$25.00 U.S.

1200/1220/1240 Batcher Manual

97-1047-01
REV. B

NOTE

It is essential that all instructions in this manual be followed precisely to ensure proper operation of the equipment.

Kistler-Morse®

97-1047-01
REV. B
March 1990

NOTICE

CAUTION

Follow these rules if welding is done on the vessel. The electrical current of the welder may pass through the transducer causing damage to it and possibly to the signal processor if these precautions are not followed.

1. Disconnect the transducer cable from the signal processor. If possible, remove the transducers or insulate them electrically. (Transducers that have fabreeka pads only require removing the mounting bolts. The pads will act as insulation.)

2. Ground the welder as close to the welding joint as possible.

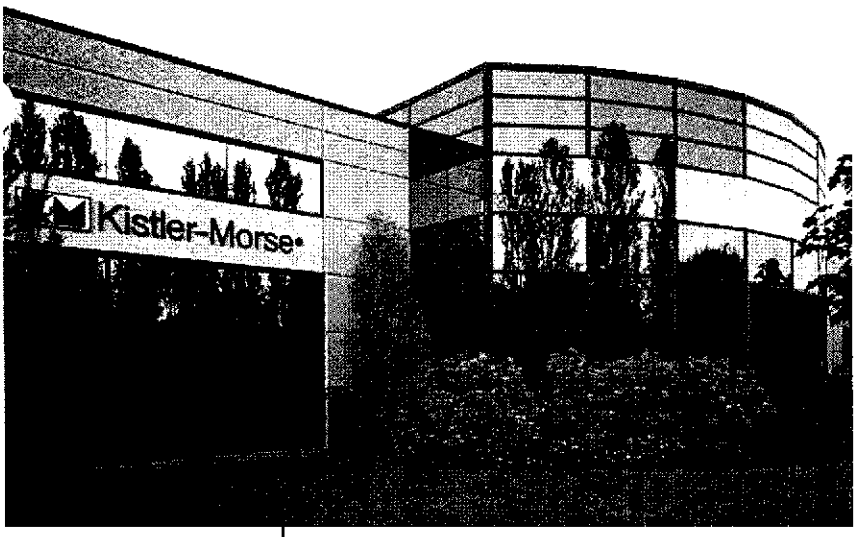
Kistler-Morse®

Technical Note
Manual Addendum

When connecting AC power to this unit, it is important that the following be adhered to:

Power wiring must comply with the national wiring requirements for the country in which the equipment is installed.

The ground conductor is to be connected to the Protective Earth (PE) terminal.



For models which do not incorporate a built-in AC power switch, the power wiring must include a switch or circuit breaker as the means for disconnecting power from the unit. The switch must be in close proximity to the unit and within easy reach of the operator, and must be marked as the disconnecting device for the unit.

For more information regarding this Technical Note, contact Kistler-Morse Service at (800) 426-9010.

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Kistler-Morse®

CE

Manufacturer's Declaration of Conformity

PRODUCT: Model 1200/1220 Batch Controllers

MODELS: (Based on Kistler-Morse Drawing 64-5084 Rev. A)

1200-8-B-X-F	1200-8-B-S-F	1200-8-C-X-F	1200-8-C-S-F
1220-8-B-X-F	1220-8-B-S-F	1220-8-C-X-F	1220-8-C-S-F

Consisting of Circuit Boards:	and	Relay Boxes:
63-1193-02 Rev. B		61-5042-01 Rev. A
63-1154-01 Rev. K2		61-5042-02 Rev. A
63-1153-02 Rev. E3		61-5030-01 Rev. A
63-1149-01 Rev. F		61-5030-02 Rev. A
63-1150-01 Rev. F		

MANUFACTURER

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Country: USA

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APPLICATION of COUNCIL DIRECTIVES: 73/23/EEC, 89/336/EEC

STANDARDS USED: EN55011-B, EN50082-2:1995, EN61010-1

MEANS OF CONFORMITY:

The product is in conformity with Directive 89/336/EEC based on test results using harmonized standards in accordance with Article 10(1) of the Directive.

REPRESENTATIVE: Sesh Velamoor
FUNCTION: President
SIGNATURE: _____

Place: Bothell, WA USA

Date: 12/31/96

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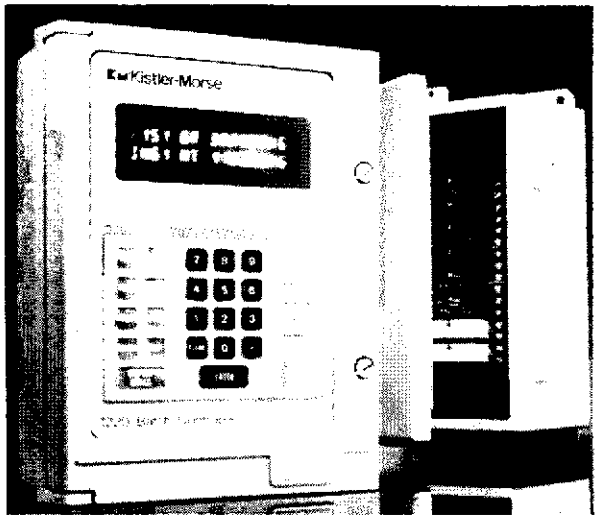


Figure 1. 1200/1220 Batch Controller and I/O Box

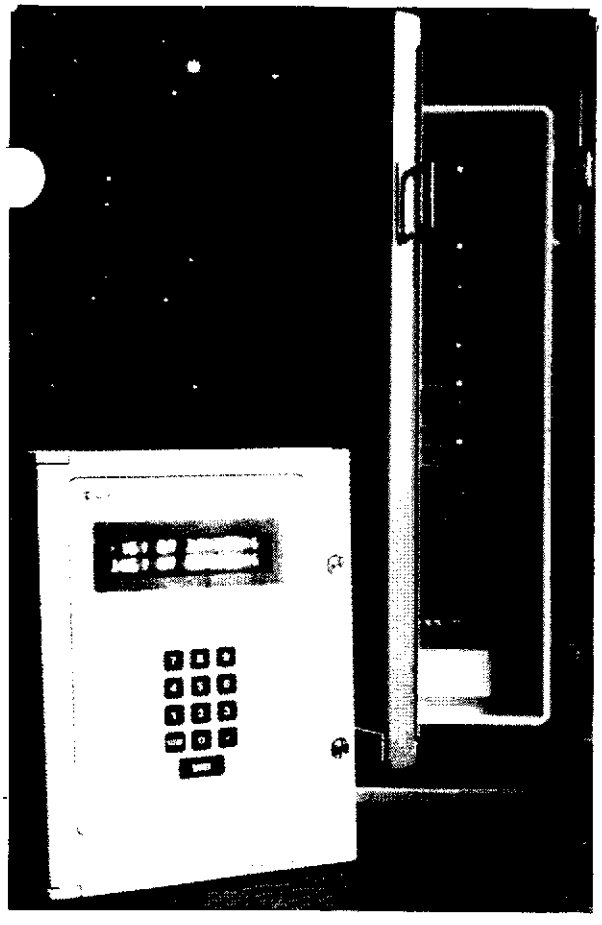


Figure 2. 1240 Batch Controller and I/O Box

Introduction

Kistler-Morse 1200, 1220, and 1240 Batch Controllers are state-of-the-art digital batchers (Figures 1 and 2). Large and small industrial plants will find Kistler-Morse Batch Controllers to be versatile and reliable systems for controlling material movement and totalizing plant throughput. The batchers can be used as standalone units or as interfaces within a distributed process control network. They offer many features typically found on large, complex custom systems, yet are easy to install and operate. NEMA-4 enclosures, reliable Kistler-Morse sensors, and built-in safety features deliver high quality batch control even in harsh industrial environments.

The 1200 is a single-ingredient batcher, while the multi-ingredient 1220 and 1240 control up to four and eight ingredients respectively. Kistler-Morse Batch Controllers automatically operate feed controls for fast or slow material feed by continuously sensing the weight of the batched product. This capability allows the batchers to control batches in accordance with previously programmed formulas. The batchers store up to nine such formulas, each of which can be recalled for immediate use or for modification.

Solid-state setpoint relays, provided with the batcher, can be assigned to control feed valves, operate alarms, or signal high and low material level. These fully isolated relays control most common external equipment directly without the need for external switching relays.

For more information on the various Kistler-Morse Batch Controllers, see Figure 3, "Comparison of Features" (page 6).

Rugged, Reliable Sensors

The 1200, 1220, and 1240 Batch Controllers are designed to be used with either Kistler-Morse Microcell® sensors or Kistler-Morse direct support sensors. The direct support sensors offer important advantages over load cells. They do not require checking hardware or stay rods for a secure installation. The patented sensing element is field replaceable. It can be unbolted and replaced immediately on-site, and therefore eliminates costly downtime.

Proven Microcell sensors bolt directly to the support structure of the weigh vessel. The sensors measure deflections in the support structure caused by the weight changes inside the vessel. As material is added to or removed from the vessel, the sensors generate an electrical signal--proportional to the weight of the material--that is conditioned by the Batch Controller. All Kistler-Morse sensors produce a high level electrical output for reliable readings in electrically noisy plants.

Each batcher provides four separate sensor input channels. Precise sensor balancing compensates for all installation variations and optimizes batching performance. With the balanced leg capability, the batcher inspects and equalizes the sensor inputs. This feature is especially important for vessels with a varying center of gravity, such as blending or mixing vessels. In addition to providing improved batching accuracy, an automatic sensor check detects sensor defects, allowing the operator to inspect and repair the sensor, then recalibrate and continue batching operations.

Easy Installation, Setup, and Calibration

Kistler-Morse batchers are designed to be installed quickly and easily by in-plant personnel. Installation involves wall- or panel-mounting the unit, and making electrical connections to AC power, feed valves, weight sensor(s) and/or tolerance alarms.

Setup tailors the batcher to the particular batching system requirements and operating environment. Once the access code has been entered, the batcher leads the operator through all setup and calibration procedures with easy-to-understand questions. Main feed, slow feed, preact amount, jog time, tolerance alarms, and up to nine batch formulas (batch sizes for the single-ingredient 1200) are selected during setup. The desired display resolution and engineering units are set at the same time. Once the operating parameters have been entered, they are stored in the system's nonvolatile memory and protected by the setup access code.

User-Friendly Display, Push-Button Operation
To simplify batching tasks for the operator, Kistler-Morse batchers provide an interactive method of operation. Easy to understand messages and questions appear on the lighted alphanumeric display. The operator responds to the messages and communicates with the batching system by means of keypad entries. On-line "help" messages are available throughout the program and provide additional assistance.

Using the keypad, the operator selects pre-programmed formulas and invokes operating commands. The operator simply presses the appropriate function keys to initiate a batch, check batch parameters, stop or cancel a batch, or display accumulated totals. Invalid entries are ignored by the batcher, and prompting messages are displayed until a suitable value is entered. Once a batch has been initiated, feed control and tolerance checks proceed automatically.

All entries relative to weights, tolerance levels, etc. are password-protected to prevent unauthorized alteration. All batching system particulars entered are stored in an internal memory that is unaffected by the interruption of AC power.

The display is visible at all times. During batching operations, the current weight of the vessel contents is continuously displayed. Accumulators within the batchers maintain running totals of the amount of ingredient batched, the amount of each formula batched, plus any cancelled or miscellaneous (manual) batches. A built-in alarm activates, and operation is suspended, anytime the batcher detects a problem with the batching system. Operation is also suspended in the event of a power failure.

Remote Control Batching
Batching can also be controlled from a remote location with START, STOP, and CANCEL commands honored via dry contact inputs. Whether the control site is local or remote, the operator can override automatic batching operations with the proper access code at any time.

Enhanced Batch Quality and Built-In Safety
The batchers provide continuous self-checking, and signal when any preset tolerance condition is not met. Several tolerance checks are performed. If the batch is under tolerance, the batcher automatically jogs the ingredient feed until the desired batch weight is achieved. The self-adjusting preact delivers increased precision. The batcher also constantly monitors the feed rate during the batching process, and indicates when the flow is too slow due to possible equipment or process problems. If additional safety is required, the Batch Controllers can activate visible or audible alarms. Diagnostic features are available to assist in identifying faults and troubleshooting.

Rugged Enclosures for Process Environments
The Kistler-Morse Batch Controllers and accompanying Input/Output boxes are designed to meet FCC specifications for RFI/EMI emission. They are protected by sealed NEMA-4 enclosures, suitable for most industrial batching situations--including those classified as hazardous. In these installations, the sensors are mounted on the vessel within the hazardous area, while the batcher unit is mounted outside the hazardous area. The Batch Controllers may be wall- or panel-mounted up to 2000 feet (600 m) from the sensors. The I/O boxes must be wall-mounted.

Interface Versatility
Fully isolated, solid-state relays are contained in a separate Input/Output box that is wall-mounted within 6 feet (1.8 m) of the 1200 and 1220 batchers. The 1240 I/O box is connected to the Batch Controller by an RS422 serial link; maximum distance between the two units is 1 mile (1.6 km). The 1240 I/O assembly is available either with or without a NEMA-4 enclosure for location in a process area or electrical cabinet.

Discrete inputs and outputs are provided for communication between the Batch Controller and a PLC (Programmable Logic Controller) or other remote control station. Several output options are available. A 4-20 mA current transmitter provides continuous output of gross weight to auxiliary equipment. Optional RS232C, RS422, and RS485 serial ports permit the Batch Controller to communicate with a printer, remote display, or host computer. With the Management Report Option, the batching system produces printouts of batch operation complete with accumulated formula production and ingredient usage.

NOTE

Refer to Appendix A (pages 89 - 92) at the back of this manual for Technical Specifications. Wiring diagrams are found in **Hardware Installation,** pages 9 - 23.

	1200		1220		1240	
	LOCAL	REMOTE	LOCAL	REMOTE	LOCAL	REMOTE
# of Ingredients Controlled	1	1	4	4	8	8
# of Formulas in Memory	9	9	9	9	9	9
Batch Sequencing Between Ingredients						
Manual	No	No	Yes	Yes	Yes	Yes
or Auto -- Time Based	No	No	Yes	Yes	Yes	Yes
or Auto -- PLC Controlled	No	No	No	No	Yes	Yes
Remote START, STOP, CANCEL	No	Yes	No	Yes	No	Yes
Remote Formula Select (Formula 1 to 8)	No	No	No	No	No	Yes
Standard Outputs Available for Feed Control, Setpoints, or Alarm	3	2	5	4	8	8
Standard Inputs/Outputs for Remote Control	0	4	0	4	0	8
Optional Outputs	3	2	1	0	8	0
Balanced Leg	Std.	Std.	Std.	Std.	Std.	Std.
4-20 mA Tx - Gross Weight	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.
Management Report Option (Serial Output)	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.
Printer for MRO	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.
Remote Display Capability (Serial Output)	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.
Remote Information Access (Serial Output)	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.

