CONTINUOUS GRAVIMETRIC BLENDER

REFERENCE MANUAL

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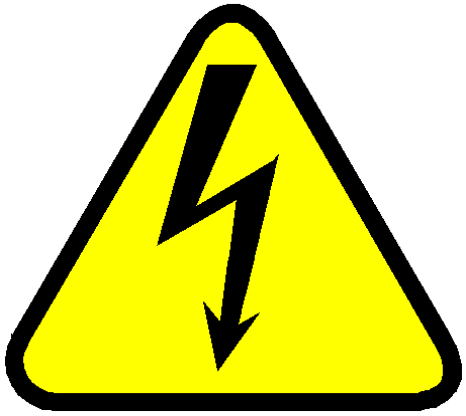

THIS EQUIPMENT CONTAINS PARTS SENSITIVE TO DAMAGE BY ELECTROSTATIC DISCHARGE (E.S.D.). USE E.S.D. PRECAUTIONARY PROCEDURES WHEN HANDLING. ALSO USE E.S.D. BAGS WHEN SHIPPING EQUIPMENT TO PROCESS CONTROL CORPORATION FOR REPAIRS OR REPLACEMENT.

RETURNING EQUIPMENT NOT IN E.S.D. BAGS MAY VOID YOUR PCC WARRANTY.

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1 OVERVIEW OF OPERATION

1.1 LOSS IN WEIGHT METERING

The continuous gravimetric blender controls the final material mix by using "loss in weight" control techniques. This is done with a variable speed motor attached to an auger to feed each material into the extruder while carefully monitoring the weight loss from the hoppers.

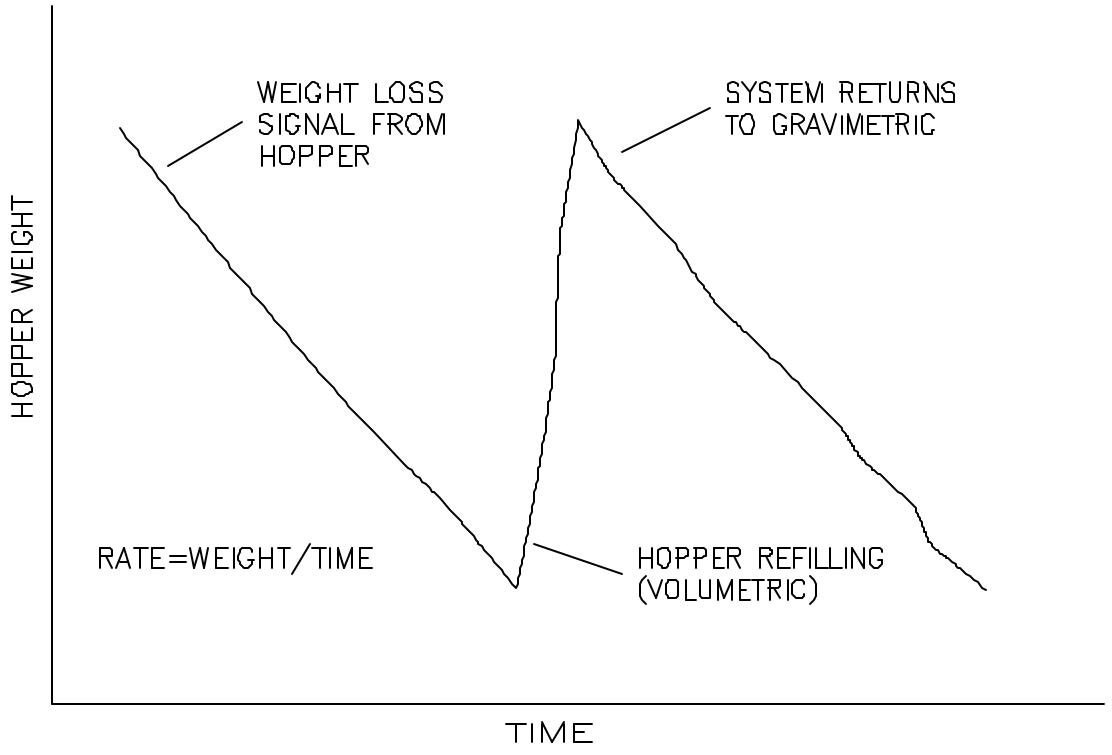

Figure 1 Weight Loss Measurement

Any hopper weight loss due to the auger's feeding of material is exactly what has been added to the blender's mix. The blender's central computer can then adjust the motor speeds to keep the correct ratio of each material.

1.2 SYSTEM DESCRIPTION

The blender is comprised of several separate components, each having a specific function. To familiarize you with the system, these parts are described below:

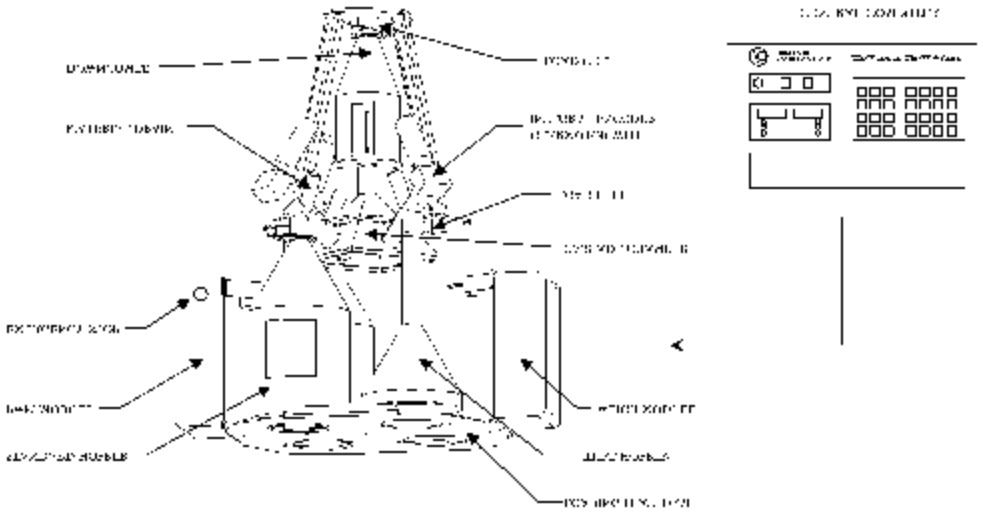

Figure 2 Basic Blender Configuration

CENTRAL COMPUTER WITH USER INTERFACE - The central computer gathers and analyzes information from other parts of the system, and includes the operator interface used to control the system. It also monitors digital I/O for system alarms and control inputs. It is referred to in this manual as the **'mini-op panel'** to distinguish it from the other larger operator stations which PCC manufactures.

WEIGH MODULE - Mounted on the blender in a metal enclosure near the hoppers, this device reads hopper weight loss. The central computer checks it multiple times each second to update its local copy of the hopper weights. One standard blender weigh module can monitor weight for up to five hoppers, or four hoppers and one weighed downcomer.

PWM DRIVE MODULE - Mounted on the blender in a metal enclosure near the hoppers, it provides the interface between the central computer and the hopper motor's drive electronics, and may interface to the relays that are used to activate the loading system. It also contains the interface used to read the motor speed via a tach mounted on the bottom of each motor. One blender pwm drive module can control motor speed for one hopper. A four element blender therefore would have four seperate PWM drive cards.

LOADCELL - Each weighed hopper and feeder unit is mounted on a loadcell (also called a strain gauge) to monitor hopper weight. The loadcell is mounted to support both the hopper and motor assembly. Variations in hopper weight result in changes in the electrical resistance of the loadcell, which is amplified and monitored by the weigh module.

CAUTION: *The loadcell is a very sensitive device, and care should be taken not to allow it to become over stressed.*

DOWNCOMER (blenders with weighed downcomer) - The downcomer, or weighed downcomer, is a tube that physically "comes down" from the main blender body. It is completely supported by a loadcell, and all material which exits the blender must first pass this loadcell. This changing material weight can be used to regulate the total blender output. The downcomer also has a high level proximity switch that acts as an overfill indicator.

1.3 BLEND RECIPES

A blend recipe tells the blender what proportion (by weight) of each ingredient should be present in the final blended material. The blend recipe can be entered into the computer in two way either as a ratio(parts) or as a percentage. The is a option under “CONFIGURE SYSTEM DESCRIPTION” in the mini-op. For example, a recipe to mix two ingredients in a 4:1 ratio (four parts of ingredient 'A' for each part of ingredient 'B') is shown below:

Ratio Method	**Percentage Method**
A: 04.00 B: 01.00 C: 00.00	A: 80.00 B: 20.00 C: 00.00

In either case, the computer would add up the parts for each hopper (4+1+0 = 5 or 80+20+0 = 100) and then determine the amount of each ingredient as a percentage of the total number of parts. You may enter recipes whichever way is most convenient for you.

NOTE: *Recipes can be stored for later recall, and are saved in the event of a power failure.*

1.4 FLOW-RATES (Process Rates)

In the CONTINUOUS mode of operation with a weighed downcomer there is no need to enter a process rate: the computer will find the actual usage rate automatically. The process rate is defined as the current rate (in lbs or kgs./hr.) of material that the blender is producing. After a short sampling period, the computer will determine the actual material usage rate required by your process and adjust its process rate accordingly.

In ON-OFF mode of operation with a weighed downcomer, the estimated process rate must be entered into the computer. The computer will then run at this rate until the high level sensor is covered (or the downcomer high weight is exceeded), then stop until the low level sensor is uncovered (or the downcomer low weight is reached).

1.5 WEIGHING SYSTEM

The blender operates by weighing the loss of material from each hopper as the material is metered into the central chamber. This weight measurement is carefully monitored by taking readings of the hopper weight many times a second to maintain blend accuracy. The material is weighed by a high-precision loadcell that is connected to the computer through the weigh module board(s), and can measure weight differences as small as several pellets. The weigh module takes the analog input, removes unwanted noise, and provides a digital input to the computer over the local network in **weigh module units** (WMUs or "bits"). To

achieve the necessary accuracy, there are thousands of WMUs per pound for each hopper. This WMU reading is then used to calculate the weight (in lbs. or kgs.) of material in the hopper.

1.6 MATERIAL FEED SYSTEM

The material is carried from the discharge point of the hopper by an inclined auger and then dropped into the central chamber. The computer controls the speed of the auger to match the desired flowrate. The computer constantly monitors the "loss-in-weight", compensating for bulk density variations.

1.7 RATE VS. SPEED CALCULATION

Whenever the material in a hopper is changed, or if a different auger or motor gearbox is used, the amount of material being metered for a specific auger speed will change. The computer must know the relationship between the flowrate and the auger speed (called the **rate-speed factor**), which enables the computer to calculate the correct auger speed for a desired flowrate. The rate-speed factor is calculated by running the auger at a known speed for a suitable time and calculating the rate.

The rate-speed factor is dependent on several parameters, the most important of which are auger size and material bulk density. For example, a small auger running at 100 RPM will dispense less material than a larger auger at the same speed. Similarly, the higher the bulk density of the material, the higher the flowrate will be at a given speed and auger size.

NOTE: *The rate-speed calculation operation should be performed whenever an auger/motor/gearbox are changed or if a different material is placed in a hopper.*

1.8 LOADING SYSTEM INTERFACE

When the weight of material in the hopper drops below the specified **load on weight**, the blender will signal for a load by closing a contact. For positive shutoff systems, there is also a **load off weight** or **load time (duration)** used to signal that the load operation should be suspended.

NOTE: *Because of hopper sizes, metering rates, and reaction time for loading systems, the load weight for each hopper is set independently.*

There is a **low alarm weight** that can be set for each hopper. If the weight in the hopper drops below this weight, an alarm condition (HOPPER x BELOW SET WEIGHT) is reported by the computer. The low alarm weight should be set about halfway between the load weight and the critical low weight.

The operator also can set a **critical low weight** for each hopper. If the computer determines that the hopper weight has dropped below this set weight, the blender stops and an alarm condition is reported (HOPPER x CRITICALLY LOW). The blender can be set to restart automatically (the

default condition) when the critical low condition is removed by setting the critical low alarm level to General or Information for the AUTO mode instead of Shutdown.

NOTE: *The critical weight should be set to a weight which will leave enough material in the hopper to keep a small head above the auger.*

2 BG/BC/BE BLENDER MECHANICAL

2.1 CASCADE POST

(applicable to 2, 3 or 4 element BG/BE blenders only)

2.1.1 DESCRIPTION OF OPERATION

The cascade post disperses the flow of ingredients being cascaded through the mixer to disperse the blended process material to fill the collection hopper at an angle which is less than the angle of repose of each ingredient material. This prevents any one ingredient from rolling off and demixing (or *classifying*) at the free surface.

Cascade Post Adjustment

If the cascade post has a spreader cone at one end, it can either be installed spreader cone down (for rates less than 875 pph (400 kg/h)) or cylinder end down for all other rates.

IMPORTANT: *The suggested rates above are approximate. Orient the cascade post according to the objective outlined in the Description of Operation.*

There is a safety rod feature incorporated in the cascade post which prevents the cascade post from passing through the mixer in the unlikely event the post fastener fails. If the safety rod is removed the cascade post may drop into the extruder causing damage to the extruder.

CAUTION: *The cotter pin securing the cascade post should be replaced each time the cascade post is disassembled. The cotter pin is 1/8" diameter and approx 2" long.*

2.2 DOWNCOMER REMOVAL

The downcomer tube can be removed for clean out. Disconnect the proximity switch lead(s) and any grounding strap(s). Hold the downcomer dust cover up and out of the way and remove the downcomer tube.

When installing the downcomer tube make sure that the ledge the tube rests on is free of process material so that the tube may sit squarely in the weigh hopper cone. Reconnect the proximity switch(es) and grounding strap(s). Make sure the grounding strap is always installed when in operation. The grounding strap helps drain static charges which may damage the switch. For this reason the blender should be mounted on grounded equipment or structures.

2.3 SAMPLE CHUTE SEAL

Each auger housing enters a sample chute through a hole in the chute. The auger housing should not touch the chute, but should be allowed to move freely in this hole. A floating seal ring is provided to keep process material in and foreign matter out. Contact between the auger housing and the sample chute can result in UNSTABLE WEIGH SYSTEM alarms, or DRIVE SYSTEM FAILURE alarms. Take care during cleaning of the sample chute interior so that when done the seal ring is left properly installed. Check the seal ring periodically.

2.4 BLENDER LIFTING

There are (2) 3/4" diameter lifting holes provided in the loading platform of the blender. See drawing BB02310000 Sheet 3. The customer must provide adequate lifting lugs.

- Use both lift points when lifting the blender. Do not lift the blender from points other than the designated lift points.

- Secure all loadcell overload protection screws before moving the blender. See Loadcell Overload Protection section of this manual.

- Do not lift the blender with loading equipment mounted on the blender as this makes the blender top heavy and apt to flip on its side.

- Do not lift the blender with any amount of process material in the weigh hoppers to prevent loadcell damage. Process material left in hoppers may adversely unbalance the blender making it difficult to handle and set into position.

- Secure all blender components before lifting the blender to prevent anything from falling during lifting. For example make sure all gearboxes are clamped to the blender properly or as a precaution remove the gearbox before lifting.

2.5 EXTRUDER MOUNTING A BLENDER

2.5.1 EXTRUDER STABILITY

Only mount the blender on a stable extruder which can safely support the blender and any loading equipment. Consider how operators have to interface with the blender and the loading equipment. If it is not practical to mount equipment directly to the extruder, DO NOT mount it this way. Instead consider mounting the blender on a mezzanine over the extruder. The blender is tolerant of noise due to mechanical vibration, although there are limits. The extruder must be as rigidly anchored as possible, preferably to a appropriately designed slab.

2.5.2 ORIENTATION

Decide on the direction for the blender mounted on the extruder. Refer to drawing BB02310000 Sheet 3, an Orientation Diagram depicting various points of concern regarding orientation. Your preference may be to give ready access to control panels or to clean out doors if you expect frequent material changes. Think about where power feeders are or will run and how you may want the blender situated for wiring. Look at the drain coming off the downcomer weigh hopper - you may want the drain directed on one side of the extruder centerline or the other.

2.5.3 SUBPLATE OPTION

Process Control offers a blender mounting plate option, called a subplate. See drawing BB0231000 Sheet 4 for the recommended use of a subplate. The blender base plate has limited space which does not readily accommodate the extruder throat bolt pattern, reference View C-C. The subplate is provided with bolts and tapped holes for mounting to the bottom of the blender and affords more space for the extruder bolt pattern. The subplate in turn is bolted down to the extruder. The customer must drill the subplate and provide the necessary fasteners for extruder mounting.

2.5.4 EXTRUDER GROUNDING

Mount the blender only on grounded extruders.

2.6 MEZZANINE MOUNTING A BLENDER

For the greatest stability, the blender can be mounted on a stable mezzanine above the extruder. This will provide easy access to all of the hoppers and motors, as well providing desired mechanical isolation from the extruder itself.

2.7 LOADCELL OVERLOAD PROTECTION

The loadcell (under each weigh hopper) is basically a network of stain gages on a beam, and has deflection limits. If the loadcell is allowed to be over stressed the stain gages may fail and the beam may deflect beyond its elastic limit leaving it permanently deformed. Overload protection is intended mainly for non-process related disturbances, such as an accidental bump by personnel on a weigh hopper during hopper clean out. Under normal operating conditions, if there are no outside disturbances, the overload protection is in stand by. It also plays an important part in protecting loadcells during transport of the blender.

There are two means of mechanical overload protection for loadcells on the blender. One is a travel stop screw accessed from the under side of the loadcell. This limits travel of the weigh hopper downward on the cell. The other travel stop is a set of screws, typically three, located lateral or perpendicular to the hopper body. These travel stops, termed "bumper screws", limit lateral (side to side) movement of the hopper.

The overload protection screw under each loadcell is set at the factory and is identified with a red tag and reads as follows:

CAUTION! OVERLOAD PROTECTION SCREW
DO NOT REMOVE OR ADJUST THIS SCREW
THIS SCREW IS FACTORY SET.
CONSULT MAINTENANCE MANUAL FOR LOAD CELL REPLACEMENT INSTRUCTIONS.

The gap between the overload protection and weigh hopper (or loadcell directly depending on hopper configuration) allows the weigh hopper to move in the operating range of the loadcell. The protection screw is set carefully in the factory by load cell output readings and should NOT be set by gapping with a feeler gage. Refer to "LOADCELL REPLACEMENT" for setting of the overload protection screw.

The loadcells are protected during shipment by shipping protection screws under each cell and by the bumper screws positioned at the sides of the hoppers.

Shipping Protection Screw

The shipping protection screw is along side the overload protection screw under each loadcell. It is identified with a green tag and reads as follows:

CAUTION! SHIPPING PROTECTION SCREW
REMOVE THIS SCREW BEFORE START UP.
DO NOT ADVANCE SCREW TOWARD LOADCELL OR DAMAGE MAY RESULT.

After the blender has been moved and secured into position for operation, loosen the jam nut and remove the shipping protection screws. When removing the shipping screw do not advance the screw toward the load cell. Damage to the load cell may result. Make sure the screw is turned in a counter-clockwise direction looking from the screw head side to retract the screw.

Bumper Screw Adjustment

The bumper screws are set to touch the weigh hopper for shipment. After the blender has been moved and secured into position for operation, back off each bumper screw to leave no more than a 1/8" gap between screw and hopper contact point.

2.8 TRANSPORTING THE BLENDER

Prepare the blender for transport before power is removed from the blender. Use a volt-ohm meter to monitor the load cell output signal (green and white load cell wires) during the load cell protection setting. The bumper screws should be reset to touch the hopper, being careful to make sure the screws are set evenly so that no one screw is forcing the weigh hopper sideways. The load cell output signal should not change more than +/-0.5mv from an initial reading before touching the bumper screws.

Install shipping protection screws before power is removed from the blender. Again, make sure the hopper is emptied of any process material and take note of the empty hopper load cell output reading using the volt-ohm meter. After the jam nut is set the loadcell output should be one half of the empty hopper reading +/-1mv.

Steps for Transporting the Blender	
Procedure	**Results**
1. Use a voltmeter to measure output signal of the empty (auger/gearbox/motor should be removed) weigh hopper.	A millivolt value should be present proportional to the weight on the load cell.
2. The bumper screws should be reset to touch the hopper evenly so that no one screw is forcing the weigh hopper sideways.	The output on the voltmeter should not change more than **+/-0.5mv** from the initial reading.
3. Install the shipping protection screw and advance it slowly so that the screw pushes upward on the load cell.	When the load cell output signal is half of the initial reading, STOP advancing the screw. Use a jam nut to lock the screw into position.
4. Repeat Steps 1-3 for each hopper.	

2.9 LOADCELL REPLACEMENT

2.9.1 LOADCELL INSTALLATION

1. Empty the weigh hopper of any process material, back off the loadcell protection screw and bumper screws, and clean all mounting surfaces interfacing with the loadcell. Any debris left at the mounting surface may cause hopper misalignment.

2. Snug the fasteners holding the load cell to the weigh hopper and the blender frame allowing slight movement of the hopper and load cell. Do not tighten as of yet. Keep the fasteners as snug as possible and still allow movement for alignment.

3. Align the hopper for maximum clearance between the weigh hopper and any fixed contact point on the blender, then tighten the load cell fasteners. Make sure the hopper doesn't misalign during tightening.

4. Set the overload protection screw while monitoring the load cell output signal with a volt-ohm meter. Add weight to the hopper until the load cell output signal reaches either:
   A) 40 mv +/-1mv for load cells with part number beginning with the letters "SPI"
   B) 27 mv +/-1mv for load cells with part number beginning with the letters "60048"

5. Advance the overload protection screw to contact the load cell and continue until the load cell output signal reaches either:
   A) 36 mv +/-1mv for load cells with part number beginning with the letters "SPI"
   B) 24 mv +/-1mv for load cells with part number beginning with the letters "60048"

6. Tighten the protection screw jam nut to lock the screw into position. Tightening the jam nut tends to advance the screw, so monitor the voltage during this step.

2.10 STAND TUBE COVER

If the blender has a downcomer, the stand tube cover is located at the discharge of the downcomer weigh hopper. It sits on top of the stand tube, and is a floating ring which keeps foreign matter from entering the process at this point. Periodically check and clean this ring if the process material tends to cling and is loaded with fines.

2.11 AUGER CHANGES

There may be the occasion when a change in recipe requires a change in rate which is beyond the rate range of the installed auger. When this occurs, it is necessary to change auger and auger sleeve combination. The auger is held in the motor gearbox by as many as four set screws. Once these screws are loosened, the auger will slide from the gearbox. When the new auger is installed, pay particular attention to the flat places on the auger shaft (they should line up under one of the set screws) and to the clearance between the rear auger flight and the gearbox face. there must be a gap of almost 1/4 inch between the auger flight and the gearbox to keep pellets from jamming.

Most augers require a special sleeve, or insert, mounted inside the hopper. The augers and sleeves are sold together to assure a 1/4 inch radial clearance. it is important that the correct auger sleeve be installed for the auger. When returning the gearbox/auger combination to the blender, make sure that no material is pinched between the auger and the gearbox faceplate. This will result in improper alignment of the auger shaft inside the auger flight.

3 XB/XG BLENDER MECHANICAL

H **CAUTION:** The blender operates in automatic mode, and hopper augers and loading equipment may start unexpectedly. Make certain that the element or blender is in zero mechanical state prior to accessing.

3.1 SAFETY

It is imperative that the users of the X series blender be completely knowledgeable about the potential hazards of the blender and associated equipment. It is the responsibility of the employer to provide competent personnel for operating and maintaining the equipment who are adequately trained and have the technical background to understand the safety policies and procedures set forth by the employer. It is the responsibility of the employer to provide training, and a program with written policy, specific procedures and rules, for safe operation and maintenance of the equipment. The employer should schedule periodic inspections that would reveal hazards caused by improper installation, missing parts, abuse, improper use, age, corrosion or fatigue. If hazards are not immediately eliminated the equipment must be removed from service.

Warning labels are affixed to the equipment. It is the responsibility of the employer to assure that operator and maintenance personnel understand the labels or to provide warning labels in the language(s) understood by operator and maintenance personnel. Employers purchasing used equipment should confirm with the original manufacturer that the machine is equipped with all of its necessary parts for safe operation, the proper operating manual, the proper electrical control schematic drawings, and warning labels.

3.1.1 EMPLOYEE SAFETY RESPONSIBILITIES

3.1.1.1 PHYSICAL ENTRY INTO MACHINE

The employee shall put the machine in Zero Mechanical State (ZMS) before placing any part of the body in the path of any movable machine member.

3.1.1.2 TROUBLE SHOOTING WITH POWER ON

When it is necessary to locate and define problems with power on, the employee has the authority to work on the machine with guards removed if such action will not place any part of the body in the path of any movable machine member.

3.1.1.3 REMOVING PROTECTIVE DEVICES

During necessary maintenance, the employee shall not remove, bypass, or alter any device that was provided to reduce hazardous conditions. Before the machine is returned to production, the employee shall replace all devices that may have been removed during maintenance.

3.1.1.4 RETURNING EQUIPMENT TO PRODUCTION

The employee shall verify that the machine is in adequate operating condition with all guards secured before releasing it for production use.

The ZMS procedure must be used in the safety training program provided by the employer to teach employees that it can be very dangerous to enter the machine unless every requirement of ZMS is satisfied. Persons must not place any part of the body in the path of movable machine members during setup, adjustment, maintenance, or installation. The operator must be trained to detect when the machine guards are defective or missing. The operator must report malfunctions or defects at once.

3.1.2 ZERO MECHANICAL STATE (ZMS)

After all energy sources have been neutralized, the machine is in the "zero mechanical state" - ZMS. This state provides maximum protection against unexpected mechanical movement. During maintenance, it is vital that the machine be put into a state in which the possibility of its making an unexpected and injury causing movement is eliminated. The procedure used for this purpose is typically referred to as *lockout*. The lockout procedure includes all energy sources:

- Electrical power
- Compressed air
- Potential energy from suspended parts
- Hydraulic fluids under pressure
- Energy in springs
- Any other sources that might cause unexpected mechanical movement.

All energy sources must be neutralized before any maintenance work can be safely done.

It is essential that user management standardizes maintenance procedures by developing a program including a written policy, specific procedure and rules.

3.1.3 PROCEDURE FOR ACHIEVING ZERO MECHANICAL STATE

User management must develop and provide to operator and maintenance personnel specific procedures for placing equipment in the ZMS that minimizes hazards. The user should follow a ZMS procedure before allowing any inspection, adjustments, or maintenance. It is the responsibility of the employee to follow the ZMS procedure established by the employer. The following is the recommended general ZMS procedure.

1. If there is a remote control device press the stop key at that remote operator's control.

2. Press the stop key at the operator's control panel local to the machine.

3. Disconnect and lock-out the primary electrical supply (disconnect supplied by user) feeding the blender.

4. Disconnect and lock-out the primary electrical supply (disconnect supplied by user) feeding the material handling system which supplies the blender with process material.

5. Shut off and lock-out the primary compressed air supply feeding the material handling devices which supply the blender with process material. Vent the compressed air supply lines feeding those devices, reducing all pressure that could create or cause a machine movement.

6. As a precaution, before the metering drives are detached from the machine, disconnect all of the cables leading to the motor of the metering drive on each weigh hopper.

7. Drain process materials from loading devices feeding the blender hoppers.

8. Drain process materials from all hoppers using drain valve beneath each hopper.

9. Lock-out all energy sources which might cause unexpected mechanical movement of equipment which is accessible through the discharge at the base of the blender (extruder, etc).

10. Test to verify that all energy sources have actually been disconnected.

3.1.4 ZERO MECHANICAL STATE FOR A SINGLE HOPPER (ELEMENT)

It may be necessary to access a single hopper, or element, of the blender while the rest of the blender is in operation. Zero mechanical state for a single element can only be achieved if all the auxiliary equipment (e.g., loading equipment) supports disabling of individual elements. Reference to documents for other equipment may be necessary to complete this procedure.

1. Disable the loading equipment that feeds the element. Follow the instructions provided with the loading equipment.

2. Remove the element from the blend recipe (see section 4.4.6).

3. Unplug the motor lead at the hopper.

3.1.5 RECOMMENDED BLENDER STARTUP PROCEDURES

User management must develop and provide to operator personnel specific procedures for equipment startup that minimizes hazards. The user shall follow a startup procedure before equipment is place in operation. It is the responsibility of the employee to follow the startup procedure established by the employer. The following is the recommended general startup procedure.

1. Verify that all parts and guards are installed.

2. Verify that metering drives are securely clamped to weigh hoppers.

3. Confirm that metering drive cable(s) disconnects are completely engaged.

4. Tighten all weigh hopper mounting knobs, (2) per hopper.

5. Verify that all weigh hopper drain valves are in the closed position.

6. Secure the downcomer slide gate in the open position.

7. Unlock and turn ON the power supply disconnect for the material handling system which feeds process material to the blender.

8. Unlock and turn ON the compressed air supply to the material handing system.

9. Turn ON the power at the material handing system control and activate the loading stations that correspond to the desired elements to be loaded in the blender.

10. Unlock and turn ON the power supply disconnect for the blender.

11. At the blender operator interface press the **<ON>** key.

12. Initialize recipe then press **<RUN>** when prompted to activate recipe and changes to the recipe if made.

3.1.6 RECOMMENDED BLENDER SHUT DOWN PROCEDURE

User management must develop and provide to operator personnel specific procedures for equipment shut down that minimize hazards. The user shall follow a shutdown procedure before allowing any inspection, adjustments, or maintenance. It is the responsibility of the employee to follow the shutdown procedure established by the employer. The following is the recommended general shutdown procedure.

