-UP, and the INPUT OUTPUT menus all contain Scale Specific Parameters, therefore, all the Parameters contained in these menus must be set up separately for each scale.

The SERIAL PORT menu is a Global Parameter menu except for the Station ID Parameter. The Station ID Parameter must be unique for each scale.

The SECURITY menu is a combination of Scale Specific and Global Parameters. The Lock Aut Zr, Lock Aut Sp, and Lock Reset Parameters are Scale Specific, whereas, the Lock Code, and Params Parameters are Global Parameters.

The MULTI SCALE menu is the only menu that contains all Global Parameters.

The following sections in this chapter contain further definitions and explanations of all the Parameters in the MS20 menus.

7.03 The Copy Params Parameter

When in program mode, the Parameter values can only be entered for the focus scale, however, a Parameter Table can be copied from one scale to another using the Copy Params Parameter (Section 7.10.61). This Parameter is very useful for increasing the speed of the Parameter entry process, particularly when starting from the default settings. The Copy Params Parameter has 4 options, Dont Copy, To all, To Next, and To Prev. Also see Section 7.10.61.

To use the Copy Params Parameter, enter the SCALE SET-UP menu and configure the Parameters for SCALE NO. 1. Next, press EXIT and then enter the MULTI SCALE menu. Press the SCROLL BACKWARD key once to display the Copy Params Parameter. Now press the SELECT key and then the up ARROW key once and the "To all" setting appears. Now when the EXIT key is pressed, all the Parameters for SCALE NO. 1 will be copied to the Parameter tables of all the other active scales. Each scale's Parameters can then be edited to support its unique characteristics.

Example 1: Assume an MS20 has four WY10 conveyor belt scales connected on its RS485 communications link. The set up of each scale will be the same (Weigh Span, Belt Length, Cal Factor, etc.). The desired decimal place settings for the RATE, belt SPEED, and TOTAL are also the same. So in this case, it would be a huge time saver to copy the Parameters from the scale that's completely set up to the other three scales by utilizing the Copy Params procedure described above. Remember that this procedure is best used at initial set up time, because Copy Params will over-write all the existing Parameters of the other scale(s). The functions of the two other options of the Copy Params Parameter are more obvious, Dont Copy does nothing upon exiting. To Next, copies the focus scale's Parameters to the next scale only, i.e 2 to 3. To Prev, copies the focus scale's Parameters to the previous scale only, i.e 4 to 3.

Example 2: Scale 2 is the focus scale and the Copy Params option To Prev is selected. After the copy is performed, Scale 1 will then have the same Parameter set as scale 2. If To Next is selected, then scale 3 will have the same parameter set as scale 2.

Note: It is very important that the Parameter Table be saved to memory after calibration, or whenever any Parameter change is made. (Refer to the Params Parameter, Section 7.09.51).

7.04 Scale Set-Up Menu (A Scale Specific Menu)

The SCALE SET-UP menu contains Parameters which refer to the actual weighing and calibration functions of the MS20. Parameters such as Cal Wt, Wgh Span, Cal Factor are critical to the accuracy of the weighing system. Listed below are the ten menu items that appear in the SCALE SET-UP Menu.

1) Units: - Selects 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 (tones)). If any English units are selected, then all setup items must use English units and similarly for metric units. Once set up, however, the RATE units can be changed at any time and all calibration related Parameters will be automatically converted to the new units of measure. 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		

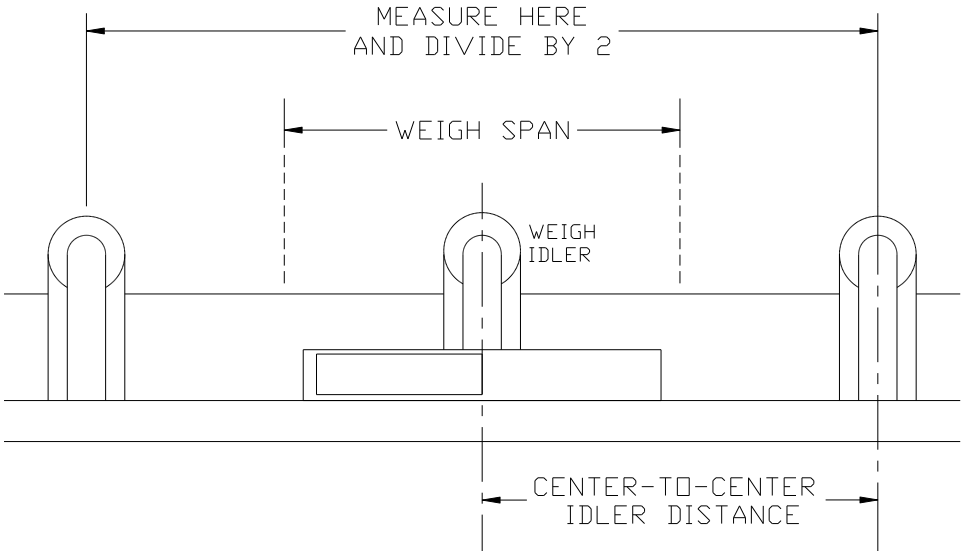
2) Cal Factor: - The calibration factor accounts for physical differences between scale types. Select the appropriate value for the scale model at hand, or select .03 if a calibration chain will be used instead of the calibration weight supplied with the scale.

WY10	.27	WY20	.54
WY10HD	.54	WY25	.36
WY10SHD	.70	WF10	.27/36 (See 12.03.2)
WY15	.36	WF18	.36

3) Cal Wt: - Enter the exact value of the calibration weight. This value is stamped on the end of the calibration weight (in pounds) if one from the factory is being used. Enter the value in pounds when using English units or kilograms when using metric (KG = 0.453 x LBS). Set this Parameter to zero when using a calibration chain instead of a 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. The weigh span equals the distance from the idler before the scale to the idler after the scale divided by 2. The measurement units are inches if using English or meters if using metric. Refer to the following figure.

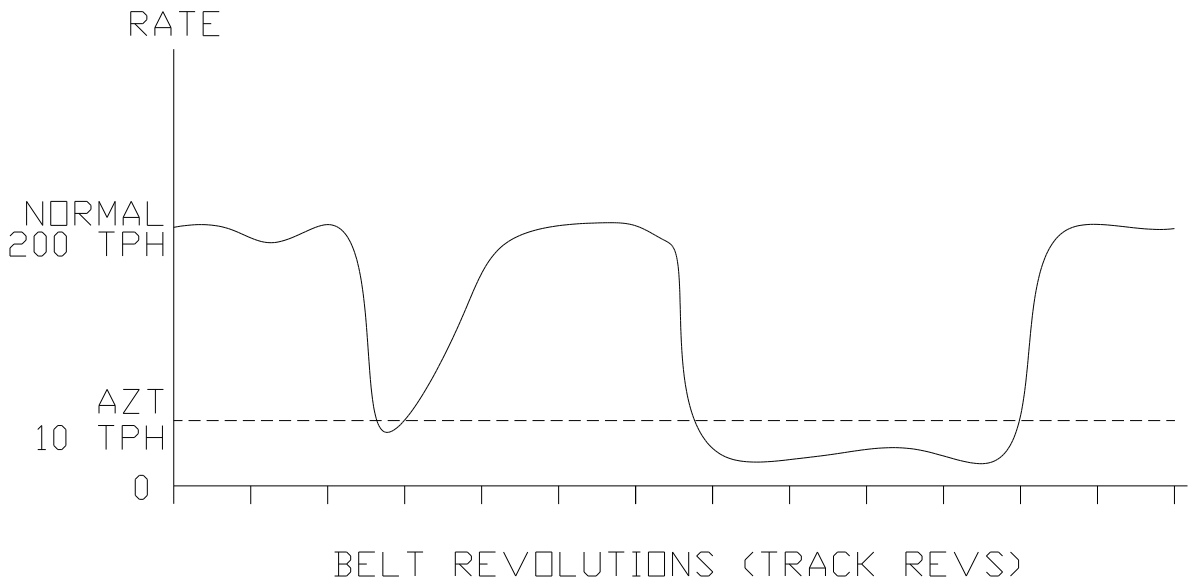


6) Blt Len: - Enter the exact length of the **conveyor belt** in feet if using English or in meters if using metric. Important, do not enter the **conveyor length!** Enter the entire belt length as if it was cut and stretched out flat.

7) 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 MS20 provides two options. The first option simply forces the displayed RATE to be zero (even though it may not be exactly zero) and totalizing stops. The second option actually performs an Auto Zero calibration when the RATE falls below the AZT RATE. Set AZT to zero to disable it, or set AZT to about 5% of the normal running RATE to enable the feature. If the running RATE is typically low, it is

recommended that the AZT be left disabled (= 0). **To avoid complications, leave AZT set to zero when first setting up the system.**

8) 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 and 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.

9) Zero Revs - When AUTO ZERO is pressed, the MS20 will zero the scale. For this Parameter, enter the number of belt revolutions to be used for an Auto Zero cycle. In general, the more time (more belt revolutions) allowed for an AUTO ZERO cycle, the more accurate it will be. While the Auto Zero cycle is being performed, the MS20 spends time “learning” about the belt splices and other inconsistencies in the system. Enter a value that allows at least two minutes of run time. AUTO ZERO is discussed further in the Calibration Section 8.03.1.

10) Span Revs - When AUTO SPAN is pressed, the MS20 will re-span the scale using the calibration weight(s) or a calibration chain. Enter the number of belt revolutions to be used for an AUTO SPAN cycle. In general, the more time (more belt revolutions) allowed for an AUTO SPAN cycle, the more accurate it will be. Enter a value that allows at least 2 minutes of run time. AUTO SPAN is discussed further in Calibration Section 8.03.2.

7.05 Display Set-Up Menu (A Scale Specific Menu)

11) Desc: - This Parameter permits identifying the different scales by more specific descriptive names instead of 1, 2, 3 and 4. The field is limited to 17 characters, with the following characters available starting with the current selection. a b c d e f g h i j k l m n o p q r s t u v w x y z "space" ! # $ % & ' ( ) * + , - / 0 1 2 3 4 5 6 7 8 9 A B C D E F G H I J K L M N O P Q R S T U V W X Y. To initiate a description, first press the DISPLAY SET-UP key and then the SELECT key. Each character can then be selected using the ARROW keys. Move to the right by pressing SELECT key. Holding down the keys for approximately 3 seconds will start a rapid scroll of the selections for faster set up.

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 look 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 look like ------- .

15) Speed Damp: - Enter the Damping Factor for the belt SPEED display. Damping makes the SPEED 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. SPEED damping does not affect the RATE, TOTAL, or the accuracy of the system. Note that the higher the damping, the slower the SPEED display will update after changes occur in the actual SPEED. A typical value for Rate Damp is 30. Set to zero to turn off damping.

16) Speed Spn: - Speed Spn is used to calibrate the belt SPEED if the MS20 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 look like -------- .