Figure 3. Comparison of Features (1200, 1220, 1240)

10 Steps to Batching with Kistler-Morse Batch Controllers

1 Unpacking Your Batch Controller

2 Selecting the Right Location

3 Installing the Hardware

4 Applying AC Power

5 Setting Up the Equipment

6 Calibrating the System

7 Doing Ingredient Setup

8 Doing Formula Setup

9 Operating the Control Panel

10 Running Your First Batch

For Your Information

- Wiring overviews appear in **Hardware Installation,** pages 13 and 21.
- A list of Batch Controller functions (their names and two-digit codes) appears in **Equipment Setup,** page 26.
- A one-page summary of local operating procedures appears in **Operation,** page 80. Remote control operations are also covered in **Operation.** For additional remote operating information, see Appendix B, pages 93 - 109.
- A handy setup form (equipment, ingredient, formula) and calibration checklist appears in Appendix C, pages 111 - 114.
- A glossary of batching terms appears in Appendix D, pages 115 - 117.

Hardware Installation

Introduction
Installation of the Batch Controller can be handled quickly and easily. Installation involves:

- Unpacking the Equipment
- Selecting a Location
- Mounting the Units
- Wiring
  - Sensor Input Channels
  - Batch Controller and Feed Controls to I/O Box
  - AC Power
  - 4-20 mA Option
  - Serial Option

Unpacking the Equipment
Kistler-Morse Batch Controllers are shipped in a heavy-duty carton especially designed for common carrier transport.

Prior to unpacking the equipment, examine the carton for any exterior shipping damage: crushed corners, torn sides, watermarks, etc. If any evidence of shipping damage is discovered, notify the carrier immediately. If necessary, open the carton(s) in the presence of the carrier's representative. If the unit is damaged, file the appropriate claim with the carrier.

Use extreme care when opening the shipping carton with any sharp tool. Remove the equipment from the carton and plastic bag. Inspect the units for any sign of damage. Save the packaging material and carton for future transport or storage.

CAUTION
Do NOT power-up the batcher until you have completed all installation procedures.

Selecting a Location

The Batch Controller and accompanying I/O box can be surface- or panel-mounted. When selecting a convenient location, keep in mind:

- Operating personnel require easy access to the keyboard unit.
- AC power must be easily accessed and on a separate circuit breaker.
- Maximum distance from the batcher to the weight sensors is 2000 feet (610 m).
- Maximum distance between the batcher and I/O box is 6 feet (1.8 m).

Mounting Procedures

The Batch Controller may be surface-mounted on any convenient surface or panel-mounted within any suitable equipment rack. For easy operation in either case, recommended mounting height is slightly below eye level. For all models, the I/O Box must be wall-mounted.

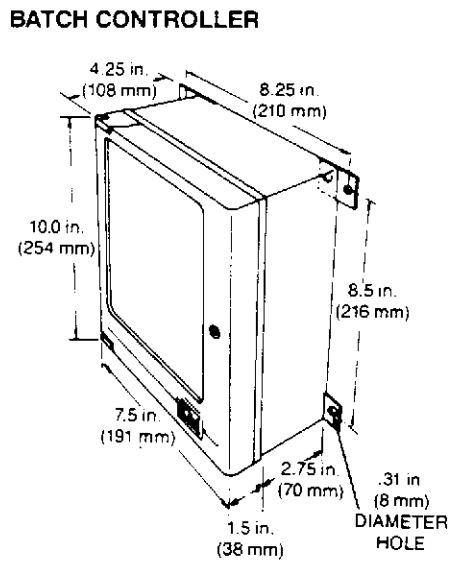


Figure 4. Surface Mount: Batch Controller Dimensions

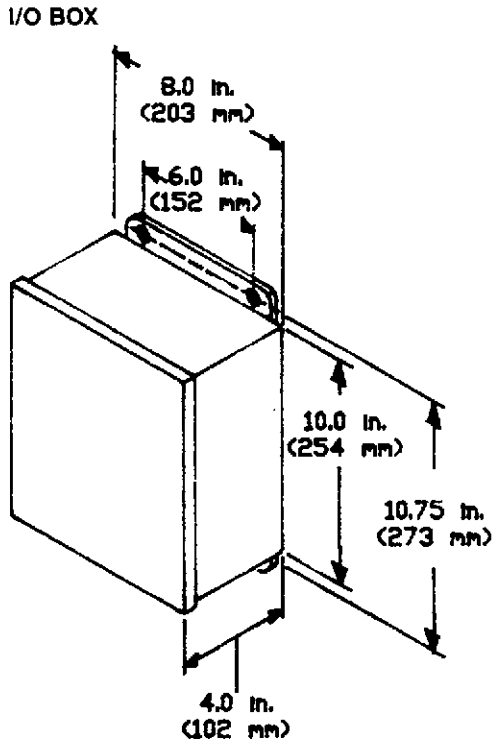


Figure 5. 1200/1220 I/O Box: Mounting Dimensions

Mounting: Surface Mount

Mounting tabs are shipped with the unit. The customer must supply the necessary fastening screws or bolts.

To attach the Batch Controller and I/O box to the mounting surface:

1 Check the mounting location. Be sure the display is easily readable, the keypad easily accessible, and the cabling holes unobstructed.

2 Mark the position of the mounting holes on the mounting surface by using the dimensions in Figures 4, 5, and 6, or by holding the units level and in place.

3 Drill pilot holes for the mounting screws, toggle bolts, or expansion bolts, whichever are to be used. Fasten the units securely in place.

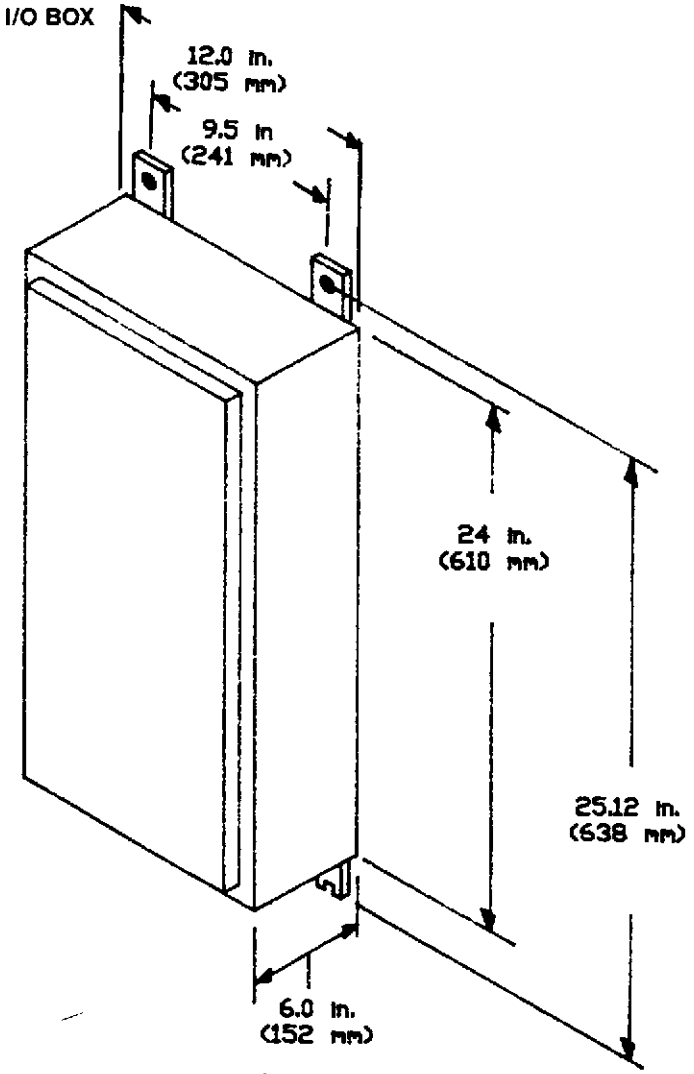


Figure 6. 1240 I/O Box: Mounting Dimensions

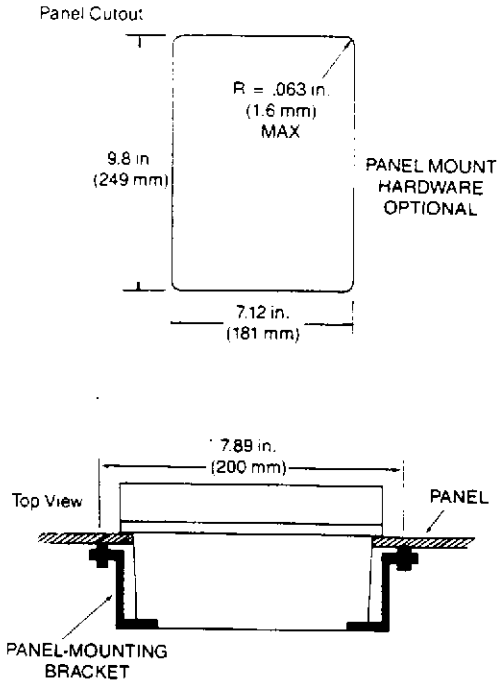


Figure 7. Panel Mount: Batch Controller Dimensions

Mounting: Panel Mount

An optional Kistler-Morse panel-mounting kit for the Batch Controller is available. See Figure 7 for panel-mounting dimensions and details.

Mounting brackets are provided with the unit. The customer is responsible for cutting the panel opening which accommodates the batcher.

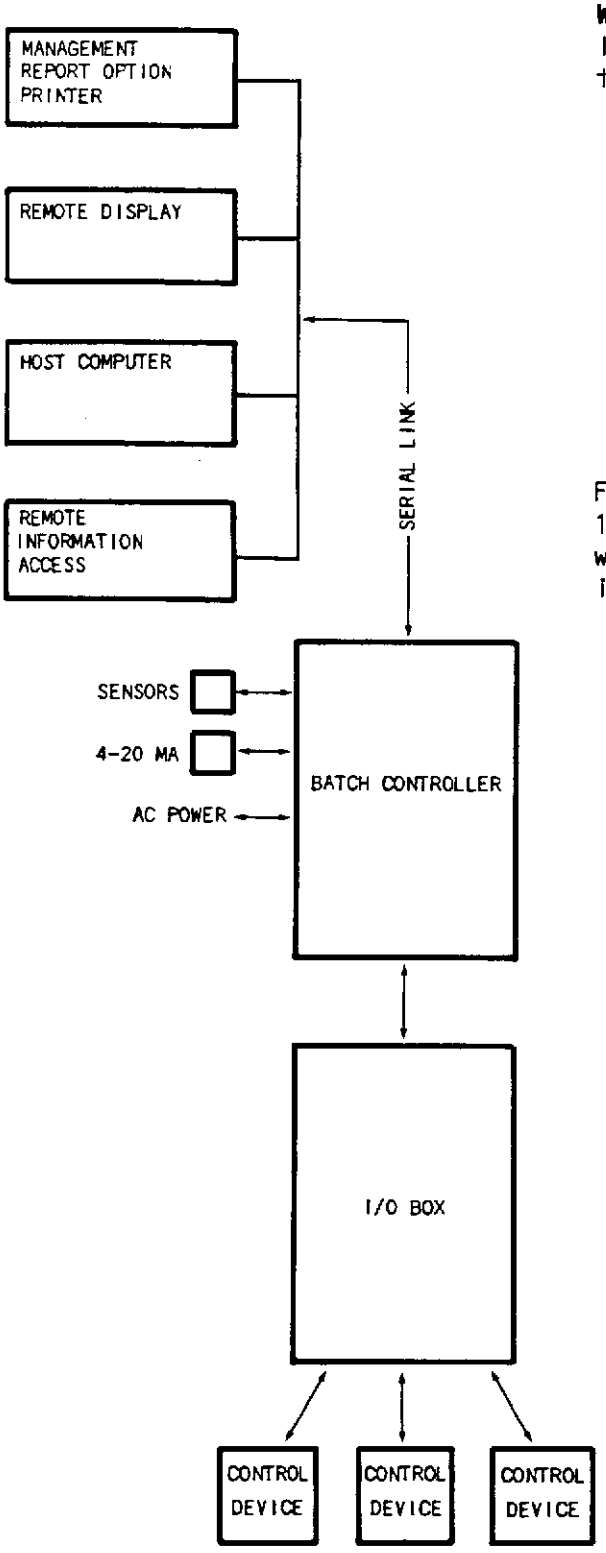
To panel mount the Batch Controller:

1 Check the chosen mounting location. Be sure the display is easily readable, the keypad easily accessible, and the cabling holes the unit unobstructed.

2 Refer to Figure 7 for the panel cutout and bezel dimensions. Use standard shop practices when cutting the opening. Place the batcher enclosure in the cutout.

3 Using the supplied panel mounting brackets, fasten the batcher to the panel so that the keypad and display fit properly within the panel opening.

4 Tighten the screws that hold the brackets to the batcher case until the batcher is fastened securely in place.



jure 8. 1200/1220 Wiring Overview

Wiring the 1200/1220

Installation of the Batch Controller involves wiring the following:

- Sensor Input Channels
- a. Batch Controller to I/O Box
  b. Feed Controls to I/O Box
- AC Power
- 4-20 mA Output Option
- Serial Output Options

Figure 8 gives an overview of wiring for the 1200/1220 batch system. Figure 17, page 21, details wiring for the 1240. All wiring shown is customer installed.

