

LIME SLAKING SYSTEM

1000, 2000 & 4000 LB/HR
WITH MODEL 31-165(DC)
GRAVIMETRIC BELT FEEDER AND
CONVEYOR-TYPE GRIT REMOVER

BOOK NO. IM 330.101BA UA ISSUE A

LIME SLAKING SYSTEM

EQUIPMENT SERIAL NO. _____

DATE OF START-UP _____

START-UP BY _____

Prompt service available from nationwide authorized service contractors.

ORDERING INFORMATION

In order for us to fill your order immediately and correctly, please order material by description and part number, as shown in this book. Also, please specify the serial number of the equipment on which the parts will be installed.

WARRANTY

Seller warrants for a period of one year after shipment that the equipment or material of its manufacture is free from defects in workmanship and materials. Corrosion or other decomposition by chemical action is specifically excluded as a defect covered hereunder, except this exclusion shall not apply to chlorination equipment. Seller does not warrant (a) damage caused by use of the items for purposes other than those for which they were designed, (b) damage caused by unauthorized attachments or modifications, (c) products subject to any abuse, misuse, negligence or accident, (d) products where parts not made, supplied, or approved by Seller are used and in the sole judgement of the Seller such use affects the products' performance, stability or reliability, and (e) products that have been altered or repaired in a manner in which, in the sole judgement of Seller, affects the products' performance, stability or reliability. **SELLER MAKES NO OTHER WARRANTY OF ANY KIND, AND THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS OF THE MATERIAL OR EQUIPMENT FOR ANY PARTICULAR PURPOSE EVEN IF THAT PURPOSE IS KNOWN TO SELLER.** If Buyer discovers a defect in material or workmanship, it must promptly notify Seller in writing; Seller reserves the right to require the return of such defective parts to Seller, transportation charges prepaid, to verify such defect before this warranty is applicable. In no event shall such notification be received by Seller later than 13 months after the date of shipment. No action for breach of warranty shall be brought more than 15 months after the date of shipment of the equipment or material.

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Statements and instructions set forth herein are based upon the best information and practices known to USFilter's Wallace & Tiernan Products, but it should not be assumed that every acceptable safety procedure is contained herein. Of necessity this company cannot guarantee that actions in accordance with such statements and instructions will result in the complete elimination of hazards and it assumes no liability for accidents that may occur.

USFilter
WALLACE & TIERNAN PRODUCTS
1901 West Garden Road, Vineland, NJ 08360

LIME SLAKING SYSTEM

INTRODUCTION

The USFilter's Wallace & Tiernan Products (USF/W&T) Lime Slaking System described in this instruction book has been designed to be completely automatic, from the quicklime input to the lime slurry and grit discharge.

The system includes a USF/W&T Model 31-165(DC) Gravimetric Belt Feeder with an electric variable speed drive and load cell for the controlled feeding of quicklime.

A control panel with optional control features is available for local or remote control and requires a minimum of wiring.

This instruction book consists of Technical Data, Installation, Operation, Service, and Parts information on the Lime Slaking System and its control equipment. Although it is as specific as possible, there may be some details that do not apply to the equipment supplied.



WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO THE EQUIPMENT, THIS EQUIPMENT SHOULD BE INSTALLED, OPERATED, AND SERVICED ONLY BY TRAINED, QUALIFIED PERSONNEL WHO ARE THOROUGHLY FAMILIAR WITH THE ENTIRE CONTENTS OF THIS INSTRUCTION BOOK.

NOTE: When ordering material, always specify model and serial number of apparatus.

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LIME SLAKING SYSTEM

VERY IMPORTANT SAFETY PRECAUTIONS

This page provides very important safety information related to safety in installation, operation, and maintenance of this equipment.

WARNING

TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO EQUIPMENT THROUGH MISUSE, OBSERVE THE FOLLOWING PRECAUTIONS:

THE WEIGHT DISTRIBUTION OF THE FEEDER IS NOT SYMMETRICAL WITH LIFTING POINTS. TO AVOID POSSIBLE INJURY FROM FEEDER SWINGING, SOME OF THE LIFTING CHAINS MAY REQUIRE SHORTENING TO OBTAIN LEVEL LIFTING. HEAVY END OF FEEDER IS AT MOTOR AND GEAR BOX END.

BEFORE STARTING SLAKER SYSTEM, ENSURE THAT ALL BELT GUARDS AND THE SCREENS OVER THE SLAKING COMPARTMENT ARE INSTALLED. WHEN SLAKING, OPEN COVERS CAREFULLY BECAUSE HOT LIME MAY BE THROWN OUT. USE APPROPRIATE FACE SHIELD AND PROTECTIVE CLOTHING WHEN CLEANING OR CLEARING AREAS CONTAINING AN ACCUMULATION OF LIME. THESE AREAS MAY CONTAIN UNSLAKED LIME WITH TRAPPED STEAM UNDER PRESSURE THAT MAY BLOW BACK.

KEEP HANDS AND LOOSE CLOTHING CLEAR OF MOVING PARTS. REPLACE COVERS AFTER INSPECTING AND SERVICING.

TO AVOID INJURY, DO NOT REMOVE TUBE SHIELDS WHEN VAREA-METER IS IN USE.

THE POWER TO THE SLAKER MUST BE IN THE OFF POSITION DURING INSPECTION AND CLEANING.

THE GRIT CONVEYOR SWITCH MUST BE IN THE OFF POSITION AND POWER MUST BE REMOVED FROM THE SLAKER DURING THE ADJUSTMENT OF THE FLIGHT CHAIN.

TO AVOID THE POSSIBILITY OF SHOCK AND PERSONAL INJURY, TURN OFF POWER WHEN CONNECTING VOLTMETER FOR SERVICING.

TO ENSURE PROPER AND SAFE OPERATION OF THIS EQUIPMENT, USE ONLY USF/W&T LISTED PARTS, OR COMMERCIALY AVAILABLE PARTS, AS IDENTIFIED BY COMPLETE DESCRIPTION ON AN ACCOMPANYING PARTS LIST. THE USE OF UNLISTED PARTS CAN RESULT IN EQUIPMENT MALFUNCTIONS CAUSING POSSIBLE SEVERE PERSONAL INJURY.

DO NOT DISCARD THIS INSTRUCTION BOOK UPON COMPLETION OF INSTALLATION. INFORMATION PROVIDED IS ESSENTIAL TO PROPER AND SAFE OPERATION AND MAINTENANCE.

LIME SLAKING SYSTEM

VERY IMPORTANT SAFETY PRECAUTIONS (CONT'D)

ADDITIONAL OR REPLACEMENT COPIES OF THIS INSTRUCTION BOOK ARE AVAILABLE FROM:

USFILTER'S WALLACE & TIERNAN PRODUCTS
1901 WEST GARDEN ROAD
VINELAND, NEW JERSEY 08360-1530
PHONE: (856) 507-9000
FAX: (856) 507-4125

NOTE

Minor part number changes may be incorporated into USF/W&T products from time to time that are not immediately reflected in the instruction book. If such a change apparently has been made in your equipment and does not appear to be reflected in your instruction book, contact your local USF/W&T sales representative for information.

Please include the equipment serial number in all correspondence. It is essential for effective communication and proper equipment identification.

LIME SLAKING SYSTEM

REGIONAL OFFICES

INSTALLATION, OPERATION, MAINTENANCE, AND SERVICE INFORMATION

Direct any questions concerning this equipment that are not answered in the instruction book to the Reseller from whom the equipment was purchased. If the equipment was purchased directly from USFilter's Wallace & Tiernan Products (USF/W&T), contact the office indicated below.

UNITED STATES

1901 West Garden Road
Vineland, NJ 08360
TEL: (856) 507-9000
FAX: (856) 507-4125

CANADA

If the equipment was purchased directly from USF/W&T Canada, contact the nearest office indicated below.

ONTARIO

250 Royal Crest Court
Markham, Ontario
L3R3S1
(905) 944-2800

QUEBEC

243 Blvd. Brien
Bureau 210
Repentigny, Quebec
(450) 582-4266

MEXICO

If the equipment was purchased directly from USF/W&T de Mexico, contact the office indicated below.

Via Jose López Portillo No. 321
Col. Sta. Ma. Cuauhtepac, Tultitlan
Edo. México 54900
TEL: +52 55 2159 2976 / +52 55 2159 2989
FAX: +52 55 2159 2985

LIME SLAKING SYSTEM

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LIME SLAKING SYSTEM

1.1 Technical Data For 1000 Lb/Hr Slaker

Capacity	1000 lb of quicklime per hour.
Operating Range	20:1
Slaking Ratio	Approx. 2 to 1 water to lime by weight before dilution.
Feeder	Model 31-165 Gravimetric Weighbelt Feeder with 9-inch (228-mm) belt, off-feed alarm, load cell, and variable speed drive with 1/2 hp dc motor.
Slaker Mixing Motor	1/2-hp; Standard is 230/460-volt, 60-Hz, 3-phase or single-phase totally enclosed.
Grit Remover Motor	1/4-hp, 230/460-volt, 60-Hz, 3-phase or single-phase totally enclosed.
Electrical Requirements	750 volt-amperes for SCR variable speed arrangements.
Water Requirements	See Dwg. 330.100.170.011.
Control Type	Manual speed control of feeder by potentiometer on control panel. Flow proportional control by pulse duration signal. Automatic control of feeder rate by milli-ampere or potentiometer signal from remote location. Automatic control of feeder rate by setpoint.
Shipping Weight	2400 lb.
Operating Weight	3110 lb.
Paddle Shaft Speed	30 rpm
Slaking Compartment Capacity	20 gal.

LIME SLAKING SYSTEM

1.2 Technical Data For 2000 Lb/Hr Slaker

Capacity	2000 lb of quicklime per hour.
Operating Range	20:1
Slaking Ratio	Approx. 2 to 1 water to lime by weight before dilution.
Feeder	Model 31-165 Gravimetric Weighbelt Feeder with 9-inch belt, off-feed alarm, load cell, and variable speed drive with 1/2 hp dc motor.
Slaker Mixing Motor	1-hp; Standard is 230/460-volt, 60-Hz, 3-phase or single-phase totally enclosed.
Grit Remover Motor	1/4-hp, 230/460-volt, 60-Hz, 3-phase or single-phase totally enclosed.
Electrical Requirements	750 volt-amperes for SCR variable speed arrangements.
Water Requirements	See Dwg. 330.100.170.011.
Control Type	Manual speed control of feeder by potentiometer on control panel. Flow proportional control by pulse duration signal. Automatic control of feeder rate by milliamperere or potentiometer signal. Automatic batching and shutdown.
Shipping Weight	2930 lb.
Operating Weight	4180 lb.
Paddle Shaft Speed	38 rpm
Slaking Compartment Capacity	41.5 gal.

LIME SLAKING SYSTEM

1.3 Technical Data For 4000 Lb/Hr Slaker

Capacity	4000 lb of quicklime per hour.
Operating Range	20:1
Slaking Ratio	Approx. 2 to 1 water to lime by weight before dilution.
Feeder	Model 31-165 Gravimetric Weighbelt Feeder with 9-inch belt, off-feed alarm, load cell, and variable speed drive with 1/2 hp dc motor.
Slaker Mixing Motor	1-1/2 hp; Standard is 230/460-volt, 60-Hz, 3-phase or single-phase totally enclosed.
Grit Remover Motor	1/4-hp, 230/460-volt, 60-Hz, 3-phase or single-phase totally enclosed.
Electrical Requirements	750 volt-amperes for SCR variable speed arrangements.
Water Requirements	See Dwg. 330.100.170.011.
Control Type	Manual speed control of feeder by potentiometer on control panel. Flow proportional control by pulse duration signal. Automatic control of feeder rate by milliamperere or potentiometer signal. Automatic batching and shutdown.
Shipping Weight	3620 lb.
Operating Weight	5860 lb.
Paddle Shaft Speed	24 rpm
Slaking Compartment Capacity	81 gal.

1.4 Technical Data for Belt Feeder

General Mechanical Specifications

Belt Speed Operating Range	20:1
Belt Load Operating Range	3:1
Feedrate Operating Range	30:1
Gate Height Adjustment	Adjustable shear gate provides opening range of 0.5 to 4 inches (12 to 101 mm) without tools.
Belt Width	Nominal 9 inches (225 mm), with 4-inch (101 mm) inlet feed section.
Belt Tensioning	Constant belt tension is automatically maintained by a weighted counterbalance at the driven (discharge) roller.
Belt Tracking	Proper belt tracking is automatically maintained by a pivoted roller and plow-shaped scraper with belt guides.
Ambient Operating Temperature	32 to 122°F (0 to +50°C).
Ingredient Temperature	32 to 195°F (0 to +90°C) std.
Feeder Housing	Papyrus-white epoxy-painted mild steel; two end and two side covers are gasketed and removable by quick release locks; top cover gasketed and drop-in removable; bottom cover gasketed and removable.
Linearity	Maximum $\pm 0.5\%$ of setpoint based upon 10 consecutive samples taken over a range of 10:1 of full scale; linearity is defined as the maximum deviation of the sample data from a straight line drawn through this data so as to minimize the deviation.
Repeatability	Maximum $\pm 1\%$ of sample mean at 2 sigma based upon 30 consecutive samples; i.e., 95.4% of the samples will be within 1% of the mean sample feed rate.
Sample Size	1 min, 1 lb, or 1 belt revolution, whichever is largest.

1.4 Technical Data for Belt Feeder (Cont'd)

General Electrical Specifications

Belt Drive Motor	1/2-hp, 90-Vdc, permanent magnet, TENV, controlled by SCR drive w/ tachometer feedback.
Tachometer	Analog, 20.8 Vdc/1000 rpm, TENV.
Feeder Junction Box and Control Enclosures	Rated NEMA 4; junction box is papyrus-white epoxy-painted mild steel; control enclosures are signal-gray epoxy-painted mild steel.
Electrical Requirements	115 Vac, 15 amps, 1 phase, 60 Hz.

Miscellaneous Standard Features

Setpoint Controller Display	24-character, 2-line, backlit LCD.
Displayed Parameters	Setpoint, feedrate, belt speed, belt load, control difference, and totalization.
Displayed Alarms	Feedrate min/max, belt load min/max, speed min/max, setpoint, and fault states.
Alarm Indication	Alarms are indicated on setpoint controller display, with feeder alarm light on door of slaker control enclosure.
Alarm Reset	A momentary pushbutton mounted on the door of the slaker control enclosure resets all alarms. Alarms can also be reset from setpoint controller keypad.
Speed Indication	A panel meter mounted on the door of the slaker control enclosure displays percent of full scale belt speed.
Feeder Running Indicator	A light mounted on door of slaker control enclosure turns on when feeder is running.
Selection of Operation	A mechanical HAND-OFF-AUTO (H-O-A) switch mounted on the door of the slaker control enclosure provides a choice of manual or automatic feeder operation; it also disables the feeder operation when in the OFF position.

1.4 Technical Data for Belt Feeder (Cont'd)

Miscellaneous Standard Features (Cont'd)

Manual Feedrate Control	A 5-kohm analog potentiometer mounted on the door of the slaker control enclosure manually controls belt speed when H-O-A switch is in HAND position.
Motor Speed Sensor	Proximity sensor measures belt motor speed and provides setpoint controller with 24 Vdc pulse rate proportional to speed.
Belt Breakage Detector	Proximity sensor detects a broken, slipping, or jammed belt and displays an alarm.
Remote Setpoint Input	An isolated 4-20 mA input is included as standard to provide a remote setpoint.
Feedrate Output	An isolated 4-20 mA output signal proportional to feedrate is included as standard; maximum allowable loop resistance is 500 ohms.
Operating Weights	
Feeder	200 pounds (91 kg)
Speed Controller Enclosure	30 pounds (14 kg)
Setpoint Controller Enclosure	30 pounds (14 kg)
Setpoint Controller	7.5 pounds (3.5 kg)

LIME SLAKING SYSTEM

SLAKER SIZE MAX. CAP. LBS/HR	RECOMMENDED SUPPLY PRESSURE (PSI)		SLAKER CUT-OFF JETS FLOWRATE (GPM)		SLAKER VAPOR ARRESTOR FLOWRATE (GPM)		TORQUE VALVE SLAKING WATER AT MAX. LIME FEED (GPM)	GRIT REMOVER BACKWASH FLOWRATE TYPICAL (GPM)	TOTAL WATER FLOWRATE REQUIREMENTS	
	MIN.	MAX.	AT MINIMUM SUPPLY PRESSURE	AT MAXIMUM SUPPLY PRESSURE	AT MINIMUM SUPPLY PRESSURE	AT MAXIMUM SUPPLY PRESSURE			AT MINIMUM SUPPLY PRESSURE	AT MAXIMUM SUPPLY PRESSURE
1000	40	75	6.0	8.1	1.4	1.9	5	3	15.4	18.0
2000	40	75	9.0	12.3	1.4	1.9	10	4	24.4	28.2
4000	40	75	18.0	24.6	1.4	1.9	20	8	47.4	54.5
8000	55	75	52.2	58.8	3.0	4.0	40	12	107.2	114.8

NOTE:

CUT-OFF JETS ARE VARIABLE WITH SUPPLY PRESSURE. IF SEPARATE SUPPLY IS USED FOR CUT-OFF JETS, MINIMUM PRESSURE FOR SATISFACTORY OPERATION IS 30 PSI. FLOW AT 30 PSI IS AS FOLLOWS: 5.1 GPM FOR 1000#/HR SLAKER, 7.8 GPM FOR 2000#/HR SLAKER, 15.6 GPM FOR 4000#/HR SLAKER, AND 39 GPM FOR 8000#/HR SLAKER.

VAPOR ARRESTOR IS VARIABLE WITH SUPPLY PRESSURE.

TORQUE VALVE WATER INCLUDES NOMINAL 2:1 WATER TO LIME RATIO IN SLAKING COMPARTMENT, MAKE UP FOR STEAM LOSS, AND OPERATOR PREFERENCE FOR PASTE CONSISTENCY (WITHIN OPERABLE LIMITS).

GRIT REMOVER BACKWASH IS VARIABLE, DEPENDING ON SIZE OF GRIT TO BE REMOVED, LOWER FLOW REMOVES FINER GRIT.

TOTAL WATER FLOWRATE GPM FIGURES ARE FOR MAXIMUM SLAKER FEED RATE. SLAKING WATER QUANTITY DECREASES PROPORTIONALLY AS FEED RATE IS DECREASED BUT OTHER QUANTITIES REMAIN FIXED REGARDLESS OF FEED RATE. AS A RESULT, MAXIMUM SLURRY CONCENTRATION OCCURS AT MAXIMUM FEED RATE, MINIMUM OPERATING PRESSURE, AND WITH THE DISCHARGE OF THE VAPOR ARRESTOR PIPED DIRECTLY TO WASTE. SLURRY CONCENTRATION IS REDUCED WHEN FEED RATE IS DECREASED.

LIME SLAKER - OPERATION Water Requirements/Gallons Per Minute

330.100.170.011

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LIME SLAKING SYSTEM

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2.1 General

The factory wiring and piping of the system is done in accordance with the planned position of the system components.

Check for tags while installing the equipment to ensure proper positioning and alignment of components is obtained. Observe tag instructions on gear boxes, motors, etc., for proper lubrication, installation, and operating instructions.

The grit remover and feeder are disassembled for shipment and must be re-installed. Limitations, if any, or the surrounding space will determine which should be installed first.

2.2 Unpacking Feeder

NOTE: Do not discard any shipping materials until the packing list has been checked and all items accounted for.

2.3 Location

Select a location for the slaker installation with sufficient space to permit access for inspection and service and with suitable drainage facilities. A source of power and water and provisions for venting are required as detailed below.

2.4 Mounting of Slaker

Mount the slaker on concrete supports as illustrated in the dimension drawing. Dwg. 330.101.100.020 shows the possible positions of the feeder, grit remover, and control or junction box if the control panel is to be remotely located.

2.5 Installation of Feeder

The feeder is to be positioned in the preselected position with the discharge end of the feeder over the inlet end of the slaker. The inlet end of the feeder is to rest on a support column and the discharge end of the feeder is supported by a connecting box mounted on the slaker.

Install the feeder inlet flexible connection, rotary valve adapter, rotary shut-off valve, and storage hoppers over the feeder inlet. For proper clearance, install the rotary shut-off valve with its handle toward the side from which the feeder weighbelt is removed.

2.6 Provisions for Lifting the Feeder (See Dwg. 310.165.000.060, In Section 5)

If the cap screws (30) at the four corners of the feeder are removed and eyebolts are inserted in their place, the feeder may be lifted by a crane or hoist.



WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE FROM FEEDER SWINGING, NOTE THAT WEIGHT DISTRIBUTION OF THE FEEDER IS NOT SYMMETRICAL WITH LIFTING POINTS. SOME OF THE LIFTING CHAINS OR CABLES MAY REQUIRE SHORTENING TO OBTAIN LEVEL LIFTING. HEAVY END OF FEEDER IS AT MOTOR AND GEAR BOX END.

2.7 Installation of Grit Conveyor

The grit conveyor is to be positioned in the preselected position in accordance with the planned position of the system. See Dwg. 330.100.010.040 (in Section 5) for appropriate mounting hardware.

2.8 Varea-Meter

The Varea-Meter® is removed for shipment and the pre-assembled water line is broken down into several sections for convenience in packaging. This breakdown is accomplished by strategically located union connections that must be made up at installation.

2.9 Water Lines

Connect a water supply line with a minimum pressure of 55 psi to the two-inch strainer, as indicated on the dimension drawing in this section.

2.10 Overflow and Drain (See Dwg. 330.100.120.011)

Run a line from the overflow connection to a suitable drain. Make provisions for draining the system through the grit remover drain plug.

In cases where minimum variations in slurry concentration are desirable, especially batch processes, disconnect the water discharge from the vapor and dust arrestor from the slurry discharge section and run directly to a drain.

2.11 Vapor Vent

Run a duct from the vapor and dust arrestor discharge inside the room (only warm, humid air is discharged). The duct may be run outside, if provisions are made to protect the exit from direct exposure to drafts. Drafts may decrease the efficiency of the vapor and dust arrestor. Ducts should be kept as short as possible for best performance; size should be three inches in diameter.

2.12 Removable Feeder Bottom Plate (See Dwg. 310.165.100.040)

The bottom plate can be removed, if desired, by removing bolts.

2.13 Wiring

NOTE: Field wiring must conform to local electrical codes.

Run field wiring in accordance with the applicable wiring drawing in this section. When the control panel has been ordered for installation at a remote location, field wiring includes wiring between the control panel and the junction box furnished on the slaker.

Because the feeder and grit remover are removed for shipment, factory wiring must be reconnected as part of the installation procedure. The grit conveyor motor leads are disconnected at the motor and the grit conveyor alarm switch leads are connected at the switch. These wires must be reconnected as labeled.

2.14 Belt Feeder Installation

2.14.1 Initial Inspection

NOTE: This equipment should be inspected for shipping damage and/or missing parts immediately upon receipt.

NOTE: Do not discard this instruction book when the installation is complete. The operator will need it.



WARNING: ENSURE THAT THE DEVICE IS LIFTED BY THE LIFTING EYEBOLTS PROVIDED.

LIME SLAKING SYSTEM

The Belt Feeder is shipped with the following components:

- Housing with doors and lid.
- Transport Mechanism (installed).
- External Scrapers (loose).
- Calibration Weight (loose).
- Setpoint Controller and SCR Speed Controller (loose).
- Instruction Book.

2.14.2 Mechanical Check-Out

- a. Carefully unpack the feeder and accessories from their shipping containers. Whenever possible, unpack the equipment at the installation site. Check all items against the packing list to be sure that no parts are discarded with the packing material. Items such as spare parts not required at the time of installation should be set aside where they will be available when needed.
- b. Refer to the feeder housing components location diagram (Dwg. 310.165.000.010).
- c. Identify all the major components of the feeder.
- d. Check the equipment for signs of shipping damage. If you find any of the following, please call the USF/W&T Product Service Department for further instructions.
 - Punctures, scuffs, or abrasions on crate.
 - Bends, dents, or scratches in sheet metal (hoppers, etc.) or mechanical components (motors, gear reducers, etc.).
 - Motor, gear reducer, or agitator loose.
 - Leaking grease or oil.
 - Tachometer not in line with motor.
 - Dents in the control cabinet or broken door covers.

2.14.3 Electrical Check-Out

Check main power supplies to ensure that they match feeder requirements. Specifically, 115 Vac, 15 Amps, single phase, and 60 Hz.

2.15 Belt Feeder Mechanical Components

The various components are identified by a number in parenthesis that is referenced on Dwg. 310.165.000.010.

2.15.1 Feeder Housing

The standard feeder housing (7) is made of papyrus-white epoxy-painted mild steel and provides a dust-tight enclosure for the feed rate mechanism. Removable, hinged covers on both sides of the feeder open using quick-turn fasteners and allow access to the feed mechanism.



WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY FROM A FALLING COVER, REMOVE COVERS COMPLETELY BEFORE SERVICING. THE TWO SIDE COVERS AND ONE END COVER ARE HEAVY AND SWING DOWN ON A HINGE FOR CONVENIENCE ONLY. THEY DISENGAGE FROM THEIR PIVOT QUITE EASILY AND ARE NOT INTENDED TO REMAIN ON THE FEEDER WHILE HINGED OPEN.

A lift-off top cover allows access to the product being moved on the belt. Stainless steel and sanitary construction are available options.

The belt drive motor and the electrical junction box are mounted at the inlet end of the feeder. Optional inlet hoppers, slide gate valves, and dust collection pans may be bolted to the appropriate sections of the housing. Refer to Section 5 for illustrations.

2.15.2 Belt Support Frame

The belt support frame is a robust, torsion-free steel structure. It is the base upon which the drive roller, driven roller, weighing unit, belt tracking system, and several scrapers are mounted. It allows the entire system to be mounted within the housing as a complete unit.

The standard material of construction is stainless steel.

2.15.3 Belt Drive

A DC gear motor is used to drive the belt and consists of a DC motor (5) with appropriate speed reducer (6). Its speed is monitored by a tachometer (4) fitted on the motor. Specifying a different reducer ratio allows operation at a different belt speed.

A chain and sprocket system (13) connects the motor to the drive roller. Changing the size of the sprockets allows operation over a different range of feed rates. The drive roller is rubber-coated to prevent belt slippage and a scraper mounted on the inside of the belt support frame prevents the roller from becoming dirty.

2.15.4 Belt Tensioning System

A counterbalance weight (9) mounted at the discharge end of the feeder uses levers to move the driven roller forward. This takes up the slack in the belt and applies the correct tension. The mechanism also automatically compensates for limited stretching of the belt.

2.15.5 Belt Tracking System

The automatic belt tracking system (8) is located under the belt support frame. It consists of a roller within a frame. One side of the frame acts as a plow-shaped scraper, while the other sides function as a belt guide. The whole assembly swings around a central vertical post.

If the belt moves to one side of the roller, the frame will pivot, placing the tracking roller at a slight angle to the direction of belt motion. The belt will then move back into the correct position.

The alignment of the driven roller relative to the belt support frame is adjusted with positioning bolts. To ensure proper belt tracking, the driven roller must be perpendicular to the belt support frame.

2.15.6 Feeder Inlet

The inlet to the belt feeder is made of stainless steel and forms a passage from the outside of the housing to the top surface of the belt. Rubber gaskets along its bottom edge prevent the material from flowing out in any direction other than the direction of belt travel.

A shear gate on the front of the inlet is used to set the height of the bed of material allowed on the belt. This gate must never be used as a shut-off valve.

2.15.7 Material Guide Rails

The material guide rails contain the material on the belt that might otherwise fall off the sides. Most rails are held in position by three or four nuts. Side rails on sanitary design belt feeders are mounted on two removable support posts.

The rails should never contact the belt. They should be positioned so that a gap of about one millimeter exists between the rail and the belt at the inlet. The gap should gradually expand toward the discharge end of the feeder to prevent particles of material from becoming wedged under the rails and jamming the belt.

2.15.8 Weigh Bar

The weigh bar (11) consists of a solid bar of stainless steel cantilevered from the load cell (11) and running across the width of the belt.

The weight of material on the belt over the weigh bar presses down and bends the load cell slightly. A signal corresponding to this weight is then produced by the load cell. The maximum movement of the load cell is about one half of a millimeter. Mechanical stops prevent the load cell from accidental overload.

The load cell is hermetically sealed, providing good protection against dust. Care must be taken when cleaning the feeder to not damage the thin metal bellows on this load cell.

NOTE: Vibration from outside forces can affect the feeder operation. Feeder location should be selected so that minimal vibration is transmitted to the feeder. In cases where external vibration cannot be avoided, special shock mounts or vibration isolators must be used (consult factory).

2.15.9 Vent Hole

A vent hole at the inlet end of the feeder housing ensures that adequate draft is present for keeping the steam generated in the slaker tub from getting into the belt transport area. Adjust the size of this opening, as required, by sealing a portion of the hole with tape. The feeder housing covers must be in place and locked when feeding product.

2.16 Belt Feeder Electrical Components

NOTE: Schematic wiring information is to be used as a general guide only. For more precise wiring information, refer to job-specific wiring diagrams.



WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY FROM ELECTRICAL SHOCK, TURN POWER OFF BEFORE SERVICING. THERE MAY BE MORE THAN ONE LIVE CIRCUIT PRESENT SINCE THE RELAY CONTACTS MAY BE ENERGIZED SEPARATELY FROM THE REST OF THE CONTROL ENCLOSURE.



CAUTION: To avoid possible equipment damage, wire conductor size should not be smaller than 14 AWG for power circuitry and 22 AWG for control circuitry.

2.16.1 Belt Drive Motor

Refer to Dwg. 330.100.155.011 in Section 4 for schematic wiring.

The belt is driven by a 1/2-horsepower, 90-volt, permanent magnet, totally enclosed and non-ventilating (TENV) dc motor. It is factory-mounted at the inlet end of the feeder housing and its rotation is controlled by an SCR speed controller with tachometer feedback for precise speed control. It connects to terminals A+ and A- in the feeder junction box. Customer wiring must be run from the feeder junction box to the corresponding terminals A+ and A- on terminal block TB-1 in the speed controller enclosure. A wire conductor size of 14 AWG or larger is recommended.

The SCR speed controller will apply 0 to 90 Vdc to these terminals in response to either the setpoint controller or the manual feedrate potentiometer. The manual feedrate potentiometer is factory-mounted on the door of the speed controller enclosure, while the setpoint controller has a separate enclosure.

2.16.2 Tachometer

Refer to Dwg. 330.100.155.011 in Section 4 for schematic wiring.

The tachometer is factory-mounted at the end of the belt drive motor and connects to terminals TG+ and TG- in the feeder junction box. It provides a voltage proportional to motor speed at the rate of 20.8 Vdc/1000 rpm. Customer wiring must be run from the feeder junction box to the corresponding terminals TG+ and TG- on terminal block TB-1 in the speed controller enclosure. The SCR speed controller compares this tachometer feedback signal with the control input from either the setpoint controller or manual feedrate potentiometer to maintain proper motor speed.

2.16.3 SCR Speed Controller

Refer to Dwg. 330.100.155.011 in Section 4 for schematic wiring.

Belt drive motor speed is controlled by an isolated, one-quadrant, thyristor-controlled speed regulator that compares the control input signal from either the setpoint controller or manual feedrate potentiometer with the actual signal from the tachometer. The difference represents an error that increases or decreases the armature voltage to maintain proper motor speed. It is factory-mounted inside the speed controller enclosure.

2.16.4 Load Cell

Refer to Dwg. 330.100.155.020 in Section 4 for schematic wiring.

The load cell is factory-mounted under the weigh bar inside the transport mechanism and connects to terminals EX+(GRN), EX-(BLK), SIG+(RED), SIG-(WHT), SEN+(BLU), SEN-(BRN), and SHLD(shield) in the feeder junction box. It provides a strain gauge voltage proportional to product weight at the rate of 2 mV/ V using an excitation of 10 Vdc. The customer must run a cable from the feeder junction box to the corresponding terminals EX+, EX-, SIG+, SIG-, SEN+, and SEN- on terminal block TB-1 in the setpoint controller enclosure. A three-pair shielded cable with a wire conductor size of AWG 22 or larger is recommended. The setpoint controller uses this belt load feedback signal to compute corrections for the SCR speed controller to maintain proper feedrate.

2.16.5 Belt Breakage Detector

Refer to Dwg. 330.100.155.020 in Section 4 for schematic wiring.

The belt breakage detector is factory-wired and mounted near the driven roller at the discharge end of the feeder housing and connects to terminals +24, #116, and #117 in the feeder junction box. It is a proximity sensor that generates one +24 Vdc pulse per revolution of the driven roller.

Customer wiring must be run from terminals #116 and #117 in the feeder junction box to the corresponding terminals on terminal block TB-1 in the setpoint controller enclosure. Note that +24 Vdc power must be connected from terminal +24 in the speed controller enclosure to the corresponding terminal in the feeder junction box. A three-conductor shielded cable with a wire conductor size of AWG 22 or larger is recommended. This feedback signal is factory-wired to setpoint controller digital input #IN4 at D-sub connector XS-2, terminal #18. The setpoint controller computes the minimum frequency at minimum belt speed, during the AUTO TARE cycle. If the actual measured frequency is lower than the calculated frequency, with a 20 percent deadband, an alarm condition will occur. The belt feeder will stop and the setpoint controller display will flash “Broken Belt”. Such a condition can be caused by a broken, slipping, or jammed belt.

2.16.6 Motor Speed Sensor

Refer to Dwg. 330.100.155.020 in Section 4 for schematic wiring.

The motor speed sensor is factory-mounted between the belt drive motor and the gearbox at the inlet end of the feeder housing and connects to terminals +P and -P in the feeder junction box. It is proximity pickup that generates a +24 Vdc pulse train proportional to motor speed ranging from 0 to 1725 Hz, from a 60-tooth gear mounted on the belt motor shaft. Customer wiring must be run from the feeder junction box to the corresponding terminals +F and -F on terminal block TB-1 in the setpoint controller enclosure. A two-conductor shielded cable, with a wire conductor size of AWG 22 or larger, is recommended. This feedback signal is factory-wired to the setpoint controller frequency input at D-sub connector XS-2, terminals #11(+F) and #24(-F). The setpoint controller uses this motor speed feedback signal to compute corrections for the SCR speed controller to maintain proper feedrate.

2.16.7 Feeder Junction Box

Refer to Dwgs. 330.100.155.011 and 330.100.155.020 in Section 4 for schematic wiring.

The feeder junction box is mounted at the inlet end of the feeder housing and provides a terminal block for wiring the tachometer, loadcell, belt motor, belt breakage detector, and motor speed sensor to the speed and setpoint controller enclosures.

2.16.8 Setpoint Controller

The input to the SCR speed controller in the AUTO mode is provided by a microprocessor-based setpoint controller utilizing proprietary PID control algorithms. Its menu-driven software provides information to the user regarding status, operational parameters, and alarm conditions. It is factory-mounted on the door of the setpoint controller enclosure that provides NEMA 4X protection.

The rear panel of the controller contains two cables with D-subminiature connectors, XS-1 and XS-2, and one power cable. These “interposing” cables connect the setpoint controller to the enclosure wiring at terminal block TB-1 and provide convenient access to all the signal lines of the D-sub connectors.

Connector XS-1 on the rear panel of the controller is a 15-pin D-sub connector that contains all the analog input/output lines. It is wired to terminal block TB-1 as indicated in Dwg. 330.100.155.030 in Section 4.

Connector XS-2 on the rear panel of the controller is a 25-pin D-sub connector that contains all the digital input/output lines. It is wired to terminal block TB-1 as indicated in Dwg. 330.100.155.040 in Section 4.

The analog output ANO1+, terminal #127, and ANO1-, terminal #122, on terminal block TB-1 of the setpoint controller enclosure must be connected by the customer to the corresponding terminals in the speed controller enclosure. A two-conductor shielded cable, with a wire conductor size of AWG 22 or larger, is recommended. These terminals are factory-wired to the SCR speed controller input at terminals #14(+) and #12(-), respectively, in the speed controller enclosure. The setpoint controller uses this input in AUTO mode to adjust belt motor speed so that proper feedrate is maintained.

2.16.9 SCR Speed Controller Enclosure

Refer to Dwg. 330.100.000.020 in Section 5 for component location and to Dwg. 330.100.155.011 in Section 4 for schematic wiring.

The SCR speed controller enclosure is customer-mounted separately from the feeder housing and provides a terminal block for wiring the tachometer and belt motor from the feeder junction box. It also provides terminals for other customer connections, such as main power, system interlock inputs, remote start/stop, feeder-running contacts, front door controls, the SCR speed controller itself, and interconnections to the setpoint controller enclosure.



WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY FROM ELECTRICAL SHOCK, TURN POWER OFF BEFORE SERVICING. THERE MAY BE MORE THAN ONE LIVE CIRCUIT PRESENT SINCE THE RELAY CONTACTS MAY BE ENERGIZED SEPARATELY FROM THE REST OF THE CONTROL ENCLOSURE.



CAUTION: To avoid possible equipment damage, wire conductor size should not be smaller than 14 AWG for power circuitry and 22 AWG for control circuitry.

LIME SLAKING SYSTEM

The various connections and their associated functions are as follows:

- **Circuit Breaker:** Customer ac power must be connected to terminals G (earth ground), L2/N (neutral), and L1 (hot) on terminal block TB-1. A 15-ampere circuit breaker, BKR-1, provides overcurrent protection and a means for disconnecting power to the control relays and the SCR speed controller.
- **Belt Motor Armature:** The belt motor armature must be wired by the customer from the feeder junction box to the corresponding terminals A+ and A- on terminal block TB-1.
- **Belt Motor Tachometer:** The belt motor tachometer must be wired by the customer from the feeder junction box to the corresponding terminals TG+ and TG- on terminal block TB-1.
- **+24 Vdc Power Supply:** A factory-mounted and wired power supply PS-1 converts 115 Vac main power to the +24 Vdc needed by the control circuits and feeder junction box. Its output terminals are +24 and 24 RTN.
- **SCR Speed Controller:** SCR speed controller SCR-1 is factory-wired to the following components within the control enclosure. Refer to Dwg. 330.100.155.011 in Section 4 for location of terminals.
 - * AC power after the breaker BKR and power on/off switch PS-1.
 - * Belt motor armature at terminals A+ and A-.
 - * Belt motor tachometer at terminals TG+ and TG-.
 - * Contacts from control relay R3 at terminals #51 and #52(-).
 - * Analog Speed Indicator FRM at terminals #213 (+) and #214 (-).
 - * Manual feedrate potentiometer FRCP at terminals #212 (+), #211 (wiper), and #210 (-) in HAND mode.
 - * Control signal output from setpoint controller analog output ANO1, terminals #14(+) and #7(-) of D-subminiature connector XS-1 at terminals #127 (wiper) and #122 (-), respectively.

The SCR speed controller controls the speed of the belt drive motor in response to either the setpoint controller WIC-1 or the manual feedrate potentiometer FRCP.

The SCR speed controller will be disabled and not power the belt drive motor if any one of the following conditions exist:

- * HAND-OFF-AUTO switch is in OFF position.

- * A slaker system interlock contact opens during HAND or AUTO mode. This includes the system shutdown relay, grit remover motor contactor, paddle shaft motor contactor, or low water pressure switch.
 - * The flow proportional input contact opens during AUTO mode only.
 - * Setpoint controller is stopped during AUTO mode only.
 - * Setpoint controller is in ALARM or FAULT state during AUTO mode only.
- **Terminal Blocks:** Terminal block TB-1 is used with the factory connections from the feeder junction box, the factory connections to the slaker control panel enclosure, and interconnections to the setpoint controller enclosure.

2.16.10 Setpoint Controller Enclosure

Refer to Dwg. 310.165.000.030 in Section 5 for component location and to Dwg. 330.100.155.020 in Section 4 for schematic wiring.

The setpoint controller enclosure is customer-mounted separately from the feeder housing and provides a terminal block for wiring the load cell, belt breakage detector, and motor speed sensor from the feeder junction box. It also provides terminals for other customer connections such as main power, remote setpoint input, feedrate output, alarm contacts, totalizer contacts, the setpoint controller itself, and interconnections to the SCR speed controller enclosure.



WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY FROM ELECTRICAL SHOCK, TURN POWER OFF BEFORE SERVICING. THERE MAY BE MORE THAN ONE LIVE CIRCUIT PRESENT SINCE THE RELAY CONTACTS MAY BE ENERGIZED SEPARATELY FROM THE REST OF THE CONTROL ENCLOSURE.



CAUTION: To avoid possible equipment damage, wire conductor size should not be smaller than 14 AWG for power circuitry and 22 AWG for control circuitry.

The various connections and their associated functions are as follows.

- **Main Power:** ac power must be connected from the slaker control panel enclosure to terminals G (earth ground), L2/N (neutral), and L1 (hot) on terminal block TB-1.

LIME SLAKING SYSTEM

- **LOAD CELL:** The customer must run a cable from the feeder junction box to the corresponding terminals EX+, EX-, SIG+, SIG-, SEN+, SEN-, and SHLD on terminal block TB-1. A three-pair shielded cable with a wire conductor size of AWG 22 or larger is recommended. This feedback signal is factory-wired to the setpoint controller strain gauge analog input at D-sub connector XS-2, terminals #9(EX+), #4(EX-), #3(SIG+), #11(SIG-), #2(SEN+), #10(SEN-), and shield.
- **BELT BREAKAGE Detector:** Customer wiring must be run from terminals #116 and #117 in the feeder junction box to the corresponding terminals on terminal block TB-1. Note that +24 Vdc power must be connected from terminal +24 in the speed controller enclosure to the corresponding terminal in the feeder junction box. This feedback signal is factory-wired to setpoint controller digital input #IN4 at D-sub connector XS-2, terminal #18.
- **MOTOR SPEED Sensor:** Customer wiring must be run from terminals +F and -F in the feeder junction box to the corresponding terminals on terminal block TB-1. This feedback signal is factory-wired to the setpoint controller frequency input at D-subminiature connector XS-2, terminals #11(+F) and #24(-F).
- **REMOTE SETPOINT Input:** An external 4-20 mA dc signal can be used to represent the setpoint by connecting it to terminals #212A(+), #211A(-), and S.G. (shield) on terminal block TB-1. A two-conductor shielded cable with a wire conductor size of AWG 22 or larger is recommended. This signal is factory-wired to setpoint controller analog input ANI2+ at D-subminiature connector XS-1, terminals #13(+) and #6(-). The controller must be configured to accept this signal as the setpoint in Menu #07 if this feature is used.
- **FEEDRATE Output:** An external 4-20 mA dc signal that represents actual feedrate can be obtained by connecting to terminals #113(+), #114(-), and S.G. (shield) on terminal block TB-1. A two-conductor shielded cable with a wire conductor size of AWG 22 or larger is recommended. This signal is factory-wired from setpoint controller analog output ANO2+ at D-subminiature connector XS-1, terminals #15(+) and #8(-). The controller is already configured to provide this signal as the default selection in Menu #07.
- **ALARM Output:** If the setpoint controller receives an alarm or fault condition during AUTO mode, its digital output OUT2 at terminal #135 of D-subminiature connector XS-2 will energize control relay CR3. Note that for a control difference alarm, the alarm condition must persist beyond the time delay programmed in Menu #04. When CR3 energizes, it closes normally open contact CR3-1 between termi-

nals #21 and #22 and opens normally closed contact CR3-2 between terminals #207 and #208 on terminal block TB-1. This provides an indication that an alarm or fault has occurred.

An alarm can be acknowledged and the ALARM output contacts reset by pressing the ALARM ACKNOWLEDGE key on the setpoint controller.

- **TOTALIZER PULSE Output:** During AUTO mode, the setpoint controller digital output OUT9 at terminal #10 of D-subminiature connector XS-2 will energize control relay CR4 whenever the controller totalizer increments because of material fed. When CR4 energizes, it closes normally open contact CR4-1 between terminals #21A and #50 on terminal block TB-1 and provides a means for externally retransmitting the setpoint controller totalizer counts to the mechanical totalizer mounted on the door of the slaker control panel enclosure. This must be configured in Menu #04.
- **+24 Vdc Power Supply:** A factory-mounted and wired power supply (PS-1) in the SCR speed controller enclosure converts 115-Vac main power to the +24 Vdc needed by the control circuits. Its output terminals are +24 and 24RTN. Customer wiring must be run from terminals +24 and 24RTN in the speed controller enclosure to the corresponding terminals on TB-1 in the setpoint controller enclosure.
- **SETPOINT CONTROLLER:** The setpoint controller WIC-1 is factory-mounted to the front door and factory-wired to terminal block TB-1 via cable harnesses with D-subminiature connectors XS-1 and XS-2 at the controller end. It controls feeder operation in the AUTO mode and provides the following inputs and outputs:
 - * Digital input IN1 used with the remote START/STOP interlock input.
 - * Digital input IN2 not currently used, but available as auxiliary start/stop input.
 - * Digital input IN4 used with the BELT BREAKAGE detector.
 - * Digital output OUT1 used with the FEEDER RUNNING output.
 - * Digital output OUT2 used with the ALARM output.
 - * Digital output OUT4 may be used to monitor deviation from setpoint (D+/-).
 - * Digital output OUT9 used with the EXTERNAL TOTALIZER output.
 - * Analog input ANI1 used with load cell.
 - * Analog input ANI2 used with remote setpoint input.

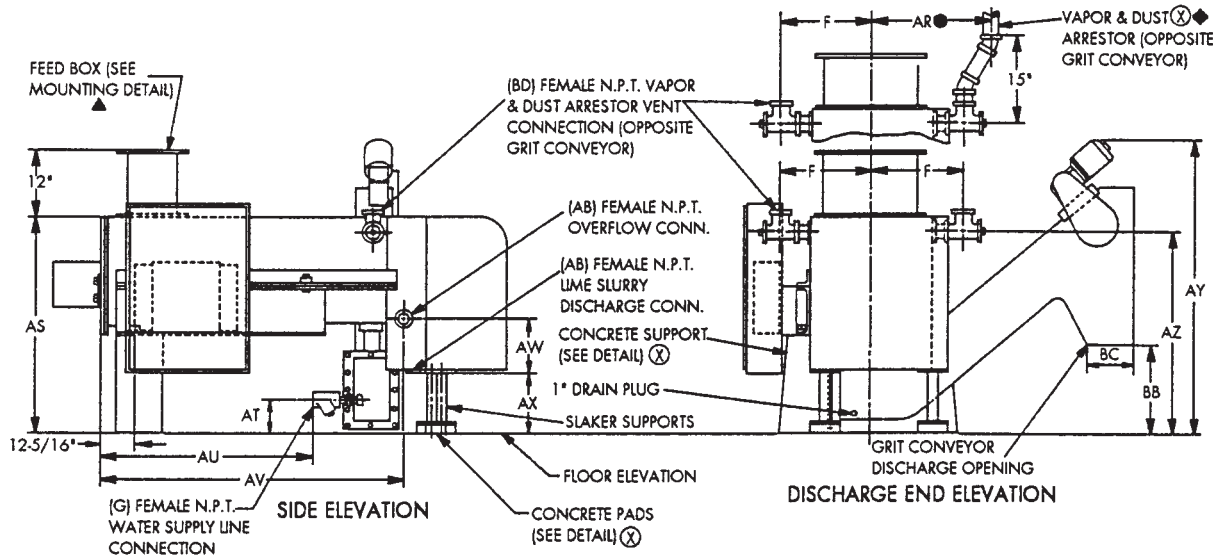
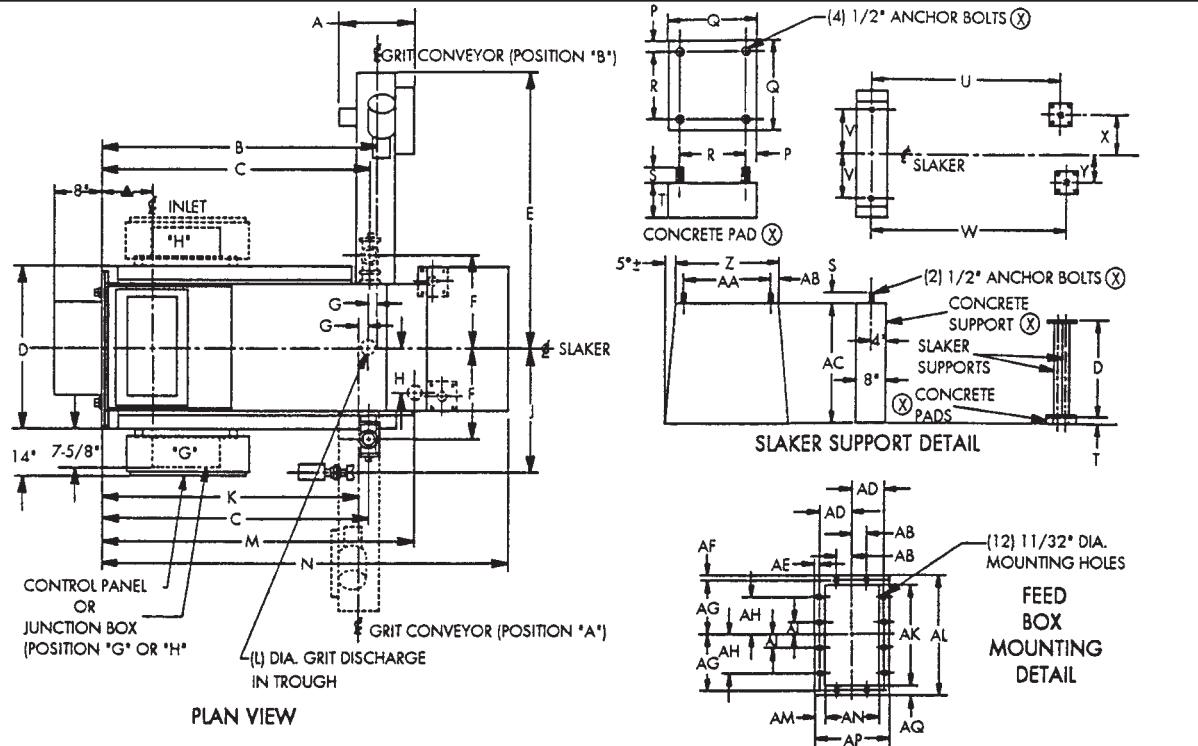
LIME SLAKING SYSTEM

- * Analog output ANO1 used with SCR speed controller input.
- * Analog output ANO2 used with FEEDRATE output.

The digital inputs and outputs share the same +24 Vdc power supply and return common 24RTN, but are optically isolated from the internal setpoint controller circuitry. The analog inputs, as a group, share a common negative terminal and the analog outputs, as a group, share a different common negative terminal; however, the analog inputs are optically isolated from the analog outputs.

- **System Relays:** There are two relays utilized, as follows:
 - * Control relay CR3 used with the ALARM output.
 - * Control relay CR4 used with the TOTALIZER output for external retransmission of the setpoint controller totalizer counts.
- **Terminal Blocks:** Terminal block TB-1 is used with the connections from the feeder junction box, the connections to the slaker control panel enclosure, the various external customer connections, and interconnections to the SCR speed controller enclosure.

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A	B	C	D	E	F	G	H	J
16-1/2"	3'-10 5/8"	3'-10 1/8"	2'-2"	4'-10"	15-1/4"	1-1/2"	9"	19-1/2"
T	U	V	W	X	Y	Z	AA	AB
2'-3/8"	3'-8"	12"	3'-10"	10-1/2"	7-1/2"	2'-4"	2'-0"	2"
AL	AM	AN	AP	AQ	AR	AS	AT	AU
16"	7/8"	7-3/4"	9-1/2"	1-1/16"	21-7/8"	4'-3 1/2"	1'-10"	2'-9 1/2"

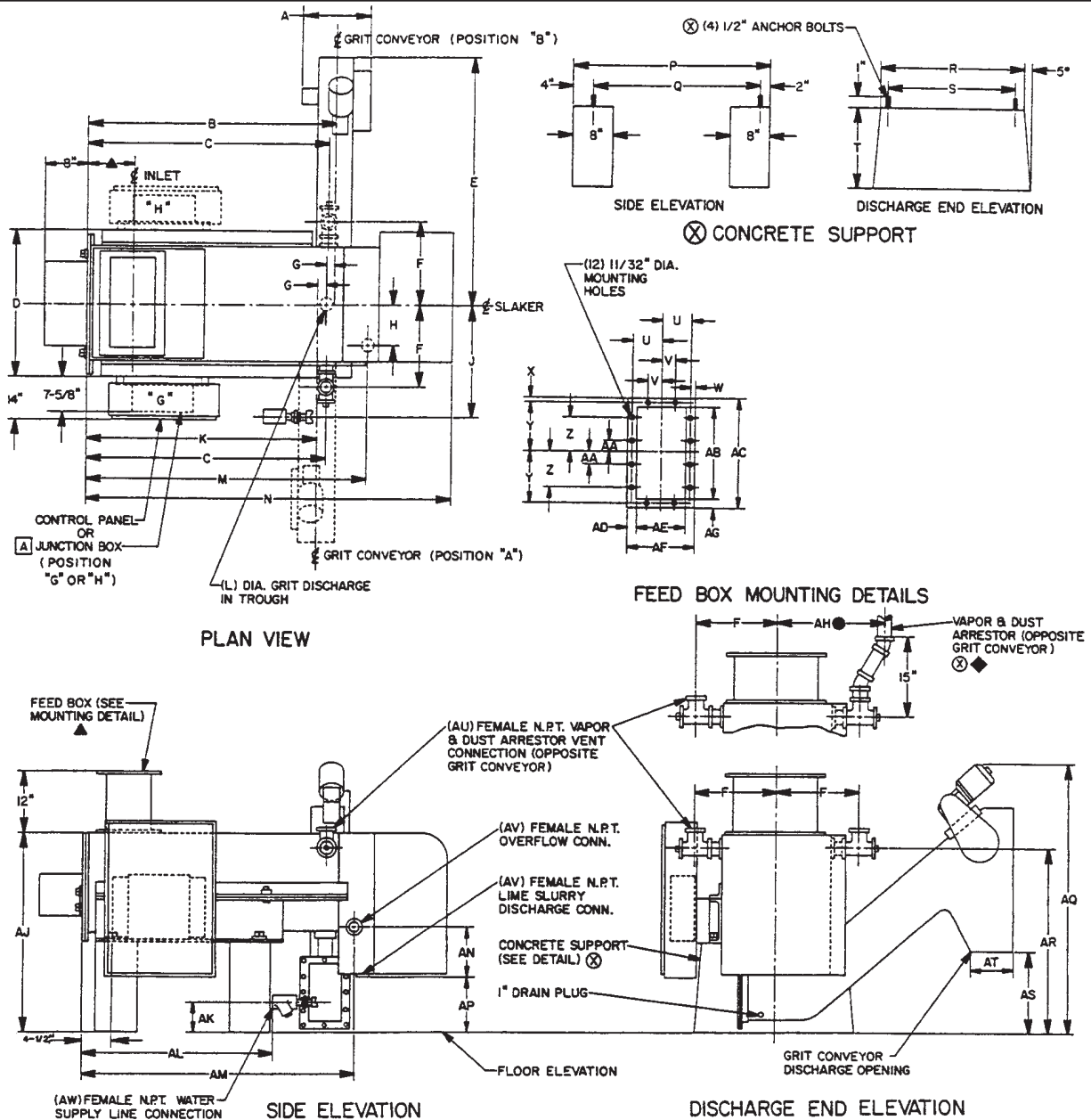
K	L	M	N	P	Q	R	S
3'-7 5/8"	1-1/4"	4'-5 1/8"	5'-9 1/2"	3/4"	6"	4-1/2"	1"
AC	AD	AE	AF	AG	AH	AJ	AK
2'-8"	4-3/8"	3/8"	5/8"	7-3/8"	5-1/4"	1-3/4"	13-7/8"
AV	AW	AX	AY	AZ	BB	BC	BD
4'-3 3/4"	6-5/8"	2'-3 1/4"	6'-1"	4'-1"	3'-2"	12-3/8"	3"

1000 LB/HR LIME SLAKING SYSTEM
WITH CONVEYOR-TYPE
GRIT REMOVER
- DIMENSIONS

330.101.100.081

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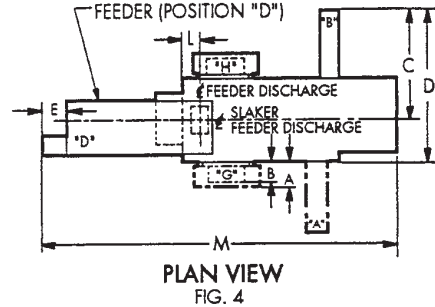
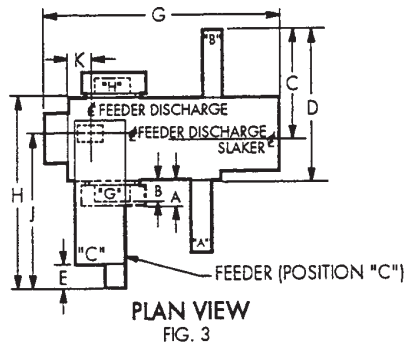
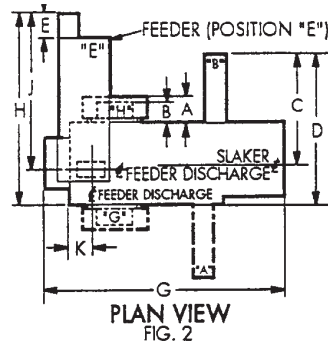
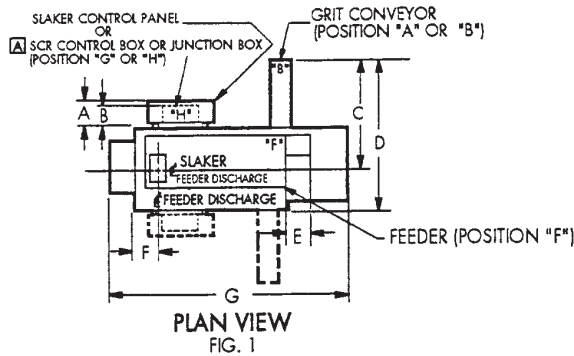
SLAKER FEED RATE LBS./HR.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
2000	16-1/2"	4'-10-7/8"	4'-10-3/8"	2'-7-1/2"	4'-10"	17-1/2"	1-1/2"	11-7/16"	22-1/4"	4'-7-7/8"	1-1/2"	5'-5-9/8"	6'-11"	3'-8-1/2"	3'-2-1/2"
4000	16-1/2"	5'-4-3/4"	6'-3-1/4"	3'-2-1/2"	4'-10"	23"	1-1/2"	14-5/8"	2'-7-1/4"	6'-1-3/4"	2-1/16"	6'-10-5/8"	8'-5"	5'-4"	4'-10"
8000	22-1/2"	6'-2-7/8"	7'-11-1/4"	4'-3-1/2"	6'-3"	2'-5-1/2"	7/8"	18-7/8"	2'-10-1/4"	8'-1-1/8"	3"	9'-3"	11'-2-1/2"	7'-2"	6'-8"
SLAKER FEED RATE LBS./HR.	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
2000	2'-9-3/8"	2'-5-3/8"	2'-8"	4'-3/8"	2"	3/8"	5/8"	7-3/8"	5-1/4"	1-3/4"	13-7/8"	16"	7/8"	7-3/4"	9-1/2"
4000	3'-4-1/2"	3'-0-1/2"	2'-8"	4'-3/8"	2"	3/8"	5/8"	7-3/8"	5-1/4"	1-3/4"	13-7/8"	16"	7/8"	7-3/4"	9-1/2"
8000	4'-6"	4'-1"	4'-0"	4'-3/8"	2"	3/8"	5/8"	7-3/8"	5-1/4"	1-3/4"	13-7/8"	16"	7/8"	7-3/4"	9-1/2"
SLAKER FEED RATE LBS./HR.	AG	AH	AJ	AK	AL	AM	AN	AP	AQ	AR	AS	AT	AU	AV	AW
2000	1-1/16"	2'-0-1/8"	4'-7-1/8"	1'-8"	3'-9"	3'-4"	7-1/4"	2'-2-1/2"	6'-1"	4'-4-1/2"	3'-2"	12-3/8"	3"	2-1/2"	1-1/2"
4000	1-1/16"	—	5'-1"	1'-8-1/4"	5'-1-1/2"	6'-10"	7-3/8"	2'-3"	6'-1"	4'-10"	3'-2"	12-3/8"	4"	3"	1-1/2"
8000	1-1/16"	—	7'-1"	2'-3-1/2"	7'-7-1/4"	9'-1-1/4"	13"	3'-1-1/2"	8'-2"	6'-8-1/2"	4'-10"	12-7/8"	5"	5"	2"

2000, 4000 & 8000 LB/HR LIME SLAKING SYSTEM
WITH CONVEYOR TYPE GRIT REMOVER - DIMENSIONS

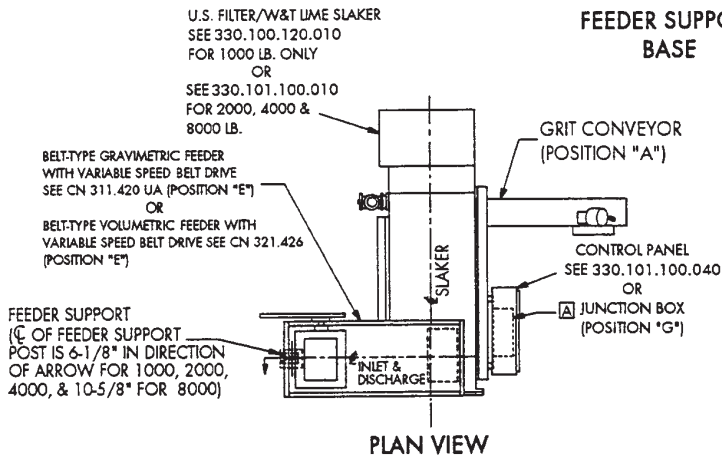
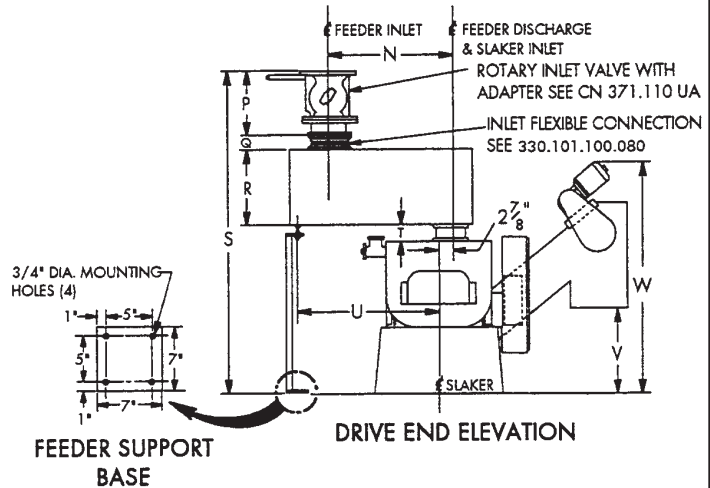
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SLAKER FEED RATE LBS./HR.	A	B	C	D	E	F	G
1000	1'4"	7'5/8"	4'10"	5'11"	10"	12'1/4"	6'5-1/2"
2000	1'4"	7'5/8"	4'10"	6'1-1/4"	10"	12'1/4"	7'7"
4000	1'4"	7'5/8"	4'10"	6'6-1/4"	10"	12'1/4"	9'1"
8000	1'4"	7'5/8"	6'3"	8'4-3/4"	10"	16'5/8"	11'10-1/2"
SLAKER FEED RATE LBS./HR.	H	J	K	L	M	N	P
1000	4'8-3/4"	3'10-5/8"	9'1/4"	6'3/8"	9'1-3/4"	2'3-15/16"	16"
2000	4'11-1/2"	3'10-5/8"	9'1/4"	6'3/8"	10'3-1/4"	2'3-15/16"	16"
4000	5'3"	3'10-5/8"	9'1/4"	6'3/8"	11'9-1/4"	2'3-15/16"	16"
8000	6'4-13/16"	3'10-5/8"	12'7/8"	9'1/8"	14'6-3/4"	2'3-15/16"	18'1/2"
SLAKER FEED RATE LBS./HR.	Q	R	S	T	U	V	W
1000	2'1/4"	18'1/4"	8'4"	12"	2'8-15/16"	3'2"	6'1"
2000	2'1/4"	18'1/4"	8'7-5/8"	12"	2'8-15/16"	3'2"	6'1"
4000	2'1/4"	18'1/4"	9'1-1/2"	12"	2'8-15/16"	3'2"	6'1"
8000	2'1/4"	18'1/4"	11'4"	12"	3'9-9/16"	4'10"	8'2"

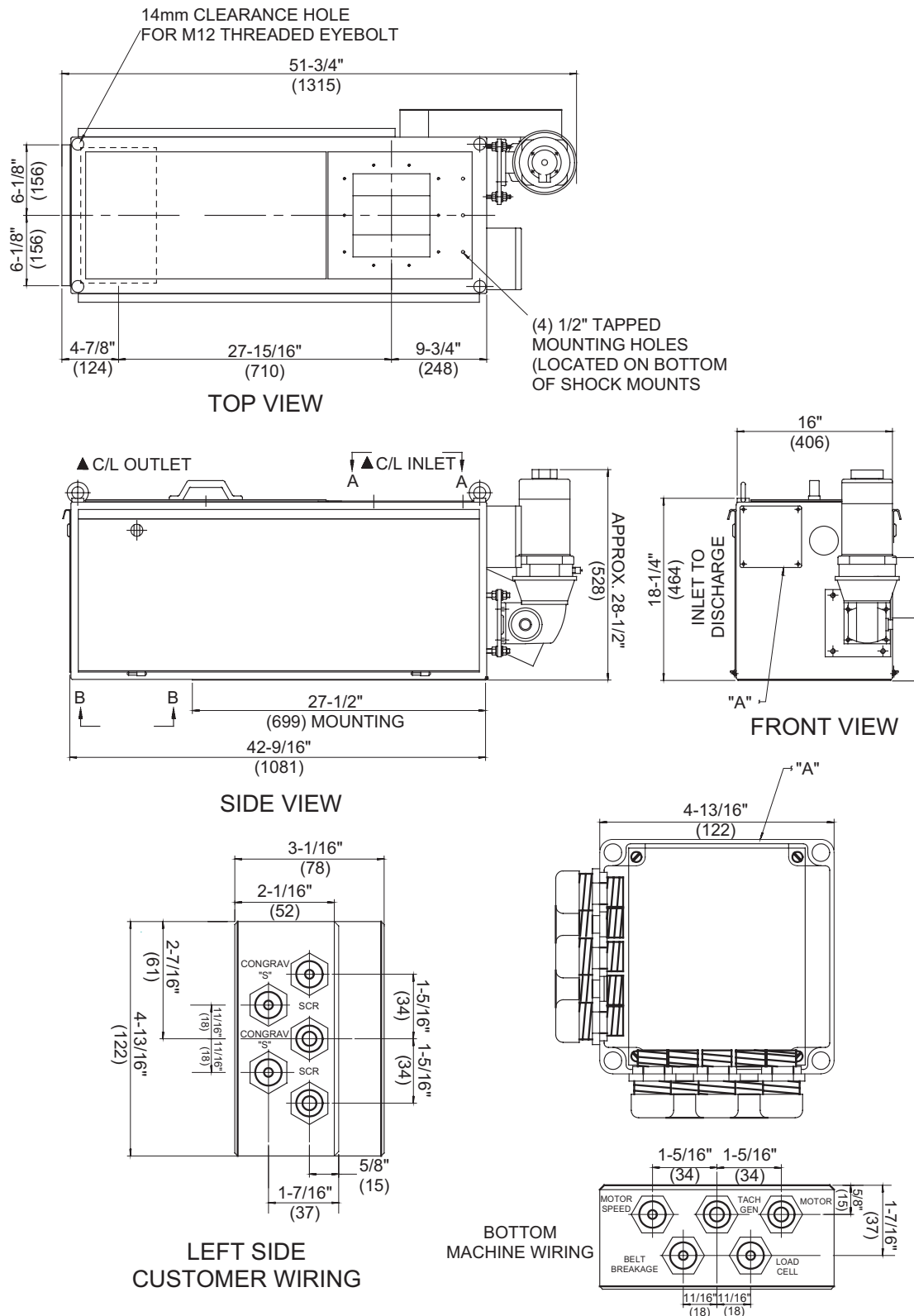


1000, 2000, 4000 & 8000 LB/HR
LIME SLAKING SYSTEM WITH
CONVEYOR-TYPE GRIT REMOVER
- DIMENSIONS

330.101.100.020

ISSUE 1 10-99

LIME SLAKING SYSTEM

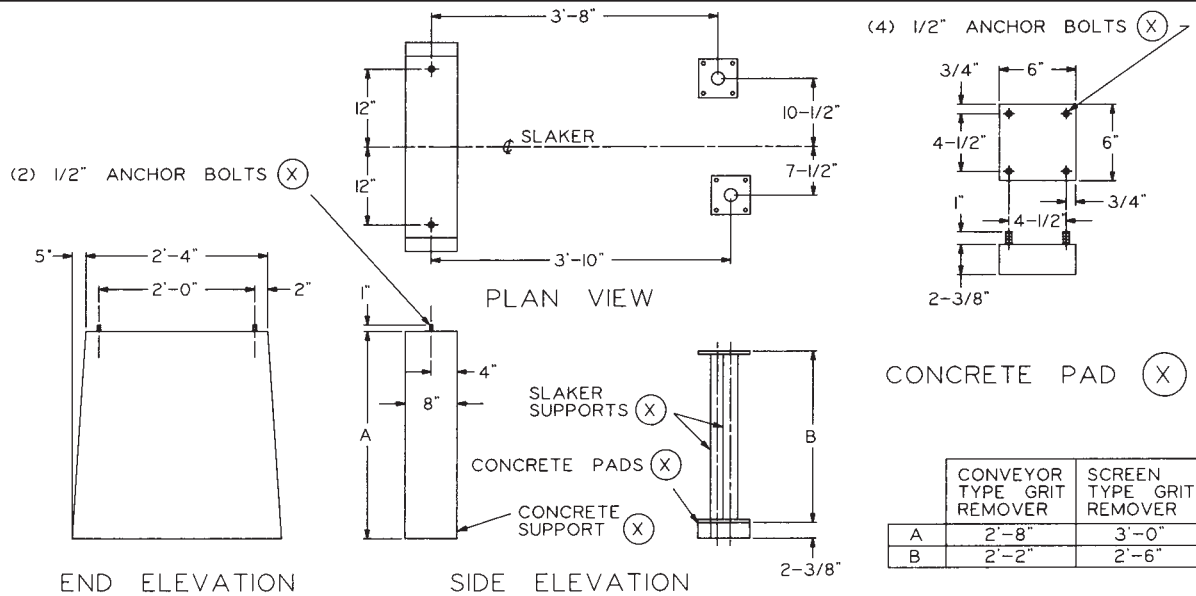


SERIES 31-165 GRAVIMETRIC FEEDER - DIMENSIONS

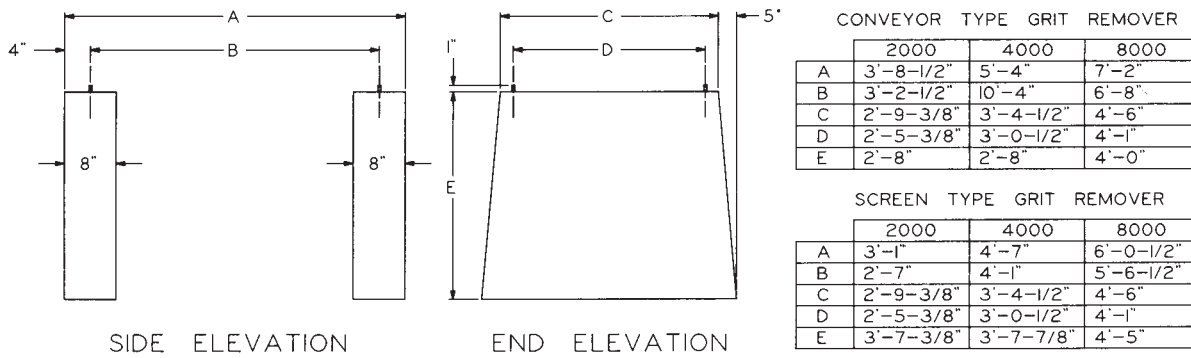
310.165.100.030

ISSUE 0 9-96

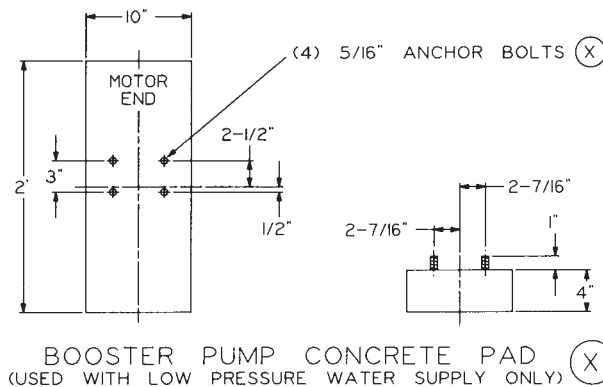
LIME SLAKING SYSTEM



SLAKER SUPPORT DETAIL FOR 1000 LB.