1. Turn off power switch at material handling system controller.

2. Press **<STOP>** at the blender operator interface, local and remote.

3. Press **<OFF>** to power down the blender.

4. Follow the Zero Mechanical State procedure before beginning maintenance or service.

3.2 CASCADE POST

3.2.1 DESCRIPTION OF OPERATION

The cascade post disperses the flow of ingredients being cascaded through the mixer. The objective is to disperse the blended process material to fill the collection hopper at an angle which is less than the angle of repose of each ingredient material. This prevents any one ingredient from rolling off and demixing (classifying) at the free surface.

Figure 3 Cascade Post

3.3 DOWNCOMER REMOVAL

The downcomer tube can be removed for clean out. Hold the downcomer dust cover up and out of the way and remove the downcomer. Disconnect any proximity switches and grounding straps. The grounding strap helps drain static charges which may damage the switch. For this reason the blender should be mounted on grounded equipment or structures.

3.4 CASCADE CHAMBER

The auger housing enters the cascade chamber through a hole in its side and should not touch the cascade chamber. It should be allowed to move freely in this hole. A floating seal is provided to keep process material in and foreign matter out. If the auger housing is against the cascade chamber it may bind and restrict free movement of the weigh hopper and cause operation failures. This could result in UNSTABLE WEIGH SYSTEM alarms, or, for a very low rate hopper, DRIVE SYSTEM FAILURE alarms.

3.5 BLENDER LIFTING

There are (2) lifting lugs provided in the loading platform of the blender.

- Use both lift points when lifting the blender. Do not lift the blender from points other than the designated lift points.

- Secure all loadcell overload protection screws before moving the blender. See Loadcell Overload Protection section of this manual.

- Do not lift the blender with loading equipment mounted on the blender as this makes the blender top heavy and apt to flip on its side.

- Do not lift the blender with any amount of process material in the weigh hoppers to prevent loadcell damage. Process material left in hoppers may adversely unbalance the blender making it difficult to handle and set into position.

- Secure all blender components before lifting the blender to prevent anything from falling during lifting. For example make sure all gearboxes and weigh hoppers are clamped to the blender properly or removed before lifting.

3.6 EXTRUDER MOUNTING THE BLENDER

3.6.1 EXTRUDER STABILITY

When mounting a blender on an extruder a number things need to be considered. One of the more important is the stability of the extruder. Make certain that the extruder can safely support the blender. Don't forget that the blender also supports loading equipment. Think also about how operators have to interface with the blender and the loading equipment.

3.6.2 ORIENTATION

Determine the desired orientation for the blender mounted on the extruder. Refer to drawing BB38410000. Your preference may be to give ready access to control panels or to clean out access if you expect frequent material changes. Think about where power and network cables are or will run and how you may want the blender situated for wiring.

3.6.3 SUBPLATE OPTION

Process Control offers a blender mounting plate option, called a subplate. See drawing BB3191000 (BB3881000 for Metric) for the recommended use of a subplate. The blender base plate has limited space which does not readily accommodate the extruder throat bolt pattern The subplate is provided with bolts and tapped holes for mounting to the bottom of the blender. The subplate affords more space for the extruder bolt pattern. The subplate in turn is bolted down to the extruder. The customer must drill the subplate and provide the necessary fasteners for extruder mounting.

3.6.4 EXTRUDER GROUNDING

Mount the blender only on grounded extruders.

3.7 MEZZANINE MOUNTING THE BLENDER

For the greatest stability, the blender can be mounted on a stable mezzanine above the extruder, but only if the blender is not used for extrusion control. This will provide easy access to all of the hoppers and motors, as well providing desired mechanical isolation from the extruder itself.

3.8 LOADCELL OVERLOAD PROTECTION

There is a loadcell under each weigh hopper on the blender. If the loadcell is allowed to be over stressed the stain gages may fail and the beam may deflect beyond its elastic limit leaving it permanently deformed. Overload protection is intended mainly for non-process related disturbances, such as when hopper clean out is necessary. Overload protection plays an important part in protecting loadcells during transport of the blender.

The means of mechanical overload protection for loadcells on the blender is a travel stop screw accessed from the under side of the loadcell. This limits travel of the weigh hopper downward on the cell. There are no overload stops for upward forces on the weigh hopper as it is very unlikely such a force would exist.

The overload protection screw under each loadcell is set at the factory and is identified with a red tag and reads as follows:

CAUTION! OVERLOAD PROTECTION SCREW
DO NOT REMOVE OR ADJUST THIS SCREW
THIS SCREW IS FACTORY SET.
CONSULT MAINTENANCE MANUAL FOR LOAD CELL REPLACEMENT INSTRUCTIONS.

The gap between the overload protection and weigh hopper (or loadcell directly depending on hopper configuration) allows the weigh hopper to move in the operating range of the loadcell. The protection screw is set carefully in the factory by load cell output readings and should not be set by gapping with a feeler gage. Refer to "LOADCELL REPLACEMENT" for setting of the overload protection screw.

The loadcells are protected during shipment by shipping protection screws under each cell along side the overload protection screw under each loadcell. It is identified with a green tag which reads as follows:

CAUTION! SHIPPING PROTECTION SCREW REMOVE THIS SCREW BEFORE START UP. DO NOT ADVANCE SCREW TOWARD LOADCELL OR DAMAGE MAY RESULT.

After the blender has been moved and secured into position for operation, loosen the jam nut and remove the shipping protection screws. When removing the shipping screw, do not advance the screw toward the load cell. Damage to the load cell may result. Make sure the screw is turned in a counter-clockwise direction looking from the screw head side to retract the screw.

3.9 TRANSPORTING THE BLENDER

Prepare the blender for transport before power is removed from the blender, Using a volt-ohm meter to monitor the load cell output signal (green and white load cell leads) during the load cell protection setting procedures that follow. A millivolt value should be present proportional to the weight on the load cell.

The blender is shipped with the metering unit (auger/gearbox/motor) separately and off the weigh hopper to minimize any disturbances to the load cell during transit. If the blender is moved or put in transit, it is recommended that the metering units be again removed.

Install "shipping protection screws" before power is removed from the blender. Again, make sure the hopper is emptied of any process material and take note of the empty hopper load cell output reading. Install the shipping protection screw and advance it slowly so that the screw pushes upward on the load cell. Watch the load cell output signal as the screw is advanced - the signal will decrease. Just before reaching halfway between the empty hopper reading and zero volts stop advancing the screw. A jam nut should be used to lock the screw into position. After the jam nut is set the loadcell output should be one half of the empty hopper reading +/-1mv.

3.10 LOADCELL REPLACEMENT

3.10.1 LOADCELL INSTALLATION

1. Empty the weigh hopper of any process material, back off the loadcell protection screw and bumper screws, and clean all mounting surfaces interfacing with the loadcell. Any debris left at the mounting surface may cause hopper misalignment.

2. Snug the fasteners holding the load cell to the weigh hopper and the blender frame allowing slight movement of the hopper and load cell. Do not tighten as of yet. Keep the fasteners as snug as possible and still allow movement for alignment.

3. Align the hopper for maximum clearance between the weigh hopper and any fixed contact point on the blender, then tighten the load cell fasteners to 18 to 20 ft/lb torque. Make sure the hopper doesn't misaligned during tightening.

4. Set the overload protection screw by first setting up to monitor the load cell output signal with a volt-ohm meter.

5. Add weight to the hopper until the load cell output signal reaches 40 mv +/-1mv for load cells with part number beginning with the numbers 65079, 36 mv +/-1mv for load cells with part number beginning with the numbers 65079.

6. Tighten the protection screw jam nut to lock the screw into position while monitoring the load cell output signal.

3.11 AUGER CHANGES

There may be the occasion when a change in recipe requires a change in rate which is beyond the rate range of the installed auger. When this occurs, it is necessary to change auger and auger sleeve combination. The auger is held in the motor gearbox by as many as four set screws. Once these screws are loosened, the auger will slide from the gearbox. When the new auger is installed, pay particular attention to the flat places on the auger shaft (they should line up under one of the set screws) and to the clearance between the rear auger flight and the gearbox face. there must be a gap of almost 1/4 inch between the auger flight and the gearbox to keep pellets from jamming.

Most augers require a special sleeve, or insert, mounted inside the hopper. The augers and sleeves are sold together to assure a 1/4 inch radial clearance. it is important that the correct auger sleeve be installed for the auger. When returning the gearbox/auger combination to the blender, make sure that no material is pinched between the auger and the gearbox faceplate. This will result in improper alignment of the auger shaft inside the auger flight.

4 BLENDER CONTROL PANEL

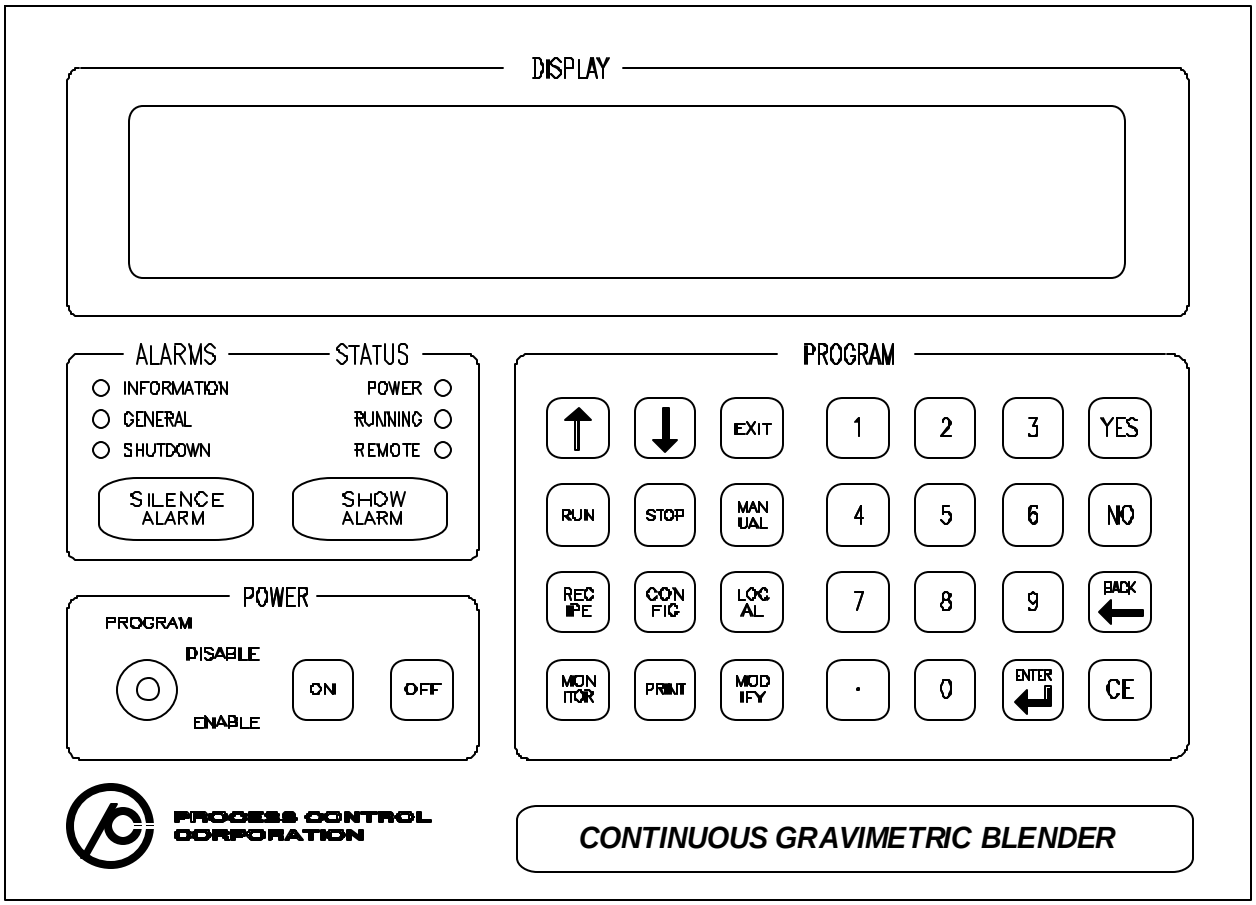

Figure 4 Blender Front Panel and Keypad

The blender

r control panel is graphically divided up into four different areas, each area with its own functionality. This section details all of the operations of the blender by functional group on the keyboard.

4.1 DISPLAY

The display section is the two line by forty character vacuum fluorescent display (VFD). The VFD is used to show all text messages and any data entry, and is the most prominent feature on the display panel.

4.2 ALARMS - STATUS

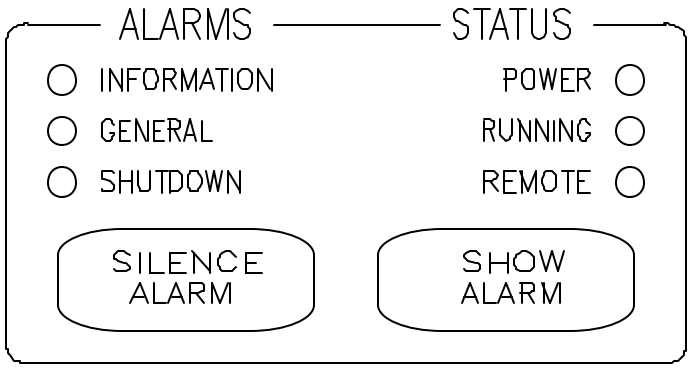

Figure 5 Alarm and Status LEDs

The ALARMS area of the keyboard provides the keys used to check alarm conditions in the blender, and is comprised of 3 LED indicators for alarms, the **<SILENCE ALARM>** and **<SHOW ALARM>** keys. When the **<SHOW ALARM>** key is pressed once, the user is presented with a menu consisting of ACKNOWLEDGE ALARMS, DISPLAY LOGGED ALARMS and EXIT SHOW ALARMS. By selecting DISPLAY LOGGED ALARMS, the user will be able to scroll (with the up and down arrow keys) through a history of the most recent alarms. By selecting ACKNOWLEDGE ALARMS (or simply pressing the **<SHOW ALARM>** key twice), the first alarm (if any) is shown on the display and the corresponding LED indicator blinks to indicate alarm severity levels of INFORMATION, GENERAL, or SHUTDOWN. If the alarm is current, only the alarm text and the severity indicator is displayed. If the alarm condition has cleared, (OLD) appears to the right of the alarm text and the alarm LED is extinguished. The severity level of the alarm conditions is set up in the system configuration.

An INFORMATION level alarm indicates that something in the system has occurred that should be noted, however, the blender operation is not immediately jeopardized. A GENERAL alarm indicates that something of immediate concern has occurred and should be checked or the blender may shut down. A SHUTDOWN alarm indicates an event serious enough to cause the blender to shut down automatically.

The **<SILENCE ALARM>** key may be pressed to turn off the relays which are usually used to control an audible alarm. This key will not clear any of the alarm conditions but it will stop any alarm horn or bell from sounding until another alarm is generated. This key should not be used as a substitute for stepping through and clearing each alarm.

Alarm conditions and their meanings:

DRIVE HARDWARE FAILURE
A failure of the drive module board has been detected. The board should be replaced.

DRIVE IN MANUAL BACKUP
This alarm will be seen on a blender with extruder control if the user has installed an AUTO/MANUAL switch for the extruder (enabling extruder control via a manual dial) and the switch is in the MANUAL position. In this position, the blender cannot modify the extruder's speed.

DRIVE INHIBITED
This alarm will be seen on a blender with extruder control if the extruder drive control board is powered off. In this position, the blender cannot modify the extruder's speed.

DRIVE NETWORK FAILURE
The central computer cannot communicate with the drive module controlling the indicated drive. The system cannot control the drive until the network problem is corrected.

DRIVE OVER MAXIMUM SPEED
An attempt has been made to drive a hopper motor above its MAX SPEED ALARM value. In MANUAL BACKUP, this alarm indicates that the set speed is greater than the alarm limit. In RUN, this alarm means that the control algorithm has attempted to raise the speed above the alarm limit because the auger used may be too small to achieve the desired rate.

DRIVE SOFTWARE FAILURE
The system has detected a software failure of the drive module. Please contact Process Control.

DRIVE SOFTWARE NEEDS UPDATING
The software in the drive module is older than the software in the central computer and should be updated. This usually occurs after an upgrade of the firmware in the mini-op panel.

DRIVE SYSTEM FAILURE
The indicated hopper is not loosing weight as it should. There may be a material bridge in the hopper, the hopper could be empty, or there may be some obstruction to the accurate weighing of the material. See the TROUBLESHOOTING section (page 89) for information on diagnosing the cause of this alarm.

DRIVE UNDER MINIMUM SPEED
The blender has attempted to set the drive speed lower than the MIN SPEED ALARM value. If the recipe cannot be changed, control of this device may fall outside the specification limit. This alarm can occur if the hopper stays in coast for more than the MAX COAST TIME, or if no update has occurred for longer than three times the update time.

HOPPER BELOW LOW WEIGHT
Material level in the hopper is low and the loading system should be checked immediately before the hopper runs out of material.

HOPPER CRITICAL LOW
Material level in the hopper is critically low and the system is (typically) being shut down to keep the blender mix from being compromised.

HOPPER HARDWARE FAILURE
The system has detected a hardware failure of a weigh module board. The board should be replaced and the hopper recalibrated.

HOPPER LOW DUMP SIZE
The hopper is not receiving large enough dumps of material during a load. This indicates a problem with the loading system and should be remedied before the hopper starts to run out of material. If this alarm occurs frequently, the performance of the system degrades.

HOPPER NETWORK FAILURE
The central computer cannot communicate with the weigh module. The weight in the hopper cannot be determined and the hopper will not even load unless in manual backup.

HOPPER OVER MAXIMUM WEIGHT
The hopper has been overfilled (based on weight) and the rate cannot be determined. This alarm indicates a problem with the loading parameters or the loading system. The fill times or load on weight should be lowered to prevent overfilling.

HOPPER SOFTWARE FAILURE
The system has detected a software failure of a weigh module. Please contact Process Control.

HOPPER SOFTWARE NEEDS UPDATING
The software in the weigh module is older than the software in the central computer and should be updated.

HOPPER UNDER MINIMUM WEIGHT
The hopper is under the minimum allowable weight, and the rate cannot be determined. This alarm indicates a problem with the overload protection screws, the loadcell, or the weigh module as this condition should not normally exist (it suggests a 'negative' weight in the hopper).

OUT OF SPECIFICATION LIMIT
The ACTUAL rate has deviated from the SET rate by more than the OUT OF SPEC LIMIT set in the configuration. It suggests a potential problem with the control algorithm settings.

UNABLE TO MEET RATE

The blender is unable to bring the material level above the low level proc switch within the UNABLE TO MEET RATE DELAY time. On a system with a weighed downcomer, this alarm will be generated if the blender is at full speed and the downcomer material weight is decreasing, or if the downcomer does not register any material gain within the UNABLE TO MEET RATE DELAY time period. This alarm can also be generated by any blender operating in ON/OFF mode if the blender cannot run at the requested recipe rate. For a blender which is monitoring line speed and controlling an extruder, or is monitoring extruder rate and controlling the line speed, this alarm can be generated if the monitored value changes to a rate which will cause the blender to exceed its limits.

UNSTABLE WEIGH SYSTEM

The weighing system is spending an excessive amount of time in volumetric mode, because of excessive vibration or something physically interfering with the weigh hopper. See the TROUBLESHOOTING section (page 89) for information on diagnosing the cause of this alarm.

4.3 POWER

The POWER section contains the power control of the blender and the key switch for enabling/disabling various keyboard functions (set up via the system configuration). To turn off power, Press the **<OFF>** key. The computer will respond with an "Are you sure?" question. Press **<YES>** and then **<ENTER>**. The computer will then perform a power off sequence and power will be removed in three or four seconds. During the power off, all user entered parameters will be saved in battery backed memory. To turn power on, press the **<ON>** key. The system will power up and control will be established in approximately ten seconds. During this time, the system performs various self tests of both itself and all attached peripheral equipment. If the blender software has just been upgraded, the startup will take longer and the messages 'CONVERTING X.XX (old version) TO X.XX(new version)'. This indicates that the system has converted the parameters for the old blender software to the new blender software.

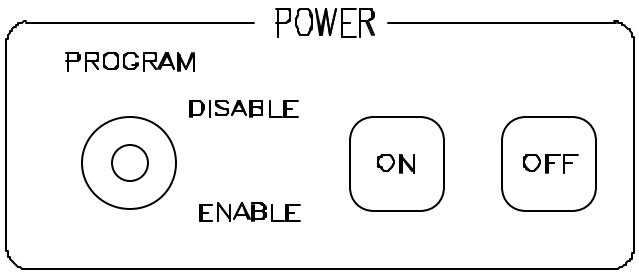

Figure 6 Power and Keyswitch

NOTE: *If the blender seems to "hang on" when the power is turned off (the green POWER light, and maybe others, do not turn off for a while) it usually indicates that there is a problem with the network, and one device is not responding. In this case it is alright to shut down the blender by disconnecting the AC power supply, but the problem with the network should be identified and fixed*

as soon as possible. Under normal operation, power should always be turned off by using the ***<OFF>*** *button.*

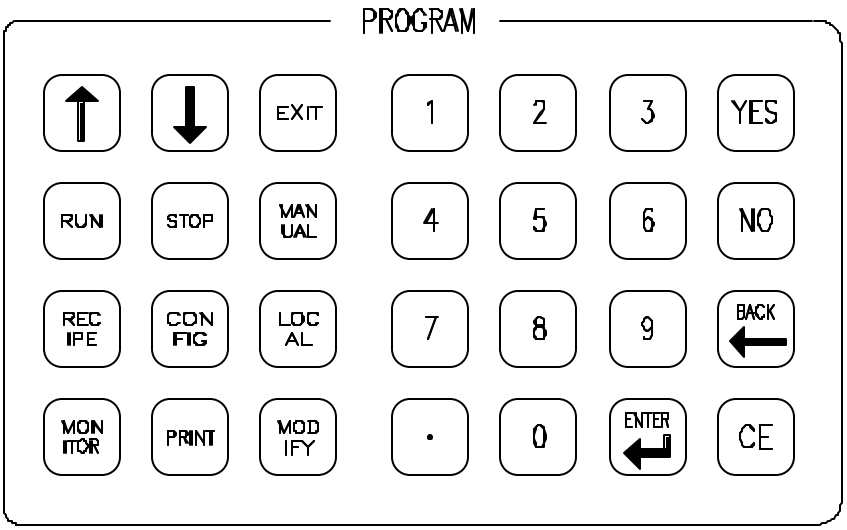

Figure 7 Data Entry and Control

4.4 PROGRAM

The PROGRAM area of the keyboard is used for all data entry, system configuration, operation, and trouble-shooting. The right half and the top two arrow keys are used for data entry. The other keys are for selecting various functions.

4.4.1 DATA ENTRY

Data is entered via the keys in the PROGRAM field. One piece of information common to all types of data entry is the use of the **<ENTER>** key. It is used to tell the computer that the information entered is correct an should be accepted. The blender will present a **default** entry choice so that if the displayed data is OK only the **<ENTER>** key need be pressed, else the user must enter the correct data.

Note: *The default data is cleared if the user presses a number key.*

4.4.1.1 NUMERIC ENTRY

Numeric entry is handled with the numeric keys 0-9, the decimal point key, the **<UP>** and **<DOWN>** keys. When numbers are typed in the numbers appear on the right and the numbers already displayed shift to the left.

First number entered:	8_
Second number entered:	82_

The **<BACK>**SPACE key will delete the last number entered (the number on the right) and shift the number to the right. To delete the entire number, press the **<CE>** key. When the number is correct, the **<ENTER>** key should be pressed.

CAUTION: *All numeric entries have automatic range checking. If a number entered is outside the allowable range, the upper or lower limit of the number is displayed as the new default and the number must be reentered.*

4.4.1.2 MENU ENTRY

Menu entry is used when a choice must be made from a list of items. Menu choices are selected by pressing either the **<UP>** or **<DOWN>** key until the proper choice is displayed and then pressing the **<ENTER>** key to select the displayed menu item.

4.4.1.3 YES/NO ENTRY

Yes/No entry is similar to menu entry. The **<YES>** and **<NO>** keys are used to enter the desired response, and like all data entry, the **<ENTER>** key is used to complete selection. The user may also use the up and down arrow keys to toggle between the Yes/No field.

4.4.2 EXIT

The **<EXIT>** key is used to exit from any function and returns the display to the idle state showing the system mode (paused, manual, or automatic). This is useful for quickly exiting from a menu system several levels deep.

4.4.3 RUN

The **<RUN>** key is used to place the blender into automatic mode. The action is dependant upon the control mode chosen. For all control modes, pressing **<RUN>** instructs the system to begin measuring and displaying weight throughput as well as inventory management. The display will respond with the message "BLENDER IN AUTOMATIC". This message will be shown after the **<RUN>** key is pressed, now other screens may be selected(ie: the MONITOR screen).

4.4.4 STOP

Pressing the **<STOP>** key instructs the blender to stop all hopper motors and cease measuring weight throughput. The display will show "BLENDER PAUSING . . . " while the processes are stopping and then "BLENDER PAUSED" when complete.

NOTE: *Loading of hoppers continues even while the blender is stopped. This is normal operation.*

If the blender is operating in extruder control mode, the user will be requested to enter the DEVICE TO STOP. The menu presented will allow the user to stop either the SYSTEM (both the extruder/line speed control and the blender), the BLENDER ONLY, or the EXTURDER/HAUL OFF ONLY. The menu items may be selected by pressing the **<UP>** or **<DOWN>** key the press the **<ENTER>** key when the correct option is displayed.

4.4.5 MANUAL

The **<MANUAL>** key has two functions depending on the type of blender. If the blender has extrusion control (BE blender), then the **<MANUAL>** key is used to start the extruder, causing the blender to follow (see Section 6.7, page 78). If MANUAL BACKUP(under the MODIFY menus) is enabled, then the **<MANUAL>** key is used to control the motor speeds (see Section 6.10, page 82). The set speeds are changed by pressing **<ENTER>** to move to the desired hopper and then enter the new desired speed with the numeric keys or the **<UP>** and **<DOWN>** keys. The **<UP>** and **<DOWN>** keys will increment or decrement the speed by one percent at a time. Once the proper speed is entered press the **<ENTER>** key to enable the new motor speed.

4.4.6 RECIPE

The **<RECIPE>** key is used to enter the recipe that will be used when the **<RUN>** key is pressed. A recipe may be stored in battery backed memory for future recall. If the blender is set to require the key to change stored recipes, and the key switch is in the DISABLE position, the production recipe is immediately displayed. Otherwise, when the **<RECIPE>** key is pressed the recipe menu is entered.

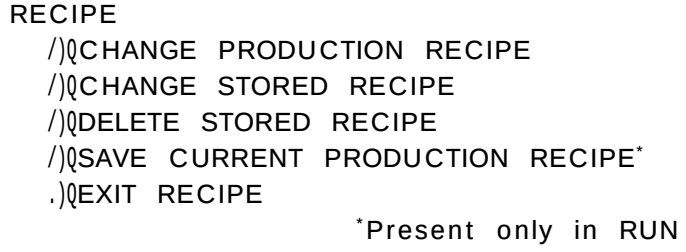

Figure 8 Overview of Recipe Menu Options

4.4.6.1 CHANGE PRODUCTION RECIPE

This menu choice allows the modification of the currently running recipe. If the system is in AUTOMATIC (via the **<RUN>** key), the currently running recipe is copied to a temporary recipe that is then edited. If the system is not in AUTOMATIC, the temporary recipe is edited without being overwritten. This allows the viewing of the currently running recipe without fear of accidentally changing the current recipe. A recipe change only takes effect in AUTOMATIC when the **<RUN>** key is pressed.

If stored recipes exist, the operator is first prompted by "RECALL STORED RECIPE?". If answered YES, a stored recipe may be recalled, overwriting the temporary recipe and allowing editing. If answered no, the current temporary recipe is edited.

The parameters the operator may be required to enter (depending on the blender operating mode) are:

LINE OUTPUT - The total output of the line in weight throughput.

HOPPER x PARTS BY WT - If the 'per hopper' components are entered as PARTS BY WT.

HOPPER x = nn.nn % - If the 'per hopper' components are entered as percents.

FILM THICKNESS - For lines which control the product thickness.

LAYFLAT WIDTH - Usually for blown film lines which are also controlling thickness.

STRETCH FACTOR - Usually for blown film lines which are also controlling thickness.

MATERIAL x SOLID DENSITY - Required for each ingredient for thickness control.

WEIGHT / LENGTH - Specifies total line output in weight per running length.

INSIDE DIAMETER - Inside diameter, used for pipe/tubing and wire/cable.

OUTSIDE DIAMETER - Outside diameter, used for pipe/tubing and wire/cable.

WALL THICKNESS - Product wall thickness, used for pipe/tubing and wire/cable.

4.4.6.2 CHANGE STORED RECIPE

This allows the modification of a stored recipe. Stored recipes are retained in a battery backed memory with a normal life of ten years.

4.4.6.3 DELETE STORED RECIPE

Used to delete a stored recipe.

4.4.6.4 SAVE CURRENT PRODUCTION RECIPE

Allows saving the currently running recipe for later recall. This is useful when experimenting with your process to save a good recipe. This option is only available if the blender is running.