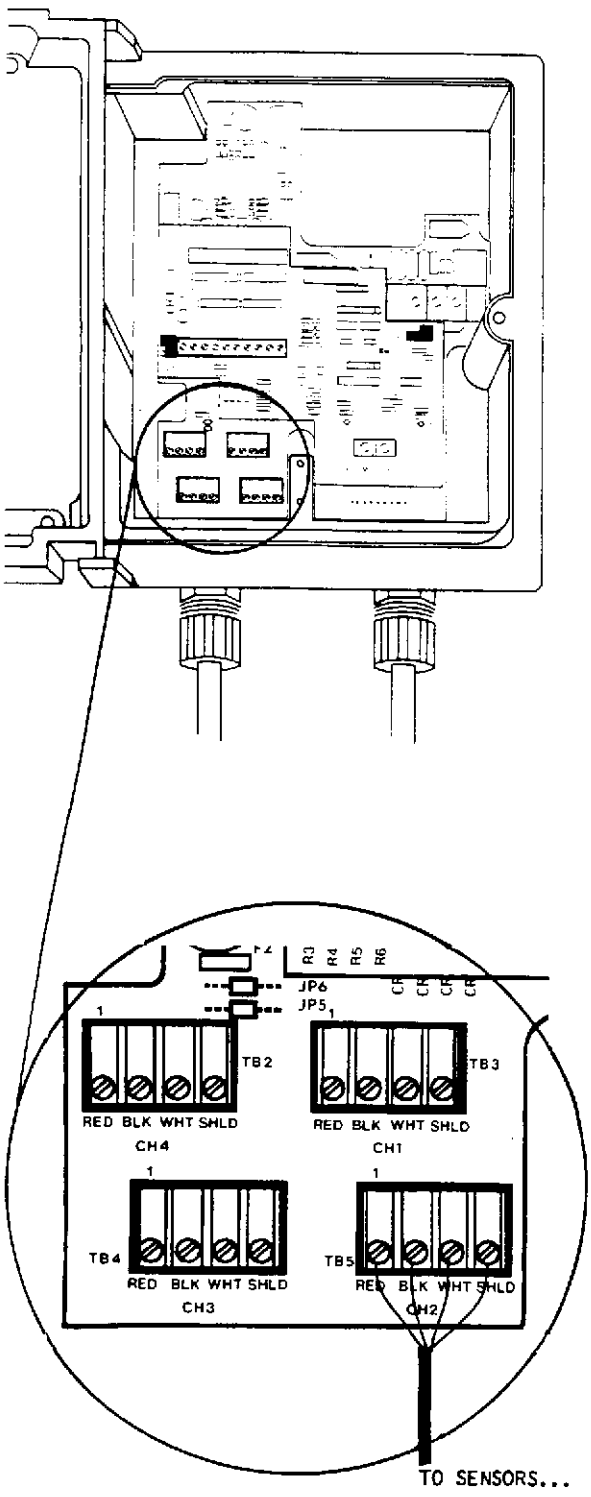


Figure 9. Wiring Sensor Input Channel(s)

Wiring: Sensor Input Channels

Kistler-Morse Batch Controllers have four sensor input channels. In a balanced leg arrangement, each sensor is wired as a single input channel.

NOTE

Not using the balanced leg feature means more than one sensor may be connected to a single input channel. Multiple sensors wired to a single input require parallel connection of the sensors.

The sensor (or sensor group) requires connection to the batcher with Belden cable #8791 or equivalent. Sensor cabling is not supplied.

To connect the sensor(s):

1 Install the sensor(s) as described in the sensor manual, and connect the three-wire interconnect cable. Connect all sensors to the sensor cable matching red to red, black to black, etc.

2 Route the cable to the batcher, keeping it away from all sources of electric noise (motors, switching equipment, etc.).

NOTE

If routing the sensor cable through conduits to the batcher, be sure that no wires carrying AC power or similar signals exist in the same conduit.

3 With appropriate fittings for the conduit (if used), route the cable into the batcher enclosure as shown in Figure 9. Use watertight conduit where required.

4 Connect bare (tinned) sensor wires to the terminal strip located in the batcher according to the labels: Red, Blk, Wht, Shield (Figure 9). Be sure to connect the shield of the sensor cable to the shield terminal. Terminate shield at electronics end only.

NOTE

All additional sensors to be wired in parallel with sensor wiring shown.

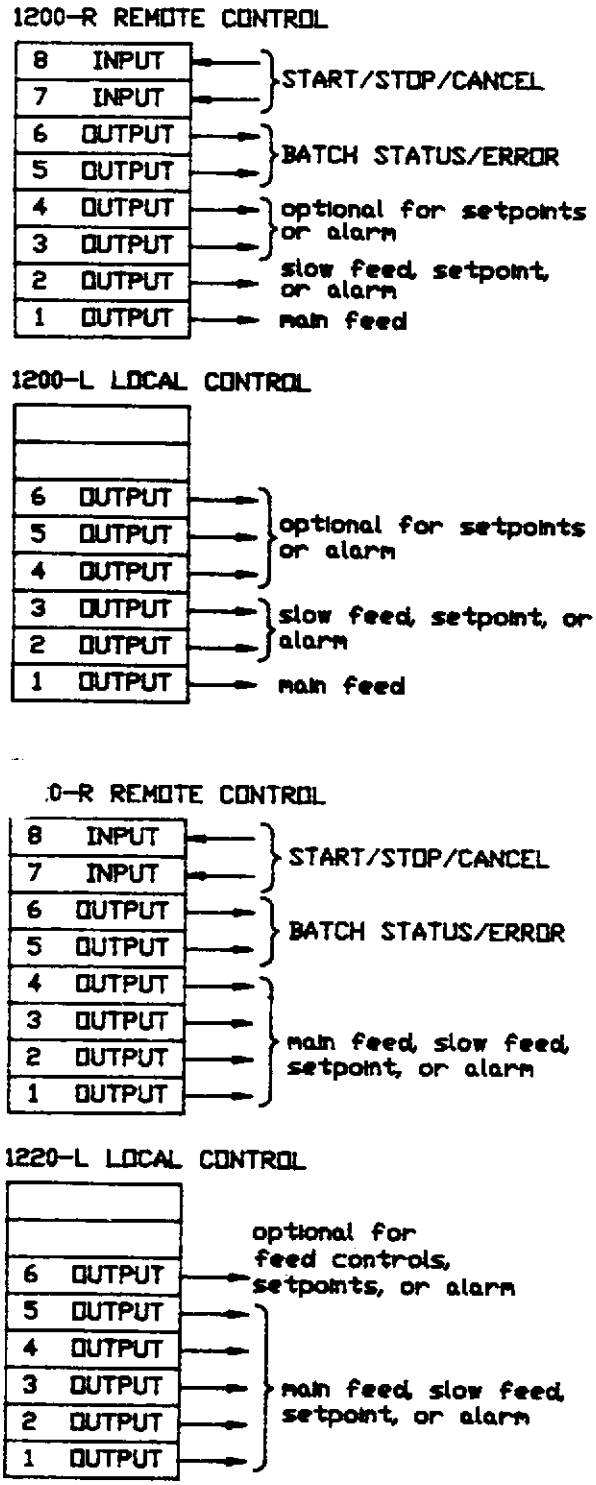


Figure 10. 1200 and 1220: Input/ Output Usage Tables

Wiring: Batcher and Feed Controls to I/O Box

Relays outputs on Kistler-Morse Batch Controllers are used to operate material feed controls.

NOTE

The relays may also be used to operate tolerance alarms or individual setpoints. See Equipment Setup, Functions 35 and 51-55.

The number of relays available is determined by the batcher model and whether or not additional relays are purchased. Solid-state relay modules that match required line voltages (specified at the time of the order) have been assigned and installed in the I/O box at the factory. Figure 10 shows input and output assignments for 1200/1220 Local and Remote Models.

The batcher provides only dry contact outputs. External power sources are required to operate valves, alarms, or indicator lamps. Be sure to choose external switching relays and connection cable suitable for the application. Installation should follow standard industrial practices with adherence to all local codes.

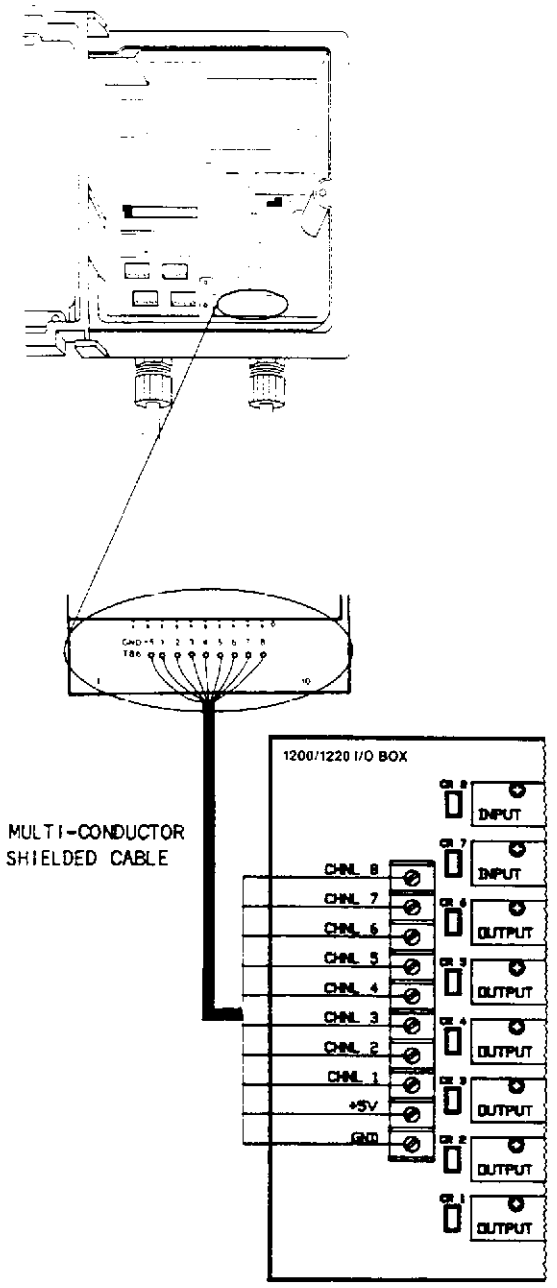


Figure 11. Wiring Batch Controller and Feed Controls to I/O Box

To connect the relays:

1 Begin by connecting the multi-conductor, shielded interconnect cable from the Batch Controller to the I/O Box. Match and connect GROUND, +5, and pins 1 - 8 (Figure 11).

2 Connect the control cable to the feed valve (or other device). Figures 12 and 13 show typical wiring for output and simple input relays. Also see Appendix B for PLC state diagrams.

3 Route the cable to the I/O box, using conduit or suitable armored cable.

4 With appropriate fittings for the conduit (if used), route the cable into the I/O enclosure (Figure 11). Use watertight conduit where required.

5 Connect feed control cable wires to the relay terminals located in the I/O box (Figure 11).

Repeat steps 2 through 5 for each of the feed control cables.

6 When all feed control cables are connected to the relays in the I/O box, connect the power source used to operate the feed control devices.

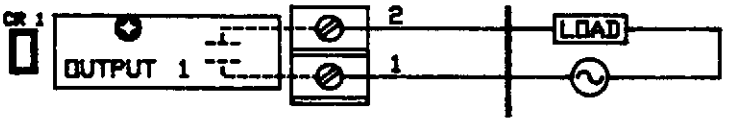


Figure 12. Typical Wiring for Output Relay

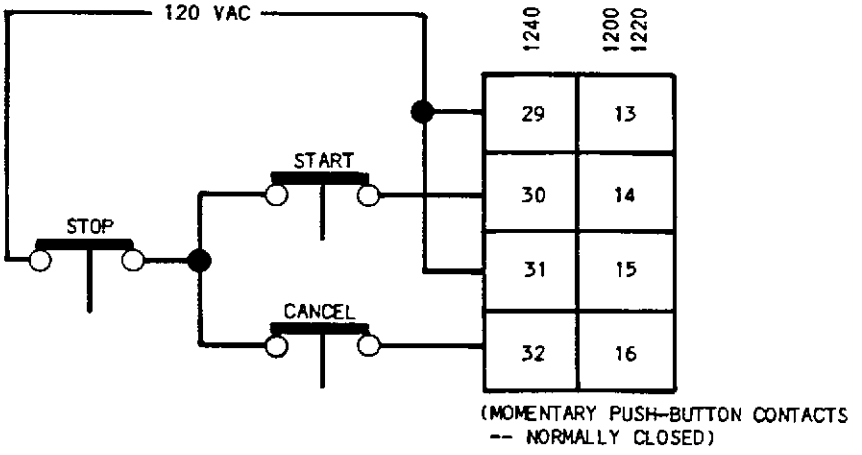


Figure 13. Typical Wiring for Push-button Input Relay (Remote Models Only)

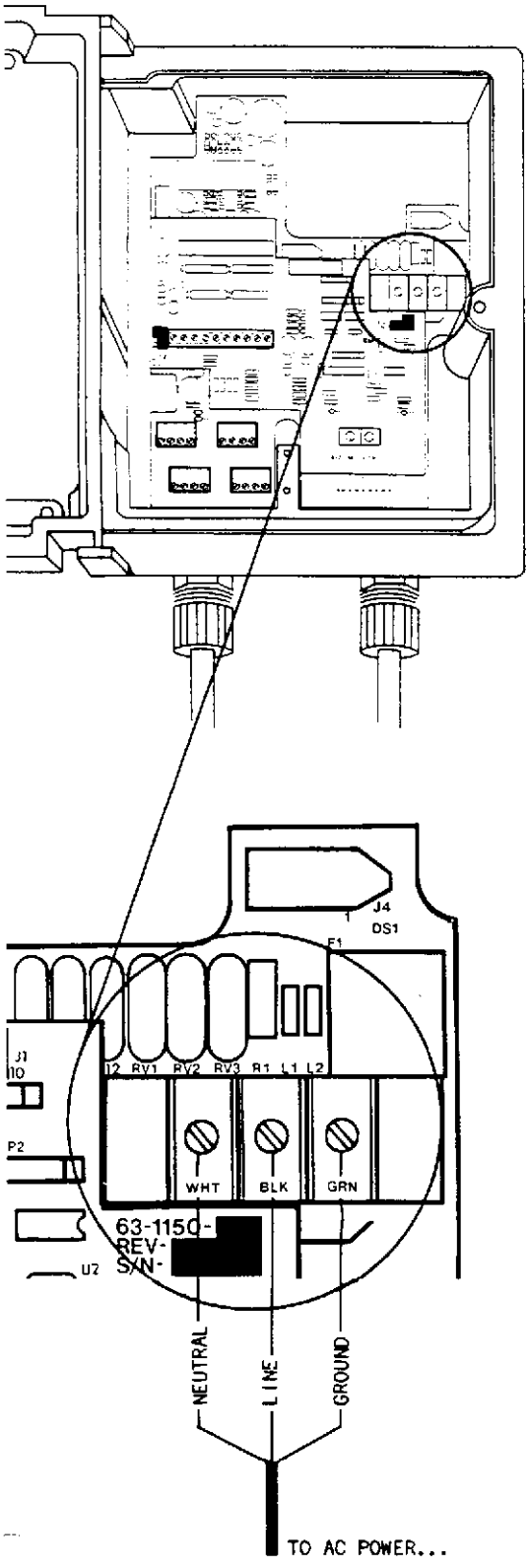


Figure 14. Wiring AC Power

Wiring: AC Power

Figure 14 shows connection of the AC power cable to the input terminals. Connect wires as shown. Bundle AC wiring separately from all other wiring.