SLAKER SUPPORT DETAIL FOR 2000, 4000 & 8000 LB.



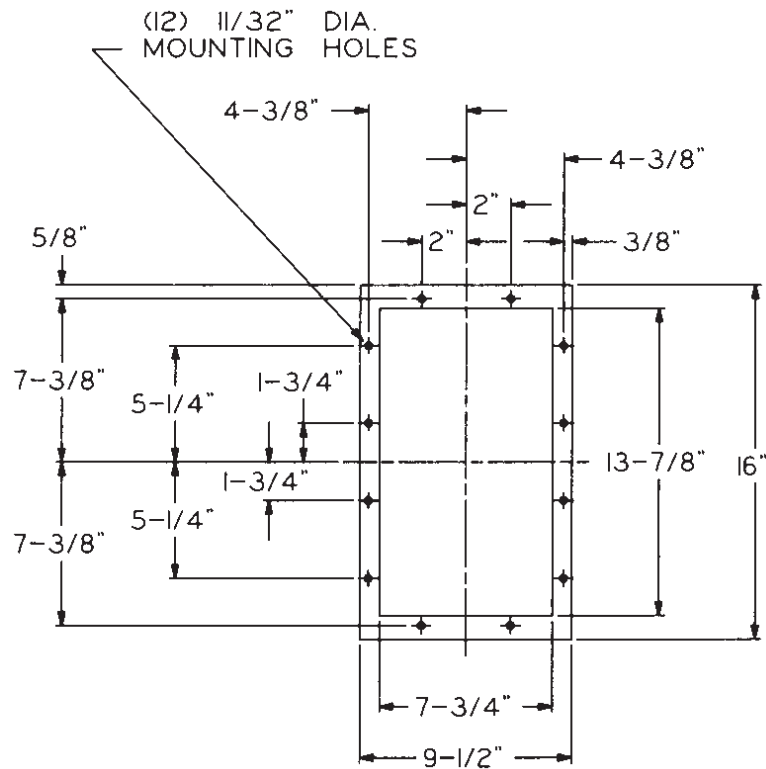
NOTE: (X) NOT FURNISHED BY USFW&T.

SLAKER SUPPORT DETAIL
- DIMENSIONS

330.100.100.500

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LIME SLAKING SYSTEM

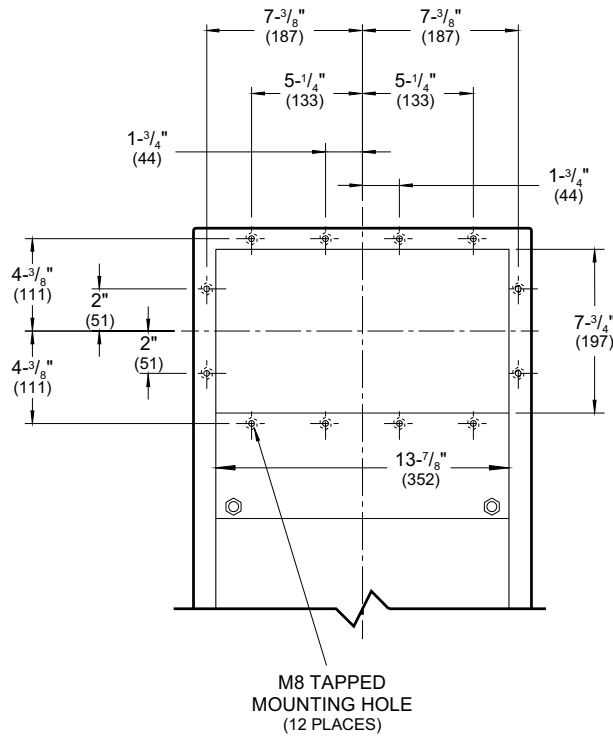


FEED BOX MOUNTING DETAIL - DIMENSIONS
For 1000, 2000, 4000 & 8000 Lb. Slakers

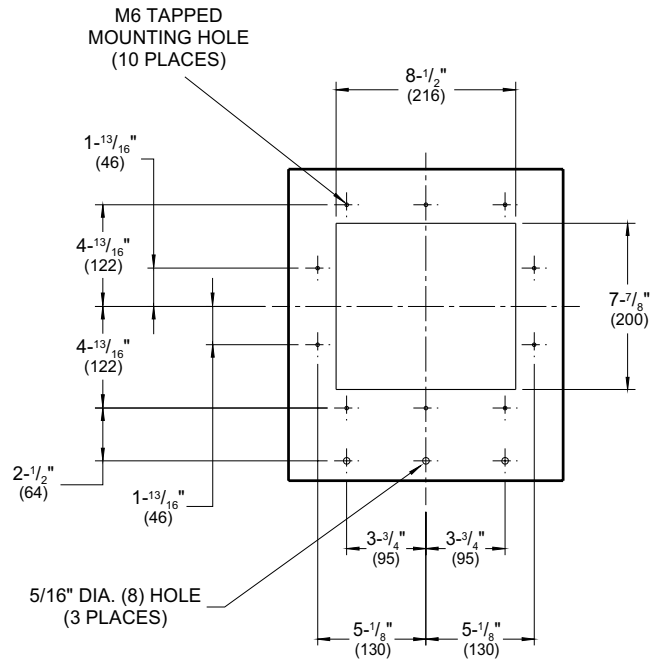
330.100.100.510

ISSUE 1 7-04

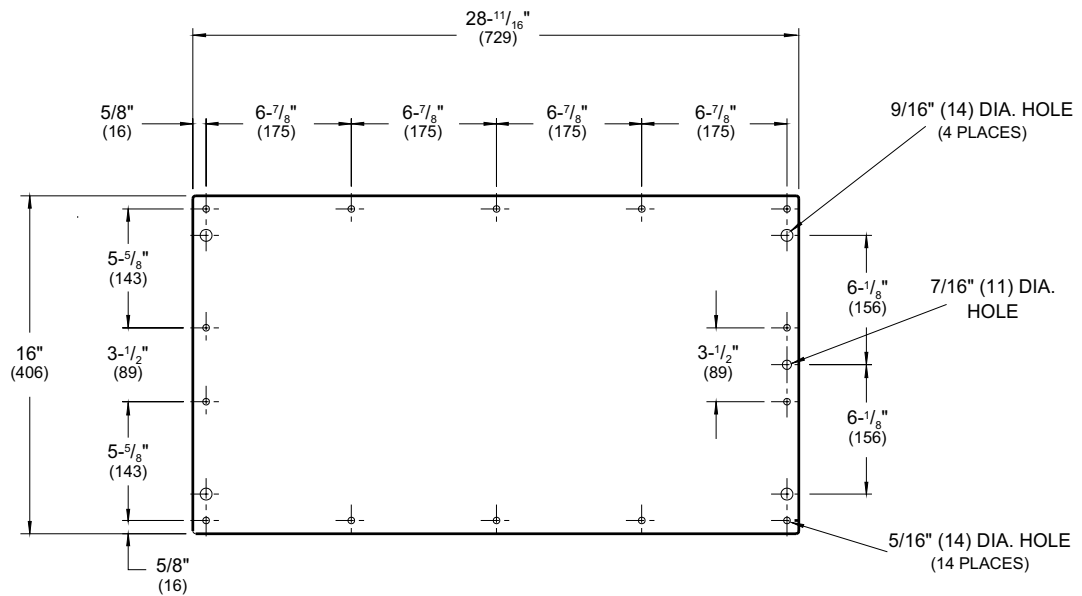
LIME SLAKING SYSTEM



DISCHARGE CONNECTION



INLET CONNECTION



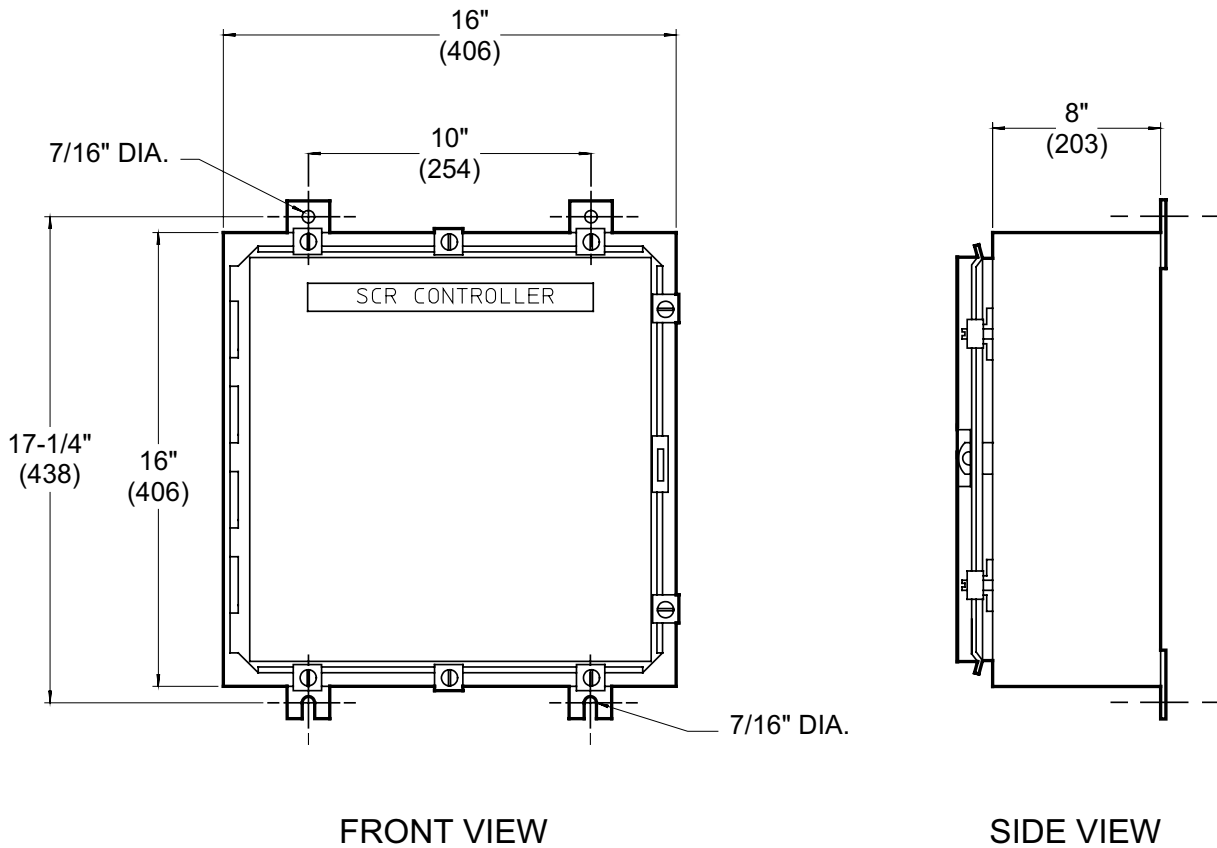
BOTTOM PLATE

REMOVABLE DISCHARGE, INLET & BOTTOM PLATE
CONNECTIONS - DIMENSIONS

310.165.100.040

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LIME SLAKING SYSTEM

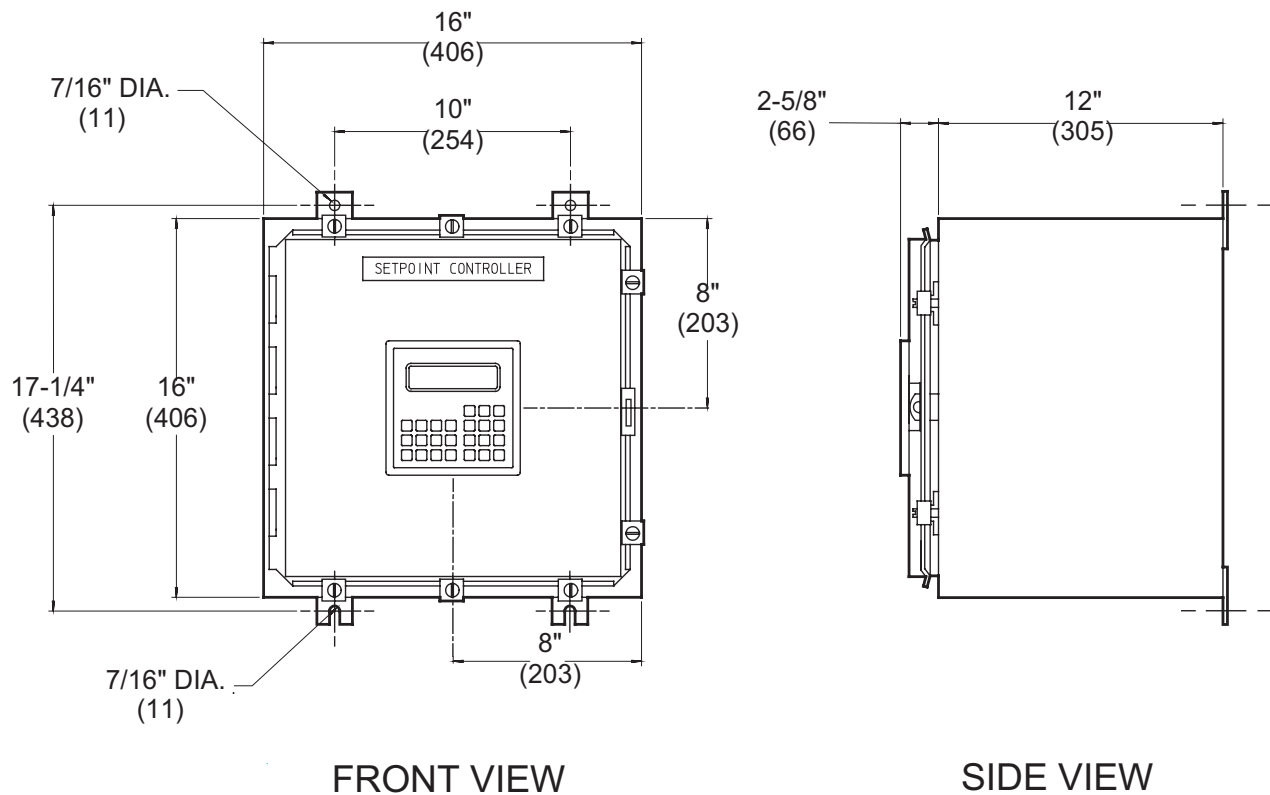


SCR ENCLOSURE - CONTROL PANEL
Used in 31-165(DC) Gravimetric & 32-215(DC) Volumetric Belt Feeders

310.165.100.011

ISSUE 2 6-04

LIME SLAKING SYSTEM

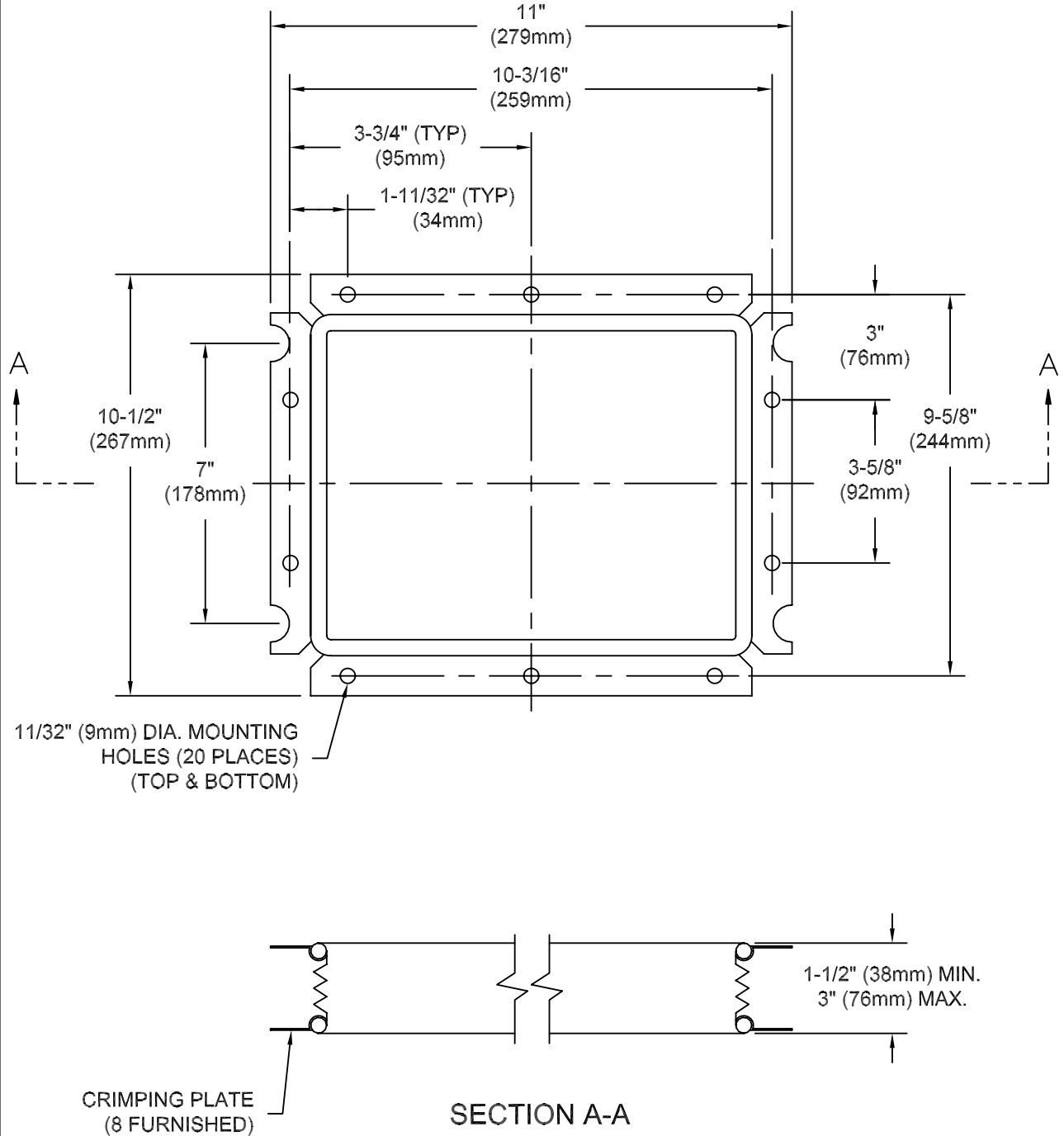


SERIES 31-165 GRAVIMETRIC BELT FEEDER
SETPOINT CONTROLLER - DIMENSIONS

310.165.100.020

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LIME SLAKING SYSTEM

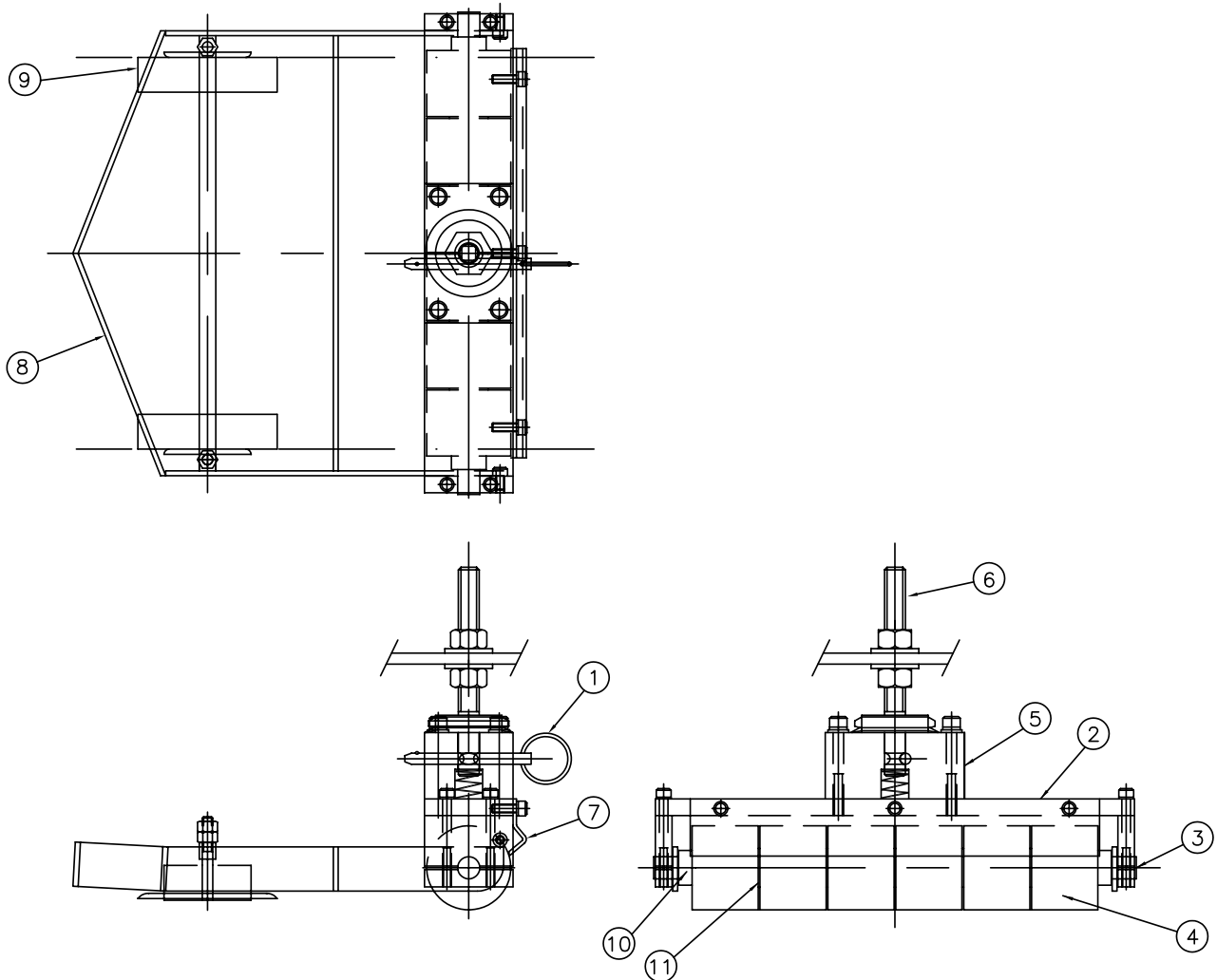


UXE13755 - HYPALON; U10434 - CANVAS
 INLET FLEXIBLE CONNECTION - DIMENSIONS
 Used With Weighbelt Feeder

310.165.100.050

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LIME SLAKING SYSTEM



KEY NO.	PART NO.	QTY.	DESCRIPTION
1	AAC5885	1	HITCH PIN, QUICK RELEASE
2	AAC5888	1	STEERING ROLLER MTG. BRACKET
3	AAC5891	1	SHAFT STEERING ROLLER
4	AAC5894	6	ROLLER, DELRIN
5	AAC5897	1	PIVOT BLOCK, QUICK RELEASE c/w GROUNDING SPRING
6	AAC5900	1	PIVOT SHAFT
7	AAB5282	1	STEERING ROLLER SCRAPER
8	AAC5903	1	BELT SCRAPER
9	AAB5285	1	BELT GUIDE
10	AAC5906	2	ROLLER SPACER, DELRIN
11	AAC5909	5	ROLLER WASHER, DELRIN

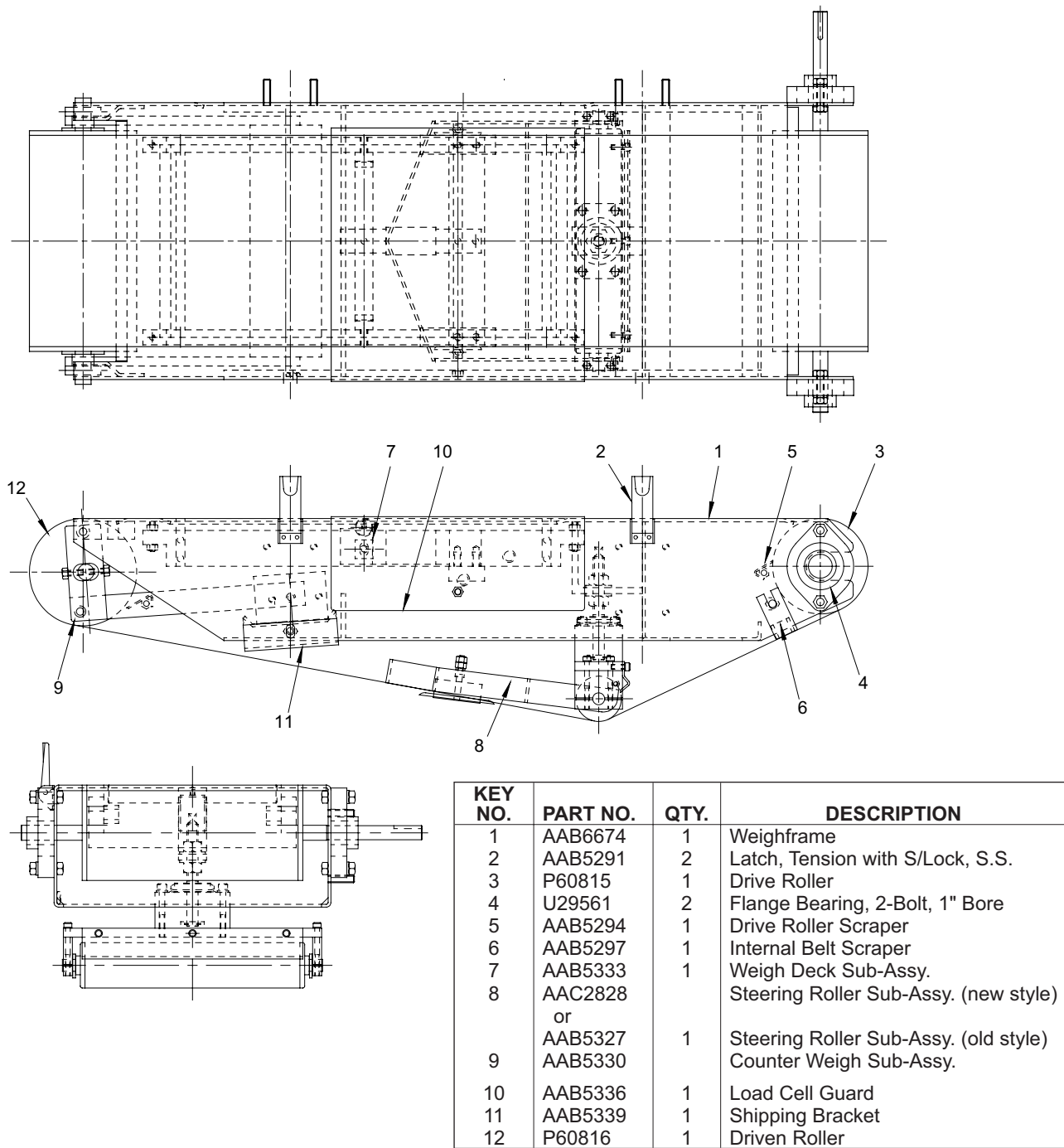
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

SERIES 31-165 GRAVIMETRIC FEEDER
BELT TRACKING - ASSEMBLY

310.165.160.020

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LIME SLAKING SYSTEM



WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

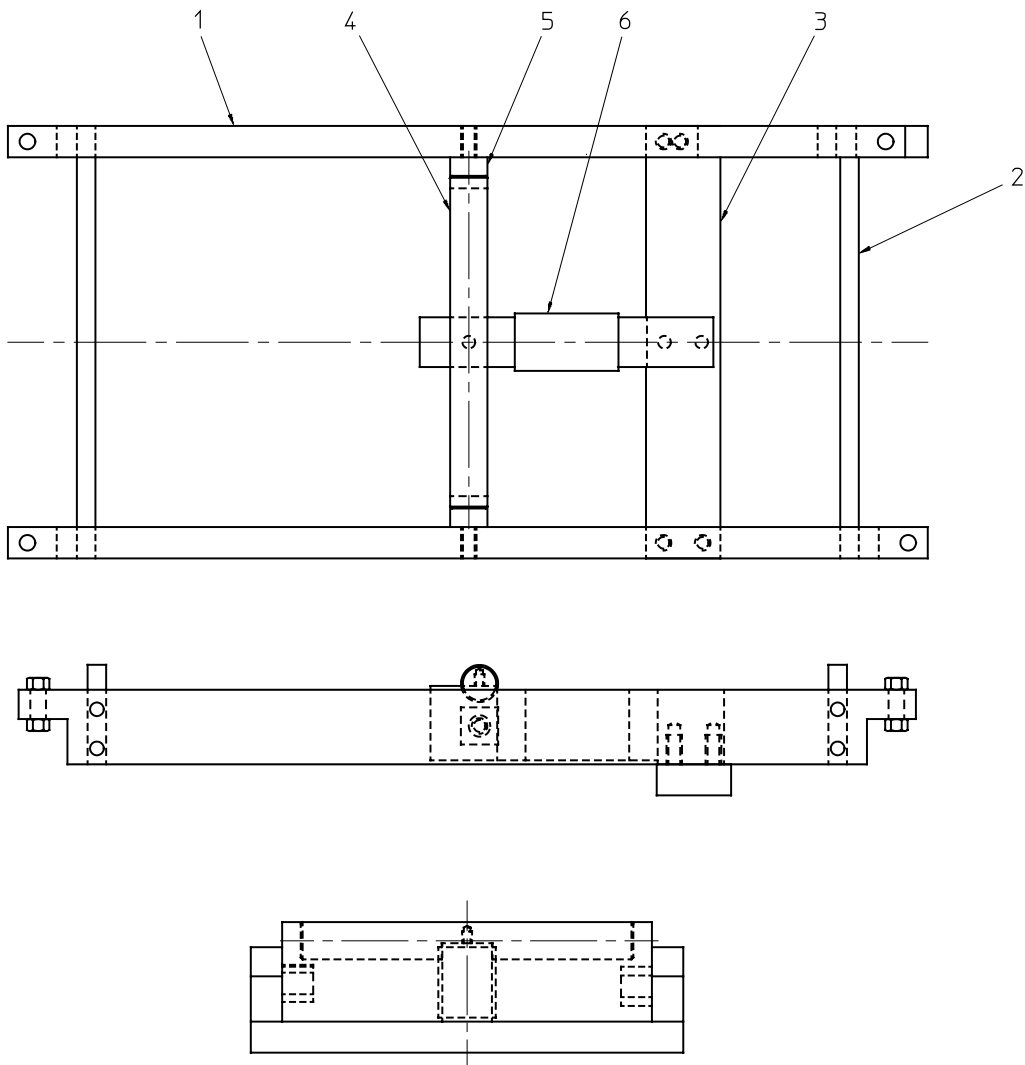
BELT TRANSPORT - ASSEMBLY

Used in 31-165 Gravimetric & 32-215 Volumetric Belt Feeders

310.165.160.030

ISSUE 2 9-03

LIME SLAKING SYSTEM



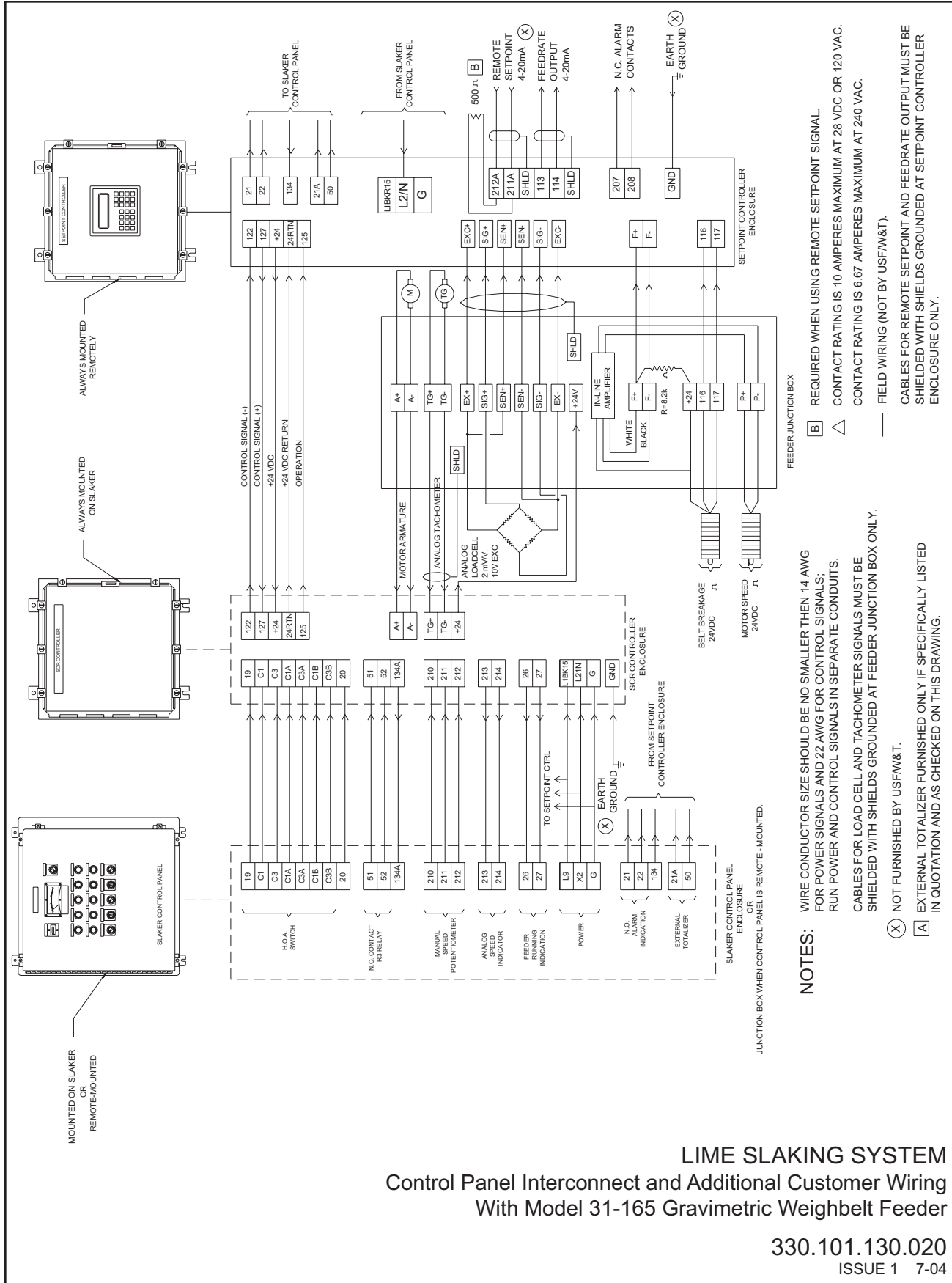
KEY NO.	PART NO.	QTY.	DESCRIPTION
1	AAB5312	2	SIDE WALL
2	AAB5315	2	END BAR
3	AAB5318	1	LOAD CELL MOUNTING BAR
4	AAB5321	1	WEIGH BAR
5	AAB5324	1	STOP
6	U29555	1	LOAD CELL

SERIES 31-165 GRAVIMETRIC FEEDER WEIGH BAR AND LOAD CELL - ASSEMBLY

310.165.160.040

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LIME SLAKING SYSTEM



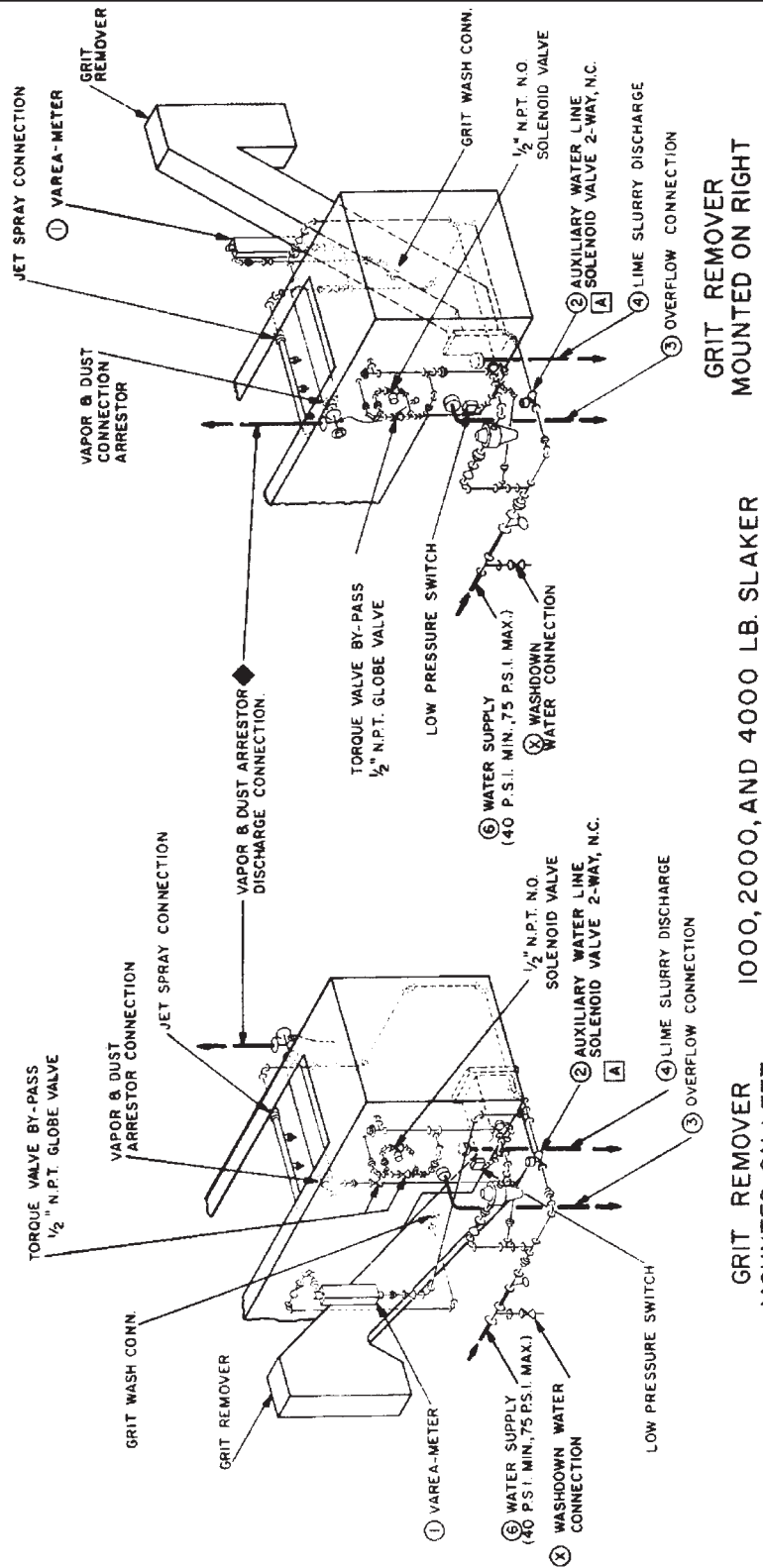
LIME SLAKING SYSTEM

Control Panel Interconnect and Additional Customer Wiring With Model 31-165 Gravimetric Weightbelt Feeder

330.101.130.020

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LIME SLAKING SYSTEM



GRIT REMOVER MOUNTED ON LEFT 1000, 2000, AND 4000 LB. SLAKER

GRIT REMOVER MOUNTED ON RIGHT

— PIPING BY U.S. FILTER / W & T

— FIELD PIPING (NOT BY U.S. FILTER / W & T)

[A] ACCESSORY ITEM FURNISHED ONLY IF SPECIFICALLY LISTED IN QUOTATION (USED ONLY WITH AUTOMATIC START-STOP CONTROL)

■ FLOW RATE ARE FOR MAXIMUM SLAKER FEED RATE.

(X) NOT FURNISHED BY U.S. FILTER / W & T.

◆ VENT INSIDE, DIRECTLY ABOVE FOR BEST PERFORMANCE (APPROX. 3 TO 6 FT.) OR VENT OUTSIDE, PROTECTING EXIT OF DUST FROM DIRECT DRAFTS WHICH MAY DECREASE THE EFFICIENCY OF THE DUST AND VAPOR ARRESTOR. DUCT SHOULD BE KEPT AS SHORT AS POSSIBLE FOR BEST PERFORMANCE.

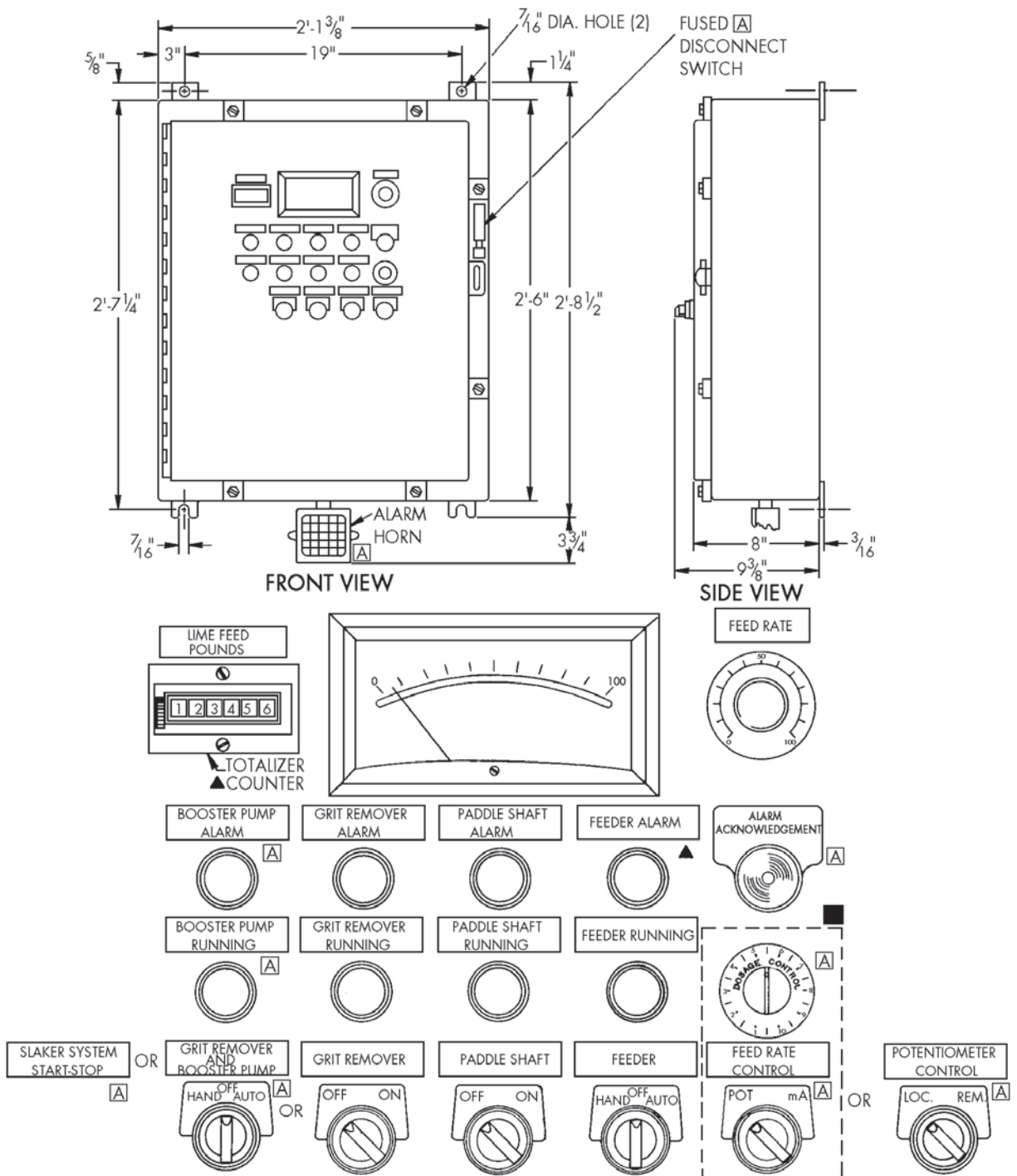
SLAKER FEED RATE LBS./HR	FEMALE NPT CONNECTIONS						WATER REQUIREMENTS (GPM)	
	①	②	③	④	⑤	⑥	Q	75 PSI. PRESSURE
1000	1/2"	1"	2"	2"	3"	1 1/2"		18
2000	3/4"	1"	2 1/2"	2 1/2"	3"	1 1/2"		28
4000	1"	1 1/4"	3"	3"	4"	1 1/2"		55

1000, 2000 & 4000 LB/HR LIME SLAKING SYSTEM - INSTALLATION PIPING With Conveyor-Type Grit Remover

330.100.120.011

ISSUE 1 11-02

LIME SLAKING SYSTEM

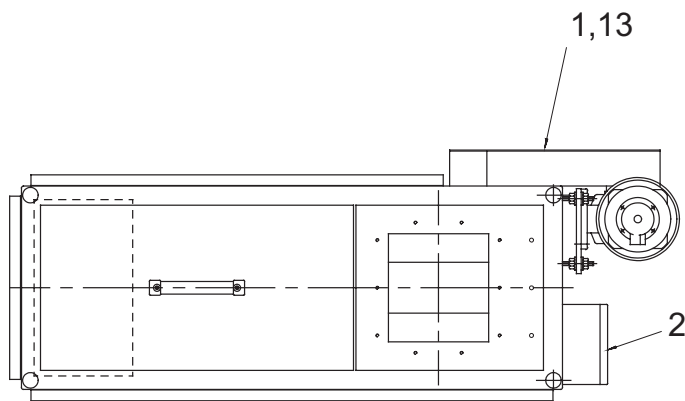


LIME SLAKING SYSTEM
Control Panel for Slaker With Feeder

330.101.100.040

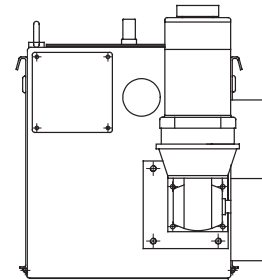
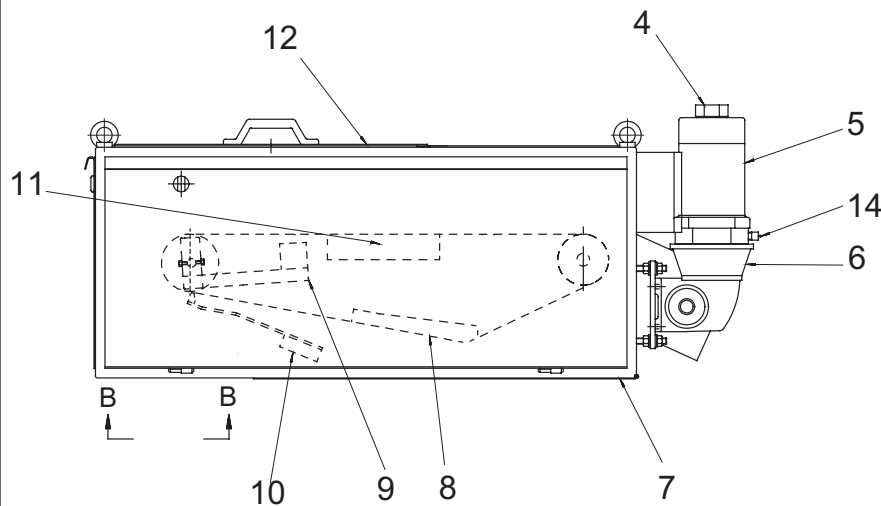
ISSUE 1 4-01

LIME SLAKING SYSTEM



ITEM	DESCRIPTION	QTY.
1	CHAIN GUARD	1
2	JUNCTION BOX	1
4	TACHOMETER	1
5	MOTOR	1
6	REDUCER	1
7	HOUSING	1
8	BELT TRACKING ASSEMBLY	1
9	BELT TENSION COUNTERWEIGHT	1
10	EXTERNAL BELT SCRAPER	1
11	WEIGH DECK ASSEMBLY	1
12	UPPER COVER PLATE	1
13	CHAIN AND SPROCKET	1
14*	PICK-UP SENSOR W/ TOOTH GEAR	1

NOTE: *USED WITH 31-165 GRAVIMETRIC BELT FEEDERS ONLY.



FEEDER HOUSING - COMPONENTS LOCATION
Used in 31-165 Gravimetric & 32-215 Volumetric Belt Feeders

310.165.000.010

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LIME SLAKING SYSTEM

LIME SLAKING SYSTEM

SECTION 3 - OPERATION

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Manual Control	3.2.2
Local-Remote Potentiometer Control	3.2.3
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LIME SLAKING SYSTEM

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For 2000 lb/h Feeder UXB29548	310.165.10B
For 4000 lb/h Feeder UXC29548	310.165.10C
Sizing Worksheet for Model 31-165 Gravimetric	
Belt Feeder	310.165.10E

3.1 Preparation for Initial Operation

Before initial operation, ensure that the procedures detailed in Section 2 have been carried out.

3.1.1 Varea-Meter (See Dwgs. 330.100.011.012, .022, and .032, In Section 5)

All Varea-Meters are shipped with the metering float removed from the tube and packed separately. When the piping has been completed, the float may be installed in the tube.



CAUTION: When unpacking the float and installing it in the tube, use extreme care to avoid damage, as any nicks or dents in the metering disc will result in improper readings.

The Varea-Meter is furnished with a detached scale. It may be more convenient to remove the tube from the rear. If there is not sufficient room in the rear for easy removal, remove the tube from the front after first dismounting the scale.

The clamping screw that holds the tube firmly in place is located on the right side of the frame near the top of the unit. Loosen the clamping screw to release pressure of the clamp on the bearing washer and upper retainer. When the clamping screw has been loosened sufficiently, lift the metering tube and the lower retainer until the lower retainer clears the inlet end fitting, then swing the lower end of the tube, with the retainer, out of the frame. The top of the tube will separate from the upper retainer.

Remove the lower retainer from the bottom of the tube, insert the float in the tube with the guide on the float up and replace the lower retainer in the bottom of the tube. The web in the lower retainer serves as a bottom stop for the float. Note that the web should be at the bottom of the retainer as it is installed.

After inserting the float and replacing the lower retainer in the tube, engage the top of the tube with the upper retainer and swing the bottom of the tube into position above the bottom end fitting, lifting the tube and upper retainer as necessary. When the lower retainer is centered over the bottom end fitting, tighten the clamp screw only enough to seat the flanges on the upper and lower retainers against the tube and the lower retainer against the bottom end fitting.



CAUTION: Do not tighten the clamp screw excessively. The only function of the clamp is to hold the tube firmly in place. Tightening the clamp does not compress the O-ring seals.

LIME SLAKING SYSTEM



CAUTION: Always remove the lower retainer with the tube as a unit to avoid dropping and possibly damaging the float.

If the detached scale was dismounted to facilitate removal of the tube, be sure to line up the zero mark on the scale with the reference line on the tube when remounting the scale.



CAUTION: When commencing operation, open the valves slowly so that flow through the Varea-Meter starts gradually. Opening the valves suddenly can cause a surge that might damage the float, tube, or upper stop and retainer. Opening the valves slowly will also aid in venting air or vapor, which must be done before proper operation can be achieved.

The flow rate is read on the scale opposite the reading edge of the float, as shown in Figure 3-1:

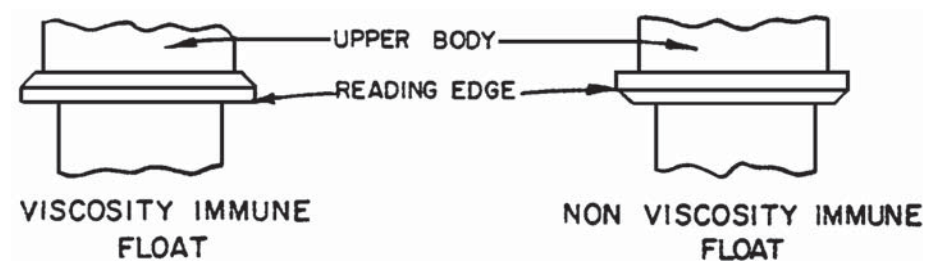


Figure 3-1

3.1.2 Tube Shield (See Dwg. 520.100.001.012, In Section 5)

The tube shield consists of a heavy piece of polycarbonate screwed to a bezel. The bezel is screwed to the frame.

To remove the shield, unscrew the screws that hold the bezel to the frame.



WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY, DO NOT REMOVE SHIELDS WHILE METER IS IN USE.

3.1.3 Setting of Timers and Time Delay Relay

When the system is furnished for automatic batching or system shut-down, make the following settings inside the control panel:

Time Delay Relay (TDR1)	60 seconds
Timer (T1)	5 minutes

LIME SLAKING SYSTEM

NOTE: These settings are approximate. Field conditions may permit shorter times or require longer time.

Time delay relay (TDR3) is factory set for 20 seconds and needs no further adjustment. If the setting has been disturbed, it must be reset to 20 seconds.

3.2 Operation

Before operating the slaker, be sure the drain and clean-out rubber plugs are in place, as shown in Figure 3-2.

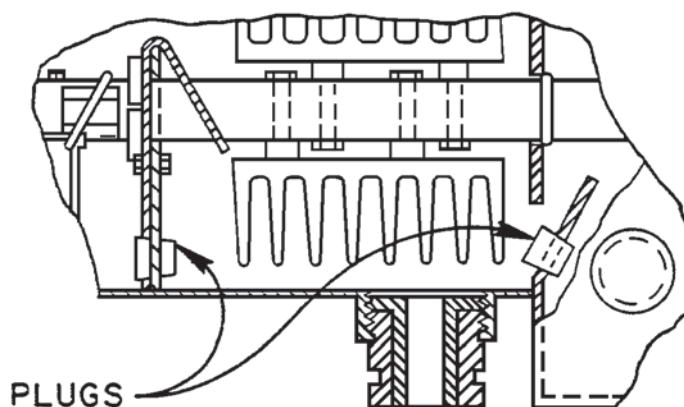


Figure 3-2



WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY BEFORE STARTING SLAKER SYSTEM, ENSURE THAT ALL BELT GUARDS AND SCREENS OVER THE SLAKING COMPARTMENT ARE INSTALLED. WHEN SLAKING, OPEN COVERS CAREFULLY BECAUSE HOT LIME MAY BE THROWN OUT. USE APPROPRIATE FACE SHIELD AND PROTECTIVE CLOTHING WHEN CLEANING OR CLEARING AREAS CONTAINING AN ACCUMULATION OF LIME. THESE AREAS MAY CONTAIN UNSLAKED LIME WITH TRAPPED STEAM UNDER PRESSURE, WHICH MAY BLOW BACK.



WARNING: TO AVOID POSSIBLE ENTANGLEMENT OR SEVERE PERSONAL INJURY, KEEP HANDS AND LOOSE CLOTHING CLEAR OF MOVING WEIGHBELT. REPLACE COVERS AFTER INSPECTING AND SERVICING.

3.2.1 Initial Start

- a. Turn off the main electrical power supply to the control panel.

LIME SLAKING SYSTEM

- b. Open the manual torque control bypass valve.
- c. If panel is supplied for manual operation, proceed to Step d. If panel is supplied or automatic batching or system shutdown, place Automatic Mode Selector Switch (SS-4, located on rear of front panel) in position 2 and make sure that control switch CC is open.
- d. Turn on the main water supply valve. With no power supply to the panel, the bypass solenoid valve SV-2 should be open (de-energized) and water should be admitted to the slaking chamber. The manual solenoid valve bypass (mounted in parallel with SV-2) should be closed.
- e. Turn on the water supply to the vapor and dust arrestor.
- f. When the slaking hamber is approximately 1/4 filled with water, turn on the main electric power supply to the control panel. Turn off torque valve supply valve located upstream of the pressure reducing valve (SV-2 opens when paddle shafts are not rotating).
- g. Turn on the water supply to the jet spray nozzles. These should be directed along the center of the separator weirs. Spray should not extend beyond either edge of weir.
- h. Set the Grit Conveyor Switch on the control panel at ON or HAND. The grit conveyor motor should start and the Grit Conveyor Running Light on the panel should light.
- i. Within about one minute, the Slaker Alarm Light should light and the Audible Alarm should sound. Silence the audible alarm by pushing the Alarm Acknowledgment button.
- j. Slowly open the water alves at the area-Meter. Adjust the valve at the top of the slakers up to 12 gpm. Optimum water quantity varies with the grade of lime and the size of grit particles that are to be removed. This must be determined locally. (See Step o.)
- k. Set the Paddle Shaft Switch to the ON position. The paddle shafts should rotate, the Paddle Shaft Running Light should light, and, within a minute or less, the Slaker Alarm Light should go out.
- l. Open the rotary valve to admit lime to the feeder.
- m. Open the torque valve supply valve (SV-2 should remain closed).

- n. Set the Feeder Switch to HAND position. Set Feed Rate at desired value by adjusting the potentiometer on the panel. The feeder should start feeding lime to the slaking chamber, where it should be slaked into paste form, discharged over the separation weirs, diluted to a slurry in the separation chamber, and delivered through the slaker discharge.

NOTE: During normal operation of the lime slaker system, the water pressure regulating valve should be set to give a pressure of 30 psig. However, under some operating conditions, such as with high rates of highly reactive lime, a slightly higher pressure setting may be required. A low pressure switch in the torque valve supply will prevent the feeder from operating if the pressure is below 20 psig. To reset the switch, the pressure must rise above 28 psig.

- o. After operation has stabilized, see Dwg. 330.100.004.013 or .014, in Section 5, and adjust the torque control water valve to obtain the desired paste consistency. Adjust both sides equally, making 1/2-turn increments. Tightening will increase or stiffen paste; loosening will decrease paste consistency.

NOTE: If paste is too thick and cannot be thinned with a torque valve adjustment and/or increase in the water pressure to torque valve, check for overfeeding of lime.

- p. After slaker has been in operation for 15 or 20 minutes, examine the grit being discharged from the grit remover. If necessary, readjust the Varea-Meter flow to obtain optimum grit removal. Decreasing the flow will result in the removal of finer grit particles and will increase the amount of grit removed. Increasing the flow will result in the removal of less-fine grit and will decrease the amount of grit removed. If minimum Varea-Meter flows do not satisfactorily remove fine-enough grit particles, it is possible to remove an insert located where the slaker is connected to the grit conveyor. For a given flow, removal of the insert will result in the removal of finer particles and increase the total amount of grit removed.



WARNING: TO AVOID SEVERE PERSONAL INJURY, SHUT DOWN THE SLAKING SYSTEM BEFORE ATTEMPTING TO REMOVE THE INSERT.

3.2.2 Manual Control

After the initial start, the system may be stopped and started by means of the FEEDER switch on the control panel being turned to the OFF or

LIME SLAKING SYSTEM

HAND position. The AUTO position is used if the feeder is controlled from pulse duration flow proportional contacts and the Setpoint Controller. The GRIT CONVEYOR and PADDLE SHAFT switches remain in the ON position.

For a complete shut-down:

- a. Turn the FEEDER switch to OFF.
- b. Run the paddle shafts and grit conveyor for at least five minutes to slake the last lime added.
- c. Open the manual solenoid valve bypass mounted in parallel with bypass solenoid valve SV-2 to admit dilution water to the slaking chamber.
- d. After the paste is diluted to a thin slurry, close the manual solenoid valve bypass.
- e. Turn the PADDLE SHAFT and GRIT CONVEYOR switches to OFF.
- f. Turn off water supply.