4.4.6.5 EXIT RECIPE

Selecting EXIT exits the RECIPE function.

4.4.7 CONFIG

<CONFIG> is used to view/change any setup or configuration parameters. The user uses menus to select a user configurable option. Several parameters require powering down the system after changing in order for the system to recognize the change (some parameters are only read on power up). If the system has never been configured, the PROGRAM key must be installed and turned to the PROGRAM ENABLE position.

There are several menu selections available : STORE CONFIGURATION (this selection has no effect in the current software), SEND CONFIGURATION/RECEIVE CONFIGURATION (see section 6.16, page 86), and CHANGE CONFIGURATION. Selecting CHANGE CONFIGURATION allows the user to access all of the following parameters.

```
<CHANGE CONFIGURATION>
  /)QSYSTEM
  *     /)QSYSTEM DESCRIPTION
  *     /)QSYSTEM ACCEL/DECEL PARAMETERS     (Extrusion/Line control only)
  *     /)QUSER INTERFACE PARAMETERS
  *     /)QALARM CONDITIONS
  *     /)QNETWORK PARAMETERS
  *     /)QUNITS
  *     /)QCOMMUNICATION
  *     /)QSYSTEM TIME
  *     /)QMISCELLANEOUS
  *     /)QCALIBRATION
  *     *     /)QCALIBRATE
  *     *     /)QEDIT CALIBRATION
  *     *     .)QEXIT
  *     /)QSIMULATION
  *     .)QEXIT
  *
  /)QEXIT
  *
  /)QHOPPER A
  *     /)QNETWORK ADDRESSES
  *     /)QALARM/LOAD WEIGHTS
  *     /)QCONTROL LOOP PARAMETERS
  *     /)QACCEL/DECEL/SPEED PARAMETERS
  *     .)QEXIT
  *
  /)QHOPPER B*
  *     .
  *     .
  *     .
  /)QHOPPER H*May not be present
  *
  .)QDOWNCOMER
        /)QNETWORK ADDRESSES
        /)QALARM/LOAD WEIGHTS
        /)QCONTROL LOOP PARAMETERS
        /)QACCEL/DECEL/SPEED PARAMETERS
```

Figure 9 Configuration Tree

4.4.7.1 SYSTEM

To get to this menu selection, press the **<CONFIG>** key. The computer will then show SYSTEM. Press **<ENTER>** to get to the SYSTEM configuration menu. The first menu item shown is SYSTEM DESCRIPTION, and this should be set first. Press **<ENTER>** to select SYSTEM DESCRIPTION.

4.4.7.1.1 SYSTEM DESCRIPTION

The following parameters can be entered (some will not be displayed if the blender is in operation):

LANGUAGE - This allows the user to select the language for the blender user interface.

WEIGHED DOWNCOMER - Select **<YES>** if the blender has a weighed downcomer.

BLENDER CONTROL MODE - Select either CONTINUOUS mode (constantly changing the blender rate to match extruder output) or ON-OFF (run at a set rate until the high level is reached and then pauses until the low level is reached).

DOWNCOMER LOW LEVEL WEIGHT - If the blender has a weighed downcomer, this is the weight used for the low level for ON-OFF and the lower bound for CONTINUOUS.

DOWNCOMER HIGH LEVEL WEIGHT - If the blender has a weighed downcomer, this is the weight used for the high level for ON-OFF and the upper bound for CONTINUOUS.

EXTRUDER CONTROL MODE - For BE/XB/XG blenders in CONTINUOUS mode only. If extruder control is desired, an EXD extruder controller (made by Process Control) must be present to allow the blender to control the extruder speed.

LINE SPEED CONTROL MODE - For BE/XB/XG blenders in CONTINUOUS mode only. This menu selects line speed monitoring or control via an EXL line speed control module (made by Process Control). If the control mode is selected, the recipe menus will prompt the user for a stretch factor (see stretch factor).

SECONDARY LINE SPEED MODE - For BE/XB/XG blenders in CONTINUOUS mode only with line speed set to control/monitor. This menu selects winder monitoring via an EXL line speed control module (made by Process Control).

STRETCH FACTOR PART OF RECIPE - For BE/XB/XG blenders in CONTINUOUS mode only with line speed control. This menu option allows the user to enter the stretch factor as part of the recipe. The stretch factor is the amount of stretching (>1.0) or shrinking(<1.0) that occurs between the primary and secondary haul of devices.

APPLICATION - Describes the line for determining the various recipe entry modes. The options are BLOWN FILM, SHEET AND CAST FILM, PIPE AND TUBING, WIRE AND CABLE and PROFILE.

FIRST RECIPE ENTRY (. . .) - Depending on the APPLICATION and extruder control mode selected, there will be several options for recipe entry. There is more discussion on this in the LINE SPEED CONTROL section of the manual, page 78.

RECIPE ENTRY MODE - The blender operates in either *percent* or *parts* mode. If percent mode is selected, the recipe must add to 100.0% before it will be accepted.

NUMBER OF HOPPERS - The physical number of blender hoppers this number should usually not be modified once the installation is complete. If it is desired that some hoppers not be used in a particular recipe, they should be disabled via the recipe entry.

CAUTION: *Altering the number of hoppers will erase stored recipes.*

DEMO MAX WTP FOR DC - This will only be displayed if the blender is in SIMULATION mode, and determines the rate that the simulated extruder will be using material if its speed is set to 100%. If the blender is not controlling the extruder, then this will be the rate that the material will appear to leave the downcomer.

DEMO MAX LTP FOR HO - For a BE/XB/XG blender in SIMULATION mode, this is the rate that the simulated line will be running with its motor set to 100.0% speed. If the blender is not controlling the line speed this will be the actual take off rate.

DEMO MAX WTP FOR HOPPER - In SIMULATION mode, sets the rate of each hopper when its motor is running at 100.0% speed.

4.4.7.1.2 SYSTEM ACCEL/DECEL PARAMETERS

For blenders doing extrusion and line speed control, any values entered here greater than zero will be used to control the master acceleration and deceleration, overriding any accel/decel factors set for the extruder or line.

4.4.7.1.3 USER INTERFACE PARAMETERS

SCREEN TIMEOUT - Sets how long the screen will show a *function done* message before returning to display the system's mode of operation. If set to 0, the screen will not display the system's mode of operation until the **<EXIT>** key is pressed.

ERROR TIMEOUT - This parameter selects how long error messages are displayed before continuing with operator entry.

EXTENDED MONITOR MENUS - If NO is selected, the user will find only the screens most commonly used to monitor the blender. This parameter will reduce the number of pages displayed in the MONITOR section.

USE ALPHA RESIN CODES - Enables/disables resin codes (see section 6.15, 6.16, page 86).

ALWAYS ENTER DENSITIES IN RECIPES - Certain configurations of blender, when used with the Gravalink option, will not prompt the user for densities even though the Gravitrol needs the densities for its calculations. Selecting YES will force the operator to enter a density for each material in the recipe.

NEED KEY . . . - These settings allow certain functions to be accessed only with the PROGRAM key in the ENABLE position.

4.4.7.1.4 ALARM CONDITIONS

NOTE: *All alarm processing is halted while alarm conditions are being changed, so this procedure should only be done with system not running.*

Each "alarmable" event can be set up to generate any of three alarm conditions. To edit an alarm, select ALARM CONDITIONS in the system menu. Use the **<UP>** and **<DOWN>** keys to display the desired alarm condition, then use the **<ENTER>** key to modify those conditions. If the alarm is valid for several different devices, the **<UP>** and **<DOWN>** keys should be used to select the correct device (Hopper 'C', for instance). Pressing the **<ENTER>** key allows modification of the alarm for each of the blender operating states (PAUSE, MANual, or AUTOmatic). To keep the currently displayed data, simply press the **<ENTER>** key. Otherwise use the **<UP>** and **<DOWN>** keys to select the desired alarm level : **S**hutdown (S), **G**eneral (G), **I**nformation (I), or **N**one (N). After entering each of these fields, the user may select a different device (if appropriate) or scroll to the EXIT display, press **<ENTER>** and move to a different alarm condition. When the blender memory is reset, all alarm conditions are set up to default values which, in most cases, will be satisfactory for blender operation.

4.4.7.1.5 NETWORK PARAMETERS

This sections configures the local area network that connects the central computer with the weigh module and drive card.

NETWORK RETRIES BEFORE FAILURE - Sets the number of retries made in attempting to communicate with an I/O module before declaring a network failure for that device.

NETWORK FAILURE REPOLL TIME - The amount of time between attempts to communicate with a device that has a network failure.

4.4.7.1.6 UNITS

The units menu system sets up all of the units used in measuring and displaying weight thruput.

UNITS SYSTEM - Select either ENGLISH (lbs, lbs/hr) or METRIC (kgs, kg/hr) units.

WEIGHT/LENGTH UNIT - Set the weight/length unit for line speed control.

THICKNESS UNIT - Thickness measurement for line speed control.

OD UNIT and ID UNIT - Outside and Inside diameter measurements for line speed control.

WIDTH UNIT - Width measurements for line speed control.

4.4.7.1.7 COMMUNICATION

Controls selection of a printer and the remote control protocol.

NOTE: *Order and availability of the following selections will vary greatly depending on blender configuration.*

PRINTER PORT = {NOT USED, PORT x, PORT y, . . .} - Select the port used for the printer (only ports available will be listed).

REMOTE PORT = {NOT USED, PORT x, PORT y, . . .} - Selects the port used for communications to a remote host computer.

REMOTE OP-STATION PORT = {NOT USED, PORT x, PORT y, . . .} - Selects the port used for control by a remote mini-op station.

MODEM PORT = {NOT USED, PORT x, PORT y, . . .} - Selects the port used for a modem line.

WIDTH CONTROLLER PORT = {NOT USED, PORT x, PORT y, . . .} - Selects the port used for a special width controller.

REMOTE GRAVITROL LINK = {NOT USED, PORT x, PORT y, . . .} - Selects the port used to connect to a GRAVITROL which is controlling the extruder fed by this blender. The blender must be run in CONTINUOUS mode, and should not be set up for extrusion control - the Gravitrol will do all extrusion

control based on data from the blender's weighed downcomer. The blender is started normally, the Gravitrol starts the extruder, and when the blender determines the extruder rate it passes it back to the Gravitrol, which will then make adjustments to the extruder speed to maintain the desired system rate. The network required is the same 485 which is used to communicate to the drive and weigh modules on the blender, but it must be a different line. The Gravitrol will identify the blender by its address (entered later).

REMOTE PROTOCOL - (NONE, EPCC, ASCII, . ..). See the Process Control *Remote Communication Manual* for complete information.

REMOTE ADDRESS - The address of the system when responding to remote control requests.

BAUD RATE - The baud rate of the remote control port (only displayed for certain protocols).

ENABLE MULTIDROP COMMUNICATION - Some remote protocols allow multiple devices on one line which will require multidrop, but for a remote system with only one blender and the remote host, NO should be selected to disable multidrop communication.

NUMBER OF DATA BITS - Number of data bits (7 or 8) for the remote control port (not selectable for all protocols).

PARITY - The remote port's parity (NONE, EVEN, or ODD). Not selectable for all protocols.

STOP BITS - The remote port's number of stop bits (1 or 2). Not selectable for all protocols.

PRINTER TYPE - NONE if no printer is used, SERIAL for serial printers.

BAUD RATE - The baud rate of the printer port. Consult your printer manual for the correct setting.

BITS/CHAR - The number of data bits (7 or 8) for the printer port.

PARITY - The printer port's parity (none, even, or odd).

STOP BITS - This sets the printer port's number of stop bits (1 or 2).

BLENDER ID - This sets the blender number which will logged with every printout, and is used to identify reports and alarms.

PRINT VERBOSE REPORTS - YES causes summary reports to be printed on a whole page of paper, NO produces condensed reports that takes up less paper.

CLEAR SHIFT TOTALS AFTER REPORT - Selecting YES causes the blender to clear the shift totals immediately after printing any summary report. Most useful for automatic report generation.

LOG ALARMS TO PRINTER - Selecting YES causes all alarm conditions to be printed on the printer as they occur and as they clear. Messages are also printed whenever the **<RUN>** or **<STOP>** key are pressed. All printed messages include the system time.

GENERATE AUTOMATIC REPORTS - YES causes generation of summary reports automatically. The start time and report interval are entered in twenty-four hour format.

REMOTE OP STATION - YES allows a second mini-op (with special software) to be used as a remote operator's console. Either unit can then control and monitor the blender. Contact Process Control Corporation for further information on this option.

4.4.7.1.8 SYSTEM TIME

The system time is logged on printouts and used to time automatic report generation. It is based upon a twenty-four hour clock. The screen will show the current time and date, to change press enter. If no change is desired, press any other key. The time can only be changed when the blender is not running.

4.4.7.1.9 MISCELLANEOUS

MOTOR SPEEDS IN PERCENT - Allows some motor speeds to be displayed and entered in percent (default) or RPM. If motor speeds are not in percent, each individual device's scaling ranges are entered in the device's ACCEL/DECEL/SPEED configuration (if changeable).

EXT/NIP RATIO'ED IN MANUAL - For BE/XB/XG blenders, this determines whether the extruder or nip (or both or neither) will appear to the 'left' of the RATIO number when in MANUAL BACKUP. All devices which are ratio'ed will appear to the 'right' of the ratio number in the manual backup screen, and when the ratio number is raised or lowered all of those devices to the right will have their speeds adjusted up or down proportionally. All devices to the 'left' of the ratio speed will not have their speeds affected by the ratio number. For instance, if the extruder is ratio'ed with the hoppers and the nip is not, doubling the ratio number will double the speeds off all of the hoppers and the extruder, but not affect the nip speed.

WEIGH MODULE FILTER - The filter frequency for the low pass filter on the weigh module. Signals above this frequency are reduced significantly. The default value should be appropriate for most installations, however a blender running a very low rate element may require a value of as low as 0.10 Hz. A very low frequency slows the reaction time of the loadcell noticeably.

ESTIMATED LINE RATE - This option will appear only for certain blender configurations. If the blender is running below about 200 pounds per hour (90 kg/hr), entering the approximate running rate can be used to improve blender operation.

SPEED CUT RELAY ADDR (0=NONE) - The optional speed cut relay address. See Section 6.13, page 85.

AUX OUT DRIVE ADDR (0=NONE) - Address for device made to follow either the blender rate or extruders rate. See Section 6.12, page 83.

AUX ALARM RELAY ADDR (0=NONE) - The blender can generate an alarm based on the status of some auxiliary event. For a compete description of this setup see Section 6.11, page 83.

RMT RUN/STOP RELAY ADDR (0=NONE) -This option gives the user the ability to RUN and STOP the system from a remote location with a switch that is connected to one of the I/O relay sockets inside the mini-op. If this address is set to anything other that zero, the system will accept a remote contact closure at that relay. If the remote RUN/STOP switch is installed the user can start and stop the blender with either the keypad or the remote switch.

RMT RUN/STOP RELAY NUMBER -This parameter configures the relay number for the remote switch. The default value is 8 and the valid range is 1-8. The physical numbers that appear on the printed circuit board for the relay sockets are 0-7. So if a relay was attached to I/O relay socket 0, the relay number the user would enter in the mini-op is 1.

DEFAULT (material) WIDTH - The default value which appears during recipe entry for line speed control, and is specific to the selected recipe entry mode.

SILENCE OLD ALARMS - Defaults to NO, but if YES is selected, any alarm signal connected to the alarm relays inside the mini-op cabinet will be silenced when the alarm condition clears. For instance, if an alarm is generated because of a hopper material level too low, and SILENCE OLD ALARMS is set to YES, the alarm contact will be closed only while the hopper low condition exists, and the alarm will be silenced automatically once the condition is corrected.

ENABLE RAPID RATE/SPEED MODE - This option is used for processes that require a quick response for motor speed control. When RAPID RATE/SPEED is enable, the blender will seek the desired RATE/SPEED with a 'approximate average calculation'.

4.4.7.1.10 CALIBRATION

The blender is only as accurate as its calibration. Therefore calibration should be carefully carried out with precise calibration weights. Re-calibration should not be needed unless a component in the weigh system

(hopper, loadcell, weigh module, auger, . . .) is changed. Calibration should be checked once a month or so by adding a test weight to the hopper and observing the hopper weight. For more information see the calibration section (Section 6.2 , page 71).

1. CALIBRATE

Select the device to calibrate and follow the instructions. For accurate calibration, please note the following:

The weigh module attached to the loadcell under the hopper to be calibrated should have been powered up for long enough to reach its final operating temperature (usually between fifteen and thirty minutes)

The hopper must be completely empty. To do this on a hopper that has had material run through it, the motor/gearbox/auger assembly must be removed and cleaned, and all material drained from the drain valve.

The hopper should not be touching anything other than the loadcell (see Section 5.3 on setting up the blender).

There should be as little vibration as possible affecting the blender.

Once a device has been selected and readied for calibration, the blender will ask the user to PRESS ENTER WHEN HOPPER IS EMPTY. The blender will then begin OBTAINING the ZERO WEIGHT REFERENCE. During this step, the weight of the empty hopper (expressed as weigh module units or "bits") will be displayed. When the blender has obtained what it feels is a reasonable number, it will prompt for the TEST WEIGHT. This is the value of the weight that will be placed in or on the hopper to get the second weight reading. The weight required will vary according to the loadcell, but should be at least ten percent of the rating of the loadcell.

The blender will then prompt the user to PLACE TEST WEIGHT IN HOPPER, and PRESS ENTER. The test weight will be most accurately weighed if actually placed inside the hopper being calibrated, but it may be possible to place the weight just above the loadcell if a small ledge is accessible. After **<ENTER>** has been pressed, a screen similar to the one visible during the first step of this process will be displayed. This time the weight displayed will be the value of the test weight plus the hopper. This number should be larger than the empty hopper (by at least 100,000) but will vary depending on the loadcell size and the test weight mass.

2. EDIT CALIBRATION

From this screen the values obtained from the actual calibration can be observed and, if necessary, modified. The numbers available (ZERO WEIGHT FACTOR, TEST WEIGHT FACTOR, and TEST WEIGHT) should be recorded sometime after calibration, because if it is required that the blender's memory be cleared these calibration numbers can be reentered without going through the actual calibration procedure again. See the configuration sheets at the end of this manual.

3. EXIT

Exits the user from the calibration menus.

4.4.7.1.11 SIMULATION

Simulation mode will allow all of the blender (or even individual hoppers) to be run without actual blender mechanical parts. Selecting simulation brings up a list of devices to simulate - an individual hopper, the NIP or Extruder (if a BE/XB/XG blender) or the entire SYSTEM. The *user will not know the difference in blender operation from an actual blender* - the only indication will be the use of lower case letters ('a' and 'b' instead of 'A' and 'B') for hopper designations on monitor screens which display a simulated value (or a value based on a simulated value) rather than an actual value. Therefore it is very important that simulation mode be disabled before the blender is returned to normal service.

An individual hopper can be simulated in entirety, or the weigh and drive system can be simulated separately. This allows a volumetric hopper to be run in a recipe and appear gravimetric. The user can also select a VIBRATION FACTOR (from 0 to 10) which adds some realism to the simulation by imitating real-world vibrations. A factor of 10 will result in a blender which is almost uncontrollable, a factor of 0 will produce a very smooth running blender.

4.4.7.2 HOPPER

Hopper configuration data is described in this section.

4.4.7.2.1 NETWORK ADDRESSES

Configuration of computer card addresses and relay positions on the local network. Each computer card (weigh module, drive module, . . .) must have a unique address, and each device attached to that card (a loadcell or motor) must have a unique channel.

DRIVE MODULE NETWORK ADDRESS - Network address for drive modules. The address is set by the rotary or dip switch located on the drive module and has an inherent offset of thirty-two. A drive module with its switch set to position *one* would have a network address of *thirty-three*.

DRIVE OUTPUT CHANNEL NUMBER - For Non-PWM drives, the drive module can run as many as eight motors, with each motor on a different channel. The channels are numbered one through eight and are usually set to match hoppers 'A' through 'H'. PWM drives only drive one motor, so there is not channel number associated with these drives.

WEIGH MODULE NETWORK ADDRESS - The address on the network of the weigh module. Blender weigh modules have an inherent offset of sixteen, so a weigh module with its switch set to position *zero* would have address *sixteen*.

WEIGH INPUT CHANNEL NUMBER - A blender weigh module has up to five loadcell inputs, each loadcell must be on a different channel. Usually the first weigh module will be at address sixteen, and a four element blender with a weighed downcomer will use channels one through four for the four elements, with channel five being used for the downcomer. If a blender has more than five weighed components (hoppers plus downcomer) then a second weigh module is needed. It can be addressed at location 17, and the next hopper needed can start over with channel one on the second weigh module.

LOADING MODULE NETWORK ADDRESS - Usually the same as DRIVE MODULE NETWORK ADDRESS. For a system with PWM drives installed, the loading is usually attached to the first drive card, and so all of the loading addresses will have the base address of the first drive card (usually 32) and a channel number that corresponds with the hopper number.

LOAD RELAY NUMBER - Loading relays are attached to the drive card, and usually they are numbered the same as the DRIVE OUTPUT CHANNEL NUMBERs.

LOADING RELAY TYPE - Either set to NORMALLY OPEN or NORMALLY CLOSED.

HOPPER TYPE - Either set to NORMAL or REGRIND. If normal is selected, the hopper will behave as usual. But if regrind is selected, the hopper becomes independent of the remaining hoppers. If the blender is in ON/OFF mode and HOPPER D of a four element blender is defined as a regrind hopper, the recipe value entered for HOPPER D will mean a different thing than the other three hopper's recipe values. For example, consider a blender with a total line WTP set to 200 LBS/HR and the following recipe entered:

A:30% B:30% C:40% D:50%

Notice that the total of all of the hoppers is 150%. This is because hopper D (the regrind hopper) has its recipe value specified as a percent of the entire line output. This means that while HOPPER D's weight is above the low alarm weight it will supply 50% of the material to the mixer. Thus HOPPER D will have a WTP of 100 LBS/HR, HOPPER A a WTP of 30 LBS/HR, HOPPER B a WTP of 30 LBS/HR, and HOPPER C a WTP of 40 LBS/HR.

If the weight of material in HOPPER D is between the critical low weight and the low weight, HOPPER D will produce 50% of the entered percent in the recipe. Thus HOPPER D's WTP will drop to 50 LBS/HR, while HOPPER A WTP will increase to 45 LBS/HR, HOPPER B to 45 LBS/HR, and HOPPER C to 60 LBS/HR.

If the weight of the material in HOPPER D is below the critical weight, HOPPER D will stop contributing to the mix. Thus HOPPER D has a WTP of 0 LBS/HR, HOPPER A has a WTP of 60 LBS/HR, HOPPER B has a WTP of 60 LBS/HR, and HOPPER C has a WTP of 80 LBS/HR.

NOTE: *If the hopper is defined as regrind, it will not generate alarms for the weight conditions.*

4.4.7.2.2 ALARM/LOAD WEIGHTS

HOPPER LOADING ON WEIGHT - Below this weight, the load relay is energized.

HOPPER LOADING OFF WEIGHT - For positive shutoff loading, weight at which load relay is de-energized. This should be set to zero for flapper valve loading or to approximately ten pounds below the hoper's maximum capacity for positive shutoff loading.

HOPPER LOADING TIME - For positive shutoff loading, controls the total time that the load relay will be energized each time the hopper calls for a load. Should usually be zero.

HOPPER LOW ALARM WEIGHT - Below this weight, a hopper low alarm is generated. The alarm will clear when the hopper weight rises above this weight.

HOPPER SHUTDOWN WEIGHT - Below this weight, a hopper critical low alarm is generated. If this alarm is setup as SHUTDOWN, a system shutdown will occur. This alarm should be set high enough to leave a small head of material above the auger.

MIN(imum) DUMP ALARM WEIGHT - This value should be set to the minimum acceptable dump size. If the average of the last five dumps falls below this value, an alarm is generated. For positive shutoff systems this value should usually be set to 0.

4.4.7.2.3 CONTROL LOOP PARAMETERS

Control loop parameters govern how the device is controlled and how certain alarm conditions are generated.

NUMBER OF MOVING POINTS - The last MOVING POINTS number of updates will be averaged together and used as data for future motor speed changes. This parameter cannot be changed while the blender is in operation.

TIME BETWEEN UPDATES - The time spent collecting data for each rate calculation, or update. Generally, the lower the hopper's desired rate, the higher this number should be (see "Optimizing the Blender", page 77). The hopper will update after ‘time between updates’ seconds has passed, regardless of how many ‘bits’ it has seen. This allows update cycles to be lengthened for hoppers which should reasonably require more time to get good data, and alows short update times (as low as 6 seconds) for hoppers which are seeing large weight losses.

LIMIT SPEED CHANGES - This question and the value that follows it (MAX SPEED CHANGE) govern how much, if any, motor speed changes are limited while in AUTOMATIC. The number entered into the MAX SPEED CHANGE parameter does not directly control the amount of change in motor speed possible. Instead it limits the amount of change of the rate/speed factor to be averaged in with the other MOVING POINTS rate/speed factors. If there was only one moving point, then the number entered into MAX SPEED CHANGE would have the effect of limiting the actual motor speed to that percent change - with two moving points its effect on the last computed rate/speed factor will be the same, but when that last rate/speed factor is averaged with the previous one, the motor speed change will be limited to one half of the MAX SPEED CHANGE. The MAX SPEED CHANGE number is used in the algorithm to detect possible non-linear load cells (see the discussion of the UNSTABLE WEIGH SYSTEM alarm, section 7.2.1, specifically page ?)

CONTROL DEAD BAND - If the average measured rate is within this percentage of the set point, no corrective motor speed change will be made.

MAX ERROR BEFORE FORCED UPDATE - Rates calculated that are greater than this percent from the set rate are not added to the moving average unless there have been "# OF MAX ERRORS/FORCED UPDATE" of them.

OF MAX ERRORS/FORCED UPDATE - If there are this many updates "MAX ERROR BEFORE FORCED UPDATE" percent away form the set point, the update will be accepted.

PERCENT ERROR TO COAST - A hopper that detects an unusual weight disturbance (excessive machine vibration, hopper loading, etc.) which gives a bit reading error of this much from the computed ideal will be put into *coast*. When in coast the control loop cannot accurately determine rates and uses previously stored data to determine inventory and motor speed.

COAST TOLERANCE - Combined with PERCENT ERROR TO COAST to specify coast tolerances. If the measured number of weigh module units (WMU's or "bits") varies by more than the coast bit tolerance from the expected amount then the control loop will go into coast.

INITIAL COAST VALUE - When a control loop goes into coast, a coast counter is set to this initial value. For each bad reading the coast value increments, and for each good reading the coast value decrements. When the coast counter decrements to zero the control loop resumes making adjustments to maintain the desired set rate.

MAX COAST TIME BEFORE ALARM - If the control loop stays in coast for this amount of time an alarm is generated signifying an unstable weigh system.

DRIVE FAIL TOLERANCE - Specifies the minimum number of weigh module units that each reading should obtain while the motor is running. Below this value a drive system failure counter is incremented to detect loss of drive. Above this value the counter is decremented.

MAX DRIVE FAILS BEFORE ALARM - When the drive system failure counter reaches this value, a drive system failure alarm is generated.

OUT OF SPEC ALARM PERCENTAGE - This specifies the percentage between the set rate and actual rate that causes an "out of spec" alarm.

4.4.7.2.4 ACCEL/DECEL/SPEED PARAMETERS

RECIPE HIGH SPEED WARNING - An entered recipe which would cause a hopper motor to exceed this value will be rejected. It is used to help the user select a recipe that the blender can produce without getting too close to the motor's maximum speed.

RECIPE LOW SPEED WARNING - An entered recipe which would cause a hopper motor to run lower than this speed will be rejected.

HIGH SPEED ALARM - A motor exceeding this speed will cause a DRIVE OVERSPEED alarm.

LOW SPEED ALARM - A motor below this speed will cause a DRIVE UNDERSPEED alarm and will be put into volumetric mode. This is because some drives are non-linear at low speeds.

MAXIMUM OUTPUT VOLTAGE - Most drive cards are capable of delivering from zero to ten volts to be used to control the motors. This will allow the maximum output voltage to be limited. For most blender hoppers, this number should be set to 6.5 volts.

RATE/SPEED ZERO CROSSING - This is used for non-PWM drives, and allows adjustment for the very low end of the motor's speed range. When set to 6%, this causes the minimum voltage sent to the motor to be 6% of the MAXIMUM OUTPUT VOLTAGE. This will eliminate the problem of being able to send 1% motor speed to the motor and having it not turn. This also will adjust the motor's rate/speed curve for linearity through zero. PWM drives need this value set to 0.0, as they are linear throughout the entire range due to the tach feedback.

MOTOR SPEED FOR RATE/SPEED - Defaulting to 50%, this is the speed that the motor will run during the initial rate speed calculations. For best performance, this speed should be set near the speed that the hopper motor will be running during the actual recipe, if known. This will result in a more accurate initial rate speed, as well as producing a material blend during the rate/speed calculation which is similar to that produced during actual blender operation.

4.4.7.3 DOWNCOMER

Downcomer configuration data is described in this section.

4.4.7.3.1 NETWORK ADDRESSES

Configuration of computer card addresses and relay positions on the local network. Each computer card (weigh module, drive module, . . .) must have a unique address, and each device attached to that card (a loadcell or motor) must have a unique channel.

DRIVE MODULE NETWORK ADDRESS - Network address for drive card used to control the extruder speed. The address is set by the rotary or dip switch located on the drive module and has an inherent offset of thirty-three. A drive module with its switch set to position *one* would have a network address of *thirty-four*.