Recommended AC Power Conditioning

Because Kistler-Morse Batch Controllers are digital instruments, they require clean power for reliable operation. AC power supplied to the batcher (and to the 1240 I/O box) should come from a source that is isolated from all other process equipment.

Kistler-Morse recommends using a power conditioner for noise attenuation and voltage regulation with a capacity of approximately 70 VA (Sola 63-13-070 or equivalent).

Grounding the Batcher

Electrical codes require that the batcher be properly grounded to an earth ground to adequately protect against electrical shock and to ensure correct operation of the unit. Ground connection to the Batch Controller is made to the terminal equipped with the green wire (Figure 14). The ground wire should be grounded to the plant ground system, a ground rod, or a suitable cold water pipe.

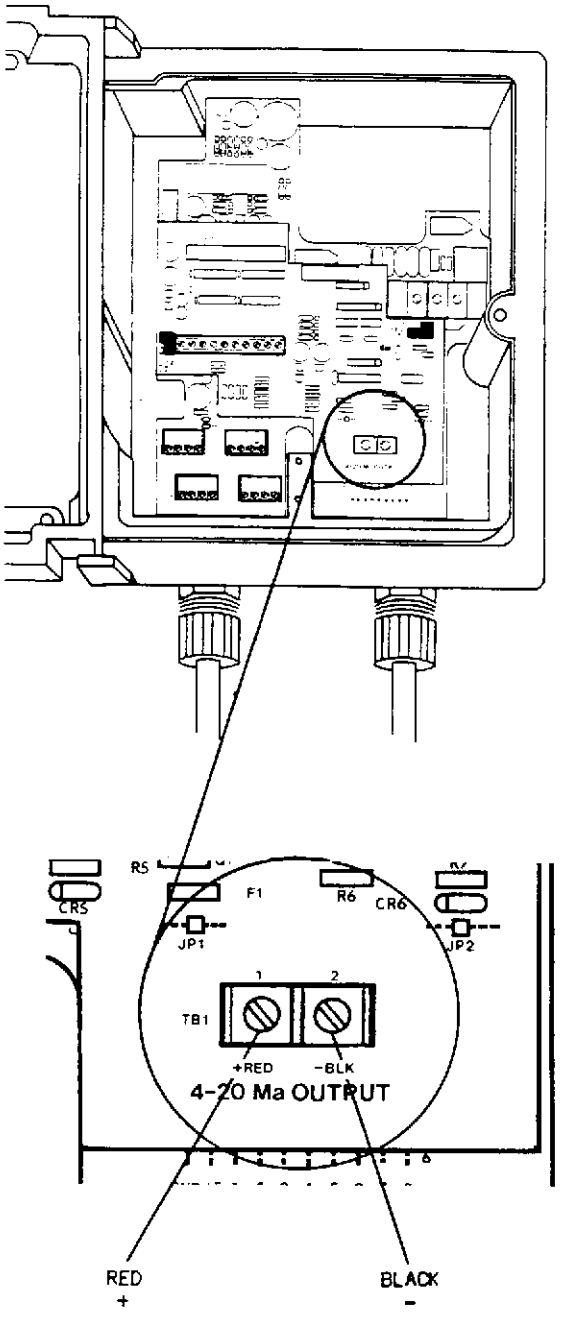


Figure 15. Wiring 4-20 mA Output

Wiring: 4-20 mA Output Option

The optional analog output provides a 4-20 mA current that is directly proportional to the gross vessel weight (digital). This output will drive up to a 500 ohm load.

Connect red and black wires as shown in Figure 15. Belden cable #8737 or equivalent should be routed separately from all AC wiring.

Refer to Output Setup, Function 43 (page 49) for more details on activating this output.

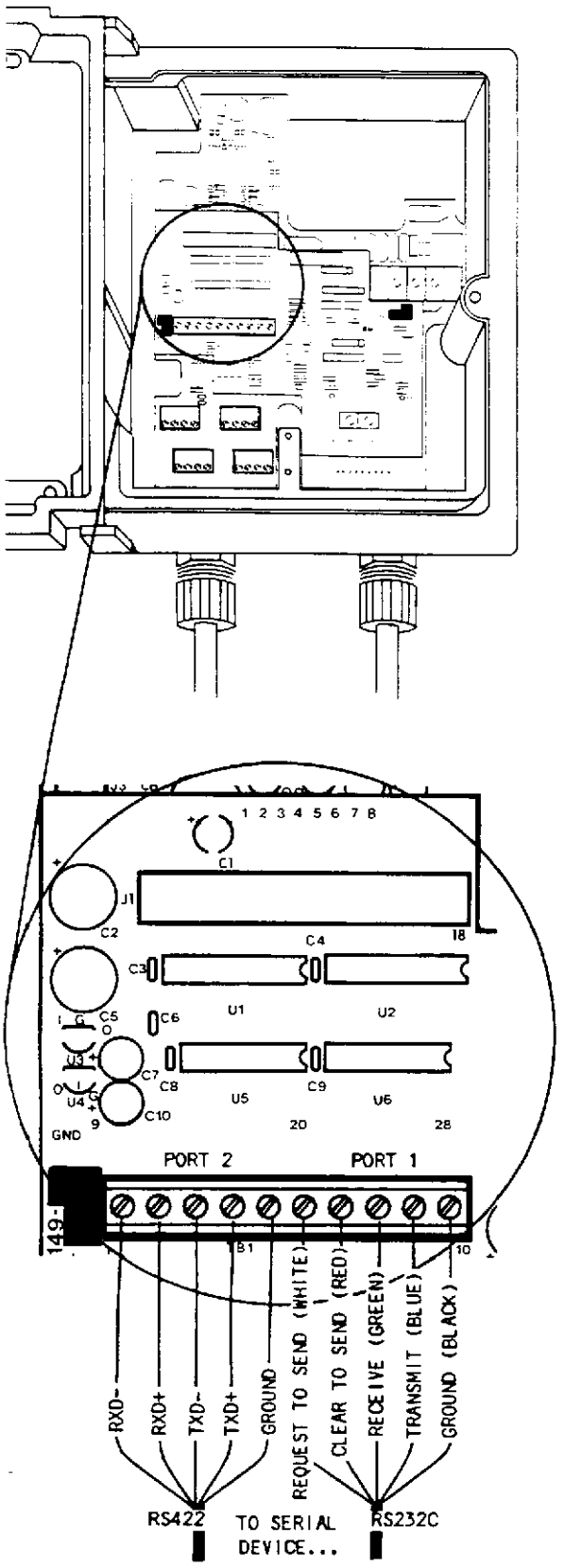


Figure 16. Wiring Serial Output

Wiring: Serial Output Option(s)

Optional ports 1 and 2 provide a serial link (RS232C, RS422, or RS485) for connecting the Batch Controller to a printer, modem, PC, or other serial device.

Table 1 shows the use of each port by model. Note the position of the ports on the board: Port 2 is on the left, Port 1 on the right.

	Port #2	Port #1
1200	Remote Display or Information Access	MRO
1220	Remote Display or Information Access	MRO
1240	I/O Box (RS422)	MRO, Remote Display, or Information Access

Table 1. Serial Ports (1200, 1220, 1240)

Use a suitable five-conductor cable (22 AWG Alpha Multiconductor Foil Shield #5580 or equivalent) to connect these outputs. If your system includes the Management Report Option, refer to the MRO manual for printer installation instructions.

Table 2 shows jumper placement by type of serial interface (RS232C, RS422, RS485).

NOTE
Jumpers are installed by Kistler-Morse before shipment.

	Port 1 Jumpers	Port 2 Jumpers
232	24, 26, 28, 1, 4	14, 16, 18, 6, 7
422	19, 22, 25, 27, 2, 3	9, 12, 15, 17, 5, 8
485	19, 20, 22, 23, 2, 3,	9, 10, 12, 13, 5, 8

Table 2. Jumper Placement (1200, 1220, 1240)

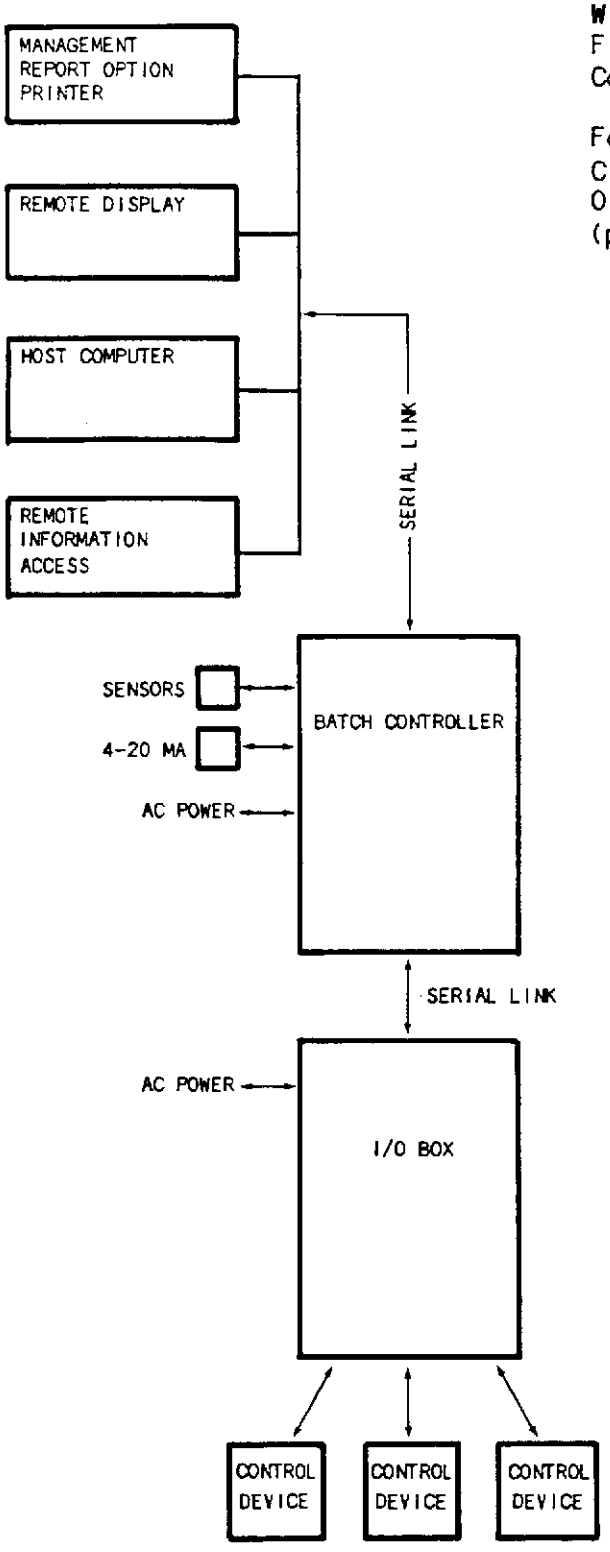
Table 3 lists serial communication signals by interface (RS232C, RS422, RS485).

	RS232C	RS422	RS485
Port 1	9 TXD 8 RXD 7 CTS 6 RTS	TXD + TXD - RXD + RXD -	 T/R + T/R -
Port 2	4 TXD 3 RXD 2 CTS 1 RTS	TXD + TXD - RXD + RXD -	 T/R + T/R -

TXD = Transmit CTS = Clear to Send
RXD = Receive RTS = Request to Send

Table 3. Serial Communication Signals (1200, 1220, 1240)

Refer to Output Setup, Functions 41 and 42 for more details on serial parameters.



'gure 17. 1240 Wiring Overview

Wiring the 1240

Figure 17 presents an overview of 1240 Batch Controller wiring.

Follow 1200/1220 wiring instructions for Sensor Input Channels (page 14), AC power (page 17), 4-20 mA Output Option (page 18), and Serial Output Option (pages 19 - 20).

NOTE

The 1240 I/O assembly has its own AC power connection, and may be board only or box.

1240-L Local Control

15	OUTPUT
14	OUTPUT
13	OUTPUT
12	OUTPUT
11	OUTPUT
10	OUTPUT
9	OUTPUT
8	OUTPUT
7	OUTPUT
6	OUTPUT
5	OUTPUT
4	OUTPUT
3	OUTPUT
2	OUTPUT
1	OUTPUT
0	OUTPUT

optional for feed controls, setpoints, or alarm

main feed, slow feed, setpoints or alarm

Wiring: 1240 Batcher and Feed Controls to I/O Box
Relays inputs and outputs are used to operate material feed valves. Solid-state relay modules that match required line voltages (specified at the time of the order) have been assigned and installed in the I/O at the factory.

NOTE
The relays may also be used to operate tolerance alarms or individual setpoints. See Equipment Setup, Functions 35 and 51-55.

The batcher provides only dry contact outputs. External power sources are required to operate valves, alarms, or indicator lamps. Be sure to choose external switching relays and connection cable suitable for the application. Installation should follow standard industrial practices with adherence to all local codes.

Figure 18 shows input and output assignments for the 1240 Local and Remote Models.

1240-R Remote Control

15	INPUT
14	INPUT
13	OUTPUT
12	OUTPUT
11	OUTPUT
10	INPUT
9	INPUT
8	INPUT
7	OUTPUT
6	OUTPUT
5	OUTPUT
4	OUTPUT
3	OUTPUT
2	OUTPUT
1	OUTPUT
0	OUTPUT

START/STOP/CANCEL

BATCH STATUS/ERROR

STEP COMPLETE

FORMULA SELECT

main feed, slow feed, setpoints or alarm

Figure 18. 1240: Input/Output Usage Tables

To connect the relays:

1 Begin by routing the interconnect cable (Beldon #9730 or equivalent) cable from Serial Port 2 in the Batch Controller to the I/O box or board. Match and connect as shown in Figure 19.

2 Connect the control cable to the feed valves (or other devices). Refer to Figure 19 for typical wiring of input and output relays. See Appendix B for PLC state diagrams. For simple operator push-button type input, see Figure 13, page 16.