18) Down Count: - This Parameter 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:

NO	disables down counting.
YES	enables down counting.

7.06 Calibration Set-Up Menu (A Scale Specific Menu)

19) P/P Wt: - The Pre/Post weight is used for a material test calibration. It should be set at zero if this is a first time setup. During calibration, material will be dispensed into a truck and then weighed on a stationary scale. The stationary scale weight will then be entered in the P/P Wt Parameter. The MS20 TOTAL and the stationary scale weight total will be compared and a tuning adjustment made. This test is discussed further in Section 8.03.3.

20) ASC: - After the MS20 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 8.03), the ASC value can be manually increased or decreased to finely tune the displayed RATE. Alternatively, a material test can be done (Section 8.03.3) 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 MS20 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 Chapter 10, Troubleshooting.

21) Load Count: - For technical trouble shooting purposes, the MS20 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).

22) Zero Count: - 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).

23) Span Count: - 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).

24) Span Detct: - 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.

7.07 Input Output Menu (A Scale Specific Menu)

The Input Output (I/O) Menu is used to set-up and calibrate the MS20's I/O capabilities. For example, relay outputs might be programmed (configured) to operate as HIGH and LOW alarms. Other applications might require remote reset capabilities or a PLC interface. This Section lists all of the I/O functions available in the MS20 (excluding the serial ports, refer to Chapter 9).

25) Simulation: - When in Simulation mode, the MS20 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 #26 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.

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

27) mA Damp - Enter the damping factor for the RATE current loop output, 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.

28) Base mA: - Enter the RATE current loop output value desired 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.

29) Rate 20mA: - This Parameter sets the RATE that corresponds to a current output of 20 mA. 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.

30) Rate LTrm: - This Parameter allows fine tuning of the Base mA output Parameter. 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.

31) Rate HTrm: This Parameter allows fine tuning of the Rate 20mA Parameter. 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.

32) Digital In: - This Parameter selects the function of the four digital (discrete) inputs, one for each scale. Scale 1 is input 1, scale 2 is input 2, etc. The following four selections are available for each input:

Not Used – When selected, the input provides no function.

Reset TOTAL – When the input is shorted to com momentarily, the TOTAL is reset.

Reset Alarm – When the input is shorted to com momentarily, alarms are reset. This is only effective if the relay(s) are used as alarms and they are set to Latch when an alarm occurs.

Interlock – When the input is shorted to com, the processor will totalize normally, but if the input is open, totalizing is inhibited.

33) RLY Func: – Each of the four relays can perform four different functions defined as follows. Select the function desired.

TPR - Total Pulse Repeater - The relay contact closes at increments of the TOTAL.

HLRA - High/Low RATE Alarm - The relay is activated when the RATE is outside a specified range.

HLSA - High/Low SPEED Alarm - The relay is activated when the SPEED is outside a specified range.

SPAN - Auto Span output – The relay is activated during an Auto Span to lower or raise the calibration weight(s).

Note: the following relay Parameters will appear only when its above associated relay function is selected. All use the Rly Logic Parameter.

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

34) RLY Logic: - 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.

35) RLY 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 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.

36) RLY TS: - When TPR is selected, enter the frequency of the relay pulse or the "TOTAL scaling". For example, set RLY TS to 1.00 to close the relay every 1 ton. Set to .01 to close the relay every .01 tons. If RLY TS is set too small and the RATE is too high, there will not be enough time to open and close the relay. Initially, it is best to set it so the relay closes once every few seconds.

37) RLY Low: - When HLRA is selected, enter the lowest RATE allowed before the low RATE alarm relay is activated. When HLSA is selected, enter the lowest SPEED allowed before the low SPEED alarm relay is activated.

38) RLY High: - When HLRA is selected, enter the highest RATE allowed before the high RATE alarm relay is activated. When HLSA is selected, enter the highest SPEED allowed before the high SPEED alarm relay is activated.

39) RLY 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 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.

7.08 Serial Port Menu (A Scale Specific & Global Menu)

40) Station ID: - This is a scale specific Parameter. When using the MS20's serial communication features, each scale must have a unique Station ID (or address). Station ID's are designated A through P. Select a different station ID from A to P for each scale.

41) Parity: - This is a global Parameter. When using the MS20's serial communication features, select the same parity as the remotely connected communications device. The selections are None, Odd, or Even. Serial ports A & B have the same Parity.

42) Baud Rate: - This is a global Parameter. When using the MS2'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. Serial ports A & B have the same Baud Rates.

43) Cmd Menu A: - This is a global Parameter for serial ports A. The MS20 can transmit data to remote devices via serial ports A either automatically (every $1/10^{th}$ second) or upon request (manually). If it's to be done automatically, the data to be transmitted must be pre-selected from the Command Menu listed in Section 9.02 (Commands 01 through 22) and entered here.

If a remote device will send a request for data to the MS20, then Cmd Menu B must be set to 00 (manual). Refer to Section 9.03 for details on how to remotely request data from the MS20.

44) Port A Scale: - This is a global Parameter for serial ports A, and has effect only when serial ports A are used in the automatic transmit mode (Cmd Menu A Parameter selections 01 to 22). The options available are 0, 1, 2, 3 and 4. When 0 is selected, serial ports A advance consecutively through the active scales and transmits the information determined by the Cmd Menu A Parameter.

For example, if there are four active scales, and Cmd Menu A is set to 01 (RATE), and this Port A Scale Parameter is set to 0, then the serial ports would send out scale 1's RATE, scale 2's RATE, scale 3's RATE, scale 4's RATE, scale 1's RATE, etc. If 1, 2, 3, or 4 are selected, then serial ports A would continuously send out the selected scale's RATE information every 1/10 second.

45) Cmd Menu B: - This is a global Parameter for serial ports B. The MS20 can transmit data to remote devices via serial ports B either automatically (every $1/10^{th}$ second) or upon request (manually). If it's to be done automatically, the data to be transmitted must be pre-selected from the Command Menu listed in Section 9.02 (Commands 01 through 22) and entered here.

If a remote device will send a request for data to the MS20, then Cmd Menu B must be set to 00 (manual). Refer to Section 9.03 for details on how to remotely request data from the MS20.

46) Port B Scale: - This is a global Parameter for serial ports B, and has effect only when serial ports B are used in the automatic transmit mode (Cmd Menu B Parameter selections 01 to 22). The options available are 0, 1, 2, 3 and 4. When 0 is selected, serial ports B advance consecutively through the active scales and transmits the information determined by the Cmd Menu B Parameter.

For example, if there are four active scales, and Cmd Menu B is set to 01 (RATE), and this Port B Scale Parameter is set to 0, then the serial ports would send out scale 1's RATE, scale 2's RATE, scale 3's RATE, scale 4's RATE, scale 1's RATE, etc. If 1, 2, 3, or 4 are selected, then serial ports B would continuously send out the selected scale's RATE information every 1/10 second.

47) Protocol: – This is a global Parameter. When making a remote (manual) request for data from the MS20 via the serial ports, 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 installations should use Tec Old. The request for data formats are the same for either protocol. Refer to Section 9.04 for further details.

7.09 Security Menu (A Scale Specific & Global Menu)

The Security Menu provides a high level of security for the MS20.

To prevent unauthorized use, the following four Parameters allow locking the AUTO ZERO, AUTO SPAN, AND RESET TOTAL keys, and also entering a Lock Code (password) to prevent entry into the menus. Note that once a Lock Code has been entered, all five digits of the Lock Code must be acknowledged before access is allowed, even if four of the five digits are zero. Once a menu has been accessed using the Lock Code, however, all the menus are accessible until the EXIT key is pressed.

IMPORTANT: After a Lock Code has been entered, the power to the MS20 must be disconnected and reconnected for the entry to take effect.

Note that the three keys can be locked without entering a Lock Code, however, the Security menu can then be entered and the keys unlocked.

Example 1: If the Lock Aut Zr Parameter (7.09.48) is set to Yes, then when the AUTO ZERO key is pressed, the message AUTO ZERO LOCKED will appear and the key will not function.

Example 2: If the Lock Aut Sp Parameter (7.09.49) is set to Yes, and a Lock Code (password) is entered into the Lock Code Parameter (7.09.51), **and the power recycled**, then when the AUTO SPAN key is pressed, the message AUTO SPAN LOCKED will appear and the key will not function. Also, the menus cannot be accessed without first entering the Lock Code.

48) Lock Aut Zr: - This is a scale specific Parameter that protects the AUTO ZERO key from unauthorized use. The selections are No or Yes. Select YES to protect the key from unauthorized use. The default is No.

49) Lock Aut Sp: - This is a scale specific Parameter that protects the AUTO SPAN key from unauthorized use. The selections are No or Yes. Select YES to protect the key from unauthorized use. The default is No.

50) Lock Reset: - This is a scale specific Parameter that protects the RESET TOTAL key from unauthorized use. The selections are No or Yes. Select YES to protect the key from unauthorized use. The default is No.

.

51) Lock Code: - A Lock Code (password) can be entered into the MS20 to prevent unauthorized access to the menus. When a Lock Code is being entered, note that all five digits must be acknowledged, even if they are left at zero. 00000 disables the Lock Code, which is also the default setting, and no menus are then locked out.

52) Params: - This is a global Parameter. This Parameter allows the user's Parameter Tables to be saved to and retrieved from memory, thereby allowing their restoration if they are inadvertently erased or corrupted due to a battery failure or an electrical spike. It also allows the retrieval of the default Parameter Tables if necessary. The selections are:

No Change - when selected, nothing will change.

Store Now - when selected, all the user's Parameters for the focus scale will be saved to memory along with the last calibration data. This needs to be done whenever a change is made 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 for the **focus scale** will be retrieved. Upon exiting Program Mode, the MODE window will display "MEMORY RESTORED".

Get All Users - when selected, all the user's Parameter values that were previously entered for **all connected scales** 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 Tables be immediately saved to memory using the Store Now Parameter.

Note: If it's impossible to enter any Parameter, it usually means that the firmware has been corrupted. The only remedy in this case is to return the printed circuit board (PCB) to **Tecweigh** to be "reflashed". Contact the **Tecweigh** Service Department (Section 2.01) for assistance.

7.10 Multi Scale Menu (Global Menu)

53) Active Scales: - The MS20 is capable of controlling a single scale as well as controlling four scales at the same time. This Parameter specifies the number of active scales that are connected to the MS20's RS485 communications network (daisy chain). If two scales were initially on the daisy chain and a third is added, simply change this Parameter to 3, add the scale to the end of the existing daisy chain, and then go to SCALE NO. 3 and enter its Parameters (or copy to, Parameter 61) and calibrate the scale. If a scale is removed from the existing daisy chain, it is equally important that the number of active scales be reduced. The focus SCALE NO. display must always be equal to or less than the number that is entered for this Parameter. For instance, SCALE NO 4 cannot be in focus on the display, and then this Parameter's value changed to 3 or less.