DRIVE OUTPUT CHANNEL NUMBER - Extruder drive modules generally have only one channel.

DRIVE INHIBIT SIGNAL ACTIVE ON - Allows the blender to recognize the signal used to inhibit the extruder as either *normally open* or *normally closed*.

WEIGH MODULE NETWORK ADDRESS - The address on the network of the weigh module. Blender weigh modules have an inherent offset of sixteen, so a weigh module with its switch set to position *zero* would have address *sixteen*.

WEIGH INPUT CHANNEL NUMBER - A blender weigh module has up to five loadcell inputs, each loadcell must be on a different channel. Usually the downcomer will be on channel five.

SYNC OPTION INSTALLED - If the blender has a weighed downcomer mounted on an extruder such that the material level seems to 'pulse' as it flows out of the downcomer, the blender will not be able to determine an accurate flow rate. This pulsing is usually caused by material being pulled from the downcomer unevenly by the extruder. The blender has the ability to take an extra input (usually generated by a switch mounted on the end of the extruder screw) into the weigh module, and only take weight readings when the screw is at the same point in its rotation. This allows the blender to get accurate loss in weight data regardless of uneven material flow.

4.4.7.3.2 ALARM/LOAD WEIGHTS

DOWNCOMER LOW LEVEL WEIGHT - Below this weight, the blender changes output to run at the maximum allowable rate

DOWNCOMER HIGH LEVEL WEIGHT - Above this weight, the blender stops blending material until the level falls below the low level weight (on/off mode) or the median weight (continuous mode).

DOWNCOMER LOW ALARM WEIGHT - Below this weight, a hopper low alarm is generated. The alarm will clear when the weight rises above this weight.

DOWNCOMER SHUTDOWN WEIGHT - Below this weight, a hopper critical low alarm is generated. If this alarm is set to SHUTDOWN, a system shutdown will occur.

MAXIMUM TOTAL BLENDER RATE - Allows the user to set a cap on the total blender weight throughput. If set to 0.0 (the default) the blender's highest rate will only be limited by the auger and recipe combinations.

4.4.7.3.3 CONTROL LOOP PARAMETERS

The control loop parameters govern how the device is controlled and how certain alarm conditions are generated.

NUMBER OF MOVING POINTS - The last MOVING POINTS number of updates will be averaged together and used as data for future motor speed changes. This parameter cannot be changed while the blender is in operation.

TIME BETWEEN UPDATES - The time spent collecting data for each rate calculation, or update. Generally, the lower the extruder rate, the higher this number should be (see "Optimizing the Blender", page 77).

MAX ERROR BEFORE FORCED UPDATE - Rates calculated that are greater than this percent from the set rate are not added to the moving average unless there have been "# OF MAX ERRORS/FORCED UPDATE" of them.

OF MAX ERRORS/FORCED UPDATE - If there are this many updates "MAX ERROR BEFORE FORCED UPDATE" percent away form the set point, the update will be accepted.

DRIVE FAIL TOLERANCE - Specifies the minimum number of weigh module units that each reading should obtain while the motor is running. Below this value a drive system failure counter is incremented to detect loss of drive. Above this value the counter is decremented.

MAX DRIVE FAILS BEFORE ALARM - When the drive system failure counter reaches this value, a drive system failure alarm is generated.

LIMIT SPEED CHANGES - This question and the value that follows it (MAX SPEED CHANGE) govern how much, if any, motor speed changes are limited while in AUTOMATIC.

CONTROL DEAD BAND - If the average measured rate is within this percentage of the set point, no corrective motor speed change will be made.

OUT OF SPEC ALARM PERCENTAGE - For BE/XB/XG blenders with line speed control, this specifies the percentage between the set rate and actual rate that causes an *out of spec* alarm.

MANUAL ON DELAY - When in manual backup, the blender waits this amount of time after the high level proximity switch is uncovered before restarting the blender auger motors.

UNABLE TO MEET RATE DELAY - Controls the amount of time blender downcomer level should be below low proximity switch before giving an UNABLE TO MEET RATE alarm. If set to a value of '0', this alarm will be disabled (useful for starve-fed applications)

RATE CHANGE DEAD BAND - Provides a method of limiting the amount of changes the blender makes in its rate when seeking to determine the downcomer out rate during extruder control. For more information, see Section 6.7.3, page 80.

EXTRUDER RATE SMOOTHING FACTOR - The number of extruder rate calculations averaged together to compute the *displayed* extruder rate. This is the rate displayed on the first monitor screen after the label 'EXT:'. To make the blender more sensitive to an extruder which may change rates frequently, this number should be lowered.

DISPLAYED EXT RATE CHANGE LIMIT - This parameter is used to 'clip' the calculated extruder rate calculation before it is averaged together to compute the *displayed* extruder rate. It works with the EXTRUDER RATE SMOOTHING FACTOR (above) to limit the variance seen in the displayed extruder rate.

IN/OUT RATE MATCH TOLERANCE - Controls when the blender will compute and store the rate-speed factor for the extruder. For additional information, see Section 6.7.3, page 80.

OUT OF SPEC DELAY - Number of updates after the **<RUN>** key is pressed before blender starts looking for a hopper out of specification. Can be used to keep the blender from looking at possible bad data when the blender first starts.

4.4.7.3.4 ACCEL/DECEL/SPEED PARAMETERS

DRIVE ACCEL RATE - The acceleration rate of the extruder drive, used when extruder control is activated.

DRIVE DECEL RATE - The deceleration rate of the extruder drive, used when extruder control is activated.

RECIPE HIGH SPEED WARNING - An entered recipe which would cause the extruder to exceed this value will be rejected. It is used to help the user select a recipe that the extruder can produce without getting too close to the motor's maximum speed.

RECIPE LOW SPEED WARNING - An entered recipe which would cause the extruder to run lower than this speed will be rejected.

HIGH SPEED ALARM - If the extruder exceeds this speed a DRIVE OVERSPEED alarm will be generated.

LOW SPEED ALARM - If the extruder runs below this speed a DRIVE UNDERSPEED alarm will be generated.

RATE/SPEED ZERO CROSSING - Sets the minimum voltage sent out to control the extruder. Also used to adjust the extruder's rate/speed curve to cause it to go through zero. If the extruder is not being controlled linearly at very low speeds, this number can be modified.

MAXIMUM DRIVE SPEED - The maximum drive speed that the system will attempt for the drive. This can be set lower than the extruder's actual maximum speed if desired. This number is in percent, and will limit the total maximum output voltage to MAXIMUM DRIVE SPEED percent of full speed, no matter whether drive speed is in percent or not.

MAXIMUM DRIVE SPEED FACTOR - Only displayed if not running in percent mode, this is used to scale the displayed speed to match the units for the drive. Most often, this number is adjusted so that the blender displayed drive speed will be in RPM to match a display on the drive. For instance, if the drive being controlled will do 230 RPM at full power, this number should be set close to 230 (it may have to be adjusted during operation to match exactly). Do not limit the motor speed with this number - always put the maximum speed here and use the previous parameter (MAXIMUM DRIVE SPEED) to keep the speed to safe operating levels.

4.4.7.4 PRIMARY NIP (BE/XB/XG blenders only)

Line control (nip) configuration data is described in this section.

4.4.7.4.1 NETWORK ADDRESSES

The network addresses section is used to select drive types, the network address of the drive module, and various relay positions.

DRIVE MODULE NETWORK ADDRESS - Network address for drive card used to control the line speed. The address is set by the rotary or dip switch located on the drive module and has an inherent offset of forty-seven. A drive module with its switch set to position *one* would have a network address of *forty-eight*.

DRIVE OUTPUT CHANNEL NUMBER - Line speed drive modules generally have only one channel.

DRIVE INHIBIT SIGNAL ACTIVE ON - Allows the blender to recognize the signal used to inhibit the line speed controller as either *normally open* or *normally closed*.

4.4.7.4.2 CONTROL LOOP PARAMETERS

The control loop parameters govern how the device is controlled and how certain alarm conditions are generated.

NUMBER OF MOVING POINTS - The last MOVING POINTS number of updates will be averaged together and used as data for future motor speed changes. This parameter cannot be changed while the blender is in operation.

TIME BETWEEN UPDATES - The time spent collecting data for each rate calculation, or update. Generally, the lower the nip rate, the higher this number should be (see "Optimizing the Blender", page 77).

LIMIT SPEED CHANGES - This question and the value that follows it (MAX SPEED CHANGE) govern how much, if any, motor speed changes are limited while in AUTOMATIC.

CONTROL DEAD BAND - If the average measured rate is within this percentage of the set point, no corrective motor speed change will be made.

MAX ERROR BEFORE FORCED UPDATE - Rates calculated that are greater than this percent from the set rate are not added to the moving average unless there have been "# OF MAX ERRORS/FORCED UPDATE" of them.

OF MAX ERRORS/FORCED UPDATE - If there are this many updates "MAX ERROR BEFORE FORCED UPDATE" percent away form the set point, the update will be accepted.

PERCENT ERROR TO COAST - If the nip detects an unusual event which gives a pulse count error of this much from the computed ideal, the nip will be put into *coast*. When in coast the control loop cannot accurately determine rates and uses previously stored data to determine inventory and motor speed.

COAST TOLERANCE - Combined with PERCENT ERROR TO COAST to specify coast tolerances. If the measured number of pulses varies by more than the coast bit tolerance from the expected amount then the control loop will go into coast.

INITIAL COAST VALUE - When a control loop goes into coast, a coast counter is set to this initial value. For each bad reading the coast value increments, and for each good reading the coast value decrements. When the coast counter decrements to zero the control loop resumes making adjustments to maintain the desired set rate.

MAX COAST TIME BEFORE ALARM - If the control loop stays in coast for this amount of time an alarm is generated signifying an unstable system.

DRIVE FAIL TOLERANCE - Specifies the minimum number of pulses that each reading should obtain while the motor is running. Below this value a drive system failure counter is incremented to detect loss of drive. Above this value the counter is decremented.

MAX DRIVE FAILS BEFORE ALARM - When the drive system failure counter reaches this value, a drive system failure alarm is generated.

OUT OF SPEC ALARM PERCENTAGE - This specifies the percentage between the set rate and actual rate that causes an "out of spec" alarm.

4.4.7.4.3 ACCEL/DECEL/SPEED PARAMETERS

DRIVE ACCEL RATE - The acceleration rate of the nip drive.

DRIVE DECEL RATE - The deceleration rate of the nip drive.

RECIPE HIGH SPEED WARNING - An entered recipe which would cause the nip to exceed this value will be rejected. It is used to help the user select a recipe that can be produced without getting too close to the nip's maximum speed.

RECIPE LOW SPEED WARNING - An entered recipe which would cause the nip to run lower than this speed will be rejected.

HIGH SPEED ALARM - If the nip exceeds this speed a DRIVE OVERSPEED alarm will be generated.

LOW SPEED ALARM - If the nip runs below this speed a DRIVE UNDERSPEED alarm will be generated.

MAXIMUM DRIVE SPEED - The maximum drive speed that the system will attempt for the drive. This can be set lower than a drive's actual maximum speed if desired. This number is in percent, and will limit the total maximum output voltage to MAXIMUM DRIVE SPEED percent of full speed, no matter whether drive speed is in percent or not.

MAXIMUM DRIVE SPEED FACTOR - Only displayed if not running in percent mode, this is used to scale the displayed speed to match the units for the drive. Most often, this number is adjusted so that the blender displayed drive speed will be in RPM to match a display on the drive. For instance, if the drive being controlled will do 230 RPM at full power, this number should be set close to 230 (it may have to be adjusted during operation to match exactly). Do not limit the motor speed with this number - always put the maximum speed here and use the previous parameter (MAXIMUM DRIVE SPEED) to keep the speed to safe operating levels.

RATE/SPEED ZERO CROSSING - Sets the minimum voltage sent out to control the line speed. Also used to adjust the line speed control's rate/speed curve to cause it to go through zero. If the line speed is not being controlled linearly at very low speeds, this number can be modified.

4.4.7.5 SECONDARY NIP (BE/XB/XG blenders only)

If the blender is controlling or monitoring a primary take up device it can be configured to monitor the speed of a secondary take up device(Winder, Spooler, or Chill Roll). In this mode the blender will monitor the secondary take up device and calculate the stretch/shrink factor between the primary and secondary devices. The stretch/shrink factor will automatically be inserted into the recipe.

The secondary take up menu option will appear under the name of the appropriate application's device. For blown film this is the Winder, for the sheet film the CHILL ROLL, for pipe/tubing or profile or wire/cable this is the SPOOLER. The configuration items are described below.

4.4.7.5.1 NETWORK ADDRESSES

The network addresses section is used to select drive types, the network address of the drive module, and various relay positions.

DRIVE MODULE NETWORK ADDRESS - Network address for drive card used to control the line speed. The address is set by the rotary or dip switch located on the drive module and has an inherent offset of forty-six. A drive module with its switch set to position *one* would have a network address of *forty-seven*.

DRIVE OUTPUT CHANNEL NUMBER - Line speed drive modules generally have only one channel.

DRIVE INHIBIT SIGNAL ACTIVE ON - Allows the blender to recognize the signal used to inhibit the line speed controller as either *normally open* or *normally closed*.

4.4.7.5.2 CONTROL LOOP PARAMETERS

The control loop parameters govern how the device is controlled and how certain alarm conditions are generated.

NUMBER OF MOVING POINTS - The last MOVING POINTS number of updates will be averaged together and used as data for future motor speed changes. This parameter cannot be changed while the blender is in operation.

TIME BETWEEN UPDATES - The time spent collecting data for each rate calculation, or update. Generally, the lower the nip rate, the higher this number should be (see "Optimizing the Blender", page 77).

LIMIT SPEED CHANGES - This question and the value that follows it (MAX SPEED CHANGE) govern how much, if any, motor speed changes are limited while in AUTOMATIC.

CONTROL DEAD BAND - If the average measured rate is within this percentage of the setpoint, no corrective motor speed change will be made.

MAX ERROR BEFORE FORCED UPDATE - Rates calculated that are greater than this percent from the set rate are not added to the moving average unless there have been "# OF MAX ERRORS/FORCED UPDATE" of them.

OF MAX ERRORS/FORCED UPDATE - If there are this many updates "MAX ERROR BEFORE FORCED UPDATE" percent away form the setpoint, the update will be accepted.

PERCENT ERROR TO COAST - If the nip detects an unusual event which gives a pulse count error of this much from the computed ideal, the nip will be put into *coast*. When in coast the control loop cannot accurately determine rates and uses previously stored data to determine inventory and motor speed.

COAST TOLERANCE - Combined with PERCENT ERROR TO COAST to specify coast tolerances. If the measured number of pulses varies by more than the coast bit tolerance from the expected amount then the control loop will go into coast.

INITIAL COAST VALUE - When a control loop goes into coast, a coast counter is set to this initial value. For each bad reading the coast value increments, and for each good reading the coast value decrements.

When the coast counter decrements to zero the control loop resumes making adjustments to maintain the desired set rate.

MAX COAST TIME BEFORE ALARM - If the control loop stays in coast for this amount of time an alarm is generated signifying an unstable system.

DRIVE FAIL TOLERANCE - Specifies the minimum number of pulses that each reading should obtain while the motor is running. Below this value a drive system failure counter is incremented to detect loss of drive. Above this value the counter is decremented.

MAX DRIVE FAILS BEFORE ALARM - When the drive system failure counter reaches this value, a drive system failure alarm is generated.

OUT OF SPEC ALARM PERCENTAGE - This specifies the percentage between the set rate and actual rate that causes an "out of spec" alarm.

STRETCH FACTOR UPDATE DELAY - This parameter specifies how long the system should delay after running a new recipe before starting to check that the stretch factor is staying within the dead band. If the stretch factor exceeds the dead band the new stretch factor will be inserted into the recipe and the new recipe will be run.

4.4.7.5.3 ACCEL/DECEL/SPEED PARAMETERS

DRIVE ACCEL RATE - The acceleration rate of the nip drive.

DRIVE DECEL RATE - The deceleration rate of the nip drive.

RECIPE HIGH SPEED WARNING - An entered recipe which would cause the nip to exceed this value will be rejected. It is used to help the user select a recipe that can be produced without getting too close to the nip's maximum speed.

RECIPE LOW SPEED WARNING - An entered recipe which would cause the nip to run lower than this speed will be rejected.

HIGH SPEED ALARM - If the nip exceeds this speed a DRIVE OVERSPEED alarm will be generated.

LOW SPEED ALARM - If the nip runs below this speed a DRIVE UNDERSPEED alarm will be generated.

MAXIMUM DRIVE SPEED - The maximum drive speed that the system will attempt for the drive. This can be set lower than a drive's actual maximum speed if desired. This number is in percent, and will limit

the total maximum output voltage to MAXIMUM DRIVE SPEED percent of full speed, no matter whether drive speed is in percent or not.

MAXIMUM DRIVE SPEED FACTOR - Only displayed if not running in percent mode, this is used to scale the displayed speed to match the units for the drive. Most often, this number is adjusted so that the blender displayed drive speed will be in RPM to match a display on the drive. For instance, if the drive being controlled will do 230 RPM at full power, this number should be set close to 230 (it may have to be adjusted during operation to match exactly). Do not limit the motor speed with this number - always put the maximum speed here and use the previous parameter (MAXIMUM DRIVE SPEED) to keep the speed to safe operating levels.

RATE/SPEED ZERO CROSSING - Sets the minimum voltage sent out to control the line speed. Also used to adjust the line speed control's rate/speed curve to cause it to go through zero. If the line speed is not being controlled linearly at very low speeds, this number can be modified.

4.4.8 LOCAL

The **<LOCAL>** key only has an effect if the blender is under remote control. If the 'REMOTE' LED in the STATUS section of the front panel is illuminated, pressing the **<LOCAL>** key returns control to the blender's front keypad.

4.4.9 MONITOR

The **<MONITOR>** key accesses the display screens which are used to monitor blender operation. The screens displayed will change depending on the blender's configuration. For instance, the screen which displays line speed and rate will not appear if the computer is not controlling the line speed. Pressing the **<MONITOR>** key displays the last screen used when monitor mode was active.

The 'home' monitor screen - the screen displayed when **<MONITOR>** is first pressed after initial blender power-on - will have varying information depending on blender configuration. A blender with a weighed downcomer will display the weight of material inside the downcomer as in the following:

```
CONTINUOUS  LEVEL:  L  LOADING:  B D
SET: 1000.4 EXT: 1000.2   DC 14.9 LBS
```

In this screen, the word in the upper left of the display (CONTINUOUS) indicates the current mode of the blender (CONTINUOUS, PAUSED, ON-OFF). The letters after LEVEL (in this case, 'L') indicate which proximity switch is covered (L=Low, H=High). For systems without a low level proximity switch, the 'L' should always be displayed. The next field (upper right) is for loading indication. While each hopper is calling for a load, its corresponding letter will be displayed. The second line displays the current blender

set rate (1000.4) and the calculated extruder rate (1000.2). If the blender has a weighed downcomer, the lower right of the display will have the letters 'DC' followed by the current weight, and an up or down arrow to indicate whether the material level is increasing or decreasing.

To view the other monitor screens, press the **<UP>** or **<DOWN>** arrow keys. If there are too many hoppers to be displayed on one screen, pressing the **<ENTER>** key will show the remaining hoppers. To limit the number of MONITOR screens, disable EXTENDED MONITOR MENUS (under CONFIGURE SYSTEM USER INTERFACE). This will result only in the screens necessary to the system operation being displayed.

Some other screens need some explanation. If ALPHA RESIN CODES are enabled, there will be two screens for keeping up with resin and recipe totals. These are discussed in section 6.15, 6.16, page 86. A screen located 'below' the home screen (press the **<DOWN>** arrow key from the home menu), displays the CURRENT recipe and the NEXT recipe. In most cases, the two will be the same, but if a recipe has been entered (either locally or remotely) and the **<RUN>** key has not been pressed, then the two may be different.

The next screens down (continue pressing the **<DOWN>** arrow key), use values based on the current rate/speed factors for the hoppers in the recipe. The first screen has two lines, the top line labeled 'HOP TOTAL' and the second line labeled 'REC TOTAL'. The top line indicates (after the text 'MIN:') the minimum possible blender rate with all of the hoppers in the recipe running slightly above their minimum motor alarm speeds. The 'MAX:' number is the possible total rate with all hoppers running close to their high alarm speeds. There will typically be slightly less than a factor of ten between these numbers (if the MIN number is 311, the MAX number might be 2204).

The second line of that display indicates the possible blender rate after the CURRENT recipe has been factored in. If the current recipe allowed all of the hopper motors to run at about the same speed, then these numbers would be fairly close to the HOP TOTAL numbers. Typically, however, there will be one or more hoppers which will be running nearer the minimum or maximum speed. This will limit the range of total blender output because the blend ratio must be maintained. For instance, a blender with the physical capability to run from 311 to 2204 PPH (the 'HOP TOTAL') might have a REC TOTAL of 452 to 1599 PPH. This indicates that with the entered recipe, the blender running at 452 PPH will have at least one hopper which is close to its low alarm speed, and that when the blender is running at 1599 PPH, there will be at least one hopper which will be running close to its maximum speed. If the blender gave any type of invalid recipe message when the recipe was entered, the minimum rate for the REC TOTAL will be above the maximum rate and there would be no rate 'band' in which the blender could operate.

The next two pages display the same data on a hopper by hopper basis. The screen labeled 'HOP MIN' and 'HOP MAX' will indicate the physical limits of each hopper - the low rate and the maximum rate with the given material and auger. If each of the minimum rates are added up, they will be very close to the HOP TOTAL number discussed above. The same is true for the hopper maximum.

The 'REC MIN', 'REC MAX' page is the most complicated. Once a rate/speed has been computed for a given hopper, the physical limits (HOP MIN and HOP MAX) will be known. After a recipe is entered, these limits and the recipe will combine to limit the total blender output. For instance, assume that hopper 'A' has a HOP MIN of 55 and a HOP MAX of 390 PPH. If the desired recipe calls for 10% of hopper 'A' in the mix, then when this hopper is running at its minimum speed (55 PPH) the total blender rate must be around 550 PPH. Likewise to keep the 10% requirement for hopper 'A' with it contributing 390 PPH, the entire blender must be delivering almost 4000 PPH.

There is also a screen which shows the AVG R/S (AVeraGe Rate/Speed) factors for the material/auger/motor combination being used in each hopper in the recipe. This is a unitless number, and is updated each time the hopper updates. If these numbers are recorded for a running material, then when that material is run again in the same hopper the rate/speed value can be entered via the **<MODIFY>** key without running a new rate/speed.

4.4.10 PRINT

Use the **<PRINT>** key to print a SUMMARY REPORT, to print all of the stored recipes, to print the entire ALARM LOG, or to print the CONFIGURATION. If ALPHA RESIN CODES are enabled, then the user can also print the RESIN INVENTORY TOTALS. The summary report is printed in the form selected when the printer is enabled (under CONFIGURE SYSTEM COMMUNICATION), either CONDENSED or VERBOSE reports, and will be sent out of the port identified when the printer was configured. If during printer configuration the operator indicated that shift totals should be cleared after a report, they will be cleared any time that a SUMMARY report is printed.

4.4.11 MODIFY

The **<MODIFY>** key provides an easy way to change many of the same parameters which can be changed with the **<CONFIG>** key, but in a way that can be quicker. As most of these parameters are covered in the CONFIGURATION section (above), only the significantly different ones will be explained here.

4.4.11.1 CLEAR SHIFT TOTALS

Two independent sets of totals are kept (SHIFT and INVENTORY), and this selection will clear just the shift totals, leaving the inventory totals untouched. These totals can also be cleared after each automatic report, depending on the report configuration.

4.4.11.2 CLEAR INVENTORY TOTALS

Allows the user to clear the inventory totals.

4.4.11.3 CLEAR LOGGED ALARMS

Every alarm and event that occurs during blender operation is logged. Use this to menu selection to clear all previously logged alarm entries, restarting the alarm log.

4.4.11.4 MODIFY LOAD WEIGHTS

Provides the same function available under the CONFIGURE menus, but in a different form.

4.4.11.5 MODIFY ALARM WEIGHTS

Used to set the CRITICAL LOW, LOW, and LOW DUMP alarm weights for each hopper without having to go through all of the CONFIGURATION menus.

4.4.11.6 MODIFY R/S FACTORS

If a hopper is paused, the user can enter the rate speed factor for the hopper/material combination (if known) to keep from having to run a rate/speed on that hopper. This rate/speed factor is considered by the blender to be an initial guess, and the blender will rapidly adjust this factor closer to the true rate/speed factor during the first five updates after the **<RUN>** key is pressed.

4.4.11.7 MODIFY BATCH SIZE

This value defaults to zero (0), indicating that the blender is not running in batch mode. Any number greater than zero will cause the blender to blend only the batch size weight each time that the **<RUN>** key is pressed, pausing at completion of each batch. This process repeats each time that the **<RUN>** key is pressed until the batch size is reset to zero (0).

4.4.11.8 MODIFY MISCELLANEOUS

If the blender is STOPPED, allows the user to put the blender (or a single hopper) into PURGE mode, which will empty the selected hopper(s) and then stop the motor. If AUX OUT has been enabled, the user

can change the AUX OUT PERCENT, and the BASE AUX RATE ON BE TOTAL. If the speed cut relay is being used, the 'SPEED CUT %' can be changed.

4.4.11.9 CLEAR DIAGNOSTIC DATA

During operation, certain diagnostics are kept monitoring the blender operation. This selection will restart all the data collection.

4.4.11.9.1 BASE AUX OUT ON BG TOTAL = nnnn.n

Only displayed if the auxiliary output has been enabled. See section 6.12, page 83 for more information.

4.4.11.9.2 SPEED CUT %

Only displayed if the speed cut relay has been enabled. See section 6.13, page 85 for more information.

4.4.11.10 SHOW DIAGNOSTIC DATA

Used to show internal system parameters useful in trouble-shooting network or weigh system problems. Different sets of data are selected by pressing the **<UP>** and **<DOWN>** keys, while switching between hoppers is accomplished by pressing the **<ENTER>** key.

Page 0 shows the weigh module network statistics. The number of good and bad messages to the weigh module is displayed as well as the percent good. In normal operation, the good number should be continuously incrementing while the bad number is not. If this is not the case, check the wiring between the central computer and the particular weigh module. A device that does not have a weigh module (a NIP, for instance) the display for that device reads "PAGE NOT USED". The number under the heading "CALIB" is a counter which is incremented each time the weigh module self-calibrates. This number should always remain very low, because excessive weigh module self-calibrations indicate a potential problem with the weigh module.

Page 1 shows the drive module network statistics in a similar format to the weigh module network statistics.

Page 2 shows the loading module network statistics in a similar format to the weigh module network statistics. This is only relevant if the blender is controlling the loading system directly.

Page 3 shows the raw a/d convertor reading for hoppers or the raw pulse count reading for take up devices, as well as the bit accumulator under the heading of "DELTAB". This counter counts up the weight lost or pulses counted and when the update time has been reached is used to determine the rate. This number will then return to 0. The number under the heading "CURBITS" is the current delta between this reading and the last.

Page 4 shows a heading of "G-E", or Got - Expected (when the blender is running) which is the current bit count received minus the bit count expected if the device was exactly on the correct rate. Instabilities are indicated if this number is moving around excessively. This value will go negative by a very large number when a load occurs. Also displayed is the "coast" (CST) counter, which indicates that control is gravimetric if zero. If non-zero the hopper is in coast and control is volumetric. This number will start at the initial coast value whenever a disturbance is detected and will then increment for each bad reading and decrement for each good reading. If the system spends over the maximum coast time in coast, an "UNSTABLE WEIGH SYSTEM" or "UNSTABLE PULSE PICKUP" alarm is generated.

This page also shows a flag indicating if the drive is ramping (RMP) or requesting a load (LD). Under the heading DRVF is the drive system failure counter. This number increments for each reading under the minimum set in the control loop parameters and decrements for acceptable readings. It may fluctuate at low rates. If the number exceeds the maximum set in the control loop parameters a "DRIVE SYSTEM FAILURE" alarm is generated. The final column (under the heading 'MD') is the current mode of that hopper/device ('P' for Pause, 'A' for Auto).

Page 5 shows the number of bad COASTS and the number of loads (as well as the average dump size for the last five dumps) since diagnostics were last cleared. The last number displayed is the percent of time that the hopper is in gravimetric mode, and should be greater than 80 percent for good performance. Otherwise, it indicates that the system is running in volumetric an excessive amount of time, typically due to small dumps, excessive machine vibration, or incorrect control loop settings. This number is cumulative: clear diagnostics and wait approximately one hour in AUTO mode to get a current reading.

Page 6 shows the weigh and drive module PCC part numbers, and their hardware and software revisions. If the software revision detected is not current for the mini-op software, a "SOFTWARE NEEDS UPDATING" alarm is generated.

Page 7 shows the central computer software version number, the software date, the number of hours since the diagnostics were last cleared, and the total number of recipes which may be stored.

Page 8 shows the number of good READS and good WRITES, as well as a count of BAD messages received over the remote control port, along with the point value of the last good message. A correctly running system will allow more than one message between updates, so the point number will not show all of the requested points

Page 9 shows the status and direction of each of the relays attached to the drive card (different relay boards are reached via the **<ENTER>** key). Each relay will be either an INput or an OUTput, and will be set or cleared (signified with a '1' or a '0').