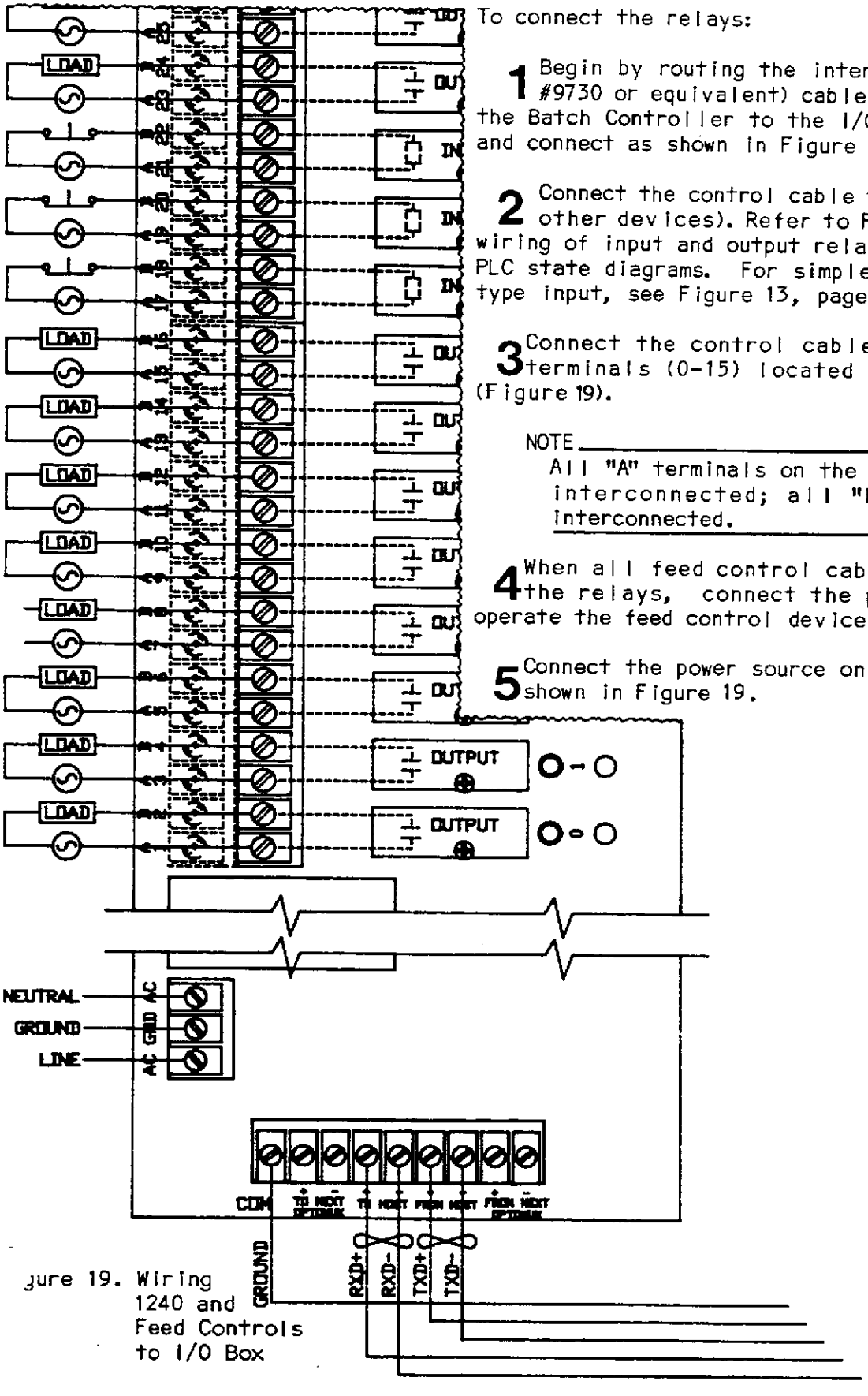
3 Connect the control cable wires to the relay terminals (0-15) located in the I/O board/box (Figure 19).

NOTE

All "A" terminals on the 1240 I/O board are interconnected; all "B" terminals are interconnected.

4 When all feed control cables are connected to the relays, connect the power source used to operate the feed control devices.

5 Connect the power source on the I/O board/box as shown in Figure 19.



gure 19. Wiring 1240 and Feed Controls to I/O Box

Equipment Setup

Introduction

Once the batcher has been installed, Equipment Setup and Calibration must be performed before any operation of the batcher system can begin.

Equipment Setup tailors the batcher's operating characteristics to the user's batching system. Setup is performed: 1) upon initial installation of the controller into a batching system, and 2) whenever the requirements of the user's batching system change.

Front Panel Keys

Setup functions are initiated and controlled by means of the keypad (Figure 20). In the Setup procedures that follow, the keys are called out as necessary, using the names as they appear on the keys.

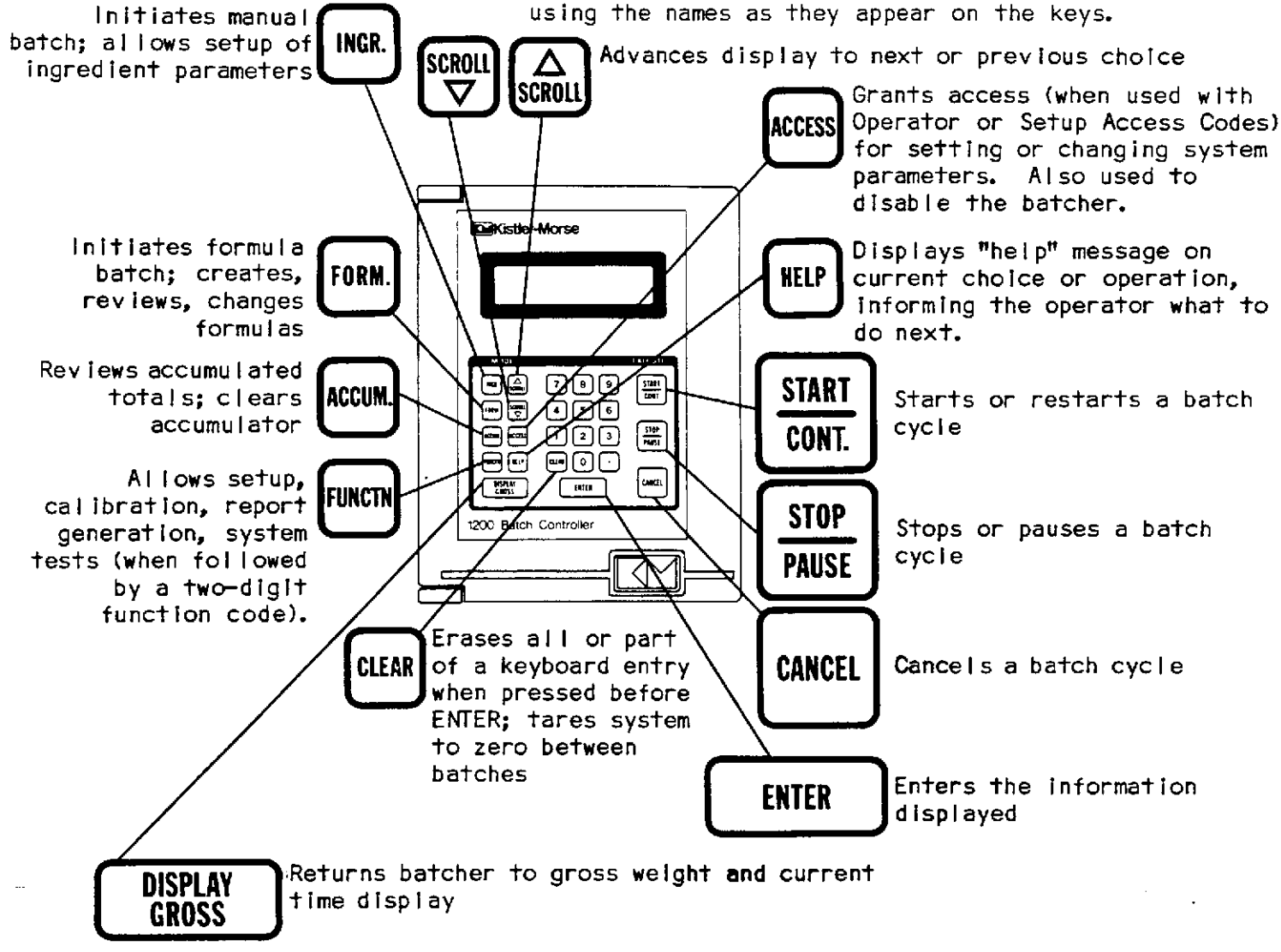


Figure 20. Batch Controller Keypad

FUNCTION MENU

10 **ACCESS CONTROL**
11 Disable Batcher
12 Operator Access Code
13 Setup Access Code

20 **INSTRUMENT SETUP**
21 Time and Date
22 Units of Measure
23 Display Format
24 Scale Averaging
25 Maximum Scale Capacity
26 Number of Sensor Inputs
27 Balance Coefficient
28 Auto Preact Adjust
29 Fast Start Batch

30 **SYSTEM SETUP**
31 Zero Tolerance
32 Settling Time
33 Batch Direction
34 Control Location
35 Horn Alarm
36 Configuration Number
37 Remote Mode Access
38 Remote Formula Select

40 **OUTPUT SETUP**
41 Serial Port 1
42 Serial Port 2
43 Current Transmitter
44 Handshake Mode
45 Remote Display

50 **SETPOINT SETUP**
51 Setpoint 1 Setup
52 Setpoint 2 Setup
53 Setpoint 3 Setup
54 Setpoint 4 Setup
55 Setpoint 5 Setup

60 **REPORT SELECTION**
(Management Report Option)
61 Audit Trail
62 Accumulator Report
63 Setup Report
64 Formula Report
65 Ingredient Report
66 Setpoint Report
67 Print All Reports
68 Set Tabulation

80 **CALIBRATION**
81 Calibrate Span
82 Calibrate Offset
83 Manual Calibrate
84 Zero Tare

90 **SYSTEM TESTS**
91 Keyboard Test
92 Current Transmitter Test
93 Relay Exerciser
94 Sensor Voltmeter
95 Sensor Raw Data
96 Display Test
98 UART 1 Test (Serial Port 1)
99 UART 2 Test (Serial Port 2)

Figure 21. Function Menu

Setup Methods

During Equipment Setup, the operator enters pertinent information about the particular batching system. With the FUNCTN key, and the Setup Access Code (factory shipped as 0), the operator can perform most functions listed in Figure 21.

There are two methods for setting up or changing function parameters. Use the Initial Setup Method when performing Equipment Setup (installation) of the Batch Controller in a batching system. Once the system is up and running, use the Single Selection Setup Method to change individual parameters quickly and easily.

Initial Setup Method

During Initial Setup, parameters for batcher functions Figure 21 are selected one after the other. Using the Initial Setup Method, each function in the group is linked together ("CHAINED"). For example, Functions 31-35 are all in the 30s function group. Within the group, SCROLL or ENTER allows selection of one function after another without entering the next function number. Once the Setup Access Code (required for any parameter change) is entered for a group of functions, it need not be entered until a new function group is selected.

NOTE
This same selection method applies to all but the 90s function group.

To use the Initial Setup Method to change a group of functions:

Press	**Display Reads**
FUNCTN + SCROLL + ENTER	(desired group name) -CHAINED (group #)
ENTER + ENTER	(first function) (first parameter)
ACCESS + Setup Access Code + ENTER + Key in desired parameter(s)	
or SCROLL	(desired parameter)
ENTER	(completes change)

(Repeat for each function in the group as necessary.
Press DISPLAY/GROSS to exit.)

DISPLAY GROSS	GROSS WEIGHT CURRENT TIME

Single Selection Setup Method

To change a single setup parameter, press FUNCTN + the two-digit code for that function. For example, to change the displayed units of measure, press FUNCTN + 22. This eliminates scrolling through the Time and Date function (21) to access the Units of Measure function (22).

To change an individual parameter:

Press **Display Reads**

FUNCTN + 2 digit code (Figure 21, page 26) + ENTER ——— (desired function name)

ACCESS + Setup Access Code + ENTER + SCROLL or Key in desired parameter(s) ——— (desired parameter)

ENTER or ENTER + DISPLAY GROSS ——— GROSS WEIGHT / CURRENT TIME

NOTE

Read through all the setup procedures to gain an understanding of each function and setup requirements.

Setup Procedures

Setup of the Batch Controller involves:

- Applying AC Power
- Instrument Setup
- System Setup
- Output Setup
- Setpoint Setup
- Access Control Setup

Instrument Setup procedures may be performed in any order. However, the following order is recommended and can be used, along with Appendix C (pages 111 - 114), as a checklist. This will ensure that each function is performed.

NOTE
Some parameters may have been pre-programmed before shipment.

Helpful Hints

- Flashing ">" Indicates that a change can be made.
- Stationary ">" Indicates that an Access Code (Operator or Setup) is required before any change can be made.
- Press and hold HELP for guidance messages.
- If you make a mistake while entering information, press CLEAR to start over.
- SCROLL means you can press either SCROLL △ or SCROLL ▽.

Keep a record of current access codes and all values entered during Setup and Calibration. Forms for each section are provided for your convenience (Appendix C). If Management Report Option is available, use Function 67: Print All Reports to produce a list of previously entered parameters. If calibration parameters are lost for any reason, then original calibration values may be reentered using Function 83: Manual Calibration.

Applying AC Power
Once the batcher has been completely installed, AC power must be applied to the unit.

CAUTION
Before power up, verify that AC ground is connected. (If AC ground is not connected, damage to the circuitry may result).

To apply AC power:

	Display Reads
Apply AC power to the unit.	SELF TEST IN PROGRESS
then	BATCHER DISABLED ACCESS CODE>

Press

ACCESS + Setup Access Code (shipped as 0) + ENTER

...If setup has already been performed

GROSS WEIGHT
CURRENT TIME

...If setup has not yet been performed

GROSS INDETER
TIME hh:mm

(indicating the system has not been calibrated, i.e. the amount of material in the weigh vessel cannot yet be determined, and the current time has not been set).

Function Series 20: Instrument Setup

Instrument Setup involves:

- Function 21: Time and Date
- Function 22: Units of Measure
- Function 23: Display Format
- Function 24: Scale Averaging
- Function 25: Maximum Scale Capacity
- Function 26: Number of Sensor Inputs
- Function 27: Balance Coefficients (Display Only)
- Function 28: Automatic Preact Adjustment
- Function 29: Fast Start Batch

Detailed procedures for each function are outlined below.

Function 21: Time and Date

The batcher has an internal clock that keeps track of time and date as long as AC power is connected. The time is displayed along with the gross weight of the vessel, while the time and date are used in the displays produced when operating the ACCUMULATOR key (see Operation). The time and date should be set when the unit is first installed into the batching system, and reset whenever AC power is interrupted.