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.

54) 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.

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

56) NMask – Used for the field-bus interface card for identifying the processor's IP mask if utilized. The selections are: 1/4, 1/2, 3/4, and FULL.

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

58) HFR Owner: - A single output provides a **H**igh **F**requency **R**ate (HFR) square wave signal with a frequency equal to 10 times the calculated RATE. This output can be used for only one selected scale. This Parameter determines the SCALE NO. that this RATE output will represent. The selections are 1, 2, 3, or 4. Refer to Sections 4.016 & 017 for further information.

59) 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 7.05.13) for the scale it is representing.

60) Alarm Relay: - When an output relay is used as a RATE or belt SPEED alarm, the alarm can be latch in or not latched in. This means that when an active alarm condition is terminated, either the MS20 retains the alarm or it is terminated with the alarm. The two choices are:

Latch – An activated alarm relay will deactivate only when the RESET ALARM key is pressed.

No Latch – An activated alarm relay is only active as long as the alarm condition exists.

61) Copy Params: - This Parameter allows copying of a scale's Parameter Table to all other scales (1 to 2, 3, & 4, for instance), or to the previous or next scales (2 to 1, or 2 to 3, for instance). Use of this Parameter during initial setup or when adding a scale can greatly reduce the time it takes to generate the Parameter Tables for the other scales. All **scale specific** Parameters will be copied except the Station ID Parameter. The procedure to copy the Parameter Table from one scale to another scale is as follows:

1) Make all final changes to the focus scale's Parameter Table that is to be copied.
2) Press the EXIT key to exit and save the focus scale's Parameter Table.
3) Press the MULTI SCALE key
4) SCROLL FORWARD to the Copy Params Parameter.

5) Select the desired copy procedure. The selections are:

Dont Copy – No copy function is performed.

To all – Parameters of the focus scale are copied to all other scales.

To Next – Parameters of the focus scale are copied to the next scale only.

To Prev – Parameters of the focus scale are copied to the previous scale only.

6) Press the EXIT key to exit and copy. (A message might appear that states copying is taking place).

7) Press the NEXT SCALE and/or PREVIOUS SCALE keys to go to the other scales and make any customizing changes to the Parameter Tables that were copied to these scales.

8) Zero and Span the desired scales. This must be performed last, because the copy procedure carries over the focus scale calibration to the other scales.

Also refer to Section 7.03 for additional information.

CHAPTER 8 - CALIBRATION

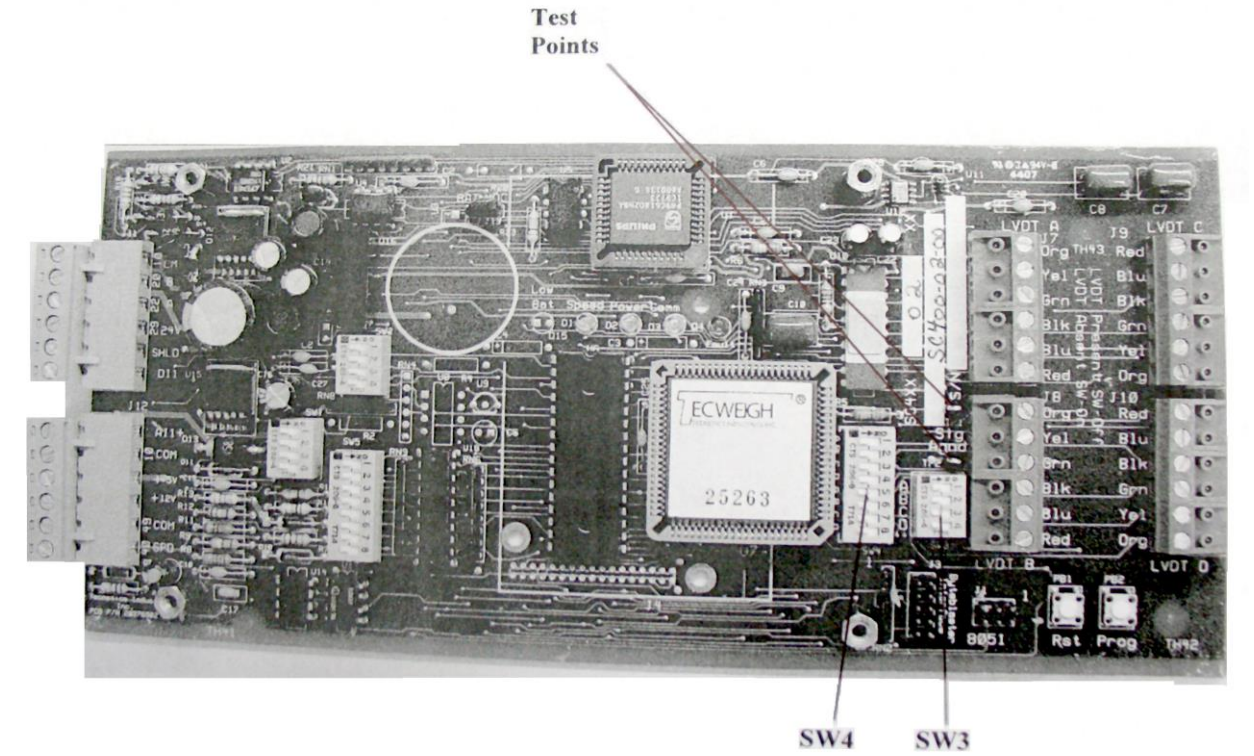
8.01 Apply Power to the System

Assuming that all the entered Parameters are correct and all the equipment is properly installed, 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), (WY10, WY10HD, WY20), 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 MS20, 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 MS20 displays a "Scale Data Error", there's a communications problem between the focus scale (its signal conditioner) and the MS20. This problem must be corrected before continuing. Consult Section 10.01, "scale data error", for troubleshooting tips.

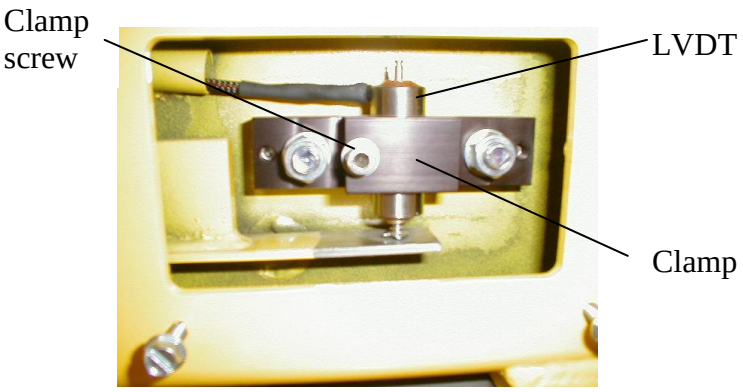
8.02 LVDT Alignment, WY10, WY10HD and WY20 Only

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 MS20 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 MS20 will now do an AUTO ZERO for as many belt revolutions as are specified in the Zero Revs Parameter (Section 7.04.9). A proper AUTO ZERO should take a minimum of two minutes to complete, because the MS20 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 7.04.7 for AZT settings to eliminate this "zero bounce".

8.03.2 Auto Span

AUTO SPAN is the second calibration step to perform. This procedure calibrates the scale using a known weight, so the MS20 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 MS20. See Section 7.06.24 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 or EXIT is pressed. 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 7.06.24) needs to be changed so the next AUTO SPAN request proceeds to completion. Change this Parameter **after** the calibration has been completed. To determine the new Span Detect value, subtract the Zero Count (Section 7.06.22) from the Span Count (Section 7.06.23), and calculate 70% (multiply by 0.7) of the difference and enter it as the new Span Detect value.

Now that the calibration is complete, the scale needs to be checked for accuracy. The following calculated **value** (or very close to it) is what you should see in the RATE window:

(?) (?) (total of one or both cal weights)

$$\frac{\textbf{Cal Factor x Belt Speed x Cal Weight}}{\textbf{Weigh Span}} = \textbf{Rate (tons/hr.)}$$

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

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

8.03.3 Material (Pre/Post) Test

To attain a more precise scale measurement, a material (or pre/post) test should 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 the Calibration Set-UP menu, go to the P/P Wt Parameter (Section 7.06.19) and enter the test material weight. When the Program Mode is exited, the MS20 will automatically compare the material test total to the total that it calculated and then modify the ASC Parameter (Section 7.06.20) accordingly. The P/P Wt Parameter is automatically set to zero after the test is done.

The calculation is:

(Post) Actual Weight/(Pre) MS20 Scale Weight x ASC = New ASC.

If, after the material test, it is shown that the MS20 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 memory in the microprocessor. To do this, simply go to the Params Parameter (Section 7.09.51), 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 be 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. Pressing the DISPLAY key momentarily will cause the MODE window display to toggle between the units of measure and the scale description, if one was entered in the Desc Parameter (7.05.11). Turn the belt off and the message ZERO BELT SPEED should be displayed. 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 7.02 for configuration information to enable the MS20 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 MS20'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 MS20 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 scales can be multi-dropped on one serial link and each scale 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 8.08.40-47.

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 A, Port A Scale, Command Menu B, Port B Scale, and Protocol.

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 MS20, it will send the selected data automatically every 1/10 second. For example, if the Command Menu is set to 04, the MS20 will transmit the RATE and TOTAL every 1/10 second.

Command Menu	Data Transmitted
00	(Used for manual data transmission only, see section 8.03)
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	Send RATE in FC20 set point mode. See FC20 manual.

Data sent from the MS20 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	Weight 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 MS20, it will only send data after a request is made. 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 is 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]	[command parameter]	[Carriage Return]
A (one character)	04 (two characters)	^M (one character)

Note that the MS20 has a 16 command input buffer.

9.04 Tecweigh Protocol

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

The Protocol Parameter (Section 7.08.47) permits two selections, they are TEC STD and TEC OLD. The differences between these two styles, detailed in section 9.05 below, 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 MS20.

9.05 Remote Calibration (see preceding section 9.04)

There are four calibration commands that can be sent to the MS20 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 MS20 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 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)	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 MS20 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 memory "chip", and then the flash memory "chip" that stores the backup "flash" Parameters. 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 the tests are complete, one of the following messages will appear in the MODE window:

"SELF TEST – PASS"	The memory is OK. No changes have occurred.
"RAM BAD, FLASH RESTORE"	The RAM memory is corrupt. The MS20 has restored the Parameter Table from flash memory.
"RAM/FLASH BAD, DEFAULTS"	Both the RAM and flash memory are corrupt. The MS20 has restored the Parameter Table from the default memory. (User determined Parameters will need to be re-entered. Refer to 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"

The AUTO ZERO and AUTO SPAN error messages indicate an abnormal condition during calibration. Press the RESET ALARM key to clear the message and perform another AUTO ZERO. After a successful AUTO ZERO has been done, 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 7.06.21) does not meet the criteria given, then the load cell(s) or LVDT(s) might be damaged or there might be a problem with the signal conditioner. See Section 10.05 or 10.06 for load cell or LVDT testing and replacement. Note: if an AUTO ZERO or AUTO SPAN is started and then the belt is stopped, it will never complete the number of belt revolutions required. Press the EXIT key and start over if the belt has been stopped.