4.4.11.11 MANUAL BACKUP

Used to control the motor speeds without having to control the blender rates, it is useful for emptying hoppers, or to be used to allow the user to continue to operate in volumetric mode while waiting for blender repairs. See Section 6.10, page 82 for a complete description of this mode.

4.4.11.12 LOADING SYSTEM

Allows the user to configure the blender's loading system. The user has three options to choose from: AUTOMATIC, MANUAL, and DISABLE. If loading is set to AUTOMATIC, the hoppers will load by weight or time, depending on the which mode is set. If loading is set to MANUAL, the loading system will start loading the hoppers when motor movement is detected. It will continue loading until the hoppers are full, thus ignoring the load off and load on weight settings. If loading is set to DISABLE, there will be no load commands sent to any of the hoppers, regardless of any load weights. This is used many times when emptying hoppers.

4.4.11.13 MODIFY RESINS

Used for ALPHA RESIN CODES (see section 6.15, 6.16, page 86)

4.4.11.14 MODIFY RESIN TOTALS

Used for ALPHA RESIN CODES (see section 6.15, 6.16, page 86)

4.4.11.15 CLEAR RECIPE TOTALS

Used for ALPHA RESIN CODES (see section 6.15, 6.16, page 86)

4.4.11.16 MODIFY USER CONFIGURABLE BLOCKS

Allows user to set up frequently used remotely accessed points into blocks for efficient access. See Process Control's Remote Communication Manual for further details.

4.4.11.17 MODIFY MULTIPLIERS

Certain remote protocols require that some values be passed back scaled by a constant. These constant multipliers are set up here. See Process Control's Remote Communication Manual for further details.

4.4.11.18 EXIT MODIFY

Exits the MODIFY menus

4.5 CONNECTORS

There are three DB-9 (nine pin) connectors on the back of the blender mini-op panel. The middle of the three is usually used for the blender system local network and is designated PORT 2. The leftmost connector (the one nearer the middle of the back, PORT 3) is usually for a printer, and is either RS-422 or RS-485. Because of this, a printer must be equipped with a signal converter (RS-485/422 to RS-232) before it can be connected. The advantage to the RS-422 protocol is that it can be transmitted over long distances even in a noisy environment. To connect a printer to the blender, contact Process Control for the appropriate line drivers and connection diagrams.

The connector on the right (PORT 1) is usually used for remote control of the blender. This allows a remote computer of some kind to issue commands and get reports from the blender.

5 BLENDER SETUP PROCEDURES

5.1 INSTALLATION PROCEDURES

1. **INSPECT CRATE** - Before removing the blender from the packing crate inspect for any shipping damage. If any damage is noticed, file a claim with the carrier and notify Process Control Corporation.

   ***NOTE**: Each hopper is mounted on a loadcell, which can easily be damaged if over stressed. It is imperative that no external forces be applied to the loadcells or the hoppers during installation. Do not lift the blender by the hoppers, or allow any of the hoppers to come into contact with other equipment when moving the blender. Do not to stand on the supports for the hoppers, as this will over stress the loadcell.*

2. **CLEAN OUT HOPPERS** - Check the interior of all hoppers for any foreign material.

3. **ANCHOR SECURELY** - Remove the blender from any packing materials and locate it in the desired position. Anchor the blender securely with either a custom mounting flange or the standard flange, using the hold-down clips provided with the blender.

4. **INSTALL AUGER MOTORS** - Install metering units (motor down) and secure to hopper using the cam-lock latches. Connect the electrical leads to the motors, using the "quick-disconnect" connectors. The labels on the motor leads should be matched to the labels on the blender.

5. **INSTALL LOADING SYSTEM** - Install the hopper loading equipment, making sure that nothing contacts the weighing hopper. Any loading equipment (surge bin, vacuum receiver, etc.) with more than a three cubic foot capacity will require additional external support.

6. **ADJUST LOADCELL OVERLOAD PROTECTION** - The blender is shipped with four mechanical stops securing each weighing hoppers. These stops serve to protect the loadcell from being over-stressed. The three stops located around the top of the hopper should be positioned away from the hopper wall. There are two stops located under the loadcell, one with a green tag used to protect the loadcell during shipment. This stop should be backed off lower than the other one. The other stop has a red tag on it and should not be adjusted in the field.

***IMPORTANT**: The stop with a red tag on it is the overload protection stop. This stop has been factory preset and should not be adjusted in the field.*

***CAUTION:** The entire weigh hopper and feeder unit are completely supported by the loadcell. Any additional mechanical contact with the weighing system will adversely affect performance and should be avoided.*

7. **FIELD WIRING** - The blender is shipped as two separate components: the computer console and the blender. You must perform the wiring required to connect the two components once they have been mechanically located in their proper operating locations. This has been greatly simplified by the fact that only the local network wire need be run from the computer console to the blender.

Although all local wiring is done at the factory, a brief description is given here. Refer to the blender technical drawings for specific details regarding the connections.

Loadcell to Weigh Module

Each loadcell has four wires terminated at the weigh module. Two of the wires carry the *excitation signal* that provides a reference voltage to the loadcell. The other two wires carry the *weight signal* back from the loadcell to the computer. This signal is proportional to the weight in the hopper and must be protected from external electrical "noise". This is accomplished by running the loadcell wires in their own conduit and using shielded twisted-pair cable.

Auger Motor to Drive Card

Each auger motor has a positive and a negative reference signal that control the motor speed. These leads should be kept away from the loadcell wires to assure the best resolution of your weighing system. Additionally, PWM drives have a tachometer feedback cable.

Weigh Module to Loading System

For loading, the blender uses two sets of wires. One set indicates when the loading system should provide a load, and the other set signals that the hopper is ready to accept a load. The second set is used for manual backup, to ensure that the hopper is kept loaded with material. When the system is operating in automatic, the computer requests a load of material whenever the weight in the hopper drops below the preset load weight.

Computer Console to Blender Body

The Control Panel is connected to either the weigh or drive module with a three conductor cable (the *local network*), over which all communication from the Central Computer to the blender is sent. This is a digital

signal, and cannot be degraded by noise - if the information is passed at all it is being passed correctly. This eliminates environmental noise from affecting the weight hopper weight readings.

IMPORTANT: *The local network used for communication between the blender console and the weigh and drive modules MUST BE TERMINATED. This termination must be done at the last device in the chain, and is many times not done at the factory because the order of connection is not known until the blender is installed. Contact Process Control for specific termination instructions and methods.*

5.2 STARTUP PROCEDURES

When you have completed the installation instructions listed above, take time to read this manual, paying special attention to the section called "PRINCIPLES OF OPERATION". If you have any problems, refer to the trouble shooting section.

1. **INITIALIZE PARAMETERS** - Turn off the loading system, and turn the Keyswitch on the computer panel to the ENABLE position. Power up the blender with the ON button. The display should show "BLENDER VERSION X.XX", and the parameters will be set to the factory default values. From CONFIGURE refer to the SYSTEM CONFIGURATION section to set the downcomer option, control mode, and number of hoppers correctly for your installation.

2. **CALIBRATE WEIGHING SYSTEM** - After checking to make sure that each hopper is only supported by the loadcell, use the **<MODIFY>** key to either set all the load on weights for each hopper to zero or to disable loading. This will keep the hoppers from loading as each hopper is calibrated. Calibrate the weighing system (see section 4.4.7.1.10 found on page 42 for a description of this procedure).

3. **CHECK FOR 'BIT DRIFT'** - By pressing the **<MODIFY>** key, bring up the SHOW DIAGNOSTIC SCREEN which displays the RAW AD parameter (this screen is just a few 'up arrows' from the main screen). Check that the AD value for each hopper does not vary by more than a value of about 40, and that there is no gradual increase or decrease in the AD value over a few minutes. Large swings in the AD value indicate some type of hopper disturbance (vibration, electrical noise) which should be fixed. A steadily increasing or decreasing AD value can either indicate a hopper which is not completely free from contact with its surroundings, or a bad load cell or weigh module.

4. **CHECK PROXIMITY SWITCHES** - Check that the high and low level proximity switches (if supplied) work correctly by covering the switches with cardboard (or your hand) and verifying that the light on the LED body goes OFF. The 'H' and 'L' indicators on the home monitor screen

should be displayed when the corresponding relay is covered . Remove the cardboard and the LEDs on the proximity switches should turn ON.

5. **VERIFY MOTOR CONTROL** - To get the augers turning, start the motors in MANUAL BACKUP mode, setting the speeds to about fifty percent. Verify that all augers are turning counter clockwise (when looking toward blender), and if not check the polarity of the wiring from the drive module to the motor. If all of the drives for the blender are driven from a single board, then the output signals from that board go through an amplifier card called a KBIC drive card. If this is the case, verify that at 100% motor speed the output voltage from the KBIC drive card is approximately 90VDC. If this voltage cannot be verified, the drive needs to be linearized. Contact Process Control Corporation for details on this procedure. A blender using PWM drives (drives which have two cables going into each motor) does not need to have its drives linearized.

6. **SET LOADING PARAMETERS AND ALARMS** - The loading system parameters should now be set up correctly. If the loading system was disabled during calibration, it should be enabled now. The load weight should take into account the rate at which the hopper will be run, the average wait time for a load to be serviced by the loader, and the load (dump) size. Critical low weights should be set to leave material in the hopper, generally not lower than five lbs. Low alarm weights should be set roughly halfway between load and critical low weights.

7. **CHECK LOADING SYSTEM** - As soon as the loading weights have been set, the hoppers should begin attempting to load. Switch on the loading system and allow the hoppers to fill with material. While this is occurring, you may wish to view the weights in the hoppers from MONITOR. As each hopper exceeds its load weight, the loading relay on the drive card will go OFF and loading should stop.

NOTE: *If the drain valve has been used to empty the hopper, make sure that it has been closed and that the motor/gearbox/auger are properly installed before loading takes place.*

8. **ADJUST LOADING SYSTEM** - The loader must be set to give the correct load based on the hopper capacity and usage rate. A 150 pound load cell has a maximum allowable dump of about fifty pounds, a fifty pound a maximum dump of about ten pounds. After a dump, the material must completely clear the flapper valve on the vacuum receiver to avoid disturbing the weighing system

6 BLENDER OPERATION

6.1 SYSTEM CONFIGURATION

There are many parameters that can be adjusted to 'tune' the blender to a particular application. This data need only be entered once, as the system configuration is stored in battery backed memory. All parameters have default values, and most of them will be acceptable and therefore will not need to be changed. Configuration worksheets are provided for production of a written log of the system configuration. Section 4.4.7 of the manual describes each parameter in detail. For initial system configuration, the Keyswitch must be in the PROGRAM ENABLE position.

6.2 CALIBRATION

For the blender to operate properly, it is essential that the weighing system be calibrated using a mass of known weight. The calibration should be checked periodically (every month or so) to ensure that accurate product is being produced. The hopper need not be empty to check calibration - the user can simply make sure that a weight of known mass produces the expected weight change. A HOPPER CALIBRATION OFF BY 0.01 LBS CAN CAUSE A VERY LARGE ERROR IN HOPPER ACCUMULATED TOTALS.

Calibration should be performed carefully to maximize the performance of the blender. Until calibration is performed, the computer cannot determine the amount of material in the hoppers. Since each loadcell and hopper is different, calibration must be performed for each hopper before use. The loadcell is a linear device that provides a voltage proportional to its stress, so measuring the loadcell output at two different weights enables the computer to determine the weight for any other reading.

NOTE: *The system should always be allowed to warm up for at least 30 minutes before calibrating*.

Once a device has been selected and readied for calibration, the blender will ask the user to PRESS ENTER WHEN HOPPER IS EMPTY. The blender will then begin OBTAINING the ZERO WEIGHT REFERENCE. During this step, the weight of the empty hopper (expressed as weigh module units or "bits") will be displayed. When the blender has obtained what it feels is a reasonable number, it will prompt for the TEST WEIGHT. This is the value of the weight that will be placed in or on the hopper to get the

second weight reading. The weight required will vary according to the loadcell, but should be at least ten percent of the rating of the loadcell.

The blender will then prompt the user to PLACE TEST WEIGHT IN HOPPER, and PRESS ENTER. The test weight will be most accurately weighed if actually placed inside the hopper being calibrated, but it may be possible to place the weight just above the loadcell if a small ledge is accessible. After **<ENTER>** has been pressed, a screen similar to the one visible during the first step of this process will be displayed. This time the weight displayed will be the value of the test weight plus the hopper. This number should be larger than the empty hopper (by at least 100,000) but will vary depending on the loadcell size and the test weight mass.

For a step by step explanation of loadcell calibration see the explanation under blender configuration in section 4.4.7.1.10 , page 42.

6.3 BLENDING

The blender is usually started from a paused condition as follows:

1. Check alarms by pressing the SHOW ALARM key.

2. Make sure all load weights, alarm weights, and downcomer level weights (if system has a weighed downcomer) are set correctly.

3. Select a recipe by either recalling a stored recipe or modifying the current recipe.

4. If required, allow blender to calculate new rate/speed factors.

5. Press the **<RUN>** key to start the blender.

A more detailed description of these steps follows.

STARTING A BLEND

To start a blend from the "paused" state, the blender must have a valid recipe. You may choose one of the following options:

Resume previous blend:

If you wish to run the same blend as was previously run, simply press the **<RUN>** key. This will resume blending without changing the blend recipe. This provides an easy, quick way to resume from a STOPped state.

Run with new blend recipe:

To enter new blend recipe (or to check on the current recipe), follow these instructions. If you make a mistake at any time, just press **<RECIPE>** or **<EXIT>** to begin again.

1. Press the **<RECIPE>** key. The computer will display a menu which will allow you to either change the production recipe or modify a stored recipe. If CHANGE PRODUCTION RECIPE is selected and there are recipes stored in the system, the blender will ask if you want to recall a stored recipe.

2. To run a stored recipe, type in the **recipe number** and press **<ENTER>** to bring up a recipe for editing. To modify or check the current recipe, simply select CHANGE PRODUCTION RECIPE and **<ENTER>**. The production recipe is always the last recipe that was executed.

3. If the blender is in ON/OFF or is controlling an extruder, the computer will prompt you for the estimated process rate. Type in the estimated **process rate** (in weight-units/hr.). Press **<ENTER>** when the rate is correct. A blender operating in line speed control may prompt for other parameters, depending on the application.

4. For each hopper, edit the recipe value (if desired), and press **<ENTER>** when the value is correct. To accept the current value without changing it, just press **<ENTER>**. Changes made to a stored recipe will not affect to the production recipe.

5. The display will show "NEW RATE VS SPEED? NO". This procedure should only be performed if you have changed augers or material (or cleared memory) since the blender was last run. Press **<ENTER>** when you have made your choice. For a discussion of the rate/speed factor, see the rate/speed section, page 74.

6. The display will show "PRESS RUN TO ACTIVATE PROCESS CHANGES". If you have made a mistake, correct it by pressing **<RECIPE>** and reentering the blend parameters. Press **<RUN>** when the recipe is correct and you wish to begin blending. *No changes are made to the running recipe until the* ***<RUN>*** *key is pressed.*

MODIFYING BLEND PARAMETERS WHILE RUNNING

If you are currently blending and wish to make adjustments to the recipe without stopping the blender, you should follow the instructions given above (STARTING A BLEND). After the recipe and/or process rate has been modified and you have entered all of the necessary information, the display will show "PRESS RUN TO ACTIVATE PROCESS CHANGES". When you press **<RUN>**, the computer will automatically change to the new blend "on-the-fly."

STOPPING THE BLENDER (PAUSING)

For most purposes, the way to stop or "pause" the blender is to press the **<STOP>** key. This causes the blender to stop the augers and wait for further keypad input. The blender can be easily restarted from this condition by simply pressing **<RUN>** to resume blending with the same recipe as before the **<STOP>**. If the blender is also controlling an extruder, the operator will be prompted for which device to stop : the blender only, the extruder/line only, or both (the SYSTEM).

INITIAL RATE/SPEED FACTOR

Any time that a new recipe is entered with the blender not running, the blender will ask if it should do a new rate/speed. If the material and weigh system haven't changed, and no hoppers in the recipe have been recalibrated, this is usually not necessary. If a rate/speed is done, the rate/speed factors for all hoppers in the just entered recipe will be cleared. If the rate/speed task is not allowed to go to completion, these hoppers will no longer have a valid rate/speed. The blender will then check the hopper weights - they must all be above their load weight. If any hopper is low, the message WAIT FOR LOADING TO COMPLETE will be displayed. If any key is pressed during this time, the initial rate/speed task will be aborted. Loading need not be disabled during the rate/speed calculations, but if a hopper loads it may cause a delay in the rate/speed calculations. All of the hopper motors in the recipe are started, and the weight loss from each hopper is monitored. The blender will monitor the rate from each hopper, and stop the hopper motor when it is finished, displaying the message PRESS RUN TO CONTINUE (unless in extruder or line speed control mode). If there are hoppers which cannot be controlled to produce the desired rate and recipe, the blender will generate an error message indicating which hoppers are too small and/or too large.

6.4 MONITORING THE BLENDER

Many parameters can be continuously monitored using the MONITOR feature of the blender. For additional information on the MONITOR screens, see the section on the **<MONITOR>** key, found on page 58, 131

ACTUAL SPEEDS - Displays the motor speeds read back from the hopper motors and, if enabled, the extruder motor.

SET LB/HR - Set rate throughput for each hopper.

ACT LB/HR - Actual computed rate for each hopper.

HOPPER LBS - Displays the current weight in the hopper.

SET vs. ACTUAL - Shows the set percentage or parts (depending on the recipe mode) for each hopper and the current, instantaneous percentage or parts being metered by the computer. The actuals are not calculated until each hopper has metered enough material to measure accurately the actual rate.

INVENTORY TOTAL - Total weight metered since the inventory totals were cleared.

SHIFT TOTAL - Total weight metered since the shift totals were cleared.

INVENTORY LBS - Total metered by each hopper since the inventory totals were cleared.

SHIFT LBS - Total weight metered by each hopper since the shift totals were cleared.

INVENTORY PERCENT - Percent each hopper's inventory represents of the total inventory.

SHIFT PERCENT - Percent each hopper's shift represents of the total shift.

WEIGH MODULE TEMPERATURE - If the system has a weighed downcomer, this is the temperature inside the weigh module cabinet.

AUX OUT PERCENT - If auxiliary output is enabled, displays the current motor speed.

6.5 CONTINUOUS VS. ON-OFF MODE

The blender can automatically adjust the system throughput to match the process rate, or can run at a user entered rate regardless of the extruder rate. The mode of operation can be selected through CONFIGURE. A description of each mode is given below:

CONTINUOUS MODE FOR BE/XB/XG BLENDERS

In continuous mode **with** a weighed downcomer the following sequence occurs regularly:

1. The blender calculates the starting material usage rate by running at full speed until a weight gain is seen in the downcomer. At this point, the usage rate is calculated, and will appear in the 'home' display page in MONITOR. The CONFIGURE section for the downcomer can be modified to limit the maximum flowrate that will be attempted by the blender.

2. The blender runs at slightly greater than the material usage rate until the weight in the downcomer gets approximately half way between the low and high weights, or until the high weight is exceeded (if it hasn't had enough updates to determine the out rate).

3. The blender cuts the speed to match the material usage rate and continues to monitor the downcomer weight.

4. The blender has a "dead band" right around the midpoint of the high and low weights where no blender speed corrections will be made. If the weight drifts outside this dead band, the blender will make minute adjustments in the total blender rate. If the material level drops below the low level weight, the blender will begin making more radical speed changes to make sure a sufficient amount of material remains in the downcomer. If the material level rises above the high level weight (or passes the high proximity switch), the blender will shut off and wait for the downcomer material level to start dropping. Once the weight in the downcomer reaches approximately halfway between the low and high level, the blender will begin blending at the newly calculated rate.

5. As long as the material usage rate remains relatively constant, the blender will easily maintain the downcomer at the half way point. Only under drastic rate changes will the blender have to make large adjustments in the total throughput.

CONTINUOUS MODE FOR BC BLENDERS

In continuous mode **without** a weighed downcomer, the following sequence occurs regularly:

1. The blender calculates the starting material usage rate by running at full speed until the high level proximity switch is covered. The blender then turns off until the low level switch is uncovered. After the blender has been able to complete one cycle of low to high and high to low, the material usage rate is calculated and be displayed on the 'home' MONITOR page. The CONFIGURE section for the downcomer can be modified to limit the maximum flowrate that will be attempted by the blender.

2. The blender now runs continuously by setting the blender rate to the estimated rate plus the cutsize (specified in CONFIGURE SYSTEM DESCRIPTION) until the high proximity switch is covered. At this point, it recomputes the estimated output rate and sets the blender rate to that estimated rate minus the cutsize. If the high switch does not uncover before the HIGH DELAY time has elapsed (also in CONFIGURE SYSTEM DESCRIPTION), the blender will shut off, otherwise it will maintain this rate until the low switch is uncovered.

3. When the low proximity switch uncovers, the blender recalculates the estimated process rate and sets its output to that rate plus the cutsize. If the low level proximity switch does not cover before the FULL SPEED DELAY has expired, the blender will go to full speed and restarts the entire process.

ON-OFF MODE

In ON-OFF mode, the blender will run at the entered recipe rate until the high level is reached (either weight or proximity switch), then shut off until the low level is reached. This sequence is repeated until **<STOP>** is pressed. This mode works very well for a starve fed application, or an application with no downcomer at all. A weighed downcomer is not required for ON-OFF mode - the blender can use either the downcomer weights or proximity switches to control the downcomer level.

6.6 OPTIMIZING THE BLENDER

One of the first things to look for to improve blender performance is that the hoppers are free to move without binding or hitting anything and there is no excessive vibration. The downcomer is not very susceptible to vibration but the hoppers are. If the hoppers are not as stable as possible (both from swaying movements and higher frequency vibration) the blend accuracy will suffer. Excessive vibration will result in a noticeable weight drift (visible from MONITOR) and can result in UNSTABLE WEIGH SYSTEM alarms.

Once you are satisfied that the blender is physically OK, the control loops can be adjusted. This can be a long process, but some general guidelines will be helpful:

- A blender in a vibration prone environment many times will benefit from having its WEIGH MODULE FILTER modified (found in the menu system under CONFIGURE SYSTEM MISCELLANEOUS). This is a low pass filter which can be used to eliminate much of the high frequency vibration 'noise'. The value for this filter can be lowered down to 0.10 Hz if necessary. As this number is lowered, the blender will react more slowly to weight changes, but for almost every application the reaction speed will exceed that needed to monitor hopper weight loss.

- Generally the more MOVING POINTS in the control loop, the less responsive the blender will be to material and rate changes. This number should probably never be set below three, which causes the data gathered during the last three updates to be used for motor speed calculations. If this number is very high (eight or more) the blender will take a long time to sense material changes and the motor speed will not be changed very much.

- A hopper that is running at a fairly high rate for its size can benefit greatly by having its TIME BETWEEN UPDATES shortened. For instance, a hopper with a 150 pound loadcell that is running about 200 PPH can have this number set down to about three seconds. This means that the blender will recalculate the current hopper's rate twenty times each minute.

- A hopper with an unstable rate might benefit by a modification of the MAX SPEED CHANGE. If this number is lowered (no more than 2%) the blender will not be as responsive to aberrant readings, and its control will be significantly dampened. Making this number large (20 %) can result in excessive motor speed changes.

- A hopper that seems to spend too much time in "coast" might benefit from having its "coast tolerances" adjusted. The easiest way to do this is to adjust the PERCENT ERROR TO COAST up to a maximum of 500%. If the hopper is a low rate hopper, then the COAST TOLERANCE can be adjusted higher with significant effect.

Although there are no hard cast rules to determine the optimum parameters for a particular installation, the following is a general guideline for possible settings for an average hopper in the extreme conditions.

	More responsive More subject to vibration	More dampened Less subject to vibration
WEIGH MODULE FILTER	0.50	0.10
NUMBER MOVING POINTS	3	10
TIME BETWEEN UPDATES	10	45
MAX SPEED CHANGE	15%	2%
CONTROL DEAD BAND	0.10%	1%
PERCENT ERROR TO COAST	150%	300%
MAX COAST TIME	15	45
DRIVE FAIL TOLERANCE	50	1
MAX DRIVE FAILS	40	75

6.7 EXTRUSION/LINE CONTROL (BE/XB/XG BLENDERS ONLY)

The BE/XB/XG blender has the ability to control a single extruder, in addition to regulating the material blend. A weighed downcomer is required for extrusion control. A blender which is also controlling the product line speed frees the operator from trying to match the line speed with the extruder output to achieve the desired product thickness. It also allows easy modification of product characteristics.

6.7.1 OVERVIEW

To start up a line, the user first starts the extruder/line by manually entering the desired device speed. As soon as the extruder is started, the blender will turn on and start to blend with the last entered recipe to keep material in the downcomer. Once the extruder has reached a stable operating speed, the blender will calculate the actual rate of the extruder and display this number. The user can now modify (if desired) a recipe and set the extruder to the desired rate. The blender will adjust its rate as needed, but the goal of the system will be to keep the extruder running at the desired rate.

Unless the downcomer level exceeds the high or low level, the blender rate will not be changed until all of the hoppers have a chance to update. This could cause quite a delay in the blender changing the set weight throughput if some hoppers are loading excessively or have extremely long update times. For extrusion control, it is important that the blender rate be computed as often as possible.

6.7.2 OPERATION

1. The blender must have been calibrated, with material loaded and rate-speed factors for each hopper in the recipe.

2. To bring up the line, the user presses the **<MANUAL>** key. If MANUAL BACKUP is disabled, the user will see a very simple screen which has the cursor on the field which represents the current extruder speed, and, if also controlling the line speed, a second parameter which represents the line speed.

3. The user can now modify the device speed by any of the numeric field modification techniques (the numeric keypad or the 'up' and 'down' arrows). The extruder and/or line will begin to go to the new speed, using the acceleration or deceleration factors previously entered. Assuming all of the operation conditions are satisfied for the blender (no hopper critical low, . . .) the blender will start blending with the last entered recipe. The blender will NOT necessarily go to the recipe set rate - it will just try to keep the downcomer level at a weight halfway between the low and the high limits.

4. Once the blender has matched the extruder rate it will determine the extruder rate for the set speed (it is getting a rate-speed for the extruder). The user can observe when this happens by watching the main monitor screen which shows the extruder rate, set and actual. After the blender has enough information to accurately determine the extruder rate, it will be displayed in the "EXT:" field. The set rate will remain zero.

5. It is best to start the extruder and let the blender learn the rate with the extruder screw and line speed operating as close to the final speed as possible. This will allow the blender to compensate for extruder screw non-linearity more quickly.

6. Once the user is satisfied that the blender has learned an accurate extruder rate, he can check the recipe (if desired) and start the extruder/line in automatic by pressing the **<RUN>** key. If this key is pressed before the blender has learned the extruder rate, the message "EXTRUDER HAS NO RATE SPEED" will appear, and the blender will continue to operate in the same mode. If the extruder rate has been determined, however, the blender will set the extruder screw speed (and line speed if being controlled) to the calculated values.

7. Once the blender is in control, the user can change the recipe to alter the blend or other product specifications. The user can press the **<STOP>** key and stop either the entire system, just the blender, or just the extruder/line speed controller. To change either the overall process rate, the user can either modify the running recipe and press the **<RUN>** key, or press the **<MANUAL>** key and modify the extruder/line speed directly. *If the user changes the extruder/line speed with the **<MANUAL>** key, the system will be in MANUAL mode and the extruder and line will*

no longer be controlled gravimetrically. The blender can be returned to the last recipe under computer control by pressing the **<RUN>** key.

6.7.3 IMPORTANT PARAMETERS FOR EXTRUSION CONTROL

Following are some downcomer control loop parameters unique to extrusion/line speed control:

RATE CHANGE DEAD BAND

During extrusion control, the blender rate is controlled to keep the downcomer material level near the midpoint. If the calculated new blender rate is less than this percent away from the current blender rate, the blender rate will not be changed.

IN/OUT RATE MATCH TOLERANCE

Controls when the blender will compute and store the extruder rate-speed factor. The blender set rate (the IN part) must be within IN/OUT RATE MATCH TOLERANCE of the computed extruder rate (the OUT part) before extruder rate-speed calculations are done. This allows the system time to reach a stable state and assures that the extruder computed rate is as accurate as possible. To cause the blender to determine the extruder actual rate faster, increase this number. If the blender seems to miss the rate because it calculates it too quickly, lower this value.

6.8 MONITORING LINE OR EXTRUDER

Please read the section **EXTRUSION/LINE CONTROL**, above.

The BE/XB/XG blender can be set up to control one device, either the extruder or line speed, and monitor the other. This allows the blender to control the one device to follow the other. A blender controlling the extruder and monitoring the line speed will need a recipe which contains the same information which would be needed for line speed control (such as weight per running length). After he extruder (started with the **<MANUAL>** key), ramps to its desired speed, the blender will determine the extruder rate. Once the extruder rate is calculated, the user can press the **<RUN>** key and the blender will adjust the extruder speed as needed to achieve the desired recipe. Any time that the line speed changes, the blender will adjust the extruder speed to keep the recipe requirements.

To control the line speed and monitor the extruder, the same parameters must be entered into the recipe. Operation is identical to extruder control, line speed monitoring except that the user will be starting the line speed (in MANUAL) rather than the extruder speed.

6.9 APPLICATIONS AND RECIPE ENTRY

Following is a brief description of the operating modes (application) and recipe options for various blender line speed and extruder speed control applications.