To set the time and date:

Press **Display Reads**

FUNCTN + 21

or

TIME AND DATE
FN21

SCROLL (if this function group is already selected)

ENTER

TIME >hh:mm:ss DATE mm-dd-yy

ACCESS + Setup Access Code + ENTER

+ Key in the hour (0-23) + ENTER

TIME >hh:mm:ss DATE mm-dd-yy

Key in the minutes + ENTER

Repeat until all time and date information has been entered.
After the last entry,

ENTER

GROSS WEIGHT
CURRENT TIME

Function 22: Units of Measure
The batcher will display the following units of measurement: units, pounds, tons, kilograms, gallons, metric tons, liters. Once a unit of measure is chosen, all weight displays will be expressed in this unit. It is the user's responsibility to match the units used during calibration with the units displayed.

To select the unit of measure:

Press	**Display Reads**
FUNCTN + 22	
or	
	UNITS OF MEASURE FN22
SCROLL (if this function group is already selected)	
ENTER	UNITS OF MEASURE ARE >
ACCESS + Setup Access Code + ENTER +	
SCROLL	(desired unit)
ENTER	GROSS WEIGHT CURRENT TIME

Function 23: Display Format and Count-By
Measurements can be displayed in any one of six formats which vary according to placement of the decimal point (xxxx00; xxxx0; xxxx; xxx.x; xx.xx; x.xxx).

A count-by factor can also be selected (1, 2, 5,). The count-by factor is the amount by which the display will increase (or decrease) when the gross weight is displayed.

To select the display format and count-by factor:

Press	**Display Reads**
FUNCTN + 23	
or	
	DISPLAY FORMAT FN23
SCROLL (if this function group is already selected)	
ENTER	
	DISPLAY FORMAT SCALE >
ACCESS + Setup Access Code + ENTER +	
SCROLL	
	(desired format)
ENTER	
	CHANGE AFFECT ALL WEIGHT SETUP
(as a reminder that all weight readings are affected by this function)	then
	DISPLAY FORMAT COUNT-BY>
SCROLL	
	(desired count-by amount)
ENTER	
	GROSS WEIGHT CURRENT TIME

Function 24: Scale Averaging
The batcher takes continuous readings of the weigh vessel and provides weight information on a real-time basis. If the gross weight fluctuates rapidly (due to the agitation from mixers, blenders or other equipment), it may be necessary to "filter out" activity in the weigh vessel. Scale averaging should be selected to give a stable gross weight display.

Scale averaging allows the batcher to calculate the vessel weight by averaging the most recent two to nine weight readings taken. Entering 1 disables this feature since the average of one reading is the reading itself. Entering 2 causes two running readings to be averaged; 3, three readings, etc.

NOTE
Only the most severe vessel instability will require 9 readings.

To select the scale averaging factor:

Press	**Display Reads**
FUNCTN + 24	
or	
	SCALE AVERAGING FN24
SCROLL (if this function group is already selected)	
ENTER	
	SCALE AVERAGING FACTOR IS >
ACCESS + Setup Access Code + ENTER +	
Key in desired averaging factor (1-9) + ENTER	
	GROSS WEIGHT CURRENT TIME

Function 25: Maximum Scale Capacity
A maximum safe capacity amount must be entered to prevent overfill of the weigh vessel. This ensures that the maximum amount is never exceeded when batching into the vessel. For example, if the vessel safely holds 10,000 pounds, and this amount is entered into the batcher, it will:

a. shutdown any batching operation if the weight vessel reaches this amount;

b. check to make sure that a newly created formula will not exceed the capacity of the weigh vessel before batching begins.

To enter the maximum scale capacity:

Press	**Display Reads**
FUNCTN + 25	
or	
	MAX. SCALE CAP. FN25
SCROLL (if this function group is already selected)	
ENTER	
	MAX SCALE CAP IS >
ACCESS + Setup Access Code + ENTER +	
Key in maximum scale capacity + ENTER	
	GROSS WEIGHT CURRENT TIME

Function 26: Number of Sensor Inputs
The batcher may be operated in a balanced-leg arrangement, where sensors are connected to up to four sensor input channels. When configured in this way, the batcher inspects and equalizes sensor inputs, providing precise sensor balancing to compensate for any shifting in the center of gravity.

To operate the batcher with multiple sensor input channels, the number of channels used must be designated. If an incorrect number of channels is specified, the batcher will operate at less than optimum accuracy.

To determine how many sensor channels are used on your batching system, refer to "Wiring Procedures" (Figure 9) in the Hardware Installation section of this manual. You can also look inside the Batch Controller box (lower left) to verify the correct number of sensor channels connected.

To enter the number of sensor input channels used:

Press	**Display Reads**
FUNCTN + 26	
or	
	NO. SENSOR INPUTS FN26
SCROLL (if this function group is already selected)	
ENTER	
	NO. SENSOR INPUTS PRESENTLY IS >
ACCESS + Setup Access Code + ENTER +	
Key in # of sensor input channels connected (1 to 4) + ENTER	
	GROSS WEIGHT CURRENT TIME

Function 27: Balance Coefficients (Display Only)
Balance coefficients are used in the weighted average computation of the vessel weight. Calibration automatically sets up the balance coefficient. With the balanced-leg feature, a coefficient other than 1.00 may be assigned after calibration. This compensates for "as installed" sensor output variations.

To review the coefficient of each sensor:

Press	**Display Reads**
FUNCTN + 27	
or	
	BALANCE COEFF. FN27
SCROLL (if this function group is already selected)	
ENTER	
	BALANCE COEFF. CHANNEL NO.1 >

ACCESS + Setup Access Code + ENTER

Continue to press ENTER to reveal each coefficient.

DISPLAY GROSS	
	GROSS WEIGHT CURRENT TIME

NOTE

Balance coefficients can only be reviewed; they cannot be changed in Function 27. Before system calibration, the balance coefficient will be displayed as BALANCE COEFF. CHANNEL NO.1> 0. This indicates that system calibration is required.

Function 28: Automatic Preact Adjustment
Preact is the amount of "in-flight" material that continues to enter the weigh vessel after the associated feed valve is closed. Following each batch, the Batch Controller automatically adjusts the preact amount for the next batch. Preact weights can be set for individual ingredients (see Ingredient Setup). This "Automatic Preact Adjustment" feature increases batch accuracy and reduces batching time.

Function 28 allows selection of preact correction amount, expressed in one-eights of the current preact weight. Selection of 1 (8/8) causes the batcher to correct the next batch by the full amount of the preact weight of the previous batch; 1/2 corrects by half the weight of the previous batch, etc. Choosing 0 (zero) adjustment means no correction will be made.

To select the automatic preact adjustment factor:

Press	**Display Reads**
FUNCTN + 28	
or	
	AUTO PREACT ADJ FN28
SCROLL (if this function group is already selected)	
ENTER	
	AUTO PREACT ADJ IS PRESENTLY >
ACCESS + Setup Access Code + ENTER +	
SCROLL	
	(desired factor)
ENTER	
	GROSS WEIGHT CURRENT TIME

Function 29: Fast Start Batch
To repeat the previous batch during Operation, a "Fast Start" option can be selected. Instead of specifying the formula number, the operator can press START/CONTINUE only to batch the same formula again. Fast Start is ideal for repetitive batching tasks.

To set the Fast Start Batch function:

Press	**Display Reads**
FUNCTN + 29	
or	
	FAST START FN29
SCROLL (if this function group is already selected)	
ENTER	
	FAST START > ON/OFF
ACCESS + Setup Access Code + ENTER +	
SCROLL	
	(ON or OFF)
ENTER	
	GROSS WEIGHT CURRENT TIME

Function Series 30: System Setup

System Setup involves:

- Function 31: Zero Tolerance
- Function 32: Settling Time
- Function 33: Batch Direction
- Function 34: Control Location (Remote Models Only)
- Function 35: Horn Alarm Relay
- Function 36: Configuration Number (Display Only)
- Function 37: Remote Mode Access (Remote Models Only)
- Function 38: Remote Formula Select (1240 Model Only)

Detailed procedures for each function are outlined below.

Function 31: Zero Tolerance

The Batch Controller is an accurate weight-measuring instrument that detects even small amounts of material in the weigh vessel or on the scale. In most batching systems, it is impractical to empty the weigh vessel completely after each batch. Often, some material remains stuck to the walls of the vessel, and could contaminate the batch that follows. The batcher detects any remaining amount of material, providing a quality assurance check prior to the next batch operation.

Setting the zero tolerance allows the batcher to tolerate some amount of material in the vessel at the beginning of the batch operation, and still consider it empty or at the zero level. Zero tolerance (the allowable amount) lets the batcher proceed with the next operation with up to the specified amount of material in the vessel.

To set the zero tolerance:

Press	**Display Reads**
FUNCTN + 31	
or	
	ZERO TOLERANCE FN31
SCROLL (if this function group is already selected)	
ENTER	
	ZERO TOLERANCE SET AT >
ACCESS + Setup Access Code + ENTER +	
Key in desired zero tolerance amount + ENTER	
	GROSS WEIGHT CURRENT TIME

Function 32: Settling Time

During a batching operation, the main and slow feed valves are closed when the amount of ingredient in the weigh vessel is within the specified tolerance. After the valves are closed, there is a period of time before the batcher takes any further action. Expressed in seconds, this "settling time" allows for any movement of the vessel to subside, and any final amounts of ingredient to flow into the vessel.

When the settling time is up, the batcher checks the final weight and tolerances. If the final weight is under tolerance, the batcher initiates the "jog" action to bring the batch into close tolerance. The settling time occurs between each "jog" action.

To enter the settling time (i.e. number of seconds):

Press	**Display Reads**
FUNCTN + 32	
or	
	SETTLING TIME FN32
SCROLL (if this function group is already selected)	
ENTER	
	SETTLING TIME SET AT >
ACCESS + Setup Access Code + ENTER +	
Key in desired settling time (in seconds) + ENTER	
	GROSS WEIGHT CURRENT TIME

Function 33: Batch Direction

The Batch Controller can be installed in batching systems that receive material into the weigh vessel (in-direction), or dispense material out of the weigh vessel (out-direction). The batch direction must be set so that the batcher can operate with either an increasing (in-direction) or decreasing (out-direction) amount of weight.

To select the batch direction:

Press	**Display Reads**
FUNCTN + 33	
or	
	BATCH DIRECTION FN33
SCROLL (if this function group is already selected)	
ENTER	BATCH DIRECTION PRESENTLY IS >
ACCESS + Setup Access Code + ENTER +	
SCROLL	(desired direction)
ENTER	GROSS WEIGHT CURRENT TIME

Function 34: Control Location (Remote Models Only)
The Batch Controller can be controlled locally by means of the keypad, or by some remote control device (e.g. remote switch, computer, or programmable controller).

If your system includes a Remote Model Batch Controller, the control location can be changed (with Function 34) from remote to local and from local to remote. When the batcher is set to the remote control mode, the Batch Controller keypad is limited.

To set or change the control location:

Press	**Display Reads**
FUNCTN + 34	
or	
	CONTROL LOCATION FN34
SCROLL (if this function group is already selected)	
ENTER	
	CONTROL LOCATION IS FROM > Local/Remote
ACCESS + Setup Access Code + ENTER +	
SCROLL (to choose Local or Remote)	
	CONTROL LOCATION IS FROM > Local/Remote
ENTER	
	GROSS WEIGHT CURRENT TIME

Function 35: Horn Alarm Relay
Under alarm conditions (during zero tolerance, batch tolerance, or minimum flow rate errors, ingredient (step) or batch completion, etc.), the batcher can be configured to operate an internal relay. The relay provides contact closures for use by external alarm equipment. If a visible or audible alarm is connected to the batcher, the relay contact # must be specified. Selecting 0 (zero) means no alarm.

To enter the alarm relay number:

Press	**Display Reads**
FUNCTN + 35	
or	
	HORN ALARM FN35
SCROLL (if this function group is already selected)	
ENTER	
	HORN ALARM RELAY NUMBER >
ACCESS + Setup Access Code + ENTER +	
Key in number of relay specified + ENTER	
	GROSS WEIGHT CURRENT TIME

Function 36: Configuration Number (Display Only)
Function 36 identifies the software version (Configuration Number) of your system. This function is for **display only.** Press FUNCTN + 36 + ENTER to reveal/view the Configuration Number.

Function 37: Remote Mode Access (Remote Models Only)
When "Remote" is selected as the Control Location (see Function 34), the operator can choose between Remote Locked Access and Remote Unlocked Access.

In the Remote Locked (restrictive) Mode, the system is protected. Only STOP/PAUSE and START (which enables the remote START) are recognized on the local display without an access code. The operator must enter the access code in order to gain control of the system (locally) for changing formulas, cancelling batches, etc.

In the Remote Unlocked (nonrestrictive) Mode, local intervention is allowed without an access code. The operator can override remote operation by locally stopping or cancelling a batch (STOP/PAUSE, CANCEL), or selecting a different formula (FORM).

To choose the Remote Mode Access:

Press	**Display Reads**
FUNCTN + 37	
or	
	REMOTE MODE ACCESS FN37
SCROLL (if this function group is already selected)	
ENTER	
	RMT MODE ACCESS SET TO > Locked/Unlocked
ACCESS + Setup Access Code + ENTER	
SCROLL (Locked or Unlocked)	
	RMT MODE ACCESS SET TO > Locked/Unlocked
ENTER	
	GROSS WEIGHT CURRENT TIME

Function 38: Remote Formula Select (1240 Remote Only)
With the 1240 Batch Controller's control location set to Remote, the operator can choose between Remote Formula Select ON and Remote Formula Select OFF. With Formula Select ON, up to three relays are dedicated to selected formulas 1 to 8 using external switch, programmable controller, or computer. The ON/OFF choice affects the number of user assignable relays (8 for Formula Select ON; 11 for Formula Select OFF). See Appendix B, pages 101 - 109.

To choose the Remote Formula Select:

Press	**Display Reads**
FUNCTN + 38	
or	
	REMOTE FORMULA SELECT FN38
SCROLL (if this function group is already selected)	
ENTER	
	REMOTE FORMULA SELECT>
ACCESS + Setup Access Code + ENTER	
SCROLL (On or Off)	
	REMOTE FORMULA SELECT >
ENTER	
	GROSS WEIGHT CURRENT TIME

Functions Series 40: Output Setup

Output Setup involves:

- Function 41: Serial Port 1
- Function 42: Serial Port 2
- Function 43: Current Transmitter
- Function 44: Handshake Mode
- Function 45: Remote Display

Detailed procedures for each function are outlined below.