"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 7.04.7). It will perform according to the Zero Revs Parameter (Section 7.04.9) and Span Revs Parameter (Section 7.04.10). The respective message will remain viewable until the corresponding cycle is completed or until the EXIT key is pressed.

"FRAMING ERROR"

This message indicates a serial communications Parameter setting is incorrect 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 A, Port A Scale, Command Menu B, Port B Scale, and Protocol (Sections 7.08.40-47).

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"

When the focus scale's Digital In Parameter (Section 7.07.32) is set to Interlock, terminals DI(1,2,3, or 4) and COM must be electrically shorted for the totalizing function to operate. If the short is opened, totalizing will cease and the message INTERLOCK OPEN will appear in the MODE window.

"LOAD ERROR"

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

On WY15 (1 load cell) and 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 7.06.21) to make sure the load counts increase when the calibration weight is lowered.

Other possible causes of the 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 required. Refer to Section 4.04 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 7.06.21) and 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. Refer to Section 4.05 for wiring.

"LOW POWER"

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

- **AC** power to the MS20 is less than 100 VAC on the **AC** power version.
- **DC** power to the MS20 is less than 9 VDC on the **DC** power version.
- The MS20 (**AC** power version) is not producing +30 VDC across terminals 10 and 29.
- The MS20 (**DC** power version) is not producing +28 VDC across terminals 10 and 29.
- The cable between the MS20 and the signal conditioner 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 signal conditioner.

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

"SCALE DATA ERROR"

This message indicates a communications problem between the MS20 and the scale (signal conditioner (SC)).

Possible causes of the message are:

- Terminals 20 and 22 are wired backwards (reverse wired).
- The MS20 (**AC** power version) is not producing +30 VDC across terminals 10 and 29.
- The MS20 (**DC** power version) is not producing +28 VDC across terminals 10 and 29.
- The cable distance between the MS20 and the SC is longer than 4000 feet.
- There is a break or short in the cable between the MS20 and the SC
- Either the processor or SC or both have been damaged by a power surge or lightening.

Refer to Sections 10.02 for more comprehensive electrical troubleshooting.

"SELF TEST"

This message always appears when power is first applied to the MS20. The MS20 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 MS20 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 (SC) 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 SC 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..

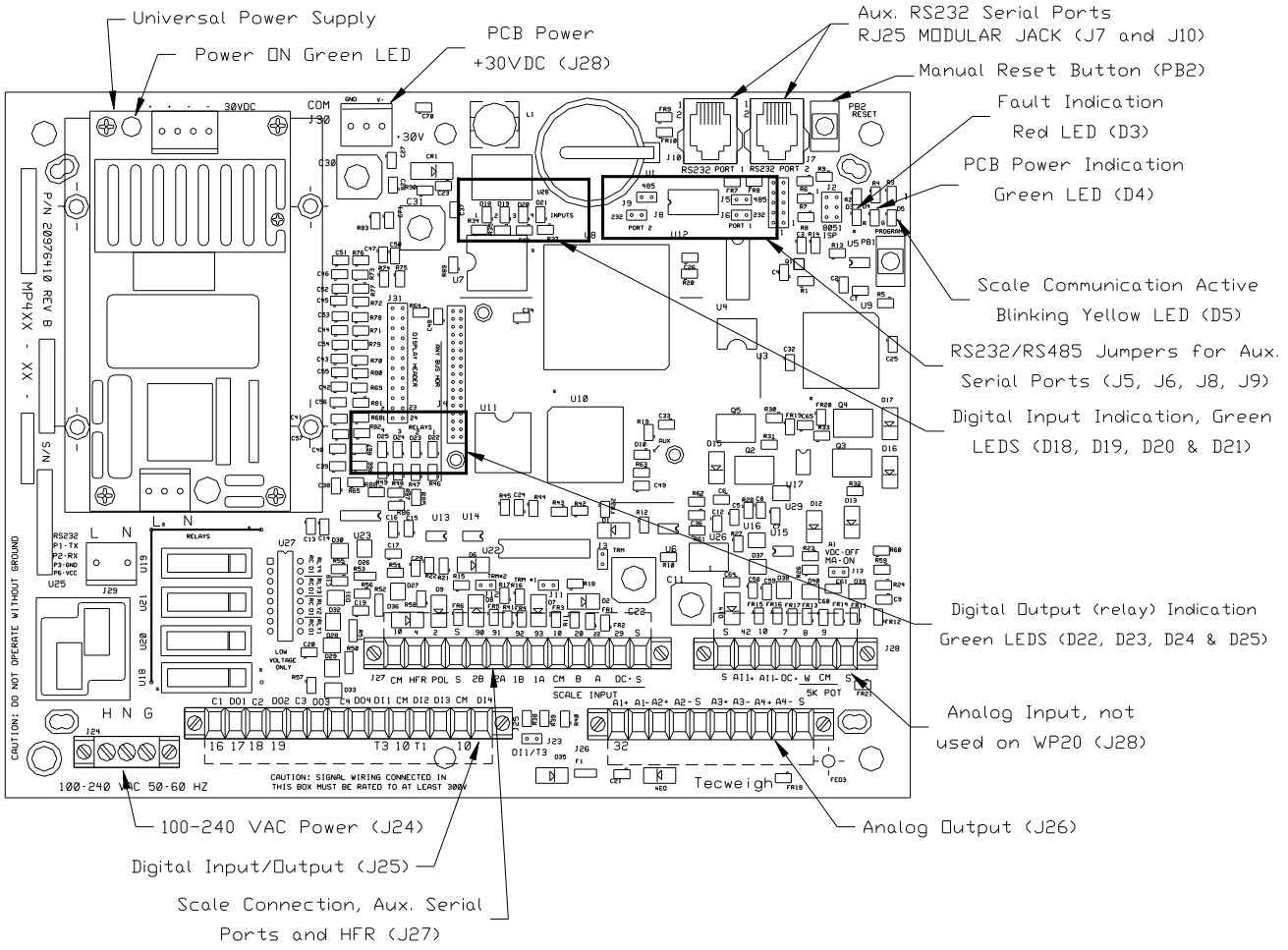
"-----"

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 7.05.12) or the Total DP Parameter (Section 7.05.17). Also note that the TOTAL will need to be RESET when it reaches the upper limit.

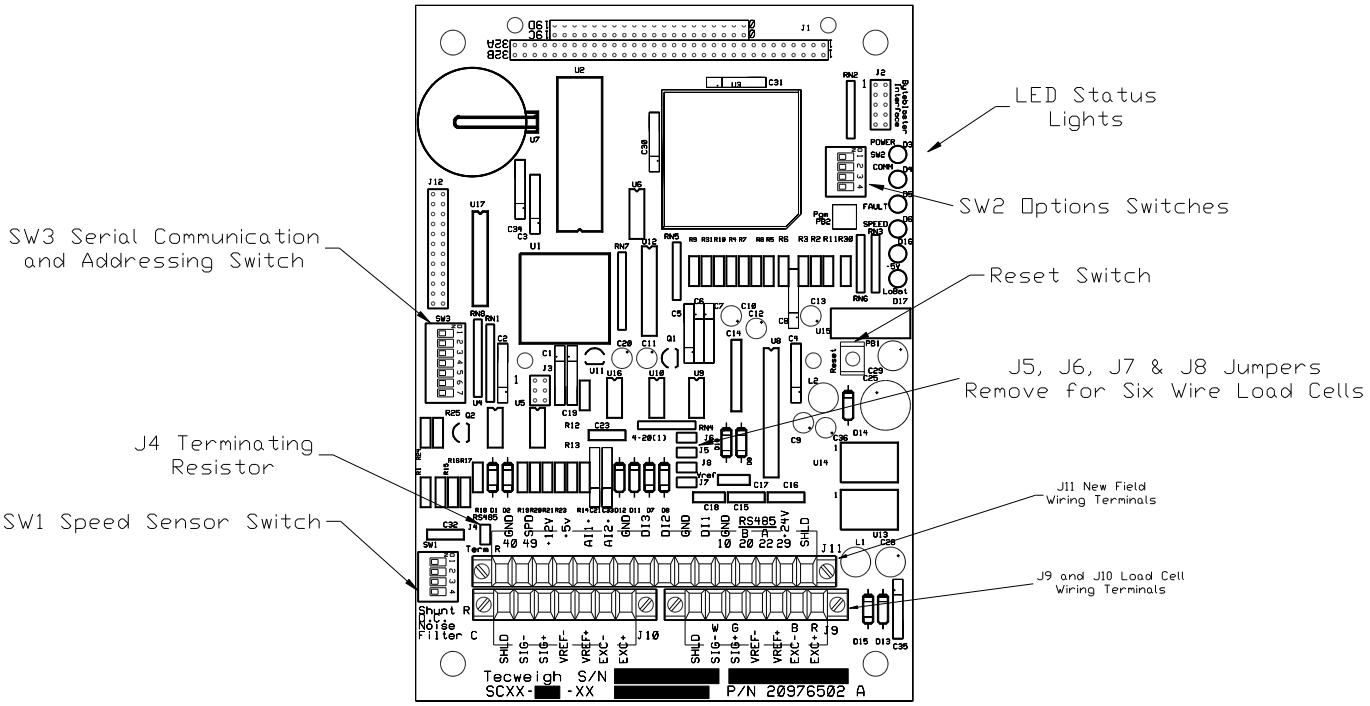
10.02 Electrical troubleshooting

This section provides methods for diagnosing lower level electrical problems with the MS20. If this is a first time installation, verify that it is correctly wired and that all wires are secure in their terminals. For reference for the following paragraphs, the following three figures show the layout of the MP400 PCB and the SC300 and SC400 signal conditioner PCB's.