To resume operation:

Turn on the water supply, the grit conveyor, the paddle shaft, and the feeder.

3.2.3 Local-Remote Potentiometer Control

Operation is as described above under MANUAL CONTROL, with the added feature that a selector switch permits remote or local control of feed. The remote control potentiometer may be operated either manually or by other equipment.

3.2.4 Automatic Batching or System Shutdown

With this type of control, a HAND-OFF-AUTO switch (SSI), a timer (TI), a relay (RT), a time delay relay (TDRI), and an AUTOMATIC MODE SELECTOR SWITCH (SS4) are added to the basic manual panel. This group of components is mounted on the rear of the front panel on the control panel.

LIME SLAKING SYSTEM

When the GRIT REMOVER switch is set at HAND, operation of the slaker system is the same as that described above under MANUAL CONTROL.

When the GRIT REMOVER switch is set at AUTOMATIC, the slaker system may be started and stopped automatically in response to high and low liquid level control probes in a holding tank or in response to a low flow switch in a water system. The AUTOMATIC MODE SELECTOR switch makes it possible to achieve this type of operation in either of two ways:

- The recommended method of automatic start-stop operation or system shutdown is obtained by placing the AUTOMATIC MODE SELECTOR switch (SS-4) in Position 2. The operating sequence in this position is described on the SLAKER SYSTEM CONTROLS WIRING DIAGRAMS in Section 5 of this manual and is arranged so that the paddle shafts and grit remover run continuously. When the STOP sequence is initiated, by closing contact CC, the feeder stops immediately and, after the period set on TIMER T-1, the jet spray water and the grit remover water shut off. Normally, a five-minute setting on T-1 should be adequate to provide for proper paste cut-off and dilution.
- In those situations where it is desired to shut off the paddle shafts and grit conveyor during the system shut-down period, the AUTOMATIC MODE SELECTOR switch (SS-4) is placed in Position 1 to achieve the optional system shut-down sequence described on the aforementioned WIRING DIAGRAMS. In this instance, it is essential that the period set on TIMER T-1 be long enough to dilute the paste in the slaking chamber to the point where it cannot harden during the system shutdown period. Set Timer T-1 for 10 minutes initially and observe for proper dilution. Adjust timer as necessary.

The torque bypass solenoid valve (SV-2) is used on all slakers regardless of the panel configuration. This is a normally open valve that requires power to close it. In normal operation, the torque valve supply valve (located on the high pressure side of the pressure reducing valve) should be open. In addition to the functions performed in the automatic operating sequences, in the event of a power failure or paddle shaft alarm, solenoid valve SV-2 will open automatically and flood the slaker compartment to prevent the paste from hardening. If the power supply to the panel is intentionally shut off to service the equipment, the torque valve supply valve may be used to cut off dilution water to the slaker chamber. The manual solenoid valve bypass that is connected in parallel with the torque bypass solenoid valve SV-2 (see Dwg. 330.101.013.010 in Section 5) may be used to dilute

LIME SLAKING SYSTEM

the paste in the slaking chamber without removing power from the control panel. During normal operation it should remain closed.

3.2.5 Paste Consistency



WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY, KEEP COVERS CLOSED EXCEPT WHEN IT IS NECESSARY TO OPEN THEM FOR OBSERVATION. WHEN SLAKING, OPEN COVERS CAREFULLY BECAUSE HOT LIME MAY BE THROWN OUT.

The following test is a good method of determining proper paste consistency:

The paste is sufficiently thick if the depression or track left by the last paddle blades retain their form (appearance of whipped cream). Paste that is too thin will not properly carry grit and other foreign particles out of the slaking chamber.

3.3 Theory of Operation

Flow Diagram 330.100.180.012 illustrates a USF/W&T Lime Slaker. The quicklime feeder in this illustration is mounted directly above the slaker. It may also be mounted at right angles to, or in line with but extending away from, the slaker. Quicklime enters the slaking section through the vertical chute on the left. The hydrated lime slurry is discharged by gravity through the slurry discharge section on the bottom of the right end.

Quicklime and water are fed continuously to the inlet end of the slaking section in a ratio of approximately 2:1, water to quicklime, by weight. The lime-water mixture is thoroughly mixed and moved to the discharge end of the slaking section by the two sets of counter-rotating intermeshing paddles. The mixing paddle shafts are driven by a gear reduction unit. The torque exerted on the gear reduction unit mechanically controls the slaking water through the torque-controlled water valve. An increase in torque, indicating an increase in viscosity of the paste, opens the water valve, admitting additional slaking water to the inlet end of the slaking compartment. The viscosity of the lime paste can be varied by adjusting the compression on the spring between the gear reducer and the water control valve. The consistency of the paste is maintained heavy enough to carry grit and insoluble material through the slaking section. A thick paste is necessary to homogenize, through shear action, the lumps that result from rapid hydration of the pebbles.

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As a ribbon of paste moves over the weir at the discharge end of the slaking section, it is broken by water jet sprays and drops into the grit removal section as a lime slurry. Rakes attached to the same shaft as the mixing paddles agitate the slurry to aid effective grit removal without settling of the lime particles. The slurry then flows under a dust shield and over a weir to the discharge port in the slaker.

A classifier is provided in the bottom section of the grit conveyor for effective separation of the grit from the slaked lime. Fresh water is applied in the grit conveyor to continuously wash lime from the grit particles. By using water rather than lime suspension to wash the grit, loss of lime is held to a minimum. A water-operated dust and vapor arrestor keeps the steam away from the quicklime feeder discharge. The operating water can be discharged into the grit removal section or to waste.

Because of the small size of the slaking section, this unit can be placed in operation in about five minutes. For starting the slaker, a manually-operated valve permits bypassing the torque-actuated water control valve. It is also used to provide additional dilution of the paste if an extended shutdown of the feeder and slaker is necessary. It is not necessary to drain the slaker for extended shut-downs since the heat required for slaking is built up quickly as soon as the quicklime feeder is started.

The lime slaker system is designed with interlocks and alarms to ensure proper operation and warning of a malfunction.

The torque bypass solenoid valve is a normally open type and closes upon being energized. This valve provides slaking chamber dilution water for the optional automatic batching or system shut-down modes and floods the slaking chamber in case of a power failure or paddle shaft alarm (paddle shafts not rotating). In addition, a manual solenoid valve bypass, mounted in parallel with the normally open torque bypass solenoid valve, may be used to dilute the paste in the slaking chamber without removing power from the control panel.

The interlocks will stop the lime feeder if the grit conveyor or paddle shafts stop or the torque valve water pressure drops below 20 psi. Stoppage of the grit remover for more than 30 seconds will cause the slaker alarm to energize relay R9. This will stop the feeder and energize the audible and visible alarms (grit remover alarm light). Stoppage of the paddle shafts for more than 10 seconds will cause the slaker alarm to energize relay R4. This will also stop the feeder and energize the audible and visual alarms (paddle shaft alarm light). In addition, when the paddle shafts stop, the torque valve bypass solenoid valve (SV2) will open and flood the slaking compartment. The low pressure switch, which opens for pressures

below 20 psi and closes again for pressures above 28 psi, prevents the lime feeder from operating when there is insufficient water pressure for proper operation. There is no alarm for a low water pressure condition.

During normal operation of the automatic batching or system shut-down mode, relay R7 will start and stop the lime feeder.

A problem or alarm condition with the lime feeder can energize audible or visual system alarms. The feeder will stop in the alarm condition, but the grit remover and paddle shaft will remain operational.

All of the above feeder interlocks de-energize the feed control relay (R3) whose contacts short the feed rate control potentiometer (FRCP) signal and stop the belt drive motor. As an added backup, when relay R3 drops out, time delay relay TDR3 is energized and starts timing. When it times out, in approximately 20 seconds, an armature lead to the belt drive motor is opened and the motor must stop if it hasn't already done so. During normal operation the motor coasts to a stop as soon as R3 is de-energized and TDR3 provides a backup in the event of a malfunction in the motor control circuit.

3.4 Preparation for Operation

3.4.1 Removing Shipping Locks and Protective Guards



WARNING: DO NOT REMOVE THE SHIPPING LOCKS OR GUARDS BEFORE THE INSTALLATION IS COMPLETE.

- a. Remove the top and side covers of the feeder.
- b. Raise the material guide plates on each side of the feeder by loosening the nuts.
- c. Slowly remove the bolt securing the red plate to the red bracket.
- d. Slowly remove the red bracket. This allows the counterweight to move into position.
- e. Slide out the red plate.
- f. Reposition the material guide plates.
- g. Replace the top and side covers.
- h. Retain both the red plate and bracket for future maintenance.

3.4.2 Preliminary Checks

- a. Verify that the installation process is complete.
- b. Make sure that equipment and material are available for feeder testing.
- c. Confirm that the test weights for static and dynamic calibration are on site.
- d. Have an adequate supply of recommended spare parts in stock.
- e. Check that all electrical connections are in accordance with the wiring diagram.
- f. Check that all material inlets and outlets are connected through appropriate flexible sleeves where necessary.
- g. Verify that the belt edges are properly inserted into the frame of the belt tracking system.
- h. Check that all bolts are tight and secure.
- i. The belt tensioning weight on the driven roller should move freely.
- j. The drive chain should be properly tensioned to allow 1/4 inch of play.
- k. The driven roller must be easily turned by hand.
- l. The material guide rails must be properly positioned so that they do not touch the belt at any point. Angle the material guide rails so that the spacing at the discharge end is greater than that at the inlet end. This will prevent any large pieces from wedging between the belt and the guide rails and possibly jamming the belt.
- m. The outside belt scraper must be properly positioned on its post.
- n. The scrapers should be parallel to the belt so that they contact the belt over its entire width.

3.4.3 Running the Feeder

Start up and operation of the Belt Feeder are performed at the control enclosures included with this shipment. The version of software installed

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in the setpoint controller determines how the material will be fed and what features are available.

The operation of the setpoint controller and its software is described in detail in paragraph 3.5. Please read this information thoroughly before attempting to start up the Belt Feeder for the first time.

3.5 Setpoint Controller

The setpoint controller for the Series 31-165 feeder has a 24-key membrane keypad for entering commands and parameters. It consists of operator, function, and numeric keys, which are listed in Table 3-1 and referenced by number in Dwg. 310.165.170.020 to facilitate identification.

Table 3-1. Setpoint Controller - Front Panel Controls and Indicators

INDEX NO.	CONTROL/INDICATOR	FUNCTION
1	Start Key (OPERATOR KEY)	When depressed, starts feeder operation. Status LED indicator (in left corner of key) glows green.
2	Setpoint Key	Displays setpoint values in units of lb/h, kg/h, and %. Also used for changing setpoint.
3	Belt Load Key	Displays the actual value of belt load in units of lb or kg.
4	Up Cursor Key	Used to scroll up through menus, parameters, or selections.
5	LCD Display Displayed Parameters Displayed Alarms Alarm Indication	24-character, 2-line, backlit LCD read-out. Displays operating parameters and alarm messages during automatic operation of the feeder. Setpoint, feedrate, belt speed, belt load, control difference, and totalization. Feedrate min/max, belt load min/max, speed min/max, setpoint, and fault states. Normally open and normally closed relay contacts are provided, rated 10 amps maximum at 28 Vdc or 120 Vac with 80% power factor. Current rating is 6.67 amps maximum at 240 Vac with 80% power factor. Contacts are independent of and isolated from each other. Normally open relay contacts are allocated for system use only and not available to the customer. Manually closed contacts are for customer use.
6	Clear Key	Used to delete digits of incorrect numeric input.

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Table 3-1. Setpoint Controller - Front Panel Controls and Indicators (Cont'd)

INDEX NO.	CONTROL/INDICATOR	FUNCTION
7	Numeric Key Pad	Used to enter data within menu modes and during normal feeder operation.
8	Down Cursor Key	Used to downward scroll through menus, parameters, or selections.
9	Enter Key	Used for signaling end of data entry and navigating through controller menus.
10	Menu Key	Used to access menu configurations (see Dwg. 310.165.180.010).
11	Step Key	Displays feeder operating parameters (i.e., setpoint, feedrate, belt load, belt speed, etc.).
12	Autotare Key	Selects and displays the autotare mode of operation.
13	Actual Value Key	Displays the feedrate of feeder in units of lb/h or kg/h.
14	Alarm Acknowledge (OPERATOR KEY)	When depressed, alarm condition is acknowledged and alarm relay is reset. Alarm message on LED Display (5) and red blinking status LED (1) extinguishes.
15	Stop Key (OPERATOR KEY)	When depressed, stops feeder operation. Status LED (1) extinguishes.
Not Shown	Predetermining Counter (optional)	Six-digit counter with both manual and electric reset. Used for batching to indicate weight of material fed. Located in Setpoint Controller Enclosure.

After switching on main power, an internal test will run for approximately two seconds. The display will then indicate the “turn-on” message consisting of the feeder type, controller type, and version of software. The message shown below will remain activated until another menu selection is made.

**Weigh-belt feeder
Congrav S-E G S1.6**

3.5.1 Explanation of Operator Keys

There are three operator keys, as follows:

- **START KEY (1):** If the controller is OFF, press the START key to start the feeder. The STATUS LED in the upper left-hand corner of the START key will glow green. For this to occur, all of the following “start” conditions must be satisfied:

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- * The MODE of operation has been selected in Menu #01.
- * There are no existing alarms or faults.
- * The weighing range is greater than zero.
- * The auto tare value is greater than zero.

If any of these “start” conditions is not met, the STATUS LED will glow red and the feeder will not start. The display will indicate an “ST” in the status field located at the left end of the first line. The display will also indicate which “start” condition was violated by flashing the corresponding message in the second line. An example of a violation caused by a zero tare weight value is shown below:

ST Setpoint 1000 lb/h
Tare weight = 0

If the feeder is running but an alarm occurs, the feeder will stop if configured for “cut-out” in Menu #05 and the STATUS LED will blink red. Note that alarms can be configured for “cut-out” or “report only” in alarm Menu #05. The display will indicate the symbols appropriate for the particular alarm in the status field located at the left end of the first line. The display will also indicate which alarm is present by flashing the corresponding message in the second line.

An example of an alarm message caused by a belt speed below the minimum configured value is shown below:

S- Setpoint 1000 b/h
Speed Min

If the feeder is running but an interlock occurs, the feeder will stop and the STATUS LED will blink orange. The feeder will restart automatically when the interlock condition is removed. The display will not flash any message during this time. The interlock feature must be configured in Menu #07.

- **STOP KEY (15):** The STOP key stops the feeder, deactivates the selected operational mode, and turns off the STATUS LED. It is also used to exit the test programs.
- **ALARM ACKNOWLEDGE KEY (14):** When an alarm occurs, the STATUS LED blinks red and the controller indicates which alarm has been actuated by flashing an appropriate message in the second line of the display. The feeder shuts down if the “cut-out” mode has been configured in Menu #05 until the problem is corrected and the controller is restarted. Note that alarms can be configured for “cut-

out” or “report only” in alarm Menu #05. During this time, the alarm control relay CR3 in the setpoint controller enclosure actuates and all keys become inactive, except for the ALARM ACKNOWLEDGE key. Pressing this key clears the alarm message from the display, stops the STATUS LED from blinking red and resets the alarm relay. Pressing the ALARM RESET pushbutton on the door of the SCR speed controller enclosure accomplishes the same thing.

The Troubleshooting section describes how to correct the various alarm conditions. The possible alarm messages are as follows:

- * **Beltload Minimum:** The weight of material on the belt has fallen below its lower limit. The status field displays “UL”.
- * **Beltload Maximum:** The weight of material on the belt has exceeded its upper limit. The status field displays “OL”.
- * **Speed Minimum:** The speed of the belt has fallen below its lower limit for longer than six seconds. The status field displays “S-”.
- * **Speed Maximum:** The speed of the belt has exceeded its upper limit for longer than six seconds. The status field displays “S+”.
- * **Deviation -:** The actual feedrate has exceeded the setpoint by more than its limit and for longer than the alarm cut-out time configured in Menu #04 for Feeder Parameters. The status field displays “D-”.
- * **Deviation +:** The actual feedrate has fallen below the setpoint by more than its limit and for longer than the alarm cut-out time configured in Menu #04 for Feeder Parameters. The status field displays “D+”.
- * **Setpoint Fault:** The entered setpoint was outside its permissible limits. The status field displays “setpoint fault”.
- * **Input Fault:** The last input of the operator was not valid. The status field displays “input error”.
- * **Input Interlocked:** All input is blocked and must be released by providing the proper password. The menus from #04 to #08 can be protected in this manner. The password must be entered in Menu #03. The status field displays “-”.

- * **SB - Fault:** Access to a memory module by the microprocessor program could not be accomplished. This is an internal failure and indicates that software or hardware may have failed. The status field displays “SB fault”.
- * **AT Fault:** The Auto Tare procedure was interrupted because the belt load was less than or equal to zero or exceeded the upper limit for the Auto Tare Range. The status field displays “AT fault”.
- * **Feeder Operating:** An attempt was made to modify a menu parameter while the feeder was started and running. Some parameters can not be changed while the feeder is running and require that the feeder be stopped. The status field displays “Feeder Operating”.
- * **Broken Belt:** The proximity sensor at the driven roller has not generated the expected minimum frequency as computed by the setpoint controller. The belt may either be broken, slipping, or jammed. The status field displays “Broken Belt”.

3.5.2 Explanation of Numeric Keys

There are 11 numeric keys consisting of the digits 0 through 9 and a decimal point. These keys (7) are used to enter data within the menu modes as well as during normal operation of the feeder.

3.5.3 Explanation of Function Keys

There are 10 function keys, as follows:

- **SETPOINT KEY (2):** The SETPOINT key displays the current value of the setpoint in units of lb/h, kg/h, or percentage and also provides a means for changing the setpoint.

To view the setpoint, press the SETPOINT key. The current value of the setpoint will appear in the top display line, preceded by the operating mode GF or GM. GF stands for gravimetric feeding and GM stands for gravimetric measuring.

In the GF mode, the feeder delivers material at the rate defined by the setpoint in units of lb/h or kg/h. It will speed up or slow down in response to variations in material density to maintain the prescribed setpoint.

In the GM mode, the feeder delivers material at a constant belt speed as defined by the setpoint in units of percentage belt speed and merely

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totalizes throughput. It will not speed up or slow down in response to variations in material density and therefore does not control to a specific feedrate.

To change the setpoint, press the SETPOINT key, type in the new value and press the ENTER key (9). As the new value is typed, it appears in the bottom display line on the extreme left. When the ENTER key is pressed, the top display line will change to indicate the new value of setpoint after a slight delay and the feeder will change speed as required to satisfy the setpoint. An example of changing a setpoint of 800 lb/h to a new value of 925 lb/h, while in the gravimetric feeding mode, is shown below:

GF Setpoint 800 lb/h
925

If an error is made while typing the new setpoint, pressing the CLEAR key (6) will remove the incorrect entry and allow you to retype the correct one.

- **ACTUAL VALUE KEY (13):** The ACTUAL VALUE key displays the instantaneous feedrate of the feeder in units of lb/h or kg/h, as computed by the setpoint controller algorithm.

To view the current feedrate, press the ACTUAL VALUE key. The actual value of feedrate will appear in the top display line in units of lb/h or kg/h and will vary in response to the actual amount of material being fed. The bottom display line will be blank. An example of the display is shown below:

GF Act. Value 765.3 lb/h

- **AUTOTARE KEY (12):** The AUTOTARE key is used to select the Autotare Mode in which the deadweight of the feeder can be electronically subtracted or tared from the displayed belt load.

To enter the Autotare Mode, press the AUTOTARE key. The current value of the tare weight will appear in the top display line, preceded by "AT" in the status field. The bottom display line will indicate the value of belt load that is currently being weighed over the weighbar. An example of the display is shown below:

AT Tare 0.025 lb
Belt Load 0.037 lb

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To begin the Autotare procedure, press the START key. The Feeder will run for a short period of time and then stop automatically. While the feeder is running, the value of belt load in the bottom display line will change continuously to indicate the instantaneous belt load reading at various points along the belt.

The tare value in the top display line will also change continuously to indicate the average value of tare weight that is being computed. When the autotare procedure is completed, the feeder stops, the belt load value in the bottom display line becomes very close to zero, and the display resumes normal mode. The autotare value is automatically stored in memory.

If the message “tare weight = 0” is displayed in the bottom display line, it means that a start condition related to autotare has been violated. Either the belt load is less than or equal to zero or the belt load exceeds the autotare range that has been configured in Menu #04 for feeder parameters. An example of a display caused by a zero tare weight value is shown below:

ST Setpoint 1000 lb/h
Tare weight = 0

- **BELT LOAD KEY (3):** The BELT LOAD key displays the actual value of belt load that is being weighed over the weighbar, in units of lb or kg.

To view the current weight, press the BELT LOAD key. The current belt load value will appear in the top display line and will vary in response to the actual amount of material present. The bottom display line will be blank. An example of the display is shown below:

GF Beltload 5.327 lb

- **STEP KEY (11):** The STEP key displays the values of six parameters in both lines of the display. The default configuration is to indicate the setpoint in the top display line and actual feedrate in the bottom display line. The other possible choices in their displayed sequence are setpoint, actual feedrate, belt load, throughput, belt speed, and control deviation.

To view the current values, press the STEP key. The current values of the selected parameters will be indicated in both display lines.

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To change a selection, press the STEP key and then use either the UP cursor key (4) to select the top display line or the DOWN cursor key (8) to select the bottom display line. Press the STEP key to scroll through the possible selections for the selected line.

An example of a typical display is shown below:

GF Setpoint 800.0 lb/h Act. Value 799.7 lb/h

- **MENU KEY (10):** The MENU key is used to access the eight configurable menus. Refer to Dwg. 310.165.180.010 for an overview of the menu structure.

To access Menu #01, press the MENU key. The UP cursor and DOWN cursor keys are then used to move from one menu to another.

To access the first parameter in a menu, press the ENTER key. Some parameters require a numeric input while others require a choice from among alternative menu-supported selections. The UP cursor and DOWN cursor keys are used to move from one selection to another within a parameter. Pressing the ENTER key accepts the selection and stores it in memory. The UP cursor and DOWN cursor keys are then used to move from one parameter to another within a menu.

The CLEAR key functions as a “backspace” key to delete, step-by-step, the digits of a numeric input.

Within a menu, press the ENTER key once to return to the top of the current menu and again to return to Menu #01.

A menu can always be exited immediately by pressing another function key.

- **UP CURSOR KEY (4):** The UP cursor key is used to scroll up through menus, parameters, or selections.
- **DOWN CURSOR KEY (8):** The DOWN cursor key is used to scroll down through menus, parameters, or selections.
- **ENTER KEY (9):** The ENTER or E key serves two purposes. First, pressing the ENTER key signals the end of data entry and makes the setpoint controller accept and store the new value. Second, the ENTER key is used to navigate through the menus. To access the first parameter in a menu, press the ENTER key once. Once within

a menu, press the ENTER key once to return to the top of the current menu and again to return to Menu #01.

- **CLEAR KEY (6):** The CLEAR key functions as a “backspace” key to delete, step-by-step, the digits of an incorrect numeric input. Once the ENTER key has been pressed, the CLEAR key can no longer be used to correct an entry.

3.5.4 Explanation of Menu Modes

There are eight user-configurable menus. Refer to Dwg. 310.165.180.010 for an overview of the menu structure and Dwgs. 310.165.10A,B&C for default values of all parameters.

3.5.4.1 Parameter Input

There are two types of parameters that can be input into the menus. They are menu-supported parameters and numerical parameters.

To access the first menu-supported parameter in a menu, press the ENTER key. The UP cursor and DOWN cursor keys are used to move from one selection to another within a parameter. Pressing the ENTER key accepts the selection and stores it in memory. The UP cursor and DOWN cursor keys are then used to move from one parameter to another within a menu.

To access the first numeric parameter in a menu, press the ENTER key. Use the numeric keys on the keypad to enter the desired value of the parameter. The CLEAR key functions as a “backspace” key to delete, step-by-step, the digits of an incorrect numeric input. Once the ENTER key has been pressed, the CLEAR key can no longer be used to correct an entry.

3.5.4.2 Menu #01 - Mode

The belt feeder has two operating modes. They are “gravimetric feeding” and “discharge”.

In the “gravimetric feeding” mode, the actual value of feedrate is computed as the product of the measured belt load and the measured belt speed. The belt load signal is processed with the tare value already compensated. The actual value is compared with the setpoint to generate a control difference for the PID control algorithm. This control difference is an error that is constantly driven to zero by adjusting the belt speed. If the control difference exceeds the limits specified in Menu #04 - Feeding Parameter for longer than the specified alarm cutout time, the controller alarms. If alarm cutout has been turned on for the control difference in Menu #05 - Alarm Cut-Out, the feeder stops. An example of the display for “gravimetric feeding” mode is shown below:

01 Mode select
grav. feeding GF

In the “discharge” mode, the actual value of feedrate is computed as the product of the measured belt load and the measured belt speed. The belt load signal is processed with the tare value already compensated. The actual value, however, is not compared with the setpoint to generate a speed correction. The setpoint is input as a percent of full scale and the belt speed is held constant for a given setpoint. An example of the display for “discharge” mode is shown below:

01 Mode select
discharge DI

The following status indications may be displayed for a weighbelt feeder:

Status	Remark
GF	The mode gravimetric feeding is active. If feeding has started, this status also means that the actual value is within the control range required.
DI	The mode discharge is active.
AT	The mode auto-tare is active.
ST	At least one start condition has not been fulfilled.
--	The feeding has been stopped and it is interlocked via the digital input interlocking.
≡	The feeding has been started but it is still interlocked via the digital input interlocking.

3.5.4.3 Menu #02 - Feeding Parameter

This menu is used to set the PID values for optimization of feeder control.

Description of the functional groups:

NOTE: These controller parameters also can be changed while the feeder is operating.

Nr	Function	m	n	Input Possibilities	Short Description
01	Controller 1 P-term		X	0.01 - 200	This function allows you to vary the proportional amplification (P-term).
02	Controller 1 I-term		X	0.01s - 100s	This function allows you to vary the reset time (I-term)
03	Controller 1 D-term		X	0.1s - 50s	This function allows you to vary the time of derivative action (D-term).

Column m = input menu supported; Column n = numerical input.

The controller monitors belt load and belt speed to determine the actual feedrate. It then compares the set point to the actual feedrate. The PID algorithm optimizes the control of the belt feeder through an analog output to the SCR drive to maintain a tight tolerance to the setpoint rate.

The following table gives typical starting values for various rates. These values may change to optimize the flow of the material.

Output in kg/h	P1	I1	D1
1-5	40	0.15	0
5-20	30	0.25	0
20-100	20	0.5	0
100-500	15	0.75	0
500-1000	10	1.0	0
1000-2000	5	2.0	0
2000-10000	3	4.0	0
10000-50000	1	8.0	0

Default values: P=1.500, I=2.000 seconds, D=0.000

3.5.4.4 Menu #03 - Code

This menu is used to lock and unlock menus #04 through #08.

03 Code
interlocked

Nr	Function	m	n	Input Possibilities	Short Description
01	Code input		X	0133	This menu allows you to lock and unlock menus (4-8)

Column m = input menu-supported; Column n = numerical input.

The security code “0133” is entered to unlock or “release” menus #04 through #08. After an interruption of power or a RAM reset, the menus #04 through #08 are locked.

The status is displayed in the lower right corner of the screen. After entering the security code the status indication “released” is displayed. Entering a number between 0 and 9 locks the menus #04 through #08.

**** **interlocked**

The security code digits are shown as “*” signs in the display. The messages interlocked or released show the status.

3.5.4.5 Menu #04 - Feeder Parameter

This menu is used to calibrate the weigh belt feeder as well as setting design parameters for alarms.

04 Feeder parameters

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Nr	Function	m	n	Input Possibilities	Remark
01	Max. output master		X	0.01-999999 kg/h	Required for master/slave operation only.
02	Weighing range		X	0.1-10000 kg	Must be set
03	Max. output		X	0.01-999999 kg/h	Must be set.
06	Coarse tare		X	0-100 %	Must be set.
07	Average weight acq.		X	2-32	Leave at default factory value.
08	Throughput divisor		X	0.001-1000 kg	Leave at default factory value.
09	Speed minimum		X	0-100 %	Leave at default factory value.
10	Speed maximum		X	0.1-100 %	Leave at default factory value.
11	Control difference		X	0.1-100 %	Leave at default factory value.
12	Alarm cut-out time		X	1-600 s	Leave at default factory value.
13	Type of interlocking		X	0-3	Must be set.
14	Indic. of act. value		X	1-20 s	Leave at default factory value.
20	Window		X	0.1-255	Leave at default factory value.
21	Filter		X	0-4	Leave at default factory value.
34	Length weigh. bridge		X	0.1-10 m	Must be set.
35	Weight test value		X	0.1-10	Must be set
36	Adaptation		X	0.1-10	Leave at default factory value.
37	Auto-tare range		X	1-50 %	Leave at default factory value.
38	No load time auto-tare		X	0-600 s	Leave at default factory value.
39	Rated belt speed		X	0.01-1000 m/min	Must be set.
40	Belt length		X	0.01-1000 m	Must be set.
41	Dead-time way		X	0.01-10 m	Leave at default factory value.
42	Belt load minimum		X	1-100%	Leave at default factory value.
43	Belt load maximum		X	1-100%	Leave at default factory value.
44	Digital speed		X	0-6.5 kHz	Has to be set for digital speed measuring.

Column m = input menu-supported; Column n = numerical input.



CAUTION: Modifications to the feeder parameters might have a considerable influence on the feeding operation. They must be made by qualified personnel only.

Descriptions of the functions:

- Maximum output master (01): The maximum output for master/slave operation (only for controller -S03 with master/slave option) of slave feeders is entered here. This is not applicable for our belt feeders.
- Weigh range (02): The weigh range of the weigh-belt feeder is determined by the load cell capacity. The default value is 5.000 kg.

Although the units of the controller are in pounds, the value entered here is in kilograms. Conversion to pounds is done by the controller.

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- Max. output (03): The max. output sets a limit to the max. rate (lb/h) of the max. output.

The setpoint range is calculated using the formula below:

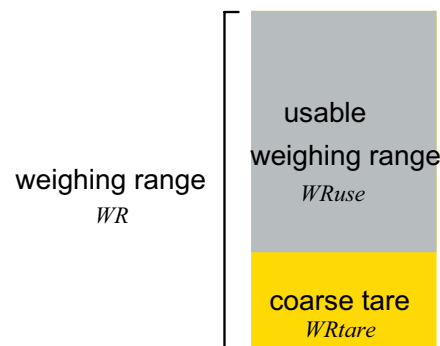
$$\text{Setpoint} < 1.1 \text{ max. output}$$

The actual value output 0(4)-20mA is spanned based on this value.

- Coarse tare (06): This function permits the user to tare mechanical preloads that are present.

The value entered in percentage is related to the weighing range. The dead load counterbalanced part, WR_{tare} , is subtracted from the weighing range to determine the usable weighing range, R_{use} . WR is calculated as follows:

$$R_{use} = WR - WR_{tare}$$



The default value is 0.000%

- Average weight acquisition (07): This value sets the number of weight samples that are averaged. The default value is 8.000.
- Throughput divisor (08): The value entered sets the increment rate in lb (kg) for the totalizer output as well as the display update. The controller can only send a maximum of 14400 pulses/h through the throughput-pulse output. The default value is 1.000 lb/pulse.
- Speed minimum (09): The value is entered here as a percentage of motor speed and sets the alarm trip point for the minimum speed alarm (S-). The default value is 2.000%.

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- **Speed maximum (10):** The value is entered here as a percentage of motor speed and sets the alarm trip point for the maximum speed alarm (S+). The default value is 99.00%.
- **Control difference (11):** The control difference is entered as a percentage of change allowed between the setpoint and actual feedrate. This is calculated and monitored in the mode “gravimetric feeding” (GF) only. If the calculated control difference exceeds the percentage permitted, the display will indicate “D+” or “D-”. If the controller cannot return to “GF” within the alarm cut-out time, an alarm will occur. The default value is 1.500%.
- **Alarm cut-out time (12):** If, during “gravimetric feeding” mode, the permitted control difference is exceeded, the alarm cut-out time starts. The value entered determines the maximum time in which a violation of the permitted control difference is allowed. If the violation of the permitted control difference is still on after the determined alarm cut-out time has elapsed, an alarm shutdown will occur. The default value is 120.00 seconds.
- **Type of interlocking (13):** This calibration point sets the logic of the digital input interlocking and of the digital output alarm. The following table lists the input possibilities. The logic “inverted” means that the alarm output is set even though no alarm is present.

Input	Interlocking with	Alarm output
0	24 V	normal
1	0 V	normal
2	24 V	inverted
3	0 V	inverted

The default value is 0.000.

NOTE:

Input value	Interlocking with	Alarm output
1	24	Feeder operates
	0	Feeder stops
0	0	Feeder operates
	24	Feeder stops

The correct input value is 1.

- **Indication of actual value (14):** Sets the update time for the actual value. The default value is 2.000 seconds.

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- Window (20): The value entered here, multiplied by 20ms, determines the time interval in which the serial load cell, IDL, scans the weight. This selection is not applicable for our load cell, but the default value is 25.000.
- Filter (21): The value entered here sets the amount of filtering applied to the weight signal (1: no filtering through 8: max. filtering). The filtering is used for serial communication load cells only. This selection is not applicable for our strain gauge load cell, but its default value is 7.000.
- Length of the weighing bridge (34): This value is entered as a correction factor to bring the actual feedrate equal to the setpoint rate. The following formula is used to calculate this value. The default is 0.390 meters.

$$LWB_{act} = \frac{\text{Setpoint} \times LWB}{\text{Actual Value}}$$

- Weight test value (35): The value entered here is the factor for the static weight adjustment of the strain gauge load cell. This value is entered as a correction factor while completing the static calibration of the strain gauge load cell. The default value is 1.000.
- Adaptation (36): This value is entered as a correction factor while completing the static calibration on specialized weigh deck belt feeders. The default value is 1.000.
- Auto tare range (37): The value entered here sets the maximum weight allowed to be tared during the auto tare cycle. The value is entered as a percentage of the usable weighing range. The default value is 10.000%.
- No load time auto tare (38): The value entered here specifies an additional time allowed for the belt motor to run during the auto tare cycle. The default value is 60.000 seconds.

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- Maximum belt speed (39): The maximum belt speed in meters per minute (m/min). This value can be calculated using the formula below.

$$V_n = n_M \times d_m \times \pi \times \frac{Z1}{Z2}$$

V_n = belt speed in meters/minute.

n_M = motor speed in rpm after reducer.

d_m = drive roller diameter d_A + belt thickness ($d_A = 0.103$ m) in meters.

$\pi \approx 3.14159$

$Z1$ = number of sprocket teeth on motor side.

$Z2$ = number of sprocket teeth on drive roller side.

The following are the rated belt speeds for the outputs shown:

1000 lb/h = 2.081 m/min

2000 lb/h = 3.924 m/min

4000 lb/h = 7.849 m/min

- Belt length (40): The value entered here is the total length of the belt on the weigh-belt feeder. The default value is 1.946 meters.
- Dead-time way (41): The value entered here, in meters, sets the distance the belt will travel under a no-load condition before an alarm will occur. The default value is 0.800 meters.
- Belt load minimum (42): The value entered here sets the minimum belt load allowed based as a percentage of the usable weighing range. If the load drops below this value, the belt will shut down in an “UL” alarm. The default value is 5.000%.
- Belt load maximum (43): The value entered here sets the maximum belt load allowed based as a percentage of the usable weighing range. If the load exceeds this value, the belt feeder will shutdown in an “OL” alarm. The default value is 95.000%.
- Digital speed (44): When using a digital tachometer for speed, the maximum frequency in KHz is entered into the calibration parameter. The default value is 1.725 KHz.

3.5.4.6 Menu #05 - Alarm Cut-Out

Below are the alarms that will shutdown the belt feeder. This menu allows you to configure these alarms as “report only” or “shutdown”. If an alarm report occurs, the digital output report is set. If an alarm shutdown occurs, the digital output alarm is set.

Nr	Function	m	n	Input Possibilities	Short Description
01	Speed minimum		X	on	Shutdown
				off	Report only
02	Speed maximum		X	on	Shutdown
				off	Report only
03	Control difference neg.		X	on	Shutdown
				off	Report only
04	Control difference pos.		X	on	Shutdown
				off	Report only
09	Belt load minimum		X	on	Shutdown
				off	Report only
10	Belt load maximum		X	on	Shutdown
				off	Report only

Column m = input menu-supported; Column n = numerical input.

Description of the functions:

- Speed minimum (01): If the speed drops below the minimum trip value for more than six seconds, an alarm will occur. The default value is “on”.
- Speed maximum (02): If the speed exceeds the maximum value for more than six seconds, an alarm will occur. The default value is “on”.
- Control difference negative (03): If the actual feedrate remains in “D-” for more than the allowed cut-out time, an alarm will occur. The default value is “on”.
- Control difference positive (04): If the actual feedrate remains “D+” for more than the allowed cut-out time, an alarm will occur. The default value is “on”.
- Belt load minimum (09): If the belt load drops below the minimum set value, an alarm will occur. The default value is “on”.
- Belt load maximum (10): If the belt load exceeds the maximum set value, an alarm will occur. The default value is “on”.

3.5.4.7 Menu #06 - Setup

This menu allows you to set the general settings.

Nr	Function	m	n	Input Possibilities	Short Description
09	Host	X		on	Activates the function.
				off	Deactivates the function.
10	Host procedure	X		off BT Standard S5 - 3964R	Sets the communication protocol ("Standard" or "Siemens 3964R") for the serial interface."
11	Identnumber	X		1 - 16	Input of the identnumber with "BT Standard".
12	Type of operation	X		Single	Sets the type of operation to "single operation".
				Master	Sets the type of operation to "master operation".
				Slave	Sets the type of operation to "slave operation".
13	M/S-Type	X		Actual value control	Sets master/slave operation to actual value control.
				Act.+ cut-out	Sets master/slave operation to actual value control with alarm shutdown.
				Setpoint control	Sets master/slave operation to setpoint control.
				Set+cut-out	Sets master/slave operation to setpoint control with alarm shutdown.
14	Unit	X		kg	Sets the unit for setpoint and actual value to kg/h.
				lb	Sets the unit for setpoint and actual value to lb/h.
15	Text switch	X		German	Sets the dialogue language to German.
				English	Sets the dialogue language to English.
				French	Sets the dialogue language to French.
16	Ram delete	X		off	Deactivates the function.
				on	This function deletes the complete RAM-contents of controller.

Column m = input menu-supported; Column n = numerical input.

Description of the functions:

- Host (09): This function activates the external control via a host computer. Host computer operation is possible only from controller models S-02. This selection is not applicable for the standard belt feeder. The default value is "off".
- Host procedure (10): This function sets the protocol operation through the serial port. This selection is not applicable for the standard belt feeder. The default value is "off".
- Identnumber (11): If the host procedure is set to "BT Standard", this point allows the controller to be identified when several controllers are being used. This selection is not applicable for the standard belt feeder. The default value is 01.

- Type of operation (12): This point sets the type of operation of the controller.

Single operation: The controller is operated as single component (standard setting).

Master operation: The controller is operated in master/slave operation with several controllers. The master feeder is set to master operation.

Slave operation: The controller is operated in master/slave operation with several controllers. The slave feeders are set to slave operation.

The default value is “single” operation.

- M/S-Type (13): If the USF/W&T controller is operated in master/slave operation, the type of control has to be defined for the master feeder controller:

Actual value control: The slave feeders are feeding as a function of the actual value of the master feeder.

Actual value control

with alarm cut-out: The slave feeders are feeding as a function of the actual value of the master feeder. With an alarm shutdown of the master feeder, the slave feeder will shutdown.

Setpoint control: The slave feeders are feeding as a function of the setpoint of the master feeder.

Setpoint control

with alarm cut-out: The slave feeders are feeding as a function of the master feeder. With an alarm shutdown of the master feeder, the slave feeder will also be shutdown.

The default value is actual value control.

- Unit (14): This point sets the units as lb or kg. The default setting is lb.
- Text switch (15): This point sets the language of the text for English, French, or German. The default setting is English.
- RAM delete (16): This point allows the deletion of the RAM. All entered parameters will be reset to standard factory values after the RAM execution. The default value is “off”.

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NOTE: After executing RAM delete, some parameters must be changed per menu set-up sheets 310.165.010A,B&C, located at the end of this section.



WARNING: IF THIS FUNCTION IS ACTIVATED WITH THE PARAMETER ON, ALL DATA IN THE RAM (FEEDER PARAMETERS, SETPOINT, ETC.) WILL BE IRRETRIEVABLY DELETED.

3.5.4.8 Menu #07 - I/O Configuration

This menu permits the configuration of various analog and digital inputs and outputs.

Nr	Function	m	n	Input Possibilities	Short Description
03	Analog	X		Off	Switches off the analog control.
				0-10 V	Switches the analog control to 0-10 V DC.
				2-10 V	Switches the analog control to 2-10 V DC.
04	Act. value output	X		off	Switches off the actual value output.
				0-20 mA	Switches the actual value output to 0-20mA.
				4-20 mA	Switches the actual value output to 4-20mA.
05	Digital input 4	X		Auto-tare	Configures the digital input 4 as auto-tare input.
				Belt breakage	Configures the digital input 4 as belt breakage input.
06	Digital output 4	X		D+/-	Configures the function control difference +/- for the digital output 4.
				B min	Configures the function belt load min for the digital output 4.
				B max.	Configures the function belt load max. for the digital output 4.
				Report	Configures the function alarm report for the digital output 4.
07	Belt breakage	X		off	Switches off the belt breakage monitoring.
				on	Switches on the belt breakage monitoring.

Column m = input menu-supported; Column n = numerical input.

Description of the functions:

- Analog control (03): This function allows you to specify an external setpoint via an analog 0-20 mA or 4-20 mA input. A 500 ohm supplied resistor converts this current to 0-10 Vdc or 2-10 Vdc for input to the controller. The default value is “off”.

NOTE: To use a DC 4-20mA control signal, select 2-10V.

- Actual value output (04): This function sets the output signal of actual feedrate as a 0-20 mA or 4-20 mA current output, which is spanned by the max. output. The default value is 4-20 mA.

- Digital input 4 (05): Digital input 4 has two possibilities:

Auto tare: This digital input allows auto tare to be activated automatically by a short pulse (min. 0.5s).

Belt breakage: The digital input is used to monitor the driven roller for belt breakage detection.

The default value is belt breakage.

- Digital output 4 (06): Digital output 4 has four possibilities:

D+/-: The digital output is set when a “D+” or “D-” occurs on the display.

B min: The digital output is set when the minimum belt load is reached.

B max.: The digital output is set when the maximum belt load is reached.

Report: The digital output is set when any report alarms are reached.

The default value is “D+/-”.

- Belt breakage (07): This point allows the belt breakage feature to be activated or deactivated. The default value is “on”.

3.5.4.9 Menu #08 - Test Program

This menu displays the various analog and digital values for test purposes.

Nr	Function	m	n	Input Possibilities	Short Description
01	Display	X		Selection with ENTER key	Starts the display test.
02	DI / DO - test	X		Selection with ENTER key	Shows all states of the digital inputs/outputs on the display.
03	AI / AO - test	X		Selection with ENTER key	Shows all states of the analog inputs/outputs on the display.
04	Simulation	X		0-100 %	If you enter a value >0 the simulation program will be started.

Column m = input menu-supported; Column n = numerical input.

Description of the functions:

- Display (01): This function activates a test of the controller display.
- DI / DO - test (02): This function displays the actual states of the digital inputs and digital outputs. 0 means not set, 1 means set.

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DI 1 0 0 1 0 0 0 0
DO 0 1 0 0 0 0 0 0

The digital outputs can be set by using the keys 1 through 8 on the numerical keypad. The 0 key resets all outputs. The 9 key sets all digital outputs.

NOTE: Digital Input position “4” changes from 1 to 0 when belt breakage sensor pulses.



WARNING: ACTIVATING THE DIGITAL OUTPUTS CAN AFFECT DOWNSTREAM EQUIPMENT. THEREFORE, THE DIGITAL OUTPUT PLUG CONNECTION ON THE REAR OF THE CONTROLLER SHOULD BE REMOVED BEFORE THIS TEST.

- **AI / AO - Test (03)** - This test function displays the state of the two analog inputs and outputs. Display is in percentage.

	1	2
AI	0.00	0.00
AO	50.00	50.00

- * AI 1 = load cell
- * AO 1 = signal from controller to drive 0-10V output
- * AI 2 = is remote setpoint signal
- * AO 2 = 4-20mA output for feed rate

The analog outputs can be set with the keys 0 through 9 according to the following table:

Key	Output		
		0-10 V	0(4)-20mA
0	0 %	0 V	0 mA
1	1 %	0,1 V	0,2 mA
2	2 %	0,2 V	0,4 mA
3	3 %	0,3 V	0,6 mA
4	4 %	0,4 V	0,8 mA
5	5 %	0,5 V	1 mA
6	10 %	1 V	2 mA
7	25 %	2,5 V	5 mA
8	50 %	5 V	10 mA
9	100 %	10 V	20 mA

- **Simulation (04):** This function allows you to simulate weigh-belt feeder operation for training or test purposes. To activate the simulation program, enter a numerical input greater than zero. The deactivation is done with an input of zero or with a power reset.

The value input in percentage refers to the full scale weighing range of the load cell. For example, for the 5 kg load cell, an entered value of 5.000% simulates a belt load of 250g or about 0.550 lb.

- **Load cell (05) -** This function is for digital load cells only. An analog load cell is used for this application.

3.6 Commissioning of a Weighbelt Feeder

3.6.1 Preliminary Checks

Commissioning your weigh-belt feeder should start with a check that all components have been shipped. Check the belt feeder for any damage.

- **Electrical checks:** Check that all connections have been made per electrical drawings supplied.

NOTE: Refer to the electrical drawings in Section 5.

- **Mechanical checks (see Figure 3-3):**
 - * All transport items (painted red) must be removed from the weigh-belt feeder.
 - * Insert the belt scraper (loosely supplied) into the retaining device.
 - * Place the belt into the belt guide of the guide roller.

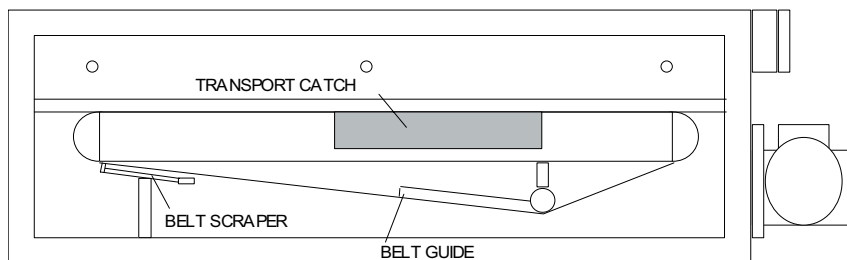


Figure 3-3. Belt Feeder Transport Details

3.6.2 Feeder Sizing

The basic approach to sizing a Model 31-165 Gravimetric Belt Feeder consists of six steps, as follows:

- a. Compute the required belt speed based on the feed rate, product density, gate inlet width, and estimated gate height.
- b. Compute the GR x SR product based on required belt speed.
- c. Select from a table of available combinations the GR x SR product that equals or is just slightly less than the computed value.
- d. Re-compute the feed rate using the selected GR X SR product.
- e. Compute the belt load and check that it agrees with the value displayed by the setpoint controller for a known product density, gate inlet width, gate height, and weigh bridge length.
- f. Compute the feedrate and check that it agrees with the value displayed by the setpoint controller for a known belt speed, belt load, GR x SR product, and weigh bridge length.

3.6.2.1 Mathematical Formula for Required Belt Speed

By definition, the following equation governs the operation of a belt feeder:

$$FR = BS \times BL \quad (1)$$

where,

FR = FEED RATE in units of lb/min or lb/hr.

BS = BELT SPEED in units of ft/min.

BL = BELT LOAD in units of lb/ft.

Solving for BELT SPEED:

$$BS = FR / BL \quad (2)$$

But, the BELT LOAD can be expressed in terms of the product density and the geometry of the inlet, as follows:

$$BL = D \times (GW / 12) \times (GH / 12) \quad (3)$$

where,

D = PRODUCT DENSITY in units of lb/ft³.

GW = Width of gate inlet in units of inches.

GH = Height of gate inlet in units of inches.

Equation (3) can be substituted into equation (2) and simplified, as follows:

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$$BS = (144 \times FR) / (D \times GW \times GH) \quad \text{for FR in lb/min}$$

or

$$BS = (2.4 \times FR) / (D \times GW \times GH) \quad \text{for FR in lb/hr} \quad (4)$$

3.6.2.2 Mathematical Formula for Computed GR x SR Product

The driving ROLLER SPEED (RS) in units of rpm is related to BELT SPEED (BS) in units of ft/min, as follows:

$$RS = BS / 1.03 \quad (5)$$

The GEAR RATIO (GR) of the reducer and the SPROCKET RATIO (SR) of the chain drive are related to the BELT SPEED (BS), as follows:

$$GR \times SR = 1400 / RS \quad (6)$$

where,

1400 = 80% of full scale belt motor rpm of 1750 rpm, to provide headroom in the sizing for variations in product density.

Equation (5) can be substituted into equation (6) and simplified, as follows:

$$GR \times SR = 1442 / BS \quad (7)$$

Equation (4) can be substituted into equation (7) and simplified, as follows:

$$GR \times SR = (10 \times D \times GW \times GH) / FR \quad \text{for FR in lb/min}$$

or

$$GR \times SR = (600 \times D \times GW \times GH) / FR \quad \text{for FR in lb/hr} \quad (8)$$

3.6.2.3 Selecting the Right Combination for GR x SR Product

By knowing FR and D, and selecting “first cut” values for GW & GH, the required GR x SR product can be estimated using equations (7) or (8), above. Use this GR x SR product and the table in the Sizing Worksheet at the end of this section to select the GR x SR combination that is equal to or just less than the computed value.

3.6.2.4 Mathematical Formula for Computed Feed Rate

To check the above selection, Equation (7) can be rewritten in terms of percent BELT SPEED (BS(%)), as follows:

$$\begin{aligned}
 BS &= (1750 \times 1.03)/(GR \times SR) \\
 &= ((BS(\%)/100) \times 1750 \times 1.03)/(GR \times SR) \\
 BS &= (18.025 \times BS(\%))/(GR \times SR)
 \end{aligned} \tag{9}$$

Substitute Equation (9) into Equation (4) and solve for FR, as follows:

$$\begin{aligned}
 FR &= (0.125 \times BS(\%) \times D \times GW \times GH)/(GR \times SR) \text{ for FR in lb/min} \\
 \text{or} \\
 FR &= (7.51 \times BS(\%) \times D \times GW \times GH)/(GR \times SR) \text{ for FR in lb/hr}
 \end{aligned} \tag{10}$$

The above equation shows the range of Feed Rate that the selected GR x SR combination provides.

3.6.2.5 Mathematical Formula for Displayed Belt Load

The weight of the material on the belt is measured by the load cell as it passes over the weigh bar. This weigh bar is a point support and has an equivalent bridge Weigh Length (WL) and an adjustment factor of 0.530928 to compensate for the point loading. The setpoint controller takes this equivalent Weigh Length into account when doing its calculations and displays Belt Load (BL_{CTRL}) using the following equation:

$$\begin{aligned}
 BL_{CTRL} &= L \times WL \times (39.37 / 12) \times 0.530928 \\
 BL_{CTRL} &= 1.742 \times BL \times WL
 \end{aligned} \tag{11}$$

where,

- BL_{CTRL} = BELT LOAD displayed by the setpoint controller in units of lb.
- BL = BELT LOAD of the material on the belt in units of lb/ft.
- WL = Equivalent bridge WEIGH LENGTH in units of meters.
- 39.37 = Factor for converting meters to inches.
- 12 = Factor for converting from inches to feet.
- 0.530928 = Adjustment factor for the point support of the weigh bar in the load cell.

Equation (3) for BELT LOAD (BL) can be substituted into Equation (11) to yield the following:

$$BL_{CTRL} = 0.0121 \times D \times GW \times GH \times WL \tag{12}$$

3.6.2.6 Mathematical Formula for Displayed Feed Rate

To check the operation of the feeder with the setpoint controller, Equation (9) and Equation (11) can be substituted into Equation (1), as follows:

$$FR_{CTRL} = (10.348 \times BS_{CTRL} \times BL_{CTRL}) / (GR \times SR \times WL) \text{ for FR in lb/min}$$

or

$$FR_{CTRL} = (620.9 \times BS_{CTRL} \times BL_{CTRL}) / (GR \times SR \times WL) \text{ for FR in lb/hr} \quad (13)$$

3.6.3 SCR Drive Calibration

3.6.3.1 Test Equipment Required

The following test equipment is required for calibration of the SCR drive.

- dc digital voltmeter.
- Setpoint controller (to be used as voltage generator).

To facilitate calibration performance, refer to Section 7, Speed Controller 806275E, pages 4 through 7.

3.6.3.2 Calibration Procedure

- a. Verify that all electrical connections are secure and have been correctly made. Ensure that circuit breakers in the SCR and setpoint enclosures are “in”. Apply power to the Setpoint Controller and SCR drive by positioning the POWER ON/OFF switch on the SCR Controller to OX1. Turn SS1 (feeder HAND/OFF/AUTO switch) to AUTO position.
- b. Place setpoint controller in the “DI” mode, as follows:
 - (1) Press the MODE key. The display will indicate “01 mode”.
 - (2) Press the ENTER key. The display will indicate “01 mode select”.
 - (3) Press the DOWN arrow key to obtain “discharge” mode.
 - (4) Press the ENTER key to accept mode.
- c. On setpoint controller, enter a setpoint of 50%, as follows:
 - (1) Press the SETPOINT key, “Xs”.
 - (2) On the numeric keypad, press “5” and “0” followed by the ENTER key to accept the value. The LCD display will indicate “DI Setpoint 50.00%”.

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- d. On the Setpoint Controller, press the START key to start the feeder. Using the digital voltmeter, measure the armature voltage on terminals A+ and A-. The voltmeter will indicate between 40 and 50 Vdc.
- e. Observe the direction of the rotation of the belt drive, as shown in Figure 3-4.

NOTE: There may be interlocks on the system that will have to be by-passed.

If the belt rotation is backwards, reverse armature wires on terminals A+ and A-. If the belt motor is operating at full speed, reverse the tachometer leads on terminals TG+ and TG-.

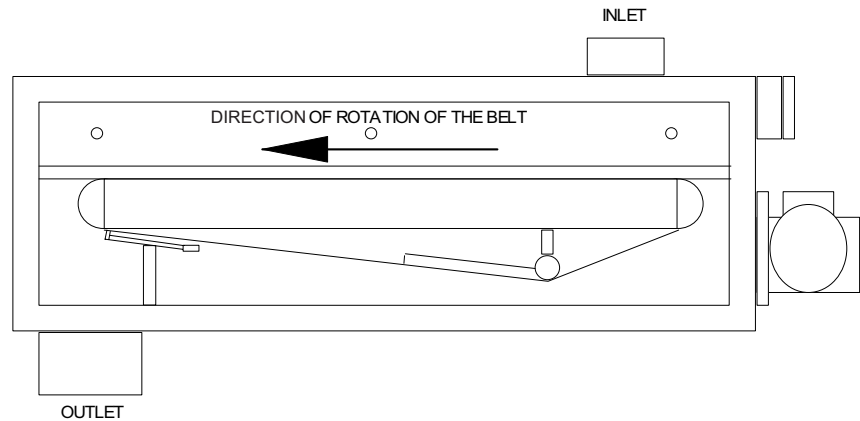


Figure 3-4. Belt Drive Rotation

- f. Adjust the internal 10-volt reference. Measure voltage between terminals 14 and 8. Adjust potentiometer P9 (Verstärk) until the indication is exactly 10.00 Vdc. Rotate P9 clockwise (CW) to increase voltage.



CAUTION: Do not touch current limit adjustment labeled I_{max}. This adjustment is factory set.

- g. Enter setpoint of 90%, as follows:
 - (1) Press SETPOINT key, "Xs".
 - (2) Press "9" and "0" on numeric keypad followed by the ENTER key. The display will indicate "DI Setpoint 90.00%". Start belt feeder by pressing START key.

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- (3) Use the STEP key to indicate “DI Speed”. Adjust the nMAX (P3) potentiometer until the motor speed reaches 90%. Rotate the nMAX (P3) potentiometer to increase voltage.
- h. Enter setpoint of 10% into the setpoint controller, as follows:
 - (1) Press the SETPOINT key, “Xs”.
 - (2) Press “1” and “0” on the numeric keypad, followed by the ENTER key. The display will indicate “DI Setpoint 10.00%”.
 - (3) Use the STEP key to indicate “DI Speed”. Rotate potentiometer P2 (n-min) until the motor operates at 10%. Rotate P2 counter-clockwise to increase rpms.
- i. Repeat steps g and h until percentage values are obtained. When obtained, proceed to step j.
- j. Adjust speed feedback for 90%, as follows:
 - (1) Enter a setpoint of 90% into the Setpoint Controller by pressing the SETPOINT key, “Xs”.
 - (2) Press “9” and “0” on the numeric keypad, followed by the ENTER key. The display will indicate “DI Setpoint 90.00%”. Using the dc digital voltmeter, measure the voltage between terminals 6 and 8 (left side). Rotate potentiometer P9 (Verstärk) until a voltage of 9.00 Vdc is obtained.
- k. Adjust speed feedback for 10%, as follows:
 - (1) Enter setpoint of 10% into the setpoint controller by pressing the SETPOINT key, “Xs”.
 - (2) Press “1” and “0” on the numeric keypad, followed by the ENTER key. The display will indicate “DI Setpoint 10.00%”. Using the dc digital voltmeter, measure the voltage between terminals 6 and 8 (left side). Rotate potentiometer P8 (Monitor Offset) until a voltage of 1.00 Vdc is obtained.
- l. Repeat steps j and k until voltage levels are obtained. When obtained, proceed to step m.
- m. Set controller back to “GF” mode, as follows:

- (1) Press the MODE key. The display will indicate “01 mode”.
- (2) Press the ENTER key. The display will indicate “01 mode select” and “Gravimetric feeding”.
- (3) Press the ENTER key to accept mode.

3.6.4 Belt Feeder Static Calibration

The following procedure is for calibrating and taring the belt feeder. This procedure should also be performed following belt or load cell replacement.

- a. For the purpose of this calibration, it is necessary to start the sequence from a known starting position. To establish this position, power the setpoint controller off and on.
- b. Enter the security code to “unlock” the feeder calibration parameters. Press the MODE key. Press the DOWN arrow key until the display indicates “03 code”. Press the ENTER key followed by the digits “0”, “1”, “3”, and “3”. The display will change from “Interlocked” to “Released”.
- c. It is necessary to reset some values in Menu #04 - Feeder Parameter. Press the MODE key. The display will indicate “01 Mode”. Press the DOWN arrow key until the display indicates “04 Feeder Parameter”. Press the ENTER key. The display will indicate “01 maximum output of master”.
- d. Press the DOWN arrow key until the display indicates “35 Weight Test Value”. Set this parameter to a value of exactly one by pressing “1.000” on the numeric keypad, followed by the ENTER key. The display will indicate “35 Weight Test Value 1.000”.
- e. Clear any value existing in the auto tare memory by pressing the “AUTOTARE” key, then the “0” key, and then the ENTER key. The display will indicate “ST TARA X.XXX lb, tare weight = 0” and the red LED in the START key will light.
- f. Press the BELT LOAD key. Observe the weight reading displayed on “Belt Load”. Record this weight as “reading with no load”.
- g. Record the weight stamped on the calibration weight as “calibration weight value”. Suspend the supplied test weight from the bolt under the load cell.

LIME SLAKING SYSTEM

- h. Record the new value of the “Belt Load” displayed as “reading with load”.
- i. Calculate the value of “Weight Test Value” using the following formula:

$$\text{Weight Test Value} = \frac{\text{calibration weight value}}{(\text{reading with load}) - (\text{reading with no load})}$$

Example: 3.000 lb test weight
 0.982 lb reading with no load
 4.002 lb reading with load

$$\begin{aligned} \text{Weight Test Value} &= \frac{\text{calibration weight value}}{(\text{reading with load}) - (\text{reading with no load})} \\ &= 3.000 \text{ lb} / (4.002 \text{ lb} - 0.982 \text{ lb}) \\ &= 0.993 \end{aligned}$$

- j. Enter the new “Weight Test Value”. Press the MODE key. The display will indicate “01 mode”. Press the DOWN arrow key until the display indicates “04 Feeder Parameter”. Press the ENTER key to access parameters. The display will indicate “01 maximum output master”. Press the DOWN arrow key until the display indicates “35 Weight Test Value”. Using the example, press “0”, “.”, “9”, “9”, “3” on the numeric keypad, followed by the ENTER key to accept the value. The display will indicate “35 Weight Test Value 0.993”.
- k. Press the BELT LOAD key to observe the weight reading. Remove the test weight from the load cell. Observe that the weight reading decreases by the same value as the calibration weight. Record this weight as “reading with no load”.
- l. Calculate the value of “Coarse Tare” using the following formula:

$$\text{Coarse Tare \%} = [(\text{reading with no load} / 11.00 \text{ lb}) \times 100] - 5$$

NOTE: If reading is less than one pound, coarse tare is not necessary.

Press the MODE key. The display will indicate “01 mode”. Press the DOWN arrow key until the display indicates “04 Feeder Parameter”. Press the ENTER key to access parameters. The display will indicate “01 maximum output master”. Press the DOWN arrow key until the

LIME SLAKING SYSTEM

display indicates “06 Coarse Tare. Enter the calculated coarse tare value followed by the ENTER key to accept the value.

- m. Ensure the test weight is removed from the load cell. Complete the auto tare sequence. Press the “START” key. The feeder will start and run for a short time and then stop automatically. While the feeder is running, the display will indicate the weight being tared out as “AT X.XX”. After the belt stops, the belt load will indicate 0.000 lb.

The static calibration of the belt feeder is now complete.

3.6.5 Belt Feeder Dynamic Calibration Using Grab Sample

The following is a procedure for calibrating the feed rate accuracy using the flow of actual product. The STATIC CALIBRATION must be completed before following this procedure.

- a. Place the controller into Gravimetric Feeding or “GF” mode. This is the default mode for the weighbelt feeder and is identified by the letters “GF” in the upper left-hand corner of the first display line.
- b. Enter the desired setpoint in lb/h. This is done by pressing the SET-POINT key, “Xs”, then pressing the desired keys on the numeric keypad, followed by the ENTER key to accept the value. This is the Setpoint Rate.
- c. Start the belt feeder by pressing the START key, “*”. Press the ACTUAL FLOWRATE key, “Xi”, to observe the actual feed rate. Allow the feeder to run until the actual feedrate is stable and under setpoint control. This occurs when the letters “D+” or “D-” are no longer displayed in the upper left-hand corner of the first display line and the letters “GF” are displayed instead.
- d. Take at least two consistent grab samples of the actual product flow and compute the equivalent feed rate in lb/h. This is the Grab Sample Rate.
- e. Using the formula below, calculate the “New Weigh Bridge Length” (W.B.L.) and enter this value into “04 Feeder Parameter” #34. Press the MODE key, then press the DOWN arrow key. The display will show “04 Feeder Parameters”. Then press the ENTER key. Using the DOWN arrow key, go to parameter “34 Length Weigh Bridge”. Note and record the value entered (Old W.B.L.), and use in the formula below:

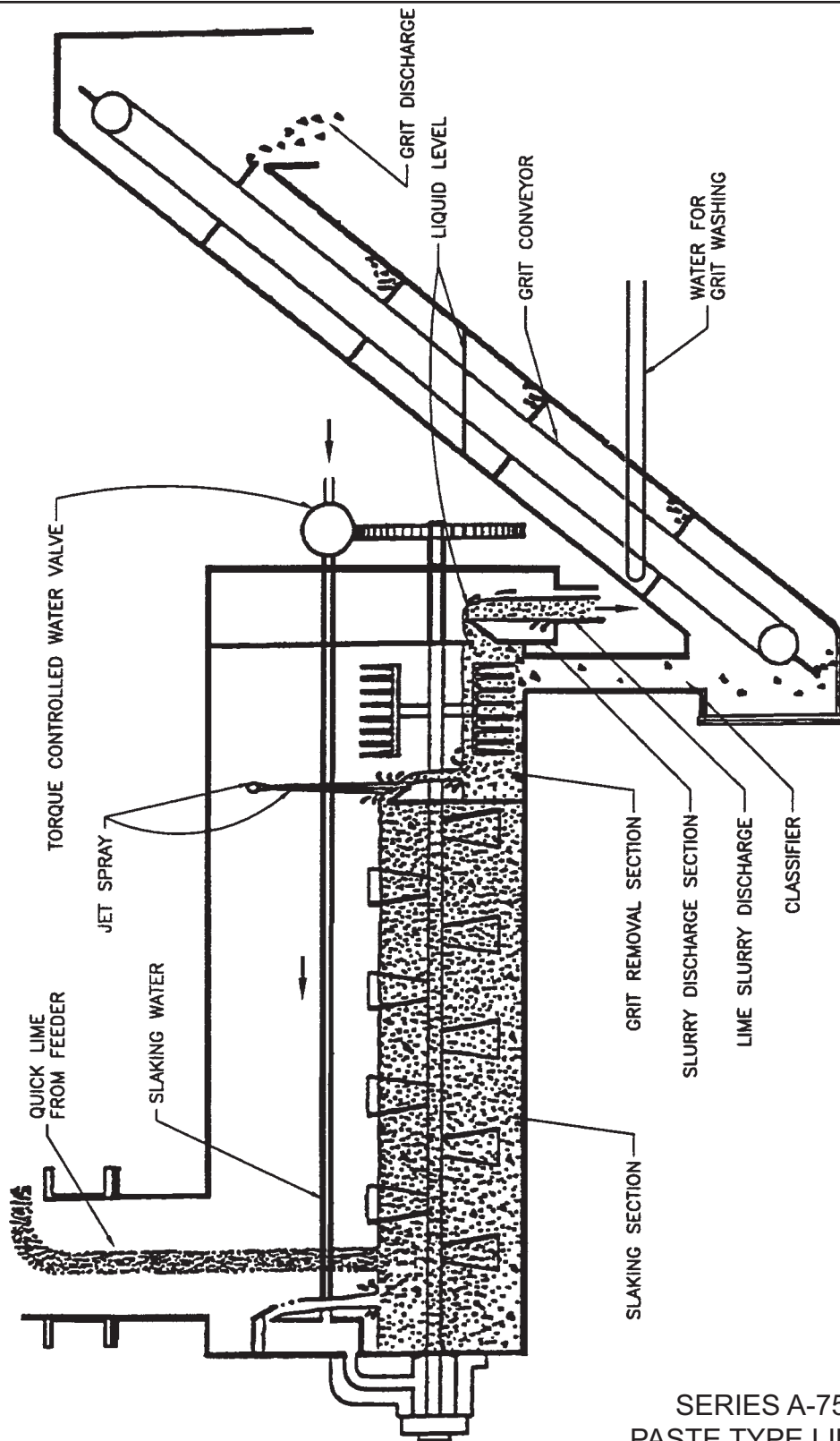
LIME SLAKING SYSTEM

$$\text{New } W.B.L. = \text{Old } W.B.L. \times (\text{Setpoint Rate} / \text{Grab Sample Rate})$$

- f. Enter the new value using the numeric keypad, followed by the ENTER key to accept the value.
- g. Repeat steps d through f, above, until the desired accuracy is obtained.