Functions 41 and 42: Serial Ports

The batcher may be equipped with optional RS232C, RS422, or RS485 serial ports (two maximum). The hardware jumpers are configurable. The ports (channels) must be set to the protocol of the external equipment.

If your system includes the Management Report Option and Kistler-Morse printer, the serial port parameters will have been pre-programmed. If a different printer is used, you will need to enter communication protocol information (see MRO Manual, Figure 2, page 2).

To set up serial ports (channels) #1 and #2:

Press	Display Reads
FUNCTN + 41/42	
or	
	SERIAL PORT FN41/42
SCROLL (if this function group is already selected)	
ENTER	
	SERIAL PORT BAUD RATE >
ACCESS + Setup Access Code + ENTER +	
SCROLL	
	(desired baud rate)
ENTER	
	SERIAL PORT PARITY IS >
SCROLL	
	(desired parity)
ENTER	
	SERIAL PORT STOP BITS >
SCROLL	
	(desired stop bit)
ENTER	
	SERIAL PORT WORDLENGTH >
SCROLL	
	(desired wordlength)
ENTER	
	GROSS WEIGHT CURRENT TIME

Function 43: 4-20 mA Current Transmitter Option

The 4-20 mA current transmitter is a 12-bit digital to analog converter which converts gross weight values into a 4-20 mA analog output. If the batcher is equipped with a 4-20 mA analog output option, the output current range must be set to a range of vessel weight values. The 4-20 mA outputs are typically set at 0 and the maximum respectively -- but can be set as close as 400 units apart.

NOTE
The smaller the weight span used to control the analog output over its full range, the higher the resolution.

To set the analog output current:

Press	**Display Reads**
FUNCTN + 43	
or	
	CURRENT TX FN43
SCROLL (if this function group is already selected)	
ENTER	
	CURRENT TX 4MA AT >
ACCESS + Setup Access Code + ENTER +	
Key in amount of material equal to the 4 mA output (typically 0) + ENTER	
	CURRENT TX 20MA AT >
Key in amount of material equal to the 20 mA output (typically maximum weight) + ENTER	
	GROSS WEIGHT CURRENT TIME

Function 44: Handshake Mode

Handshaking refers to the communication protocol between the batcher and the optional remote equipment that establishes and maintains the orderly transfer of data over the communications link. The handshake mode selected (ON/OFF ONLY, MODEM, BOTH) on the batcher must match that of the remote equipment in order for proper communications to take place.

To select the handshake mode:

Press	**Display Reads**
FUNCTN + 44	
or	
	HANDSHAKE MODE FN44
SCROLL (if this function group is already selected)	
ENTER	
	HANDSHAKE MODE >
SCROLL	
	(desired mode)
ENTER	
	GROSS WEIGHT CURRENT TIME

Function 45: Remote Display Option
This feature allows the Batch Controller to display the ingredient net, formula net, or gross weight on a remote display. With Function 45, the operator selects which weight will be displayed. If the Remote Display option is unavailable, Function 45 should be set to "disabled."

To select the remote weight display:

Press	**Display Reads**
FUNCTN + 45	
or	
	REMOTE DISPLAY FN45
SCROLL (if this function group is already selected)	
ENTER	
	REMOTE DISPLAY DISABLED >
ACCESS + Setup Access Code + ENTER +	
SCROLL (to choose ingredient net, formula net, scale gross)	
	(desired weight display)
ENTER	
	GROSS WEIGHT CURRENT TIME

Function Series 50: Setpoint Setup

The Batch Controller allows setup of individual setpoints. Setpoints are used to indicate critical levels in the vessel. When material is added to or removed from the weigh vessel so that it reaches a setpoint, the relay designated in the procedure changes state.

For each setpoint, the operator indicates which relay has been assigned (by number), "point relativity" (Above, Below, Never, Always), and the setpoint gross and deadband amounts. The unit of measure used to establish the setpoints is set with Function 22. Begin with Function 51, and continue until all setpoints are assigned. The number of setpoints depends on the relays available.

To establish a setpoint (Functions 51-55):

Press **Display Reads**

FUNCTN + 51

or

SETPOINT 1
FN51

SCROLL (if this function group is already selected)

ENTER

SETPOINT 1 OFF
RELAY NUMBER >00

(OFF is the current state of the alarm relay and 00 is the default relay number used to establish no setpoints.)

ACCESS + Setup Access Code + ENTER +

Key in relay # + ENTER

SETPOINT 1 OFF
RELAY NO. >

SCROLL to view choices: ABOVE, BELOW, NEVER, ALWAYS.

(This is the point relative to the setpoint when the relay operates. For example, use ABOVE when material is being added to the vessel in order to achieve the setpoint; BELOW when material is being removed, etc.). When your choice appears,

Functions 51-55, continued

Press	**Display Reads**
ENTER	SETPOINT 1 OFF GR AMT >

(The amount of material in the weigh vessel that represents the setpoint. When the material amount reaches this level, the designated relay will operate.)

Key in desired setpoint amount + ENTER	SETPOINT 1 OFF D BAND >

Deadband prevents relay oscillation due to the effects of preact, or "chattering" in the event the setpoint is reached but is unstable due to weight shifting, vibration, etc. For example, if the setpoint is 10,000 with a deadband of 10, then the alarm would operate at 10,000 and would stay on even if the material amount in the vessel reached 10,010 or dropped to 9,990.

Key in deadband amount + ENTER	SETPOINT 1 OFF RELAY NUMBER >
DISPLAY GROSS	GROSS WEIGHT CURRENT TIME

Repeat these procedures for each setpoint.

Functions 11-13: Access Control Setup

Both the Operator and Setup Access Codes are factory shipped as 0. Once installation, equipment setup, and calibration have been performed, access codes may be changed for security. The access codes, or passwords, are 1 to 4 digit numbers.

The Operator Access Code is required to enable and disable the batching operations (see Operation.) The Setup Access Code prevents unauthorized changes to system parameters and is required before any such change can be made.

Operator Access Code

To establish or change an Operator Access Code:

Press	**Display Reads**
FUNCTN + 12	
or	
	OPER ACCESS CODE FN12
SCROLL (if this function group is already selected)	
ENTER	OPER ACCESS CODE VALUE IS>
ACCESS + Setup Access Code + ENTER + ENTER	(old code)
Key in New Operator Access Code (1-4 digits) + ENTER	GROSS WEIGHT CURRENT TIME

NOTE
The Operator Access Code can only be changed with the Setup Access Code.

Setup Access Code

To establish or change a Setup Access Code:

Press	Display Reads
FUNCTN + 13	
or	
	SETUP ACCESS CODE FN13
SCROLL (if this function group is already selected)	
ENTER	
	SETUP ACCESS CODE VALUE IS >
ACCESS + Current Setup Access Code + ENTER + ENTER	
	(old code)
Key in New Setup Access Code (1-4 digits) + ENTER	
	GROSS WEIGHT CURRENT TIME

NOTE

Be sure to record the new Setup Access Code and put it in a safe place. Changes to the system cannot be made without it. If you lose it, call Kistler-Morse Service.

Function Series 80: System Calibration
Once Equipment Setup is completed, the batch controller must be calibrated to the particular vessel (or scale) to achieve accurate weight measurements.

NOTE
Vessel maximum capacity, display units, and number of sensor inputs must be established before calibration.

Calibration involves:

- **Function 81: Set Span**
  Adjusting the input sensitivity so that changes in vessel contents result in corresponding changes in the quantity displayed. This allows the batcher to calculate weight changes over the entire range of the weigh sensors coupled to the batcher input(s). The more ingredient moved into or out of the weigh vessel for calibration purposes, the more accurate the calibration since the weigh sensors will be used over a greater portion of their operating range during calibration.

- **Function 82: Set Offset**
  Entering the amount of material in the weigh vessel so that accurate weight information can be displayed when material is added to or removed from the vessel. The actual (or estimated) contents of the vessel (by weight, unit, volume) must be entered into the batcher.

Using this method, the batcher is informed of how a specific change in weigh vessel content appears to its sensor input(s), and also how a known amount of ingredient appears. From this information, the batcher calculates a given amount of material placed in the vessel.

Calibration is completed by:

- **Function 83: Manual Calibration**
  Reviewing and recording the raw weight values (for both span and offset) provided by the sensors at the batcher inputs and the equivalent weight values calculated and displayed by the batcher.

A record of these weight values is invaluable in case they are lost (due to system or memory failure) and need to be re-entered into the batcher. Re-entering the values manually eliminates the need to move potentially costly material into or out of the weigh vessel for recalibration. Be sure to keep the recorded values in a safe place.

CAUTION
Failure to properly calibrate the batcher to a particular weigh vessel causes incorrect gross weight amounts.

NOTE
Where possible, perform Function 82: Calibrate Offset first. Then return to calibrate Span (Function 81).

Function 81: Set Span (Batcher Input Sensitivity)
This step of calibration establishes the batcher input sensitivity. This makes a known change in the vessel weight correspond to the sensor values and weight indication on the display.

To set the span:

Press	**Display Reads**
FUNCTN + 81	
or	
	CALIBRATE SPAN FN81
SCROLL (if this function group is already selected)	
ENTER	CALIBRATE SPAN BY/ADD/REMOVE WT
ACCESS + Setup Access Code + ENTER +	
SCROLL (choose ADD or REMOVE WEIGHT) + ENTER	ADD/REMOVE MATERIAL AND PRESS ENTER
(Add or remove a known amount of material.)	
ENTER + Key-in amount of material added or removed	TOTAL ADDED/REMOVED WEIGHT >
ENTER	GROSS WEIGHT SCALE SPAN SET
	then GROSS WEIGHT CURRENT TIME

Function 82: Set Offset

Calibrating the offset means to enter the actual weight of the vessel contents (to separate the weight of the contents from the weight of the vessel). The present gross weight in the weigh vessel must be determined before calibrating the offset.

To set the offset:

Press	**Display Reads**
FUNCTN + 82	
or	
	CALIBRATE OFFSET FN82
SCROLL (if this function group is already selected)	
ENTER	
	GROSS WEIGHT ACTUAL >
ACCESS + Setup Access Code + ENTER +	
Key-in actual weight of material in vessel + ENTER	
	GROSS SCALE OFFSET SET
then	
	GROSS WEIGHT CURRENT TIME

Function 83: Manual Calibration
Function 83 provides a means of obtaining raw calibration data from the batcher. This data can be re-entered if calibration parameters are lost for any reason. Manual calibration using valid calibration data eliminates the need to move material into or out of the vessel for recalibration purposes.

Transfer the calibration data obtained from Function 83 to the form provided in Appendix C, page 113. If the Management Report Option is included in your system, use FUNCTION 63: Print Setup Report to list the calibration information.

To obtain the calibration data:

1 **Press**
FUNCTN + 83

or

SCROLL (if this function group is already selected)

Display Reads
MANUAL CALIBRATE
FN83

2 ENTER

MANUAL SPAN RAW VALUE CH 1>

Raw data units from the sensors to channel one input are displayed.

...If the batcher is configured as a single-channel sensor system, go to step 4.

...If the batcher is a multi-channel input system, continue:

3 SCROLL

MANUAL SPAN RAW VALUE CH 2>

then

MANUAL SPAN RAW VALUE CH 3>

then

MANUAL SPAN RAW VALUE CH 4>

(Make a note of the value for each channel.)

Function 83: Manual Calibration, continued

4 Press SCROLL

Display Reads

SPAN WT VALUE
ACTUAL >

(Make a note of the actual span weight value.)

5 SCROLL

MANUAL OFFSET RAW VALUE CH 1>

Raw data units from the sensors to channel one input are displayed.

...If the batcher is configured as a single-channel sensor system, go to step 7.

...If the batcher is a multi-channel system, continue:

6 SCROLL

MANUAL OFFSET RAW VALUE CH 2>

then

MANUAL OFFSET RAW VALUE CH 3>

then

MANUAL OFFSET RAW VALUE CH 4>

(Make a note of the value for each channel.)

7 SCROLL

OFFSET WT VALUE
ACTUAL >

(Make a note of the actual offset weight value.)

8 DISPLAY GROSS

GROSS WEIGHT
CURRENT TIME

Function 84: Zero Tare

"Taring" the batcher system to zero can improve the accuracy of subsequent measurements by zeroing build-up in the vessel. If Function 84 is set to ON, it provides a means of manually correcting the offset parameter (and thereby updates Function 83). Zero Tare (once it is set to ON) can be performed any time after batching is complete (i.e. between batches). See **Operation** for zero taring procedures.

NOTE

Function 84 is shipped in the OFF position. If Zero Tare is not required, simply leave it OFF.

To set the Zero Tare feature:

Press	**Display Reads**
FUNCTN + 84	
or	
	ZERO TARE FN84
SCROLL (if this function group is already selected)	
ENTER	ZERO TARE FUNCTION IS > ON/OFF
ACCESS + Setup Access Code + ENTER +	
SCROLL (to select ON or OFF) +	ZERO TARE
ENTER	FUNCTION IS > ON/OFF
IF set to OFF...	GROSS WEIGHT CURRENT TIME
IF set to ON...	ZERO TARE LIMIT >
Key in zero tare limit (amount in weight units) + ENTER	GROSS WEIGHT CURRENT TIME

Operation

Introduction
This section contains information on operating procedures for Kistler-Morse Batch Controllers. For detailed information on REMOTE Batching, see Appendix B, pages 93 - 109. A summary of LOCAL operating procedures is found at the end of this section, page 80.

NOTE
Before attempting to operate the batcher, be sure to complete all Installation, Equipment Setup, and Calibration procedures.

Operation involves:

- Ingredient Setup
- Formula Setup
- Batching

  Automatic or Manual Operation (Local)
  Repeat the Previous Batch
  Stop/Cancel a Batch
  Zero Tare
  Remote Batching Mode (Locked or Unlocked Access)

- Displaying and Clearing Accumulated Totals
- Printing Reports

All local batching operations are initiated and controlled by means of the keypad (See Figure 20, page 25).

Enable the Batcher
When the batcher has been disabled, it must be enabled before any further batcher operations can be initiated.

To enable the batcher:

Press	**Display Reads**
Key in Operator or Setup Access Code + ENTER	GROSS WEIGHT CURRENT TIME

The weight of the material presently in the weigh vessel is expressed in the selected units of measure -- determined during Equipment Setup. Current time is displayed in hours and minutes.

If an incorrect access code is entered ...

BATCHER DISABLED
INVALID CODE

Function 11: Disable the Batcher

To prevent unauthorized operation of the batcher, the operator can disable the batcher. To do so, the Operator or Setup Access Code is required.