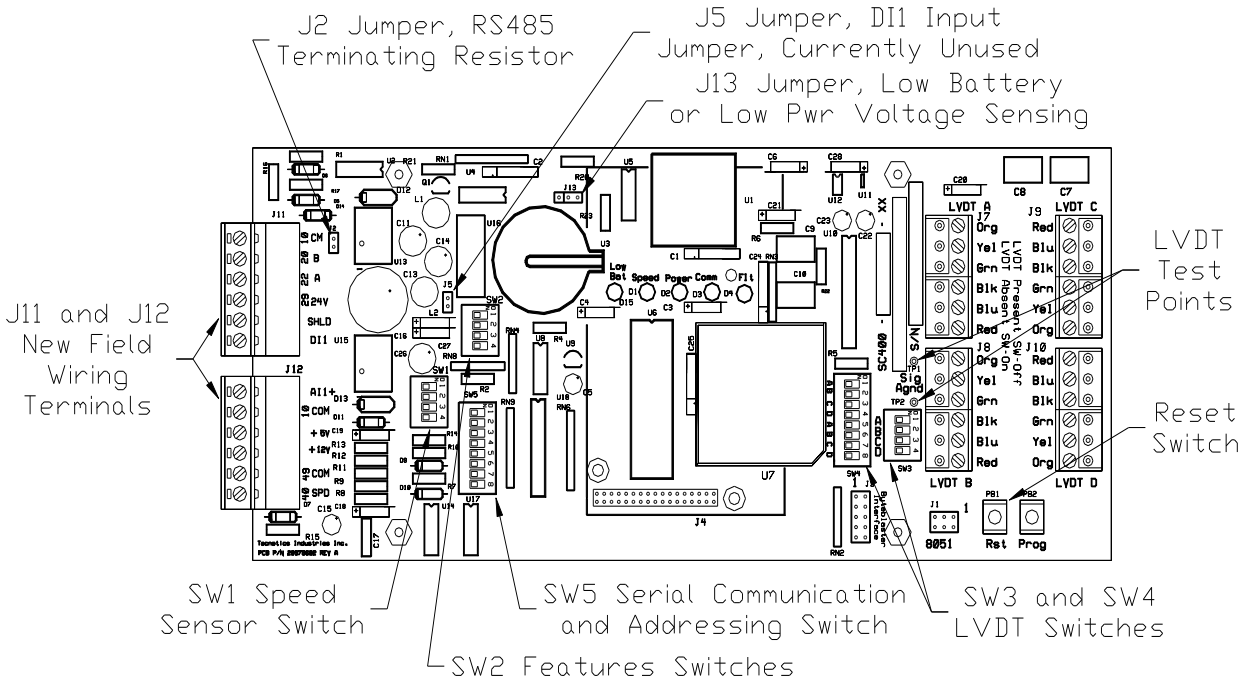
MP400 Main Processor PCB



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 MS20 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 MS20 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 assisstance.

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 MS20 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 MS20 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 MS20 and signal conditioner (SC) operation. The following are things that can be done to help prevent this problem:

- Assure that the MS20 is on its own electrical circuit and verify that terminal G is **earth** grounded.
- Use dual twisted pair shielded cable from the MS20 to the SC. Belden #1063A is recommended (See section 4.01.1).
- Connect shield wires to the MS20 only, not to the SC.
- Do not mount the scale or the MS20 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 MS20, 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 MS20 fails to work, you might need to replace both the MS20 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 SC300 or SC400 signal conditioner 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 then be recalibrated per section 8.03.

Pos2--when ON, a fixed simulated SPEED for trouble shooting is produced. The SPEED value displayed on the MS20 will equal 200 times the Speed Span Parameter (Section 8.05.16). 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 to MS20's with the WP20-02B main processor board. Contact the **Tecweigh** Service Department (Section 2.01) for further details when using this option.

10.03 Operation Troubleshooting

If the system is electrically functional, but it does not seem to be calculating the correct RATE or TOTAL, first verify that all the Parameters are correct. Leaving Weigh Spn = 0 or Belt Len = 0 (Section 7.04.5 & 6), for example, will cause an erroneous calibration and the displayed RATE will be incorrect. The following are some other problems that might exist and possible solutions:

RATE is unsteady…

If there are large swings in the RATE 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 off the belt and look at the Load Count Parameter (Section 7.06.21). 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 cell(s) (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 procedures were not successful. Try doing an AUTO ZERO and AUTO SPAN again and be sure to do the AUTO ZERO first (Section 8.03.1). Other things to consider are the AZT setting and RATE damping. First try disabling the AZT Parameter (Section 7.04.7), and then try increasing the Rate Damp Parameter (Section 7.05.13).

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 7.06.20) up or down accordingly.

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

- The scale and weigh idler(s) are not aligned properly (See 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 (See Section 10.05-06).
- 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 (See 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 8.03.3).
- 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 action 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 (Section 7.07.33) is to request that the relay open and close too frequently (Section 7.07.35-36). 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 7.07.33) is that the selected limits (Sections 7.07.37-38) are not realistic. This causes the alarm condition to never exist or to exist constantly. Also check the time delay before energization (Section 7.07.39). The alarm condition must exist for at least the length of the delay time before the relay will be energized.

RATE current loop outputs are non-functional…

The MS20 has four 4(or 0) to 20 milli-amp outputs, one for each scale, that are proportional to the RATE. If one or more of the outputs are non-functional, first verify that the mA output Parameters (Sections 7.07.27-31) are configured properly for each scale and adjust if necessary. If the output(s) still do not work, disconnect all loads and put the MS20 in Simulation mode (Section 7.07.25). Next, set the Sim Rate Parameter (Section 7.07.26) to the same value as the Rate 20mA Parameter (Section 7.07.29) value. Now connect a milli-ammeter to the non-functioning output(s). The milli-ammeter should display a value between 19 and 21 milli-amps (mA). If the value is something other than that, the PCB is defective. It is not field repairable. Contact the **Tecweigh** Service or Parts Departments (Section 2.01) for assistance.

If the above adjustments were successful, and the output was verified to be correct, return to Run Mode and re-connect the load(s), but with the milli-ammeter **in series** with the load(s). Under normal operation the output current displayed on the milli-ammeter should vary in proportion to the RATE from 4 (or 0) to 20 ma. If that does not happen, next verify that the remote device(s) 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. If it is larger than that, 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 4.07). Also refer to Section 4.01, "4-20 ma RATE current loop output".

If all of the above fails to rectify the problem, the MS20 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 7.10.59), as does the RATE display (Section 7.05.13), and the RATE analog output (Section 7.07.27). 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 4.01.6, "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…

An auxiliary output(s) could also become disabled or not operate as expected, 1) when the DI Interlock is open when in interlock mode ((Section 7.07.32)), 2) during an Auto Zero or Auto Span, or, 3) while the MS20 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.

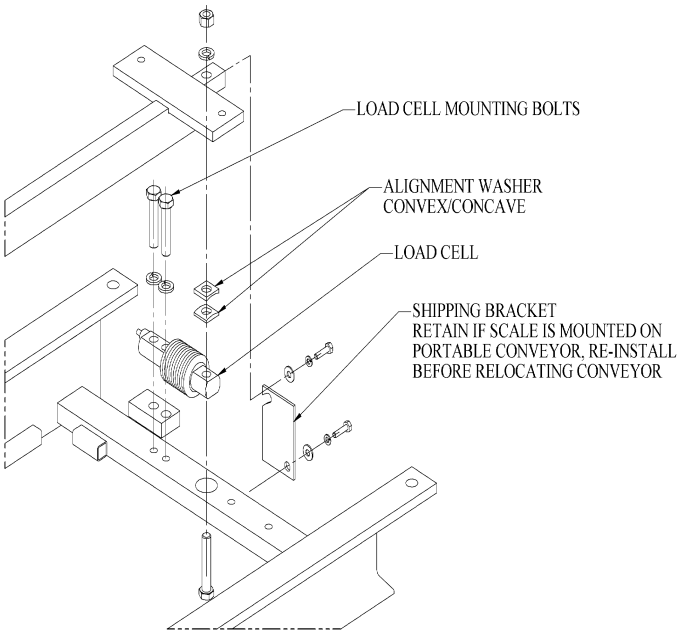
10.05 Load Cell Testing / Replacement

The following explains how to test a load cell(s). First stop the conveyor and disconnect power from the MS20. 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 an 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. Refer to the following figure.

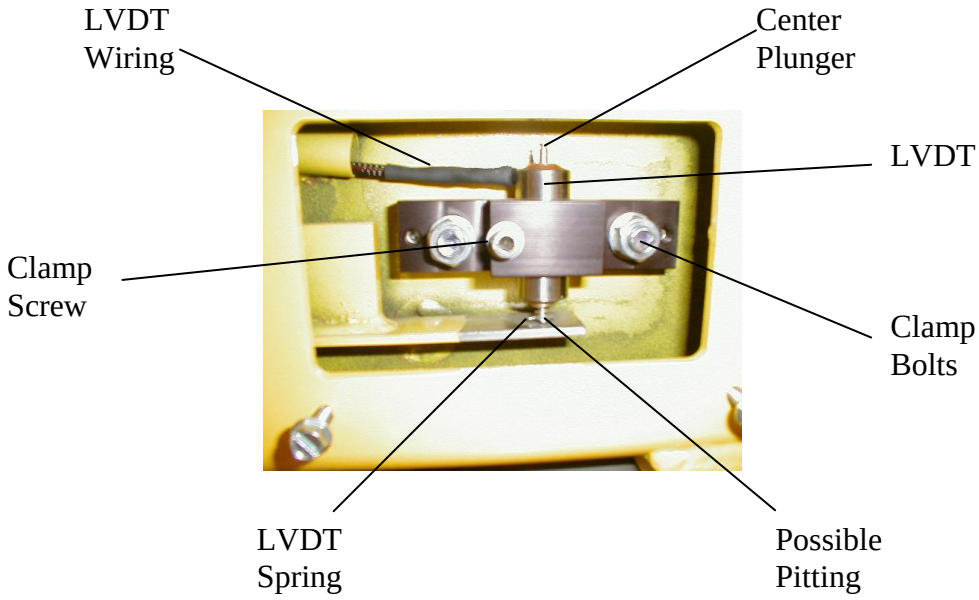


10.06 LVDT Testing/Replacement

The following explains how to test and replace a LVDT(s). First stop the conveyor and disconnect power from the MS20. 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** MS20 and the scale's signal conditioner (SC).

If a lightening strike is a possibility, first visually inspect both the MS20 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 **MS20 PCB** the four wires (or the plug-in connector) that connect the MS20 to the SC. Next, measure the voltages between the following terminals on the PCB. The indicated voltages are what should be present at the terms. 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

If the voltages are not correct, the PCB is defective. If this occurs, **both** the MS20 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 MS20 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 MS20 and SC PCBs should be returned for servicing. Contact the **Tecweigh** Service or Parts Departments (Section 2.01) for further assistance.

10.08 The Default Parameter (resetting all Parameters to their defaults)

If the MS20 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** MP200, MP300, and MP400 printed circuit boards (PCB)s**.** This procedure should only be done when the MS20 will not respond to any other commands

IMPORTANT NOTE: Before the processor is defaulted, make sure that all current user determined Parameters (recorded in the Parameter Table) are available, so they can be replaced in the MS20 processor after defaulting.

To perform the default procedure, press the SECURITY key and then SCROLL FORWARD TO the Params Parameter. The message. "Params NO CHANGE" will appear. Now press the SELECT key once. The message "NO CHANGE" will flash. Press the UP ARROW key twice and the flashing "DEFAULTS" message appears. Press the SELECT key and it will stop flashing. Now press the EXIT key and the message "default restored" will appear momentarily.

The processor has now been reset to its default values.