The dynamic calibration of the belt feeder using a grab sample is now complete.

LIME SLAKING SYSTEM

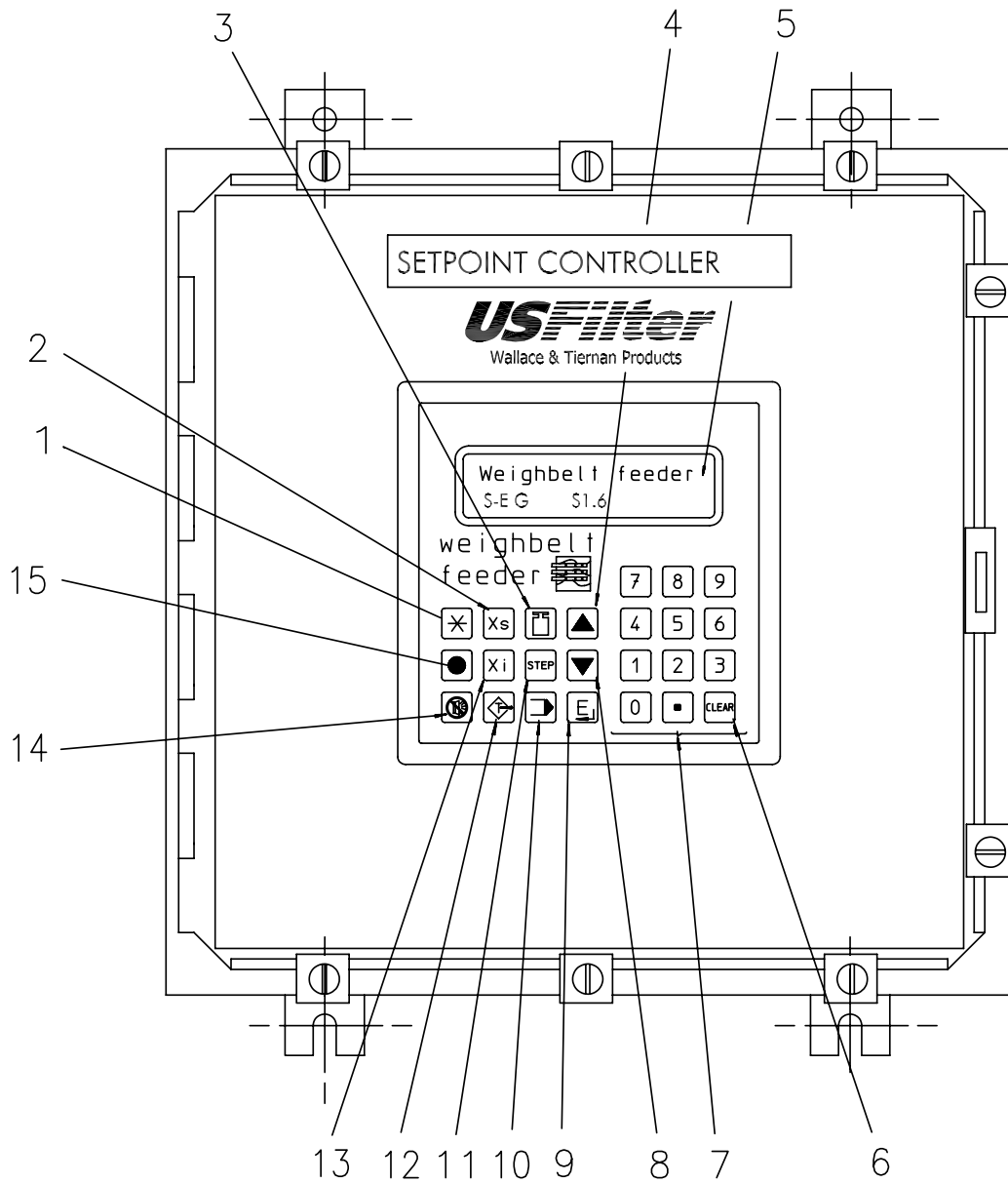


SERIES A-758 USF/W&T
PASTE TYPE LIME SLAKER
- FLOW DIAGRAM

330.100.180.012

ISSUE 0 3-97

LIME SLAKING SYSTEM



INDEX NO.	CONTROL/INDICATOR	INDEX NO.	CONTROL/INDICATOR
1	START KEY (OPERATOR KEY)	9	ENTER KEY
2	SETPOINT KEY	10	MENU KEY
3	BELT LOAD KEY	11	STEP KEY
4	UP CURSOR KEY	12	AUTOTARE KEY
5	LCD DISPLAY	13	ACTUAL VALUE KEY
6	CLEAR KEY	14	ALARM ACKNOWLEDGE (OPERATOR KEY)
7	NUMERIC KEY PAD	15	STOP KEY (OPERATOR KEY)
8	DOWN CURSOR KEY		

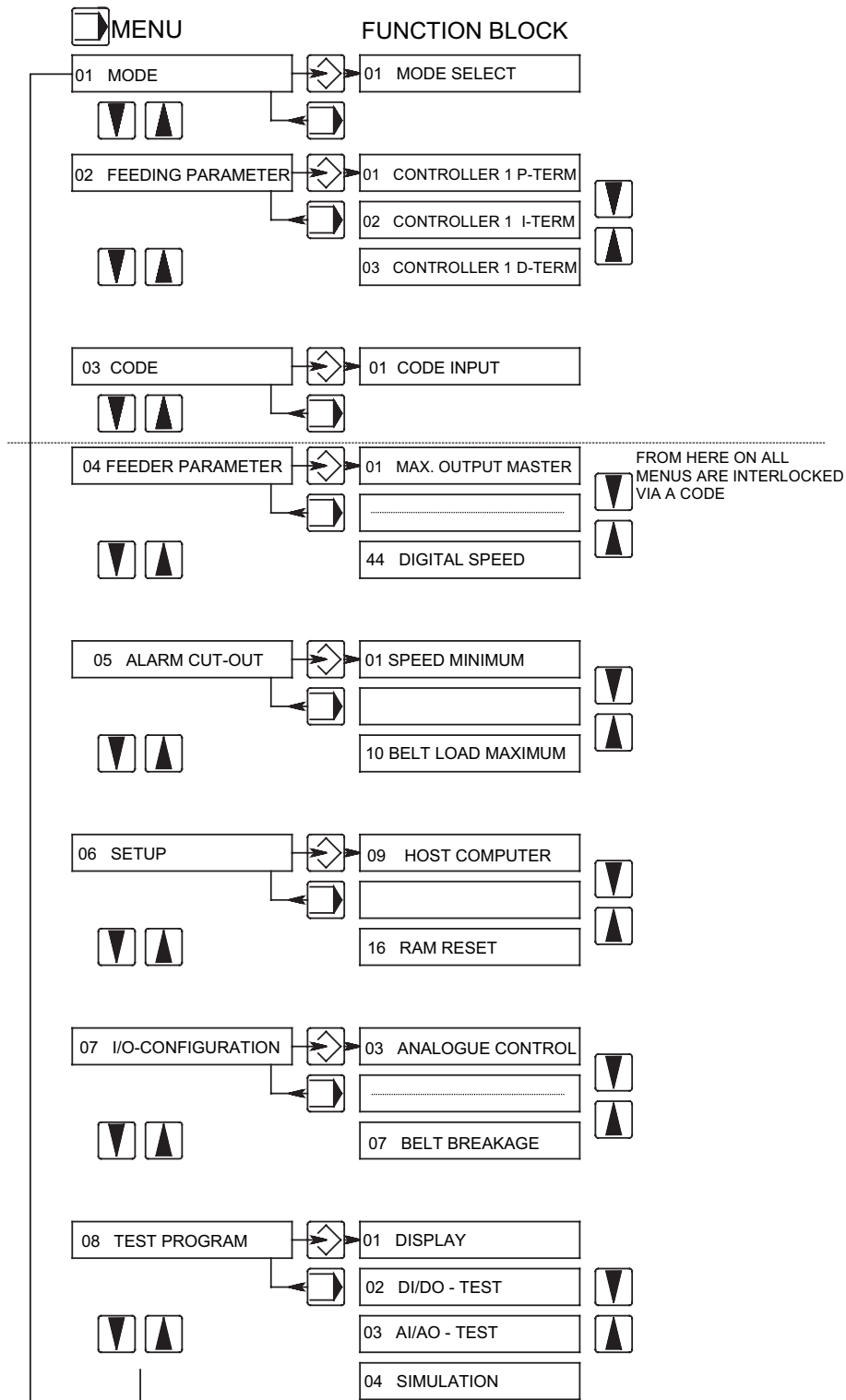
SETPOINT CONTROLLER FRONT PANEL
CONTROLS AND INDICATORS - OPERATION

310.165.170.020

ISSUE 3 9-03

LIME SLAKING SYSTEM

MENU OVERVIEW



SERIES 31-165 GRAVIMETRIC FEEDER
SETPOINT CONTROLLER MENU - OPERATION

310.165.180.010

ISSUE 0 9-96

LIME SLAKING SYSTEM

USFILTER'S WALLACE & TIERNAN PRODUCTS

SETPOINT CONTROLLER DEFAULT MENU SETTING FOR 1000lb/hr FEEDER UXA29548

Program Version: GVI.5

CALIBRATION POINT	DEFAULT VALUE	ENTERED VALUE	CALIBRATION POINT	DEFAULT VALUE	ENTERED VALUE
MODE (Menu #01)					
01 MODE SELECT	GF				
FEEDING PARAMETERS (Menu #02)					
01 CONTROL 1 P-TERM	1.500				
02 CONTROL 1 I-TERM	2.000 sec				
03 CONTROL 1 D-TERM	0.000 sec				
INTERLOCKING (Menu # 03) SECURITY CODE: ENTER, 0,1,3,3 (RELEASED)					
FEEDER PARAMETERS (Menu # 04)					
01 MAXIMUM O/P MASTER	1000 lb/h		20 WINDOWS	25.000	
02 WEIGHING RANGE	5.000 kg		21 FILTER	7.000	
03 MAXIMUM OUTPUT	1000 lb/h		34 LGTH WEIGHT BRIDGE	0.390 m	
06 COARSE TARE	0.000 %		35 WEIGHT TEST VALUE	1,000	
07 AVERAGE WEIGHT ACQ.	8000		36 ADAPTATION	1,000	
08 THROUGHPUT DIVISOR	1.000lb		37 AUTO TARE RANGE	10,000 %	
09 SPE ED MINIMUM	2.000 %		38 NO LOAD TIME A-TARE	60.000 secs	
10 SPEED MAXIMUM	99.00 %		39 RATED BELT SPEED	2.081m/min	
11 CONTROL DIFFERENCE	1.500 %		40 BELT LENGTH	1.946 m	
12 ALARM CUTOUT TIME	120.00 secs		41 DEAD-TIME WAY	0.800 m	
13 TYPE OF INTERLOCKING	0		42 BELT LOAD MIN.	5.000 %	
14 INDIC. OF ACTUAL VALUE	2.000 secs		43 BELT LOAD MAX.	95.000 %	
			44 DIGITAL SPEED	1.725kHz	
ALARM CUTOUT (Menu #05)					
01 SPEED MINIMUM	ON		04 CONTROL DIF. POS.	ON	
09 SPEED MAXIMUM	ON		09 BELT LOAD MIN.	ON	
03 CONTROL DIF. NEG.	ON		10 BELT LOAD MAX.	ON	
FEEDER SETUP (Menu #06)					
09 HOST	OFF		13 M/S TYPE	ACT. CONT.	
10 HOST PROCEDURE	OFF		14 UNIT	lb	
11 IDENT. NUMBER	01		15 TEXT SWITCH	ENGLISH	
01 TYPE OF OPERATION	SINGLE		16 RAM DELETE	OFF	
I/O CONFIGURATION (Menu #07)					
03 ANALOG CONTROL	OFF		06 DIGITAL OUTPUT 4	D+/-	
04 ACT. VALUE OUTPUT	4-20mA		07 BELT BREAKAGE	ON	
05 DIGITAL INPUT 4	BELT BRE.				

COMMENTS:

CHECKED BY:

Name:

Signature:

Date:

SETPOINT CONTROLLER MENU SETTING WORKSHEET
FOR 1000 lb/h FEEDER UXA29548

310.165.10A

LIME SLAKING SYSTEM

USFILTER'S WALLACE & TIERNAN PRODUCTS

SETPOINT CONTROLLER DEFAULT MENU SETTING FOR 1000lb/hr FEEDER UXA29548

Program Version: GVI.5

CALIBRATION POINT	DEFAULT VALUE	ENTERED VALUE	CALIBRATION POINT	DEFAULT VALUE	ENTERED VALUE
MODE (Menu #01)					
01 MODE SELECT	GF				
FEEDING PARAMETERS (Menu #02)					
01 CONTROL 1 P-TERM	1.500				
02 CONTROL 1 I-TERM	2.000 sec				
03 CONTROL 1 D-TERM	0.000 sec				
INTERLOCKING (Menu # 03) SECURITY CODE: ENTER, 0,1,3,3 (RELEASED)					
FEEDER PARAMETERS (Menu # 04)					
01 MAXIMUM O/P MASTER	1000 lb/h		20 WINDOWS	25.000	
02 WEIGHING RANGE	5.000 kg		21 FILTER	7.000	
03 MAXIMUM OUTPUT	1000 lb/h		34 LGTH WEIGHT BRIDGE	0.390 m	
06 COARSE TARE	0.000 %		35 WEIGHT TEST VALUE	1,000	
07 AVERAGE WEIGHT ACQ.	8000		36 ADAPTATION	1,000	
08 THROUGHPUT DIVISOR	1.000lb		37 AUTO TARE RANGE	10,000 %	
09 SPE ED MINIMUM	2.000 %		38 NO LOAD TIME A-TARE	60.000 secs	
10 SPEED MAXIMUM	99.00 %		39 RATED BELT SPEED	2.081m/min	
11 CONTROL DIFFERENCE	1.500 %		40 BELT LENGTH	1.946 m	
12 ALARM CUTOUT TIME	120.00 secs		41 DEAD-TIME WAY	0.800 m	
13 TYPE OF INTERLOCKING	0		42 BELT LOAD MIN.	5.000 %	
14 INDIC. OF ACTUAL VALUE	2.000 secs		43 BELT LOAD MAX.	95.000 %	
			44 DIGITAL SPEED	1.725kHz	
ALARM CUTOUT (Menu #05)					
01 SPEED MINIMUM	ON		04 CONTROL DIF. POS.	ON	
09 SPEED MAXIMUM	ON		09 BELT LOAD MIN.	ON	
03 CONTROL DIF. NEG.	ON		10 BELT LOAD MAX.	ON	
FEEDER SETUP (Menu #06)					
09 HOST	OFF		13 M/S TYPE	ACT. CONT.	
10 HOST PROCEDURE	OFF		14 UNIT	lb	
11 IDENT. NUMBER	01		15 TEXT SWITCH	ENGLISH	
01 TYPE OF OPERATION	SINGLE		16 RAM DELETE	OFF	
I/O CONFIGURATION (Menu #07)					
03 ANALOG CONTROL	OFF		06 DIGITAL OUTPUT 4	D+/-	
04 ACT. VALUE OUTPUT	4-20mA		07 BELT BREAKAGE	ON	
05 DIGITAL INPUT 4	BELT BRE.				
COMMENTS:					
CHECKED BY:					
Name:		Signature:		Date:	
<p style="text-align: center;">SETPOINT CONTROLLER MENU SETTING WORKSHEET FOR 2000 lb/h FEEDER UXB29548</p> <p style="text-align: right;">310.165.10B</p>					

LIME SLAKING SYSTEM

USFILTER'S WALLACE & TIERNAN PRODUCTS

SETPOINT CONTROLLER DEFAULT MENU SETTING FOR 1000lb/hr FEEDER UXA29548

Program Version: GVI.5

CALIBRATION POINT	DEFAULT VALUE	ENTERED VALUE	CALIBRATION POINT	DEFAULT VALUE	ENTERED VALUE
MODE (Menu #01)					
01 MODE SELECT	GF				
FEEDING PARAMETERS (Menu #02)					
01 CONTROL 1 P-TERM	1.500				
02 CONTROL 1 I-TERM	2.000 sec				
03 CONTROL 1 D-TERM	0.000 sec				
INTERLOCKING (Menu # 03) SECURITY CODE: ENTER, 0,1,3,3 (RELEASED)					
FEEDER PARAMETERS (Menu # 04)					
01 MAXIMUM O/P MASTER	1000 lb/h		20 WINDOWS	25.000	
02 WEIGHING RANGE	5.000 kg		21 FILTER	7.000	
03 MAXIMUM OUTPUT	1000 lb/h		34 LGTH WEIGHT BRIDGE	0.390 m	
06 COARSE TARE	0.000 %		35 WEIGHT TEST VALUE	1,000	
07 AVERAGE WEIGHT ACQ.	8000		36 ADAPTATION	1,000	
08 THROUGHPUT DIVISOR	1.000lb		37 AUTO TARE RANGE	10,000 %	
09 SPE ED MINIMUM	2.000 %		38 NO LOAD TIME A-TARE	60.000 secs	
10 SPEED MAXIMUM	99.00 %		39 RATED BELT SPEED	2.081m/min	
11 CONTROL DIFFERENCE	1.500 %		40 BELT LENGTH	1.946 m	
12 ALARM CUTOUT TIME	120.00 secs		41 DEAD-TIME WAY	0.800 m	
13 TYPE OF INTERLOCKING	0		42 BELT LOAD MIN.	5.000 %	
14 INDIC. OF ACTUAL VALUE	2.000 secs		43 BELT LOAD MAX.	95.000 %	
			44 DIGITAL SPEED	1.725kHz	
ALARM CUTOUT (Menu #05)					
01 SPEED MINIMUM	ON		04 CONTROL DIF. POS.	ON	
09 SPEED MAXIMUM	ON		09 BELT LOAD MIN.	ON	
03 CONTROL DIF. NEG.	ON		10 BELT LOAD MAX.	ON	
FEEDER SETUP (Menu #06)					
09 HOST	OFF		13 M/S TYPE	ACT. CONT.	
10 HOST PROCEDURE	OFF		14 UNIT	lb	
11 IDENT. NUMBER	01		15 TEXT SWITCH	ENGLISH	
01 TYPE OF OPERATION	SINGLE		16 RAM DELETE	OFF	
I/O CONFIGURATION (Menu #07)					
03 ANALOG CONTROL	OFF		06 DIGITAL OUTPUT 4	D+/-	
04 ACT. VALUE OUTPUT	4-20mA		07 BELT BREAKAGE	ON	
05 DIGITAL INPUT 4	BELT BRE.				

COMMENTS:

CHECKED BY:

Name:

Signature:

Date:

SETPOINT CONTROLLER MENU SETTING WORKSHEET
FOR 4000 lb/h FEEDER UXC29548

310.165.10C

LIME SLAKING SYSTEM

USFILTER'S WALLACE & TIERNAN PRODUCTS

SIZING WORKSHEET FOR MODEL 31-165 GRAVIMETRIC BELT FEEDER

	2" GATE WIDTH	4" GATE WIDTH	6" GATE WIDTH		
COMPUTED BELT SPEED BS in ft/min	$\frac{72 \times FR}{D \times GH}$ for FR in lb/min or $\frac{1.2 \times FR}{D \times GH}$ for FR in lb/hr	$\frac{36 \times FR}{D \times GH}$ for FR in lb/min or $\frac{0.6 \times FR}{D \times GH}$ for FR in lb/hr	$\frac{24 \times FR}{D \times GH}$ for FR in lb/min or $\frac{0.4 \times FR}{D \times GH}$ for FR in lb/hr		
BS RESULT					
COMPUTED GR x SR	1442/BS	1442/BS	1442/BS		
GR x SR RESULT					
	AVAILABLE VALUES				
		1:1	2:1	3:1	4:1
AVAILABLE GR VALUES	9:1 12:1 18:1 26:1 35:1 49:1 66:1	9 12 18 26 35 49 66	18 24 36 52 70 98 132	27 36 54 78 105 147 198	36 48 72 104 140 196 264
SELECTED GR x SR					
COMPUTED FEED RATE FR FOR SELECTED GR x SR	$\frac{0.25 \times BS\% \times D \times GH}{GR \times SR}$ for FR in lb/min or $\frac{15 \times BS\% \times D \times GH}{GR \times SR}$ for FR in lb/hr	$\frac{0.5 \times BS\% \times D \times GH}{GR \times SR}$ for FR in lb/min or $\frac{30 \times BS\% \times D \times GH}{GR \times SR}$ for FR in lb/hr	$\frac{0.75 \times BS\% \times D \times GH}{GR \times SR}$ for FR in lb/min or $\frac{45 \times BS\% \times D \times GH}{GR \times SR}$ for FR in lb/hr		
FR_{CTRL} RESULT					
DISPLAYED FEED RATE FR_{CTRL}	0.024 x D x GH x WL	0.048 x D x GH x WL	0.072 x D x GH x WL		
DISPLAYED FEED RATE FR_{CTRL}	10.3 x BS _{CTRL} x BL _{CTRL} GR x SR x WL FOR FR _{CTRL} IN lb/min.	OR	620.9 x BS _{CTRL} x BL _{CTRL} GR x SR x WL FOR FR _{CTRL} IN lb/min.		
FR_{CTRL} RESULT					
COMMENTS:					
CHECKED BY:					
Name:		Signature:			
		Date:			
SIZING WORKSHEET FOR MODEL 31-165 GRAVIMETRIC FEEDER 310.165.10E					

LIME SLAKING SYSTEM

SECTION 4 - SERVICE

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Digital Inputs and Outputs.....	330.100.155.040



WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY FROM CONTACT WITH MOVING PARTS AND HOT LIME, REPLACE SCREENS AFTER SERVICING EQUIPMENT.



WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY, KEEP HANDS AND LOOSE CLOTHING CLEAR OF MOVING PARTS. REPLACE COVERS AFTER INSPECTING AND SERVICING. USE APPROPRIATE FACE SHIELD AND PROTECTIVE CLOTHING WHEN CLEANING OR CLEARING AREAS CONTAINING AN ACCUMULATION OF LIME. THESE AREAS MAY CONTAIN UNSLAKED LIME WITH TRAPPED STEAM UNDER PRESSURE, WHICH MAY BLOW BACK.

4.1 Lime Slaker

4.1.1 Lubrication

To be performed at three-month intervals:

- a. Grease all gears and bearings of gear boxes and speed reducers with water-resistant grease (Shell Alvania EP-2 or equivalent). See Dwgs. 330.100.002.093, 330.100.002.094, 330.100.002.095, 330.100.001.072, 330.100.001.073, 330.100.010.040, 330.100.000.094, and 330.100.000.095 in Section 5.
- b. Check oil level of the speed reducer (U19939). The oil filter and vent plug are on the top side of the reducer. The level plug is on the side opposite the geared output shaft, closest to the slaker trough. Use USF/W&T Part No. U18805 (Gulf R680). Refer to Dwg. 330.100.99.011. Ensure the vent plug has been reinstalled.

Refer to Dwg. 330.100.150.050 for lubrication of the grit remover speed reducer. Use USF/W&T Part No. U18805 (Gulf R680). Ensure the vent plug has been reinstalled.

4.1.2 Periodic Maintenance



WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY FROM CONTACT WITH MOVING PARTS, THE POWER TO THE SLAKER MUST BE IN THE OFF POSITION DURING INSPECTION AND CLEANING.

To be performed at intervals determined by local conditions:

LIME SLAKING SYSTEM

- **SLAKER**

- a. Clean out any accumulation of scaled paste and paste build-up. To drain the paste compartment open the three-inch plug at end of the slaker.
- b. Inspect discharge and overflow ports for scale obstruction.
- c. Inspect cut-off spray nozzle for plugging and, if necessary, re-set nozzle. The spray should be directed along the center of the separator weirs and should not extend beyond either edge of the weir.
- d. Inspect paddles for wear. (End paddles wear first.)

- **FEEDER**

- a. Inspect and clean the feeder-slaker connection.
- b. Check the feed rate to ensure that the proper amount of lime is being fed to slaker.

NOTE: When the slaker is in operation, avoid opening the covers as much as possible. This will prevent steam from entering the feeder and causing plugging or other feeder malfunctions.

- **DUST ARRESTOR**

- a. Inspect and remove any accumulation around the inlet of the vapor and dust arrestor.
- b. Clean jet spray nozzle.

- **GRIT CONVEYOR**

- a. Check flight scrapers for excessive bending or breakage. Replace as needed.
- b. Tighten flight chain.



WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY FROM CONTACT WITH MOVING PARTS, THE GRIT CONVEYOR SWITCH MUST BE IN THE OFF POSITION AND POWER MUST BE REMOVED FROM THE SLAKER DURING THE ADJUSTMENT OF THE FLIGHT CHAIN.



CAUTION: Be sure the chain is not taut. When properly adjusted the upper chord of the chain should drop approximately one inch at its mid-point and have approximately three inches between the upper and lower chains at its point of closest approach. The proper tautness can be achieved by loosening the hex nuts (P13678) and adjusting both of the bolts (P41504) equally. Refer to Dwg. 330.100.010.040 (in Section 5).

- c. Check classifier section of slaker for plugging and scale build-up.

NOTE: If necessary, the slaker classifier section can be drained by removing the drain plug at the bottom of the grit conveyor housing.

- **MOTOR**

Lubricate the motor as directed by the motor manufacturer on the tag attached to the motor. Check motors to ensure they are free of moisture and scale buildup.

4.1.3 Mechanical Overload Protection

The spur gear on the output shaft of the gear reducer is secured with a clutch. The clutch should slip if the paddle drive is overloaded by too-thick paste, or by grit or foreign materials interfering with the action of the paddles. (See Dwg. 330.100.150.021 for more information.)

The grit conveyor drive is protected by a clutch that will slip under overload conditions. (See Dwg. 330.100.150.040 for more information.)

4.1.4 Steam

The appearance of steam at the feeder is an indication of insufficient air flow through the feeder or clogging of the vapor and dust arrestor. To increase the air flow through the feeder, make sure the vent hole of the inlet end wall of the feeder housing is open and that the feeder covers are all in place and tightly locked. If the vapor and dust arrestor is clogged, remove and clean the hose or tubing. Remove the plug and clean inside the dust arrestor. Clean the jet spray nozzle.

4.1.5 Alarm Actuator (See Dwg. 330.100.008.022)

The alarm unit will operate within 10 seconds after the paddle shaft stops or within 30 seconds after the grit conveyor stops.

LIME SLAKING SYSTEM

To test the alarm circuit, proceed as follows:

- a. Energize the control panel and check for 115 Vac across terminals 7 and 8.
- b. If 115 Vac is not present, de-energize the control panel and check for a faulty fuse.
- c. Re-energize the control panel and turn on the grit conveyor and paddle shafts.
- d. After one minute, shut off the paddle shaft. The alarm should sound within 10 seconds.
- e. Restart the paddle shaft. The alarm should reset within five seconds.



WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY, DO NOT TOUCH ANY PART OF THE CIRCUIT BOARD EXCEPT THE TOGGLE SWITCH (S1). A SHOCK HAZARD EXISTS.

- f. To check the grit conveyor alarm function, flip switch S1 on the alarm circuit board to the up position. The alarm should sound within 30 seconds.
- g. Return switch S1 to the normal down position. The alarm should reset within 15 seconds.

If the circuit malfunctions, check the shaft switches as follows:

- (1) Using a voltmeter, 24Vdc or greater, connect the positive lead to terminal 4 and the negative lead to terminal 6. The meter should indicate about 36 pulses per minute.

If pulses are irregular, check the position of the paddle shaft switch and adjust as required by moving the mercury switch to obtain a clear, sharp pulse.

- (2) Move the plus lead of the voltmeter to terminal 5. The meter should indicate about eight pulses per minute. If necessary, adjust the position of the grit remover switch by moving the grit remover mercury switch to obtain a clear, sharp pulse.
- (3) Disconnect the voltmeter.

- (4) If no adjustments were necessary, the circuit board must be replaced. If adjustments were made, repeat steps c through g.

4.1.6 Settings of Control Panel Switches During Feeder Calibration

Power to the feeder control circuit is on whenever the control panel power is on. However, the belt drive and feeder alarm are interlocked with the system so that they cannot operate unless the paddle shaft and grit conveyor are on and the slaker alarm is in its normal (non-alarm) condition. In order to check the feeder calibration, set the control panel switches as follows:

- Grit Conveyor (SS1) ON
- Control Contact Switch (CC) OPEN
- Paddle Shaft (SS2) ON
- Optional Local or Remote Feeder Control
- Switch (SS5) set to desired position

When the slaker alarm reaches its normal condition, the feeder may be turned on with Feeder Switch SS3.

4.1.7 Low Pressure Switch

The low pressure switch (LPS) mounted next to the pressure gauge in the lime slaker piping is factory set and needs no further adjustment.

However, check the pressure switch periodically for proper operation. This can be done with the slaker system in operation. Using the water pressure reducing valve, decrease the torque valve water pressure until the lime feeder stops. This should occur at a pressure of 20 ± 1 psi. Slowly increase the water pressure until the feeder restarts. The pressure gauge should indicate 27 ± 1 psi. Reset the water pressure to the original setting.

If the pressure switch did not perform as stated above refer to the manufacturer's instructions in Section 7 for details of adjustment.

4.1.8 Capacity

Inability to make capacity is generally caused by one of the following:

- Improperly calibrated feeder (over capacity).
- Low water pressure to torque valve.
- Inadequate water supply.
- Restriction of flow in supply line.

4.2 Gravimetric Feeder

4.2.1 Lubrication

The feeder gear reducer and roller bearings are hermetically sealed and lubricated for life.

4.2.2 Belt Removal and Replacement (See Dwg. 310.165.000.040)

Perform the following for belt removal and replacement.

- a. Ensure all material is removed from the belt and any cut-off gates for material flow are closed.
- b. Lock counter weight (5) in upper position with transport bracket supplied (red U-shaped bracket) (8). Remove outside scraper.
- c. Loosen nuts (1, 2) on both sides. Adjust bolt (4) on both sides to bring driven roller shaft (3) to the end of the slot closest to the drive motor.
- d. Remove belt from the belt guides (7) on both sides.
- e. Disconnect transport frame clamps (10).
- f. Slide belt off transport frame.
- g. Ensure transport frame is clean. No material should be present on frame. Material can be cleaned off using an air gun or cloth rag.

NOTE: Do not apply air or heavy loads to weigh bar (9), for damage to the load cell may occur.

- h. Slide belt on transport frame. Replace outside scraper.
- i. Connect two clamps (10) to hold transport frame.
- j. Place belt into belt guides (7) on both sides.
- k. Adjust driven roller shaft (3) using bolt (4) to center shaft (11) in the slots cut out on both sides.
- l. Remove transport bracket holding counter weight (5).

- m. Ensure counter weight is sitting level with the transport frame. Adjust steering roller assembly (6) to level counter weight, if required.
- n. Set belt tracking using the belt tracking procedure.

4.2.3 Belt Tracking Adjustment (See Dwg. 310.165.000.040)

Perform the following procedure for adjustment of belt tracking.

- a. Ensure belt is placed in belt guides (7) on both sides.
- b. Loosen nuts (1, 2) on both sides and adjust bolt (4) to center driven roller shaft (11) in cut-out slot.
- c. Check that counter weight (5) is set level to frame. Adjust steering roller assembly (6) to level counter weight, if necessary.
- d. Run belt at full speed and adjust bolt (4) on both sides until belt runs true.
- e. Lock nuts (1, 2).

4.2.4 Troubleshooting

Troubleshooting of Model 31-165 Gravimetric Belt Feeder consists of procedures and instructions for repair and/or replacement of subassemblies and components.

The troubleshooting procedures are limited to fault isolation to a defective item. Potential problems that could be at fault, and recommendations for corrective action, are listed in Table 4-1. Procedures are based on potential fault conditions that may occur under normal feeder operation.

LIME SLAKING SYSTEM

Table 4-1. Troubleshooting Guide

FAULT CONDITION	POSSIBLE CAUSE	CORRECTIVE ACTION
Belt comes off rollers.	Belt tracking mechanism not functioning.	Check that belt edges are properly inserted into belt tracking guide. If required, refer to procedures for belt removal and replacement and/or belt tracking adjustment in paragraphs 4.2.2 and 4.2.3, respectively.
Belt speed indications are too low while operating with setpoint controller adjusted for higher feed rates.	Motor speed sensor is not properly positioned in adapter plate.	Very carefully rotate sensor into plate until correct speed is obtained.
Belt turns in wrong direction.	Leads (A+, A-) from feeder junction box are reversed on motor armature.	Reverse leads on motor armature. (Refer to SCR enclosure schematic wiring diagram.)
Belt turns at maximum speed.	Electrical connection between tachometer and controller is loose.	Inspect wiring for broken leads and ensure all connections are tight.
	Defective motor tachometer.	Check motor tachometer for proper output voltage (20.8V/1000 RPM). Remove and replace tachometer if required.
	Leads (TG+, TG-) from feeder junction box are reversed on motor tachometer.	Reverse leads on motor tachometer. (Refer to SCR enclosure schematic wiring diagram.)
Belt not moving or moving at incorrect speed.	Coupling between motor and speed reducer is loose or disconnected.	Properly align reducer and coupling. Tighten coupling.
Motor will not operate.	No power to motor.	Check that circuit breaker on rear of SCR controller enclosure is pushed "in". On front of SCR controller enclosure, verify that power ON/OFF switch is set to ON and HAND-OFF-AUTO switch is set to HAND or AUTO.
	Defective SCR drive.	Remove and replace SCR drive.
	Defective motor.	Remove and replace motor.

LIME SLAKING SYSTEM

Table 4-1. Troubleshooting Guide (Cont'd)

FAULT CONDITION	POSSIBLE CAUSE	CORRECTIVE ACTION
Rollers do not turn.	Rollers are jammed.	Clean rollers and bearings and inspect for damage. Remove and replace damaged components. Inspect and adjust roller scrapers if required.
Both bearings on driven roller do not move freely.	Bearings are dirty or defective.	Clean and inspect bearings. Remove and replace bearings if required.
Drive roller slips.	Belt tensioning system stuck.	Check that the belt tensioning weight on driven roller moves freely. Correct tensioning on drive chain to allow for 1/4" of play.
Build-up of material observed on drive roller and on inside of belt.	Scrapers not functioning properly.	Clean roller and belt. Check and adjust scrapers as required.
Feed rate is unstable.	Side rails touching weigh deck.	Adjust side rails so they do not touch weigh deck.
Incorrect feed rate.	Material build-up around load cell.	Carefully clean load cell with soft brush.
Material jamming between side rails and weigh deck.	Side rails are not properly adjusted.	Adjust side rails so that the gap between the rails and the belt increases in the direction of belt travel.
Speed control inoperative.	Defective motor tachometer.	Check motor tachometer for correct output voltage (20.8V/1000 RPM). Remove and replace motor tachometer if required.
	Leads (TG+, TG-) from feeder junction box are reversed on motor tachometer.	Reverse leads on motor tachometer. (Refer to SCR enclosure schematic wiring diagram.)
	SCR drive out of calibration.	Re-calibrate SCR drive in accordance with paragraph 3.6.3.
	Defective SCR drive.	Remove and replace SCR drive. Re-calibrate drive in accordance with paragraph 3.6.3.

LIME SLAKING SYSTEM

WARNING LABELS AND TAGS

The following warning labels and tags are attached to the equipment:

L2016: TO AVOID POSSIBLE SEVERE PERSONAL INJURY FROM ELECTRICAL SHOCK, TURN POWER OFF BEFORE SERVICING.

L2022: TO AVOID POSSIBLE SEVERE PERSONAL INJURY FROM ELECTRICAL SHOCK, TURN POWER OFF BEFORE SERVICING.

L2023: TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO EQUIPMENT, READ INSTRUCTION BOOK BEFORE INSTALLING, OPERATING, OR SERVICING THIS EQUIPMENT.

L2024: TO AVOID POSSIBLE SEVERE PERSONAL INJURY FROM CONTACT WITH MOVING PARTS, REPLACE GUARD AFTER SERVICING EQUIPMENT.

L2067: TO AVOID POSSIBLE SEVERE PERSONAL INJURY, OPEN COVERS CAREFULLY.

WHEN COVERS ARE OPENED, HOT LIME MAY BE THROWN OUT!

USE FACE AND EYE PROTECTION.

L2620: TO AVOID POSSIBLE SEVERE PERSONAL INJURY FROM CONTACT WITH MOVING PARTS AND HOT LIME, REPLACE SCREENS AFTER SERVICING EQUIPMENT.

L2437: TO AVOID POSSIBLE SEVERE PERSONAL INJURY, DO NOT REMOVE SHIELDS WHILE METER IS IN USE. DO NOT EXCEED TEMP. AND PRESS. LIMITS ON METER SCALE.

L2497: TO AVOID INJURY, DO NOT OPERATE WITHOUT SHIELDS.

LIME SLAKING SYSTEM

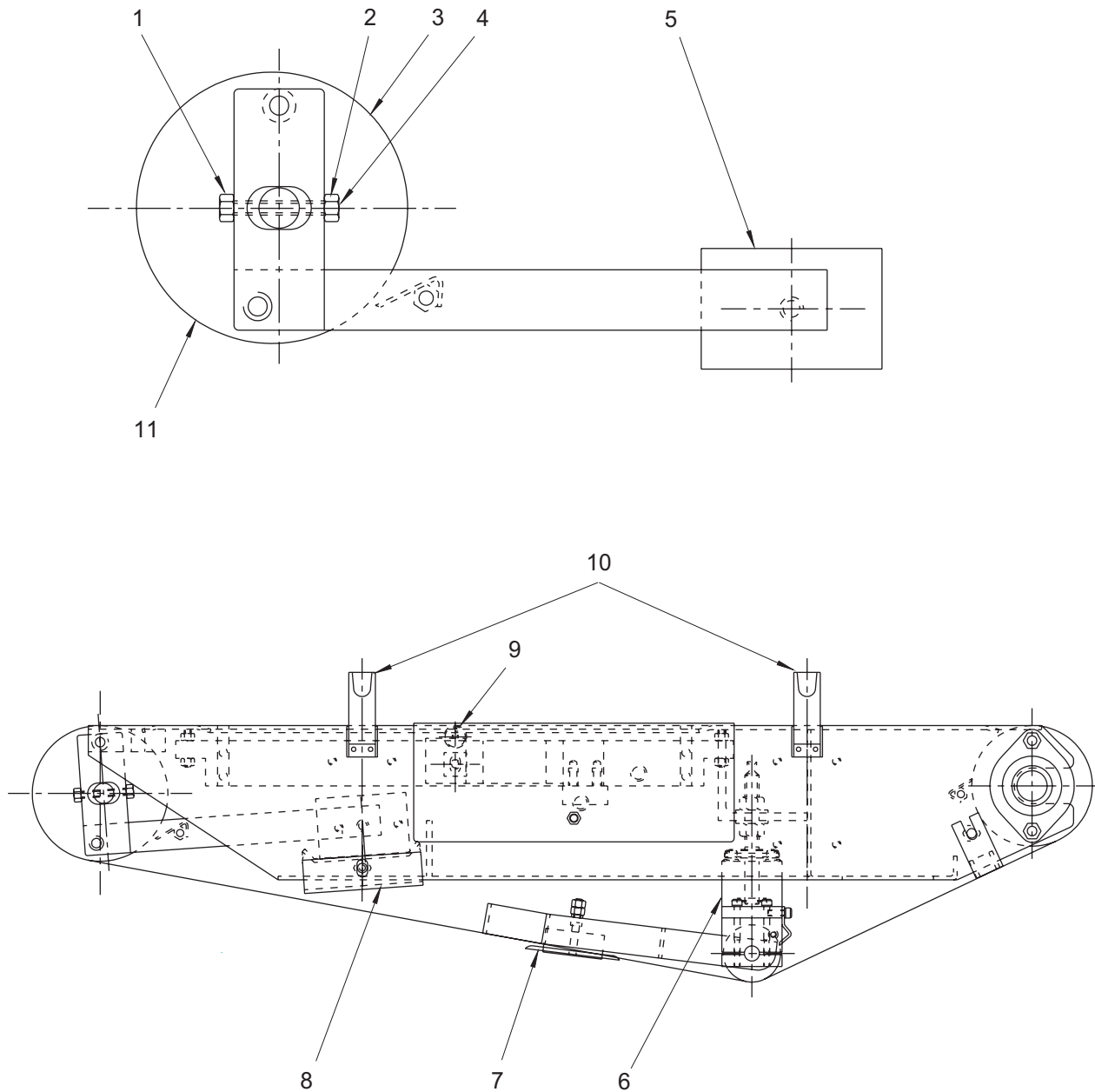
WARNING LABELS AND TAGS (CONT'D)

L2498: TO AVOID POSSIBLE PERSONAL INJURY, DO NOT USE THIS METER FOR TOXIC OR HAZARDOUS FLUIDS THAT ATTACK GLASS.

SEE INSTRUCTION BOOK FOR FURTHER PRECAUTIONS AND IMPORTANT INSTALLATION AND OPERATING DETAILS.

L2029: TO AVOID POSSIBLE SEVERE PERSONAL INJURY, KEEP HANDS AND LOOSE CLOTHING CLEAR OF MOVING WEIGHBELT. REPLACE COVERS AFTER INSPECTING OR SERVICING.

LIME SLAKING SYSTEM



NOTE: SEE DWG. 310.165.000.040B FOR THE PROCEDURE FOR REMOVING, REPLACING, AND ADJUSTMENT OF BELT.

LOCATIONS FOR BELT REMOVAL, REPLACEMENT, AND ADJUSTMENT - PARTS
Used in 31-165 Gravimetric & 32-215 Volumetric Belt Feeders

310.165.000.040A

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LIME SLAKING SYSTEM

The following is a procedure for removing, replacing and adjustment of belt. See Dwg. 310.165.000.040A to locate items.

- 1) Ensure all material is removed off belt and cut off gates for material flow are closed.
- 2) Lock counter weight (5) in upper position with the transport bracket supplied. This is a red U-shaped bracket (8) on the diagram. Remove outside scraper.
- 3) Loosen nuts (1, 2) on both sides. Adjust bolt (4) on both sides to bring driven roller shaft (3) to the end of the slot closest to the drive motor.
- 4) Remove belt from the belt guides (7) on both sides.
- 5) Disconnect transport frame clamps (10)
- 6) Slide belt off transport frame.
- 7) Ensure transport frame is clean. No material should be present on frame. Material can be cleaned off using an air gun or cloth rag.

NOTE: DO NOT APPLY AIR OR HEAVY LOADS TO WEIGH BAR (9), AS DAMAGE TO THE LOAD CELL MAY OCCUR. (LOAD CELL PRESENT ON 31-165 GRAVIMETRIC BELT FEEDERS ONLY.)

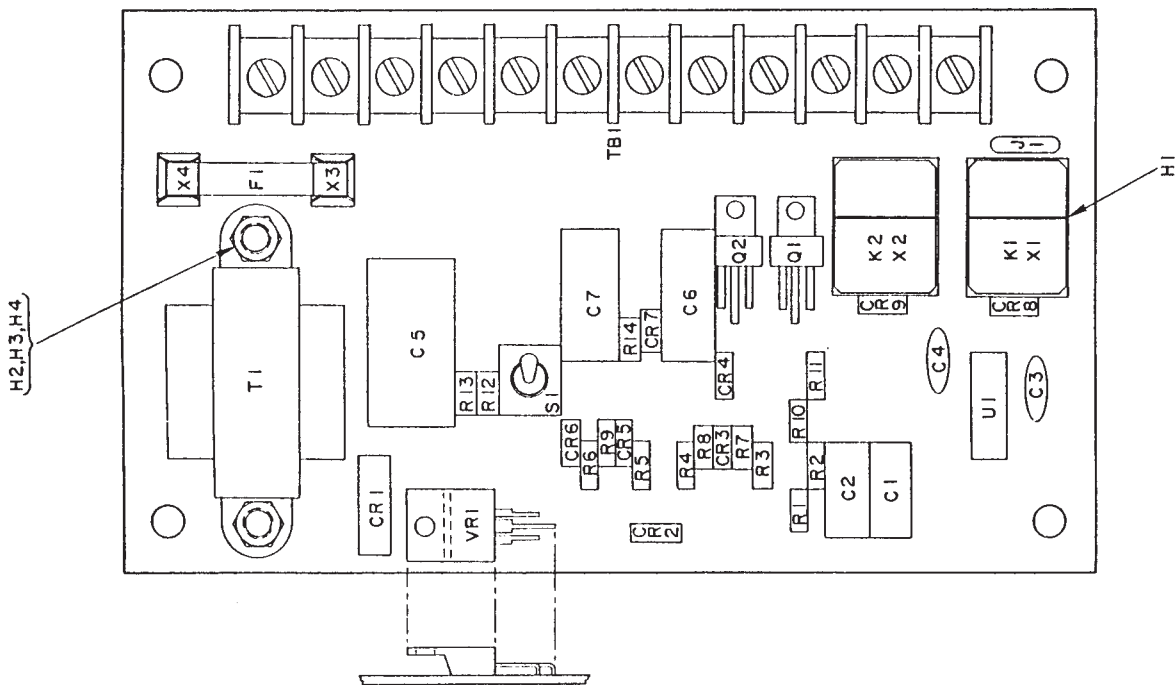
- 8) Slide belt on transport frame. Replace outside scraper.
- 9) Connect two clamps (10) to hold transport frame.
- 10) Place belt into belt guide (7) on both sides.
- 11) Adjust driven roller shaft (3) using bolt (4) to center shaft in slot cut out (11) on both sides.
- 12) Remove transport bracket holding counter weight (5).
- 13) Ensure counter weight is sitting level with the transport frame. Adjust steering roller assembly (6) to level counterweight if required.
- 14) Set belt tracking using the belt tracking procedure.
- 15) Ensure belt is placed in belt guide (7) on both sides.
- 16) Loosen nuts (1, 2) both sides and adjust bolt (4) to center driven roller shaft (8) in slot cut out.
- 17) Check counter weight (5) is set level to frame. Adjust steering roller assembly (6) to level counter weight if necessary.
- 18) Run belt at full speed and adjust bolt (4) on both sides until belt runs true.
- 19) Lock nuts (1, 2).

LOCATIONS FOR BELT REMOVAL, REPLACEMENT, AND ADJUSTMENT
Used in 31-165 Gravimetric & 32-215 Volumetric Belt Feeders

310.165.000.040B

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LIME SLAKING SYSTEM



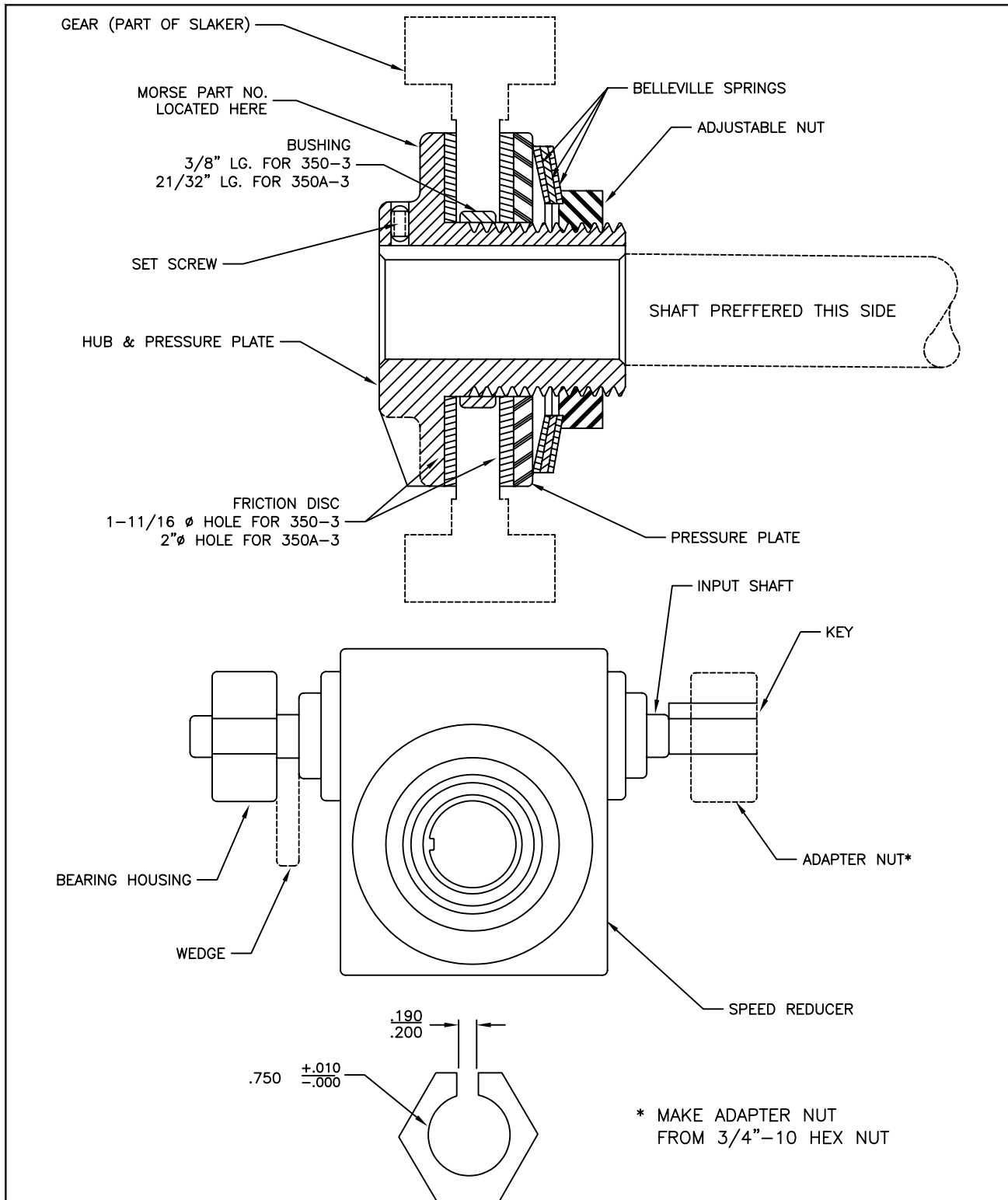
U25659 ALARM UNIT - PARTS

Used in Paste-Type Lime Slaker Control Panels

330.100.008.022

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LIME SLAKING SYSTEM



NOTE: U20698 IS MORSE CHAIN CO. PART NO. 35C-3 CR 350A-3. PARTS MAY BE OBTAINED FROM MORSE CHAIN CO. FOR SERVICE DIRECTIONS, SEE DWG. 330.100.150.021B.

U20698 CLUTCH UNIT - SERVICE

330.100.150.021A

ISSUE 7 1-03

LIME SLAKING SYSTEM

THE CLUTCH UNIT IS FACTORY-SET AND SHOULD NEED NO ADJUSTMENT UNLESS REPLACEMENT PARTS ARE INSTALLED. IF THE CLUTCH IS DISASSEMBLED, PROCEED AS FOLLOWS:

1. ASSEMBLE THE CLUTCH UNIT AS SHOWN. ON 1000 LB SLAKERS ONLY, USE TWO BELLEVILLE SPRINGS INSTEAD OF THREE.
2. TIGHTEN THE ADJUSTMENT NUT JUST ENOUGH SO THE BELLEVILLE SPRINGS ARE SLIGHTLY COMPRESSED.
3. WEDGE THE PADDLE GEARS SO THE PADDLE SHAFTS CANNOT ROTATE. WEDGE THE BEARING HOUSING ON THE SPEED REDUCER. RUN THE DRIVE FOR 10 MINUTES.

CAUTION: APPRECIABLE HEAT MAY BE DEVELOPED IN THE CLUTCH UNIT.

4. REMOVE THE PULLEY FROM THE SPEED REDUCER.
5. PLACE THE ADAPTER NUT ON THE PULLEY SHAFT USING THE KEY.
6. TIGHTEN THE ADJUSTMENT NUT ON THE CLUTCH SO THAT THE TORQUE AT THE INPUT OF THE SPEED REDUCER SLIPS THE CLUTCH AT THE TORQUE BELOW.

12.5 LB.FT. FOR 1000LB. SLAKER
15.0 LB.FT. FOR 2000LB. SLAKER
16.0 LB.FT. FOR 4000LB. SLAKER

7. REMOVE THE WEDGES FROM THE BEARING HOUSING AND PADDLE GEARS. REMOVE ADAPTER NUT AND REPLACE PULLEY.

U20698 CLUTCH UNIT - SERVICE

330.100.150.021B

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LIME SLAKING SYSTEM

1 1/16" NUT

BEARING

CLUTCH
ADJUSTMENT
NUT

CLUTCH ADJUSTMENT

GRIT CONVEYOR
HOUSING

GRIT CONVEYOR
HOUSING

BEARING HOUSING

BEARING HOUSING

BOTTOM SHAFT

NOTE: FOR SERVICE DIRECTIONS, SEE DWG. 330.100.150.040B.

ADJUSTMENT OF GRIT CONVEYOR CLUTCH UNIT - SERVICE

330.100.150.040A

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LIME SLAKING SYSTEM

THE CLUTCH UNIT IS SET AT THE FACTORY. HOWEVER, IF THE CLUTCH IS DISASSEMBLED OR NEEDS TO BE RESET, PROCEED AS FOLLOWS:

PLACE A 1-1/16-INCH SOCKET AND TORQUE WRENCH ON THE 1-1/16-INCH NUT LOCATED ON THE SHAFT.

WITH THE TORQUE WRENCH HELD FIRM AND THE GRIT CONVEYOR IN THE RUNNING POSITION, ADJUST THE CLUTCH ADJUSTMENT NUT UNTIL THE CLUTCH SLIPS AT 100 ± 25 FT-LB FOR 1000, 2000, AND 4000 LB SLAKERS AND 275 ± 25 FT-LB FOR 8000 LB SLAKERS.

NOTE: THE NUT ON THE SHAFT IS LEFT-HAND THREAD.

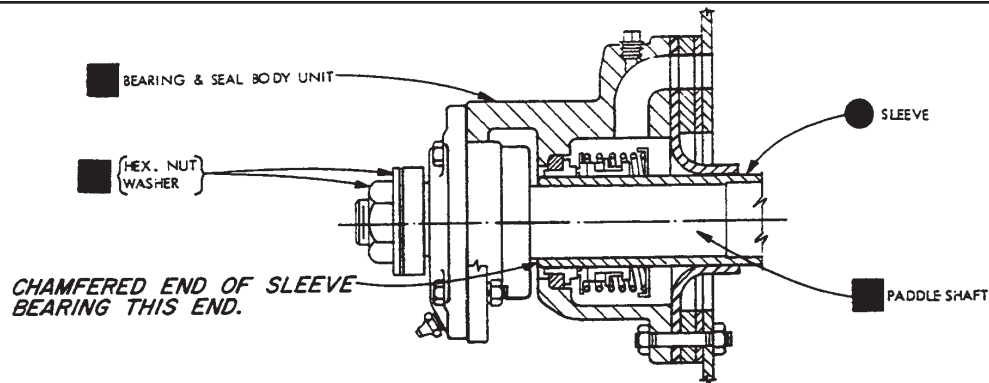
CAUTION: IF THE BOTTOM SHAFT IS REMOVED, BE SURE TO REPLACE THE BEARING HOUSINGS IN THEIR ORIGINAL POSITIONS TO ENSURE PROPER REALIGNMENT OF SHAFT. MARK BOTH THE BEARING AND GRIT CONVEYOR HOUSING FOR PROPER IDENTIFICATION.

ADJUSTMENT OF GRIT CONVEYOR CLUTCH UNIT - SERVICE

330.100.150.040B

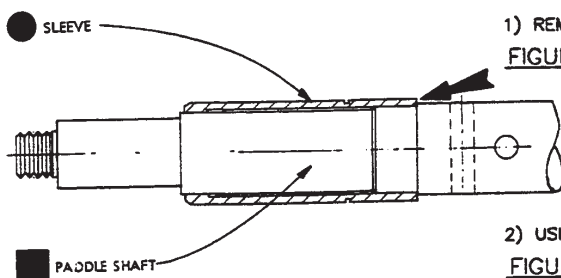
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LIME SLAKING SYSTEM



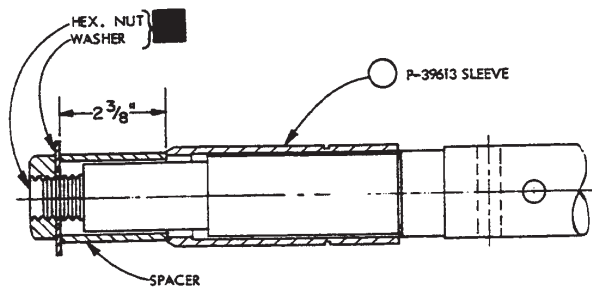
1) REMOVE BEARING & SEAL BODY UNIT & PADDLE SHAFT

FIGURE 1



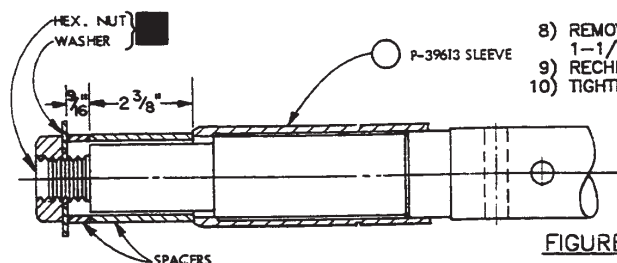
2) USING SUITABLE TOOL REMOVE SLEEVE FROM SHAFT.

FIGURE 2



- 3) SLIP NEW SLEEVE (FLAT SURFACE FORWARD) SEE FIG. 1) ON SHAFT, POSITIONING FOR PRESS FIT.
- 4) PLACE SPACER MADE FROM 2-3/8" LG., 1-1/2" SCHEDULE 40 STEEL PIPE OR EQUIVALENT TOOL AGAINST SLEEVE.
- 5) SECURE HAND TIGHT WITH EXISTING WASHER & HEX. NUT.
- 6) CHECK CONCENTRICITY OF SPACER & SLEEVE ON SHAFT & AGAINST CHAMFERED EDGE OF SLEEVE SO AS NOT TO DAMAGE THE CHAMFERED EDGE.
- 7) TIGHTENING OF HEX. NUT WILL PUSH SLEEVE PART WAY ONTO SHAFT.

FIGURE 3



- 8) REMOVE HEX. NUT & WASHER, ADD SPACER MADE FROM 9/16" LG., 1-1/2" SCHEDULE 40 STEEL PIPE OR EQUIVALENT TOOL.
- 9) RECHECK CONCENTRICITY AS IN STEP #6
- 10) TIGHTEN HEX. NUT, PUSHING SLEEVE TO SHOULDER ON SHAFT.

FIGURE 4

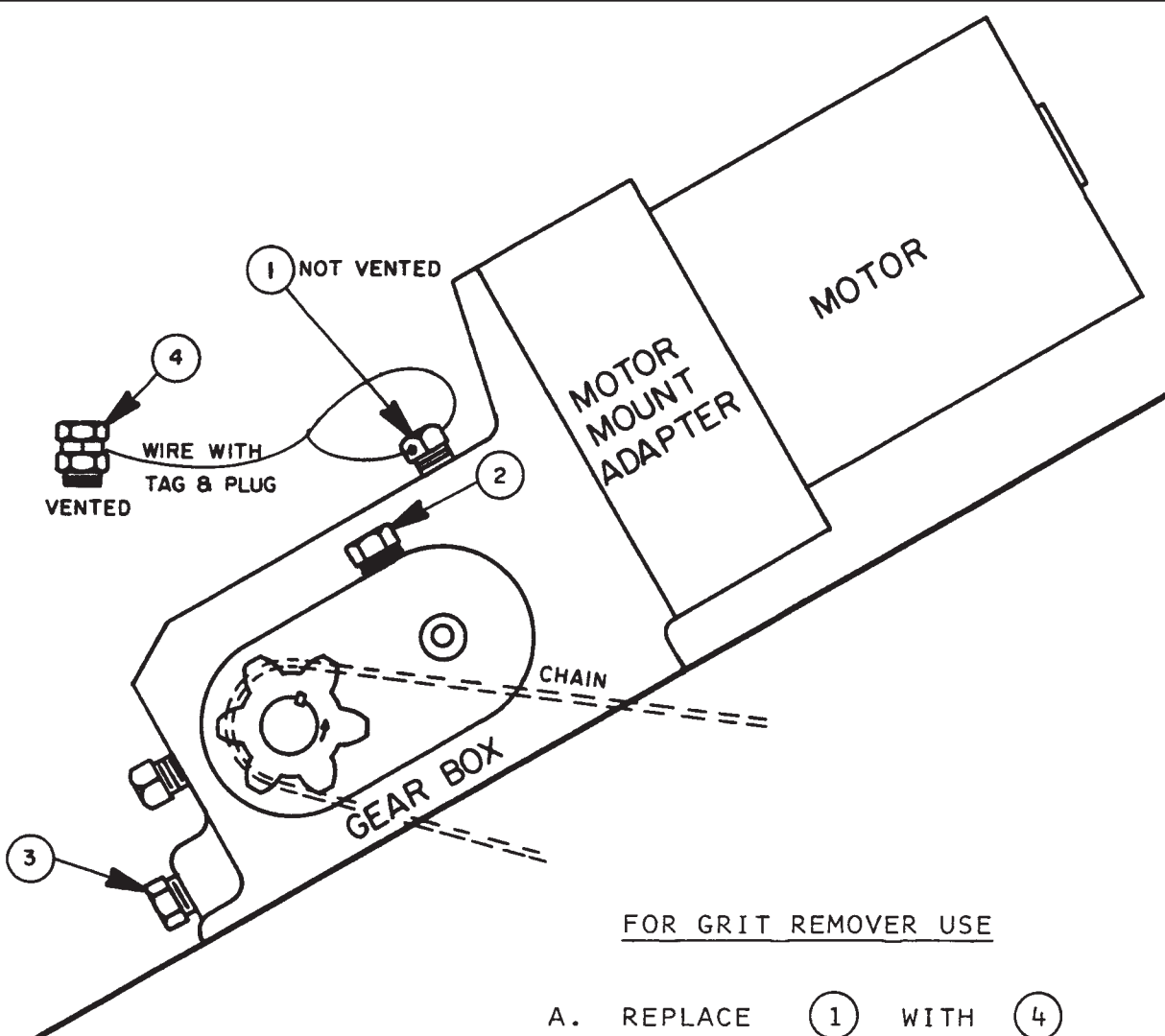
- EXISTING PARTS TO BE DISCARDED
- EXISTING PARTS TO BE RE-USED
- NEW PARTS

REPLACEMENT OF PADDLE SHAFT SLEEVE - SERVICE

330.100.150.011

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LIME SLAKING SYSTEM



FOR GRIT REMOVER USE

- A. REPLACE (1) WITH (4)
- B. TO CHECK OIL LEVEL, REMOVE (2) ADD OIL VIA (4) HOLE UNTIL IT STARTS TO OVERFLOW AT (2) OR REPLACE PLUGS.
- C. USE (3) TO DRAIN GEAR BOX.