Application : Blown Film, Sheet and Cast Film, Pipe and Tubing, Wire and Cable, or Profile
Recipe Mode : W/L, WTP

Enter the desired weight/running length (W/L) and the desired weight throughput (WTP). The blender determines the extruder and line speed. For Blown Film applications, the weight/length is for the whole bubble - if the bubble is split in half then each half will have only fifty percent of the total weight/length.

Application : Blown Film, Sheet and Cast Film, Pipe and Tubing, Wire and Cable, or Profile
Recipe Mode : W/L, LTP

Enter the desired weight/running length (W/L) and the desired length throughput (LTP). For Blown Film applications, the weight/length is for the whole bubble - if the bubble is split in half then each half will have only fifty percent of the total weight/length.

Application : Blown Film, Sheet and Cast Film
Recipe Mode : THICKNESS, WIDTH, WTP

Enter the desired product thickness and width, and the line total weight throughput (WTP). The user is also required to enter the density of each material in the recipe.

Application : Blown Film, Sheet and Cast Film
Recipe Mode : THICKNESS, WIDTH, LTP

Enter the desired product thickness and width, and the line's desired length throughput. The user is required to enter the density of each material in the recipe.

Application : Pipe and Tubing or Wire and Cable: THICKNESS, ID / OD, WTP / WPL

The first recipe entry is the desired wall thickness of the product. The next entry is either the inside diameter (ID) or the outside diameter (OD), depending on blender configuration. The last recipe entry is configurable to either be the total line weight throughput (WTP) or the desired line weight/running length (WPL). The user is required to enter the density of each material in the recipe.

Application : Pipe and Tubing or Wire and Cable: OD / ID, ID / OD, WTP / WPL

The first recipe entry is either the product outside diameter (OD) or inside diameter (ID). The next entry is either the inside diameter (ID) or the outside diameter (OD), depending on blender configuration, and will be used to determine the desired wall thickness. The last recipe entry is configurable to either be the total line weight throughput (WTP) or the desired line weight/running length (WPL). The user is required to enter the density of each material in the recipe.

6.10 MANUAL BACKUP

Under certain conditions the user may wish to operate the blender in a mode where the motor speeds can be set directly, causing the system to operate like a volumetric blender. This can be accomplished at any time by putting the blender into MANUAL BACKUP mode. This mode is NOT the same as MANUAL mode (see extrusion control, section 6.7, 6.7)

Manual backup is enabled by pressing the MODIFY key and selecting the MANUAL BACKUP option. Once manual backup is enabled, any alarm lights which are active will deactivate. The alarms will still be present, and can be viewed via the **<SHOW ALARMS>** key, but they will no longer have any effect on the system. The **<MANUAL>** key now becomes the key used to modify the hopper motor speeds and, if extrusion control is enabled, the extruder speed as well. When the **<MANUAL>** key is pressed, a screen is displayed which shows the speeds of all motors. The operator can vary each motor's speed by using the enter key to select a device, and then either the numeric entry keys or the arrow keys to adjust the speed. One of the entries is labeled RATIO. This is a single number which can be used to adjust all of the blender motor speeds at the same time. RATIO defaults to 100, but can be changed either up or

down to vary the total blender output without changing the 'recipe'. For instance, if the blender is running in MANUAL BACKUP mode, with a speed set for each of the blender hoppers, changing the RATIO value from 100 to 200 will double all of the speeds. They will still show the same set value in MANUAL, but the actual speeds will double.

A hopper in MANUAL mode will call for a load until the hopper's motor is stopped. This is to make sure that there is always material in the hopper.

6.11 AUXILIARY ALARM

The blender has the ability to trigger an alarm based on an external event. From the CONFIGURE SYSTEM MISCELLANEOUS menu, enter a non-zero number for the AUX ALARM RELAY ADDRess and fill in a relay number (see Appendix E, Addressing and the blender, page 97). If the auxiliary alarm is to be a relay position located inside the mini-op panel, the address should be set to '1'.

This alarm is set up just like all of the other alarms, and can be used to generate an INFORMATION, GENERAL or SHUTDOWN alarm whenever the indicated relay is activated. In addition to notifying user of the alarm via the normal alarm indications, there can also be an AUX ALARM OUT RELAY set up (its configuration immediately follows the AUX ALARM RELAY configuration). If the AUX ALARM OUT relay has a non-zero address it will close whenever the aux alarm occurs. An address of '1' places this relay inside of the mini-op panel. The relays inside the mini-op station are numbered from right to left, with relay 1, 2, and 3 being the Shutdown, General and Information alarms, respectively.

6.12 AUXILIARY OUTPUT

In the CONFIGURE SYSTEM MISCELLANEOUS section is the setup for the AUX OUT DRIVE, which can be used to add an ingredient which needs its ratio based on the blender output, such as an anti-static compound. This drive, like the drives for each hopper, needs an address and channel assigned (see Appendix E, Addressing and the blender, page 102, 131). An address of zero disables this output, but if the address is non-zero the operator will be prompted for several other parameters, discussed below:

AUX OUT DRIVE ADDR (0=NONE) = nn
The address for the drive card used to control this motor's speed.

AUX OUT DRIVE CHANNEL = n
The channel on the drive card which is used to control this motor's speed.

AUX OUT PERCENT = nnn.nn %
Used to calculate the motor speed. See the formulas below.

BASE AUX RATE ON BG TOTAL = nnn.n LBS
Used to calculate the motor speed. See the formulas below

MAXIMUM AUX OUT VOLTAGE = n.n VOLTS
The maximum voltage output by the drive card when the motor's speed is 100%. If this drive is a regular hopper's motor (controlled from one output of the standard Octal Drive Card or a PWM card) it should not be set to more than 6.5 volts.

The auxiliary motor speed and output voltage are based on the AUX OUT PERCENT, the BASE AUX RATE ON BG TOTAL (both entered by the user) and the blender mode as follows:

Out_Percent	= AUX OUT PERCENT
Base	= BASE AUX RATE ON BG TOTAL
Max_Volts	= MAXIMUM AUX OUT VOLTAGE
Mode	= Current operating mode (CONTINUOUS or ON/OFF)
Volts_Out	= Resultant output voltage
Set_Rate	= Blender set rate, visible from MONITOR
Ext_Out	= Extruder actual out rate, visible from MONITOR

If the blender mode is ON/OFF, the voltage out is based on the blender rate as follows:

```
If Set_Rate is less than Base
    Volts_Out = (Set_Rate / Base) * Out_Percent * Max_Volts
Else
    Volts_Out = Out_Percent * Max_Volts
```

If the blender mode is CONTINUOUS, the output voltage is based on the extruder rate as follows:

```
If Ext_Out is less than Base
    Volts_Out = (Ext_Out / Base) * Out_Percent * Max_Volts
Else
    Volts_Out = Out_Percent * Max_Volts
```

For instance, a blender running in ON/OFF mode at a rate of 300.0, with Out Percent set to 50.0, Base at 600.0, and Max Volts set to 6.5 would have an output voltage of:

(300.0/600.0) * 0.50 * 6.5 = 1.625 Volts, or 25.0 %

6.13 SPEED CUT RELAY

In the CONFIGURE SYSTEM MISCELLANEOUS section is the setup for the SPEED CUT RELAY. This is an optional input which can be used to make a user definable speed change in the rate of the blender when the blender is running in ON/OFF mode.

Once the relay's address and number have been configured, the user is prompted for the speed cut percent (default 100.0%), which is the amount of change which will occur in the blender speed when the relay is activated. If this value is set to 25.0%, and the blender set rate is 500 PPH, the blender will reduce its total output by 125 PPH to 375 PPH. The blender will remain at this rate until the downcomer low level is reached and the relay is deactivated, when it will return to the recipe set rate (500 PPH). If the downcomer high level is reached before the low level, the blender will set its rate to zero, as normal, and turn on again at the recipe set rate when the low level has been reached.

The speed cut relay can be used to create a REMOTE PAUSE input. If the default speed cut of 100% is used, then when this relay is active the blender will cut the speed by 100% which will cause the blender to pause. When the relay is deactivated, the blender will restart.

6.14 TWO WAY COMMUNICATION BASICS

To send or receive data to a remote computer, remote communication must be enabled and a protocol selected from the CONFIGURE menus. The blender will then respond to queries and commands received over the serial link attached to the REMOTE port on the blender. Note that the blender cannot be started remotely unless it has first been started locally, or the rate/speed is done remotely.

Data elements inside the blender are accessed remotely by treating the values as memory locations (points) that can be read or written individually or in groups. When a new recipe is downloaded from a remote location, and the command sent to start blending, the effect is the same as if the user had pressed the **<RECIPE>** key, entered a new recipe, and pressed the **<RUN>** key locally. If the blender is running when this command is sent, the blender will change recipes literally in mid stream.

Process Control has produced a separate manual detailing remote communication, describing methods and protocols. Contact Process Control Corporation for further information.

6.15 ALPHA RESIN CODES

Enabling alpha resin codes allows the user to track material usage by resin, as well as to keep up with totals for each product produced by specifying all materials and product recipes by alpha-numeric names, with resin codes up to 10 characters and product codes up to 15 characters long. For the totals tracking to work correctly, the user should first set up the names associated with each resin number via the **<MODIFY>** key (MODIFY RESINS). The user selects the resin number (from 0 to 99) either with the **<UP>** and **<DOWN>** arrow or numeric keys, and then presses **<ENTER>**. For a resin that has not yet been assigned a name, the cursor will move over to a blank space just to the right of the resin number. At this point, pressing the **<UP>** and **<DOWN>** arrow keys will scroll through all of the letters of the alphabet, the digits 0 through 9, and a selection of symbols. To reach letters near the end of the alphabet, press and hold the arrow key - the key will auto-repeat. When the correct letter/digit/symbol has been selected, press **<ENTER>** to move to the next character location. Numbers can be also entered via the numeric keypad. Once the **<ENTER>** key is pressed on a blank space, the blender will ask for the density of the material. Since there cannot be a blank space in any name, try using the underscore ('_') or period ('.') for spaces, if required.

Once the resin codes have been assigned names and densities, recipe entry will work differently. As the user enters the parts (or percent) that each hopper will contribute to the mix, he will also be asked to enter a description number. Using the **<UP>** and **<DOWN>** arrows (or the numeric entry keys), he can select a number which corresponds to the material that he is running in that hopper. Once the material is selected correctly, the **<ENTER>** key is pressed as usual to take the user to the next hopper. If the user has previously stored recipes, then he will be able to select a recipe number corresponding to a product name. Product names can be assigned to each recipe number (via the CHANGE STORED RECIPE selection under **<RECIPE>**) in the same way as resin names are assigned to individual resins.

During blender operation, material usage can be monitored under the MONITOR screens for products and resins in the current recipe, or all of the resins and product totals can be viewed by printing the appropriate report (with the **<PRINT>** key).

6.16 SEND/RECEIVE CONFIGURATION

Once a blender has been fully configured, especially if many alpha based recipes and resins have been set up, the configuration should be recorded in a written form somewhere, preferably near the blender. This will provide an easy way of returning the blender to a known state if the configuration is later modified, the software is updated, or of transferring the configuration to a second similar blender. In addition to the written method of saving the configuration, Process Control provides an automated way of saving a blender's configuration and all recipes with the SEND CONFIGURATION and RECEIVE CONFIGURATION commands. This allows the user to quickly load the entire memory contents of the blender into a personal computer, to be later loaded back into the same blender or to be loaded into any number of identical blenders at the same location. The only equipment needed will be the personal computer to store the configuration (with some type of terminal emulation software), an RS-422 to RS-232 converter to convert the blender's RS-422 signal to the RS-232 level required by the personal computer, and the necessary length of cable.

Once the computer is connected to an available port on the back of the blender mini-op (usually port 1 or port 3), start the terminal emulation program on the personal computer. Select SEND CONFIGURATION (from the menu under the **<CONFIG>** key) and select the port connected to the computer with the **<UP>** and **<DOWN>** arrow keys. Make sure that the baud rate is correct, and pause at the SEND CONFIGURATION? question on the mini-op. Set up the personal computer to receive a *binary transfer* using the XModem protocol with any file name that you desire. Answer **<YES>** to the SEND CONFIGURATION question, and, if desired, **<YES>** to the SEND RECIPES question. The blender will then start trying to establish communication with the personal computer, and soon the configuration file should begin to transfer. If you requested that the recipes be sent also, then the terminal emulation program will close out the configuration file and you will have to restart a binary transfer with a different filename to receive the recipes. The blender will wait until it detects that the second file is ready on the personal computer, and then begin the recipe transfer. Once the transfer is complete, the blender will restart and the file on the personal computer will be closed. Don't worry if the names that you gave the files during the upload process were not exactly what you wanted - these files can later be renamed or copied just like any other files on your computer.

To return the configuration and or recipes to the same blender (or to any other blender running the same version of firmware with the same number of hoppers) make the same connection made during the SEND CONFIGURATION section, above, with a similar communications package running on the personal computer. Select RECEIVE CONFIGURATION from the menu under the **<CONFIG>** key, and answer **<YES>** to the appropriate questions about the configuration or the recipes. The blender will then pause with the message RECEIVING CONFIGURATION on the display. Start a binary file transfer (using XModem, as before) on the PC, and select the file containing the configuration data previously uploaded from the blender. The data transfer will begin and complete automatically. If you requested that the recipes

be transferred, start a second transfer when the blender displays the message RECEIVING RECIPES. After successful data transfer, the blender will restart and be ready with the loaded configuration and or recipes.

IMPORTANT: *Configuration and recipes can only be sent and received between blenders with the same number of hoppers, and running the same version of blender firmware (displayed at blender power up). To try to send configuration to a blender with a different software version will result in unpredictable (and surely undesirable) data in the receiving blender.*

7 TROUBLESHOOTING

This section details troubleshooting tips for solving the most common blender problems sectioned by problem symptoms. Some problems have several possible symptoms and these are explained.

7.1 GENERAL TROUBLESHOOTING HINTS

If the blender is not operating correctly, the first thing to do is make sure that the blender is in the configuration which is required for your installation. Many times one important configuration parameter has been changed, and the blender now is operating differently than desired.

Press the **<STOP>** key.

If the blender seems to be 'acting peculiar' but there are no alarm lights lit, press the **<SHOW ALARM>** key anyway to see if any alarms are active or old which may give any clues. If MANUAL BACKUP mode has been enabled (under the MODIFY menus) the alarms will register but the alarm lights will not light.

Check to make sure that the loading system has not been disabled (under the MODIFY menus).

Check the recipe to make sure that the correct recipe is running.

Check to make sure that the number of hoppers has not been changed, and that the blender is still in the correct configuration (ON/OFF, CONTINUOUS, EXTRUSION CONTROL, etc.) by viewing the setup under the CONFIGURATION SYSTEM DESCRIPTION menu.

Check to make sure that all load weights are correct, including the high and low level weights on the downcomer (if the system has a weighed downcomer)

Check to make sure that the high level proximity switch is not covered. No matter what the blender operation mode, if the high level proximity switch is covered the blender will not run. The best way to make sure that the blender is seeing a good high proximity switch reading is to view the main monitor screen - it will show what it believes to be the states of both the high and low level proximity switches.

Check to make all of the motors are plugged in.

Make sure that the loading system is powered up (if controlled via a PLC) and that any loading valves that need compressed air have compressed air.

Check to make sure that the blender can see weight changes at the hoppers by viewing the hopper weights (from the MONITOR menu) and changing the hopper weight by adding or removing weight.

A hopper which does not seems to be loosing material at the rate the blender thinks it is, or a hopper with an UNSTABLE WEIGH SYSTEM alarm may have a slow or erratic 'pellet dribble' from a loading system or slide gate, or something blocking the auger flight or interfering with the load cell or hopper free movement.

Power down just the weigh module or the drive module, or disconnect the network somewhere in the system. Within several seconds alarms should occur.

Power the blender and/or the weigh and drive modules off and back on.

Rerun a rate/speed for the desired recipe.

Check to make sure that there is nothing blocking the material from flowing from a hopper. Sometimes material will produce shavings which can clog one end of the feed auger.

7.2 ALARMS

Persistent occurrence of an alarm indicates a problem that should be resolved. Although explanations of alarms are given elsewhere, this section gives more detailed information on certain alarms that may have multiple sources.

7.2.1 UNSTABLE WEIGH SYSTEM

The unstable weigh system alarm most often occurs because the blender cannot get a good update from the blender for three update times.

Possible causes:

1. The overload protection screws may be touching the loadcell or hopper. Check to ensure that it is not. Check the three hopper overload protection screws around the hopper and back them away if they are touching. Check any place that the hopper may contact the blender body. *The hopper must be free to move, with the only contact to the blender through the loadcell*.

2. If the blender is mounted directly on the extruder and if the extruder is vibrating more than normal, this excess vibration may disturb the hopper weights. If the vibration cannot be reduced, raise the coast bit tolerance (see section 4.4.7.2.3), initially doubling the entered value.

3. Some materials do not flow consistently from the hopper up the auger throat. If this alarm occurs after a new material is introduced, raise the coast bit tolerance (see section 4.4.7.2.3), initially doubling the entered value. If this does not solve the problem, partially open the sample chute and watch the material falling off the end of the auger. If the material appears to "pulse" out of the hopper, check to make sure that the nylon auger insert is properly positioned so that just the end of the insert is visible through the open sample chute (see mechanical drawings). Also check to make sure there is no 'angel hair' or similar material blocking the auger flight.

4. Check the loadcell calibration. If the loadcell calibration is off by more than five percent, the loadcell or weigh module may be damaged.

7.2.2 DRIVE SYSTEM FAILURE

A drive system failure alarm is generated because the blender does not see what it considers to be an adequate amount of weight loss for a given motor speed.

Possible causes:

1. Check to see that the hopper motor is operating. If not, the motor, the cabling or the drive module should be suspected. If the motor is operating, check that material is flowing out of the hopper. No material flow indicates a blockage in the hopper, a loose or broken auger, or incorrect motor rotation.

2. If the material is surging out of the hopper (material flow can be checked by partially opening the sample chute) check to make sure that the nylon auger insert is properly positioned so that just the end of the insert is visible through the open sample chute (see mechanical drawings).

3. If material is feeding consistently out of the hopper, the drive system failure detection parameters may be set too tight. Lower the DRIVE FAIL TOLERANCE and raise the MAX DRIVE FAILS BEFORE ALARM parameters (see section 4.4.7.2.3).

4. If the hopper is overloaded, this alarm will be generated, usually along with the HOPPER OVER MAX WEIGHT alarm.

5. The rate may be too low for the hopper type used. Check sales documentation for hopper rates.

7.2.3 HOPPER/DRIVE NETWORK FAILURE

All devices on the network have a 'happy light' to indicate the communication status. This light will be blinking and green if communication to that device is good, otherwise it will appear orange or red.

If all hoppers and drives show network failure:

1. Cycle power to the entire system to ensure that a power line disturbance has not temporarily faulted a module or the central computer.

2. Check for a short in the network wiring.

3. One module may have failed, shorting out the entire network. Turn off and disconnect all modules from the network but one. If communication is OK to that module, another has failed. Turn on power and reconnect to each module in turn to find the failed module.

A group of hoppers and/or drives show network failure:

1. Check the network wiring between the last module in the network with good communication and the first module to show network failure.

2. Check that no modules have the same address setting. The address switch is found on the module pc board.

A single hopper or drive shows a failure:

1. Check the network wiring to that module.

2. Check that the address switch setting on the module matches that in the configuration for that device.

3. Check the device number to make sure it is unique and within the range for either the weigh module or the drive module.

4. Replace the module.

7.3 OTHER PROBLEMS

7.3.1 NO UPDATE

If a hopper does not update its weight throughput (displays 0.0) when the motor is running, possible causes may include:

1. Not enough time for the hopper to update and compute the correct rate after a speed change. If this only persists for a short period, this is not a problem.

2. The following alarms will prevent a hopper from updating: HOPPER UNDER MINIMUM WEIGHT, HOPPER OVER MAXIMUM WEIGHT, UNSTABLE WEIGH SYSTEM, DRIVE SYSTEM FAILURE, or HOPPER CRITICAL LOW.

3. If the hopper reload time is such that the time between the end of a hopper fill and the start of the next hopper fill is less than the update time, the hopper rate will not be calculated.

4. There may be too much vibration for the blender to determine the rate.

7.3.2 NO RATE SPEED

If the system will not go into automatic when the RUN key is pressed and displays the message "NO RATE SPEED FOR xxx," the system has not learned the relationship between rate (weight throughput) and motor speed. For a hopper, run a new rate/speed. For an extruder, run the extruder in manual mode to learn a rate/speed factor. If the device does update (shows a rate greater than 0.0) but does not get a rate/speed, the device is probably running below the low alarm speed.

7.3.3 SET RATE DIFFERS FROM RECIPE RATE

If the blender is running in ON/OFF mode but not running at the set rate, the set rate may be outside of the possible rates for the blender operation. To determine this, either check the MONITOR screens which indicate the minimum and maximum blender rates with the given recipe (see discussion of the 'REC MIN' and 'REC MAX' MONITOR screens on page ?), or look at the motor speeds for each hopper. The blender needs room to adjust the motor speeds without generating alarms, and so will not allow the blender to run with one of the motor speeds too close to the alarm speeds.

Another possibility is that the maximum blender rate has been limited (under CONFIGURE DOWNCOMER ALARM/LOAD WEIGHTS, MAXIMUM TOTAL RATE). This will act as a 'ceiling' for the total blender rate.

7.3.4 SET RATE DIFFERS FROM PROCESS RATE

There may be times when the blender does not seem to be running at the rate indicated on the MONITOR screens. This can be caused from improper hopper calibration or a bad load cell, but more often the problem is an incorrect rate/speed factor for one or more of the hoppers. If the problem is with the rate/speed factor, the blender will eventually compute the correct rate (during operation, the blender is constantly updating the rate/speeds for each hopper), or the user may simply stop the blender and check the recipe, allowing the blender to do a new rate/speed.

7.3.5 BLENDER NEVER LEARNS PROCESS RATE

A blender running in CONTINUOUS mode with a weighed downcomer should keep the downcomer level fairly close to the midpoint (between the high and low level). When this occurs, the blender has learned the process rate. If the blender is not determining this rate quickly enough, the following things should be checked:

Make sure that the blender has enough 'room' to maneuver the motor speeds around the actual process rate. If the process is running around 500 PPH, the blender should be configured to have a running range of at least 425 to 600 PPH.

Make sure that full speed for the blender is not way over the estimated process rate. The blender starts by going to full speed, and will shut off when the downcomer high level is reached, turning on again at the downcomer midpoint. If the blender does not have enough time to compute the process rate before reaching the high level the output rate may never be learned. One fairly easy way to correct this problem is by lowering the MAXIMUM TOTAL RATE under CONFIGURE DOWNCOMER ALARM/LOAD WEIGHTS.

Make sure that no hopper is coasting too much, or being loaded too often. To compute the output rate, all of the hoppers must have updated, and hopper which is taking excessively long to compute a rate will keep the blender from determining the actual process rate.

8 PREVENTIVE MAINTENANCE

This preventive maintenance section refers only to the blender, and does not cover other components used with the blender. Refer to the maintenance section in the appropriate User Manual for information on these components (ie. conveying equipment: receivers, vacuum pump, etc.).

8.1 DC MOTOR MAINTENANCE

The DC permanent magnet auger motors have extended life brushes, but both brushes should be inspected every so often. One brush may wear more than the other. Replace brushes if they are worn down to the shunt. Clean out brush debris before installing new brushes.

The motor should not be lubricated. Any sign of armature bearing malfunction is cause for motor replacement and return.

8.2 AUGER SEAL

The auger seal is located in the gearbox/gearmotor output flange casting. It is designed to contain the process material in the auger housing as the auger rotates. If the process material contains particle fines, more frequent inspection is required than if a negligible amount of fines are present. These fines are abrasive and shorten seal life. Replace the seal if there is an obvious discharge of process material between seal and auger. Install the new seal with lip spring on the side of the seal away from the process material.

8.3 FEEDER UNIT GEARBOX/GEARMOTOR

The gearbox/gearmotor is permanently lubricated so inspection of the lubrication level is not required. If there are excessive lubrication leaks at either end of the hollow output shaft or at the motor input, a seal may have reached the end of its service life.

8.4 LOADCELLS

It is important that the loadcells be free to deflect under the normal load of material in the weigh hopper. For this reason, stray process material should be kept clear of the loadcell.

8.5 AUGER INSPECTION

Each auger is mounted in a hollow shaft gearbox with cup-point set screws. The screws contact flats on the auger to eliminate slippage. Inspect the auger periodically to be sure that the auger is securely fastened. The augers should also be inspected periodically for straightness, as a bent auger could affect metering rates. Any bent augers should be repaired or replaced.

8.6 FEEDER UNIT LATCHES

The feeder unit is connected to the auger housing by a pair of latches which must be adjusted to provide a secure mount. If the feeder unit is not fastened correctly, the auger could be misaligned with the auger housing, causing the auger to become bent or broken. The latches should be adjusted so that they are snug, but not so tight that excessive force is required to close the latch. Be very careful not to allow pellets (process material) to become lodged between the gearbox flange and the auger housing, as this could also cause auger misalignment. This can be prevented by always checking the inner flange of the feeder unit before replacing the feeder unit on the blender, making sure that the mounting surface is free of all material.

APPENDIX A NEW FEATURES/REVISIONS/UPGRADE PROCEDURE

There are new features which will be noticed by the user who upgrades a blender from version 3.0x firmware to version 3.14. They are the following:

- Fixed problem with oscillating critical low alarm. If a hopper in the currently running recipe went critical low but the temporary recipe did not have the hopper in the recipe the blender would oscillate on and off.
- Fixed problem with version conversion which repeated converting from 3.13 to 3.12.

Major changes in blender operation from earlier versions:

As of 3.13

- Fixed bug with auxiliary output which occurred with a PWM drive blender using an EXD for the auxiliary output. The blender would only communicate with the drive when the output was changed which allowed the EXD to time out and drop the reference occasionally.
- Improved Gravilink so that extruder rate updates are synchronized with the Gravitrol system.

As of 3.12

- Added support for the Siemens 3964R protocol.

As of 3.11

- Added support for remote recipe selection via relays on the back of the mini-op panel.

As of 3.10

- The loading system can now be set to either AUTO, MANUAL, or DISABLED. Previously it could only be DISABLED or ENABLED.
- The user can now perform a rate/speed operation remotely.
- The blender in primary line speed control or monitor mode now supports a secondary nip.
- The user can enter stretch factors to account for material area changes between the primary nip and the secondary nip.
- Specific hoppers can be designated as ‘regrind’ hoppers.
- Integer version of alternate registers added (point 87).
- Remote RUN/STOP relay support added.
- Blender can output debug data in a format directly importable to a spreadsheet program.
- Blender will automatically update memory from recent versions (3.00 and higher).

As of 3.08

- Fixed a problem in parsing the address in the ASCII protocol.
- Fixed a problem with word range reads and writes with the Allen Bradley protocol.

As of 3.07

- Added a feature to the EXTROL protocol to improve error handling in the EXTROL system.
- Fixed a problem with the calculated minimums and maximum blender rate. The blender would sometimes use the temporary recipe instead of the running recipe, thereby calculating the incorrect maximum blender rate.

As of 3.06

- Added remote diagnostics to each protocol to keep track of number of good and bad messages as well as the last i/o point written.

As of 3.05

- This version was never released.

As of 3.04:

- In version 3.03, if BATCH was enabled, the system would not run if BATCH was later disabled. This was fixed in 3.04.

As of 3.03:

- BC in BATCH mode will now restart after critical low in hopper is satisfied even if the low prox on the downcomer is covered.
- BC running in CONTINUOUS and also in BATCH mode will now stop when batch reached.
- Printer buffer should no longer overflow. Used to overflow occasionally with CHECK PRINTER alarm.
- Rate/Speed can no longer be run if the network is failed.
- Shift and Inventory totals no longer increase when in MANUAL BACKUP
- Allow restart of current batch where left off when STOP key is pressed.

As of 3.02:

- If "NEED KEY TO MODIFY" was set to "NO", no longer get random text messages under the <MODIFY> key
- Can now use high number recipes after a low number recipe has been used
- Can now take a critical low hopper out of the recipe even if downcomer almost empty

As of 3.01:

- Blender loading by time works correctly
- Initial rate/speed for hoppers now works correctly (it did not always give correct results in 3.00)
- Shutdown alarms now latch correctly
- Can now send AUTO/AUTO remote command (with new mode button) for BE doing extrusion control when extruder has been put into MANUAL mode
- Remote writes and reads of the ACCEL/DECEL parameters now work correctly

- Blender can no longer starve extruder while running at a speed which is below the blender total maximum.
- Remote reads of points 1015, 2015, . . . return invalid points
- Removed some false UNABLE TO MEET RATE alarms
- Update times no longer randomly changed to 1 second
- Extruder can now be easily started remotely from a stopped condition
- BE in AUTO in compatibility mode now accepts new extruder rates (previously had to PAUSE before accepted)

As of 3.00:

- CALCBIT default lowered to 350 bits (results in faster updates)
- Added alarm and event logging
- New rate/speed routines:
  - Can monitor average rate/speed factors
  - Can enter new rate/speed factors for each hopper
  - Can set motor speed for rate/speeds for each hopper in CONFIG
  - Can run rate/speed on hopper not in AUTO while blender running
  - Rate/speed takes only 6 seconds
  - Initial rate/speed modified for first 5 updates before going into average
- Added resin codes and resin product totals
- Un-calculated rates now show "..." instead of "0.0"

For users who upgrade from an older version, here is a brief listing of the changes made with each new version:

As of 2.25, 2.26 and 2.27:

- User no longer has the option of running a bad recipe (previous to this, the user could 'ATTEMPT TO RUN ANYWAY')
- Added DRIVE IN MANUAL BACKUP and DRIVE INHIBIT alarms
- Ability to return the set rates instead of the actuals to a remote process
- Added good remote reads and good remote writes to service displays
- Added new MODE button for remote communication
- Added ability to start/stop extruder/blender separately via new remote MODE button
- HOP and REC displays in MONITOR kept current with each hopper update (used to only update when RUN was pressed)
- Added "RATIO" in <MANUAL> if controlling both extruder and line speed
- Fixed problem which caused thickness to clear when recipe key pressed and controlling LTP
- Show all actuals even when have a MANUAL BACKUP alarm
- Added ability to print some of the configuration (is in menu under <PRINT> key)
- Can now step through partial recipe, changing only what is needed, and then press <RUN>
- Added selection (under ADDRESSES) for normally open or normally closed loading relays

- If go from KG to LBS, all weights are converted (load, calibration, alarms, . . .)