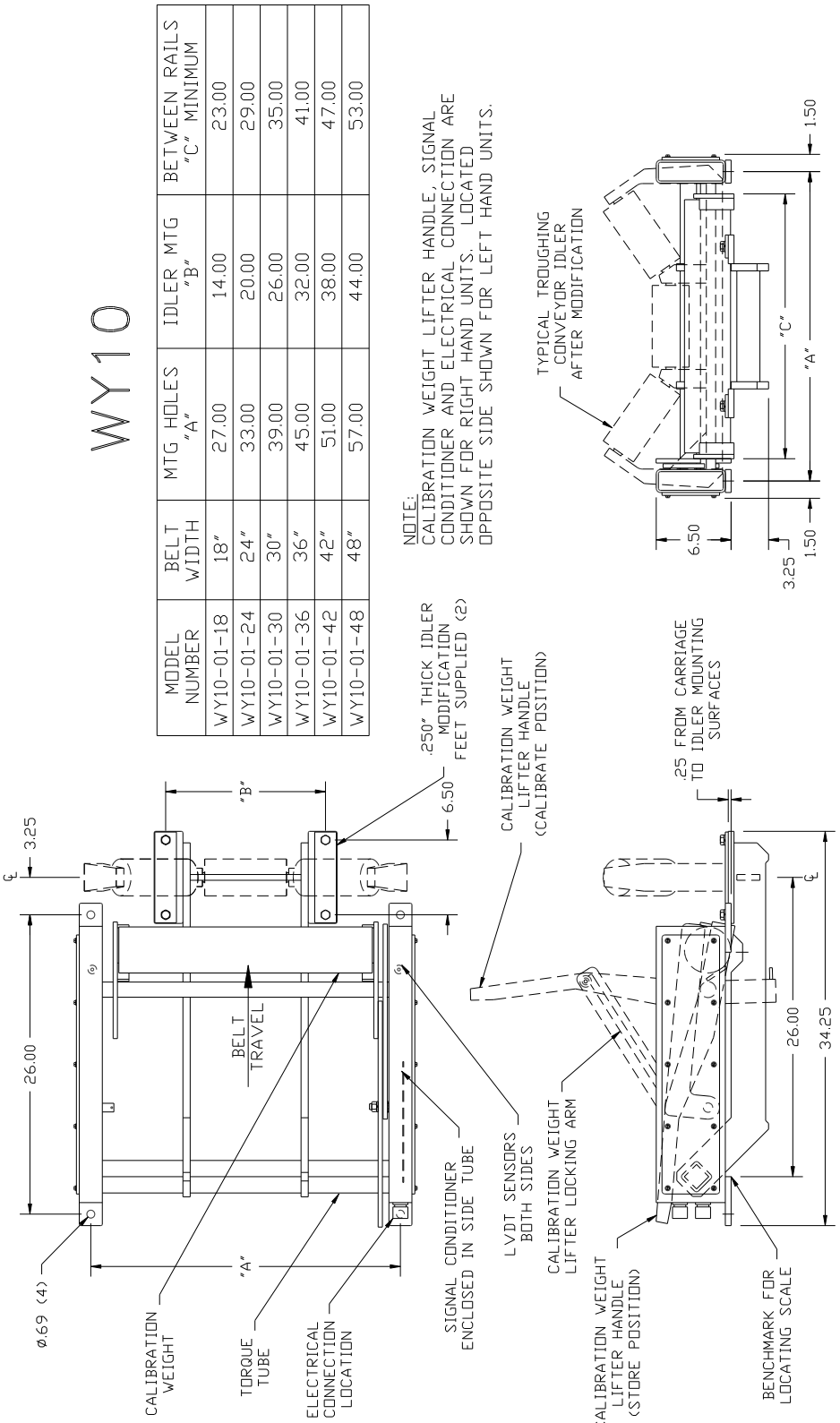
If the above default procedure **did** work, you will need to re-enter the previously saved Parameters into the processor. Refer to Chapter 7.

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 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.

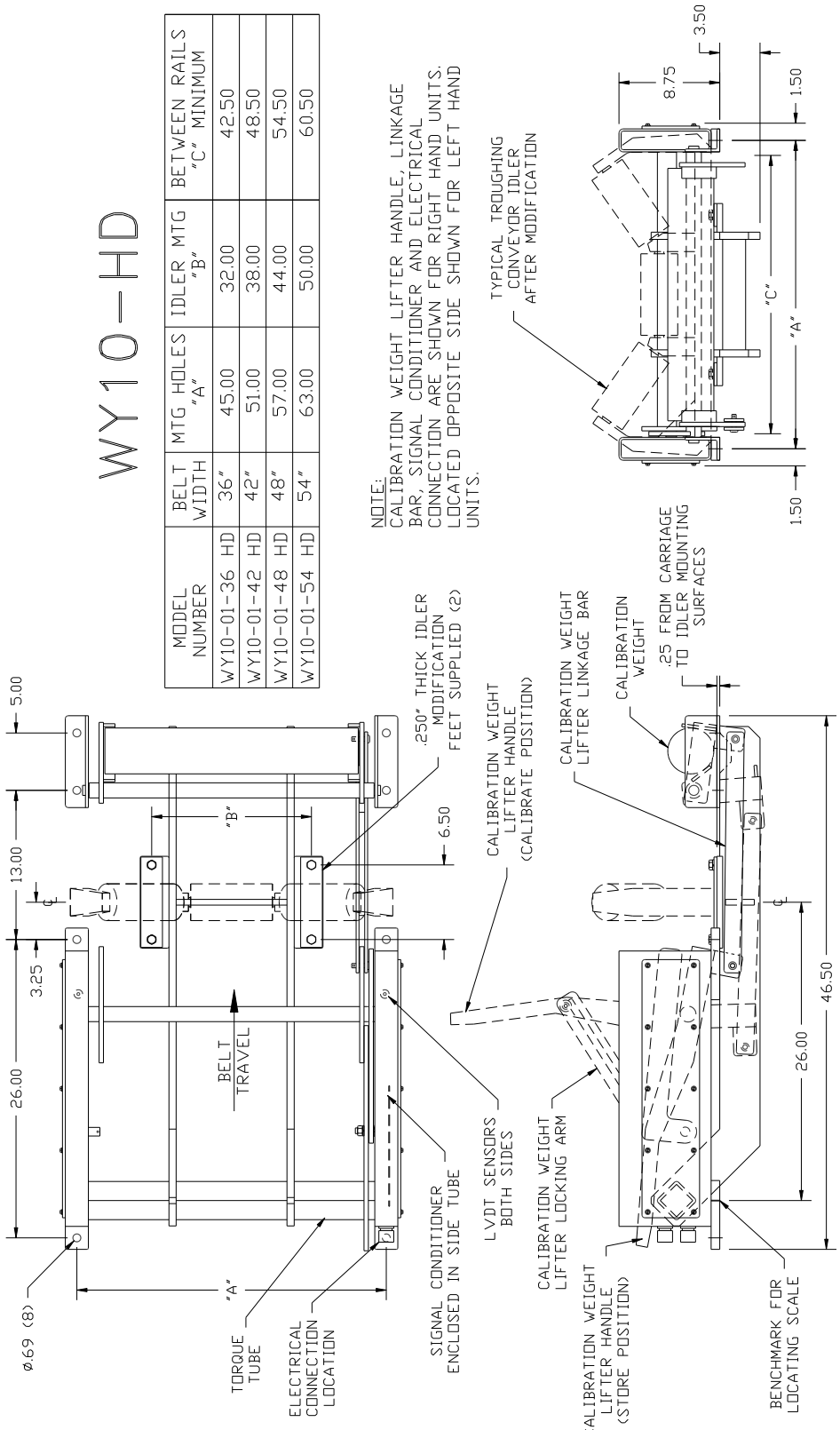
If **neither** of the above procedures worked, another Default procedure can be tried, but most likely the PCB is defective and needs to be returned for servicing. Contact the **Tecweigh** Service or Parts Department (Section 2.01) for assistance.