LUBRICATION OF GRIT CONVEYOR GEAR BOX - SERVICE

330.100.150.050

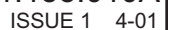
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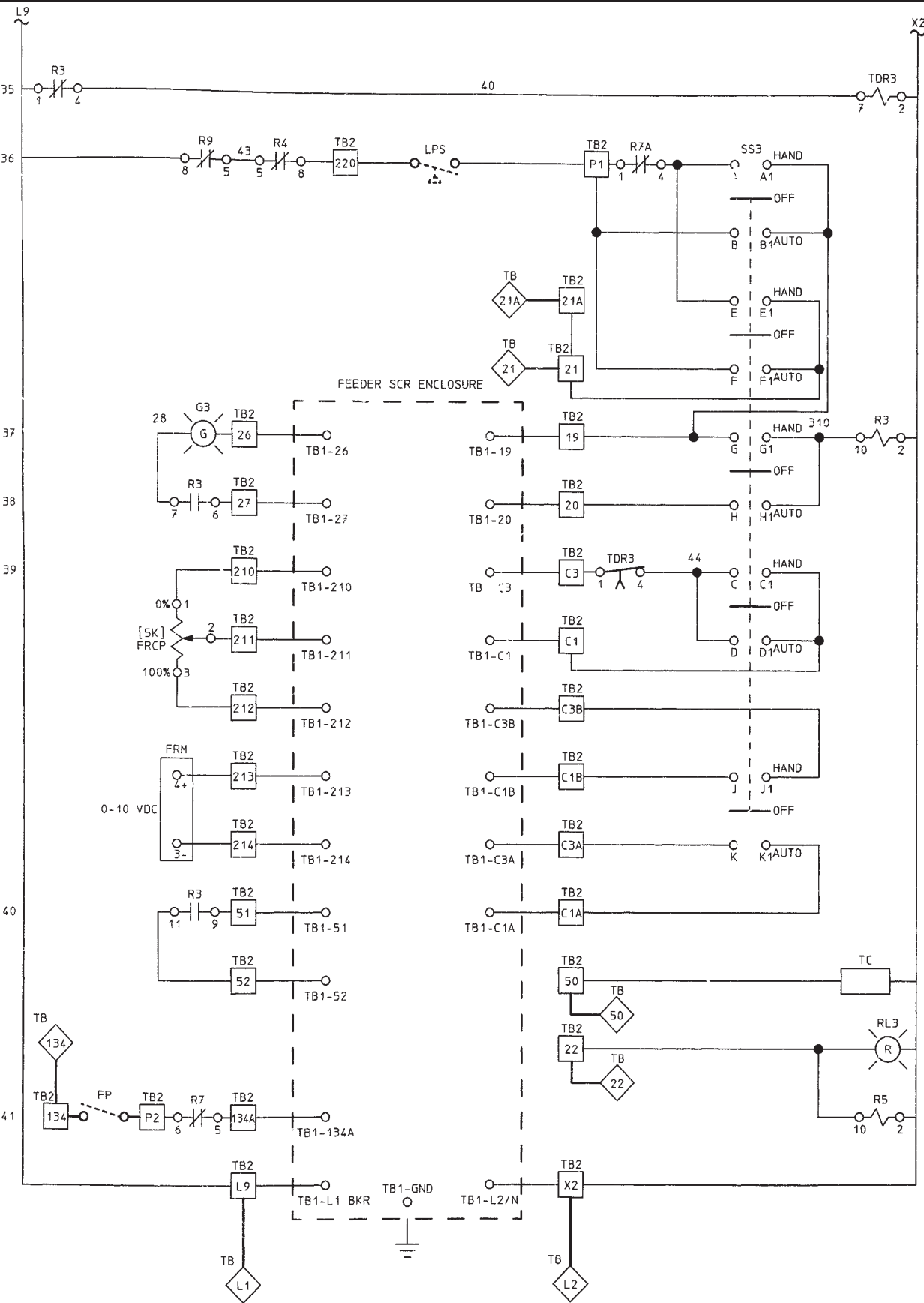
LIME SLAKING SYSTEM

LIME SLAKING SYSTEM



LIME SLAKING SYSTEM





LEGEND

- AH ALARM HORN
- CC CONTROL CONTACT - CLOSING AT ZERO FLOW OR HIGH LEVEL
- DS FUSED DISCONNECT SWITCH
- FP CONTACT CLOSED - PROPORTIONAL TO FLOW
- FRCP FEED RATE CONTROL POTENTIOMETER
- FRM FEED RATE METER
- FU1 FUSE - 6 AMP
- G1 GRIT REMOVER OPERATING LIGHT [GREEN]
- G2 PADDLE SHAFT OPERATING LIGHT [GREEN]
- G3 FEEDER OPERATING LIGHT [GREEN]
- LPS LOW PRESSURE SWITCH
- M1 GRIT REMOVER MOTOR
- M2 SLAKER PADDLE SHAFT MOTOR
- M4 D.C. FEEDER MOTOR
- MS1 MAGNETIC MOTOR STARTER FOR M1
- MS2 MAGNETIC MOTOR STARTER FOR M2
- R3 FEEDER CONTROL RELAY
- R4 & R4A SLAKER PADDLE SHAFT ALARM RELAY
- R5 FEEDER ALARM RELAY
- R6 ALARM SILENCING RELAY
- R7 & R7A SYSTEM SHUT-DOWN RELAY
- R9 & R9A GRIT REMOVER RELAY
- RL1 GRIT REMOVER ALARM LIGHT [RED]
- RL2 SLAKER PADDLE SHAFT ALARM LIGHT [RED]
- RL3 FEEDER ALARM LIGHT [RED]
- S1 GRIT REMOVER SWITCH
- S2 SLAKER PADDLE SHAFT SWITCH
- SB ALARM ACKNOWLEDGEMENT PUSHBUTTON
- SS1 SELECTOR SWITCH - GRIT REMOVER AND SLAKER
- SS2 SELECTOR SWITCH - SLAKER PADDLE SHAFT
- SS3 SELECTOR SWITCH - FEEDER
- SS4 SELECTOR SWITCH - AUTOMATIC MODE
- N.C. SOLENOID VALVE, 1" - WATER LINE AUXILIARIES
- N.O. SOLENOID VALVE, 1/2" - TORQUE BY-PASS
- T1 TIMER - FLUSH CYCLE AUXILIARIES
- TACH TACHOMETER
- TB1 TERMINAL BOARD - FEEDER SCR CONTROL ENCLOSURE
- TB2 TERMINAL BOARD - SLAKER CONTROL PANEL
- TB6 TERMINAL BOARD - SLAKER ALARM UNIT
- TC TOTALIZER COUNTER
- TDR1 FEEDER ALARM TIME DELAY RELAY
- TDR3 FEEDER SCR TIME DELAY RELAY
- XFMR1 TRANSFORMER
- OPTIONAL EQUIPMENT

◇ INDICATES TERMINAL IN FEEDER SETPOINT CONTROLLER ENCLOSURE

MULTIELEMENT DEVICE LOCATION TABLE

DEVICE	COIL	CONTACTS		CONTACTS USED			
		NUMBER	SPARE	1	2	3	4
MS1	16 [16]	4	0	1 [16]	1 [16]	2 [16]	17 [16]
MS2	20 [16]	4	0	3 [16]	3 [16]	4 [16]	21 [16]
R3	37 [17]	3	0	35 [17]	38 [17]	40 [17]	
R4	29 [16]	2	0	23 [16]	36 [17]		
R4A	30 [16]	3	0	9 [16]	22 [16]	25 [16]	
R5	41 [17]	3	1	26 [16]	28 [16]		
R6	25 [16]	2	1	25 [16]	28 [16]		
R7	7 [16]	3	0	9 [16]	14 [16]	41 [17]	
R7A	9 [16]	2	1	36 [17]			
R9	31 [16]	2	0	25 [16]	36 [17]		
R9A	32 [16]	2	0	24 [16]	27 [16]		
T1	8 [16]	2	0	8 [16]	10 [16]		
TDR1	15 [16]	2	0	22 [16]	23 [16]		
TDR3	35 [17]	2	1	39 [17]			

LINE NUMBER → 22 [22] ← SHEET NUMBER

→ CLOSED CONTACT

OPERATING SEQUENCE

- ALARM CONDITIONS:
- 1 IF EITHER THE GRIT CONVEYOR OR SLAKER STOPS, THE SLAKER VISUAL ALARM (RL2) AND RL3 AND AUDIBLE ALARM HORN (AH) OPERATE AND THE FEEDER STOPS WITH PADDLE SHAFT ALARM, BY-PASS SOLENOID VALVE (SV2) OPENS
 - 2 AUDIBLE ALARM MAY BE SILENCED BY PUSHING ACKNOWLEDGMENT PUSH BUTTON (SB)

- AUTOMATIC BATCHING OR SYSTEM SHUT-DOWN SS4-POSITION 2
- AUTO STOP (CC SWITCH CLOSING):
- 1 CC SWITCH CLOSING TO ENERGIZE (R7) AND START TIMER (T1)
 - 2 (R7) N.C. CONTACT OPENS TO STOP FEEDER IMMEDIATELY
 - 3 AT END OF TIME INTERVAL SET ON (T1), N.C. CONTACT ON (T1) OPENS TO CLOSE SOLENOID VALVE (SV1) TO SHUT-OFF JET SPRAY AND GRIT REMOVER WATER
 - 4 PADDLE SHAFT AND GRIT REMOVER RUN CONTINUOUSLY
 - 5 SLAKER ALARM IS FUNCTIONAL

- AUTO START (CC SWITCH OPENS)
- 1 CC SWITCH OPENS TO DE-ENERGIZE (R7) AND TIMER (T1)
 - 2 (R7) N.C. CONTACT CLOSING TO START FEEDER IMMEDIATELY
 - 3 SOLENOID VALVE (SV1) IS OPENED IMMEDIATELY BY N.C. CONTACT ON TIMER (T1) TO RESTORE JET SPRAY AND GRIT REMOVER WATER

- NOTES:
- A PADDLE SHAFTS AND GRIT REMOVER RATE CONTINUOUSLY
 - B BY-PASS SOLENOID VALVE (SV2) ALWAYS CLOSED UNLESS POWER FAILS (OPENS MOMENTARILY ON "IP")
 - C DUST ARRESTOR WATER IS CONTINUOUS
 - D WATER SUPPLY TO TORQUE VALVE (SV2) IS ON

- OPTIONAL SYSTEM SHUT-DOWN SS4-POSITION 1
- AUTO STOP (CC SWITCH OPENS):
- 1 CC SWITCH CLOSING TO ENERGIZE RELAY (R7) AND START TIMER (T1)
 - 2 A FIRST (R7) N.C. CONTACT OPENS TO STOP FEEDER IMMEDIATELY
 - B SECOND (R7) N.C. CONTACT OPENS TO DE-ENERGIZE BY-PASS SOLENOID VALVE (SV2) TO ADMIT DILUTION WATER TO PASTE COMPARTMENT
 - C THIRD (R7) N.C. CONTACT OPENS TO RESET (TDR1) TO OPEN CONTACT CONDITION TO PREVENT SLAKER ALARM
 - 3 AFTER TIME SET ON TIMER (T1) TIMER CONTACTS REVERSE TO A CLOSE BY-PASS SOLENOID VALVE (SV2)
 - B CLOSE SOLENOID VALVE (SV1) TO STOP JET SPRAY AND GRIT REMOVER WATER
 - C STOP GRIT CONVEYOR AND PADDLE SHAFTS BY KILLING MOTOR STARTER CONTROL CIRCUITS

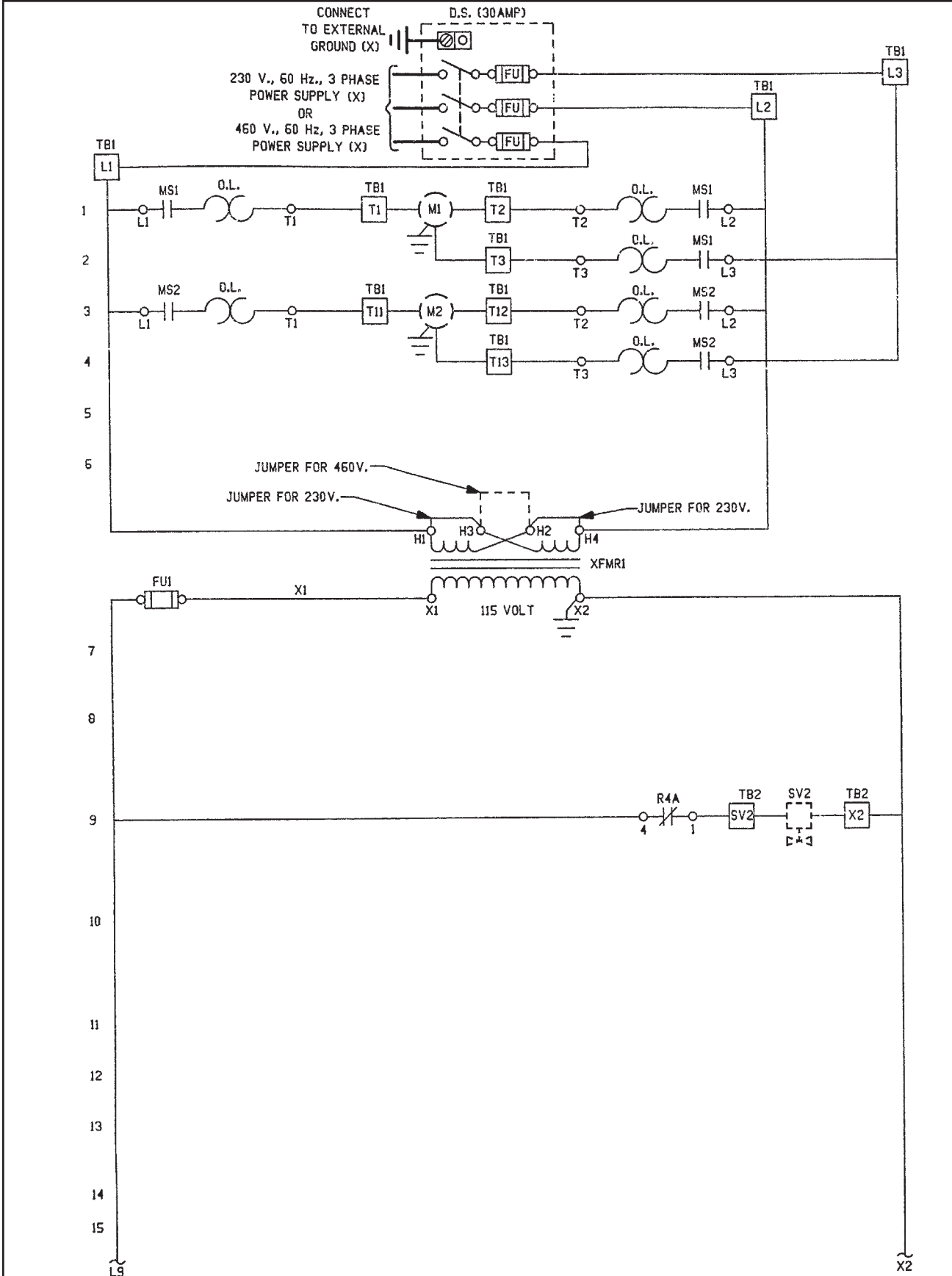
- AUTO START (CC SWITCH OPENS)
- 1 CC SWITCH OPENS TO DE-ENERGIZE RELAY (R7) AND TIMER (T1)
 - 2 GRIT REMOVER AND PADDLE SHAFTS START
 - 3 A FIRST (R7) N.C. CONTACT CLOSING TO START FEEDER AFTER SLAKER ALARM REACHES NORMAL CONDITION, (R4 AND R9 DE-ENERGIZED)
 - B SECOND (R7) N.C. CONTACT CLOSING TO CLOSE BY-PASS SOLENOID VALVE (SV2) THRU N.C. TIMER CONTACT
 - C THIRD (R7) N.C. CONTACT CLOSING TO START (TDR1) OPERATION, NO SLAKER ALARM POSSIBLE UNTIL END OF TIME DELAY SETTING
 - 4 SOLENOID VALVE (SV1) OPENS THROUGH N.C. CONTACT ON TIMER (T1), JET SPRAY AND GRIT REMOVER WATER RESTORED

SLAKER SYSTEM CONTROL USING MODEL 31-165 GRAVIMETRIC BELT FEEDER AND CONVEYOR TYPE GRIT REMOVER - WIRING

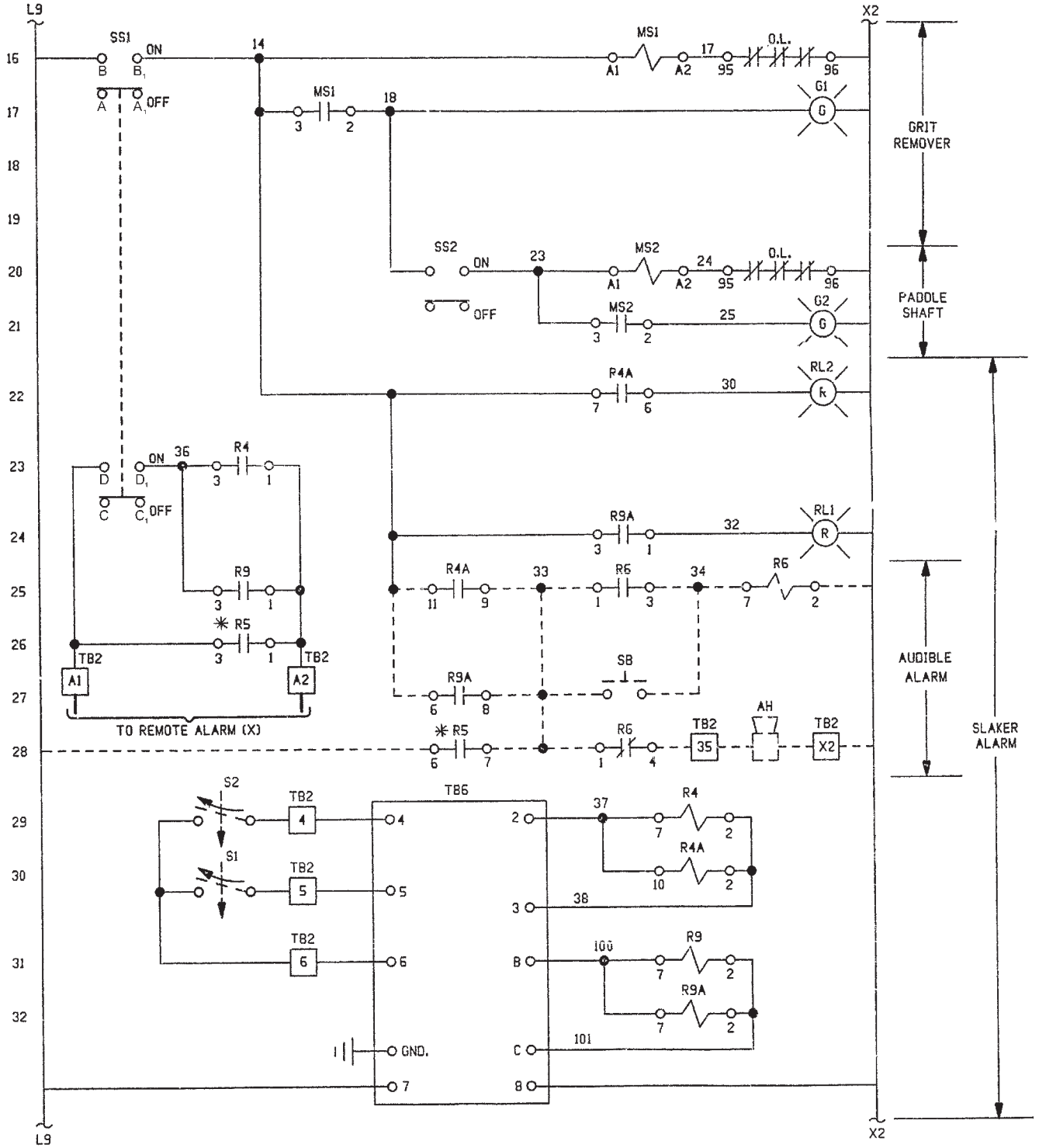
Automatic Batching or System Shutdown

330.101.155.010B
ISSUE 1 4-01

LIME SLAKING SYSTEM



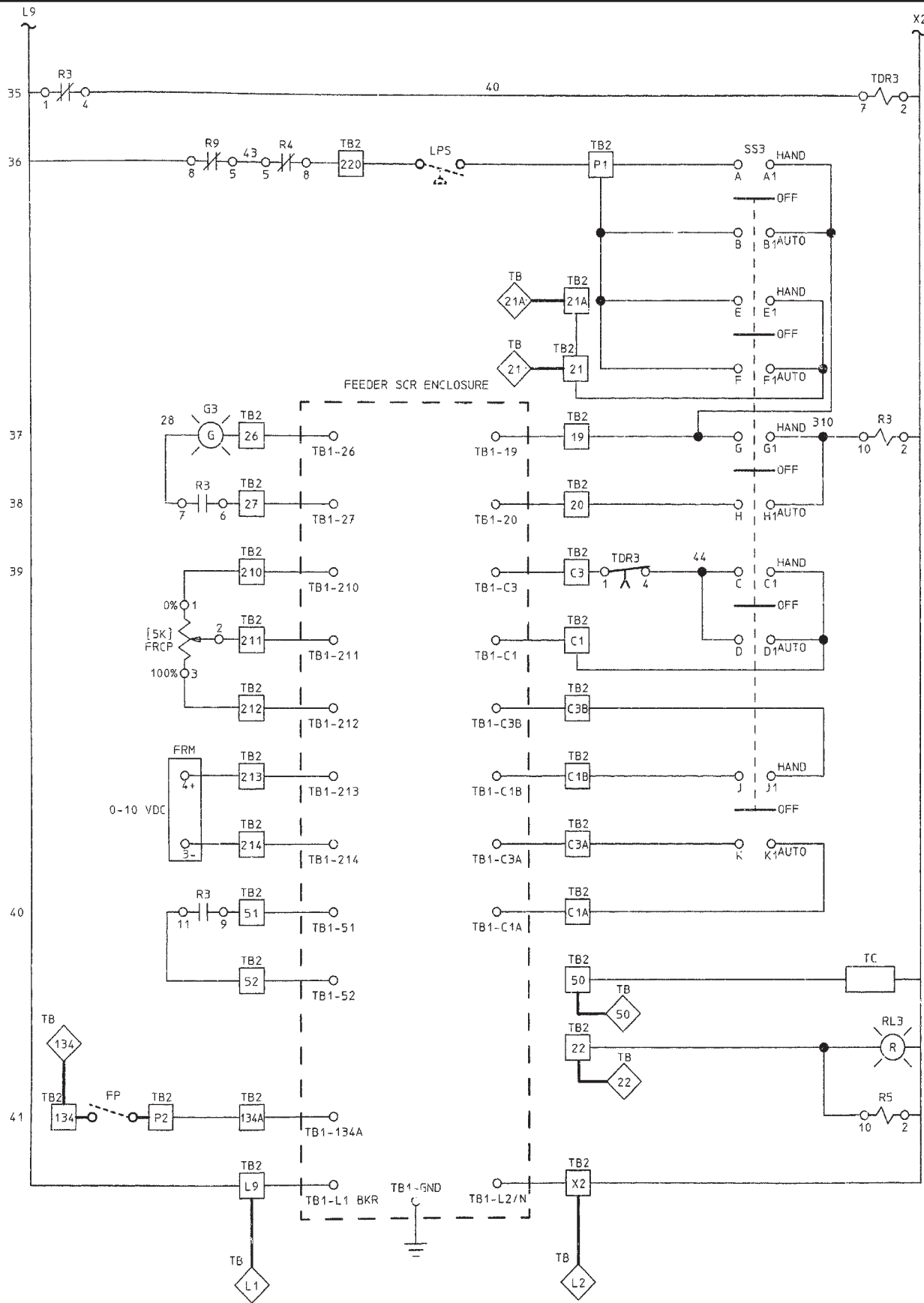
LIME SLAKING SYSTEM



SLAKER SYSTEM CONTROL USING MODEL 31-165 GRAVIMETRIC BELT FEEDER
AND CONVEYOR TYPE GRIT REMOVER - WIRING
Manual or Pulse Duration Flow Proportional Control

330.101.155.020A

ISSUE 1 4-01



- LEGEND**
- AH ALARM HORN
 - DS FUSED DISCONNECT SWITCH
 - FP CONTACT CLOSED - PROPORTIONAL TO FLOW
 - FRCP FEED RATE CONTROL POTENTIOMETER
 - FRM FEED RATE METER
 - FU1 FUSE - 6 AMP
 - G1 GRIT REMOVER OPERATING LIGHT [GREEN]
 - G2 PADDLE SHAFT OPERATING LIGHT [GREEN]
 - G3 FEEDER OPERATING LIGHT [GREEN]
 - LPS LOW PRESSURE SWITCH
 - M1 GRIT REMOVER MOTOR
 - M2 SLAKER PADDLE SHAFT MOTOR
 - M4 D.C. FEEDER MOTOR
 - MS1 MAGNETIC MOTOR STARTER FOR M1
 - MS2 MAGNETIC MOTOR STARTER FOR M2
 - R3 FEEDER CONTROL RELAY
 - R4 & R4A SLAKER PADDLE SHAFT ALARM RELAY
 - R5 FEEDER ALARM RELAY
 - R6 ALARM SILENCING RELAY
 - R9 & R9A GRIT REMOVER RELAY
 - RL1 GRIT REMOVER ALARM LIGHT [RED]
 - RL2 SLAKER PADDLE SHAFT ALARM LIGHT [RED]
 - RL3 FEEDER ALARM LIGHT [RED]
 - S1 GRIT REMOVER SWITCH
 - S2 SLAKER PADDLE SHAFT SWITCH
 - SB ALARM ACKNOWLEDGEMENT PUSHBUTTON
 - SS1 SELECTOR SWITCH - GRIT REMOVER AND SLAKER
 - SS2 SELECTOR SWITCH - SLAKER PADDLE SHAFT
 - SS3 SELECTOR SWITCH - FEEDER
 - SV2 N.O. SOLENOID VALVE, 1/2" - TORQUE BY-PASS
 - TACH TACHOMETER
 - TB1 TERMINAL BOARD - FEEDER SCR CONTROL ENCLOSURE
 - TB2 TERMINAL BOARD - SLAKER CONTROL PANEL
 - TB6 TERMINAL BOARD - SLAKER ALARM UNIT
 - TC TOTALIZER COUNTER
 - TDR3 FEEDER SCR TIME DELAY RELAY
 - XFMR TRANSFORMER
 - OPTIONAL EQUIPMENT

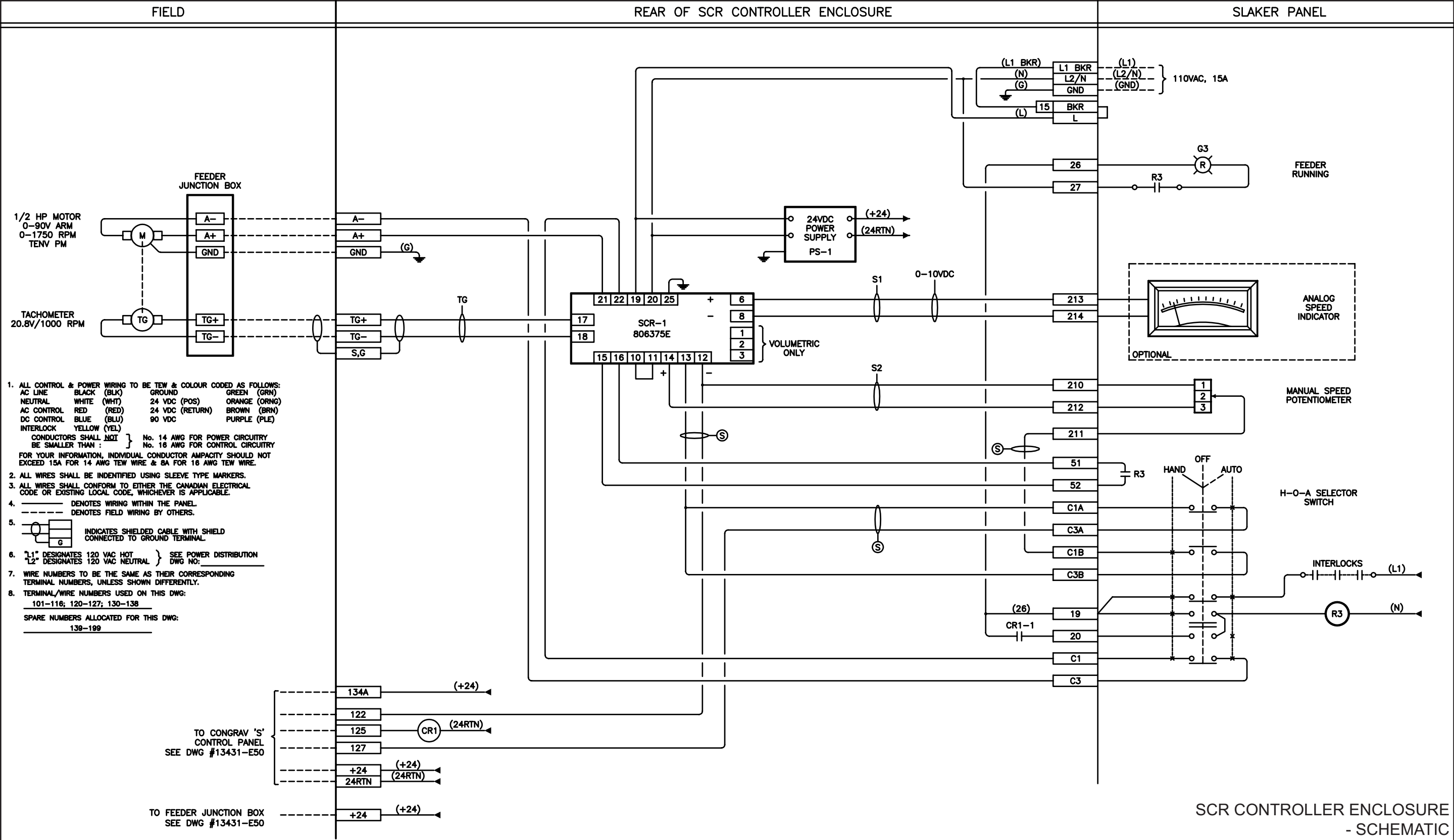
- OPERATING SEQUENCE**
- GRIT CONVEYOR STARTS.
 - SLAKER STARTS.
 - SLAKER VISUAL ALARM RL2 & RL3, AUDIBLE ALARM AH, AND BY-PASS SOLENOID VALVE SV2 FUNCTION UNTIL ALARM PANEL REACHES NORMAL OPERATING CONDITION AND DE-ENERGIZES RELAY R4, R4A, R9 AND R9A.
 - FEEDER STARTS.
- ALARM CONDITIONS:**
- IF EITHER THE GRIT CONVEYOR OR SLAKER STOPS, SLAKER VISUAL ALARM RL2 OR RL3 AND AUDIBLE ALARM AH OPERATE, AND FEEDER STOPS. BY-PASS SOLENOID VALVE SV2 OPENS ON PADDLE SHAFT ALARM.
 - AUDIBLE ALARM MAY BE SILENCED BY PUSHING ACKNOWLEDGMENT BUTTON SB.

◇ INDICATES TERMINAL IN FEEDER SETPOINT CONTROLLER ENCLOSURE.

MULTIELEMENT DEVICE LOCATION TABLE							
DEVICE	COIL	CONTACTS		CONTACTS USED			
		NUMBER	SPARE	1	2	3	4
MS1	16 [10]	4	0	1 [10]	1 [10]	2 [10]	17 [10]
MS2	20 [10]	4	0	3 [10]	3 [10]	4 [10]	21 [10]
R3	37 [11]	3	0	35 [11]	38 [11]	40 [11]	
R4	29 [10]	2	0	23 [10]	36 [11]		
R4A	30 [10]	3	0	2 [10]	22 [10]	25 [10]	
R5	41 [11]	3	1	26 [10]	28 [10]		
R6	25 [10]	2	1	25 [10]	28 [10]		
R9	31 [10]	2	0	25 [10]	36 [11]		
R9A	32 [10]	2	0	24 [10]	27 [10]		
TDR3	35 [11]	2	1	39 [11]			
LINE NUMBER → 22 [22] ← SHEET NUMBER							
CLOSED CONTACT							

SLAKER SYSTEM CONTROL USING MODEL 31-165 GRAVIMETRIC BELT FEEDER
AND CONVEYOR TYPE GRIT REMOVER - WIRING
Manual or Pulse Duration Flow Proportional Control

330.101.155.020B
ISSUE 1 4-01

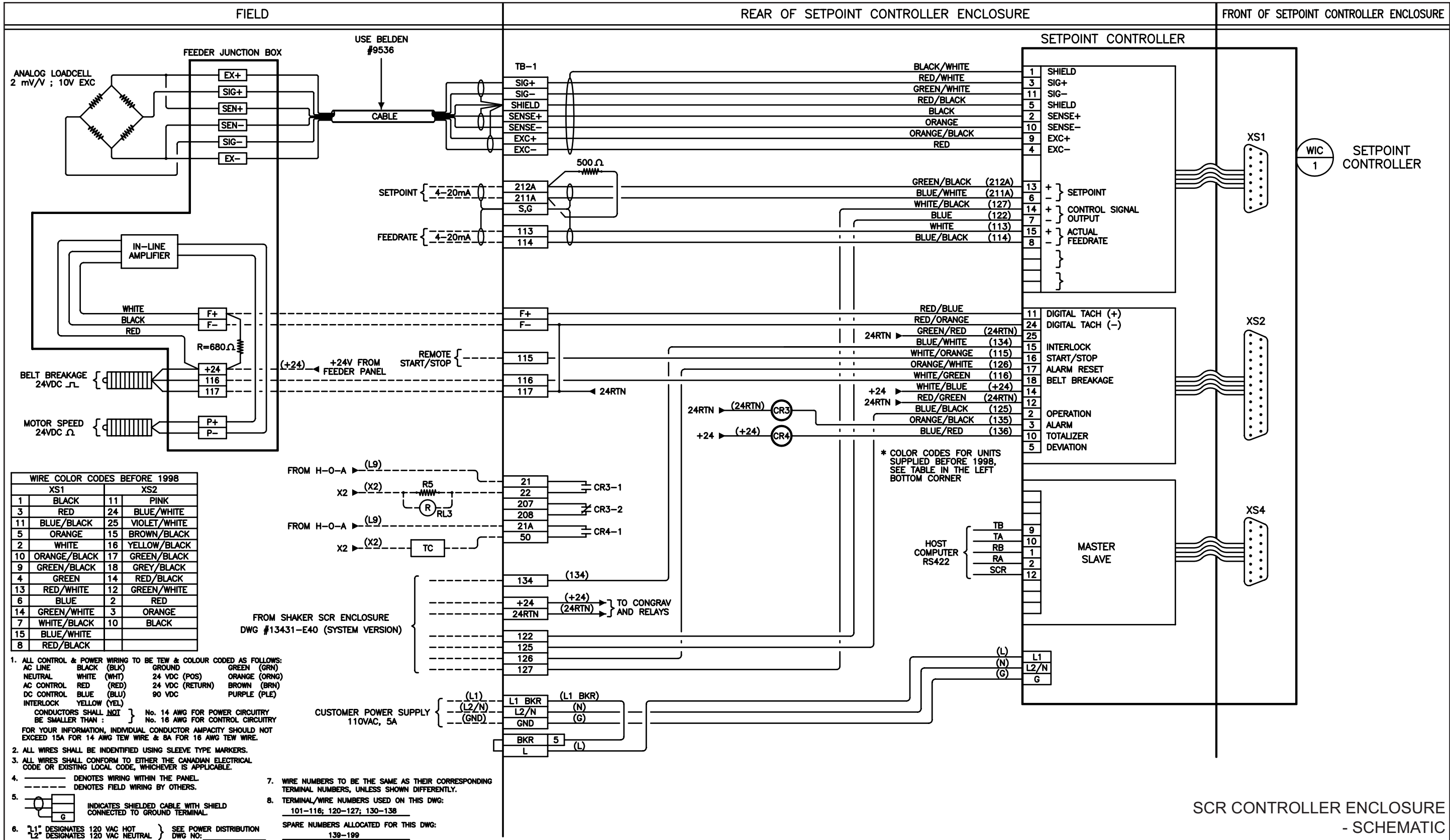


SCR CONTROLLER ENCLOSURE
- SCHEMATIC

330.100.155.011
ISSUE 1 4-01

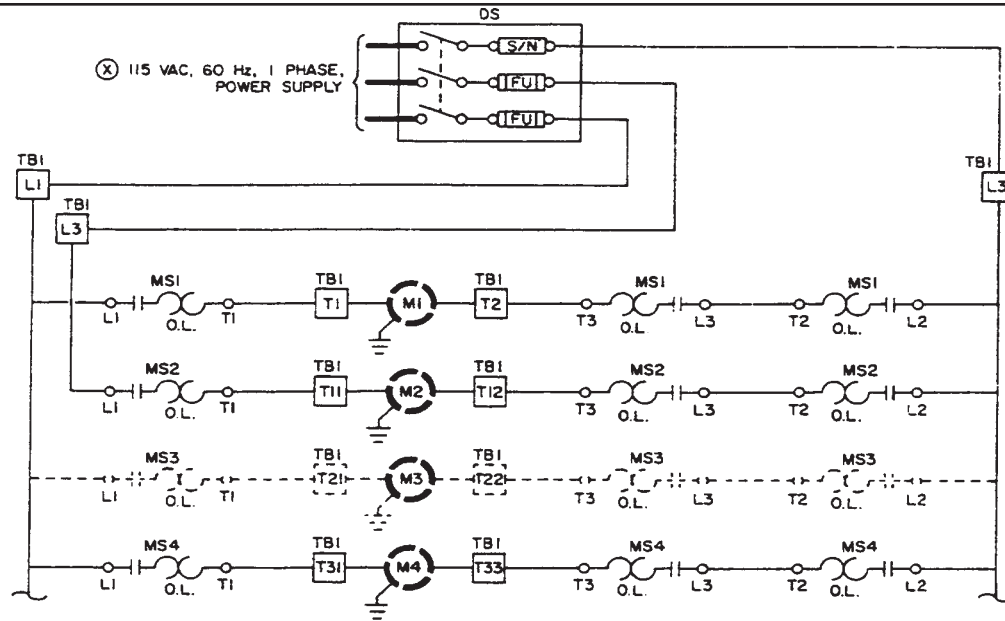
LIME SLAKING SYSTEM

LIME SLAKING SYSTEM

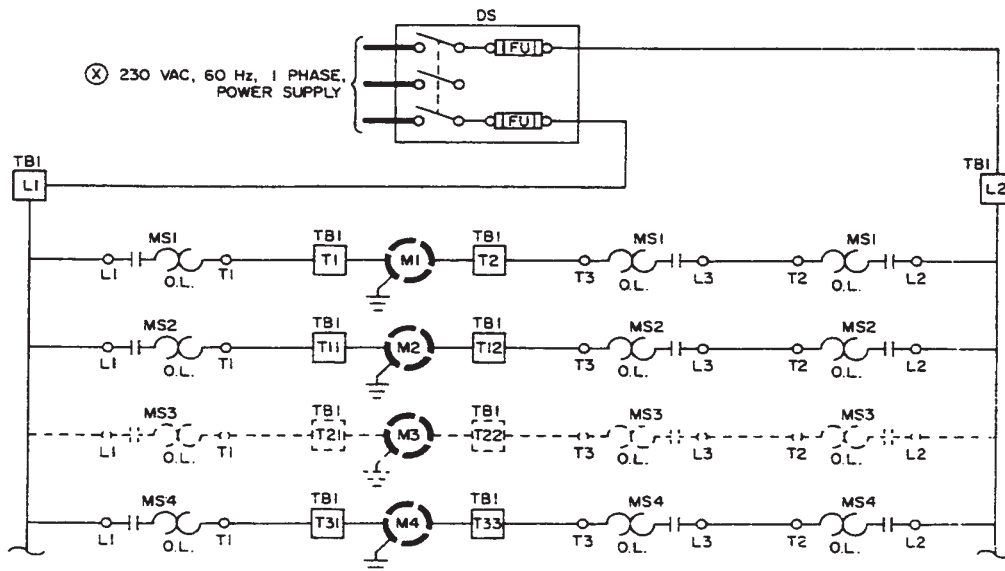


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LIME SLAKING SYSTEM



115 VAC SINGLE PHASE WIRING



230 VAC SINGLE PHASE WIRING

NOTE: (X) NOT FURNISHED BY U.S. FILTER/W&T

— WIRING BY U.S. FILTER/W&T

- - - OPTIONAL COMPONENTS

----- COMPONENTS REMOTE FROM PANEL ILLUSTRATED

— FIELD WIRING (NOT BY U.S. FILTER/W&T) MUST CONFORM TO LOCAL ELECTRICAL CODES

SINGLE PHASE WIRING FOR SLAKER SYSTEM CONTROLS - WIRING

330.100.140.230

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LIME SLAKING SYSTEM

TABLE 1
CONNECTIONS FROM XS-1 TO TB-1

TERMINAL NUMBER AT TB-1	PIN NUMBER AT XS- 1	DESIGNATION	DESCRIPTION	FUNCTION
#212A	13	AN12+	ANALOG INPUT #2 PLUS	REMOTE SETPOINT 4-20mA INPUT
#211A	6	AN12-	ANALOG INPUT #2 MINUS	
#127	14	AN01 +	ANALOG OUTPUT #1 PLUS	SCR CONTROL SIGNAL 0-10 Vdc
#122	7	AN01-	ANALOG OUTPUT #1 MINUS	
#113	15	AN02+	ANALOG OUTPUT #2 PLUS	FEEDRATE OUTPUT 4-20mA
#114	8	AN02-	ANALOG OUTPUT #2 MINUS	
EXC+	9	EX+	EXCITATION PLUS	LOAD CELL 0-20mV
SEN+	2	SEN+	SENSE PLUS	
SIG+	3	AN11+	ANALOG INPUT #1 PLUS	
SIG-	11	AN11-	ANALOG INPUT #1 MINUS	
SEN-	10	SEN-	SENSE MINUS	
EXC-	4	EX-	EXCITATION MINUS	
SHLD	5	AGND	ANALOG GROUND	

SETPOINT CONTROLLER CONNECTIONS
Analog Inputs and Outputs

330.100.155.030

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LIME SLAKING SYSTEM

TABLE 2
CONNECTIONS FROM XS-2 TO TB-1

TERMINAL NUMBER AT TS-1	PIN NUMBER AT XS-2	DESIGNATION	DESCRIPTION	FUNCTION
#125	2	OUT 1	DIGITAL OUTPUT #1	FEEDER RUNNING
#21 & #22 N.O. CONTACT #207 & #208 N.O. CONTACT	3	OUT 2	DIGITAL OUTPUT #2	ALARM
#21A & #50	10	OUT 9	DIGITAL OUTPUT #9	EXTERNAL TOTALIZER
+F	11	FI 1+	FREQUENCY INPUT PLUS	MOTOR SPEED SENSOR
-F	24	FI-	FREQUENCY INPUT GND	
#134	15	IN1	DIGITAL INPUT #1	REMOTE START/STOP INTERLOCK
#115	16	IN2	DIGITAL INPUT #2	AUXILIARY START / STOP
#126	17	IN3	DIGITAL INPUT #3	ALARM RESET PUSHBUTRON
#116	18	IN4	DIGITAL INPUT #4	BROKEN BELT DETECTOR
#+24	14	+24VDC	+24 Vdc PLUS	EXTERNAL SUPPLY
#24 RTN	12	24 RTN	+24 Vdc COMMON	
#24 RTN	25	24 RTN	+24 Vdc COMMON	

SETPOINT CONTROLLER CONNECTIONS
Digital Inputs and Outputs

330.100.155.040
ISSUE 0 9-97

LIME SLAKING SYSTEM

LIME SLAKING SYSTEM

SECTION 5 - ILLUSTRATIONS

List of Contents

DRAWING NO.

LIME SLAKER

Parts

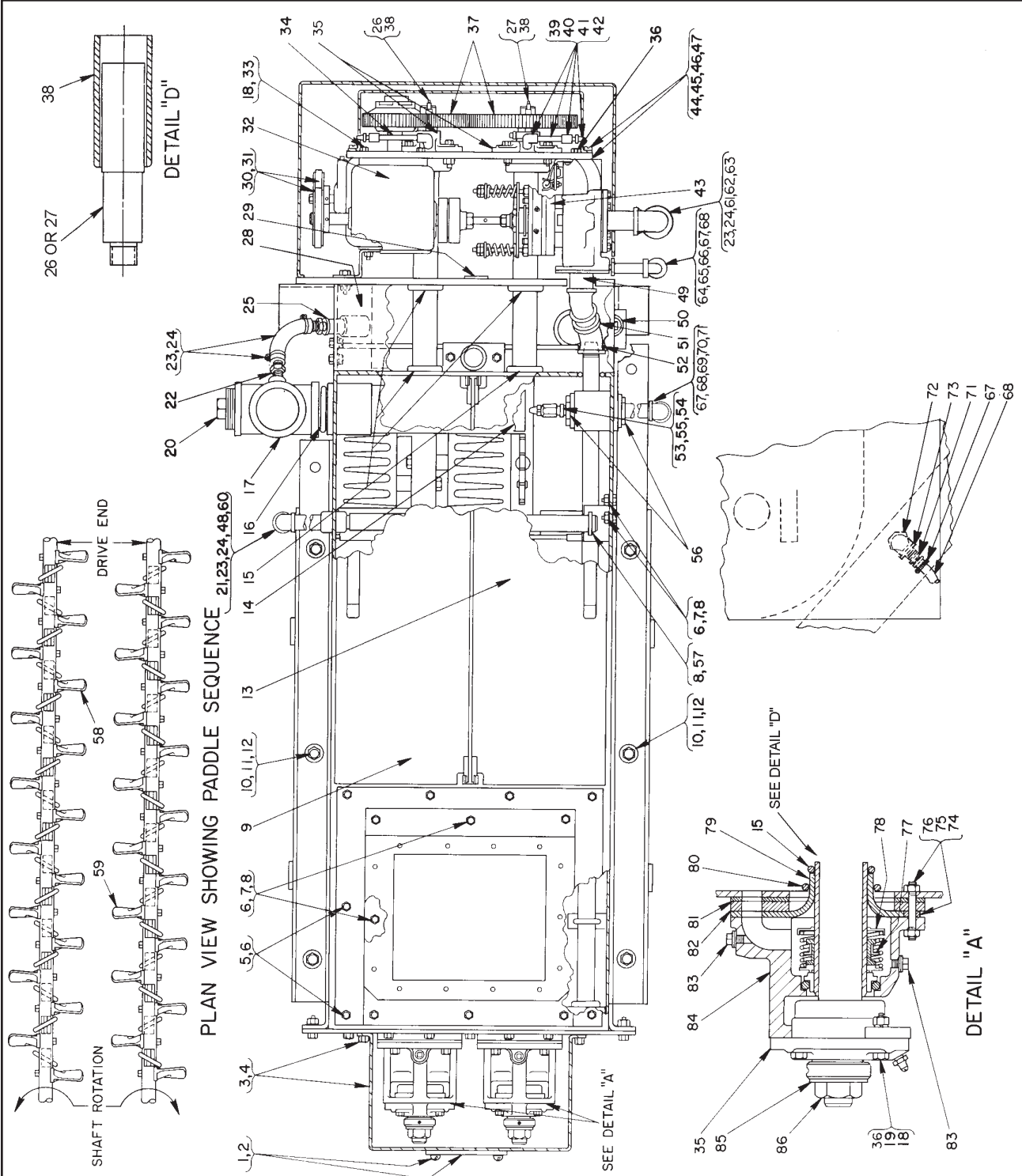
Plan View - 1000 lb/hr	330.100.000.094A-C
Side Elevation - 1000 lb/hr.....	330.100.000.095A-C
Plan View - 2000 lb/hr.....	330.100.001.072A-C
Side Elevation - 2000 lb/hr	330.100.001.073A-C
Plan View - 4000 lb/hr.....	330.100.002.093A-C
Side Elevation - 4000 lb/hr	330.100.002.094A-C
Parts Details - 4000 lb/hr.....	330.100.002.095A&B
Automatic Grit Remover.....	330.100.010.040A-C
Special Low-Profile Grit Remover.....	330.100.10.011A-C
Torque Actuated Water Control Valve	
1000 & 2000 lb/hr.....	330.100.004.013A&B
4000 lb/hr.....	330.100.004.014A&B
Varea-Meter - 1000 lb/hr	330.100.011.012
Varea-Meter - 2000 lb/hr	330.100.011.022
Varea-Meter - 4000 & 8000 lb/hr	330.100.011.032
Glass-Tube Varea-Meter - Tube Shield.....	520.100.001.012A&B
U19939 Speed Reducer	330.100.99.011
Motor Starter Overload Relays	33.100.015.010
Water Supply Control Components.....	330.101.013.010

GRAVIMETRIC BELT FEEDER

Parts

Feeder Housing	310.165.000.060A-C
SCR Speed Controller Enclosure	330.100.000.020
Setpoint Controller Enclosure	310.165.000.030

LIME SLAKING SYSTEM



NOTE: FOR PARTS LIST, SEE DWGS. 330.100.000.094B&C.

U27160 1000 LB. LIME SLAKER - PARTS

Plan View

330.100.000.094A

ISSUE 3 1-03

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	P 58164	1	NAMEPLATE
2	PC35137	4	SET SCREW (RD.HD.,STL.) #4-40 x 3/16" LG.
3	P 41084	1	COVER
4	PC 8117	4	MACH. SCREW (HEX.HD.,STL.) 3/8"-16 x 5/8" LG.
5	P 874	19	CAP SCREW (HEX.HD.,STL.) 5/16"-18 x 1" LG.
6	PC 4763	18	5/16" LOCKWASHER (CARB. STL.)
7	P 873	9	CAP SCREW (HEX.HD.,STL.) 5/16"-18 x 3/4" LG.
8	PC 2487	9	HEX. NUT (STL.) 5/16"-18
9	P 39259	1	MAIN COVER #2
10	P 855	6	CAP SCREW (HEX.HD.,STL.) 1/2"-13 x 1-1/4" LG.
11	PC12230	6	1/2" LOCKWASHER (CARB. STL.)
12	P 889	6	HEX. NUT (STL.) 1/2"-13
13	P 39258	1	MAIN COVER #1
14	P 52701	1	PIPE (DUST REMOVER)
15	P 37190	6	O-RING (329) BUNA-N, 2" ID x 2-3/8" OD
16	P 41398	1	PIPE NIPPLE (3" x 2-5/8" LG.)
17	U 29178	1	TEE UNIT, 3"P
18	PC 8334	12	3/8" LOCKWASHER (CARB. STL.)
19	P 888	8	HEX. NUT (STL.) 3/8"-16
20	PC41395	1	3" PIPE PLUG
21	P 17721	1	NIPPLE (GALVANIZED) 1" X 2" LG.
22	P 11118	2	1" HOSE ADAPTER
23	U 3707	8	1" CLAMP HOSE
24	P 1027	●	1" HOSE (RED)
25	P 60074	1	ELBOW - 3/4" x 45°
26	P 39614	1	PADDLE SHAFT (L.H.)
27	P 39615	1	PADDLE SHAFT (R.H.)
28	P 40353	1	SLURRY CHAMBER COVER
29	L 2024	1	WARNING LABEL
30	P 57373	1	"A" BELT
31	P 54112	1	PULLEY
32	U 19939	1	GEAR REDUCER
33	P 2758	4	CAP SCREW (HEX.HD.,STL.) 3/8"-16 x 1-1/4" LG.
34	P 54137	1	NIPPLE - 1/8" NPT x 4-3/4" LG.
35	U 18534	4	ROLLER BEARING
36	P 877	10	CAP SCREW (HEX.HD.,STL.) 3/8"-16 x 1-1/2" LG.
37	P 39290	2	SPUR GEAR (10P., 75T)
38	P 39613	2	SLEEVE
39	PC 697	2	ELBOW (BR.) 1/8" NPT
40	P 54138	1	NIPPLE (BRASS) 1/8 NPT x 2-7/8" LG.
41	PC 631	2	COUPLING (BR.) 1/8 NPT
42	---	2	GREASE FITTING (PART OF KEY NO. 35)
43	---	1	TORQUE ACTUATED WATER CONTROL VALVE (SEE DWG. 330.100.004.013)

NOTE: ● QUANTITY AS REQUIRED.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

U27160 1000 LB. LIME SLAKER - PARTS

Plan View

330.100.000.094B

ISSUE 3 9-03

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
44	P 2535	6	MACH. SCREW (FIL.HD.,STL.) 1/4"-20 x 1/2" LG.
45	P 42333	1	GEAR COVER
46	P 42334	1	MOUNTING PLATE
47	U 20036	1	GEAR COVER GASKET
48	P 18357	1	ELBOW 1" x 90°
49	PC39740	1	NIPPLE - 1" NPT x 2-9/16" LG.
50	P 17527	1	3/4" PIPE PLUG
51	PC39338	2	ELBOW - 1" x 45°
52	P 39330	1	GASKET RING
53	U 19582	1	FULL - JET NOZZLE
54	P 3811	1	3/8" CLOSE PIPE NIPPLE
55	P 17374	1	BUSHING - 1/2" x 3/8"
56	PC52700	2	REDUCING BUSHING (STL.) 3" x 1/2"
57	P 33940	1	U BOLT
▲ 58	R 32235	33	PADDLE (RIGHT HAND)
▲ 59	R 32234	33	PADDLE (LEFT HAND)
60	P 60222	1	NIPPLE (STL.) 1" NPT x 1" LG.
61	P 48650	1	NIPPLE (BRASS) 1" x 2-9/16" LG.
62	P 53495	1	ELBOW (BRONZE) 1" x 90°
63	P 60198	1	NIPPLE (BRASS) 1" NPT x 1" LG.
64	P 6648	1	NIPPLE (BRASS) 1/2" x 3" LG.
65	P 1088	1	ELBOW (BRONZE) 1/2" x 90°
66	P 60196	1	NIPPLE (BRASS) 1/2" NPT x 1/2" LG.
67	U 10119	6	HOSE CLAMP (SS) 9/16" - 1-1/16" CLAMPING DIA.
68	P 1024	●	HOSE 1/2" RED
69	P 683	1	NIPPLE (IRON) 1/2" x 2" LONG
70	P 17772	1	ELBOW (STL.) 1/2" x 90°
71	P 60200	1	NIPPLE (STL.) 1/2" NPT x 1/2" LG.
72	P 49168	1	ELBOW (IRON) 1" x 90°
73	P 2387	1	BUSHING (STL.) 1" x 1/2"
74	P 39261	8	STUD (7/16"-14 x 2-3/8" LG.)
75	PC 6115	8	HEX NUT (STL.) 7/16"-14
76	P 42892	8	SLEEVE
77	U 18080	2	SEAL
78	P 39335	2	RETAINING RING
79	P 38408	2	SEAL
80	P 41154	2	O-RING (330) BUNA-N, 2-1/8" ID x 2-1/2" OD
81	P 39366	2	GASKET
82	P 38458	2	FILLER PLATE
83	AAA2562	4	1/4" PIPE PLUG
84	P 38411	2	BEARING AND SEAL BODY
85	PC17535	2	1" WASHER (STL.)
86	P 6815	2	HEX NUT (STL.) 1"-14

NOTE: ● QUANTITY AS REQUIRED.

▲ ONLY 32

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

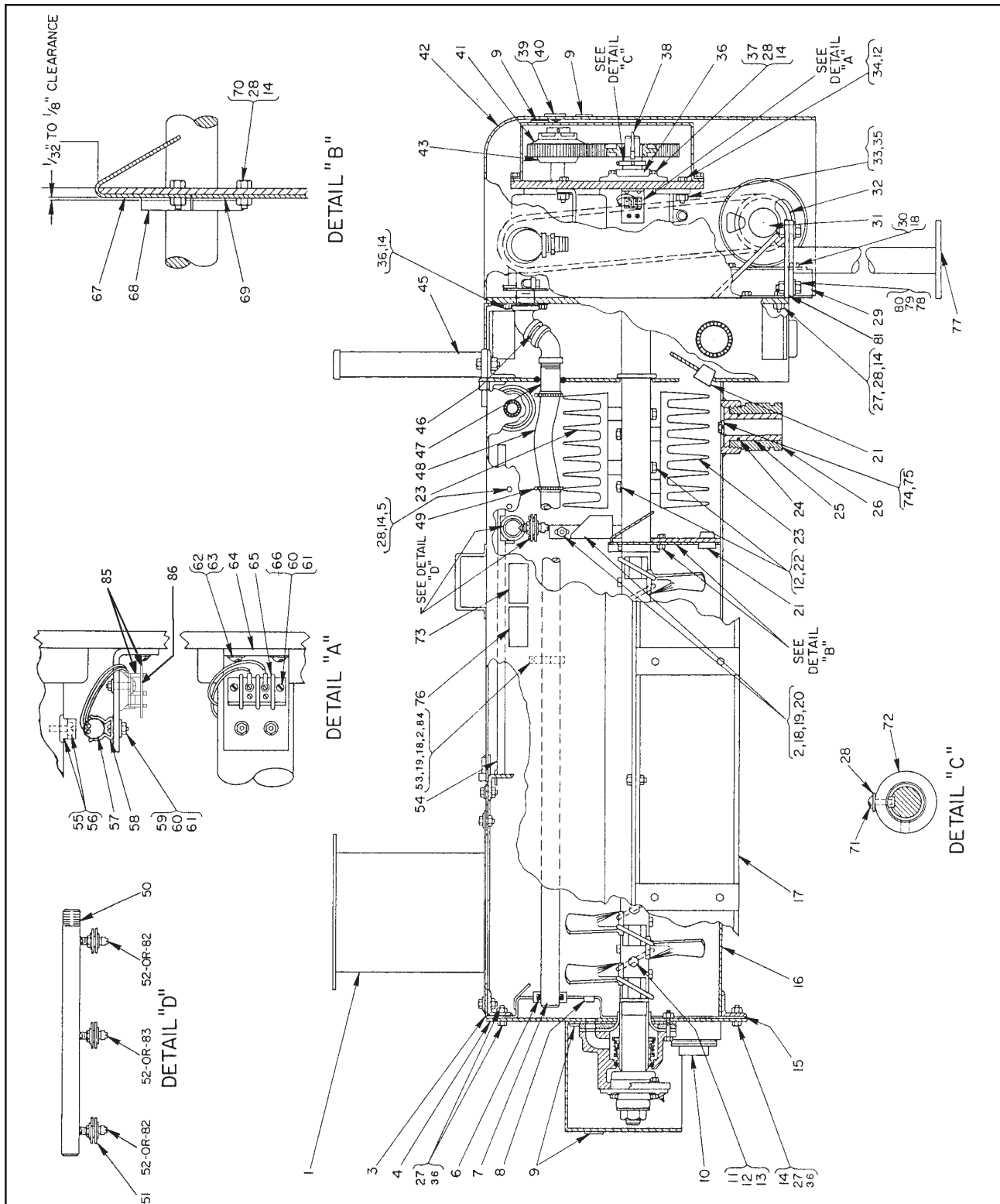
U27160 1000 LB. LIME SLAKER - PARTS

Plan View

330.100.000.094C

ISSUE 3 9-03

LIME SLAKING SYSTEM



NOTE: FOR PARTS LIST, SEE DWGS. 330.100.000.095B&C.

U27160 1000 LB. LIME SLAKER - PARTS

Side Elevation

330.100.000.095A

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LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
▲ 1	U 22586	1	FEED BOX
	OR		
	P 57424	1	FEED BOX FOR VOLUMETRIC SCREW FEEDER
2	PC 2487	1	HEX. NUT (STL.) 5/16-18
▲ 3	P 47809	1	ADAPTER PLATE
	OR		
	P 57425	1	ADAPTER PLATE FOR VOLUMETRIC SCREW FEEDER
4	U 20440	1	END PLATE
5	P 869	4	CAP SCREW (HEX.HD.,STL.) 3/8-16 x 1" LG.
6	P 39330	1	RING GASKET (5/16" DIA. CORD)
7	P 55131	1	WATER LINE
8	PC 17866	2	1/2" FLUSH PLUG
9	L 2024	4	WARNING LABEL
10	PC 41395	1	3" PIPE PLUG
11	PC 36387	66	CAP SCREW (HEX.HD.,STL.) 1/2-13 x 3-1/4" LG.
12	PC 12230	80	1/2" LOCKWASHER (CARBON STL.)
13	PC 17493	66	SQUARE NUT (STL.) 3/8-16
14	P 888	58	HEX. NUT (STL.) 3/8-16
15	U 18548	1	END GASKET
▲ 16	U 27050	1	TROUGH
17	P 56070	2	CHANNEL SUPPORT
18	PC 4763	5	5/16" LOCKWASHER (CARBON STEEL)
19	P 873	1	CAP SCREW (HEX.HD.,STL.) 5/16-18 x 3/4" LG.
▲ 20	P 43129	1	SEPARATOR WEIR (LOW CONCENTRATION SLURRY)
	OR		
	P 56053	1	SEPARATOR WEIR (HIGH CONCENTRATION SLURRY)
21	P 39305	2	#7 RUBBER PLUG
22	PC 14107	8	CAP SCREW (HEX.HD.,STL.) 1/2-20 x 2-3/4" LG.
23	U 18531	4	FORK UNIT
▲ 24	P 40374	1	O-RING (326) BUNA-N 1-5/8"ID x 2"OD
▲ 25	P 40361	1	CONNECTION 1-1/4" TO 2" (FEED END)
▲ 26	P 53504	1	NIPPLE (GRIT CONVEYOR)
	OR		
	P 56080	1	NIPPLE (9" DEFLECTOR)
27	P 2758	43	CAP SCREW (HEX.HD.,STL.) 3/8-16 x 1-1/4" LG.
28	PC 8334	22	3/8" LOCKWASHER (CARBON STEEL)
29	U 27051	1	MOTOR BRACKET
30	P 874	4	CAP SCREW (HEX.HD.,STL.) 5/16-28 x 1" LG.
▲ 31	U 26125	1	MOTOR (GIVE NAMEPLATE DATA WHEN ORDERING)
	OR		
	U 26126	1	MOTOR (GIVE NAMEPLATE DATA WHEN ORDERING)
32	P 54113	1	V BELT PULLEY
● 33	PC 33350	12	WASHER (STL.)
34	P 6582	6	CAP SCREW (HEX.HD.,STL.) 1/2-13 x 1-1/2" LG.
35	P 889	6	HEX. NUT (STL.) 1/2-13
36	PC 1090	75	3/8 WASHER (STL.)
37	P 877	8	CAP SCREW (HEX.HD.,STL.) 3/8-16 x 1-1/2" LG.
38	P 39605	2	GIBBS KEYS
39	P 48901	1	INSIGNIA

NOTE:

- ▲ NOT PART OF U27160.
- USE AS REQUIRED FOR ALIGNING GEARS (2), SPUR, AND GEAR PLATE.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

U27160 1000 LB. LIME SLAKER - PARTS

Side Elevation
330.100.000.095B
ISSUE 6 9-03

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
40	P 42820	3	1/8" SPEED NUT (PUSH-ON TYPE, S.S.)
41	P 43603	1	DRIVE GEAR
42	P 56073	1	MACHINERY COVER
43	U 20698	1	CLUTCH UNIT (SEE DWG. 330.100.150.021)
▲ 45	U 22588	1	FEEDER SUPPORT
46	P 17721	1	NIPPLE (STEEL) 2" LG.
47	P 55130	1	NIPPLE 1" x 2" LG.
48	P 5179	○	HOSE
49	U 788	2	HOSE CLAMP
▲ 50	U 18529	1	MANIFOLD (LOW CONCENTRATION SLURRY)
	OR		
	U 27054	1	MANIFOLD (HIGH CONCENTRATION SLURRY)
▲ 51	U 18535	3	ADJUSTABLE JOINT
▲ 52	U 18536	3	SPRAY NOZZLE (LOW CONCENTRATION SLURRY)
53	P 55132	1	BRACKET
54	U 23371	1	SAFETY SCREEN
55	P 23992	1	MAGNET
56	PC 23139	1	MACH. SCREW (FIL.HD.,BR.) #5-40 x 3/8" LG.
57	U 29189	1	SWITCH
58	P 28597	1	CLIP
59	P 14614	2	MACH. SCREW (RD.HD.,BR.) #6-32 x 7/16" LG.
60	PC 16955	4	#6 LOCKWASHER (CARBON STEEL)
61	P 13704	4	HEX. NUT (BRASS) #6-32
62	PC 7750	2	MACH. SCREW (RD.HD.,STL.) #10-32 x 5/8" LG.
63	P 12615	2	#10 LOCKWASHER (CARBON STEEL)
64	P 39394	1	BRACKET
65	U 15055	1	TERMINAL BLOCK
66	P 3729	2	MACH. SCREW (RD.HD.,BR.) #6-32 x 5/8" LG.
67	P 40474	1	WEARING PLATE (TOP)
68	U 19240	2	COLLAR PADDLE SHAFT
69	P 40473	1	WEARING PLATE ((BOTTOM)
70	P 15390	6	CAP SCREW (HEX.HD.,STL.) 3/8-16 x 7/8" LG.
71	P 49179	2	CAP SCREW (BUT.HD.,STL.) 3/8-16 x 3/4" LG.
72	P 19379	2	3/8" SHAKEPROOF LOCKWASHER (STL.)
73	L 2067	2	WARNING LABEL
□ 74	PC2333	2	MACH.BOLT (STEEL) 5/16-18 x 1/2" LG.
□ 75	P 15363	2	5/16" LOCKWASHER (S.S.)
76	L 2620	2	WARNING LABEL
▲ 77	U 27052	2	SUPPORT
	OR		
	U 27694	2	SUPPORT (FOR SLAKERS WITH GRIT CONVEYOR ONLY)
78	P 1091	8	1/2" WASHER (STL.)
79	P 13678	8	HEX. NUT (STL.) 1/2-20
80	P 13679	8	BOLT (HEX.HD.,STL.) 1/2-20 x 2" LG.
81	P 57283	1	MOUNTING PLATE
▲ 82	P 56024	2	SPRAY NOZZLE (HIGH CONCENTRATION SLURRY)
▲ 83	P 56025	1	SPRAY NOZZLE (HIGH CONCENTRATION SLURRY)
84	P 1062	80	WASHER
85	AAB6062	1	COVER, BARRIER TYPE
86	AAB6065	1	LABEL

NOTE:

- QUANTITY AS REQUIRED.
- ▲ NOT PART OF U27160.
- PART OF G1803.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

U27160 1000 LB. LIME SLAKER - PARTS

Side Elevation

330.100.000.095C

ISSUE 3 7-04

Technical drawing of a mechanical device, likely a pump or motor, showing a plan view and three detailed cross-sectional views (A, B, and D).

PLAN VIEW SHOWING PADDLE SEQUENCE

The plan view shows the paddle sequence and shaft rotation. The shaft rotation is indicated by a curved arrow labeled "SHAFT ROTATION". The paddle sequence is labeled "PADDLE SEQUENCE" and "DRIVE END". The plan view includes various numbered components: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91.

DETAIL "A"

Detail A shows a cross-section of the device, including the collar and grease fitting. Components labeled include: 34, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60.

DETAIL "B"

Detail B shows a cross-section of the device, including the internal mechanism and shaft. Components labeled include: 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91.

DETAIL "D"

Detail D shows a cross-section of the device, including the shaft and paddle sequence. Components labeled include: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91.