As of 2.20:
- Fixed problem which sometimes gave 'NO RATE/SPEED HOPPER h' or 'HOPPER h NOT CALIBRATED' messages for hoppers which were not in the recipe
- New BE control mode : Monitor extruder and Control haul-off
- Added PURGE mode for hoppers or system

As of 2.12:
- Allowed print 'id' of up to 9999 (used to only go up to 128)
- Added support for four proximity switches on BC downcomer
- Bug introduced in manual backup in 2.11 corrected
- Special registers for remote communication (75 and 85) added to allow modification of most configuration parameters
- Recipes which appear to add to 100% will no longer give 'RECIPE MUST ADD TO 100%' message (this occurred due to internal roundoffs)

As of 2.11:
- Support for length throughput monitoring
- Extruder and haul-off now reach final speeds at the same time during rate changes when controlling both NIP and extruder
- Messages for 'RUN', 'STOP', etc. will now be logged to the printer when LOG ALARMS TO PRINTER is selected (this did not work correctly in 2.10)

As of 2.10:
- Support for two more languages - French and German
- MANUAL ON DELAY and UNABLE TO MEET RATE DELAY can now be set to different numbers
- Support for Allen Bradley DH+ communications
- Enhanced, easier to use alarm entry
- "HOPPER CRITICAL" message now displays when blender pauses for critical low (used to be "HIGH LEVEL EXCEEDED")
- Loading will not ever be activated if loading disabled (blender used to 'bump' load relays when MANUAL first entered)
- RUN cannot be pressed when in MANUAL BACKUP mode
- CONFIGURATION is now stored when any control key (PRINT, MONITOR, RECIPE, . . .) is pressed, alleviating the need for periodically selecting "STORE CONFIGURATION" from the configuration menus
- Communication ports now user configurable
- Entering 0 for UNABLE TO MEET RATE ALARM disables it (for starve fed applications)

- If the key is required for the CONFIGURATION section but not or CALIBRATION, pressing CONFIG without the key in the ENABLE position will take the user straight to CALIBRATE.
- Diagnostic screen is now available from MODIFY
- Multidrop communication now selectable for EPCC and ASCII

UPGRADING FROM A PREVIOUS RELEASE

Updating from earlier releases of software requires replacing the firmware in the central computer. This will many times, unfortunately, require reconfiguring and recalibrating your blender. The firmware is a set of 2 EPROMS labeled FWH1xx300 and FWH2xx300. The FW signifies that the part is firmware. The next character, an 'H', indicates a 4 megabit EPROM. (NOTE: When going from a 'G' (2 MB) EPROM to an 'H', jumper J3 may need to be modified to connect pins 15-17). The next digit indicates where on the pc board the chip is located. The '1' chip is the 'high' portion of the code, and goes into the socket on the PC board labeled 'ROMH'. The '2' chip is the 'low' portion and goes into the socket labeled with a 'ROML'. The xx indicates that the firmware is for gravimetric blenders (BG), blenders with a non-weighed downcomer (BC), XB or XG series blenders (XB/XG) or blenders with extrusion control (BE). The 300 indicates that the release is version 3.00.

The EPROMS should be handled with care as they are sensitive to static electricity. DO NOT TOUCH THE PINS. Keep the EPROMS in their package until ready to perform the upgrade. When removing an old EPROM, use a flat blade screwdriver to pry the it up, or use an EPROM puller. To insert a new EPROM, bend the pins (if necessary) until they are perpendicular to the body by rotating against a flat grounded object and insert into the appropriate socket.

In order to provide some of the new features and enhancements, it may be necessary to change the software in the weigh and drive modules (the blender will give an alarm if a firmware upgrade is required). Upgrading requires a programmer module, programmer to i/o module cable, programmer to PC cable, software disk, and an IBM compatible PC with an available COM1 port. All except the PC will be provided with the upgrade kit. To upgrade software, perform the following steps:

1. Connect the two cables to the programmer. The cables have different connector types to avoid confusion. Connect the 9 pin D connector to COM1 of the PC. If the PC has a 25 pin D connector, an adapter may be used or the programmer may be plugged directly into the COM1 port of the PC.

2. Insert the disk into the PC. Switch to the drive containing the disk by typing "A:" or "B:" and then RETURN. For color displays, type "DOWNLOAD" and then RETURN. For monochrome displays type "DOWNLOAD -m" and then RETURN. Selecting "Help" at any time will provide information which may be useful in the download process. Pressing any key will exit the Help Menu.

3. Plug the I/O module end of the program cable into the module to be downloaded (weigh module, drive module, etc.). The 10 pin flat ribbon connector mates with a connector on the pc board marked "PROGRAM" or "PROGRAMMER". Ensure that the connector is inserted with the keys matching.

4. On C1200 and C1181 modules there is an 8 position jumper bed near an IC marked "28C64". This jumper bed controls the boards ability to accept a download. If there is a jumper between pins 3 and 4 move it to between pins 1 and 3. This will allow the board to accept the download.

5. On the PC, select "Download Software", then "Board Select". A list of board types and software revisions will appear. Select the board type (C1200 Rev A, etc.) and the software revision to be downloaded. The board hardware revision is found next to the part number. Next to the software revision is a note that states that the software is for central computer software prior to V2.00 (<V2.00) or for V2.00 or later (>=V2.00). Make sure that the correct version is selected. Press RETURN.

6. The PC screen will show status messages detailing download progress. When complete, the program will state that the download was successful. If a download failure occurs a read window will appear describing where the download failed and offer suggestions to fix the problem.

APPENDIX B ADDRESSING AND THE BLENDER

The basic blender system consists of a main CPU card (referred to as the mini-op station), and several other cards (drive module, weigh modules(s), . . .). These cards communicate by way of a three wire cable, called the *local network* cable. This cable carries messages in a high speed serial form from card to card whenever power is applied to the system. Each card has an LED which indicates the message traffic on the network - when this light is solid green, no communication is taking place. When the LED is flashing between green and off, messages are being received. If this LED is ever an orange color, the card has not received any messages lately and has 'failed' the network (timed-out).

In order for there to be an orderly progression of traffic from card to card, each card has an address on this network. These addresses are set at the factory by means of a small rotary switch, but can be modified in the field if there is ever any addressing conflict during system expansion. Each message sent on the network has included with it the address of the device with which it wishes to communicate. Each device looks at all messages sent, but only processes the ones which have a destination address matching its own. For cards with multiple devices (the drive card, for instance), each device attached to that card will have a separate channel. In this manner, the main CPU can send a message to change the motor speed for hopper B, and be assured that the correct motor will begin to turn.

The Octal Drive Card has a default address of 32, with hopper A's motor being channel one, hopper B's motor being channel two and so on. This drive card can control up to eight motors, so a 'fully loaded' blender with eight hoppers only needs one drive card. If the blender is using the PWM motor controllers, there is one drive card (again with a default or ‘base’ address of 32) for each motor, and the addresses are usually incremented with each hopper. The default address of the weigh module for the first four hoppers and the downcomer is 16, with hoppers A through D being found on channels one through 4, respectively. The weighed downcomer (if it exists) is usually on the fifth channel of the first weigh module. A blender with more than four hoppers and a weighed downcomer (or five hoppers and no weighed downcomer) will have a second weigh module with an address of seventeen, with the next hopper (either E or F) being channel 1, and so fourth. If the blender is set up for extrusion control, the drive for the extruder is usually located at address 33, channel one for a system with an Octal Drive Card, or address 48 or 49 for a system with PWM drives.

Under most circumstances, these addresses will not be modified. If, however, a user needs to modify some of the default addressing, these new addresses should be recorded in case the blender must be reconfigured at some future date (see the configuration worksheets elsewhere in the appendix).

APPENDIX C CONFIGURATION WORKSHEETS

The following pages are worksheets designed to help you enter and keep up with your system's configuration. This information is most useful when updating to a new revision of software which sometimes may require reentering the data. Not all blenders and configurations will have all of the parameters listed in the worksheets.

SYSTEM CONFIGURATION WORKSHEET

SYSTEM DESCRIPTION:

Language:	_____	
Choices: ENGLISH; NEDERLANDS; DEUTSCH; FRENCH;SPANISH; PORTUGUOS		
Weighed Downcomer?	_____	(yes/no) [no]
Blender Control Mode:	_____	
Choices: CONTINUOUS; ON/OFF		
Downcomer Low Level Weight	_____	
Downcomer High Level Weight	_____	
Full Speed Delay	_____	
High Delay	_____	
Cutsize	_____	
Extruder Control Mode:	_____	
Choices: MONITOR, CONTROL		
Line Speed Control Mode:	_____	
Choices: UNUSED, MONITOR, CONTROL		
Application	_____	[BLOWN FILM]
Choices: BLOWN FILM SHEET AND CAST FILM PIPE AND TUBING WIRE AND CABLE PROFILE		
First Recipe Entry	_____	[W/L]
Second Recipe Entry	_____	
Recipe Entry Mode:	_____	
Choices: PARTS, PERCENT		
Number of hoppers	_____	(1-8) [4]

SYSTEM ACCEL/DECEL PARAMETERS

System Accel Rate	_____
System Decel Rate	_____

USER INTERFACE PARAMETERS:

Screen Timeout (0=none) _____	(seconds)	[10]
Error Timeout _____	(seconds)	[2]
Extended Monitor Menus? _____	(yes/no)	[yes]
Use Alpha Resin Codes? _____	(yes/no)	[no]
Always Enter Densities in Recipe? _____	(yes/no)	[no]
Need Key to Configure? _____	(yes/no)	[yes]
Need Key to Calibrate? _____	(yes/no)	[yes]
Need Key to Change Recipe? _____	(yes/no)	[yes]
Need Key to Store Recipe? _____	(yes/no)	[yes]
Need Key to Stop? _____	(yes/no)	[yes]
Need Key to Run? _____	(yes/no)	[yes]
Need Key for Manual? _____	(yes/no)	[yes]
Need Key to Turn Off? _____	(yes/no)	[yes]
Need Key to Modify? _____	(yes/no)	[no]
If "Need Key to Modify" is NO:		
Need Key to Clear Shift Totals? _____	(yes/no)	[no]
Need Key to Clear Inventory Totals? _____	(yes/no)	[yes]
Need Key to Clear Alarm Log? _____	(yes/no)	[yes]
Need Key to Modify Load Weights? _____	(yes/no)	[yes]
Need Key to Modify Alarm Weights? _____	(yes/no)	[yes]
Need Key to Modify RS/Factors? _____	(yes/no)	[yes]
Need Key to Modify Batch Size? _____	(yes/no)	[yes]
Need Key to Modify Sys Accel/Decel? _____	(yes/no)	[yes]
Need Key to Modify Miscellaneous? _____	(yes/no)	[yes]
Need Key to Clear Diagnostic Data? _____	(yes/no)	[yes]
Need Key to Show Diagnostic Data? _____	(yes/no)	[yes]
Need Key to Modify Special Software? _____	(yes/no)	[yes]
Need Key to Modify Manual Backup? _____	(yes/no)	[yes]
Need Key to Disable Loading System? _____	(yes/no)	[yes]
Need Key to Modify Resins? _____	(yes/no)	[yes]
Need Key to Display Resins Totals? _____	(yes/no)	[yes]
Need Key to Clear Resin Totals? _____	(yes/no)	[yes]
Need Key to Clear Recipe Totals? _____	(yes/no)	[yes]
Need Key to Display Recipe Totals? _____	(yes/no)	[yes]
Need Key to Modify UCB? _____	(yes/no)	[yes]
Need Key to Modify Multipliers? _____	(yes/no)	[yes]

NETWORK PARAMETERS:

Network Retries Before Failure _____ (1-99) [10]
Network Failure Repoll Time _____ (seconds) [5]

UNITS:

Units System _____ (Eng/Met) [E]
If Units System = English
  Weight/Length Unit _____ (lb/1000ft;lb/ft)
If Units System = Metric
  Weight/Length Unit _____ (g/m;kg/m) [g/m]

COMMUNICATION:

Printer Port _____
Remote Port _____
Remote Op-Station Port _____
Modem Port _____
Width Controller Port _____
Remote Gravitrol Link _____
Remote Protocol _____
  Choices: NONE; EPCC; ASCII; SPI; ALLEN BRADLEY DH+; BGE EXTROL CCM;MODBUS
Depending upon Remote Protocol:
  Remote Address _____ (1 - 127) [1]
  Baud Rate _____ (bits/sec) [9600]
  Number of Data Bits _____ (bits) [8]
  Parity _____ (e/o/n) [none]
  Number of Stop Bits _____ (½) [1]
  AB Plc Type _____ [PLC-2]
    Choices: PLC-2 WORD ADDRESSING;PLC-2 BYTE ADDRESSING;PLC-5 ONLY

Baud Rate _____ (bits/sec) [9600]
Bits/Char _____ (bits) [8]
Parity _____ (e/o/n) [none]
Stop Bits _____ (½) [1]
Blender ID _____ [1]
Print Verbose Reports? _____ (yes/no) [yes]
  Clear Shift Totals After Report _____ (yes/no) [no]
Log Alarms to Printer? _____ (yes/no) [no]
Generate Automatic Reports? _____ (yes/no) [no]

If "Generate Automatic Reports" is YES

Start Time for Reports (24 hour clock)	_____	(hh:mm)	[00:00]
Report Interval	_____	(hh:mm)	[08:00]

MISCELLANEOUS:

Motor Speed in Percent?	_____	(yes/no)	[yes]
Ext Ratio'ed in Manual?	_____	(yes/no)	[yes]
Nip Ratio'ed in Manual?	_____	(yes/no)	[yes]
Weigh Module Filter	_____	(Hz)	[0.20]
Speed Cut Relay Addr	_____	(0 - 126)	[0]
If Speed Cut Relay Addr:			
Speed Cut Relay Number	_____	(1 - 8) [8]	
Speed Cut	_____	(0 - 100%)	[100%]
Aux Out Drive Addr	_____	(0 - 126)	[0]
If Aux Out Drive Addr:			
Aux Out Drive Channel	_____	(1 - 8) [8]	
Aux Out Percent	_____	(0 - 100%)	[100]
Base Aux Rate on BG Total	_____	(0 - 9999)	[0]
Maximum Aux Out Voltage	_____	(0 - 10 V)	[6.5]
Aux Alarm Relay Addr	_____	(0 - 126)	[0]
If Aux Alarm Relay Addr			
Aux Alarm Relay Number	_____	(1 - 4) [4]	
If Aux Alarm Relay Addr:			
Aux Alarm Relay Channel	_____	(1 - 8) [8]	
Aux Alarm Out Relay Addr	_____	(0 - 126)	[0]
Run/Stop Relay Address	_____	(1=mini-op)	[0]
Silence Old Alarms?	_____	(yes/no)	[no]
Cutsize	_____		[25.0%]

DOWNCOMER CONFIGURATION WORKSHEET

NOTE: *Each line contains the menu display, a line for the user to record the blender configuration value, the valid data ranges and the default data value. Not all options will appear on all blenders.*

NETWORK ADDRESSES:

Drive Module Network Address	_____	(2-126)	[33]
Drive Output Channel Number	_____	(1-8)	[8]
Drive Inhibit Signal Active On?	_____	(yes/no)	[no]
Weigh Module Network Address	_____	(2-126)	[16]
Weigh Input Channel Number	_____	(1-5)	[5]
Alarm Relay Number	_____	(1-16)	[12]
Sync Option Installed?	_____	(yes/no)	[no]

NOTE: *If using a 5 channel weigh module, both the Weigh Module Network Address and the Weigh Input Channel Number must be modified when more than 5 channels are assigned. The fifth device must be placed at a Network Address not equal to the previous Network Address, and must have a Channel Number on that board (1-5). In most cases, the sixth device will have a Weigh Module Network Address of 17 and a Weigh Input Channel Number of 0. If a weighed downcomer is used, it usually occupies Weigh Module Address 16 and Input Channel Number 5.*

ALARM/LOAD WEIGHTS:

Downcomer Low Level Weight	_____	(lbs/kgs)	[10]
Downcomer High Level Weight	_____	(lbs/kgs)	[20]
Downcomer Low Alarm Weight	_____	(lbs/kgs)	[5]
Downcomer Critical Weight (Critical Low)	_____	(lbs/kgs)	[1]
Maximum Total Rate	_____	(lb/kg hr)	[0]

CONTROL LOOP PARAMETERS:

Number of Moving Points	_____	(1-10)	[5]
Time Between Updates	_____	(seconds)	[8]
Limit Speed Changes?	_____	(yes/no)	[yes]
If "Limit Speed Changes" is YES:			
Max Speed Change	_____	(%)	[5]
Control Dead Band	_____	(%)	[0.25]
Max Error Before Forced Update	_____	(%)	[75]
Number of Max Errors/Forced Update	_____	(1-10)	[2]

Drive Fail Tolerance	_____	(bits)	[1]
Max Drive Fails Before Alarm	_____	(10-999)	[20]
Out of Spec Alarm Percentage	_____	(%)	[2]
Manual On Delay	_____	(sec)	[90]
Unable to Meet Rate Delay	_____	(sec)	[90]
Rate Change Dead Band	_____	(0 - 99.99%)	[2.5]
Extruder Rate Smoothing Factor	_____	(1 - 20)	[10]
In/Out Rate Match Tolerance	_____	(0 - 99.99%)	[50.0]
Out of Spec Delay	_____	(updates)	[5]

ACCEL/DECEL/SPEED PARAMETERS:

Drive Accel Rate	_____	(%/second)	[2]
Drive Decel Rate	_____	(%/second)	[2]
Recipe High Speed Warning	_____	(%)	[95]
Recipe Low Speed Warning	_____	(%)	[10]
High Speed Alarm	_____	(%)	[98]
Low Speed Alarm	_____	(%)	[5]
Rate/Speed Zero Crossing	_____	(%)	[0.1]
Maximum Drive Speed	_____	(%)	[100]

CALIBRATION FACTORS:

Zero Weight Factor	_____	(bits)
Test Weight Factor	_____	(bits)
Test Weight	_____	(lb/kg)

HOPPER A CONFIGURATION WORKSHEET

NOTE: *Each line contains the BG menu display, a line for the user to record the BG configuration value, the valid data ranges and the default data value. The letter 'H' (as in '[32+H]') indicates the hopper number which corresponds to the hopper letter ('0' for 'A', '1' for 'B', etc.).*

NETWORK ADDRESSES:

Drive Module Network Address	_____	(2-126)	[32]	
Drive Output Channel Number	_____	(1-8)	[1+H]	
Weigh Module Network Address	_____	(2-126)	[16]	
Weigh Input Channel Number	_____	(1-5)	[1+H]	Loading Module
Network Address	_____	(2-126)	[32]	
Load Relay Number	_____	(1-16)	[1+H]	
Loading Relay Type	_____	NO/NC	[NO]	
Hopper Type	_____	(nor/eg)	[Normal]	

NOTE: *If using a 5 channel weigh module, both the Weigh Module Network Address and the Weigh Input Channel Number must be modified when more than 5 channels are assigned. The fifth device must be placed at a Network Address not equal to the previous Network Address, and must have a Channel Number on that board (1-5). In most cases, the sixth device will have a Weigh Module Network Address of 17 and a Weigh Input Channel Number of 0. If a weighed downcomer is used, it usually occupies Weigh Module Address 16 and Input Channel 5.*

ALARM/LOAD WEIGHTS:

Hopper Loading On Weight	_____	(lbs/kgs)	[10]
Hopper Loading Off Weight	_____	(lbs/kgs)	[0]
Hopper Loading Time	_____	(seconds)	[0]
Hopper Low Alarm Weight	_____	(lbs/kgs)	[6]
Hopper Critical Weight (Critical Low)	_____	(lbs/kgs)	[5]
Min Dump Size Alarm Weight	_____	(lbs/kgs)	[5]

CONTROL LOOP PARAMETERS:

Number of Moving Points	_____	(1-10)	[5]
Time Between Updates	_____	(seconds)	[6]
Bits Between Updates	_____	(bits)	[350]
Limit Speed Changes?	_____	(yes/no)	[yes]
If "Limit Speed Changes" is YES:			
Max Speed Change	_____	(%)	[5]

Control Dead Band	_____	(%)	[0.25]
Max Error Before Forced Update	_____	(%)	[25]
Number of Max Errors Per Forced Update	_____	(1-10)	[3]
Percent Error to Coast	_____ (%)	[200]	
Coast Tolerance	_____	(1-999)	[160]
Initial Coast Value	_____	(1-250)	[5]
Max Coast Time Before Alarm	_____	(seconds)	[30]
Drive Fail Tolerance	_____	(bits)	[1]
Max Drive Fails Before Alarm	_____ (10-999)	[75]	
Out of Spec Alarm Percentage	_____ (%)	[1.0]	

ACCEL/DECEL/SPEED PARAMETERS:

Recipe High Speed Warning	_____	(%)	[95]
Recipe Low Speed Warning	_____	(%)	[10]
High Speed Alarm	_____	(%)	[98]
Low Speed Alarm	_____	(%)	[5]
Maximum Output Voltage	_____	(Volts) [6.5]	
Rate/Speed Zero Crossing	_____	(%)	[6.0]
Motor Speed for Rate/Speed	_____	(%)	[50]

CALIBRATION FACTORS:

Zero Weight Factor	_____	(bits)
Test Weight Factor	_____	(bits)
Test Weight	_____	(lb/kg)

HOPPER B CONFIGURATION WORKSHEET

NOTE: *Each line contains the BG menu display, a line for the user to record the BG configuration value, the valid data ranges and the default data value. The letter 'H' (as in '[32+H]') indicates the hopper number which corresponds to the hopper letter ('0' for 'A', '1' for 'B', etc.).*

NETWORK ADDRESSES:

Drive Module Network Address	_____	(2-126)	[32]	
Drive Output Channel Number	_____	(1-8)	[1+H]	
Weigh Module Network Address	_____	(2-126)	[16]	
Weigh Input Channel Number	_____	(1-5)	[1+H]	Loading Module
Network Address	_____	(2-126)	[32]	
Load Relay Number	_____	(1-16)	[1+H]	
Loading Relay Type	_____	NO/NC	[NO]	
Hopper Type	_____	(nor/eg)	[Normal]	

NOTE: *If using a 5 channel weigh module, both the Weigh Module Network Address and the Weigh Input Channel Number must be modified when more than 5 channels are assigned. The fifth device must be placed at a Network Address not equal to the previous Network Address, and must have a Channel Number on that board (1-5). In most cases, the sixth device will have a Weigh Module Network Address of 17 and a Weigh Input Channel Number of 0. If a weighed downcomer is used, it usually occupies Weigh Module Address 16 and Input Channel 5.*

ALARM/LOAD WEIGHTS:

Hopper Loading On Weight	_____	(lbs/kgs)	[10]
Hopper Loading Off Weight	_____	(lbs/kgs)	[0]
Hopper Loading Time	_____	(seconds)	[0]
Hopper Low Alarm Weight	_____	(lbs/kgs)	[6]
Hopper Critical Weight (Critical Low)	_____	(lbs/kgs)	[5]
Min Dump Size Alarm Weight	_____	(lbs/kgs)	[5]

CONTROL LOOP PARAMETERS:

Number of Moving Points	_____	(1-10)	[5]
Time Between Updates	_____	(seconds)	[6]
Bits Between Updates	_____	(bits)	[350]
Limit Speed Changes?	_____	(yes/no)	[yes]
If "Limit Speed Changes" is YES:			
Max Speed Change	_____	(%)	[5]

Control Dead Band	_____	(%)	[0.25]
Max Error Before Forced Update	_____	(%)	[25]
Number of Max Errors Per Forced Update	_____	(1-10)	[3]
Percent Error to Coast	_____	(%)	[200]
Coast Tolerance	_____	(1-999)	[160]
Initial Coast Value	_____	(1-250)	[5]
Max Coast Time Before Alarm	_____	(seconds)	[30]
Drive Fail Tolerance	_____	(bits)	[1]
Max Drive Fails Before Alarm	_____	(10-999)	[75]
Out of Spec Alarm Percentage	_____	(%)	[1.0]

ACCEL/DECEL/SPEED PARAMETERS:

Recipe High Speed Warning	_____	(%)	[95]
Recipe Low Speed Warning	_____	(%)	[10]
High Speed Alarm	_____	(%)	[98]
Low Speed Alarm	_____	(%)	[5]
Maximum Output Voltage	_____	(Volts)	[6.5]
Rate/Speed Zero Crossing	_____	(%)	[6.0]
Motor Speed for Rate/Speed	_____	(%)	[50]

CALIBRATION FACTORS:

Zero Weight Factor	_____	(bits)
Test Weight Factor	_____	(bits)
Test Weight	_____	(lb/kg)

HOPPER C CONFIGURATION WORKSHEET

NOTE: *Each line contains the BG menu display, a line for the user to record the BG configuration value, the valid data ranges and the default data value. The letter 'H' (as in '[32+H]') indicates the hopper number which corresponds to the hopper letter ('0' for 'A', '1' for 'B', etc.).*

NETWORK ADDRESSES:

Drive Module Network Address	_____	(2-126)	[32]	
Drive Output Channel Number	_____	(1-8)	[1+H]	
Weigh Module Network Address	_____	(2-126)	[16]	
Weigh Input Channel Number	_____	(1-5)	[1+H]	Loading Module
Network Address	_____	(2-126)	[32]	
Load Relay Number	_____	(1-16)	[1+H]	
Loading Relay Type	_____	NO/NC	[NO]	
Hopper Type	_____	(nor/eg)	[Normal]	

NOTE: *If using a 5 channel weigh module, both the Weigh Module Network Address and the Weigh Input Channel Number must be modified when more than 5 channels are assigned. The fifth device must be placed at a Network Address not equal to the previous Network Address, and must have a Channel Number on that board (1-5). In most cases, the sixth device will have a Weigh Module Network Address of 17 and a Weigh Input Channel Number of 0. If a weighed downcomer is used, it usually occupies Weigh Module Address 16 and Input Channel 5.*

ALARM/LOAD WEIGHTS:

Hopper Loading On Weight	_____	(lbs/kgs)	[10]
Hopper Loading Off Weight	_____	(lbs/kgs)	[0]
Hopper Loading Time	_____	(seconds)	[0]
Hopper Low Alarm Weight	_____	(lbs/kgs)	[6]
Hopper Critical Weight (Critical Low)	_____	(lbs/kgs)	[5]
Min Dump Size Alarm Weight	_____	(lbs/kgs)	[5]

CONTROL LOOP PARAMETERS:

Number of Moving Points	_____	(1-10)	[5]
Time Between Updates	_____	(seconds)	[6]
Bits Between Updates	_____	(bits)	[350]
Limit Speed Changes?	_____	(yes/no)	[yes]
If "Limit Speed Changes" is YES:			
Max Speed Change	_____	(%)	[5]

Control Dead Band	_____	(%)	[0.25]
Max Error Before Forced Update	_____	(%)	[25]
Number of Max Errors Per Forced Update	_____	(1-10)	[3]
Percent Error to Coast	_____ (%)	[200]	
Coast Tolerance	_____	(1-999)	[160]
Initial Coast Value	_____	(1-250)	[5]
Max Coast Time Before Alarm	_____	(seconds)	[30]
Drive Fail Tolerance	_____	(bits)	[1]
Max Drive Fails Before Alarm	_____ (10-999)	[75]	
Out of Spec Alarm Percentage	_____ (%)	[1.0]	

ACCEL/DECEL/SPEED PARAMETERS:

Recipe High Speed Warning	_____	(%)	[95]
Recipe Low Speed Warning	_____	(%)	[10]
High Speed Alarm	_____	(%)	[98]
Low Speed Alarm	_____	(%)	[5]
Maximum Output Voltage	_____	(Volts) [6.5]	
Rate/Speed Zero Crossing	_____	(%)	[6.0]
Motor Speed for Rate/Speed	_____	(%)	[50]

CALIBRATION FACTORS:

Zero Weight Factor	_____	(bits)
Test Weight Factor	_____	(bits)
Test Weight	_____	(lb/kg)

HOPPER D CONFIGURATION WORKSHEET

NOTE: *Each line contains the BG menu display, a line for the user to record the BG configuration value, the valid data ranges and the default data value. The letter 'H' (as in '[32+H]') indicates the hopper number which corresponds to the hopper letter ('0' for 'A', '1' for 'B', etc.).*

NETWORK ADDRESSES:

Drive Module Network Address	_____	(2-126)	[32]	
Drive Output Channel Number	_____	(1-8)	[1+H]	
Weigh Module Network Address	_____	(2-126)	[16]	
Weigh Input Channel Number	_____	(1-5)	[1+H]	Loading Module
Network Address	_____	(2-126)	[32]	
Load Relay Number	_____	(1-16)	[1+H]	
Loading Relay Type	_____	NO/NC	[NO]	
Hopper Type	_____	(nor/eg)	[Normal]	

NOTE: *If using a 5 channel weigh module, both the Weigh Module Network Address and the Weigh Input Channel Number must be modified when more than 5 channels are assigned. The fifth device must be placed at a Network Address not equal to the previous Network Address, and must have a Channel Number on that board (1-5). In most cases, the sixth device will have a Weigh Module Network Address of 17 and a Weigh Input Channel Number of 0. If a weighed downcomer is used, it usually occupies Weigh Module Address 16 and Input Channel 5.*

ALARM/LOAD WEIGHTS:

Hopper Loading On Weight	_____	(lbs/kgs)	[10]
Hopper Loading Off Weight	_____	(lbs/kgs)	[0]
Hopper Loading Time	_____	(seconds)	[0]
Hopper Low Alarm Weight	_____	(lbs/kgs)	[6]
Hopper Critical Weight (Critical Low)	_____	(lbs/kgs)	[5]
Min Dump Size Alarm Weight	_____	(lbs/kgs)	[5]

CONTROL LOOP PARAMETERS:

Number of Moving Points	_____	(1-10)	[5]
Time Between Updates	_____	(seconds)	[6]
Bits Between Updates	_____	(bits)	[350]
Limit Speed Changes?	_____	(yes/no)	[yes]
If "Limit Speed Changes" is YES:			
Max Speed Change	_____	(%)	[5]

Control Dead Band	_____	(%)	[0.25]
Max Error Before Forced Update	_____	(%)	[25]
Number of Max Errors Per Forced Update	_____	(1-10)	[3]
Percent Error to Coast	_____ (%)	[200]	
Coast Tolerance	_____	(1-999)	[160]
Initial Coast Value	_____	(1-250)	[5]
Max Coast Time Before Alarm	_____	(seconds)	[30]
Drive Fail Tolerance	_____	(bits)	[1]
Max Drive Fails Before Alarm	_____ (10-999)	[75]	
Out of Spec Alarm Percentage	_____ (%)	[1.0]	

ACCEL/DECEL/SPEED PARAMETERS:

Recipe High Speed Warning	_____	(%)	[95]
Recipe Low Speed Warning	_____	(%)	[10]
High Speed Alarm	_____	(%)	[98]
Low Speed Alarm	_____	(%)	[5]
Maximum Output Voltage	_____	(Volts) [6.5]	
Rate/Speed Zero Crossing	_____	(%)	[6.0]
Motor Speed for Rate/Speed	_____	(%)	[50]

CALIBRATION FACTORS:

Zero Weight Factor	_____	(bits)
Test Weight Factor	_____	(bits)
Test Weight	_____	(lb/kg)

HOPPER E CONFIGURATION WORKSHEET

NOTE: *Each line contains the BG menu display, a line for the user to record the BG configuration value, the valid data ranges and the default data value. The letter 'H' (as in '[32+H]') indicates the hopper number which corresponds to the hopper letter ('0' for 'A', '1' for 'B', etc.).*

NETWORK ADDRESSES:

Drive Module Network Address	_____	(2-126)	[32]	
Drive Output Channel Number	_____	(1-8)	[1+H]	
Weigh Module Network Address	_____	(2-126)	[16]	
Weigh Input Channel Number	_____	(1-5)	[1+H]	Loading Module
Network Address	_____	(2-126)	[32]	
Load Relay Number	_____	(1-16)	[1+H]	
Loading Relay Type	_____	NO/NC	[NO]	
Hopper Type	_____	(nor/eg)	[Normal]	

NOTE: *If using a 5 channel weigh module, both the Weigh Module Network Address and the Weigh Input Channel Number must be modified when more than 5 channels are assigned. The fifth device must be placed at a Network Address not equal to the previous Network Address, and must have a Channel Number on that board (1-5). In most cases, the sixth device will have a Weigh Module Network Address of 17 and a Weigh Input Channel Number of 0. If a weighed downcomer is used, it usually occupies Weigh Module Address 16 and Input Channel 5.*

ALARM/LOAD WEIGHTS:

Hopper Loading On Weight	_____	(lbs/kgs)	[10]
Hopper Loading Off Weight	_____	(lbs/kgs)	[0]
Hopper Loading Time	_____	(seconds)	[0]
Hopper Low Alarm Weight	_____	(lbs/kgs)	[6]
Hopper Critical Weight (Critical Low)	_____	(lbs/kgs)	[5]
Min Dump Size Alarm Weight	_____	(lbs/kgs)	[5]

CONTROL LOOP PARAMETERS:

Number of Moving Points	_____	(1-10)	[5]
Time Between Updates	_____	(seconds)	[6]
Bits Between Updates	_____	(bits)	[350]
Limit Speed Changes?	_____	(yes/no)	[yes]
If "Limit Speed Changes" is YES:			
Max Speed Change	_____	(%)	[5]

Control Dead Band	_____	(%)	[0.25]
Max Error Before Forced Update	_____	(%)	[25]
Number of Max Errors Per Forced Update	_____	(1-10)	[3]
Percent Error to Coast	_____	(%)	[200]
Coast Tolerance	_____	(1-999)	[160]
Initial Coast Value	_____	(1-250)	[5]
Max Coast Time Before Alarm	_____	(seconds)	[30]
Drive Fail Tolerance	_____	(bits)	[1]
Max Drive Fails Before Alarm	_____	(10-999)	[75]
Out of Spec Alarm Percentage	_____	(%)	[1.0]

ACCEL/DECEL/SPEED PARAMETERS:

Recipe High Speed Warning	_____	(%)	[95]
Recipe Low Speed Warning	_____	(%)	[10]
High Speed Alarm	_____	(%)	[98]
Low Speed Alarm	_____	(%)	[5]
Maximum Output Voltage	_____	(Volts)	[6.5]
Rate/Speed Zero Crossing	_____	(%)	[6.0]
Motor Speed for Rate/Speed	_____	(%)	[50]

CALIBRATION FACTORS:

Zero Weight Factor	_____	(bits)
Test Weight Factor	_____	(bits)
Test Weight	_____	(lb/kg)

HOPPER F CONFIGURATION WORKSHEET

NOTE: *Each line contains the BG menu display, a line for the user to record the BG configuration value, the valid data ranges and the default data value. The letter 'H' (as in '[32+H]') indicates the hopper number which corresponds to the hopper letter ('0' for 'A', '1' for 'B', etc.).*

NETWORK ADDRESSES:

Drive Module Network Address	_____	(2-126)	[32]	
Drive Output Channel Number	_____	(1-8)	[1+H]	
Weigh Module Network Address	_____	(2-126)	[16]	
Weigh Input Channel Number	_____	(1-5)	[1+H]	Loading Module
Network Address	_____	(2-126)	[32]	
Load Relay Number	_____	(1-16)	[1+H]	
Loading Relay Type	_____	NO/NC	[NO]	
Hopper Type	_____	(nor/eg)	[Normal]	

NOTE: *If using a 5 channel weigh module, both the Weigh Module Network Address and the Weigh Input Channel Number must be modified when more than 5 channels are assigned. The fifth device must be placed at a Network Address not equal to the previous Network Address, and must have a Channel Number on that board (1-5). In most cases, the sixth device will have a Weigh Module Network Address of 17 and a Weigh Input Channel Number of 0. If a weighed downcomer is used, it usually occupies Weigh Module Address 16 and Input Channel 5.*

ALARM/LOAD WEIGHTS:

Hopper Loading On Weight	_____	(lbs/kgs)	[10]
Hopper Loading Off Weight	_____	(lbs/kgs)	[0]
Hopper Loading Time	_____	(seconds)	[0]
Hopper Low Alarm Weight	_____	(lbs/kgs)	[6]
Hopper Critical Weight (Critical Low)	_____	(lbs/kgs)	[5]
Min Dump Size Alarm Weight	_____	(lbs/kgs)	[5]

CONTROL LOOP PARAMETERS:

Number of Moving Points	_____	(1-10)	[5]
Time Between Updates	_____	(seconds)	[6]
Bits Between Updates	_____	(bits)	[350]
Limit Speed Changes?	_____	(yes/no)	[yes]
If "Limit Speed Changes" is YES:			
Max Speed Change	_____	(%)	[5]

Control Dead Band	_____	(%)	[0.25]
Max Error Before Forced Update	_____	(%)	[25]
Number of Max Errors Per Forced Update	_____	(1-10)	[3]
Percent Error to Coast	_____	(%)	[200]
Coast Tolerance	_____	(1-999)	[160]
Initial Coast Value	_____	(1-250)	[5]
Max Coast Time Before Alarm	_____	(seconds)	[30]
Drive Fail Tolerance	_____	(bits)	[1]
Max Drive Fails Before Alarm	_____	(10-999)	[75]
Out of Spec Alarm Percentage	_____	(%)	[1.0]

ACCEL/DECEL/SPEED PARAMETERS:

Recipe High Speed Warning	_____	(%)	[95]
Recipe Low Speed Warning	_____	(%)	[10]
High Speed Alarm	_____	(%)	[98]
Low Speed Alarm	_____	(%)	[5]
Maximum Output Voltage	_____	(Volts)	[6.5]
Rate/Speed Zero Crossing	_____	(%)	[6.0]
Motor Speed for Rate/Speed	_____	(%)	[50]

CALIBRATION FACTORS:

Zero Weight Factor	_____	(bits)
Test Weight Factor	_____	(bits)
Test Weight	_____	(lb/kg)

HOPPER G CONFIGURATION WORKSHEET

NOTE: *Each line contains the BG menu display, a line for the user to record the BG configuration value, the valid data ranges and the default data value. The letter 'H' (as in '[32+H]') indicates the hopper number which corresponds to the hopper letter ('0' for 'A', '1' for 'B', etc.).*

NETWORK ADDRESSES:

Drive Module Network Address	_____	(2-126)	[32]	
Drive Output Channel Number	_____	(1-8)	[1+H]	
Weigh Module Network Address	_____	(2-126)	[16]	
Weigh Input Channel Number	_____	(1-5)	[1+H]	Loading Module
Network Address	_____	(2-126)	[32]	
Load Relay Number	_____	(1-16)	[1+H]	
Loading Relay Type	_____	NO/NC	[NO]	
Hopper Type	_____	(nor/eg)	[Normal]	

NOTE: *If using a 5 channel weigh module, both the Weigh Module Network Address and the Weigh Input Channel Number must be modified when more than 5 channels are assigned. The fifth device must be placed at a Network Address not equal to the previous Network Address, and must have a Channel Number on that board (1-5). In most cases, the sixth device will have a Weigh Module Network Address of 17 and a Weigh Input Channel Number of 0. If a weighed downcomer is used, it usually occupies Weigh Module Address 16 and Input Channel 5.*

ALARM/LOAD WEIGHTS:

Hopper Loading On Weight	_____	(lbs/kgs)	[10]
Hopper Loading Off Weight	_____	(lbs/kgs)	[0]
Hopper Loading Time	_____	(seconds)	[0]
Hopper Low Alarm Weight	_____	(lbs/kgs)	[6]
Hopper Critical Weight (Critical Low)	_____	(lbs/kgs)	[5]
Min Dump Size Alarm Weight	_____	(lbs/kgs)	[5]

CONTROL LOOP PARAMETERS:

Number of Moving Points	_____	(1-10)	[5]
Time Between Updates	_____	(seconds)	[6]
Bits Between Updates	_____	(bits)	[350]
Limit Speed Changes?	_____	(yes/no)	[yes]
If "Limit Speed Changes" is YES:			
Max Speed Change	_____	(%)	[5]

Control Dead Band	_____	(%)	[0.25]
Max Error Before Forced Update	_____	(%)	[25]
Number of Max Errors Per Forced Update	_____	(1-10)	[3]
Percent Error to Coast	_____	(%)	[200]
Coast Tolerance	_____	(1-999)	[160]
Initial Coast Value	_____	(1-250)	[5]
Max Coast Time Before Alarm	_____	(seconds)	[30]
Drive Fail Tolerance	_____	(bits)	[1]
Max Drive Fails Before Alarm	_____	(10-999)	[75]
Out of Spec Alarm Percentage	_____	(%)	[1.0]

ACCEL/DECEL/SPEED PARAMETERS:

Recipe High Speed Warning	_____	(%)	[95]
Recipe Low Speed Warning	_____	(%)	[10]
High Speed Alarm	_____	(%)	[98]
Low Speed Alarm	_____	(%)	[5]
Maximum Output Voltage	_____	(Volts)	[6.5]
Rate/Speed Zero Crossing	_____	(%)	[6.0]
Motor Speed for Rate/Speed	_____	(%)	[50]

CALIBRATION FACTORS:

Zero Weight Factor	_____	(bits)
Test Weight Factor	_____	(bits)
Test Weight	_____	(lb/kg)

HOPPER H CONFIGURATION WORKSHEET

NOTE: *Each line contains the BG menu display, a line for the user to record the BG configuration value, the valid data ranges and the default data value. The letter 'H' (as in '[32+H]') indicates the hopper number which corresponds to the hopper letter ('0' for 'A', '1' for 'B', etc.).*

NETWORK ADDRESSES:

Drive Module Network Address	_____	(2-126)	[32]	
Drive Output Channel Number	_____	(1-8)	[1+H]	
Weigh Module Network Address	_____	(2-126)	[16]	
Weigh Input Channel Number	_____	(1-5)	[1+H]	Loading Module
Network Address	_____	(2-126)	[32]	
Load Relay Number	_____	(1-16)	[1+H]	
Loading Relay Type	_____	NO/NC	[NO]	
Hopper Type	_____	(nor/eg)	[Normal]	

NOTE: *If using a 5 channel weigh module, both the Weigh Module Network Address and the Weigh Input Channel Number must be modified when more than 5 channels are assigned. The fifth device must be placed at a Network Address not equal to the previous Network Address, and must have a Channel Number on that board (1-5). In most cases, the sixth device will have a Weigh Module Network Address of 17 and a Weigh Input Channel Number of 0. If a weighed downcomer is used, it usually occupies Weigh Module Address 16 and Input Channel 5.*

ALARM/LOAD WEIGHTS:

Hopper Loading On Weight	_____	(lbs/kgs)	[10]
Hopper Loading Off Weight	_____	(lbs/kgs)	[0]
Hopper Loading Time	_____	(seconds)	[0]
Hopper Low Alarm Weight	_____	(lbs/kgs)	[6]
Hopper Critical Weight (Critical Low)	_____	(lbs/kgs)	[5]
Min Dump Size Alarm Weight	_____	(lbs/kgs)	[5]

CONTROL LOOP PARAMETERS:

Number of Moving Points	_____	(1-10)	[5]
Time Between Updates	_____	(seconds)	[6]
Bits Between Updates	_____	(bits)	[350]
Limit Speed Changes?	_____	(yes/no)	[yes]
If "Limit Speed Changes" is YES:			
Max Speed Change	_____	(%)	[5]

Control Dead Band	_____	(%)	[0.25]
Max Error Before Forced Update	_____	(%)	[25]
Number of Max Errors Per Forced Update	_____	(1-10)	[3]
Percent Error to Coast	_____	(%)	[200]
Coast Tolerance	_____	(1-999)	[160]
Initial Coast Value	_____	(1-250)	[5]
Max Coast Time Before Alarm	_____	(seconds)	[30]
Drive Fail Tolerance	_____	(bits)	[1]
Max Drive Fails Before Alarm	_____	(10-999)	[75]
Out of Spec Alarm Percentage	_____	(%)	[1.0]

ACCEL/DECEL/SPEED PARAMETERS:

Recipe High Speed Warning	_____	(%)	[95]
Recipe Low Speed Warning	_____	(%)	[10]
High Speed Alarm	_____	(%)	[98]
Low Speed Alarm	_____	(%)	[5]
Maximum Output Voltage	_____	(Volts)	[6.5]
Rate/Speed Zero Crossing	_____	(%)	[6.0]
Motor Speed for Rate/Speed	_____	(%)	[50]

CALIBRATION FACTORS:

Zero Weight Factor	_____	(bits)
Test Weight Factor	_____	(bits)
Test Weight	_____	(lb/kg)

ALARM CONFIGURATION WORKSHEET

HOPPER ALARMS	A	B	C	D	E	F	G	H	DC	DEFAULT
Drive Over Maximum Speed										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	N
Action in MANual mode	__	__	__	__	__	__	__	__	__	G
Action in AUTO mode	__	__	__	__	__	__	__	__	__	G
Unstable Weigh System										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	N
Action in MANual mode	__	__	__	__	__	__	__	__	__	G
Action in AUTO mode	__	__	__	__	__	__	__	__	__	G
Out Of Specification Limit										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	N
Action in MANual mode	__	__	__	__	__	__	__	__	__	N
Action in AUTO mode	__	__	__	__	__	__	__	__	__	I
Drive Under Minimum Speed										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	N
Action in MANual mode	__	__	__	__	__	__	__	__	__	N
Action in AUTO mode	__	__	__	__	__	__	__	__	__	G
Drive System Failure										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	N
Action in MANual mode	__	__	__	__	__	__	__	__	__	G
Action in AUTO mode	__	__	__	__	__	__	__	__	__	G
Hopper Hardware Failure										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	G
Action in MANual mode	__	__	__	__	__	__	__	__	__	S
Action in AUTO mode	__	__	__	__	__	__	__	__	__	S
Hopper Software Failure										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	I
Action in MANual mode	__	__	__	__	__	__	__	__	__	I
Action in AUTO mode	__	__	__	__	__	__	__	__	__	I
Hopper Software Needs Updating										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	I
Action in MANual mode	__	__	__	__	__	__	__	__	__	I
Action in AUTO mode	__	__	__	__	__	__	__	__	__	I
Hopper Network Failure										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	G
Action in MANual mode	__	__	__	__	__	__	__	__	__	S
Action in AUTO mode	__	__	__	__	__	__	__	__	__	S
Hopper In Manual Backup										

Action in PAUSE mode	__	__	__	__	__	__	__	__		I
Action in MANual mode	__	__	__	__	__	__	__	__		I
Action in AUTO mode	__	__	__	__	__	__	__	__		I

HOPPER ALARMS	A	B	C	D	E	F	G	H	DC	DEFAULT
Hopper Over Maximum Weight										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	I
Action in MANual mode	__	__	__	__	__	__	__	__	__	G
Action in AUTO mode	__	__	__	__	__	__	__	__	__	G
Hopper Over Max Volume										
Action in PAUSE mode	__	__	__	__	__	__	__	__		I
Action in MANual mode	__	__	__	__	__	__	__	__		G
Action in AUTO mode	__	__	__	__	__	__	__	__		G
Hopper Low Dump Size										
Action in PAUSE mode	__	__	__	__	__	__	__	__		N
Action in MANual mode	__	__	__	__	__	__	__	__		I
Action in AUTO mode	__	__	__	__	__	__	__	__		I
Hopper Below Low Weight										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	I
Action in MANual mode	__	__	__	__	__	__	__	__	__	G
Action in AUTO mode	__	__	__	__	__	__	__	__	__	G
Hopper Critical Low										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	I
Action in MANual mode	__	__	__	__	__	__	__	__	__	I
Action in AUTO mode	__	__	__	__	__	__	__	__	__	G
Hopper Loss of Sync										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	N
Action in MANual mode	__	__	__	__	__	__	__	__	__	G
Action in AUTO mode	__	__	__	__	__	__	__	__	__	G
Hopper Under Minimum Weight										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	I
Action in MANual mode	__	__	__	__	__	__	__	__	__	G
Action in AUTO mode	__	__	__	__	__	__	__	__	__	G
Auxiliary Alarm										
Action in PAUSE mode									__	I
Action in MANual mode									__	I
Action in AUTO mode									__	I
Unable to Meet Rate										
Action in PAUSE mode									__	N
Action in MANual mode									__	G

Action in AUTO mode									__	G
Drive Hardware Failure										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	G
Action in MANual mode	__	__	__	__	__	__	__	__	__	S
Action in AUTO mode	__	__	__	__	__	__	__	__	__	S
HOPPER ALARMS	A	B	C	D	E	F	G	H	DC	DEFAULT
Drive Software Failure										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	I
Action in MANual mode	__	__	__	__	__	__	__	__	__	I
Action in AUTO mode	__	__	__	__	__	__	__	__	__	I
Drive Software Needs Updating										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	I
Action in MANual mode	__	__	__	__	__	__	__	__	__	I
Action in AUTO mode	__	__	__	__	__	__	__	__	__	I
Drive Network Failure										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	G
Action in MANual mode	__	__	__	__	__	__	__	__	__	S
Action in AUTO mode	__	__	__	__	__	__	__	__	__	S
Drive In Manual Backup										
Action in PAUSE mode									__	I
Action in MANual mode									__	G
Action in AUTO mode									__	G
Drive Inhibited										
Action in PAUSE mode									__	I
Action in MANual mode									__	S
Action in AUTO mode									__	S
Drive Analog Input Overload										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	I
Action in MANual mode	__	__	__	__	__	__	__	__	__	I
Action in AUTO mode	__	__	__	__	__	__	__	__	__	I
Drive Pulse Feedback Failure										
Action in PAUSE mode	__	__	__	__	__	__	__	__	__	N
Action in MANual mode	__	__	__	__	__	__	__	__	__	G
Action in AUTO mode	__	__	__	__	__	__	__	__	__	G
SYSTEM ALARMS:										
Check Printer										
Action in PAUSE mode	__		I							
Action in MANual mode	__		I							

Action in AUTO mode	__	I
User Int Software Needs Updating		
Action in PAUSE mode	__	I
Action in MANual mode	__	I
Action in AUTO mode	__	I
Job Weight Reached, Blender Paused	__	
Unable to Run	__	

APPENDIX D QUICK REFERENCE FOR THE BLENDER

MONITOR BASICS

The **<MONITOR>** key accesses the display screens which are used to monitor blender operation. The screens displayed will change depending on the blender's configuration. For instance, the screen which displays line speed and rate will not appear if the computer is not controlling the line speed. Pressing the **<MONITOR>** key displays the last screen used when monitor mode was active.

The 'home' monitor screen - the screen displayed when **<MONITOR>** is first pressed after initial blender power-on - will have varying information depending on blender configuration. This screen can also be reached from any other MONITOR screen by pressing the **<MONITOR>** key twice. Pressing the **<MONITOR>** key twice again will return the display to the previous screen. A blender with a weighed downcomer will display the weight of material inside the downcomer as in the following:

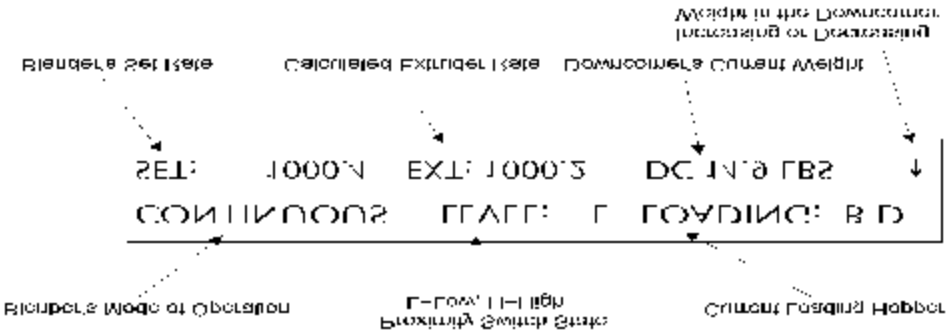

Figure 10 Home Monitor Screen for Continuous Mode with Weighed Downcomer

On the following page is an example of various screens for the monitor function. Each screen can be accessed by pressing the **<UP>** or **<DOWN>** key. For the following example the screens appear in order by pressing the **<UP>** key.

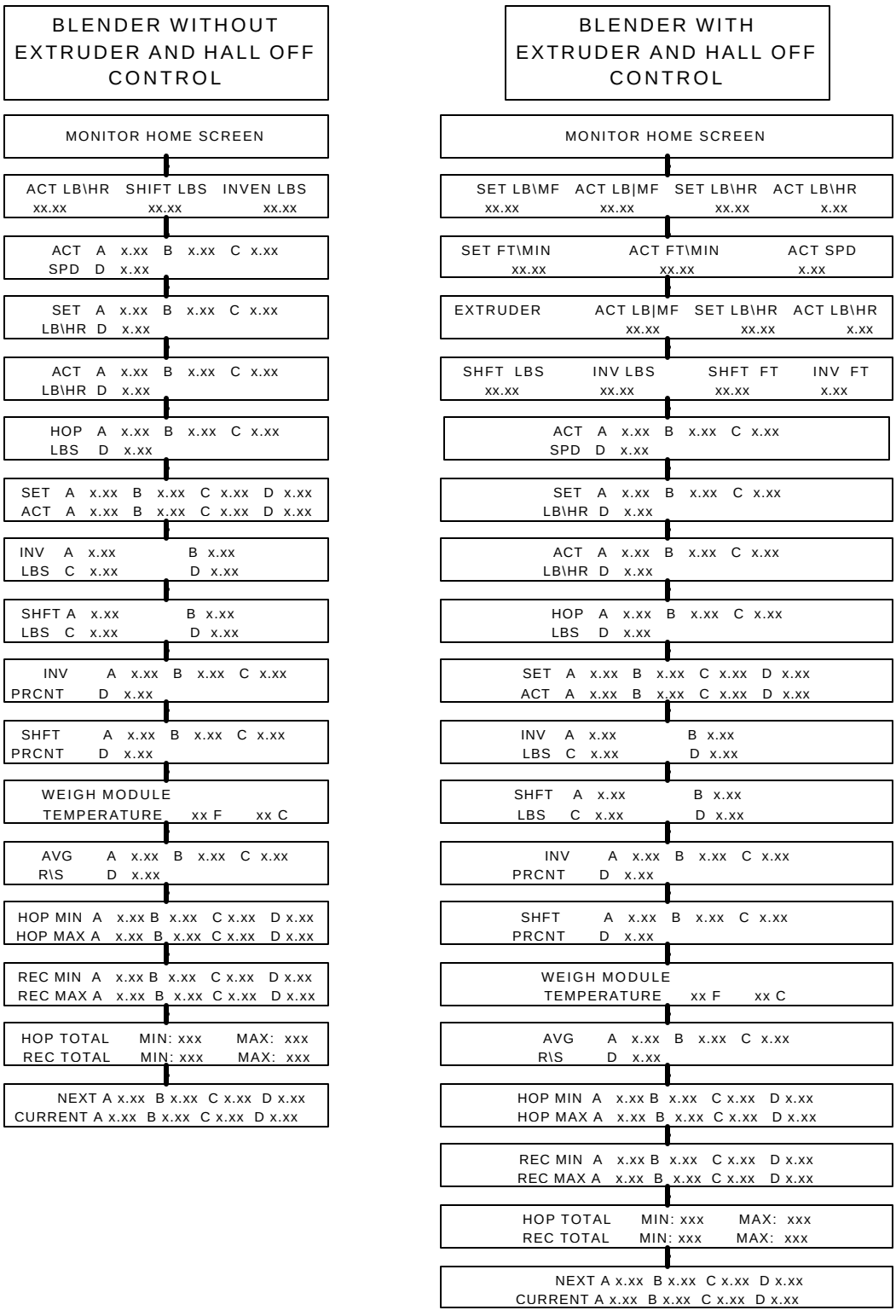

Figure 11 Sample Monitor Screen Sequence

RECIPE BASICS

The **<RECIPE>** key is used to enter the recipe that will be used when the **<RUN>** key is pressed. A recipe may be stored in battery backed memory for future recall. If the blender is set to require the key to change stored recipes, and the key switch is in the DISABLE position, the production recipe is immediately displayed. Otherwise, when the **<RECIPE>** key is pressed the recipe menu is entered.

Choose the **CHANGE PRODUCTION RECIPE** menu option. This menu choice allows the modification of the currently running recipe. If the system is in AUTOMATIC (via the **<RUN>** key), the currently running recipe is copied to a temporary recipe that is then edited. If the system is not in AUTOMATIC, the temporary recipe is edited without being overwritten. This allows the viewing of the currently running recipe without fear of accidentally changing the current recipe. A recipe change only takes effect in AUTOMATIC when the **<RUN>** key is pressed.

If stored recipes exist, the operator is first prompted by "RECALL STORED RECIPE?". If answered YES, a stored recipe may be recalled, overwriting the temporary recipe and allowing editing. If answered no, the current temporary recipe is edited.

The parameters the operator may be required to enter (depending on the blender operating mode) are:

LINE OUTPUT - The total output of the line in weight throughput.

HOPPER x PARTS BY WT - If the 'per hopper' components are entered as PARTS BY WT.

HOPPER x = nn.nn % - If the 'per hopper' components are entered as percents.

FILM THICKNESS - For lines which control the product thickness.

LAYFLAT WIDTH - Usually for blown film lines which are also controlling thickness.

MATERIAL x SOLID DENSITY - Required for each ingredient for thickness control.

WEIGHT / LENGTH - Specifies total line output in weight per running length.

INSIDE DIAMETER - Inside diameter, used for pipe/tubing and wire/cable.

OUTSIDE DIAMETER - Outside diameter, used for pipe/tubing and wire/cable.

WALL THICKNESS - Product wall thickness, used for pipe/tubing and wire/cable.

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