CHAPTER 11 – DIMENSIONS

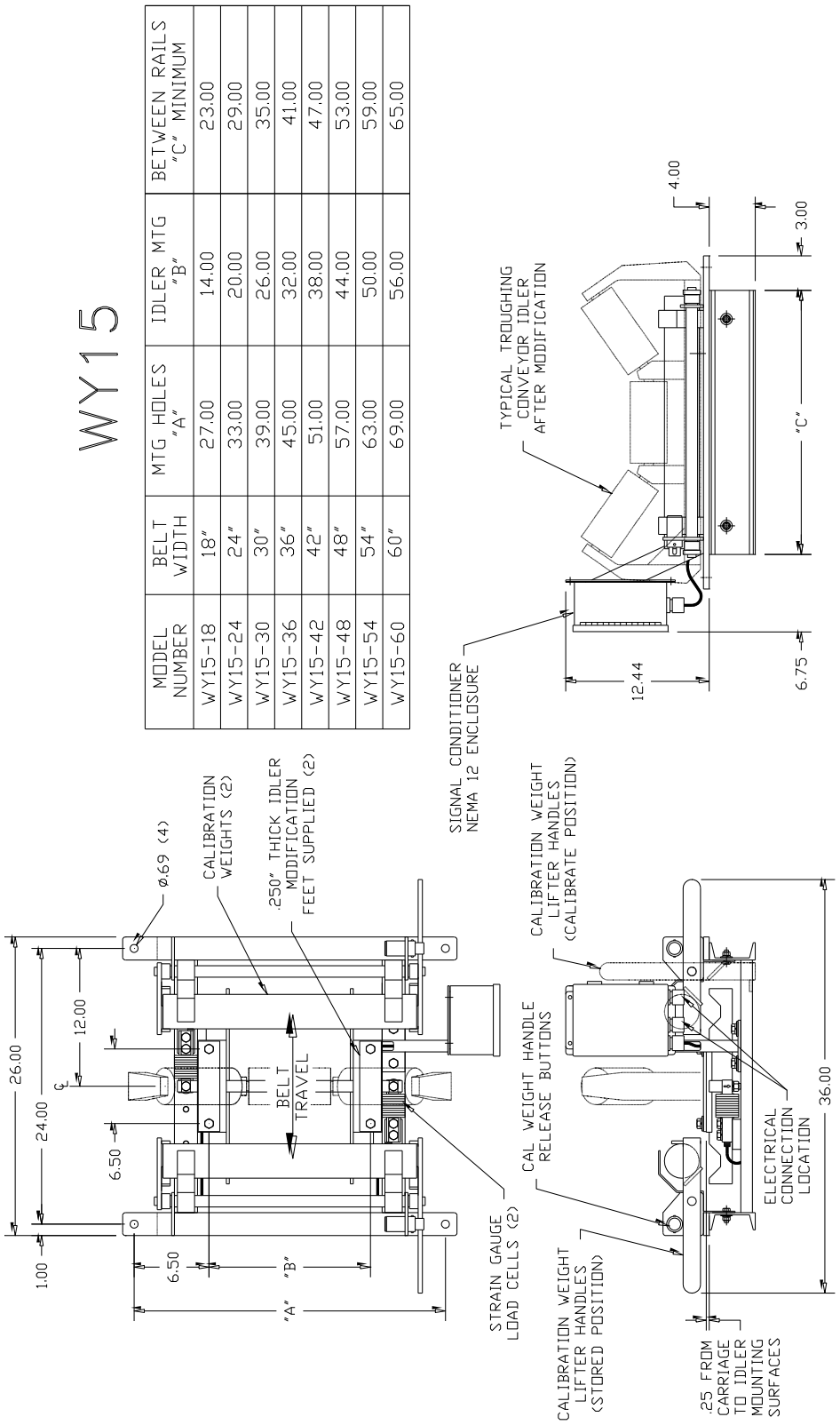
11.01 WY10 Dimensions



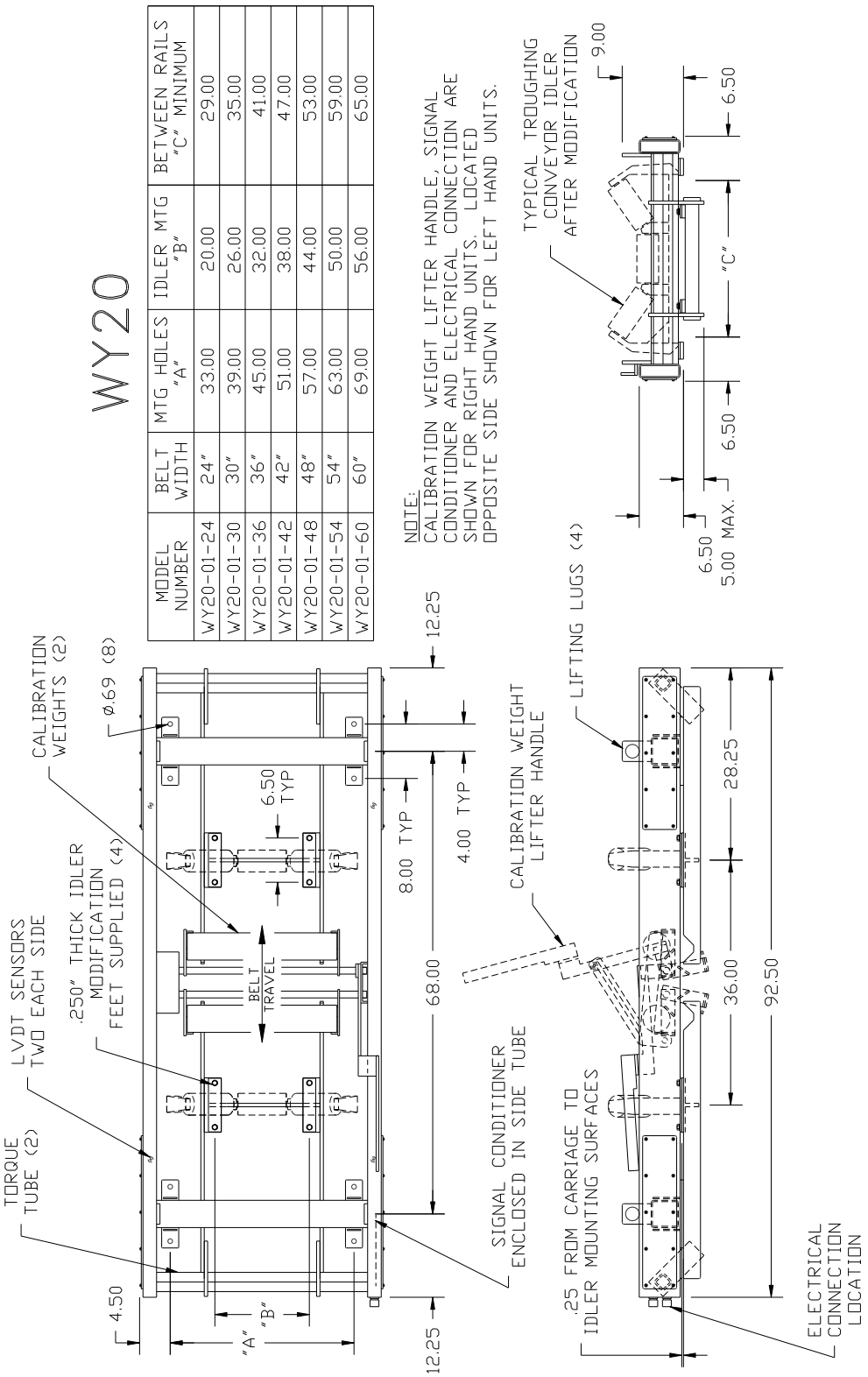
11.02 WY10 HD (Heavy Duty) Dimensions



11.03 WY15 Dimensions



11.04 WY20 Dimensions



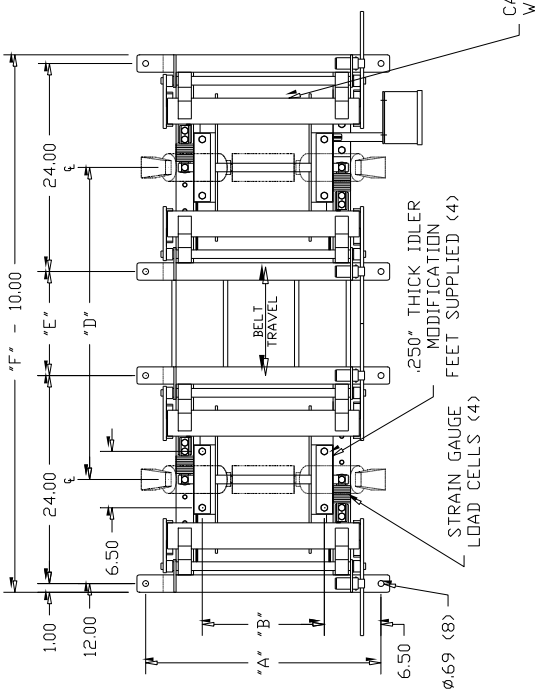
MODEL NUMBER	BELT WIDTH	MTG HOLES "A"	IDLER MTG "B"	BETWEEN RAILS "C" MINIMUM
WY20-01-24	24"	33.00	20.00	29.00
WY20-01-30	30"	39.00	26.00	35.00
WY20-01-36	36"	45.00	32.00	41.00
WY20-01-42	42"	51.00	38.00	47.00
WY20-01-48	48"	57.00	44.00	53.00
WY20-01-54	54"	63.00	50.00	59.00
WY20-01-60	60"	69.00	56.00	65.00

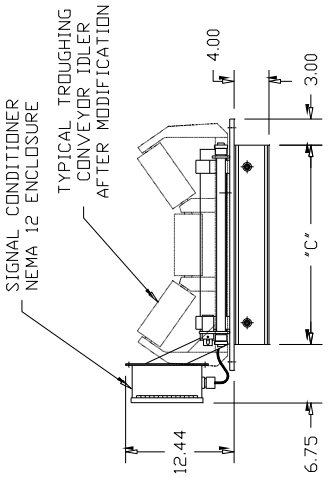
11.05 WY25 Dimensions

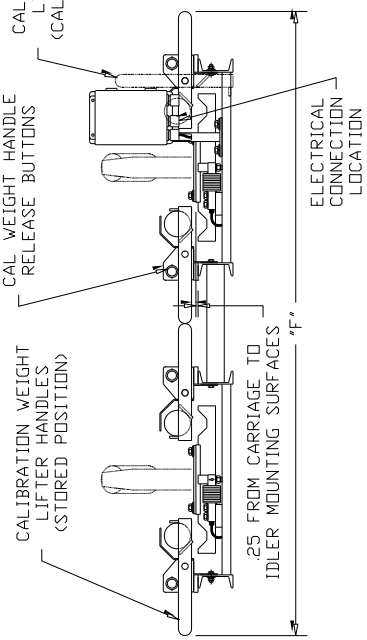
WY25

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

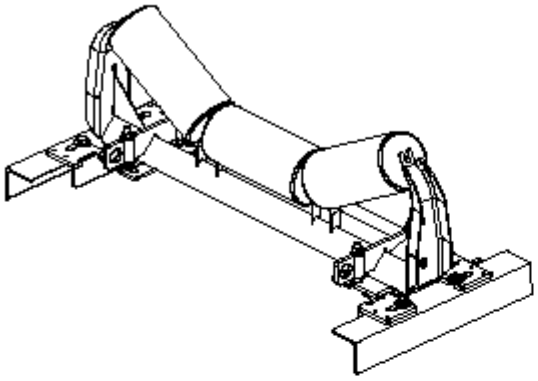
MODEL NUMBER	BELT WIDTH	IDLER SPACING "D"	MTG HOLES "E"	OVERALL LENGTH "F"
ALL	ALL	36.00	12.00	72.00
		48.00	24.00	84.00