NOTE: FOR PARTS LIST, SEE DWGS. 330.100.001.072B&C.

U27163 2000 LB. LIME SLAKER - PARTS

Plan View

330.100.001.072A

ISSUE 2 7-04

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	P 58164	1	NAMEPLATE
2	PC 35137	4	MACH. SCREW (RD.HD.,STL.) #4-40 x 3/16" LG.
3	P 41086	1	COVER
4	PC 8117	4	CAP SCREW (HEX.HD.,STL.) 3/8"-16 x 5/8" LG.
5	P 874	8	CAP SCREW (HEX.SOC.,HD.,STL.) 5/16"-18 x 1" LG.
6	PC 4763	17	5/16" LOCKWASHER
7	P 873	5	CAP SCREW (HEX.SOC.HD.,STL.) 5/16"-18 x 3/4 LG.
8	PC 2487	7	HEX., NUT 5/16"-18 (STL.)
9	P 41157	1	MAIN COVER (RIGHT)
10	P 6582	8	CAP SCREW (HEX.HD.,STL.) 1/2"-13 x 1-1/2" LG.
11	PC 12230	8	1/2" LOCKWASHER (CARB.STL.,CAD.PL.)
12	P 889	8	HEX. NUT (STL.) 1/2"-13
13	P 41155	1	MAIN COVER (LEFT)
14	---	1	MANIFOLD (SEE DWG. 330.100.001.073)
15	P 41164	1	CLASSIFIER COVER
16	P 41471	1	FUME REMOVER
17	P 15293	4	O-RING (RUBBER) 2-3/8" ID x 2-7/8" OD
18	P 41398	1	3" CLOSE NIPPLE (STL.)
19	U 29178	1	3" TEE
20	PC 41395	1	3" PLUG
21	P 11118	2	ADAPTER 3/4" P TO 1" H
22	P 17721	1	NIPPLE (GALVANIZED) 1" x 2" LG.
23	P 1027	●	1" HOSE (AS REQUIRED)
24	U 3707	8	1" HOSE CLAMP
25	P 60074	1	ELBOW 3/4 x 45°
26	P 41163	1	SLURRY CHAMBER COVER
27	P 41844	1	PULLEY "A" 7 .PD (2 GROOVE)
28	U 19776	1	BELTS (MATCHED PAIR)
29	U 19939	1	GEAR REDUCER
30	P 2758	4	CAP SCREW (HEX.HD.,STL.) 3/8-16 x 1-1/4" LG.
31	PC 8334	20	3/8" LOCKWASHER (CARB.STL.)
32	P 43044	2	GIBBS KEYS 5/16" x 5/16" x 2-1/2" LG.
33	P 44139	2	SPUR GEAR 80.80T
34	U 18534	4	ROLLER BEARING
35	P 54139	2	NIPPLE 1/8 NPT x 4-5/16" LG.
36	PC 631	2	1/8" COUPLING NPT
37	---	2	GREASE FITTING (PART OF KEY NO. 34)
38	---	1	TORQUE ACTUATED WATER CONTROL VALVE (SEE DWG. 330.100.004.013)
39	P 48650	1	NIPPLE (BRASS) 1" x 2-9/16" LG.
40	PC 39740	1	NIPPLE 1" x 2-9/16" LG.
41	PC 17527	1	3/4" PLUG
42	PC 52700	2	REDUCING BUSHING 3 x 1/2"
43	P 17374	1	BUSHING 1/2" x 3/8"
44	P 3811	1	CLOSE NIPPLE 3/8"
45	U 19582	1	FULL JET NOZZLE
46	P 33940	1	"U" BOLT
47	AAA2562	4	1/4" PLUG
48	P 38411	2	BEARING & SEAL BODY

NOTE: ● QUANTITY AS REQUIRED.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

U27163 2000 LB. LIME SLAKER - PARTS

Plan View

330.100.001.072B

ISSUE 2 9-03

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
49	P 17535	2	WASHER (STEEL)
50	P 6815	2	HEX. NUT (STL.) 1"-14
51	P 877	8	CAP SCREW (HEX.HD.,STL.) 3/8"-16 x 1-1/2" LG.
52	P 888	8	HEX. NUT 3/8"-16
53	P 42892	8	SLEEVE
54	P 41133	8	STUD 7/16"-14 x 1-7/8" LG.
55	PC 6115	8	HEX. NUT (STL.) 7/16"-14
56	U 18080	2	SEAL UNIT
57	P 39335	2	RETAINING RING
58	P 37190	2	O-RING (329) BUNA-N, 2" ID x 2-3/8" OD
59	P 38408	2	SEAL
60	P 41154	2	O-RING (330) BUNA-N, 2-1/8" ID x 2-1/4" OD
61	P 23992	1	MAGNET
62	P 23139	1	MACH. SCREW (FIL.HD.,BR.) #6-32 x 7/16" LG.
63	U 29189	1	SWITCH
64	P 28597	1	CLIP
65	P 14614	2	MACH. SCREW (RD.HD.,BR.) #6-32 x 7/16" LG.
66	PC 16955	4	#6 LOCKWASHER (CARB. STL.)
67	P 13704	4	HEX. NUT (BRASS) #6-32
68	P 39394	1	BRACKET
69	PC 7750	2	MACH. SCREW (RD.HD.,STL.) #10-32 x 5/8" LG.
70	P 12615	2	#10 LOCKWASHER (CARB. STL.)
71	U 15055	●	TERMINAL BLOCK
72	P 3729	2	MACH. SCREW (RD.HD.,BR.) #6-32 x 5/8" LG.
73	P 18357	1	ELBOW - 1" x 45°
74	P 60222	1	NIPPLE (STL.) 1" NPT x 1" LG.
75	P 53495	1	ELBOW (BRONZE) 1" x 90°
76	P 60198	1	NIPPLE (BRASS) 1" NPT x 1" LG.
77	P 6648	1	NIPPLE (BRASS) 1/2" x 3" LG.
78	P 1088	1	ELBOW (BRONZE) 1/2" x 90°
79	P 60196	1	NIPPLE (BRASS) 1/2" NPT x 1/2" LG.
80	U 10119	6	HOSE CLAMP (SS) 9/16" - 1-1/16" CLAMPING DIA.
81	P 1024	1	HOSE 1/2" RED
82	P 683	1	NIPPLE (IRON) 1/2" x 2" LONG
83	P 17772	1	ELBOW (STL.) 1/2" x 90°
84	P 60200	2	NIPPLE (STL.) 1/2" NPT x 1/2" LG.
85	P 2387	1	BUSHING (STL.) 1" x 1/2"
86	P 49168	1	ELBOW (IRON) 1" x 90°
87	PC 697	2	ELBOW 90°, 1/8" NPT
88	P 39613	2	SLEEVE
▲ 89	P 41131	1	PADDLE SHAFT (LEFT HAND)
	OR		
	P 41132	1	PADDLE SHAFT (RIGHT HAND)
▲ 90	R 32567	33	PADDLE (LEFT HAND)
▲ 91	R 32568	33	PADDLE (RIGHT HAND)
92	AAB6062	1	COVER, BARRIER TYPE
93	AAB6065	1	LABEL

NOTE: ▲ ONLY 32 PADDLES ARE UTILIZED WHEN SCREEN-TYPE GRIT REMOVER AND BOOSTER PUMP ARE USED.
● QUANTITY AS REQUIRED.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

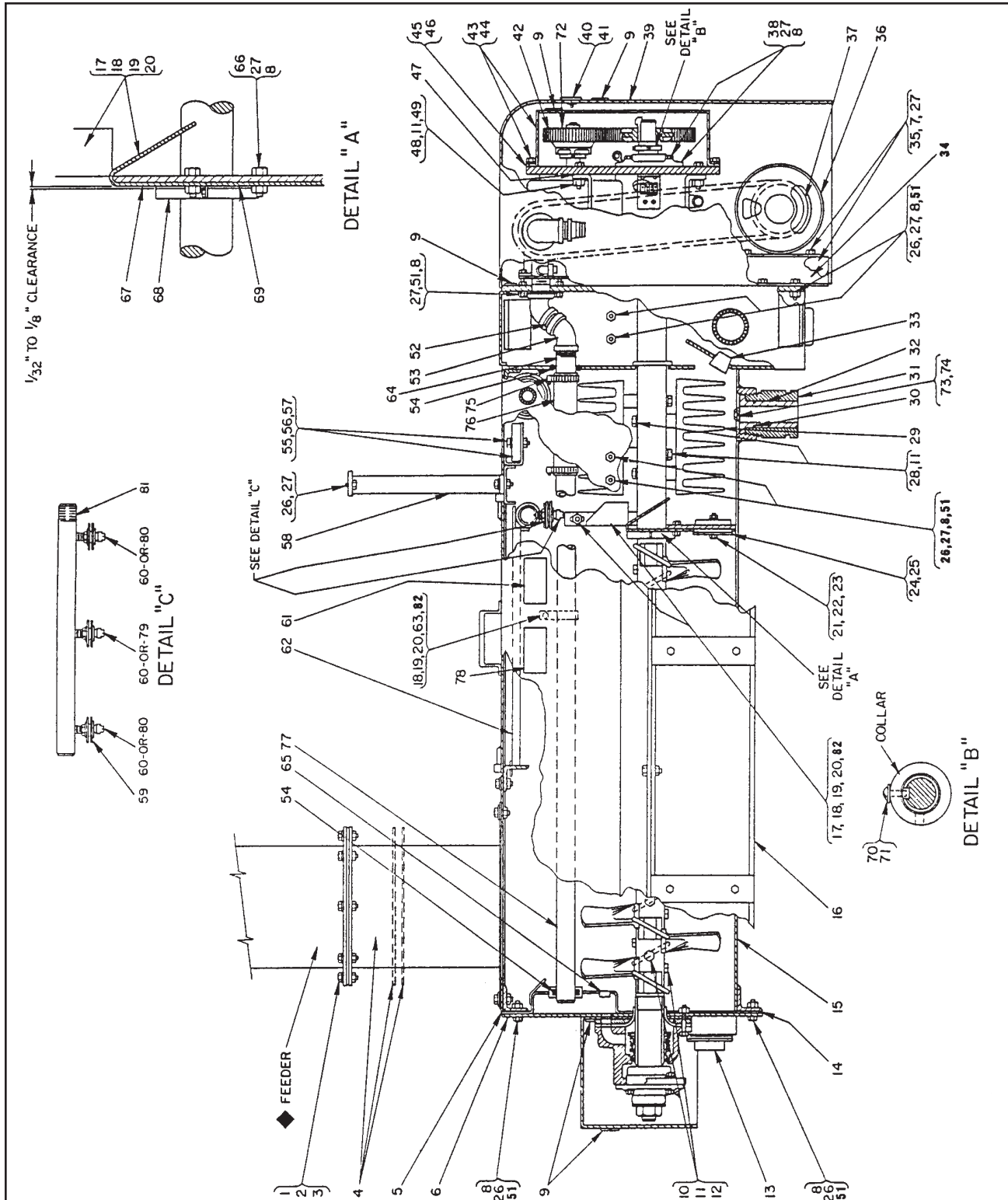
U27163 2000 LB. LIME SLAKER - PARTS

Plan View

330.100.001.072C

ISSUE 3 7-04

LIME SLAKING SYSTEM



NOTES: FOR PARTS LIST, SEE DWGS. 330.100.001.073B&C.

◆ NOT PART OF U27163.

U27163 2000 LB. LIME SLAKER - PARTS

Side Elevation

330.100.001.073A

ISSUE 3 9-94

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
◆ 1	PC 8715	14	MACH. SCREW (HEX.HD.,BR.) 1/4"-20 x 3/4" LG.
◆ 2	PC 8644	14	LOCKWASHER SHAKEPROOF (STL.) 1/4"
◆ 3	PC 10946	14	HEX. NUT (BRASS) 1/4"
◆ 4	U 22586	1	FEED BOX
◆ 5	P 47810	1	ADAPTER PLATE
	OR		
	P 57426	1	ADAPTER PLATE FOR VOLUMETRIC SCREW FEEDER
6	U 20446	1	END PLATE
7	P 869	4	CAP SCREW (HEX.HD.,STL.) 3/8"-16 x 1" LG.
8	P 888	45	HEX. NUT (STL.) 3/8"-16
9	L 2024	5	WARNING LABEL
10	PC 7848	66	MACH. SCREW (HEX.HD.,STL.) 1/2"-13 x 4" LG.
11	PC 12230	81	1/2" LOCKWASHER (CARB. STL.,CAD,PL.)
12	PC 17493	66	SQUARE NUT (STL.) 1/2"-13
13	PC 41401	1	4" PIPE PLUG
14	U 19517	1	END GASKET
◆ 15	U 25895	1	TROUGH
16	P 56071	2	9" SUPPORT CHANNEL
◆ 17	P 43170	1	SEPARATOR (LOW CONCENTRATION SLURRY)
	OR		
	P 56052	1	SEPARATOR (HIGH CONCENTRATION SLURRY)
18	P 873	3	CAP SCREW (HEX.HD.,STL.) 5/16"-18 x 3/4" LG.
19	PC 4763	3	5/16" LOCKWASHER (CARB.STL.,CAD.PL.)
20	PC 2487	3	HEX. NUT (STL.) 5/16"-18
21	P 11415	1	CAP SCREW (HEX.HD.,STL.) 1/4"-20 x 2" LG.
22	P 886	1	NUT (STL.) 1/4"-20
23	PC 16966	1	1/4" WASHER (STL.)
24	P 42893	1	#5 RUBBER PLUG WITH HOLE
25	P 42891	1	DISC
26	P 2758	40	CAP SCREW (HEX.HD.,STL.) 3/8"-16 x 1-1/4" LG.
27	PC 8334	26	3/8" LOCKWASHER (CARB.STL.)
28	P 22966	8	CAP SCREW
29	U 19518	4	FORK UNIT
□ 30	□ P 41154	1	O-RING (330) BUNA-N, 2-1/8" ID x 2-1/2" OD
31	P 53505	1	NIPPLE (GRIT CONVEYOR)
	▼ OR		
	□ P 56080	1	NIPPLE (9" DEFLECTOR)
32	P 41156	1	CONNECTION INSERT
33	P 39305	1	#7 RUBBER PLUG
34	P 41137	1	MOTOR BRACKET
35	P 41134	2	MOTOR CLAMPING BAR
36	---	1	MOTOR (GIVE NAMEPLATE DATA WHEN ORDERING)
37	P 41843	1	PULLEY "A" 2.3 PD (GROOVE)
38	P 877	8	CAP SCREW (HEX.HD.,STL.) 3/8"-16 x 1-1/2" LG.

NOTES: ◆ NOT PART OF U27163.
 □ PART OF G1804.
 ▼ PART OF G1801.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

U27163 2000 LB. LIME SLAKER - PARTS

Side Elevation

330.100.001.073B

ISSUE 3 1-93

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
39	P 41153	1	MOUNTING COVER
40	P 48901	1	INSIGNIA
41	P 42820	3	SPEEDNUT (PUSH-ON) 1/4" x 19/64"
42	P 43604	1	SPUR GEAR, 8P., 44T
43	P 42629	1	GEAR COVER
44	P 2535	8	MACH. SCREW (FIL.HD.,STL.) 1/4"-20 x 1/2" LG.
45	P 42630	1	MOUNTING PLATE
46	U 20166	1	GEAR COVER GASKET
■ 47	PC 33350	12	SHIM 1" OD x 33/64" x .028
48	P 6582	7	CAP SCREW (HEX.HD.,STL.) 1/2"-13 x 1/2" LG.
49	P 889	7	HEX. NUT (STL.) 1/2"-13
51	PC 1090	70	3/8" WASHER (STL.)
52	PC 17721	2	NIPPLE
53	PC 39338	2	ELBOW, 45° x 1"
54	P 39330	2	GASKET, RING
55	U 23373	1	SAFETY SCREEN
56	P 31645	2	CAP SCREW (HEX.HD.,SS) 1/4"-20 LG.
57	P 14635	2	1/4" LOCKWASHER (SS)
◆ 58	U 22588	1	SUPPORT (SHORT)
	OR		
	U 18555	1	SUPPORT
◆ 59	U 18535	3	ADJUSTABLE JOINT
◆ 60	U 19515	3	SPRAY NOZZLE (LOW CONCENTRATION SLURRY)
61	L 2067	2	LABEL
62	U 23372	1	SAFETY SCREEN
63	P 55132	1	BRACKET
64	P 55130		NIPPLE
65	PC 17866	2	FLUSH PIPE PLUG
66	P 15390	6	CAP SCREW (HEX.HD.,STL.) 3/8"-16 x 7/8" LG.
67	P 41152	1	WEARING PLATE (UPPER)
68	U 19241	2	SPLIT COLLAR
69	P 41151	1	WEARING PLATE
70	P 49179	2	CAP SCREW (SOC.HD.,STL.) 3/8"-16 x 3/4" LG.
71	P 19379	2	3/8" SHAKEPROOF LOCKWASHER
72	U 20698	1	CLUTCH (SEE DWG. 330.100.150.021)
◆ 73	P 2333	2	MACH. BOLT (STL.) 5/16"-18 x 1/2" LG.
◆ 74	P 15363	2	5/16" LOCKWASHER (SS)
75	U 788	2	HOSE CLAMP
76	P 5179	-	HOSE (AS REQUIRED)
77	P 55715	1	1" PIPE
78	L 2620	2	WARNING LABEL
◆ 79	P 56027	1	SPRAY NOZZLE (HIGH CONCENTRATION SLURRY)
◆ 80	P 56026	2	SPRAY NOZZLE (HIGH CONCENTRATION SLURRY)
◆ 81	U 19519	1	MANIFOLD (LOW CONCENTRATION SLURRY)
	OR		
	U 27053	1	MANIFOLD (HIGH CONCENTRATION SLURRY)
82	P 1062	4	5/16" WASHER

NOTES: ◆ NOT PART OF U27163.
 ■ USE AS REQUIRED FOR ALIGNING GEAR (2) AND SPUR GEAR.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

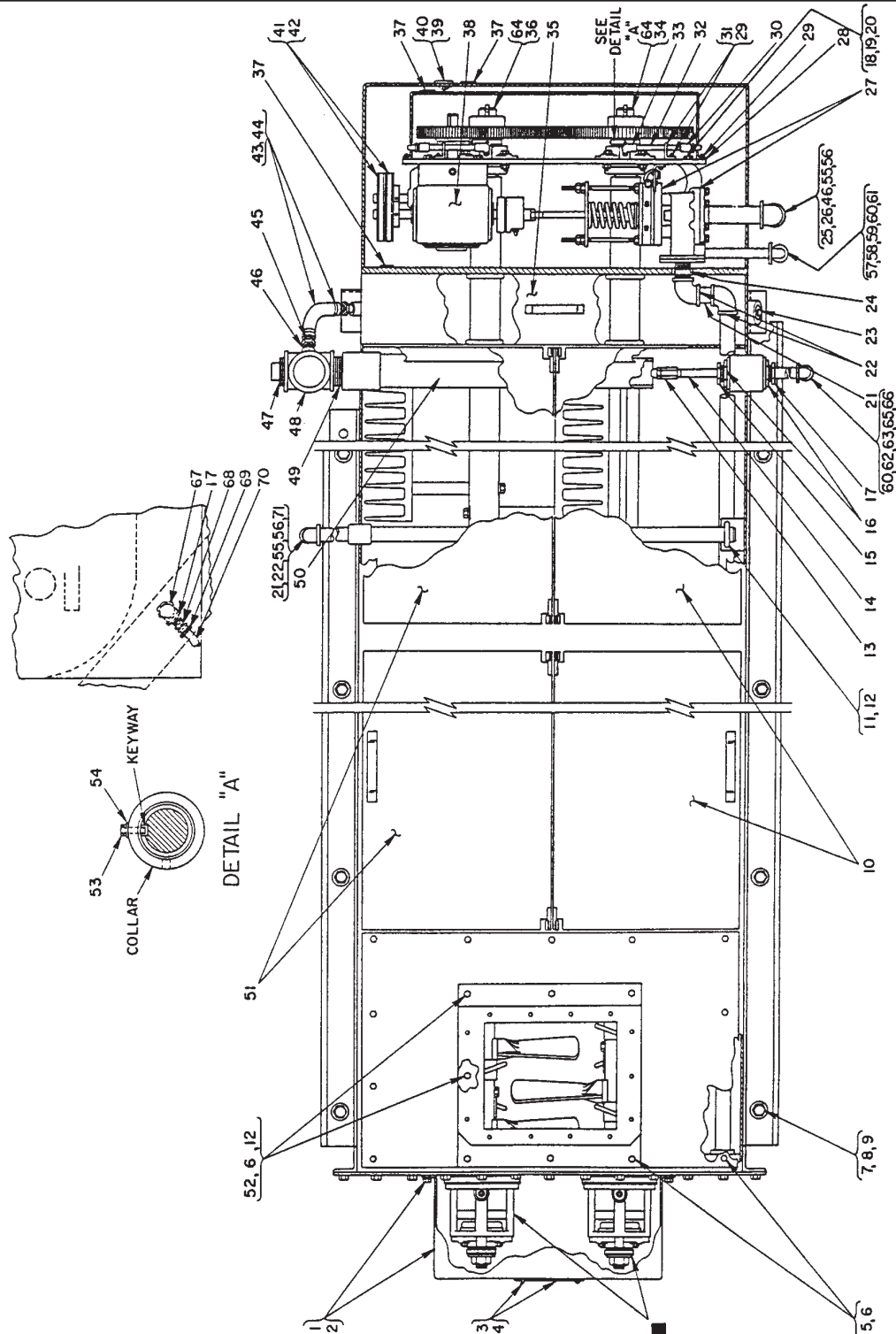
U27163 2000 LB. LIME SLAKER - PARTS

Side Elevation

330.100.001.073C

ISSUE 2 9-03

LIME SLAKING SYSTEM



NOTE: ■ SEE DETAIL "A" ON DWG. 330.100.002.095.
FOR PARTS LIST, SEE DWGS. 330.100.002.093B&C.

U27164 4000 LB. LIME SLAKER - PARTS

Plan View

330.100.002.093A

ISSUE 2 3-93

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	P 41086	1	COVER
2	PC 8117	4	CAP SCREW (HEX.HD.,STL.) 3/8"-16 x 5/8" LG.
3	P 58164	1	NAMEPLATE
4	P 35137	4	MACH. SCREW (RD.HD.,STL.) #4-40 x 3/16" LG.
5	P 874	18	CAP SCREW (HEX.SOC.,STL.) 5/16"-18 x 1" LG.
6	PC 4763	19	5/16" LOCKWASHER (CARB.STL.,CAD.PL.)
7	P 6582	8	CAP SCREW (HEX.HD.,STL.) 1/2"-13 x 1-1/2" LG.
8	PC 12230	8	1/2" LOCKWASHER (CARB.STL.,CAD.PL.)
9	P 889	8	HEX. NUT (STL.) 1/2"-13
10	P 39263	2	#1 MAIN COVER
11	P 33940	1	"U" BOLT
12	PC 2487	7	HEX. NUT (STL.) 5/16"-18
13	U 19582	1	FULL JET NOZZLE
14	PC 52691	1	NIPPLE (IRON) 3/8" x 4-1/2" LG.
15	PC 52689	1	REDUCING BUSHING 1" x 3/8" P.
16	PC 52690	2	REDUCING BUSHING 4" x 1" P.
17	PC 2387	2	REDUCING BUSHING 1" x 1-1/2" P.
18	PC 1090	8	3/8" WASHER (STL.)
19	P 877	16	MACH. SCREW 3/8-16 x 1-1/2" HEX. HD.
20	PC 8334	4	3/8" LOCKWASHER (CARB.STL.)
21	P 17721	2	NIPPLE 2" LG.
22	PC 18357	3	ELBOW, 90° x 1"
23	P 17527	1	3/4" PIPE PLUG
24	PC 39740	1	NIPPLE, 1" NPT x 2-9/16" LG.
25	P 53495	1	ELBOW (BRONZE) 1" x 90°
26	P 6785	1	NIPPLE (COPPER) 1" X 6-1/2" LG.
27	---	1	TORQUE ACTUATED WATER CONTROL VALVE (SEE DWG. 330.100.004.014)
28	U 20165	1	GEAR COVER GASKET
29	P 2535	10	MACH. SCREW (FIL.HD.,STL.) 1/4"-20 x 1/2" LG.
■ 30	PC 631	2	GREASE FITTING (PART OF BEARING U 18534)
31	P 54407	2	BRACKET
32	P 54140	2	NIPPLE 1/8" NPT x 5-5/16" LG.
33	PC 697	2	ELBOW (STL.)
34	P 39617	1	PADDLE SHAFT (LEFT)
35	P 40354	1	SLURRY CHAMBER COVER

NOTE: ■ SEE DETAIL "A" ON DWG. 330.100.002.095.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

U27164 4000 LB. LIME SLAKER - PARTS

Plan View

330.100.002.093B

ISSUE 2 9-03

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
36	P 39616	1	PADDLE SHAFT (RIGHT)
37	L 2024	3	WARNING LABEL
38	U 19939	1	GEAR REDUCER
39	P 48901	1	INSIGNIA
40	P 42820	3	SPEEDNUT (PUSH-ON) 1/4" x 19/64" LG.
41	U 19777	1	BELTS (MATCHING PAIR)
42	P 41844	1	PULLEY A" 7.0 P.D. (2 GROOVE)
43	U 3707	2	1" HOSE CLAMP
44	RK01 4823	13"	RUBBER TUBING
45	P 11118	2	ADAPTER 3/4" P. TO 1" H.
46	P 60197	1	NIPPLE (BRASS) 1-1/4" H. x 1" P.
47	P 41401	1	4" PIPE PLUG
48	U 29179	1	TEE UNIT, 4"
49	P 41400	1	CLOSE NIPPLE 4" P.
50	P 41403	1	DUST ARRESTOR
51	P 39264	2	#2 MAIN COVER
52	P 873	5	CAP SCREW (HEX.HD.,STL.) 5/16"-18 x 3/4" LG.
53	P 49179	2	CAP SCREW (SOC.HD.,STL.) 3/8"-16 x 3/4" LG.
54	P 19379	2	3/8" SHAKEPROOF LOCKWASHER
55	U 24502	4	1-1/4" HOSE CLAMP (SS)
56	P 5179	-	1-1/4" HOSE (AS REQUIRED)
57	P 3583	1	NIPPLE (BRASS) 1/2" x 5-1/2"
58	P 1088	1	ELBOW (BRONZE) 1/2" x 90°
59	P 60196	1	NIPPLE (BRASS) 1/2" H x 1/2" P.
60	U 10119	4	1/2" HOSE CLAMP (SS)
61	P 1024	-	1/2" HOSE (AS REQUIRED)
62	P 683	1	NIPPLE (IRON) 1/2" x 2" LG.
63	P 17772	1	ELBOW (STL.) 1/2" x 90°
64	P 39613	2	SLEEVE
65	P 60200	1	NIPPLE (STL.) 1/2" x 90°
66	P 1024	-	1/2" HOSE (AS REQUIRED)
67	P 49168	1	ELBOW (IRON) 1" x 90°
68	P 16813	1	NIPPLE (STL.) 3/4" H x 1/2" P.
69	P 10120	2	3/4" HOSE CLAMP
70	P 1026	-	3/4" HOSE (AS REQUIRED)
71	P 60199	1	NIPPLE (STL.) 1-1/4" x 1" P.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

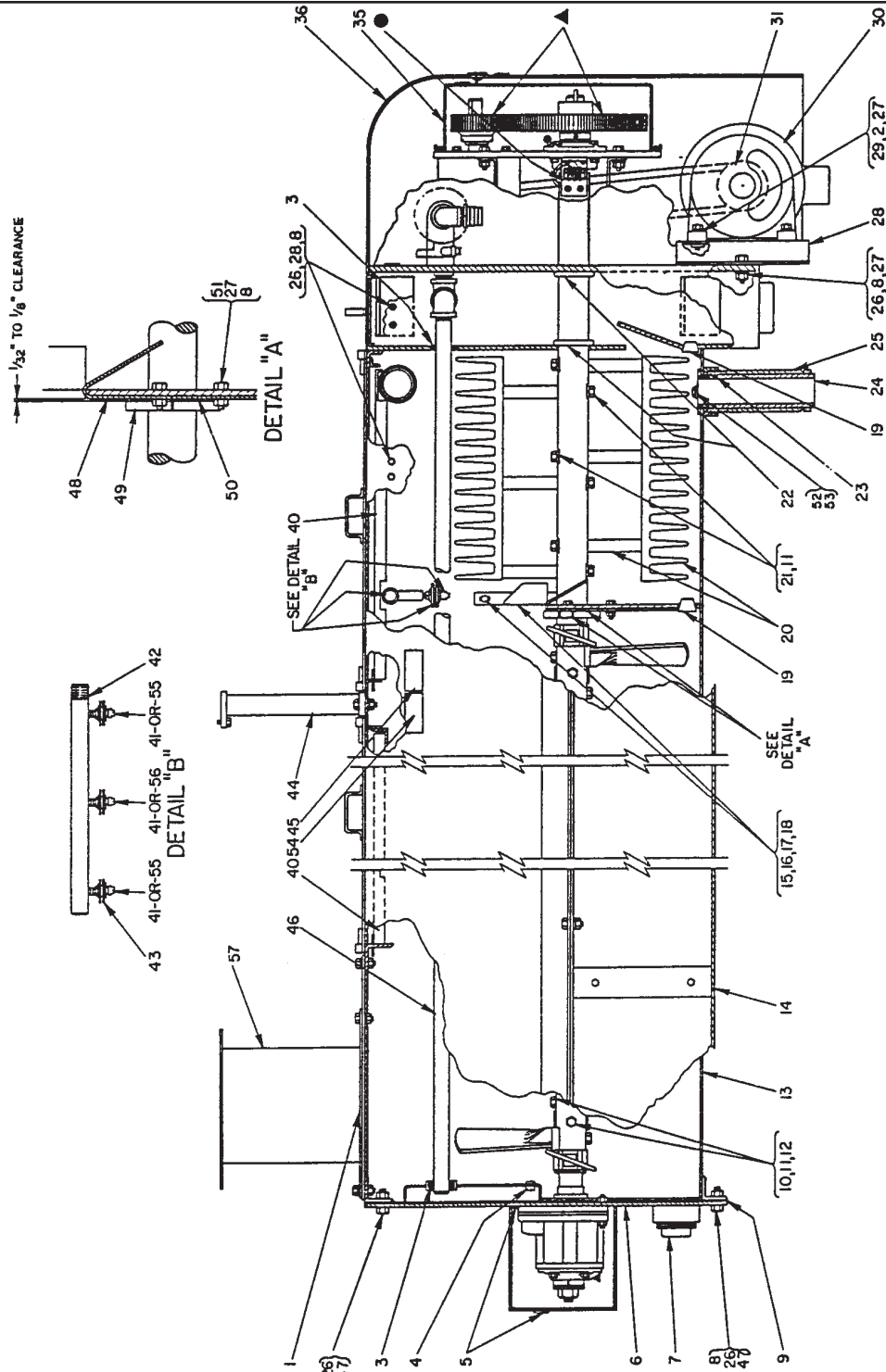
U27164 4000 LB. LIME SLAKER - PARTS

Plan View

330.100.002.093C

ISSUE 1 9-03

LIME SLAKING SYSTEM



NOTE: ● SEE DETAIL "B" ON DWG. 330.100.002.095.
▲ SEE DETAIL "C" ON DWG. 330.100.002.095 FOR GEARS AND SPUR GEAR ALIGNMENT.
FOR PARTS LIST, SEE DWGS. 330.100.002.094B&C.

U27164 4000 LB. LIME SLAKER - PARTS

Side Elevation

330.100.002.094A

ISSUE 5 1-93

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
■ 1	P 47811	1	ADAPTER PLATE
	OR		
	P 57427	1	ADAPTER PLATE FOR VOLUMETRIC SCREW FEEDER
2	P 869	4	CAP SCREW (HEX.HD.,STL.) 3/8"-16 x 1" LG.
3	P 39330	2	RING GASKET (RUBBER) 1-15/16" OD x 1-5/16" ID.
4	PC 17866	2	1/2" PIPE PLUG
5	L 2024	2	LABEL
6	U 20442	1	END PLATE
7	PC 41401	1	4" PIPE PLUG
8	P 888	42	HEX. NUT 3/8"-16
9	U 18542	1	END GASKET
10	PC 7848	66	MACH. SCREW (HEX.HD.,STL.) 1/2"-13 x 4" LG.
11	PC 12230	78	1/2" LOCKWASHER (CARB.STL.,CAD.PL.)
12	PC 17493	66	SQUARE NUT (STL.) 1/2"-13
■ 13	U 25896	1	TROUGH
14	P 56072	2	SUPPORT CHANNEL
■ 15	P 43130	1	SEPARATOR WEIR (LOW CONCENTRATION SLURRY)
	OR		
	P 56051	1	SEPARATOR WEIR (HIGH CONCENTRATION SLURRY)
16	P 873	2	CAP SCREW (HEX.HD.,STL.) 5/16"-18 x 3/4" LG.
17	PC 4763	2	5/16" LOCKWASHER (CARB.STL.,CAD.PL.)
18	PC 2487	2	HEX.NUT (STL.) 5/16"-18
19	P 39305	2	#7 RUBBER PLUG
20	U 18546	4	RAKE
21	P 22966	12	CAP SCREW (HEX.HD.,STL.) 1/2"-20 x 3-1/2" LG.
22	P 15293	4	O-RING (RUBBER) 2-3/8" ID x 2-7/8" OD
■ 23	P 40375	12	O-RING (334) BUNA-N, 2-5/8" ID x 3" OD
■ 24	P 40362	1	CONNECTION 2-1/16" TO 3"
■ 25	P 53506	1	NIPPLE (GRIT CONVEYOR)
	OR		
	P 56080	1	NIPPLE (9" DEFLECTOR)
26	P 2758	51	CAP SCREW (HEX.HD.,STL.) 3/8"-16 x 1-1/4" LG.
27	PC 8334	18	3/8" LOCKWASHER (CARB.STL.)
28	P 39281	1	MOTOR BRACKET
29	P 39266	2	MOTOR CLAMPING BAR
■ 30	---	1	MOTOR (GIVE NAMEPLATE DATA WHEN ORDERING)
31	P 41843	1	PULLEY "A" 2.3" PD (2 GROOVE)
35	P 42627	1	GEAR COVER
36	P 39274	1	MACHINERY COVER
40	U 23375	2	SAFETY SCREEN
■ 41	U 18734	3	SPRAY NOZZLE (LOW CONCENTRATION SLURRY)
■ 42	U 18547	1	MANIFOLD (LOW CONCENTRATION SLURRY)
	OR		
	U 27105	1	MANIFOLD (HIGH CONCENTRATION SLURRY)

NOTE: ■ NOT PART OF U27164.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

U27164 4000 LB. LIME SLAKER - PARTS

Side Elevation

330.100.002.094B

ISSUE 5 9-03

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
■ 43	U 18535	3	ADJUSTABLE JOINT
■ 44	U 22588	1	SUPPORT
45	L 2067	2	LABEL
46	P 39384	1	PIPE 1" x 81"
47	PC 1090	67	3/8" WASHER
48	P 40476	1	TOP WEARING PLATE
49	U 19241	2	SPLIT COLLAR
50	P 40475	1	BOTTOM WEARING PLATE
51	P 15390	6	CAP SCREW (HEX.HD.,STL.) 3/8"-16 x 7/8" LG.
▲ 52	P 2333	2	MACH.BOLT (STL.) 5/16"-18 x 1/2" LG.
▲ 53	P 15363	2	5/16" LOCKWASHER (SS)
54	L 2620	2	LABEL
■ 55	P 56028	2	SPRAY NOZZLE (HIGH CONCENTRATION SLURRY)
■ 56	P 56029	1	SPRAY NOZZLE (HIGH CONCENTRATION SLURRY)
■ 57	U 22586	1	FEED BOX
	OR		
	P 57424	1	FEED BOX FOR VOLUMETRIC SCREW FEEDER

NOTE: ■ NOT PART OF U27164.
▲ PART OF G1805.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

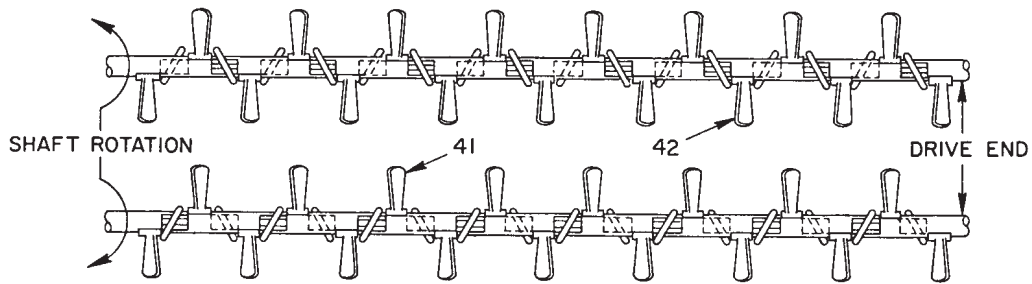
U27164 4000 LB. LIME SLAKER - PARTS

Side Elevation

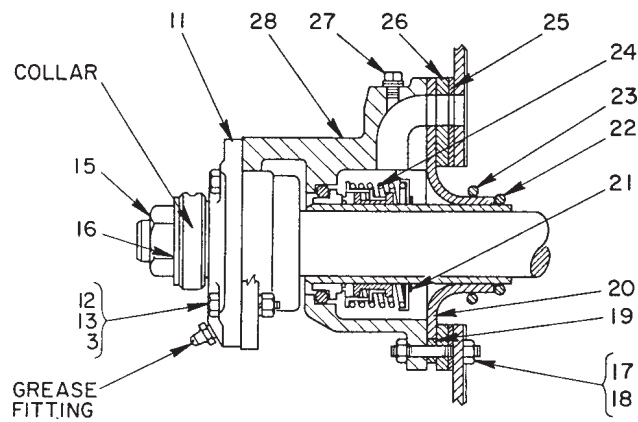
330.100.002.094C

ISSUE 5 9-03

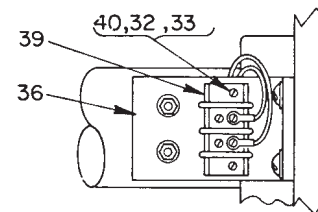
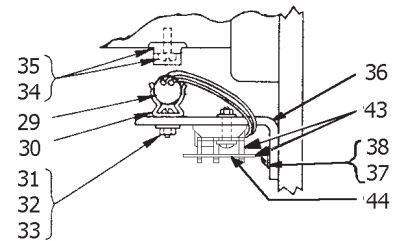
LIME SLAKING SYSTEM



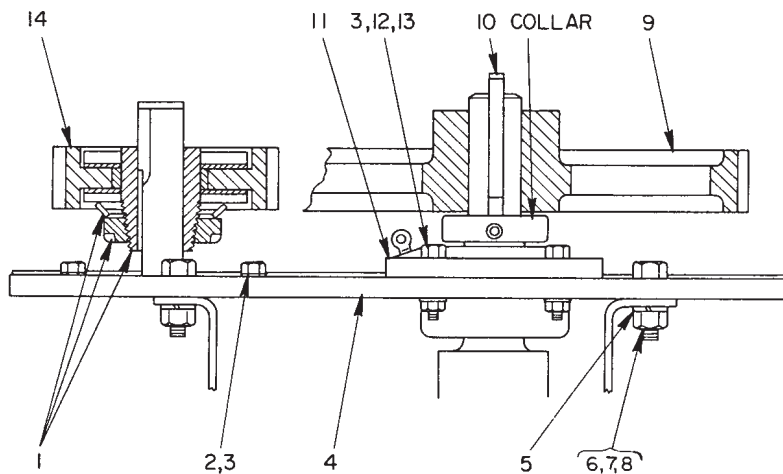
PLAN VIEW SHOWING PADDLE SEQUENCE



DETAIL "A"



DETAIL "B"



DETAIL "C"

NOTE: FOR PARTS LIST, SEE DWG. 330.100.002.095B.

U27164 4000 LB. LIME SLAKER - PARTS

Details

330.100.002.095A

ISSUE 2 8-04

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	U 20698	1	CLUTCH
2	P 2758	4	CAP SCREW (HEX.HD.,STL.) 3/8-16 x 1-1/4" LG.
3	PC 8334	20	3/8" LOCKWASHER
4	P 42628	1	MOUNTING PLATE
□ 5	PC 33350	12	SHIM 1" OD x 33/64" ID x.028"
6	P 6582	7	CAP SCREW (HEX.HD.,STL.)1/2"-13 x 1/2" LG.
7	P 889	7	HEX. NUT (STL.) 1/2"-13
8	PC 12230	7	LOCKWASHER (CARB.STL.) 1/2"
9	P 39284	2	SPUR GEAR 6P, 72T
10	P 43044	2	GIBBS KEY
11	U 18534	4	ROLLER BEARING
12	P 877	16	CAP SCREW (HEX.HD.,STL.)3/8"-16 x 1-1/2" LG.
13	P 888	16	HEX. NUT (3/8"-16
14	P 43605	1	SPUR GEAR 6P, 33T
15	P 6815	2	HEX. NUT (STL.) 1"-14
16	PC 17535	2	1" WASHER
17	P 39261	8	STUD (CAD.PL.) 7/16"-14 x 2-3/8" LG.
18	PC 6115	8	HEX. NUT (STL.) 7/16"-14
19	P 42892	8	SLEEVE
20	P 38408	2	SEAL
21	P 39335	2	RETAINING RING
22	P 37190	2	O-RING (329) BUNA-N 2" ID x 2-3/8" OD
23	P 41154	2	O-RING (330) BUNA-N 2-1/2" ID x 2-1/2" OD
24	U 18080	2	SEAL
25	P 39366	2	PILOT GASKET
26	P 38458	2	FILLER PLATE
27	AAA2562	4	1/4" PIPE PLUG
28	P 38411	2	BODY BEARING & SEAL
29	U 29189	1	SWITCH
30	P 28597	1	CLIP
31	P 14614	2	MACH.SCREW (RD.HD.,BR.) #6-32 x 7/16" LG.
32	PC 16955	4	#6 LOCKWASHER (CARB.STL.)
33	P 13704	4	HEX NUT (BRASS) #6-32
34	P 23992	1	MAGNET
35	PC 23139	1	MACH.SCREW (FIL.HD.,BR.) #5-40 x 3/8" LG.
36	P 39394	1	BRACKET
37	PC 7750	2	MACH.SCREW (RD.HD.,STL.) #10-32 x 5/8" LG.
38	P 12615	2	#10 LOCKWASHER (CARB.STL.)
39	U 15055	1	TERMINAL BLOCK
40	P 3729	2	MACH.SCREW (RD.HD.,BR.) #6-32 x 5/8" LG.
▲ 41	R 32236	33	PADDLE (LEFT HAND)
▲ 42	R 32237	33	PADDLE (RIGHT HAND)

NOTE: □ ONLY 32 PADDLES ARE UTILIZED WITH SCREEN TYPE GRIT REMOVER AND BOOSTER PUMP.
▲ USE AS REQUIRED FOR ALIGNING GEARS (2), SPUR GEAR, AND PLATE.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

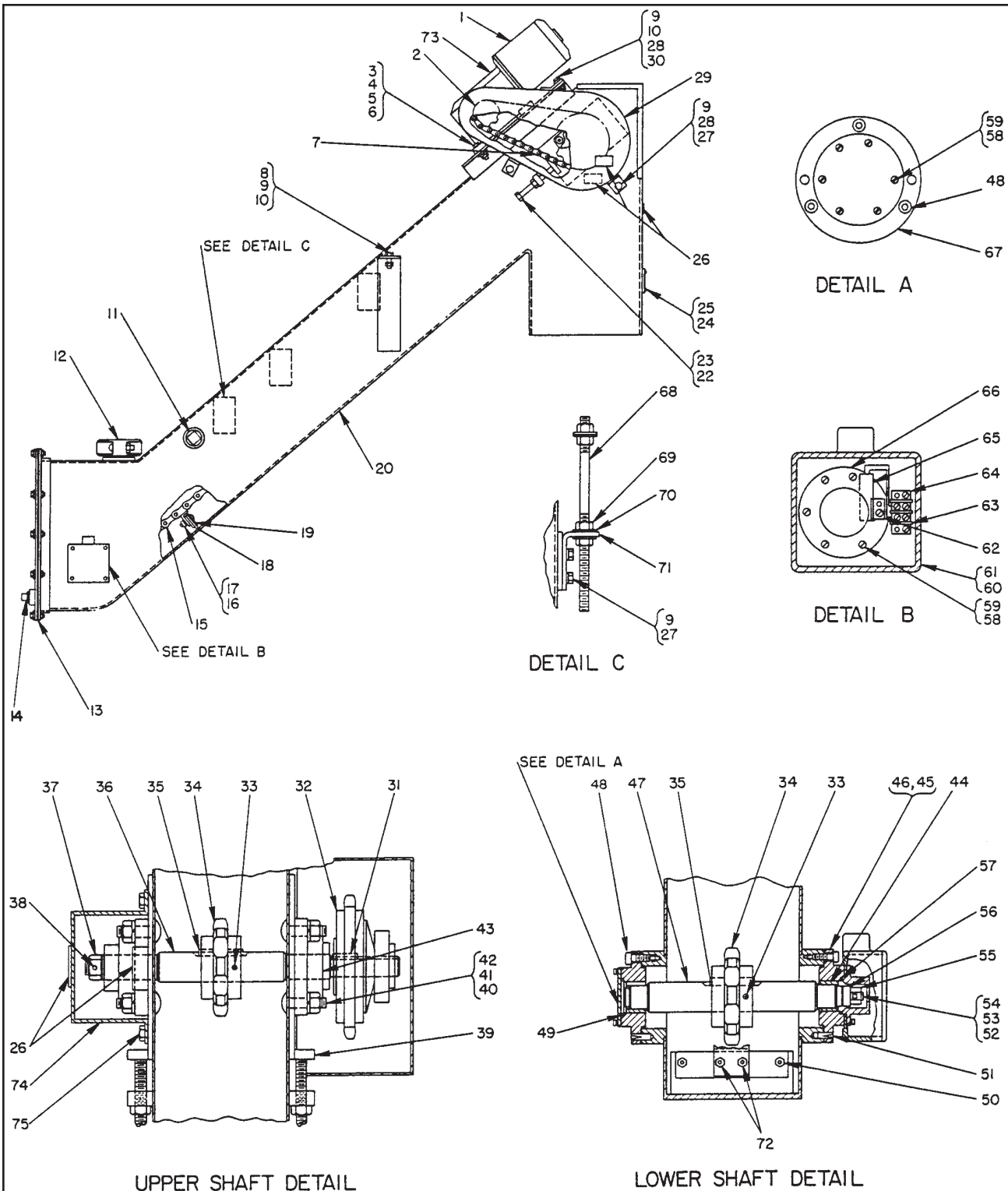
U27164 4000 LB. LIME SLAKER - PARTS

Details

330.100.002.095B

ISSUE 3 9-03

LIME SLAKING SYSTEM



NOTE: FOR PARTS LIST, SEE DWGS. 330.100.010.040B&C.

U25863 STANDARD AUTOMATIC GRIT REMOVER - PARTS

330.100.010.040A

ISSUE 7 6-04

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
▲ 1	U 26211 OR	1	MOTOR (230V., 3PH.) GIVE NAMEPLATE DATA WHEN ORDERING
	U 26210	1	MOTOR (115V., 1PH.)
2	P 47845	1	SPROCKET
3	PC 3816	4	BOLT (H.H.STL.) 5/16"-18 x 1-1/2" LG.
4	PC 1062	4	5/16" WASHER (STL.)
5	PC 4763	4	5/16" LOCKWASHER (CARB. STL.)
6	PC 887	4	HEX NUT (STL.) 5/16"-18
7	U 25716	1	ROLLER CHAIN
8	PC 2758	2	BOLT (H.H.STL.) 3/8"-16 x 1-1/4" LG.
9	PC 8334	7	3/8" LOCKWASHER
10	PC 888	3	HEX NUT (STL.) 3/8"-16
11	PC 39980	1	1-1/2" PIPE PLUG
12	U 18557	1	3" VICTAULIC PIPE COUPLING
13	P 53514	1	HOUSING GASKET
14	PC 8045	1	1" PIPE PLUG
15	U 25717	1	PINTLE CHAIN
16	PC 12615	48	#10 LOCKWASHER (CARB. STL.)
17	P 17309	48	HEX NUT (STL.) #10-32
18	P 53392	12	SCRAPER
19	P 53391	24	BACKING PLATE
20	U 25699	1	HOUSING
22	PC 41504	2	BOLT (H.H.STL.) 1/2"-20 x 4" LG.
23	PC 13678	2	HEX NUT (STL.) 1/2"-20
24	P 6881	1	IDENTIFICATION PLATE
25	PC 35137	4	SCREW (RD.HD.HDN.STL.) #4-40 x 3/16" LG.
26	L 2024	5	LABEL
27	PC 8117	4	BOLT (H.H.STL.) 3/8"-16 x 5/8" LG.
28	PC 1090	3	3/8" WASHER (STL.)
29	U 25718	1	CHAIN GUARD
30	PC 869	1	BOLT (H.H.STL.) 3/8"-16 x 1" LG.
31	P 34369	1	KEY 1/4" SQ. x 1-1/4" LG.
32	U 25715	1	CLUTCH
33	P 39286	2	ROLL PIN
34	P 39294	2	SPROCKET
35	PC 39393	2	KEY 3/8" SQ. x 2" LG.
36	P 53394	1	UPPER SHAFT
37	P 53556	1	HEX NUT (STL.) 3/4"-10
38	P 26641	1	ROLL PIN

NOTE: ▲ NOT PART OF U25863.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

U25863 STANDARD AUTOMATIC GRIT REMOVER - PARTS LIST

330.100.010.040B

ISSUE 11 6-04

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
39	P 41461	2	ADJUSTABLE CHAIN TENSION PLATE
40	PC 41273	8	CARRIAGE BOLT (RD.HD.,STL.) 1/2"-13 x 1-3/4" LG.
41	PC 12230	8	1/2" LOCKWASHER (CARB. STL.)
42	PC 889	8	HEX NUT (STL.) 1/2"-13
43	U 21001	2	FLANGED BEARING
44	P 55893	2	BEARING
45	P 53395	2	BEARING HOUSING
46	P 53389	2	HOUSING GASKET
47	P 53393	1	LOWER SHAFT
48	P 58960	6	SHOULDER BOLT (SOC.HD.,STL.) 5/16"-18 x 1/2" LG.
49	P 27083	1	O-RING (222) BUNA-N, 1-3/4" OD x 1-1/2" ID
50	PC 38416	24	MACH. SCREW (HEX. HD.,STL.) #10-32 x 3/4" LG.
51	P 19034	4	GROOV PIN
52	P 49384	1	MAGNET CLAMP
53	P 42866	2	MACH.SCREW (BD.HD.,SS) #4-40 x 5/8" LG.
54	P 15362	2	#4 LOCKWASHER (SS)
55	NP 1365	1	INDICATOR MAGNET
56	P 39392	1	ALARM SWITCH SPACER
57	P 39375	1	ALARM SWITCH GASKET
58	PC 18898	12	MACH. SCREW (FIL.HD.BR.) #6-32 x 1/2" LG.
59	P 13662	12	#6 LOCKWASHER (SS)
60	P 39376	1	CONDULET BOX
61	U 7428	1	CONDULET BOX COVER & GASKET
62	P 39389	1	SWITCH CLIP
63	U 15055	1	TERMINAL STRIP
64	PC 17359	2	MACH. SCREW (FIL.HD.BR.) #6-32 x 5/8" LG.
65	U 29189	1	SWITCH
66	P 39355	1	CAP
67	P 39395	1	COVER
68	P 53390	1	MOUNTING STUD
69	PC 15414	4	HEX NUT (STL.) 5/8"-18
70	PC 1092	4	5/8" WASHER (STL.)
71	P 39265	1	SUPPORT BRACKET
72	P 17309	24	MACH. SCREW (HEX.HD.,STL.) #10-32 x 1" LG.
▲ 73	U 26209	1	GEAR BOX (GIVE NAMEPLATE DATA WHEN ORDERING)
74	P 55291	1	GUARD
75	PC 12763	2	BOLT (HEX.HD.,STEEL) 1/4"-20 x 3/8" LG.

NOTE: ▲ NOT PART OF U25863.

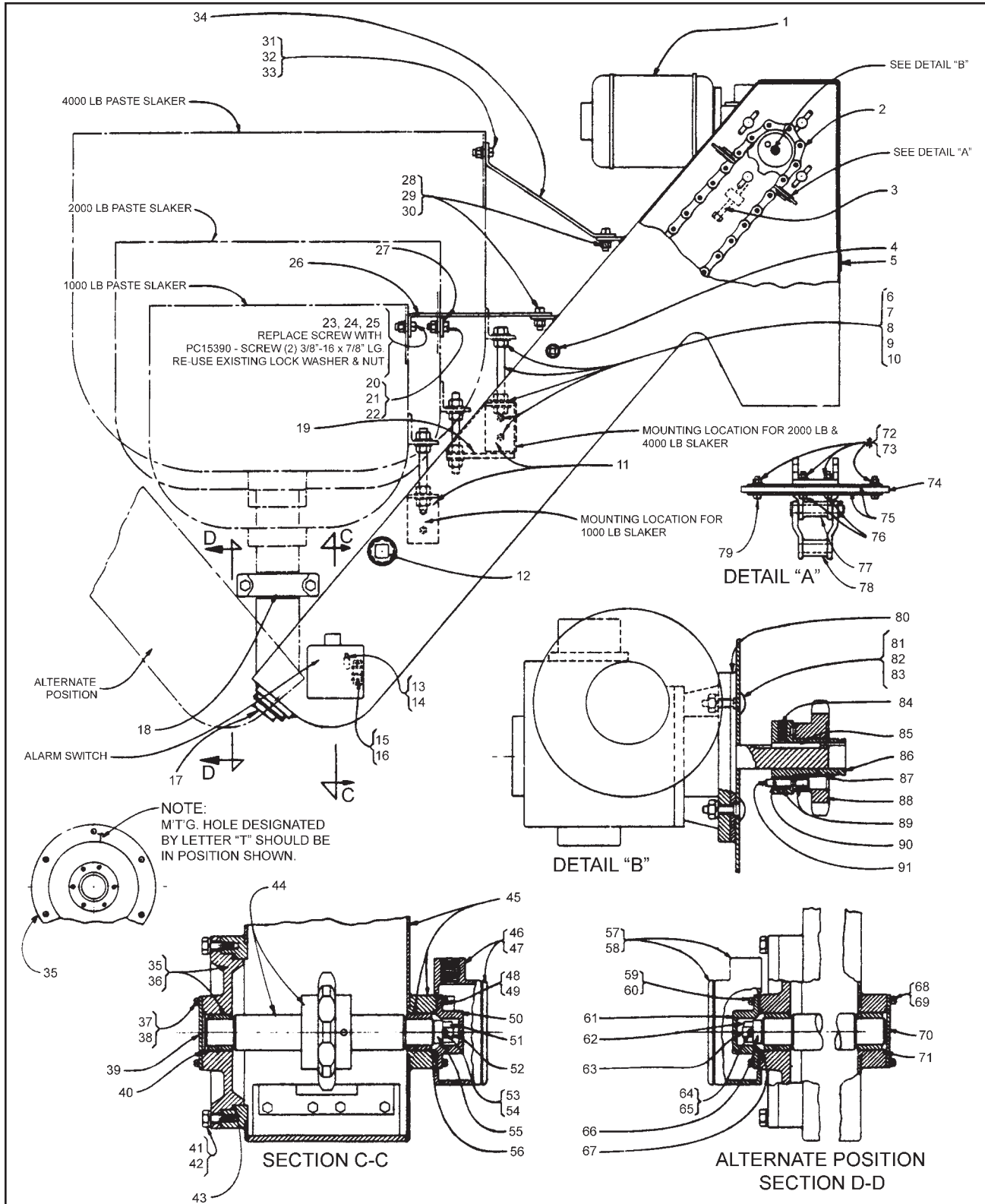
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

U25863 STANDARD AUTOMATIC GRIT REMOVER - PARTS LIST

330.100.010.040C

ISSUE 2 6-04

LIME SLAKING SYSTEM



NOTE: FOR PARTS LIST, SEE DWGS. 330.100.10.011B&C.

A763011 SPECIAL LOW-PROFILE GRIT REMOVER - PARTS

330.100.10.011A

ISSUE 10 6-04

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	AAB4454	1	GEAR MOTOR
▲ 2	U18532	1	CHAIN
3	P39292	1	SCREW ½"-20 x 3½" LG.
4	P995	2	½" PIPE PLUG
5	L2024	1	WARNING LABEL
6	P39291	1	STUD 5/8"-18 x 6½" LG. (USED IN SECURING TO SLAKER)
7	PC1092	4	WASHER (USED IN SECURING TO SLAKER)
8	PC15414	4	HEX NUT (USED IN SECURING TO SLAKER)
9	PC8117	2	SCREW 3/8"-16 x 5/8" LG. (USED IN SECURING TO SLAKER)
10	PC8334	2	LOCK WASHER (USED IN SECURING TO SLAKER)
11	P39265	1	ANGLE BRACKET (USED IN SECURING TO EITHER 1000 LB OR 4000 LB SLAKER)
12	PC39980	1	1½" PIPE PLUG
13	U10092	1	MERCURY SWITCH
14	P39389	1	CLIP
15	PC17359	2	SCREW #6-32 x 5/8" LG.
16	U15055	1	TERMINAL BLOCK
17	PC3810	1	2" PIPE PLUG
18	U18557	1	COUPLING
19	P41180	1	ANGLE BRACKET (USED IN SECURING TO 2000 LB SLAKER)
● 20	* PC2758	2	SCREW 3/8"-16 x 1¼" LG.
● 21	PC8334	2	LOCK WASHER
● 22	PC888	2	HEX NUT
● 23	PC8117	2	SCREW 3/8"-16 x 5/8" LG.
● 24	PC8334	2	LOCK WASHER
● 25	PC888	2	HEX NUT
■ 26	P39257	1	BRACKET (1000 LB)
■ 27	P41165	1	BRACKET (2000 LB)
28	PC2758	2	SCREW 3/8"-16 x 1¼" LG. (USED IN SECURING TO BRACKET)
29	PC8334	2	LOCK WASHER (USED IN SECURING TO BRACKET)
30	PC888	2	HEX NUT (USED IN SECURING TO BRACKET)
● 31	PC2758	2	SCREW 3/8"-16 x 1¼" LG.
● 32	PC8334	2	LOCK WASHER
● 33	PC888	2	HEX NUT
■ 34	P39262	1	BRACKET (4000 LB)
35	U18813	1	BEARING HUB
36	P39295	1	BEARING ONLY
37	PC18898	6	SCREW #6-32 x ½" LG.
38	P12996	6	LOCK WASHER
39	P39395	1	COVER
40	P27083	1	O-RING
41	PC869	6	CAP SCREW (HEX. HD., STEEL) 3/8"-16 x 1" LG.
42	PC8334	6	LOCK WASHER
43	P39296	1	O-RING (BUNA-N) (5.984" ID x .139" SECT. DIA.)
44	U18670	1	SHAFT & SPROCKET UNIT
45	U18812	1	HOUSING, COVER & BEARING
	OR		
	P39295	1	BEARING ONLY

NOTE: ▲ SPECIFY U18533 TO ORDER THESE PARTS.

● PART OF A-758 PASTE SLAKER.

■ NOT PART OF A-763.

* REPLACE SCREW WITH PC15390 (SCREW 3/8"-16 x 7/8" LG.) AND RE-USE EXISTING LOCK WASHER AND NUT.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

A763011 SPECIAL LOW-PROFILE GRIT REMOVER - PARTS LIST

330.100.10.011B

ISSUE 0 6-04

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
46	P39376	1	CONDULET BOX
47	U7428	1	COVER
48	PC18898	6	SCREW #6-32 x 1/2" LG.
49	P12996	6	LOCK WASHER
50	P39355	1	CAP
51	NP1365	1	MAGNET
52	P49384	1	CLAMP
53	PC22805	2	SCREW #4-36 x 5/8" LG.
54	P15362	2	LOCK WASHER
55	P39392	1	SPACER
56	P39375	1	GASKET
57	P39376	1	CONDULET BOX
58	U7428	1	COVER
59	PC18898	6	SCREW #6-32 x 1/2" LG.
60	P12996	6	LOCK WASHER
61	P39355	1	CAP
62	NP1365	1	MAGNET
63	P49384	1	CLAMP
64	PC22805	2	SCREW #4-36 x 5/8" LG.
65	P15362	2	LOCK WASHER
66	P39392	1	SPACER
67	P39375	1	GASKET
68	PC18898	6	SCREW #6-32 x 1/2" LG.
69	P13662	6	LOCK WASHER
70	P39395	1	COVER
71	P27083	1	O-RING
▲ 72	PC17309	44	HEX. NUT
▲ 73	PC12615	44	LOCK WASHER
▲ 74	P39272	11	FLIGHT SCRAPER
▲ 75	P39255	22	BACKING PLATE
▲ 76	PC38415	22	SCREW #10-32 x 1" LG.
77	U18707	11	ATTACHMENT LINK (CHAIN BELT CO. #955 F-2)
78	U18708	66	PLAIN LINK (CHAIN BELT CO. #955)
▲ 79	PC38416	22	SCREW #10-32 x 1" LG.
80	P39260	1	MOUNTING PLATE
81	PC859	4	CARRIAGE BOLT 3/8"-16 x 1 1/2" LG.
82	PC8334	4	LOCK WASHER
83	PC888	4	HEX. NUT
84	PC8791	2	SET SCREW 5/16"-18 x 3/8" LG.
85	P34369	1	KEY
86	P39369	1	SLEEVE
87	P39368	1	RETAINING RING
88	P39348	1	SPROCKET
89	P39352	2	BUSHING
90	PC20993	1	COTTER RING
91	P39370	1	SHEAR PIN (GREEN DOT)

NOTE: ▲ SPECIFY U18533 TO ORDER THESE PARTS.

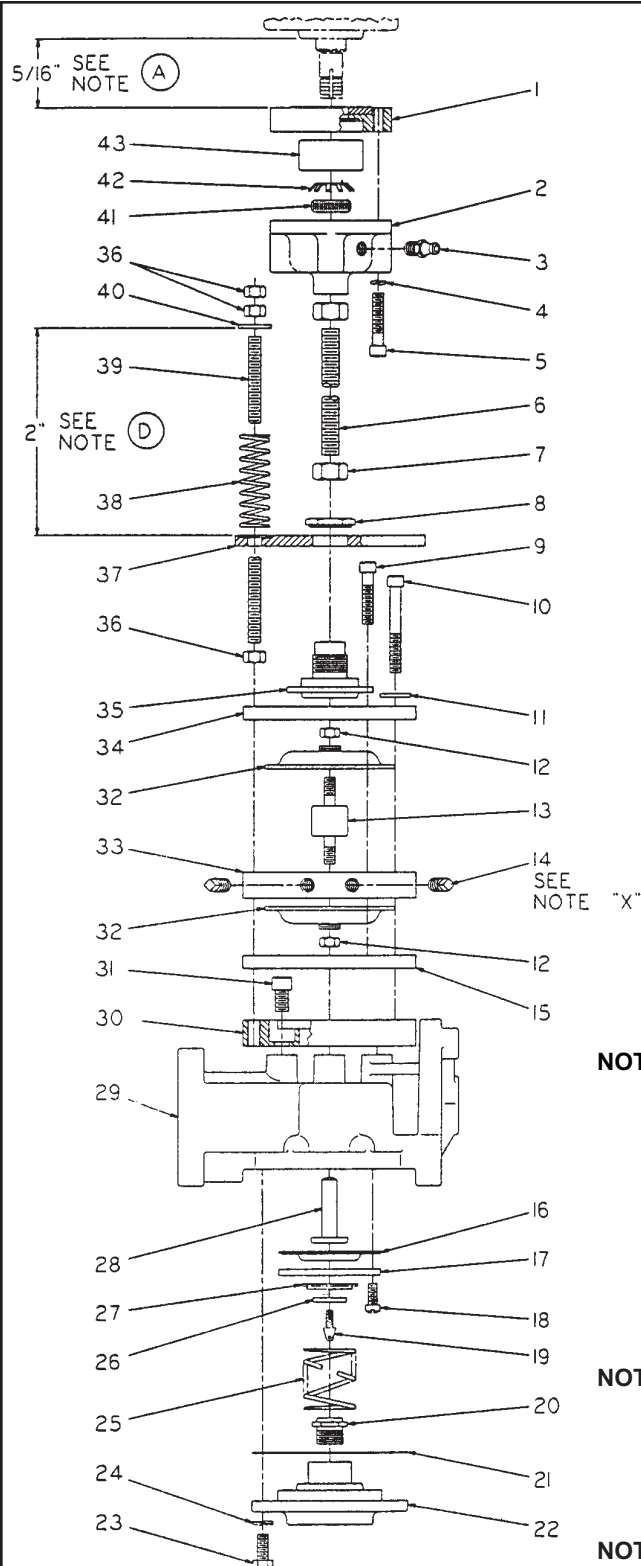
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

A763011 SPECIAL LOW-PROFILE GRIT REMOVER - PARTS LIST

330.100.10.011C

ISSUE 0 6-04

LIME SLAKING SYSTEM



NOTE: WHEN THE WATER VALVE IS SHUT DOWN, THE BEARING HOUSING (P39379) IS ADJUSTED ON THE ACTUATING ROD (P60323 - 1000 LB. SLAKER OR P60326 - 2000 LB. SLAKER) TO OBTAIN 5/16" CLEARANCE AT (A). ADJUSTMENT IS MADE BETWEEN SPRING BAR (P43103) AND WASHER (PC1090) SO THAT DIMENSION (D) IS APPROXIMATELY 2". (D) MAY BE ADJUSTED AS REQUIRED TO OBTAIN PROPER CONSISTENCY OF LIME PASTE. SEE INSTRUCTION TEXT.

NOTE X: IF DISASSEMBLED FOR SERVICE, FILL BOTH SIDES OF DIAPHRAGM CHAMBER WITH PROPYLENE GLYCOL MIXTURE (50% WATER & 50% USF/W&T PART NO. U28652). CHECK THAT NO AIR REMAINS IN EITHER SIDE.

NOTE: FOR PARTS LIST SEE DWG. 330.100.004.013B.

TORQUE ACTUATED WATER CONTROL VALVE - PARTS

Used in 1000 and 2000 Lb. Lime Slakers

330.100.004.013A

ISSUE 8 7-04

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
○ 1	U 19667	1	BEARING CLAMP
○ 2	P 39379	1	BEARING HOUSING
○ 3	U 3497	1	GREASE FITTING
○ 4	PC 26342	4	LOCKWASHER
○ 5	P 39337	4	SCREW 5/16"-18 x 1-1/2" LG.
6	P 60323	1	ACTUATING ROD (1000 LB. SLAKER)
	OR		
	P 60326	1	ACTUATING ROD (2000 LB. SLAKER)
7	PC 8714	2	JAM NUT 1/2"-13
8	P 17302	1	LOCKNUT 1"-14
* 9	P 39337	4	SCREW 5/16"-18 x 1-1/2" LG.
10	P 41216	4	SCREW 5/16"-18 x 2-1/2" LG.
11	P 1062	4	WASHER
* 12	P 26118	2	HEX. NUT 5/16"-18
* 13	P 43100	1	PISTON
* 14	PC 1166	4	1/8" PIPE PLUG
* 15	P 43096	1	MOUNTING RING
▲ 16	P 39321	1	DIAPHRAGM
▲ 17	P 39324	1	DIAPHRAGM CLAMPING RING
▲ 18	P 29715	6	SCREW 1/4"-20 x 5/8" LG.
▲ 19	P 42723	1	STEM
▲ 20	P 39317	1	SEAT
▲ 21	P 39325	1	GASKET
▲ 22	P 43115	1	HEAD
▲ 23	P 873	6	SCREW 5/16"-18 x 3/4" LG.
▲ 24	PC 4763	6	LOCKWASHER
▲ 25	P 43116	1	SPRING
▲ 26	P 39323	1	ORIFICE SEAL
▲ 27	P 43123	1	SEAL WASHER
▲ 28	U 20501	1	DIAPHRAGM SUPPORT
▲ 29	U 20499	1	BODY UNIT
30	P 43101	1	END CAP
31	P 43119	2	SCREW 3/8"-16 x 5/8" LG.
* 32	P 43099	2	DIAPHRAGM
* 33	P 43097	1	DIAPHRAGM CHAMBER
* 34	P 43098	1	CLAMPING RING
35	P 43102	1	SPRING SUPPORT
36	P 888	6	HEX. NUT 3/8"-16
37	P 43103	1	SPRING BAR
38	P 43105	2	SPRING
39	P 60324	2	TIE ROD
40	PC 1090	2	WASHER
○ 41	P 21120	1	LOCK NUT (N.D. #N-03)
○ 42	P 21121	1	LOCKWASHER, (N.D. #W-03)
○ 43	U 19533	1	BALL BEARING (N.D. #5603)

NOTE: * PART OF U 20437. ▲ PART OF UXA 20438 (INCLUDES U20438). ○ PART OF U20620.
ALL PARTS REQUIRE ASSEMBLY. ORDERING U20438 WILL PROVIDE ALL PARTS IN UXA20438 EXCEPT FOR P39317 (SEAT) AND P42723 (STEM).

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

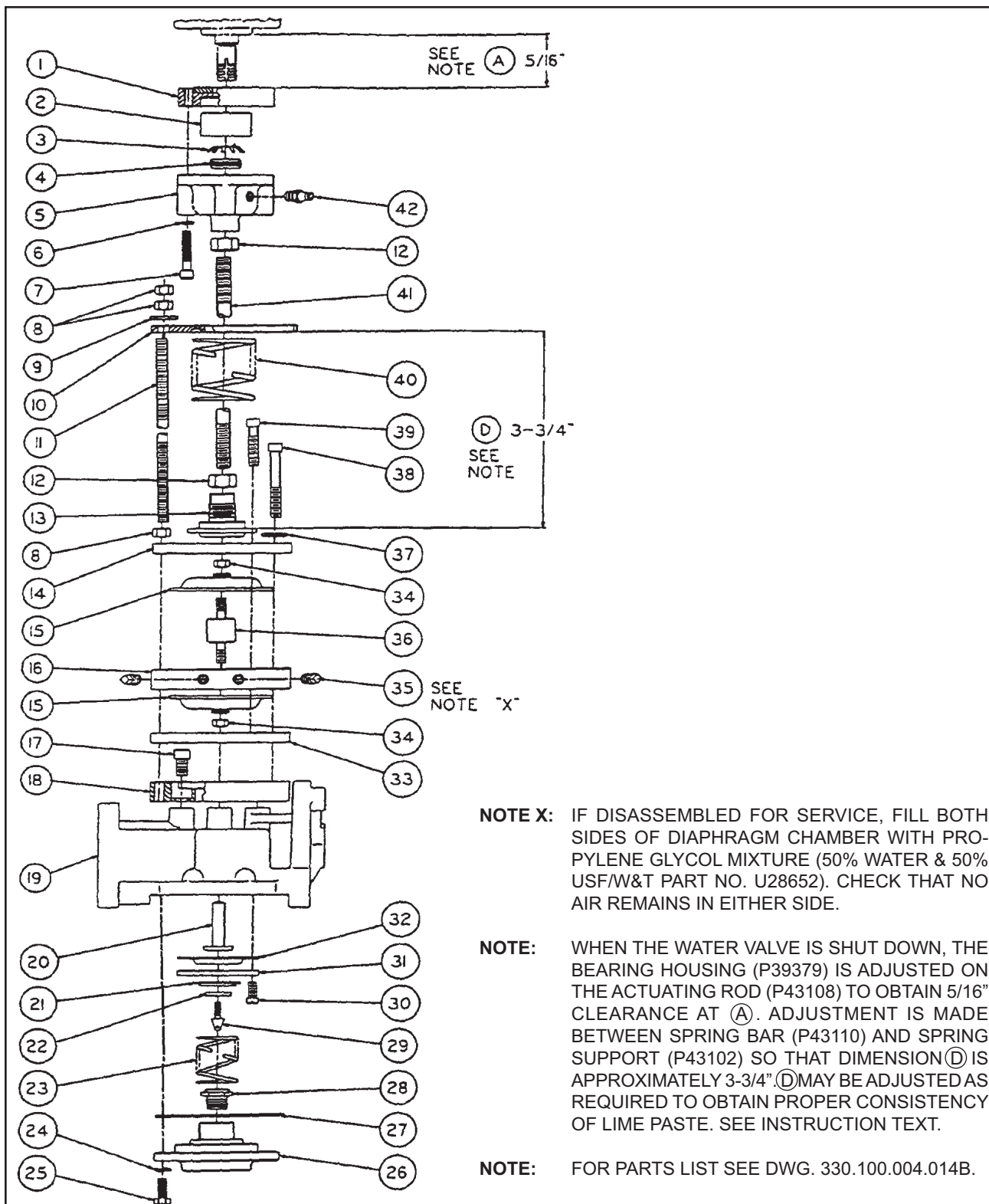
TORQUE ACTUATED WATER CONTROL VALVE - PARTS LIST

Used in 1000 and 2000 Lb. Lime Slakers

330.100.004.013B

ISSUE 1 9-03

LIME SLAKING SYSTEM



TORQUE ACTUATED WATER CONTROL VALVE - PARTS

Used in 4000 Lb. Lime Slaker

330.100.004.014A

ISSUE 8 7-04

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
○ 1	U 19667	1	BEARING CLAMP
○ 2	U 19533	1	BALL BEARING (N.D. #5603)
○ 3	P 21121	1	LOCKWASHER, (N.D. #W-03)
○ 4	P 21120	1	LOCK NUT (N.D. #N-03)
○ 5	P 39379	1	BEARING HOUSING
○ 6	PC 26342	4	LOCKWASHER
○ 7	P 39337	4	SCREW 5/16"-18 x 1-1/2" LG.
8	P 888	6	HEX. NUT 3/8"-16
9	PC 1090	2	WASHER
10	P 43110	1	SPRING BAR
11	P 43109	2	TIE ROD
12	PC 8714	2	JAM NUT 1/2"-13
13	P 43102	1	SPRING SUPPORT
* 14	P 43098	1	CLAMPING RING
* 15	P 43099	2	DIAPHRAGM
* 16	P 43097	1	DIAPHRAGM CHAMBER
17	P 43119	2	SCREW 3/8"-16 x 5/8" LG.
18	P 43101	1	END CAP
▲ 19	U 20499	1	BODY UNIT
▲ 20	U 20501	1	DIAPHRAGM SUPPORT
▲ 21	P 43123	1	SEAL WASHER
▲ 22	P 39323	1	ORIFICE SEAL
▲ 23	P 43116	1	SPRING
▲ 24	PC 4763	6	LOCKWASHER
▲ 25	P 873	6	SCREW 5/16"-18 x 3/4" LG.
▲ 26	P 43115	1	HEAD
▲ 27	P 39325	1	GASKET
▲ 28	P 39327	1	SEAT
▲ 29	P 43126	1	STEM
▲ 30	P 29715	6	SCREW 1/4"-20 x 5/8" LG.
▲ 31	P 39324	1	DIAPHRAGM CLAMPING RING
▲ 32	P 39321	1	DIAPHRAGM
* 33	P 43096	1	MOUNTING RING
* 34	P 26118	2	HEX. NUT 5/16"-18
* 35	PC 1166	4	1/8" PIPE PLUG
* 36	P 43100	1	PISTON
37	P 1062	4	WASHER
38	P 41216	4	SCREW 5/16"-18 x 2-1/2" LG.
* 39	P 39337	4	SCREW 5/16"-18 x 1-1/2" LG.
40	P 43111	1	SPRING
41	P 60327	1	ACTUATING ROD
○ 42	U 3497	1	GREASE FITTING

NOTE: ▲ PART OF UXB20438 (INCLUDES U20438).

○ PART OF U20620.

* PART OF U20437.

ALL PARTS REQUIRE ASSEMBLY. ORDERING U20438 WILL PROVIDE ALL PARTS IN UXB20438 EXCEPT FOR P39327 (SEAT) AND P43126 (STEM).

WHEN ORDERING MATERIAL ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

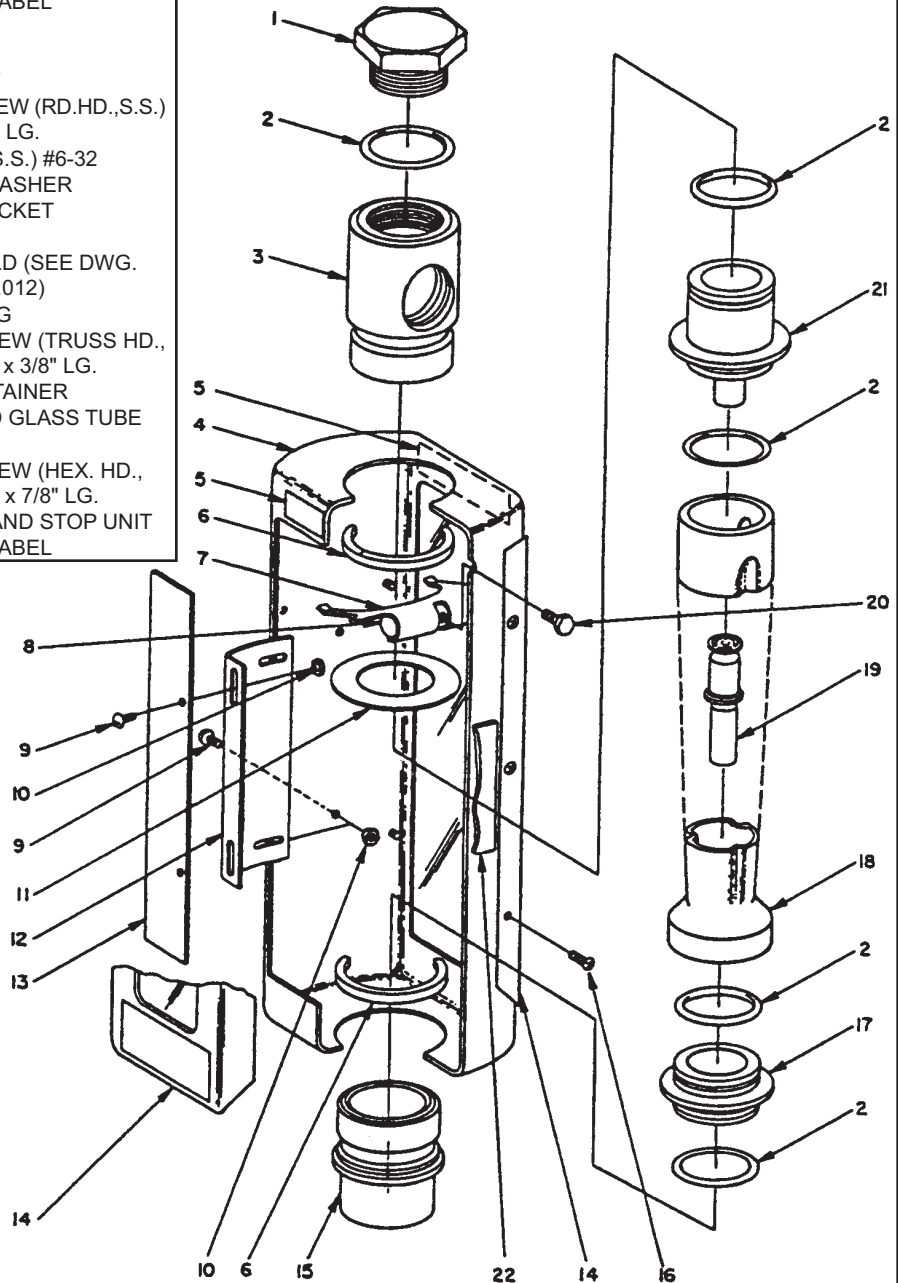
TORQUE ACTUATED WATER CONTROL VALVE - PARTS LIST
Used In 4000 Lb. Lime Slaker

330.100.004.014B

ISSUE 2 9-03

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	NPXB210	1	END SEAL
2	P 26784	5	O-RING (114) BUNA-N, 5/8" ID x 13/16" OD
3	NPXB209	1	END FITTING
4	NU 1229	1	FRAME
5	L 2497	2	WARNING LABEL
6	P 41309	2	O-RING
7	NP 185	1	CLAMP
8	NP 295	1	CLAMP NUT
9	P 40971	4	MACH. SCREW (RD.HD.,S.S.) #6-32 x 5/16" LG.
10	P 19822	4	HEX, NUT (S.S.) #6-32
11	NP 278	1	BEARING WASHER
12	NP 404	1	SCALE BRACKET
13	NPYH858	1	SCALE
14	NU 1221	2	TUBE SHIELD (SEE DWG. 529.100.001.012)
15	NPXB263	1	END FITTING
16	P 54178	12	MACH. SCREW (TRUSS HD., S.S.) #10-24 x 3/8" LG.
17	NP 211	1	LOWER RETAINER
18	NPXA158	1	10" BEADED GLASS TUBE
19	NUYA299	1	FLOAT UNIT
20	P 40594	1	MACH. SCREW (HEX. HD., S.S.) 1/4"-20 x 7/8" LG.
21	NU 1194	1	RETAINER AND STOP UNIT
22	L 2498	1	WARNING LABEL



WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

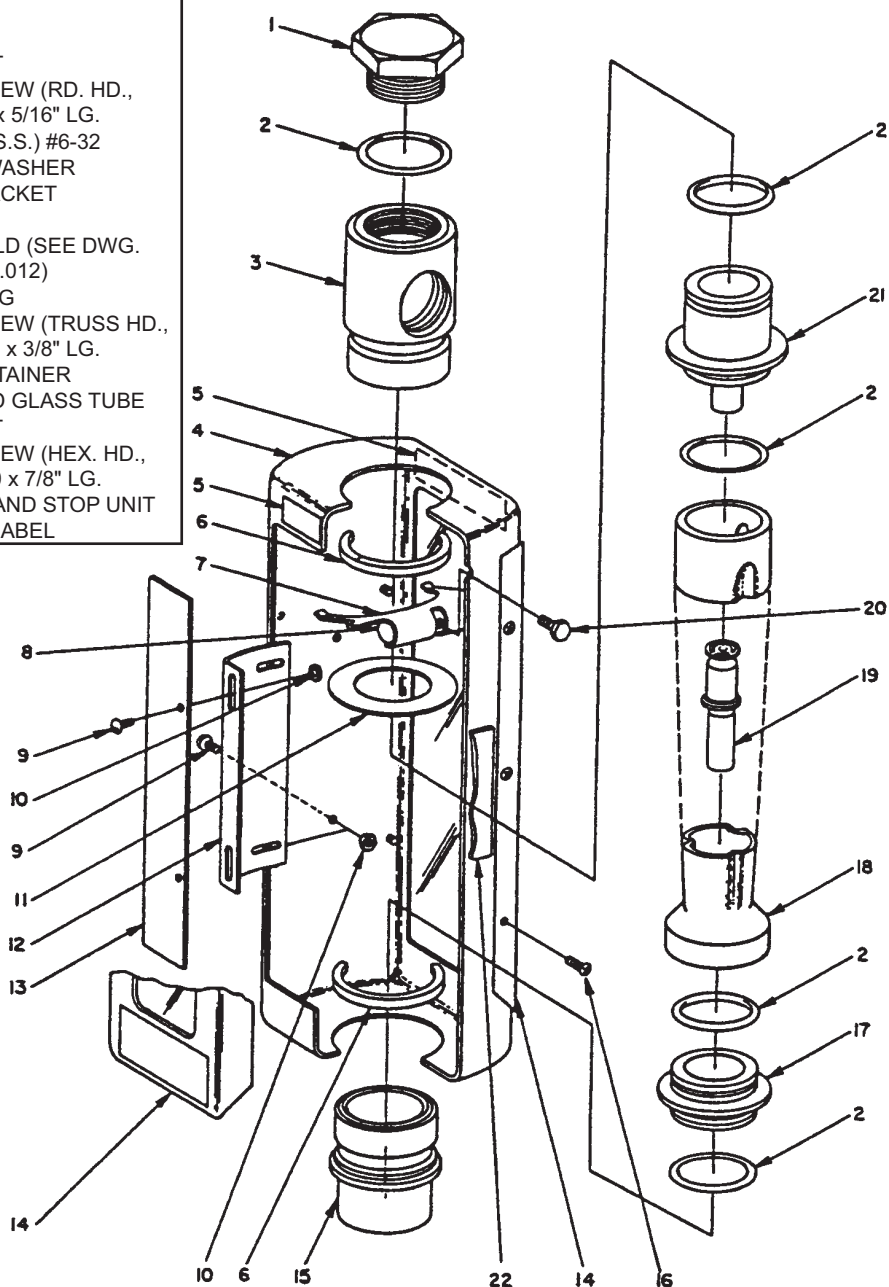
U26550 1/2" USF/W&T VAREA-METER - PARTS
Used With Series A-758 1000 Lb. Lime Slaker

330.100.011.012

ISSUE 2 3-82

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	NPXB187	1	END SEAL
2	P 39892	5	O-RING (114) BUNA-N, 5/8" ID x 3/16" OD
3	NPX3186	1	END FITTING
4	NU 1229	1	FRAME
5	L 2497	2	WARNING LABEL
6	P 41309	2	O-RING
7	NP 185	1	CLAMP
8	NP 295	1	CLAMP NUT
9	P 40971	4	MACH. SCREW (RD. HD., S.S.) #6-32 x 5/16" LG.
10	P 19822	4	HEX, NUT (S.S.) #6-32
11	NP 278	1	BEARING WASHER
12	NP 283	1	SCALE BRACKET
13	NPXJ860	1	SCALE
14	NU 1221	2	TUBE SHIELD (SEE DWG. 520.100.001.012)
15	NPXB264	1	END FITTING
16	P 54178	12	MACH. SCREW (TRUSS HD., S.S.) #10-24 x 3/8" LG.
17	NP 183	1	LOWER RETAINER
18	NPXA160	1	10" BEADED GLASS TUBE
19	NUXA302	1	FLOAT UNIT
20	P 40594	1	MACH. SCREW (HEX. HD., S.S.) 1/4"-20 x 7/8" LG.
21	NU 1194	1	RETAINER AND STOP UNIT
22	L 2498	1	WARNING LABEL



WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

U26551 3/4" USF/W&T VAREA-METER - PARTS

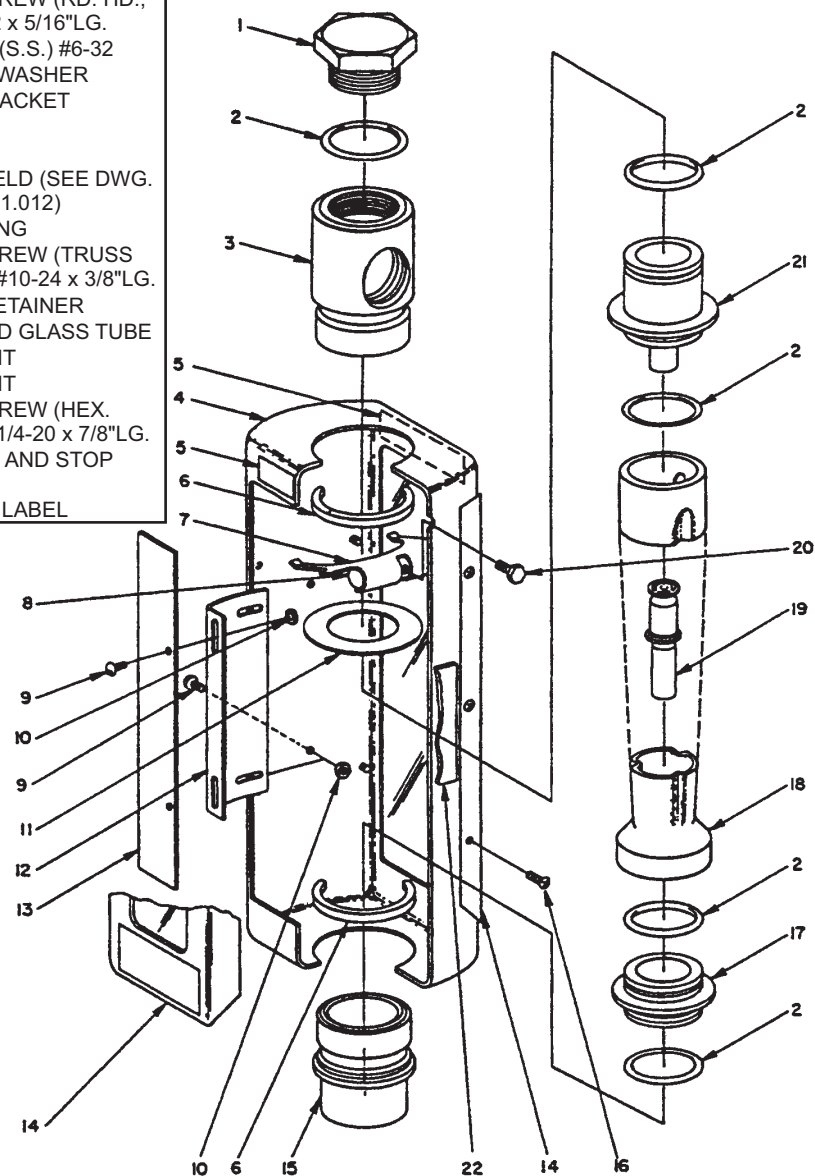
Used With Series A-758 2000 Lb. Lime Slaker

330.100.011.022

ISSUE 2 3-82

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.		DESCRIPTION
		U26552	U26553	
1	NPXB202	1	1	END SEAL
2	P 39952	5	5	O-RING (114) BUNA-N 5/8"ID x 13/16"OD
3	NPXB201	1	1	END FITTING
4	NU 1231	1	1	FRAME
5	L 2497	2	2	WARNING LABEL
6	P 41310	2	2	O-RING
7	NP 200	1	1	CLAMP
8	NP 295	1	1	CLAMP NUT
9	P 40971	4	4	MACH. SCREW (RD. HD., S.S.) #6-32 x 5/16"LG.
10	P 19822	4	4	HEX. NUT (S.S.) #6-32
11	NP 284	1	1	BEARING WASHER
12	NP 405	1	1	SCALE BRACKET
13	NPYFB91	1	-	SCALE
	NPYJB91	-	1	SCALE
14	NU 1223	2	2	TUBE SHIELD (SEE DWG. 520.100.001.012)
15	NPX3265	1	1	END FITTING
16	P 54178	12	12	MACH. SCREW (TRUSS HD., S.S.) #10-24 x 3/8"LG.
17	NP 198	1	1	LOWER RETAINER
18	NPXA291	1	1	10"BEADED GLASS TUBE
19	NUYA287	1	-	FLOAT UNIT
	NUYA303	-	1	FLOAT UNIT
20	P 29770	1	1	MACH. SCREW (HEX. HD., S.S.) 1/4-20 x 7/8"LG.
21	NU2498	1	1	RETAINER AND STOP UNIT
22	L 2498	1	1	WARNING LABEL



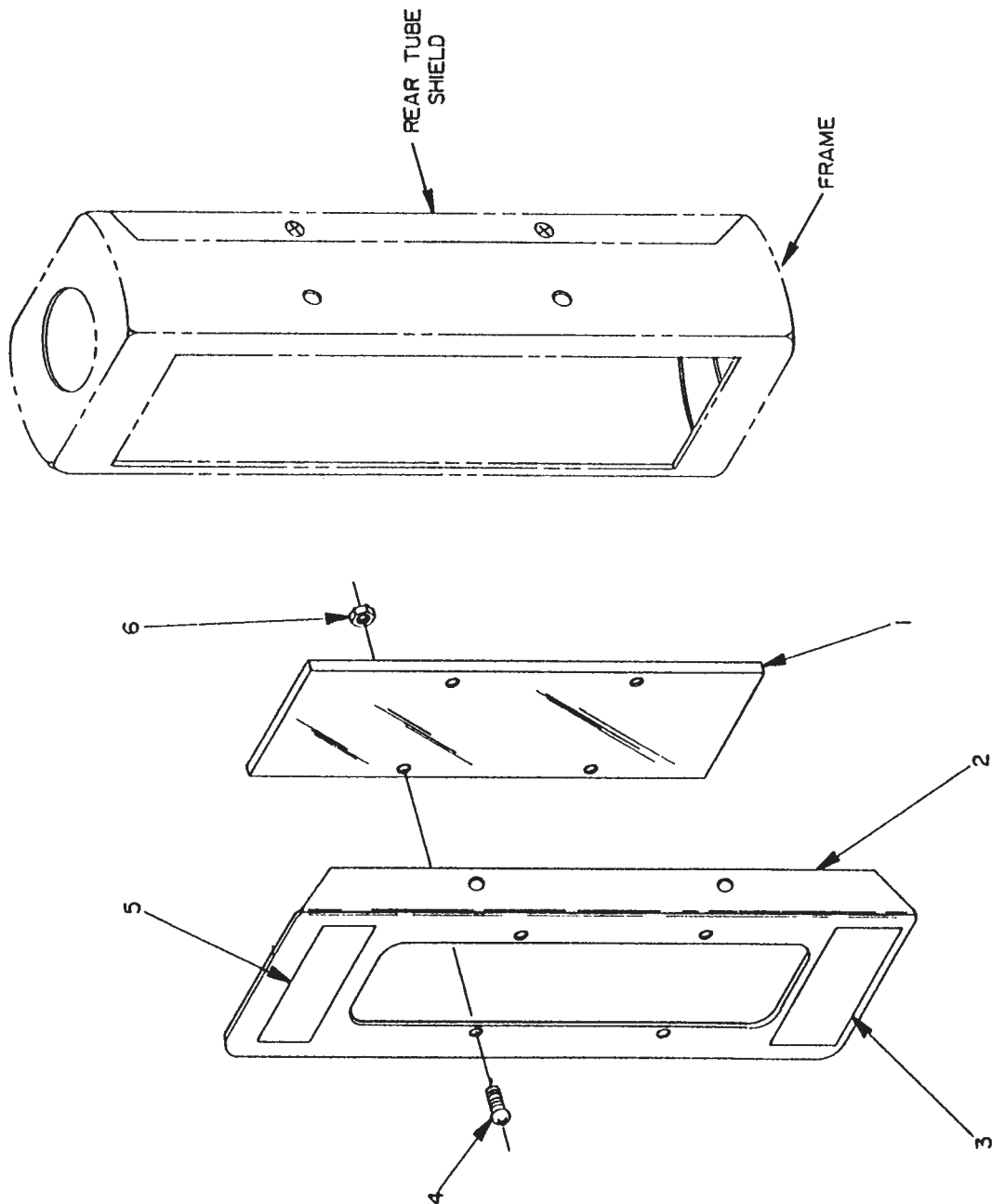
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

1" USF/W&T VAREA-METER - PARTS
U26552 USED WITH 4000 LB. & U26553 USED WITH 8000 LB. SLAKERS
Used With Series A-758 4000 Lb. and 8000 Lb. Lime Slakers

330.100.011.032

ISSUE 3 8-98

LIME SLAKING SYSTEM



WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

GLASS-TUBE VAREA-METER - PARTS

Tube Shield

520.100.001.012A

ISSUE 2 4-82

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QUANTITY								DESCRIPTION
		TUBE SHIELD 5" FRAME				TUBE SHIELD 10" FRAME				
		NU1220	NU1222	NU1224	NU1226	NU1221	NU1223	NU1225	NU1227	
1	NP2636	1	-	-	-	-	-	-	-	WINDOW
	OR									
	NP2637	-	-	-	-	1	-	-	-	WINDOW
	OR									
	NP2638	-	1	-	-	-	-	-	-	WINDOW
	OR									
	NP2639	-	-	-	-	-	1	-	-	WINDOW
	OR									
NP2640	-	-	1	1	-	-	-	-	WINDOW	
OR										
NP2641	-	-	-	-	-	-	-	1	1	WINDOW
2	NP2644	1	-	-	-	-	-	-	-	BEZEL
	OR									
	NP2645	-	-	-	-	1	-	-	-	BEZEL
	OR									
	NP2646	-	1	1	-	-	-	-	-	BEZEL
	OR									
	NP2647	-	-	-	-	-	1	-	-	BEZEL
	OR									
	NP2648	-	-	-	-	-	-	-	-	BEZEL
	OR									
NP2649	-	-	-	-	-	-	1	-	BEZEL	
OR										
NP2650	-	-	-	1	-	-	-	-	-	BEZEL
OR										
NP2651	-	-	-	-	-	-	-	-	-	BEZEL
3	L 2437	1	1	1	1	1	1	1	1	WARNING LABEL
4	P54177	4	4	4	4	8	8	8	8	SCREW (RD.HD.,SS) #8-32 x 3/8" LG.
5	L 2424	1	-	-	-	1	-	-	-	INSIGNIA
	OR									
	L 2425	-	1	1	1	-	1	1	1	INSIGNIA
6	P29488	4	4	4	4	8	8	8	8	HEX. NUT (18-8 SS) #8-32

NOTE: NU1220, NU1221-3/8", 1/2", 3/4" GLASS TUBE; NU1223-1" GLASS TUBE; NU1224, NU1225-1-1/2" GLASS TUBE; NU1227-2" GLASS TUBE EACH METER IS PROVIDED WITH TWO TUBE SHIELDS; ONE FRONT AND ONE REAR.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

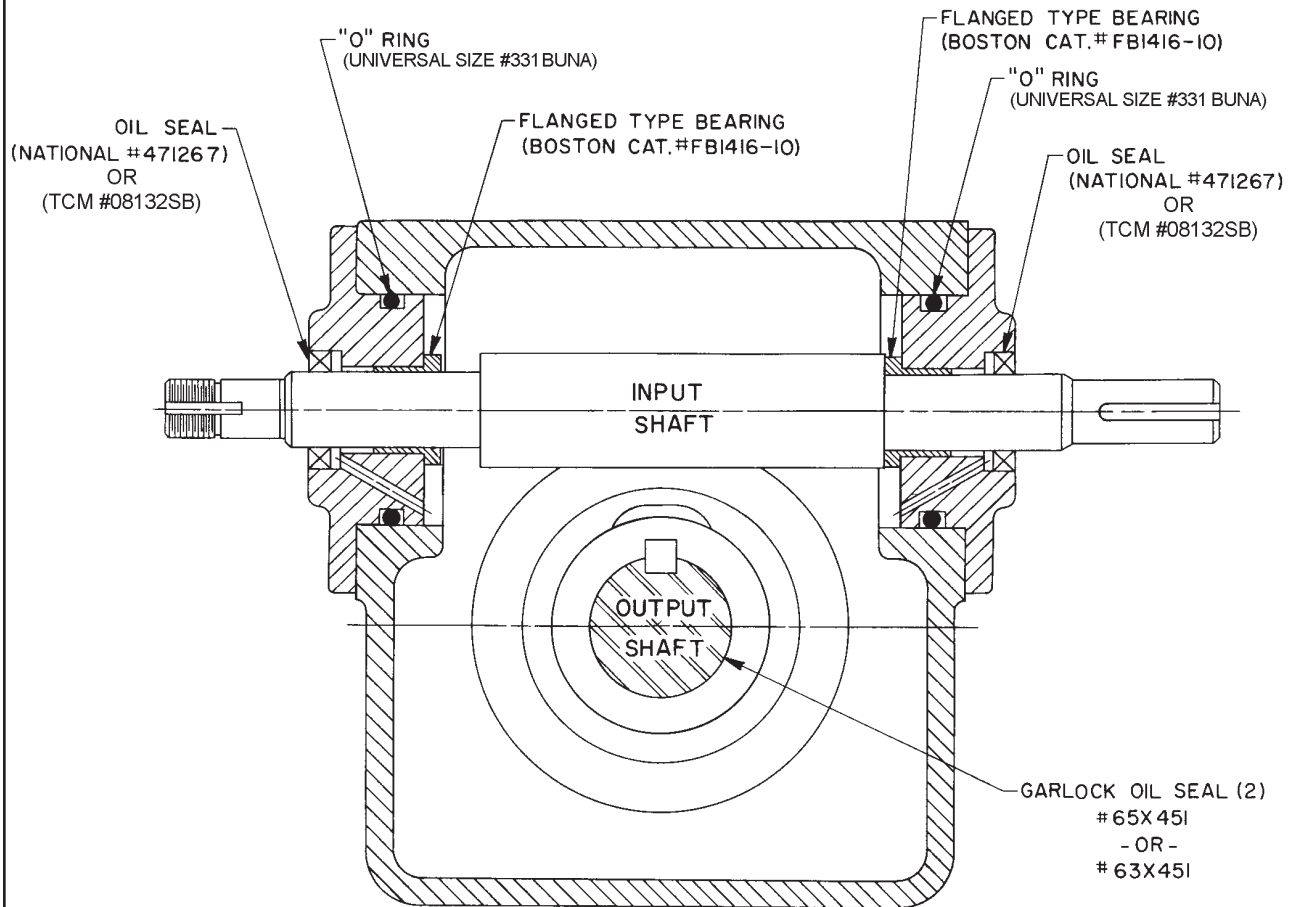
GLASS-TUBE VAREA-METER - PARTS LIST

Tube Shield

520.100.001.012B

ISSUE 2 4-82

LIME SLAKING SYSTEM



NOTE: ONLY THE COMPLETE SPEED REDUCER, U19939, IS STOCKED BY USF/W&T.

THE SEAL, O-RING, AND BEARING PARTS DESCRIBED ABOVE MAY BE AVAILABLE FROM LOCAL INDUSTRIAL SUPPLY SOURCES.

FOR ALL OTHER PARTS, CONSULT USF/W&T.

U19939 IS USED ONLY ON 1000, 2000, & 4000 LB. SLAKERS.

FILL OIL TO UPPER PLUG ON VERTICAL FACE ON SIDE OPPOSITE OUTPUT SHAFT WITH GEAR OIL U18805.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

U19939 SPEED REDUCER - PARTS
Input Shaft / Commercial Parts

330.100.99.011

ISSUE 9 9-03

LIME SLAKING SYSTEM

FOR GRIT CONVEYOR TYPE GRIT REMOVER MOTOR (M1)	
PART NO.	DESCRIPTION
UXF 27096	4.0 - 6.3 AMPS (FOR 1000 LB/HR. SLAKER, 1/4 HP, 115V, 1PH)
UXD 27096	1.6 - 2.5 AMPS (FOR 1000 LB/HR. SLAKER, 1/4 HP, 230V, 3PH)
UXC 27096	1.0 - 1.6 AMPS (FOR 1000, 2000, 4000 & 8000LB/HR SLAKER, 1/4HP, 230V, 3PH)
UXA 27096	0.4 - 0.63 AMPS(FOR 1000, 2000, 4000 & 8000LB/HR SLAKER, 1/4HP, 460V, 3PH)

FOR POSITIVE SCREEN TYPE GRIT REMOVER MOTOR (M1)	
PART NO.	DESCRIPTION
UXC 27096	1.0 - 1.6 AMPS (FOR 1000 LB/HR SLAKER, 1/3 HP, 230V, 3PH)
UXB 27096	0.63 - 1.0 AMPS (FOR 1000 LB/HR SLAKER, 1/3 HP, 460V, 3PH)
UXD 27096	1.6 - 2.5 AMPS (FOR 2000 & 4000 LB/HR SLAKER, 1/2HP, 230V, 3PH)
UXC 27096	1.0 - 1.6 AMPS (FOR 2000 & 4000 LB/HR SLAKER, 1/2HP, 460V, 3PH)
UXH 27096	8.0 - 12.5 AMPS (FOR 8000 LB/HR SLAKER, 2-1/2HP, 230V, 3PH)
UXF 27096	4.0 - 6.3 AMPS (FOR 8000 LB/HR SLAKER, 2-1/2HP, 460V, 3PH)

FOR SLAKER PADDLE SHAFT MOTOR (M2)	
PART NO.	DESCRIPTION
UXG 27096	6.3 - 10.0 AMPS (FOR 1000 LB/HR SLAKER, 1/2 HP, 115V, 1PH)
UXF 27096	4.0 - 6.3 AMPS (FOR 1000 LB/HR SLAKER, 1/2 HP, 230V, 1PH)
UXD 27096	1.6 - 2.5 AMPS (FOR 1000 LB/HR SLAKER, 1/2 HP, 230V, 3PH)
UXC 27096	1.0 - 1.6 AMPS (FOR 1000 LB/HR SLAKER, 1/2 HP, 460V, 3PH)
UXF 27096	4.0 - 6.3 AMPS (FOR 2000 LB/HR SLAKER, 1 HP, 230V, 3PH)
UXD 27096	1.6 - 2.5 AMPS (FOR 2000 LB/HR SLAKER, 1 HP, 460V, 3PH)
UXF 27096	4.0 - 6.3 AMPS (FOR 4000 LB/HR SLAKER, 1-1/2HP, 230V, 3PH)
UXE 27096	2.5 - 4.0 AMPS (FOR 4000 LB/HR SLAKER, 1-1/2HP, 460V, 3PH)
UXG 27096	6.3 - 10.0 AMPS (FOR 8000 LB/HR SLAKER, 2HP, 230V, 3PH)
UXE 27096	2.5 - 4.0 AMPS (FOR 8000 LB/HR SLAKER, 2HP, 460V, 3PH)

FOR HIGH CONCENTRATION SLURRY - BOOSTER PUMP (M3)	
PART NO.	DESCRIPTION
UXD 27096	1.6 - 2.5 AMPS (FOR 1000 & 2000 LB/HR SLAKER., 1/2HP, 230V, 3PH)
UXC 27096	1.0 - 1.6 AMPS (FOR 1000 & 2000 LB/HR SLAKER., 1/2HP, 460V, 3PH)
UXF 27096	4.0 - 6.3 AMPS (FOR 4000 LB/HR SLAKER, 1-1/2HP, 230V, 3PH)
UXE 27096	2.5 - 4.0 AMPS (FOR 4000 LB/HR SLAKER, 1-1/2HP, 460V, 3PH)
UXG 27096	6.3 -10.0 AMPS (FOR 8000 LB/HR SLAKER, 2HP, 230V, 3PH)
UXE 27096	2.5 - 4.0 AMPS (FOR 8000 LB/HR SLAKER, 2HP, 460V, 3PH)

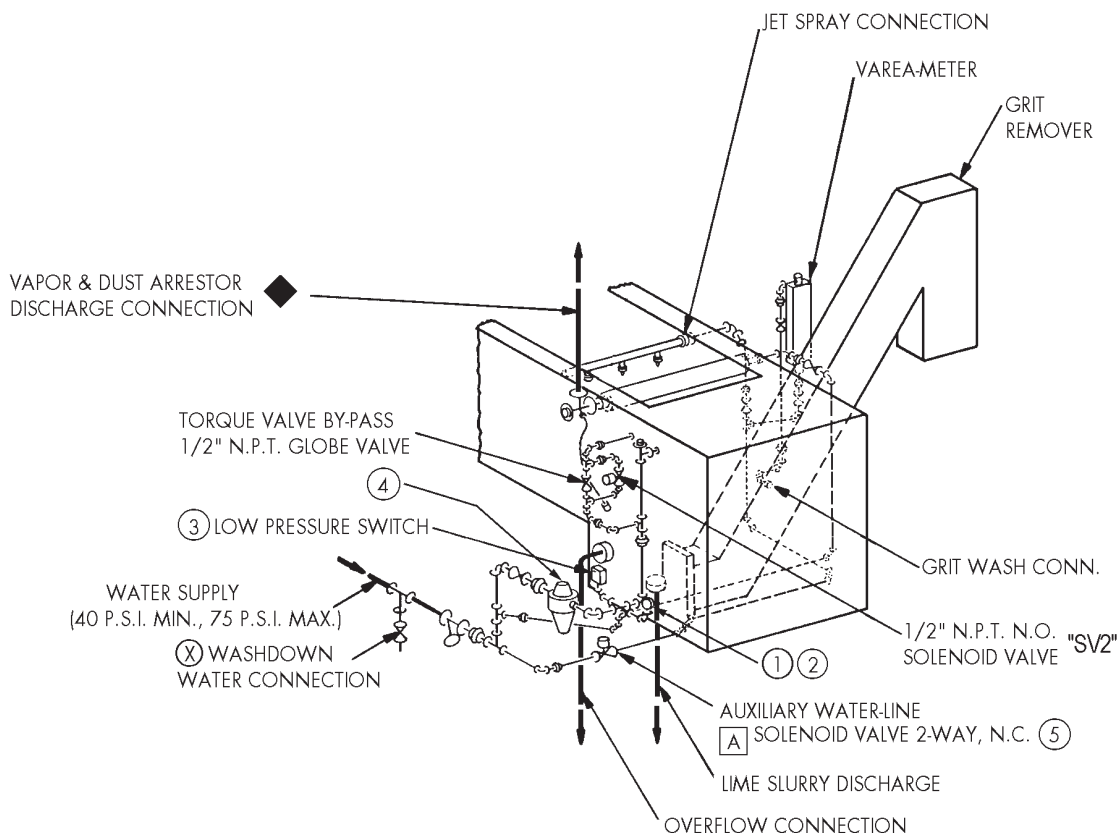
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

MOTOR STARTER OVERLOAD RELAYS - PARTS LIST

330.100.015.010

ISSUE 1 9-97

LIME SLAKING SYSTEM



1000, 2000 & 4000 LB. SLAKER
GRIT REMOVER MOUNTED ON RIGHT

NOTE:

- PIPING BY U.S. FILTER/ W&T.
- FIELD PIPING (NOT BY U.S. FILTER/ W&T).
- ⊗ NOT FURNISHED BY U.S. FILTER/ W&T.

■ FLOW RATES ARE FOR MAXIMUM SLAKER FEED RATE.

[A] ACCESSORY ITEM FURNISHED ONLY IF SPECIFICALLY LISTED IN QUOTATION AND AS CHECKED ON THIS DRAWING. (USED ONLY WITH AUTOMATIC START-STOP CONTROL).

◆ VENT INSIDE, DIRECTLY ABOVE FOR BEST PERFORMANCE (APPROX. 3 TO 6 FT.) OR VENT TO OUTSIDE, PROTECTING EXIT OF DUCT FROM DIRECT DRAFTS WHICH MAY DECREASE THE EFFICIENCY OF THE DUST AND VAPOR ARRESTOR. DUCT SHOULD BE KEPT AS SHORT AS POSSIBLE FOR BEST PERFORMANCE.

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	P686	1	BUSHING 1/8" x 1/4"
2	U1693	1	GAUGE, WATER PRESSURE 0-60 PSIG
3	U11930	1	PRESSURE SWITCH
4	U3528	1	WATER PRESSURE REDUCING VALVE
5	UXD20461	1	SOLENOID VALVE "SV1" FOR 1000 & 2000 LB SLAKER
	OR		
	U22480	1	SOLENOID VALVE "SV1" FOR 4000 LB SLAKER
	OR		
	U22495	1	SOLENOID VALVE "SV1" FOR 8000 LB SLAKER

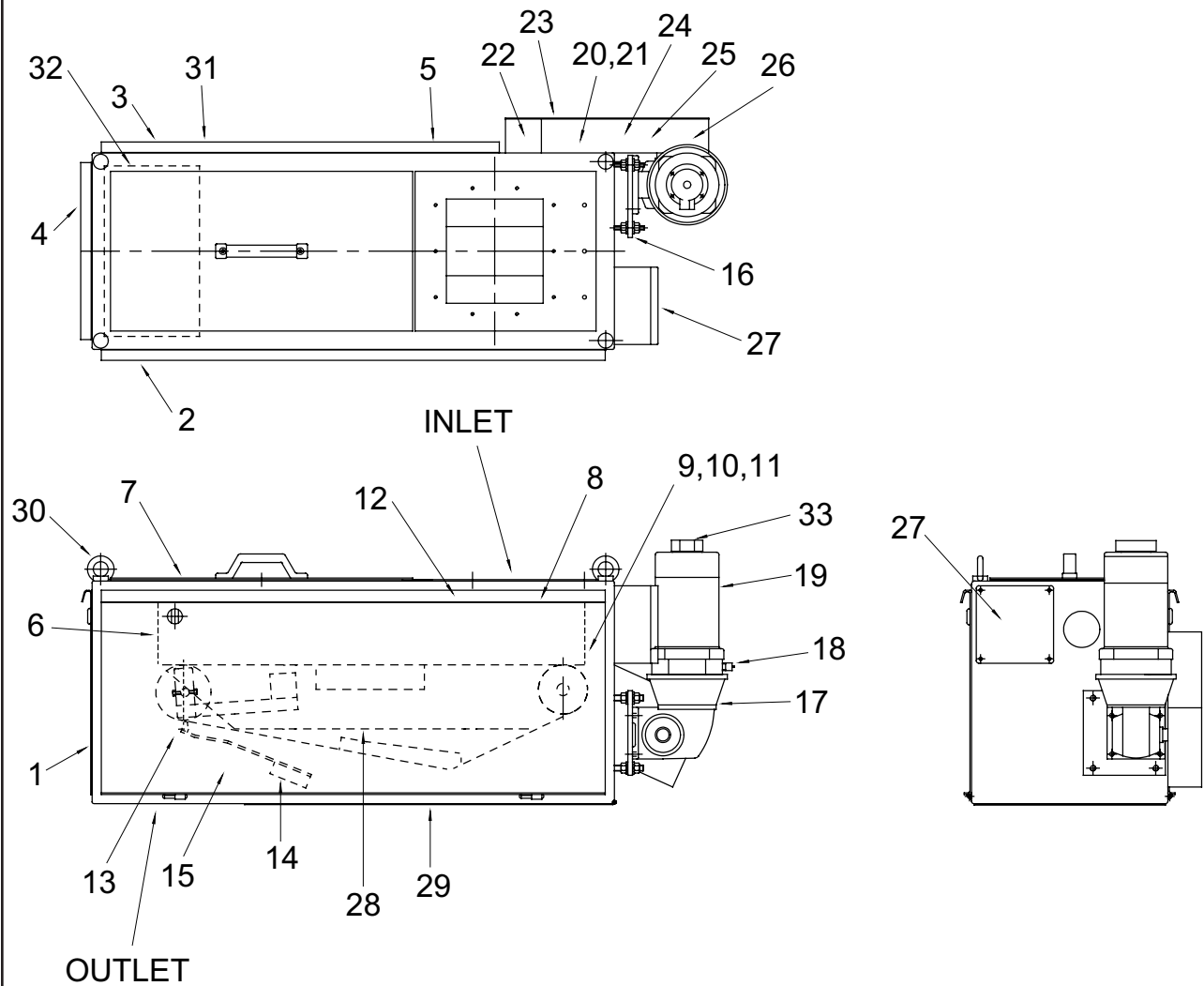
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

WATER SUPPLY CONTROL COMPONENTS - PARTS
Used With Series A-758 Slakers

330.101.013.010

ISSUE 3 9-03

LIME SLAKING SYSTEM



NOTE: FOR PARTS LIST, SEE DWGS. 310.165.000.060B&C.

SERIES 31-165 GRAVIMETRIC BELT FEEDER
FEEDER HOUSING - PARTS

310.165.000.060A

ISSUE 2 9-03

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	AAB6671	1	HOUSING
2	AAB5342	1	LONG SIDE COVER
3	AAB5345	1	SHORT SIDE COVER
4	AAB5348	1	FRONT SIDE COVER
5	AAB5357	5	QUAD LATCH, #E5-1-111-04D
6	AAB5351	2	MATERIAL GUIDE PLATE
7	AAB5354	1	TOP COVER
8	UXA29546	1	INLET CHUTE 2"
	OR		
	UXB29546	1	INLET CHUTE 4"
	OR		
	UXC29546	1	INLET CHUTE 6"
9	AAC5873	1	INLET SEAL 2"
	OR		
	P60807	1	INLET SEAL 4"
	OR		
	AAC5876	1	INLET SEAL 6"
10	AAB5360	2	INLET SIDE BACKING STRIP
11	AAB5363	1	INLET REAR BACKING STRIP
12	AAB5366	1	INLET GATE 2", 4"
	OR		
	AAC5879	1	INLET GATE 6"
13	P60813	1	EXTERNAL BELT SCRAPER
14	AAB5369	1	EXTERNAL SCRAPER ARM
15	AAB5372	1	EXTERNAL SCRAPER SUPPORT
16	AAB6662	1	REDUCER MOUNTING PLATE
17	UXA29544	1	REDUCER, SK1S540-C56, 9:1
	OR		
	UXB29544		REDUCER, SK1S540-C56, 12:1
	OR		
	UXC29544		REDUCER, SK1S540-C56, 18:1
	OR		
	UXD29544		REDUCER, SK1S540-C56, 26:1
	OR		
	UXE29544		REDUCER, SK1S540-C56, 35:1
	OR		
	UXF29544		REDUCER, SK1S540-C56, 49:1
	OR		
	UXG29544		REDUCER, SK1S540-C56, 66:1
	OR		
	UXH29544		REDUCER, SK1S540-C56, 100:1
18	U29558	1	PICK-UP SENSOR
19	AAB7346	1	MOTOR, 230/460 VAC 1/2 HP
20	P60806	1	SHAFT SEAL

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

SERIES 31-165 GRAVIMETRIC BELT FEEDER
FEEDER HOUSING - PARTS

310.165.000.060B

ISSUE 1 9-03

LIME SLAKING SYSTEM

KEY NO.	PART NO.	QTY.	DESCRIPTION
21	AAB5375	1	SHAFT SEAL PLATE
22	AAB6671	1	CHAIN GUARD
23	AAB5378	1	CHAIN GUARD COVER
24	PXA60812	1	CHAIN SPROCKET 35B48 OR 35B28, 1:1
	OR		
	PXB60812		CHAIN SPROCKET 35B48 OR 35B28, 2:1
	OR		
	PXC60812		CHAIN SPROCKET 35B48 OR 35B28, 3:1
	OR		
	PXD60812		CHAIN SPROCKET 35B48 OR 35B28, 4:1
25	P60811	1	CHAIN SPROCKET 35B13
26	P60809	1	CHAIN #35
27	AAB5384	1	JUNCTION BOX
28	AAB6665	1	WEIGH FRAME SUB-ASSEMBLY
29	AAB5381	1	BOTTOM COVER
30	AAB5387	4	EYEBOLT
31	AAB5390	1	SANITARY ROLLER TARGET
32	AAA4721	1	24 VDC BELT PROXIMITY/BREAKAGE SENSOR
33	AAA3862	1	TD-3 TACH

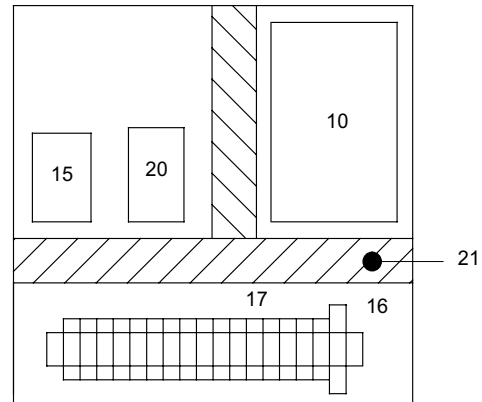
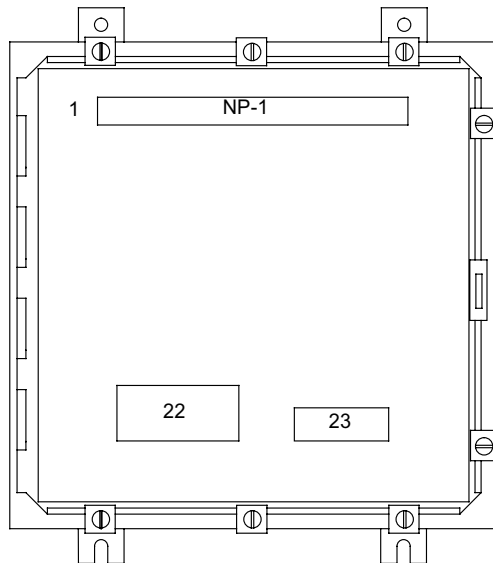
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

SERIES 31-165 GRAVIMETRIC BELT FEEDER
FEEDER HOUSING - PARTS

310.165.000.060C

ISSUE 0 9-03

LIME SLAKING SYSTEM



ITEM NO.	DESCRIPTION	TAG NO.	MANUFACTURER	MODEL NO.	USF/W&T PART NO.
1	NEMA 4X ENCLOSURE		RALSTON	N4X-166166	AAB6680
10	SCR	SCR-1	BRABENDER	806275E	
15	24V DC, 2A POWER SUPPLY	PS-1	HAMMOND	GFOF M16-24	
16	15A BREAKER	BKR	WEIDMULLER	ETA-15	
17	TERMINALS (APPROX. 30)	TB-1	ELECTROVERT	WK4/32	
20	24V DC CONTROL RELAY	CR1	ALLEN-BRADLEY	700-HB33Z24	
21	WIRE DUCT		PANDUIT		
22	WARNING LABEL	L2022	USF/W&T	L2022	
23	WARNING LABEL	L2023	USF/W&T	L2023	

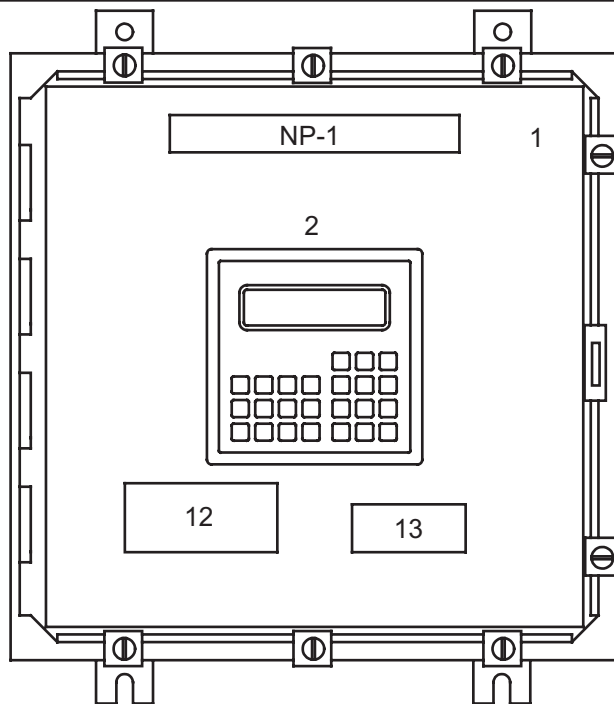
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

SCR SPEED CONTROLLER ENCLOSURE - PARTS

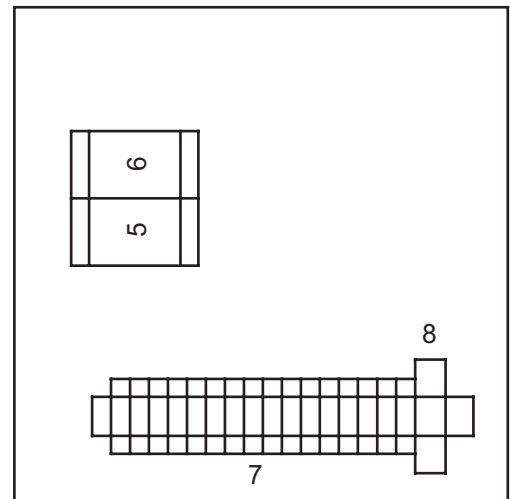
330.100.000.020

ISSUE 2 6-04

LIME SLAKING SYSTEM



FRONT VIEW



MOUNTING PLATE

ITEM	DESCRIPTION	TAG NO.	MANUFACTURER	MODEL NO.
1	NEMA 4X ENCLOSURE		CUSTOM RALSTON	N4X-161612
2	CONTROLLER	WIC-1	BRABENDER	CONGRAV S
3				
4				
5	24 VDC CONTROL RELAY	CR3	P & B	KUP14D15-24
6	24 VDC CONTROL RELAY	CR4	P & B	KUP14DA5-24
7	TERMINALS (APPROX. 30)	TB-1	ELECTROVERT	WK4/32
8	5A BREAKER	BKR	WEIDMULLER	ETA-5
9				
10				
11				
12	WARNING LABEL	L2022	U.S. FILTER/W&T	L2022
13	WARNING LABEL	L2023	U.S. FILTER/W&T	L2023
14				
15				
16				
17				
18				
19				
20				

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

SETPOINT CONTROLLER ENCLOSURE - PARTS

310.165.000.030

ISSUE 0 9-96

LIME SLAKING SYSTEM

SECTION 6 - SPARE PARTS LIST

1000 Lb/Hr Slaker

<u>QTY.</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>
1	V-Belt	P42210
2	Gasket	P39366
2	O-Ring	P41154
2	O-Ring	P37190
2	Boot	P38408
2	Seal	U18080
1	Gasket	U18548
1	O-Ring	P40374
2	O-Ring	P39330
1	Gasket	U20036
2	Diaphragm	P43099
1	Diaphragm	P39321
1	Valve Disc	P39323
1	Gasket	P39325
1	O-Ring	P27083
1	O-Ring	P39296
1	Gasket	P39375
5	O-Ring	P34384
1	Fuse	U18693
1 Gal.	Gear Box Oil	U18805*
3	Flight Scraper	P53392

*Commercially available as Gulf E.P. Lubricant HD680.

LIME SLAKING SYSTEM

SECTION 6 - SPARE PARTS LIST (CONT'D)

2000 Lb/Hr Slaker

<u>QTY.</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>
2	O-Ring	P37190
3	O-Ring	P41154
1	Boot	P38408
1 Pair	V-Belt	U19776
4	O-Ring	P15293
2	O-Ring	P39330
1	Gasket	U19517
1	Diaphragm	P43099
1	Diaphragm	P39321
1	Valve Disc	P39323
1	Gasket	P39325
1	Fuse	U18693
1	O-Ring	P27083
1	O-Ring	P39296
1	Gasket	P39375
3	O-Ring (UXA29224 & UXB29224)	P34384
3	O-Ring (UXA29224 only)	P48080
1 Gal.	Gear Box Oil	U18805*
3	Flight Scraper	P53392

*Commercially available as Gulf E.P. Lubricant HD680.

LIME SLAKING SYSTEM

SECTION 6 - SPARE PARTS LIST (CONT'D)

4000 Lb/Hr Slaker

<u>QTY.</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>
1	V-Belt Pair	U19777
2	O-Ring	P39330
1	Gasket	U18542
4	O-Ring	P15293
1	O-Ring	P40375
1	Gasket	P39366
2	O-Ring	P41154
2	O-Ring	P37190
2	Boot	P38408
2	Diaphragm	P43099
1	Diaphragm	P39321
1	Valve Disc	P39323
1	Gasket	P39325
1	Fuse	U18693
1	O-Ring	P27083
1	O-Ring	P39296
1	Gasket	P39375
6	O-Ring (UXA29225)	P48080
	-or-	
3	O-Ring (UXB29225)	P48080
1 Gal.	Gear Box Oil	U18805*
3	Flight Scraper	P53392

*Commercially available as Gulf E.P. Lubricant HD680.

LIME SLAKING SYSTEM

SECTION 6 - SPARE PARTS LIST (CONT'D)

Model 31-165 Gravimetric and Model 32-215 Volumetric Belt Feeders

<u>QTY.</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>
1	Belt, thin white	PXA60797
1	Belt, high temperature white	PXB60797
1	Belt, heavy duty white (standard)	PXC60797
1	Belt, static conductive black	PXD60797
1	Gasket, side cover, 20 feet	P60802
1	Gasket, top cover, 6 feet	P60803
1	Gasket, bottom cover, 10 feet	P60804
1	Gasket, end cover, 6 feet	P60819
1	Gasket, inlet chute, 5 feet	P60805
1	Seal, inlet-to-belt, skirt	P60807
1	Seal, drive shaft-to-housing	P60806
1	Seal, TFE, reducer-to-chain guard	AAA4247
1	Washer, sliding, driven roller pivot	P60808
1	Bearings, drive roller	U29561
1	Chain, 2.5 feet	P60809
1	Link, master chain	P60810
1	Sprocket, drive	P60811
1	Sprocket, driven, 1:1 reduction ratio	PXA60812
1	Sprocket, driven, 2:1 reduction ratio	PXB60812
1	Sprocket, driven, 3:1 reduction ratio	PXC60812
1	Sprocket, driven, 4:1 reduction ratio	PXD60812
1	Scraper, external belt, plastic	P60813
1	Congrav Setpoint Controller	U29564
1	24-Volt Power Supply	AAA4736
1	SCR Drive (Model 806275E)	AAB6680

LIME SLAKING SYSTEM

SECTION 6 - SPARE PARTS LIST (CONT'D)

Model 31-165 Gravimetric and Model 32-215 Volumetric Belt Feeders

<u>QTY.</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>
1	Counterweight	AAB5288
1	Arm, Counterweight, Right-Hand	AAB5300
1	Arm, Counterweight, Left-Hand	AAB5303
1	Adjustable Thread Rod - Driven Roller	AAB5306
1	Driven Roller Scraper	AAB5309
1	Short Side Cover	AAB5345
1	3-Point Target, Roller	AAC5912
1	8-Point Target, Roller	AAC5915

LIME SLAKING SYSTEM

SECTION 7 - ADDITIONAL LITERATURE

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	LIT. NO.
Speed Controller	806275E
Square D	
Machine Tool Pressure Switches	65013-008-90J
Industrial Pressure Switches (abbr.).....	9012CT9701
Maintenance and Troubleshooting Tips	881 AS

LIME SLAKING SYSTEM

SPEED CONTROLLER

806275E

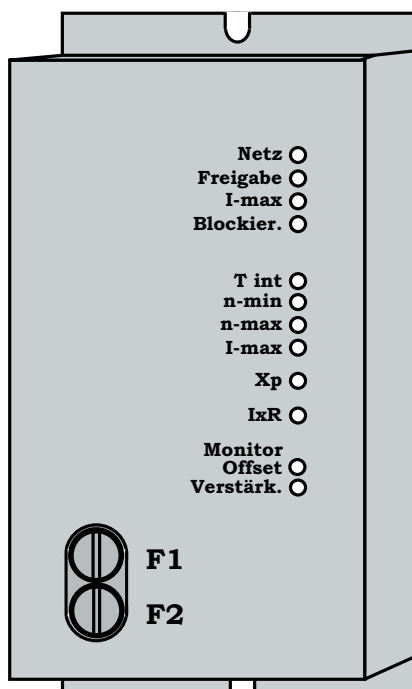


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1 SAFETY INSTRUCTIONS

- The mounting, manipulation, maintenance, and/or repair of this device should be performed by qualified staff only.
- Qualified staff are persons that have the training, experience, instructions, and knowledge concerning standards, regulations, rules for the prevention of accidents, and rules of the plant, and that have been authorized by the persons that are responsible for the safety of the installation to carry through the necessary operations and manipulations and to realize and avoid possible dangers.
- When handling products that are in contact with electrical voltage, the valid regulations of VDE have to be observed, especially VDE 0100, VDE 105, VDE 550/551, VDE 0700, VDE 0711, and VDE 0860, as well as the rules for the prevention of fire and accidents VBG4.
- Before opening a device, always disconnect the mains plug or check whether the device has been disconnected from the power source.
- Construction elements, groups, or devices must only be commissioned if they have been mounted in a housing that is contact-voltage proof. During mounting they must be disconnected from the power source.
- Tools must only be used with construction elements, groups, or devices if they have been disconnected from the supply voltage and the electrical charges in the devices have been previously discharged.
- Live cables or lines that are connected to the construction elements, groups, or devices must always be checked on isolation errors or ruptures. If you find a fault in the line, the device must be placed out of service immediately, until the defective line has been replaced.
- Electronic devices are not necessarily fail-safe. The operator is responsible for putting the drives in a safe state.
- Motors that are powered by a power converter can be operated with a speed that is higher than the nominal speed. Observe the allowed speed range of the motors and the device.

These safety instructions do not claim to be complete; nor do the wiring examples and technical instructions contained in this manual. It is the user's responsibility to ensure their suitability and whether they apply for each application. The Company does not assume any liability.