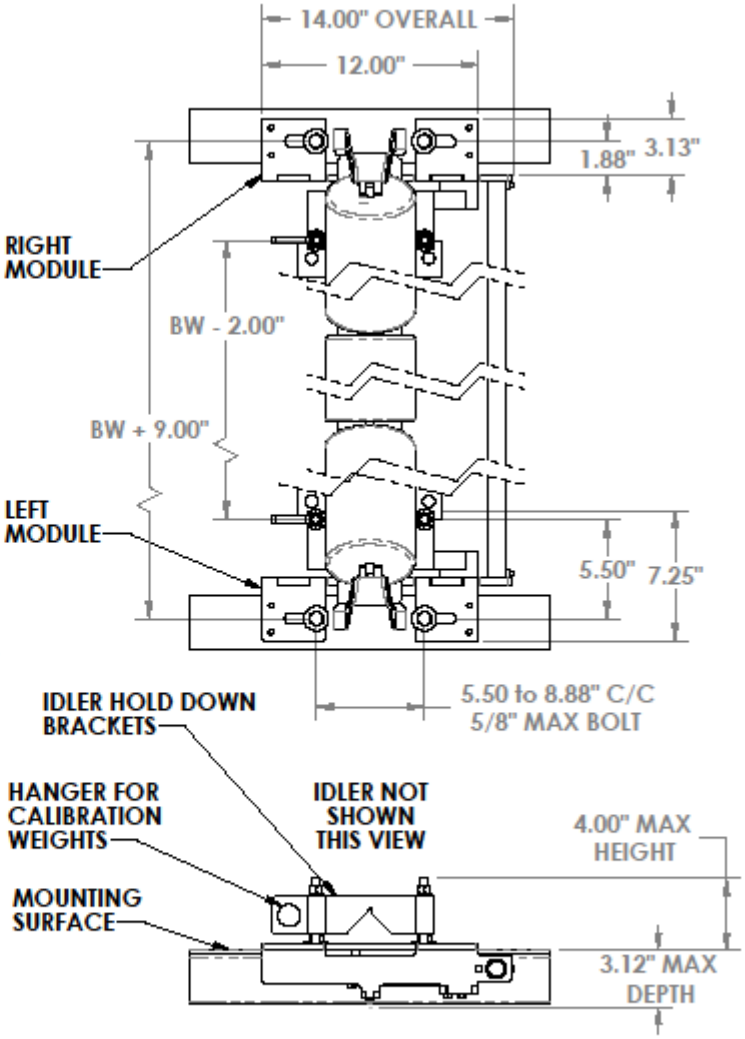


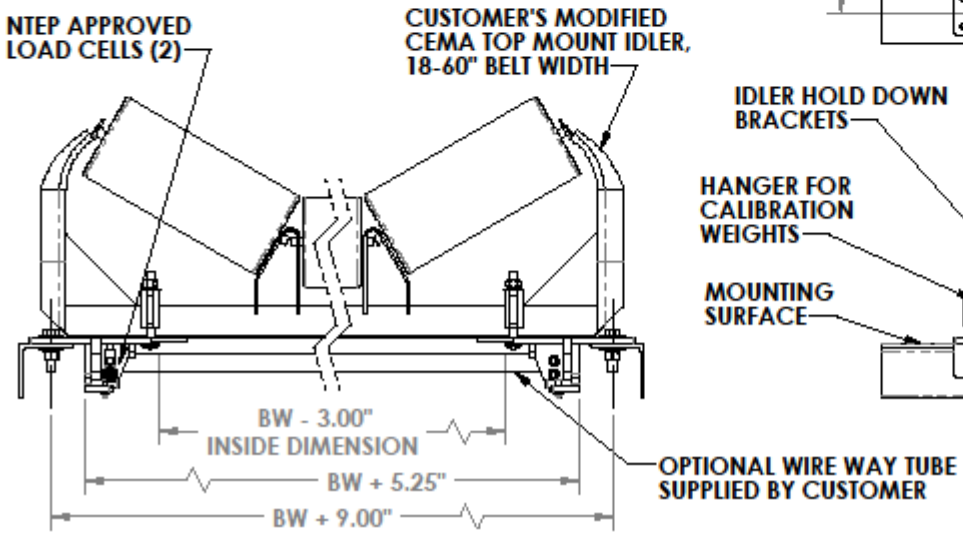




11.06 HY15 and 25 Dimensions







- CHAPTER 12 -
PARAMETER TABLE AND FACTORY/FIELD SET-UP

12.01 Factory Set-Up Summary

JOB NO. _____ JOB/CLIENT NAME _____

MS20 PRINTED CIRCUIT BOARD MODEL NO. _____

Scale	No. 1	No. 2	No. 3	No. 4
Scale Model No.				
Tag No. (if applicable)				
Signal Conditioner Model No.				
Speed Sensor Model No.				
Unit of Measure				
Belt Width				
Belt Length				
Feed Rate, Average				
Feed Rate, Minimum				
Feed Rate, Maximum				
Belt Speed, Average				
Belt Speed, Minimum				
Belt Speed, Maximum				
Analog Rate Output @ 20mA				

TEST TECHNICIAN _____ DATE _____

SPECIAL NOTES:

12.02 PARAMETER TABLE

Scale Set-up Menu (Scale Specific Parameters)			
No.	**Parameter**	**Description**	**Default Value**
1	Units	Selects units of measure	Tons/Hr
2	Cal Factor	Calibration value for a given scale type	0.36
3	Cal Wt	Calibration weight value (lbs, kgs)	120.00
4	Cal Chn	Calibration chain (lbs/ft., kg/m)	0000.0
5	Wgh Span	Weigh span length (in.m)	048.00
6	Blt Len	Belt length (ft, m)	0105.00
7	AZT +/-	Auto zero tracking rate	0000
8	Trck Revs	Number of belt revolutions used by AZT	00.0
9	Zero Revs	Number of belt revolutions used by Auto Zero	02.0
10	Span Revs	Number of belt revolutions used by Auto Span	02.0
Display Set-up Menu (Scale Specific Parameters)			
11	Desc	Description of weighing device	Scale 1
12	Rate DP	Rate display decimal point setting	ONES
13	Rate Damp	Rate display damping factor	015
14	Speed DP	Speed display decimal point factor	ONES
15	Speed Damp	Speed display damping factor	15
16	Speed Spn	Speed calibration span	1.8800
17	Total DP	Total display decimal point setting	ONES
18	Down Count	Allow negative rates to be deducted from the total	NO
Calibration Set-up Menu (Scale Specific Parameters)			
19	P/P Wt	Material test weight	00000
20	ASC	Auto Span Correction factor	1.0000
21	Load Counts	Live load counts indicated from signal conditioner	0
22	Zero Counts	Load count selected during Auto Zero to represent zero	1000
23	Span Counts	Load count selected during Auto Span to represent zero	2000
24	Span Detect	Change in load counts required to initiate Auto Span	00050
Input-Output Menu (Scale Specific Parameters)			
25	Simulation	Provides artificial rate for calibrating other equipment	OFF
26	Sim Rate	Artificial rate shown when Simulation is ON	0000
27	mA Damp	Current output damping factor	15
28	Base mA	Current output at rate of zero	4.0
29	Rate 20mA	Rate at current output of 20 mA	1000
30	Rate LTrim	Trims the low mA rate output	150
31	Rate HTrim	Triims the high mA rate output	050
32	Digital In	Sets the function of the digital (dry contact) input	Not Used
33	RLY Func	Relay output function	TPR
34	RLY Logic	Relay logic state, nor open (N.O.) or nor closed (N.C.)	N.O.
35	RLY Pls	Relay pulse duration (seconds)	0.10
36	RLY TS	Relay totalizer scale	00000
37	RLY Low	Relay low rate alarm setpoint	0000
38	RLY High	Relay high rate alarm setpoint	0000
39	RLY Delay	Time delay before relay activates (seconds)	10

Serial Port Menu (Scale Specific (SSP) and Global Parameters (GP))			
No.	Parameter	Description	Default Value
40	Station ID	MS20 serial interface station ID character (SSP)	A through D
41	Parity	Serial port parity type (GP)	NONE
42	Baud Rate	Serial port baud rate (GP)	9600
43	Cmd Menu A	Serial port transmitter menu for port A (GP)	00
44	Port A Scale	Scale select for port A command menu (GP)	0
45	Cmd Menu B	Serial port transmitter menu for port B (GP)	00
46	Port B Scale	Scale select for port B command menu (GP)	0
47	Protocol	Selects new Tecweigh protocol or old version (GP)	TEC STD
Security Menu (Scale Specific (SSP) and Global Parameters (GP))			
48	Lock Aut Zr	Locks or unlocks the AUTO ZERO key (SSP)	NO
49	Lock Aut Sp	Locks or unlocks the AUTO SPAN key (SSP)	NO
50	Lock Reset	Locks or unlocks the RESET key (SSP)	NO
51	Lock Code	Security passcode (GP)	00000
52	Params	Saves Parameters to flash memory (GP)	NO CHANGE
Multi Scale Menu (Global Parameters (GP))			
53	Active Scales	Number of scales on serial daisy chain	4
54	Data Fmt	Field-buss data type Long Interger or Float (32 bit)	Long
55	IPAdd	Field-buss IP address	0000.0000.000.0000
56	NMask	Field-buss IP mask	255.255.255.000
57	RIO Rack	Field-buss rack size for Remote I/O protocol only	1/4
58	HFR Owner	Dictates which scale the HFR simulates	1
59	HFR Damp	HFR output damping factor	15
60	Alarm Relay	Selects alarm relay function, latch or no latch	Latch
61	Copy Params	Copies a scale’s Parameter table to other scales	Dont Copy

12.03 Factory/Field Parameter Values

			Factory/Field Parameter Values (when different from default)							
			Scale No. 1		Scale No. 2		Scale No. 3		Scale No. 4	
			Scale Set-Up Menu							
No.	**Parameter**	**Default**	**Factory**	**Field**	**Factory**	**Field**	**Factory**	**Field**	**Factory**	**Field**
1	Units	Tons/Hr								
2	Cal Factor	0.36								
3	Cal Wt	120.00								
4	Cal Chn	0000.0								
5	Wgh Span	048.00								
6	Blt Len	0105.00								
7	AZT +/-	0000								
8	Trck Revs	00.0								
9	Zero Revs	02.0								
10	Span Revs	02.0								
			Display Set-Up Menu							
11	Desc	Scale 1								
12	Rate DP	ONES								
13	Rate Damp	015								
14	Speed DP	ONES								
15	Speed Damp	15								
16	Speed Spn	1.8800								
17	Total DP	ONES								
18	Down Count	NO								
			Calibration Set-Up Menu							
19	P/P Wt	00000								
20	ASC	1.0000								
21	Load Counts	0								
22	Zero Counts	1000								
23	Span Counts	2000								
24	Span Detect	00050								

			Factory/Field Parameter Values (when different from default)							
			Scale No. 1		Scale No. 2		Scale No. 3		Scale No. 4	
			Input/Output Menu							
No.	**Parameter**	**Default**	**Factory**	**Field**	**Factory**	**Field**	**Factory**	**Field**	**Factory**	**Field**
25	Simulation	OFF								
26	Sim Rate	0000								
27	mA Damp	15								
28	Base mA	4.0								
29	Rate 20mA	1000								
30	Rate LTrim	150								
31	Rate HTrim	050								
32	Digital In	Not Used								
33	RLY Func	TPR								
34	RLY Logic	N.O.								
35	RLY Pls	0.10								
36	RLY TS	00000								
37	RLY Low	0000								
38	RLY High	0000								
39	RLY Delay	10								
			Serial Port Menu							
40	Station ID	A thru D								
41	Parity	NONE								
42	Baud Rate	9600								
43	Cmd Menu A	00								
44	Port A Scale	0								
45	Cmd Menu B	00								
46	Port B Scale	0								
47	Protocol	TEC STD								

			Factory/Field Parameter Values (when different from default)							
			Scale No. 1		Scale No. 2		Scale No. 3		Scale No. 4	
			Security Menu							
No.	**Parameter**	**Default**	**Factory**	**Field**	**Factory**	**Field**	**Factory**	**Field**	**Factory**	**Field**
48	Lock Aut Zr	NO								
49	Lock Aut Sp	NO								
50	Lock Reset	NO								
51	Lock Code	00000								
52	Params	NO CHANGE								
			Multi-Scale Menu							
53	Active Scales	4								
54	Data Fmt	Long								
55	IPAdd	0000.0000.000.0000								
56	NMask	255.255.255.000								
57	RIO Rack	1/4								
58	HFR Owner	1								
59	HFR Damp	15								
60	Alarm Relay	Latch								
61	Copy Params	Dont Copy								

- 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 exclude 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.