NOTE: The speed controllers that are subject of these instructions are designated as devices; however, they are not devices or machines ready to use or to connect in the sense of the “safety law for devices,” the “law for electromagnetic compatibility,” or the “machine guideline of the European Union.” They are simply components. Only the integration of these components into the assembly of the user determines its final function.

The user is responsible for making his assembly comply with existing legal regulations.

All indications contained in this operating manual are meant to specify the corresponding product qualities, they are not a warranty of characteristics. Despite the utmost care, the Company cannot guarantee the faultlessness of this manual.

1.1 Regulations for Assembly



WARNING: BEFORE EACH MANIPULATION, ENSURE THAT DEVICE HAS BEEN DISCONNECTED FROM THE POWER SOURCE. THE CONNECTION OF THE POWER CONVERTER HAS TO BE MADE ACCORDING TO THE PRESCRIPTIONS OF VDE, SO THAT THE VOLTAGE CAN BE DISCONNECTED WITH PROPER MEANS (E.G., MAIN SWITCH).

The motor can be disconnected by means of contactors or protective motor switches.

For the electrical connection the following general regulations have to be observed:

- VDE 0100: Regulation for power installations with nominal voltages up to 1000V.
- VDE 0113: Regulations for the electrical equipment of processing machines.
- VDE 0160: For power installations with electronic electrical equipment.

In case of special applications, you may have to observe further regulations.

1.2 Operating Instructions for External Components

- The device is not protected against short circuits and shorts to earth.

- Connecting the motor line is only allowed if the release (pin 15,16) is open or if the device stands still.
- When the drive is being controlled, do not switch between the mains line and the motor line. Start-Stop operation must be made by connecting the setpoint or by means of the release.

Do not connect the running motors or invert the sense of rotation of the motor during its operation by means of contactors.

The contacts of the switching devices for the control signals must be gold-plated and a high contact pressure must be employed. As a preventive measure, all switching devices must be provided with measures for interference suppression, such as RC modules or protective diodes.

- If you wish to switch between two speeds, this can be accomplished with two potentiometers and a switching relay.
- Control contacts have to be dimensioned for small currents.
- Connect ohmic inductive loads only. Capacitive consumers lead to a destruction of the device.
- Do not connect motors that are bigger than specified.
- If you run other electric devices, such as contactors, etc., in proximity to this device, they must be shielded by a suitable interference suppression.
- As motor protection, a thermistor protection is recommend.
- The mains protection is a function of the line section and has to be carried through as per DIN 57100 part 430 / VDE 0100 part 430. Further regulations may have to be observed depending on the application, the place of the installation, and the implantation. The devices are additionally protected by internal protective measures.

1.3 Designation of the Types

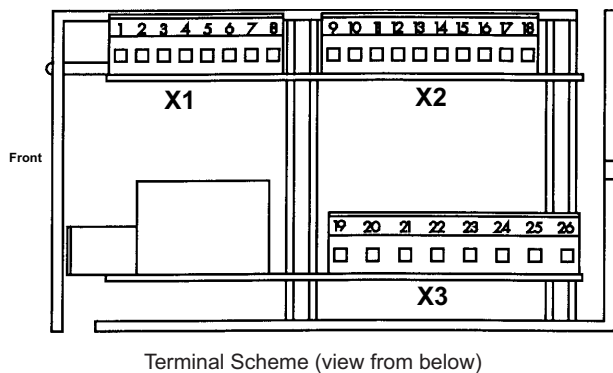
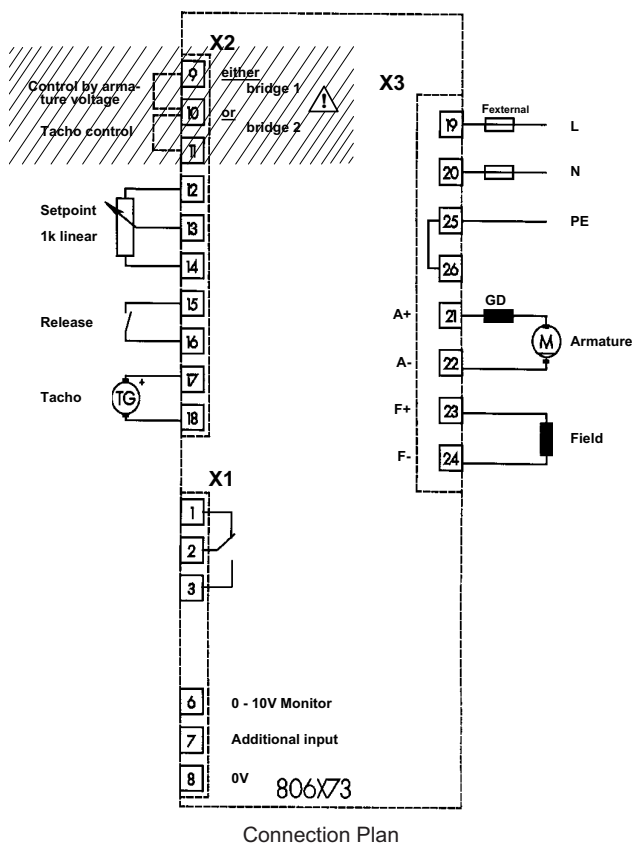
<i>806273E</i>	Standard design - Mains supply 230V 50/60Hz, setpoint input and monitor output 0 -10V.
<i>806275E</i>	Mains supply 110V 50/60Hz.
<i>N/A</i>	Setpoint input and monitor output as current loop 0/4 -20mA.

2 POWER AND CONTROL CONNECTIONS

2.1 Connection Plan and Terminal Scheme (Standard Design)



WARNING: A FALSE CONNECTION MAY LEAD TO FAILURE OR COMPLETE DESTRUCTION OF THE POWER INVERTER (AND THE MOTOR).



Terminal	Function
X2 / 9	either
X2 / 10	bridge 1 (control by armature voltage)
X2 / 10	or
X2 / 11	bridge 2 (tachometer control)
X2 / 12	GND
X2 / 13	Setpoint input 0...10V Ri = 20 kΩ
X2 / 14	Auxiliary voltage +10V max. 10 mA
X2 / 15	Auxiliary voltage +24V max. 10 mA
X2 / 16	Controller release Ri = 2 kΩ
X2 / 17	Tachometer +
X2 / 18	Tachometer -

Terminal	Function
X1 / 1-3	Relay output 24V max. 1 mA
X1 / 6	Monitor output 0...10V max. 2 mA
X1 / 7	Add. input for setpoint Ri = 20 kΩ
X1 / 8	GND

Terminal	Function
X3 / 19	L 230V 50/60Hz Ø 1,5 mm ²
X3 / 20	N
X3 / 25	PE

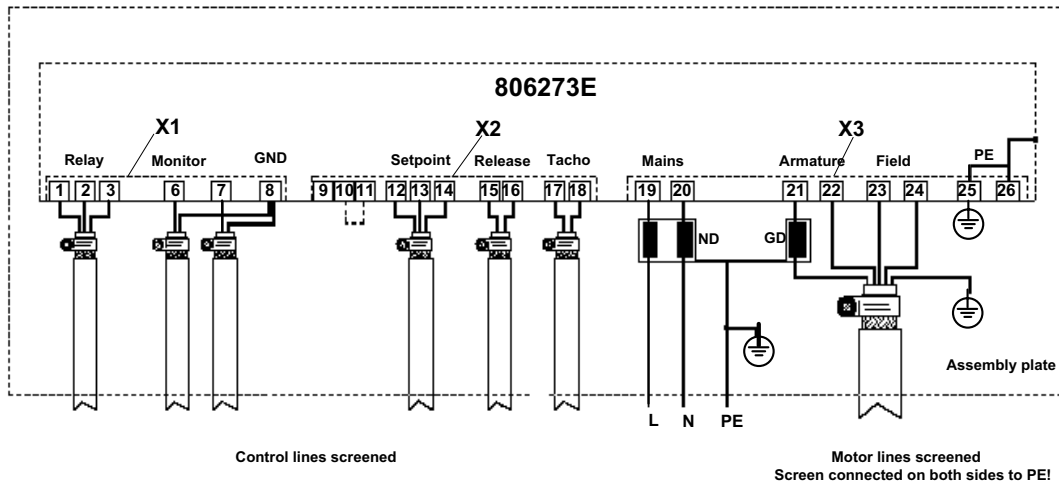
NOTE: The potential of all control terminals is isolated from the mains voltage.

The power inverter is protected internally via L and N with one main protection each (10 AF).

Terminal	Function
X3 / 21	Motor armature + Ø 1,5 mm ²
X3 / 22	Motor armature -
X3 / 23	Motor field +
X3 / 24	Motor field -
X3 / 26	PE

NOTE: If the release is open or the release signal is switched off, the motor is not galvanically isolated from the mains. Motor terminals are still live!

2.2 Connection Plan - Electromagnetic Compatibility



In order to comply with the limit values (EN55011 class A), observe the following instructions and recommendations:

- The device and the screened lines have to be assembled or fixed together on a metal surface that is connected to earth (assembly plate). Grounding of the screen braiding must be made on a large surface (e.g., with corresponding cable clips).
- The screen of the motor line must be laid on a large surface.
- Motor line, control lines, and the mains line must be laid in separate ducts.
- All unscreened connections, power choke (ND), and smoothing choke (GD), must be kept as short as possible (it is recommended that they be twisted). For the length of the screened motor cable, the following wirings are valid:

Motor Line	Power Choke	Smoothing Choke*
screened, length < 10m	not necessary	GD8 / 55
screened, length < 25m	ND8 / 1D with wiring	GD8 / 55
screened, length < 130m	ND8 / 3.5D with wiring	GD8 / 55

* A function of motor and motor current.

Typical values: motor current < 4.5A GD8/55 small type
motor current > 4.5A GD8/55 large type

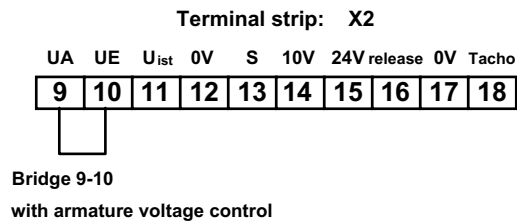
- In case of special requirements (motor/application), an additional filter for the mains and/or corresponding modified chokes may be required.

2.3 Actual Value Feedback



WARNING: OPERATION WITHOUT ACTUAL VALUE FEEDBACK IS NOT POSSIBLE. IN CASE OF FAULTY OR MISSING ACTUAL VALUE FEEDBACK, THE DRIVE ACCELERATES IN AN UNCONTROLLED MANNER UNTIL REACHING THE MAXIMUM SPEED AFTER THE RELEASE HAS BEEN CLOSED.

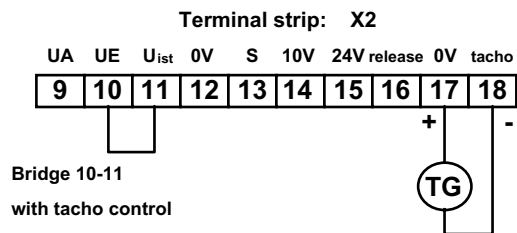
2.3.1 Armature Voltage Feedback



For operation with armature voltage control, terminal 9 must be connected to terminal 10 (bridge).

With this mode, the speed drop caused if the motor is loaded is compensated with the IxR-compensation.

2.3.2 Tacho Reading In



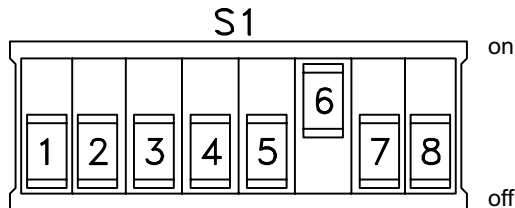
In case of operation with feedback of a tacho signal, terminal 10 must be bridged with terminal 11 and the tacho must be connected to terminals 17 and 18.

WARNING: IF THE POLARITY OF THE TACHO SIGNAL IS WRONG, THE DRIVE ACCELERATES UNTIL REACHING THE MAXIMUM SPEED AFTER CLOSING OF THE RELEASE.

TERM. 17: TACHO + TERM. 18: TACHO -

Adaptation of the tachometer voltage to the motor speed is made by means of the 8 pole switch (S1) located on the right-hand side of the housing (front view).

Switch setting is made according to the following table:

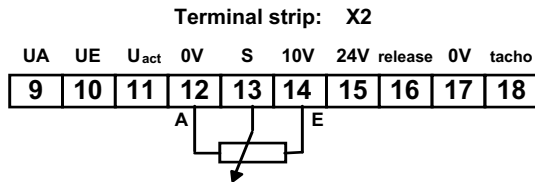


Tacho voltage V / (1000/min)	maximum motor speed		
	1500 / min	2000 / min	3000 / min
60	6	7	8
40	5	6	7
30	4	5	6
20	3	4	5
10	1	2	3

A connected tachometer is not taken into consideration if armature voltage feedback (bridge) has been selected and it will not be damaged due to the galvanic separation.

2.4 Setpoint setting

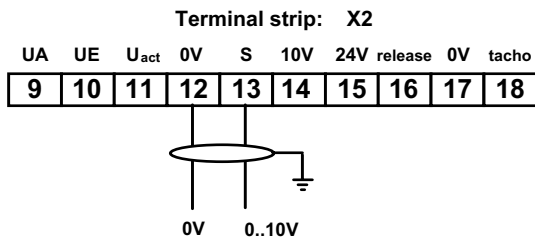
2.4.1 1k Ω Potentiometer



Input resistance $R_i = 20\text{ k}\Omega$

Max. resistance value of the potentiometer = 10 k Ω

2.4.2 External 0 - 10V (Operation With Guiding Voltage)

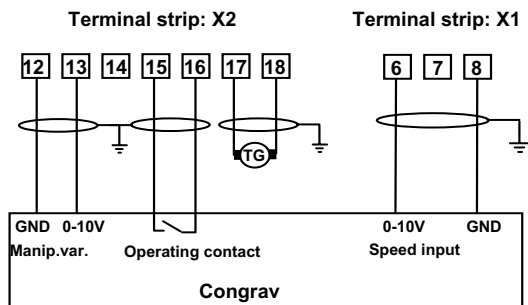


Input resistance $R_i = 20\text{ k}\Omega$

Setpoint voltage 0V = n-min-setting

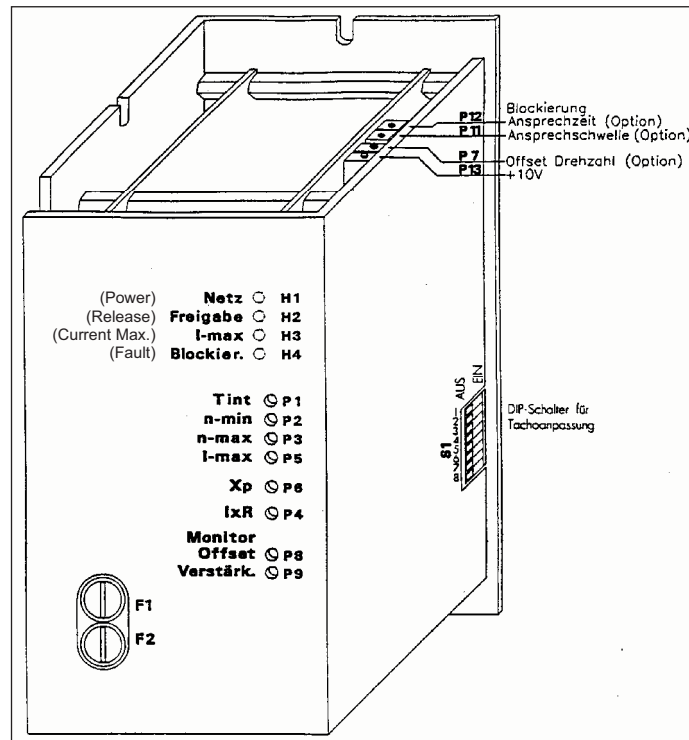
Setpoint voltage 10V = n-max-setting

2.5 Connection to a Controller Type Congrav



In order to connect the speed controller 806273E to a Brabender Congrav-controller, proceed according to the wiring plan. The manipulated variable output of the Congrav determines the setpoint. The monitor output of the 806273E is read in to the Congrav for the speed monitoring. The release for the 806273 is made by means of the operating contact, which will be set if the Congrav is started. With Congrav types (24V signal operating contact), an external relay must be employed.

3 ADJUSTMENT OF THE DRIVER PARAMETERS



3.1 I x R – Compensation

P4: I x R In case of armature voltage feedback, the setting of the IxR-compensation compensates for the speed drop that appears if the motor is charged.

Adjustment: The adjustment is made slowly. By a revolution to the right of the potentiometers (P4), increase the compensation until only a small speed modification remains between idling and nominal load of the drive. Check the setting for average speed values and final speed; correct if necessary.

NOTE: In case of an extreme increase, the drive may vibrate or to run out of true.

3.2 Run-Up Period

P1: tint = 0,5..10s P1 permits setting of the run-up period
works setting = 2s

3.3 Minimum Speed

P2: n-min P2 sets the minimum speed.

Adjustment:

- a. Turn setpoint potentiometer until the left limit stop (start value) is reached, or set guiding voltage to 0V.
- b. Close release contact.
- c. Set the desired minimum speed by means of potentiometer (P2). If it is not possible to set the setpoint to zero, use P2 to reset the speed to zero. (P2 and P3 influence one another.)

3.4 Maximum Speed

P3: n-max P3 sets the maximum speed.

Adjustment:

- a. Turn setpoint potentiometer until the right limit stop (final value) or the preset guiding voltage is reached.
- b. Close release contact.
- c. Set the maximum speed by means of potentiometer P3. (P2 and P3 influence one another.)

3.5 Control Amplification

P6: Xp P6 sets the control amplification.

Adjusts the controller dynamic to the operational requirements.

3.6 Current Limitation

NOTE: Factory set; do not adjust.

P5: I-max P5 sets the maximum output current between 0 and the nominal current of the device.

This reduces the maximum output current and adjusts it accordingly to the motor data.

Adjustment:

- a. Separate device from mains.
- b. Connect current meter (moving coil instrument) into armature circuit and set meter to register maximum current reading.
- c. Turn P5 until the left limit stop ($I_{\max} = 0$) is reached.
- d. Disconnect field (if available) or, if motor is permanent magnet, disconnect one of the tachometer leads (TG+ or TG-).
- e. Preset setpoint.
- f. Open release contact (switch off release signal).
- g. Connect mains.
- h. Close release contact (switch on release signal).
- i. Observe maximum current. Feeder will stop and Blockier (fault) LED will turn red. Set the maximum output current to $1,35 * \text{nom. motor current}$ (identification plate) by means of potentiometer P5.*

$$I_{\max} = 1.35 * \text{nom. motor current}$$

- j. Undo modifications in steps b and d with disconnected mains.
- k. Reconnect feeder to mains.

* Due to antilock monitoring, the speed controller will be switched off after approximately 2.10 seconds.

3.7 Current Limitation

NOTE: Factory set; do not adjust.

P13: 9,5 .. 10,5V

P13 sets the internal auxiliary voltage for the external setpoint potentiometer.

In standard execution, the auxiliary voltage is adjusted to 10V.

3.8 Monitor

The monitor output (terminal X1/6) emits a voltage 0...+10V/2mA that is proportional to the speed.

P8: Offset P8 permits zero setting with minimum speed or stand-still.

P9: amplif. P9 permits setting of the final value with nominal speed.

An adjustment of P8 and P9 should be made only if the minimum and the maximum speed have been adjusted by means of P2 and P3.

3.9 Antilock Monitoring

NOTE: Factory set; do not adjust.

P12: 2 ... 10s P12 permits setting of the antilock period. Works setting = 3s.

The antilock monitoring consists of a time ramp that starts if the motor is operated near the current limit. After rundown of the period is adjusted by means of P12, the output valve is switched off. The DEL “I-max” indicates the maximum current has been reached. The DEL “antilock” lights up after switching off the device. Switching off of the release or the mains voltage resets the antilock switch-off.



CAUTION: During the antilock switch-off, the motor is not galvanically isolated from the mains. The motor terminals are still alive.

3.10 LED Functions

Mains (green) Mains is live.

Release (green) Release is active.

I-max (red) Maximum current has been reached.

Antilock (red) Antilock switching off.

4 COMMISSIONING

Please observe the following notes. Depending on the application and the requirements, additional measures may be necessary. Apart from these instructions, the corresponding regulations for the mounting or the electric installation and for the prevention of accidents must be observed.

4.1 Installation

- a. Only work if the device has been disconnected from the power source.
- b. Check whether the installation area, the device, and/or machine have been disconnected from the power source.
- c. Determine whether the system operates with armature voltage control or tachometer control.

Armature voltage: Set bridge between terminals X2/9 and X2/10.

Tacho voltage: Set bridge between terminals X2/10 and X2/11.

- d. On switch S1, ensure that #3 is on.
- e. Connect device as per wiring plan. Observe the corresponding instructions.

4.2 Controller Setting

- The installation area, the device, or machine are still disconnected from the power source (the main switch is not yet on).
- Visual check of current inverter, motor, and cabling for any mechanical damage.
- Check the mains connection. The protective conductor must be connected.
- Connection voltage is 115 VAC.
- All terminal screws must be well tightened.
- Set the switch or the control signal for the controller release to “OFF”.
- Set the setpoint to zero.

- Turn potentiometer P3 (n-max) until the left limit stop is reached.
- Switch on main switch; the LED “mains” lights up.
- Switch on release; the LED “release” lights up.



WARNING: IF THE MOTOR RUNS UP IN A NON-CONTROLLED MANNER (IF THE RELEASE IS SWITCHED ON OR IF THE SETPOINT IS INCREASED) IMMEDIATELY SWITCH OFF THE RELEASE OR THE MAINS AND CHECK THE FOLLOWING POINTS:

- Check the actual value feedback (bridge: X2/9 - X2/10 or X2/10 - X2/11).
- With tacho control, check the setting of the switch S1. Check the polarity of the tacho lead.
- Slowly increase the setpoint potentiometer from 0 to 100% or raise the setpoint voltage slowly from 0 to 100%. Measure the motor speed. Adjust the maximum speed by means of P3, if necessary.
- If the speed range has to be limited as far as the lower values are concerned, set the setpoint potentiometer to its minimum and adjust the minimum speed using P2.
- P2 and P3 influence one another; therefore, the setting of the maximum speed and the minimum speed must be checked once again.
- Test the time required for running up. Change the setpoint in a discontinuous manner from 0 to 100%.

The adjustment of the drive by setting of I-max and I x R is a function of application and utilization.

5 TECHNICAL DATA

5.1 Output

Recommended motor output	550 W
Output of the device	960 W
Armature current	6 A
Armature voltage	0..160 V
Form factor (a function of motor, armature current, and armature voltage)	1.4
Field voltage	210 V
Field current	1 A

5.2 Input

Voltage	1 x 230V +/-10% L, N, PE (806273E)
Mains frequency	50/60Hz
Power consumption	980 W
Internal fuse protection	10 A F

5.3 General

Mode	1 Q
Adjustment range with IxR	app. 1:25
Adjustment range with tacho	app. 1:50 (depending on motor, tacho, and final speed)
Control accuracy with IxR	app. 5%
Control accuracy with tacho	app. 2% (depending on final value)

5.4 Controller at Zero Potential

Setpoint setting	0..10V or 1k Ω (max. 10k Ω) potentiometer (806273E)
Current limitation	adjustable
IxR compensation	adjustable
Run-up braking ramp	app. 0.5 ... 10 sec.
Maximum speed	adjustable
Minimum speed	adjustable
Controller release	Make contact / 24VDC

5.5 Environment

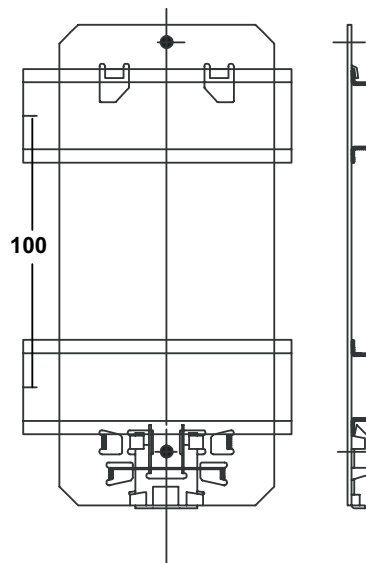
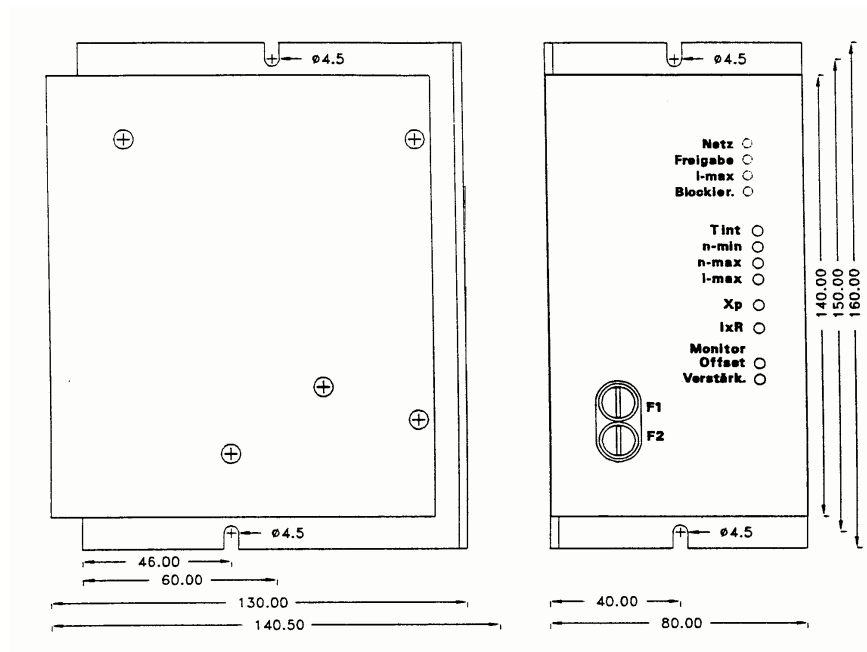
Ambient temperature	0 ... 40°C
Type of ventilation	Convection
max. dissipator temp.	70°C
Output reduction	3%/°C >40°C
Rel. humidity of the air	0..80% not dewing

5.6 Mechanics

Dimensions	see dimensional drawings
Protection	IP 00
Weight	ca. 1.20 kg
Type of assembly	vertical

6 MECHANICAL INSTALLATION

6.1 Dimensional Drawings



Fixing device for rail mounting

6.2 Instructions for Mounting the Device

The speed controller 806273E is designed for mounting with screws or on rails. For mounting on rails, the fixing device that is also part of the supply must be employed. By means of this fixing device, the speed controller is fixed to two rails. Both rails must have a distance of 100 mm from center to center.

- Mounting must be made on a vertical surface and the inscription must be horizontal. In case of screw mounting, screw size M4 must be employed.
- The place of implantation must be free from aggressive gases, dust, and humidity.
- If the speed controllers are to be installed in a control cabinet, the dissipation heat must be led out by the corresponding ventilation.
- The technical data are valid for a temperature range from 0 to 40°C. This range must not be exceeded, even if the controller is mounted in a control cabinet.

In order to avoid a heat accumulation in the current inverters, the following mounting instructions must be observed:

- Mount in vertical position.
- If several current inverters are mounted one above the other, a minimum distance of approximately 120 mm is required.
- If several current inverters are mounted next to one another, a minimum distance of approximately 50 mm is required.
- Cable ducts must not cover the openings of the housing or the dissipator. Keep a minimum distance of at least 100 mm or the depth of cable duct.
- In case of unfavorable conditions of the implantation, the power output must be reduced in order to avoid overheating of the current inverter.



Replaces / Reemplaza / Remplace 65013-008-90H 4/98

Machine Tool Pressure Switches

Interruptores de presión para máquinas-herramienta

Manostats de machines-outils

Class Clase Classe	Type / Tipo / Type		Series Serie Série
	Adjustable Differential Diferencial ajustable Différentiel réglable	Non-adjustable Differential Diferencial no ajustable Différentiel fixe	
9012	GAW, GBW, GCW, GAWM, GBWM, GCWM	GDW, GEW, GFW, GDWM, GEWM, GFWM	C

⚠ CAUTION / PRECAUCION / ATTENTION

EXCESSIVE PRESSURE HAZARD Maximum pressure on this switch must not exceed the nameplate rating. Excessive pressure can cause seal leakage, resulting in injury or equipment damage.	PELIGRO DE PRESION EXCESIVA La presión máxima en éste interruptor no debe exceder el valor nominal contenido en la placa de datos. La presión excesiva puede producir fugas por el sello, lo cual puede causar lesiones o daño al equipo.	RISQUE DE PRESSION EXCESSIVE La pression maximale de ce manostat ne doit pas excéder la valeur nominale indiquée sur la plaque signalétique. Une pression trop forte peut entraîner des fuites par le joint, ce qui peut entraîner des blessures ou des dommages matériels.
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RATINGS

Do not use the switch directly on steam that exceeds 15 psig (1 bar). For indirect use, attach a minimum of 10 ft (3.05 m) of capillary tubing between the steam source and the actuator. Use Class 9049 A7A for G•W switches or Class 9049 EA7 for G•WM switches. The tubing is rated for use on steam up to 250 psig (17 bars). Do not exceed the maximum pressure and temperature ratings of the switch.

VALORES NOMINALES

No utilice el interruptor directamente en vapor que exceda 1 bar (15 lb manométrica por pulg²). Si desea utilizar el interruptor indirectamente, conecte un tubo capilar de por lo menos 3,05 m (10 pies) de longitud entre la fuente de vapor y el actuador. Utilice tubos clase 9049 A7A para interruptores G•W o tubos clase 9049 EA7 para interruptores G•WM. El tubo debe estar clasificado para usar en vapor de hasta 17 bares (250 lb manométrica por pulg²). No exceda los valores nominales máximos de presión y de temperatura del interruptor.

VALEURS NOMINALES

Ne pas utiliser l'interrupteur directement avec de la vapeur à une pression excédant 15 lb/po² manométrique (1 bar). Pour l'utilisation indirecte, raccorder une longueur minimale de 3,05 m (10 pi) de tube capillaire entre la source de vapeur et l'actionneur. Utiliser la classe 9049 A7A pour les interrupteurs G•W ou la classe 9049 EA7 pour les interrupteurs G•WM. Les tubes sont homologués pour l'utilisation avec la vapeur jusqu'à 250 lb/po² manométrique (17 bars). Ne pas dépasser les valeurs nominales maximales de pression et de température de l'interrupteur.

Table / Tabla / Tableau 1 : Continuous Use Temperature Ratings / Valores nominales en temperaturas de uso continuo
Valeurs nominales de température en régime d'utilisation continu

Ambient Temperature / Temperatura ambiente Température ambiante	Pressure Media Temperature / Temperatura de los medios de presión Température des milieux sous pression
-10 to +185 °F (-25 to +85 °C) -25 a +85 °C (-10 a +185 °F) -25 à +85 °C (-10 à +185 °F)	-10 to +250 °F (-25 to +120 °C) -25 a +120 °C (-10 a +250 °F) -25 à +120 °C (-10 à +250 °F)

Note: The switch may not operate properly if the media fluid freezes or if frost or ice forms inside the switch.

Nota: Puede que el interruptor no funcione adecuadamente si se congela el líquido o si se forma hielo o escarcha dentro del interruptor.

Remarque : L'interrupteur peut ne pas fonctionner correctement si le fluide sous pression gèle ou si du givre ou de la glace se forme à l'intérieur de l'interrupteur.

⚠ DANGER / PELIGRO / DANGER

HAZARDOUS VOLTAGE Turn off all power supplying this equipment before working on it. Failure to follow this instruction will result in death or serious injury.	TENSION PELIGROSA Desenergice el equipo antes de realizar cualquier trabajo en él. El incumplimiento de esta precaución podrá causar la muerte o lesiones serias.	TENSION DANGEREUSE Coupez l'alimentation de l'appareil avant d'y travailler. Si cette précaution n'est pas respectée, cela entraînera la mort ou des blessures graves.
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MOUNTING

Mount the pressure switch by the surface mounting holes (F or G, Figures 1 and 2), as well as to the pressure connection. Do not mount the switch by its pressure connection only. Turn the switch onto the pressure system pipe using a wrench on the actuator's hexagonal pipe connector. Do not apply leverage through the switch housing. Periodically torque the actuator mounting screws of Types GAW, GAWM, GDW, and GDWM switches to 8–10 lb-in (0.9–1.13 N•m).

NOTE: Do not obstruct the 1/4 in. (6 mm) vent hole on Types GBW, GEW, GCW, GFW, GEWM, GBWM, GCWM, and GFWM switches.

WIRING

- **Wire:** #12–16 AWG (2.5–1.5 mm²) solid or stranded *copper* (not aluminum)
- **Tightening torque:** 6–9 lb-in (0.7–1.0 N•m)
- **Grounding** (⏏): see Figure 3
- **SPDT snap switch** (single pole, double throw): contains 1 N.O. and 1 N.C. double break element that must be used on circuits of the same polarity
- **DPDT snap switch** (double pole, double throw): contains two electrically separated sets of contact elements for use on circuits of opposite polarity. Each set contains 1 N.O. and 1 N.C. double break element that must be used on circuits of the same polarity.
- **Pilot lights:**
 - 120 V neon (Forms G17 and G18)
 - 240 V neon (Forms G19 and G20)
 - 24 Vdc LED (Forms G21 and G22)

MONTAJE

Monte el interruptor de presión en los agujeros de montaje en la superficie (F o G, figuras 1 y 2) y a la conexión de presión. No instale el interruptor por la conexión de presión solamente. Gire el interruptor hacia el tubo del sistema de presión con una llave para tuercas en el conector de tubo hexagonal del actuador. No haga palanca en la caja del interruptor. Regularmente, apriete los tornillos de montaje del actuador de los interruptores tipos GAW, GAWM, GDW y GDWM a un par de apriete de 0,9–1,13 N•m (8–10 lb-pulg).

NOTA: No bloquee el agujero de ventilación de 6 mm (1/4 pulg) en los interruptores tipos GBW, GEW, GCW, GFW, GEWM, GBWM, GCWM y GFWM.

CABLEADO

- **Conductor:** calibre 2,5–1,5 mm² (12–16 AWG) de *cobre* (no de aluminio) sencillo o múltiple
- **Par de apriete:** de 0,7 a 1,0 N•m (6 a 9 lb-pulg)
- **Tierra** (⏏): vea la figura 3
- **Interruptor de resorte 1P2T** (un polo, doble tiro): contiene unidades de apertura doble, 1 N.A. y 1 N.C., que deben usarse en circuitos con la misma polaridad
- **Interruptor de resorte 2P2T** (dos polos, doble tiro): incluye dos juegos de unidades de contactos eléctricamente separados para usarse en circuitos con polaridad opuesta. Cada juego contiene unidades de apertura doble, 1 N.A. y 1 N.C., que deben usarse en circuitos con la misma polaridad.
- **Lámparas piloto:**
 - 120 V~ de neón (formas G17 y G18)
 - 240 V~ de neón (formas G19 y G20)
 - LED de 24 V = (cd) (formas G21 y G22)

MONTAGE

Monter le manostat par les trous de montage de surface (F ou G, figures 1 et 2), et aussi au raccordement de pression. Ne pas monter l'interrupteur uniquement par le raccordement de pression. Faire tourner l'interrupteur sur le tuyau du système de pression en utilisant une clé sur le connecteur de tuyau hexagonal de l'actionneur. Ne pas appliquer d'effet de levier sur l'enveloppe de l'interrupteur. Serrer de temps à autre les vis de montage de l'actionneur des interrupteurs de type GAW, GAWM, GDW et GDWM à un couple entre 0,9 à 1,13 N•m (8 à 10 lb-po).

REMARQUE : Ne pas boucher le trou d'aération de 6 mm (1/4 de po) sur les interrupteurs de type GBW, GEW, GCW, GFW, GEWM, GBWM, GCWM et GFWM.

CÂBLAGE

- **Fil :** n° 12–16 AWG (2,5–1,5 mm²) en *cuivre* (pas en aluminium) rigide ou toronné
- **Couple de serrage :** entre 0,7 et 1,0 N•m (6 à 9 lb-po)
- **Mise à la terre** (⏏) : voir la figure 3
- **Interrupteur à rupture brusque UPBD** (unipolaire, bidirectionnel) : contient des éléments d'ouverture double, 1 N.O. et 1 N.F., qui doivent être utilisés avec des circuits de la même polarité
- **Interrupteur à rupture brusque BPBD** (bipolaire, bidirectionnel) : contient deux jeux électriquement séparés d'éléments de contact pour l'utilisation avec des circuits de polarité opposée. Chaque jeu contient des éléments d'ouverture double, 1 N.O. et 1 N.F., qui doivent être utilisés avec des circuits de la même polarité.
- **Lampes témoins :**
 - 120 V, néon (formes G17 et G18)
 - 240 V, néon (formes G19 et G20)
 - 24 VCC, DÉL (formes G21 et G22)

Table / Tabla / Tableau 2 : Pressure Connections / Conexiones de presión / Raccordements de pression

Form / Forma / Forme	Type / Tipo / Type	Connection	Conexión	Raccordement
Standard Estándar Standard	G•W	1/4-18 NPTF The dry seal thread should seal against a new external 1/4-NPT thread without sealing tape or compounds.	1/4-18 NPTF La rosca con cierre sin lubricante deberá cerrar herméticamente con una nueva rosca externa de 1/4-NPT (presión y temperatura normales) sin necesidad de cinta o de los compuestos de sellado.	1/4-18 NPTF Le filetage de type sec devrait fermer hermétiquement avec un nouveau filetage externe de 1/4-NPT sans besoin de ruban ou de composés de scellement.
Z	GAW, GDW	1/4-18 NPT external thread	Rosca externa de 1/4-18 NPT	Filetage externe de 1/4-18 NPT
Z16	GAW, GDW	1/2-14 NPT external and 1/4-18 NPTF internal thread	Rosca externa de 1/2-14 NPT e interna de 1/4-18 NPTF	Filetage externe de 1/2-14 NPT et interne de 1/4-18 NPTF
Z18	G•W	7/16-20 UNF-2A	7/16-20 UNF-2A	7/16-20 UNF-2A
Metric / Métrica / Metric	G•WM	G 1/4 BS2779	G 1/4 BS2779	G 1/4 BS2779

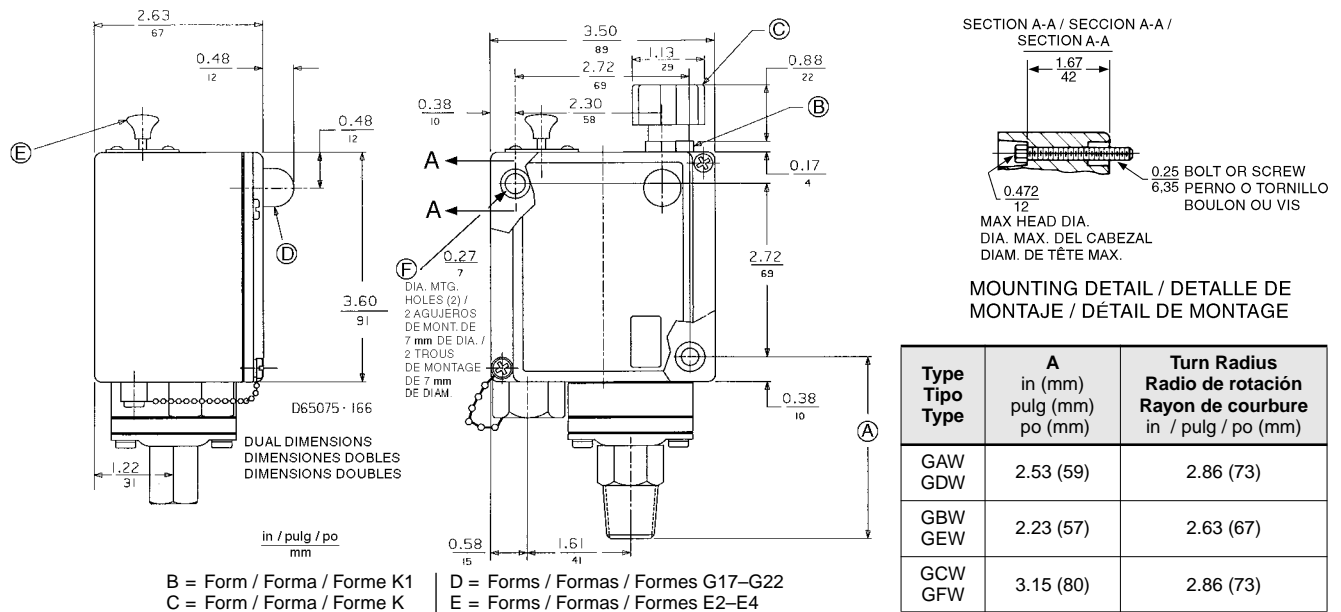


Figure / Figura / Figure 1 : Standard Dimensions / Dimensiones estándar / Dimensions normales

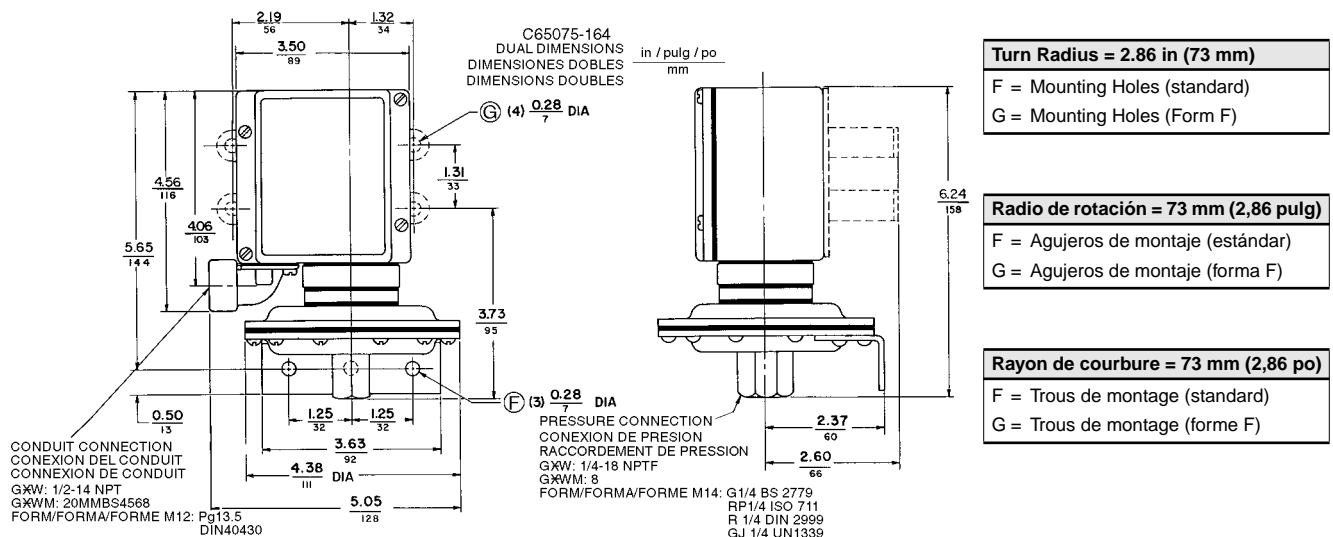


Figure / Figura / Figure 2 : Dimensions for Types / Dimensiones para los tipos / Dimensions pour les types :
GAW, GAWM, GDW, & GDWM-1, 21

SETPPOINT ADJUSTMENTS

The pressure switch is set at the factory to the operating point(s) marked on the outside of the switch housing. Before readjusting the switch, cycle it to determine actual operating points.

Non-Adjustable Differential (GDW, GDWM, GEW, GEWM, GFW, GFWM)

The range adjustment nut (Figure 3H) or knob (Figure 3C) adjusts both setpoints by the same amount. To adjust the operating points:

1. Place a flat-blade screwdriver in a range adjustment nut slot.
2. Rotate the nut to the left (to increase the operating points) or right (to decrease the operating points).

Adjustable Differential (GAW, GAWM, GBW, GBWM, GCW, GCWM)

The range adjustment nut or knob determines the decreasing setpoint. The adjusting screw (Figure 3J) determines the increasing setpoint. To adjust the operating points:

1. Adjust the decreasing setpoint (see Steps 1 and 2 above).
2. Turn the adjusting screw clockwise (to raise the increasing setpoint). This adjustment does not affect the decreasing setpoint.

AJUSTE DE LOS PUNTOS DE REFERENCIA

El interruptor de presión se calibra en la fábrica de acuerdo con el (los) punto(s) de funcionamiento marcados en el exterior de la caja. Antes de volver a ajustar el interruptor, páselo por un ciclo para determinar los puntos reales de operación.

Diferencial no ajustable (GDW, GDWM, GEW, GEWM, GFW, GFWM)

La tuerca (figura 3, H) o perilla (figura 3, C) de ajuste de la gama fija ambos puntos de referencia al mismo valor. Para ajustar los puntos de operación:

1. Coloque un desarmador de punta plana en una de las ranuras de la tuerca de ajuste de la gama.
2. Gire la tuerca hacia la izquierda (para incrementar los puntos de operación) o hacia la derecha (para disminuir los puntos de operación).

Diferencial ajustable (GAW, GAWM, GBW, GBWM, GCW, GCWM)

La tuerca o perilla de ajuste de la gama determina el punto de referencia de disminución. El tornillo de ajuste (figura 3, J) determina el punto de referencia de incremento. Para ajustar los puntos de operación:

1. Ajuste el punto de referencia de disminución (vea los pasos 1 y 2 anteriores).
2. Gire el tornillo de ajuste en el sentido de las manecillas del reloj (para aumentar el punto de referencia de incremento). Este ajuste no altera el punto de referencia de disminución.

RÉGLAGES DES POINTS DE CONSIGNE

Le manostat est réglé à l'usine au(x) point(s) de fonctionnement indiqué(s) à l'extérieur de l'enveloppe de l'interrupteur. Avant de régler de nouveau le manostat, effectuer un cycle de manœuvre pour déterminer les points de fonctionnement actuels.

Différentiel fixe (GDW, GDWM, GEW, GEWM, GFW, GFWM)

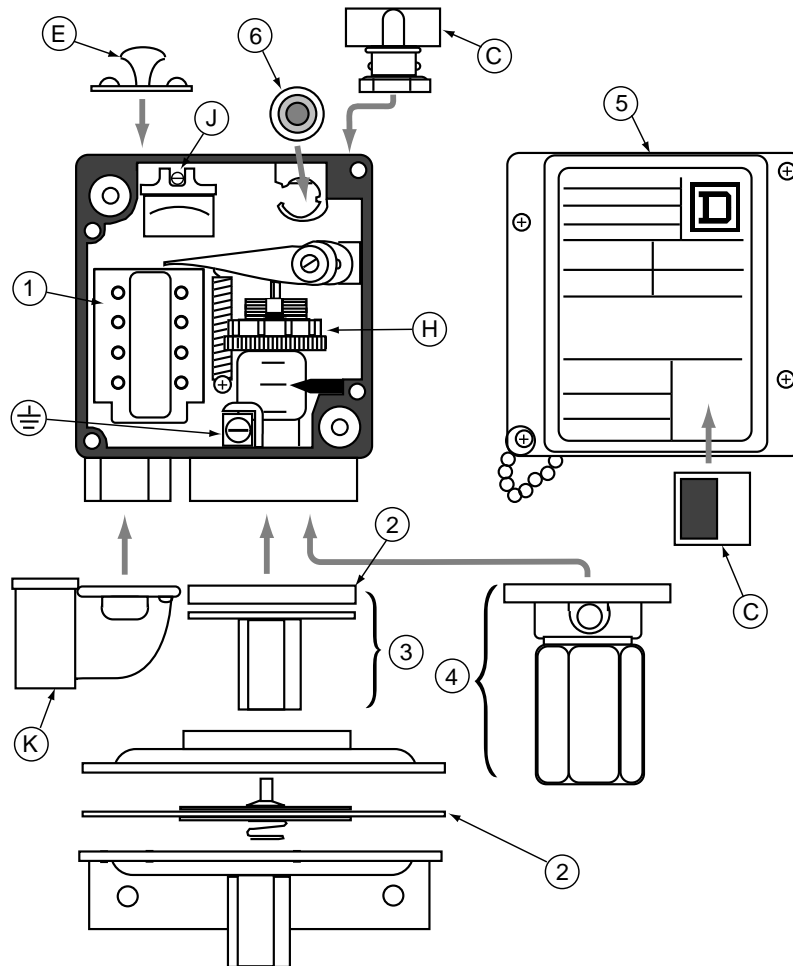
L'écrou (figure 3, H) ou le bouton (figure 3, C) de réglage de la gamme permet de régler les deux points de consigne à la même valeur. Pour régler les points de fonctionnement :

1. Introduire un tournevis à lame plate dans une fente de l'écrou de réglage de gamme.
2. Faire tourner l'écrou vers la gauche (pour augmenter les points de fonctionnement) ou vers la droite (pour diminuer les points de fonctionnement).

Différentiel réglable (GAW, GAWM, GBW, GBWM, GCW, GCWM)

L'écrou ou le bouton de réglage de la gamme détermine le point de consigne de diminution. La vis de réglage (figure 3, J) détermine le point de consigne d'augmentation. Pour régler les points de fonctionnement :

1. Régler le point de consigne de diminution (voir les étapes 1 et 2 ci-dessus).
2. Faire tourner la vis de réglage dans le sens horaire (pour augmenter le point de consigne d'augmentation). Ce réglage n'affecte pas le point de consigne de diminution.



- 1 = Snap switch
- 2 = Diaphragm
(only the diaphragm can be replaced)
- 3 = Diaphragm actuator
(only available as an assembly)
- 4 = Piston actuator
(only available as an assembly)
- 5 = Cover
- 6 = Pilot light (Forms G17–G22)

- C = Range adjustment knob and window
(Form K)
- E = Pull or push knob (Form E2–E4)
- H = Range adjustment nut
(not replaceable—**do not remove**)
- J = Adjustment screw
- K = Side conduit (Form B2)

- 1 = Interruptor de resorte
- 2 = Diafragma
(solamente se puede reemplazar el diafragma)
- 3 = Actuador del diafragma
(solamente está disponible como ensamble)
- 4 = Actuador del pistón
(solamente está disponible como ensamble)
- 5 = Cubierta
- 6 = Lámpara piloto (formas G17–G22)

- C = Perilla de ajuste de la gama y ventana
(forma K)
- E = Perilla de empujar y jalar (forma E2–E4)
- H = Tuerca de ajuste de la gama
(no se puede reemplazar—**no lo desmonte**)
- J = Tornillo de ajuste
- K = Tubo conduit lateral (forma B2)

- 1 = Interrupteur à rupture brusque
- 2 = Diaphragme
(seul le diaphragme peut être remplacé)
- 3 = Actionneur du diaphragme
(seulement disponible en tant qu'assemblage)
- 4 = Actionneur du piston
(seulement disponible en tant qu'assemblage)
- 5 = Couverture
- 6 = Lampe témoin (formes G17–G22)

- C = Bouton de réglage de la gamme et fenêtre (forme K)
- E = Bouton pousser-tirer (formes E2–E4)
- H = Écrou de réglage de la gamme
(non remplaçable—**ne pas démonter**)
- J = Vis de réglage
- K = Conduit latéral (forme B2)

Figure / Figura / Figure 3 : Pressure Switch Assembly / Montaje del interruptor de presión / Assemblage du manostat

REPLACEMENT PARTS

When ordering a replacement part, always specify the Class, Type, and Form of the switch.

PIEZAS DE REPUESTO

Cuando solicite piezas de repuesto, siempre especifique la clase, el tipo y la forma del interruptor.


PIÈCES DE RECHANGE

Pour commander une pièce de rechange, il faut toujours spécifier la classe, le type et la forme de l'interrupteur.

Table / Tabla / Tableau 3 : Machine Tool Pressure Switch Replacement Parts / Piezas de repuesto del interruptor de presión para máquinas-herramienta / Pièces de rechange du manostat de machines-outils


Item Art.	Description Descripción Description	Class Clase Classe	Type Tipo Type	Form Forma Forme	Use on Types: Para usar en tipos: Utiliser avec types :
1	Snap switch assembly Ensamble del interruptor de resorte Assemblage de l'interrupteur à rupture brusque	9998	PC 313 PC 314 PC 339 PC 340	— — — —	G•W 1–6 G•W 21–26 G•WM 1–6 G•WM 21–26
2	Diaphragm assembly Ensamble del diafragma Assemblage du diaphragme	9998	PC 265 PC 266 PC 267	— — —	GAW, GAWM, GDW, GDWM 1, 21 ^[1] GAW, GAWM, GDW, GDWM 2, 22 ^[1] GAW, GAWM, GDW, GDWM 4, 24 ^[1]
3	Diaphragm actuator assembly Ensamble del actuador del diafragma Assemblage de l'actionneur du diaphragme	9998	PC 268 PC 269 PC 177 PC 178	— — — —	GAW, GAWM, GDW, GDWM 5, 25 GAW, GAWM, GDW, GDWM 6, 26 GBW, GBWM, GEW, GEWM 1, 21 GBW, GBWM, GEW, GEWM 2, 22
4	Piston actuator assembly Ensamble del actuador del pistón Assemblage de l'actionneur du piston	9998	PC 270 PC 271 PC 272 PC 273	— — — —	GCW, GCWM, GFW, GFWM 1, 21 GCW, GCWM, GFW, GFWM 2, 22 GCW, GCWM, GFW, GFWM 3, 23 GCW, GCWM, GFW, GFWM 4, 24
5	Cover assembly Ensamble de la cubierta Assemblage du couvercle	9998	PC 302	—	Order must include the Class, Type, and Form to be printed on the nameplate. La solicitud de piezas debe incluir la clase, el tipo y la forma para que se imprimen en la placa de identificación. La commande doit inclure la classe, le type et la forme afin d'être imprimée sur la plaque signalétique.
6	Pilot light kits Accesorios de la lámpara piloto Kits de lampe témoin	9998	PC 278 PC 279 PC 276 PC 303 PC 304 PC 305 PC 306 PC 307 PC 308	G17, G18 G19, G20 G21, G22 G17, G18 G19, G20 G21, G22 G17, G18 G19, G20 G21, G22	Modification Kit for / Accesorio de modificación para Kit de modification pour : G•WM (120 V) G•WM (240 V) G•WM (24 Vdc / V --- (cd) / VCC) Replacement for / Repuesto para / Rechange pour : 120 V 240 V 24 Vdc / V --- (cd) / VDC Field conversion for / Conversión en campo para Conversion sur place pour : G•W (120 V) G•W (240 V) G•W (24 Vdc / V --- (cd) / VCC)
—	Gasket kit (not shown) Accesorio de empaques (no se muestra) Kit de joint (non indiqué)	9998	PC 184	—	All / Todos / Tous

^[1] Except Form O1 / Excepto la forma O1 / Sauf la forme O1

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TECHNICAL OVERVIEW

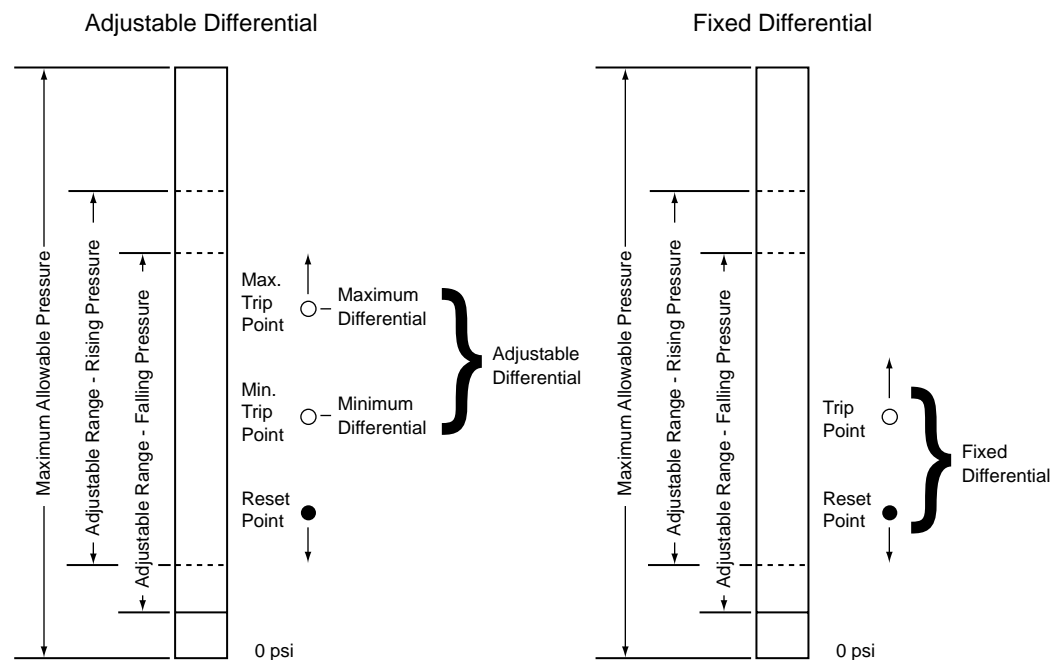
Operating Points (Settings)

Every pressure switch has two operating points; one on rising pressure and one on falling pressure. The operating point on rising pressure is referred to as the TRIP POINT and the operating point on falling pressure is referred to as the RESET POINT. These operating points are called the SETTINGS of the switch.

- TRIP POINT (rising pressure)
- RESET POINT (falling pressure)

Differential

The differential is the difference in pressure between the trip point and the reset point. It can be adjustable or nonadjustable (fixed).



Range

The range is the pressure limits within which the operating points (settings) can be adjusted. The range of the Class 9012 pressure switch is referenced to the operating point on falling pressure (reset point). The differential adds to the reset point setting and determines the operating point on rising pressure (trip point).

To determine the operating range on rising pressure for a nonadjustable (fixed) differential type switch, the differential is added to both the low end of the range and the high end of the range.

For example, to determine the range on **rising** pressure for a Class 9012 Type GDW5:

1. Range on falling pressure = 3 to 150 psi
2. Nonadjustable differential = 6.0 ± 0.8 psi
3. Range on rising pressure = 9 ± 0.8 to 156 ± 0.8 psi

Industrial Pressure Switches

Class 9012, Type G—Technical Overview

For adjustable differential type switches, add the minimum differential to the low end of the range and the maximum differential to the high end of the range.

For example, to determine the range on **rising** pressure for a Class 9012 Type GAW5:

1. Range on falling pressure = 3 to 150 psi
2. Adjustable differential = 6.0 to 30 psi
3. Range on rising pressure = 9 to 180

During the normal operating cycle, system pressure should never exceed the upper limit of the range when using a diaphragm actuated switch. This will greatly reduce the life of the diaphragm.

Maximum Allowable Pressure

Maximum allowable pressure is the pressure to which a switch can be subjected without causing a change in operating characteristics, shift in settings, or damage to the device.

Pressure surges may occur in a system during the start up of a machine or from valve operation. Surges are not normally detrimental to the life of a switch if the surge is within the maximum allowable pressure rating of the switch. Diaphragm actuated switches should not be subjected to more than 10 surges per day. More frequent surges will greatly reduce the life of the diaphragm.

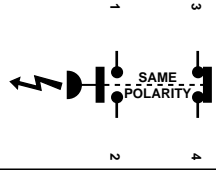


Industrial Pressure Switches Class 9012, Type G—Specifications

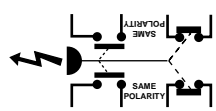
SPECIFICATIONS

Contact Arrangement

Type G Machine Tool, Temperature & Vacuum (except GVG)

Type	Contact Arrangement	Contact Symbol
Single Pole Double Throw	1 N.O. – 1 N.C.	

Snap switch contains two (2) double break contact elements (1 N.O. – and 1 N.C.) that must be used on circuits of same polarity.

Type	Contact Arrangement	Contact Symbol
Double Pole Double Throw	2 N.O. – 2 N.C.	

Snap switch contains two electrically separated sets of contact elements allowing use on circuits of opposite polarity. Each set contains two double break contact elements (1 N.O. and 1 N.C.) that must be used on circuits of same polarity.

Type G Industrial

Contact Arrangement	Contact Symbol
1 N.O. – 1 N.C.	

Contacts are single pole, double throw — one circuit normally open and one circuit normally closed. These circuits are not electrically separate and can not be used on opposite polarities.

Circuit Ratings

Contacts	AC – 50 or 60 Hz						DC			AC or DC
	Volts	Inductive 35% Power Factor				Resistive 75% Power Factor	Volts	Inductive and Resistive		Continuous Carrying Amperes
		Make		Break		Make and Break Amperes		Make and Break Amperes		
		Amps.	VA	Amps.	VA			Single Throw	Double Throw	
SPDT	120	60	7200	6	720	6	125	0.55	0.22	10
	240	30	7200	3	720	3	250	0.27	0.11	10
	480	15	7200	1.5	720	1.5	600★	0.10	....	10
	600	12	7200	1.2	720	1.2	....	....	....	....
DPDT	120	60	7200	6	720	6	125	0.22	0.22	10
	240	30	7200	3	720	3	250	0.11	0.11	10
	480	15	7200	1.5	720	1.5	600	....	....	10
	600	12	7200	1.2	720	1.2	....	....	....	....

★ 600 volt DC rating does not apply.

Acceptable Wire Sizes. #12-22 AWG

Recommended Terminal Clamp Torque. 7 in-lbs

Temperature Ratings

	Actuator	Minimum	Maximum
Ambient	All	-23 °C (-10 °F)	+85 °C (+185 °F)
Media	Diaphragm	-40 °C (-40 °F)	+120 °C (+250 °F)
	Piston	-26 °C (-15 °F)	
	All with Forms Q4 and Q14	-26 °C (-15 °F)	





Class 9012 Type A and Type G MAINTENANCE AND TROUBLE-SHOOTING TIPS

All maintenance recommended by the manufacturer of the equipment shall be performed. If the equipment fails to operate properly, carefully re-read the manufacturers' instructions and recommendations to see that they have been correctly followed. If the operating problems persist and it is suspected that the pressure switch is the cause, the following chart may be of assistance in identifying and correcting the most common pressure switch problems.

PROBLEM	POSSIBLE CAUSE	CORRECTION
Switch will not trip at desired pressure.	<ol style="list-style-type: none"> 1. Defective pressure gauge. 2. Incorrect pressure settings. 3. Settings outside of switch pressure limits. 4. Damaged actuator. 5. Damaged snap switch. 6. Contacts overloaded (welded). 7. Surge pressure in system exceeds maximum allowable pressure rating of switch. 	<ol style="list-style-type: none"> 1. Replace pressure gauge. 2. Readjust to correct pressure setting (see Service Bulletin). 3. Replace with switch with correct range and differential (see catalog). 4. Replace actuator. 5. Replace snap switch.
Switch will not reset at desired pressure.	<ol style="list-style-type: none"> 1. Defective pressure gauge. 2. Incorrect pressure settings. 3. Differential either too wide or too narrow. 4. Damaged actuator. 5. Damaged snap switch. 6. Contacts overloaded (welded). 7. Surge pressure in system exceeds maximum allowable pressure rating of switch. 	<ol style="list-style-type: none"> 6. Correct overload condition and replace snap switch. If normal load is higher than snap switch rating, install relay. 7. Replace switch with one with correct maximum allowable pressure (see catalog). 8. Replace with switch with correct differential (see catalog).
Contact chatter or bounce (trips and resets rapidly).	<ol style="list-style-type: none"> 9. Peaks and valleys of ripples in excess of switch setting. 10. Excessive vibration. 	<ol style="list-style-type: none"> 9a. Place restriction in pressure line to smooth out pressure fluctuations.
Nuisance tripping on falling pressure.	<ol style="list-style-type: none"> 11. Momentary dip in pressure before cycle ends. 	<ol style="list-style-type: none"> 9b. If switch is adjustable differential type, increase differential until chatter or bounce stops.
Switch operates mechanically but not electrically.	<ol style="list-style-type: none"> 12. No power to switch. 13. Wired to wrong contact. 14. Corroded or loose connections. 5. Damaged snap switch. 6. Contacts overloaded (welded). 	<ol style="list-style-type: none"> 9c. If switch is non-adjustable differential type, change to adjustable differential type and increase differential until chatter or bounce stops. 10. Move switch to new location or shock mount.



PROBLEM	POSSIBLE CAUSE	CORRECTION
Erratic operation.	15. Diaphragm or O-ring swell (pressure medium non-compatible with diaphragm or O-ring material). 10. Excessive shock. 16. Foreign matter in pressure medium. 6. Contacts overloaded (welded).	11. Widen differential or replace with wider differential. 12. Get power to switch. 13. Wire to correct contact. (See wiring diagram). 14. Make new connections or tighten existing connections.
Oil leaking past diaphragm into switch housing on 9012 Type A piston type switch.	17. Plug has not been removed from drain hole. 18. Drain line not open to atmosphere.	15. Replace with switch with correct diaphragm or O-ring material. 16. Install filter in system and replace actuator.
Oil leaking from drain hole on 9012 Type A piston type switch.	19. Some bypass leakage is normal on unsealed piston type switch.	17. Remove plug from drain hole and replace diaphragm assembly.
Oil leaking from vent hole on 9012 Type G.	4. Small amount of seepage is normal to ensure seal lubrication. Excessive leakage indicates seal failure.	18. Check drain line to be sure it is always open to atmosphere and not connected into another line. Replace diaphragm assembly.
Pilot light does not light.	13. Wired to wrong contact. 14. Loose connections. 5. Damaged snap switch. 20. Pilot light burned out.	19. If leakage is objectionable, install drain line. 20. Replace bulb or bulb assembly.
Manual reset button will not reset switch.	5. Damaged snap switch. 21. System pressure has not changed by amount of differential of switch.	21. Change system pressure by amount of differential of switch.

ROUTINE MAINTENANCE

During the normal maintenance period for the machine, the following steps should be followed for all pressure switches.

1. Remove cover
2. Visually inspect for leakage
3. Check all electrical connections
4. Check all pneumatic or hydraulic connections
5. If switch is used as a safety shutdown device, check setting
6. Replace cover