To disable the batcher:

Press	Display Reads
FUNCTN + 11	
or	
	DISABLE BATCHER FN11
SCROLL (if this function group is already selected)	
ENTER	
	DISABLE BATCHER ACCESS CODE >
Key in Operator or Setup Access Code + ENTER	
	BATCHER DISABLED ACCESS CODE >

Ingredient Setup
Ingredient Setup must be performed before any batcher operation can begin. Kistler-Morse batchers provide individually-controlled relay outputs to control the batching process. See "Comparison of Features" for product distinctions (Equipment Description, page 6).

For the 1220 and 1240: If alarms, setpoints, or slow feed valves are used in the system, then the maximum number of assignable ingredients will be reduced accordingly. See Appendix A, pages 89 - 91, for Input/Output Usage Tables.

Any conflicts in relay assignment will be reported before batching begins with the message "RELAY ASSIGNMENT IN CONFLICT." Batching cannot continue until the assignment is corrected.

Ingredient Setup involves assigning the following parameters for each ingredient:

- Ingredient #
  - Main Feed
    - Relay #
    - Minimum Flow Rate
    - Rate Alarm Delay
    - Rate Alarm (Pause/Continue)
  - Slow Feed
    - Used/Not Used
    - Relay #
    - Minimum Flow Rate
    - Rate Alarm Delay
    - Rate Alarm (Pause/Continue)
    - Simultaneous/Consecutive
  - Preact
    - Amount
    - Minimum Limit
    - Maximum Limit
  - Jogtime
    - On
    - Off

A convenient form for recording ingredient parameters can be found in Appendix C, page 113.

To set up or change ingredient parameters:

	Press	Display Reads
1	INGR	MANUAL BATCH OF AN INGREDIENT?
2	SCROLL	INGREDIENT SETUP DESIRED?
3	ENTER	DO SETUP FOR INGREDIENT NO.>
4	Key in Ingredient # + ENTER + ACCESS + Setup Access Code + ENTER + Key in Relay #	INGR # MAIN FEED RELAY NUMBER>
5	ENTER	INGR # MAIN FEED MIN FLO>
6	Key in Minimum Flow Rate + ENTER (Entering 0 means the flow rate will be ignored.)	INGR # MAIN FEED RATE ALRM DLY>
7	Key In Rate Alarm Delay (in seconds) + ENTER	INGR # MAIN FEED RATE ALRM> PAUSE
8	SCROLL (Pause/Continue) + ENTER	INGR # SLOW FEED USED/NOT USED
9	SCROLL (Used/Not Used) + ENTER	INGR # SLOW FEED RELAY NUMBER>

If NOT USED, go to step 14 for PREACT.

or

If USED, continue:

Ingredient Setup, continued

	Press	Display Reads
10	Key in Relay # + ENTER	INGR # SLOW FEED MIN FLO>
11	Key in Minimum Flow Rate + ENTER	INGR # SLOW FEED RATE ALARM DLY>
12	Key in Rate Alarm Delay (in seconds) + ENTER	INGR # SLOW FEED RATE ALARM> PAUSE
13	SCROLL (Pause/Continue) + ENTER	INGR # SLOW FEED SIMULT/CONSEC>
14	SCROLL (Simultaneous/Consecutive) + ENTER	INGR # PREACT CURRENT>
15	Key in Preact Amount + ENTER	INGR # PREACT MINIMUM>
16	Key in Minimum Preact + ENTER	INGR # PREACT MAXIMUM>
17	Key in Maximum Preact + ENTER	INGR # JOGTIME MINIMUM ON>
18	Jogtime On + ENTER	INGR # JOGTIME MINIMUM OFF>
19	Jogtime Off + ENTER + DISPLAY GROSS	GROSS WEIGHT CURRENT TIME

This completes setup for a single ingredient. To set up additional ingredients, repeat the preceding steps as necessary for each ingredient. Be sure to keep track of ingredient setups. If your system includes the optional Management Report Option, use FUNCTION 65: INGREDIENT REPORT to list relay assignments and operating parameters (flow rates, preact, jogtimes) for each ingredient.

Formula Setup

The Kistler-Morse Batch Controllers allow setup of nine batch formulas. A batch formula is made up of one or more steps. Each step of the formula controls the batching of a single ingredient into the weigh vessel. Since the 1220 and 1240 Batch Controllers can control up to four and eight ingredients (respectively), a batching step for either of these models can use any of the ingredients.

To create a formula, each step of the batch must be designated by specifying which ingredient is to be added at that point in the batching operation. For example, to batch three ingredients into the weigh vessel, followed by a second batching of the first ingredient, four steps would be required for the formula. For each formula stored in the batch controller, items such as batch amount, slow feed (dribble) amount, etc. must be entered before automatic batching can be performed.

The Setup Access Code is required in order to set up or change batch formulas, and thus prevents unauthorized alteration. Record programmed formulas in Appendix C, page 114.

Automatic Sequencing on all 1220 and 1240 models allows batching of ingredients within a formula without operator intervention. Automatic sequencing can be selected on a "per formula" basis during setup. If the feature is desired, the operator chooses "YES" and then enters the time (in seconds) the Batch Controller waits between the end of batching one ingredient and the automatic sequencing of the next.

All Kistler-Morse Batch Controllers allow the operator to examine previously programmed formulas (ingredients, tolerances, slow feed points, etc.) without entering an access code. SCROLL will display each of the formula steps for examination. To change a displayed step, enter the setup access code and then enter the new value.

NOTE

If an error is made during the entry of any numeric value on the keypad, press CLEAR and re-enter the desired value.

To set up, change, or review a batching formula:

	Press	Display Reads
1	FORM	FORMULA BATCHING DESIRED?
2	SCROLL	FORMULA SETUP DESIRED?
3	ENTER	DO SETUP FOR FORMULA NO.>
4	Key in Formula # (1 to 9) + ENTER	FORMULA # INGREDIENT # >
5	SCROLL (to review formula setup)	(next step of formula)
	or	
	ACCESS + Setup Access Code + ENTER (to set up or change formula)	
6	Key in Ingredient # + ENTER	FO # STP # INGR # NET AMT>
7	Key in Net Amount + ENTER	FO # STP # INGR # TOLERANCE>
8	Key in Tolerance + ENTER	FO# STP # INGR # AUTO SEQUENCE>

NOTE
Automatic Sequencing of ingredients within a formula is available with 1220 and 1240 Batch Controllers.

9	SCROLL (YES/NO)	FO # STP # INGR # AUTOSEQUENCE> Y/N
10	ENTER	
	If yes...	FO # STP # INGR # TIME DEL>
11	Key in # of seconds for time delay + ENTER	FO # STP # INGR # LAST STEP>

Formula Setup, continued

12	**Press**	**Display Reads**
	If yes, ENTER	DO SETUP FOR FORMULA NO.>
	[Go to next formula.]	
	or	
	If no, SCROLL + ENTER	FO # STP # INGR # LAST STEP> NO

[To continue with the next step of current formula, go to step 6.]

13		
	DISPLAY GROSS	GROSS WEIGHT CURRENT TIME

Use the form in Appendix C to record formula setups. If your system includes Management Report Option, use FUNCTION 64: FORMULA REPORT to list all formulas by ingredients, net weights, and tolerances.

Batching Operations

Each Kistler-Morse Batch Controller can store up to nine pre-programmed batch formulas in memory. Once stored, each formula can be recalled for batching operations. Batching begins with step 1 of the formula.

NOTE

In local models, batching can be initiated at a specific step within the formula (i.e. other than step 1). To do this, press the decimal point key after the formula # and then key in the desired starting step #.

Automatic Batching (Local)

To initiate an automatic batching operation:

Press	**Display Reads**
FORM	
	FORMULA BATCHING DESIRED?
ENTER	
	FORMULA TO BE BATCHED IS >?
Key in Formula # to be batched (+ "." + step # to begin at a step other than 1 if in local mode)	
ENTER	
	START KEY REQD TO START BATCH
START CONTINUE	
	...the batching operation begins with step 1 of the formula if no other step was specified.

During operation, the batcher displays the FORMULA #, the STEP #, the GROSS weight of material in the weigh vessel, the INGREDIENT # being batched, and the NET amount of the current ingredient batched so far.

After the first ingredient has been batched:

Display Reads
PRESS START TO CONTINUE BATCH

Press	Display Reads
START CONTINUE (to begin batching of the next ingredient)	

NOTE
On 1220s and 1240s, if AUTO SEQUENCE is enabled, the batcher will pause (# of seconds determined during Ingredient Setup) and then continue automatically with the next step/ingredient of the formula. While in pause, a "DELAY" message is displayed.

When batching of the last ingredient is complete, BATCH COMPLETE

DISPLAY
GROSS — GROSS WEIGHT
CURRENT TIME

Zero Tolerance Errors
Whenever a batching operation is initiated, the batcher examines the weigh vessel to make sure no residue is left from the previous batch. If the amount of material remaining in the vessel (or on the scale) is greater than the zero tolerance amount (selected with FUNCTION 31 during Equipment Setup), the display reads:

```
FORM #  STEP #  GROSS
ZERO TOL ERROR
```

then

```
FORM #  STEP #  GROSS
CONT OR CANCEL
```

If the amount shown in the weigh vessel is unacceptable, press CANCEL.

If the amount shown in the weigh vessel is acceptable, press START/CONTINUE to begin batching. At this point batching begins with step 1 of the formula by enabling the first ingredient to be placed in the weigh vessel.

Repeating the Previous Batch
For repetitive batching (where the formula does not change from one batch to the next), Function 29: Fast Start can be enabled. This means the operator simply presses START/CONT. to repeat the previous batch (without having to specify the formula #).

Stop/Cancel Batcher Operation
The Batch Controller can be stopped at any time during operation.

To stop batcher operations:

Press	**Display Reads**
STOP/PAUSE or CANCEL	FORM # STEP # GROSS ING # BATCH IN PAUSE

At this point, your options are:

Press	**Display Reads**
START CONTINUE (to resume operation from this point)	...batching continues
or	
CANCEL (to cancel the operation)	**CANCEL** ARE YOU SURE?

CANCEL must be pressed twice. The warning "Are you sure?" prevents erroneous key entries from affecting the batch. If CANCEL is pressed twice, the material is directed to the "cancelled batch account" and batching stops.

Taring between Batches
If the taring feature (Function 84) is set to ON, the operator can "zero out" the weigh vessel between batches.

To set Zero Tare:

Press	**Display Reads**
CLEAR	SET ZERO TARE ARE YOU SURE?
CLEAR (if yes) [Press any other key to ignore.]	...Zero Tare is set
then	GROSS WEIGHT CURRENT TIME

Manual Batching

Batching may be performed manually. In the manual mode, the ingredient to be batched is selected by number, the amount to batched is entered via the keypad, and the operation is initiated.

Although referred to as the manual mode, it is not entirely manual, since the batcher automatically stops the batching process when the desired amount of ingredient is present in the weigh vessel. In the case of batching out, the batch is stopped when the selected amount has been removed from the weigh vessel.

To batch a formula manually:

	Press	Display Reads
1	INGR	MANUAL BATCH OF AN INGREDIENT?
2	ENTER	INGREDIENT TO BE BATCHED IS >
3	Key in Ingredient# to batch manually + ENTER	INGREDIENT NO. NET AMOUNT >
4	Key in Net amount to be batched	

If this ingredient is not set up with Slow Feed, go to step 6.

or

If this ingredient is set up with Slow Feed, ENTER

		INGREDIENT NO. SLOW PT >
5	Key in Ingredient # (for slow feed) + Amount of Ingredient (for slow feed) + ENTER	INGREDIENT NO. TOL. >
6	Key in tolerance amount + ENTER	INGREDIENT NO. PRESS START KEY
7	START CONTINUE	...batching operation of the specified ingredient begins.

Manual Batching, continued

When batching of the last ingredient is complete_____

BATCH COMPLETE

then_____

GROSS WEIGHT
CURRENT TIME

Remote Batching

Remote Control capabilities on 1200-R, 1220-R, and 1240-R Kistler-Morse Batch Controllers to be connected to remote control equipment (PLC, PC, operator switch, etc.) via a parallel (1200/1220) or serial (1240) Input/Output module. Table 4 shows type of relays dedicated to remote communication on remote models.

Contact Type	Use
Input	START signal
Input	STOP signal
Output	Batch COMPLETE signal
Output	STEP COMPLETE signal (1240 only)
Output	Batch ERROR signal

Table 4. Relays Dedicated to Remote Communication

During Remote Batching Operation, only certain keys on the Batch Controller keyboard are active. For more information, see Equipment Setup, Function 37: Remote Mode Access) and Appendix B, pages 93 - 109.

To disable remote control, Function 34: Control Location must be set to LOCAL. The Setup Access Code is required.

Accumulated Totals: Display Totals

The batcher keeps track of all ingredient and formula totals during batching operations. These totals, expressed in the units of measure selected during Equipment Setup, can be displayed with ACCUM. The totals displayed are those accumulated for that function since the accumulators were last cleared. The accumulators are preserved during power down.

To display accumulated totals, press ACCUM. Then press SCROLL to display accumulated totals for:

- TOTAL ING #: Accumulated total of this ingredient batched since the totals were last cleared.
- TOTAL FOR #: Accumulated total of all batches of this formula.
- TOTAL MISC: Accumulated total of all manually batched material.
- TOTAL CANCL: Accumulated total of all cancelled material.
- TOTAL ALL: Accumulated total of all ingredient usage. This total will equal the sum of the ingredient displays (item 1 above), and will also equal the sum of the formula, miscellaneous, and cancel displays.
- LAST CLEAR: Indicates the date and time that the accumulators were last cleared.

If your system includes the Management Report Option, you can print the accumulated totals with Function 62: Accumulator Report. See Function Series 60: Report Selection.

Accumulated Totals: Clear Totals
In order to keep track of batcher totals for specific periods (weeks, days, shifts, etc.), the operator can clear/reset the batcher accumulators. The Setup Access Code is required.

To clear the accumulators:

Press — **Display Reads**

ACCUM +

SCROLL repeatedly until the display alternates between: PUSH CLEAR KEY / TO CLEAR TOTALS

and PUSH SCROLL KEYS / TO REVIEW TOTALS

ACCESS + Setup Access Code + ENTER + CLEAR **CLEAR TOTALS** / ARE YOU SURE?

(This is a safeguard against accidental erasure of accumulated data.)

DISPLAY GROSS (If no) GROSS WEIGHT / CURRENT TIME

or

CLEAR (If yes) ALL ACCUMULATORS / ARE NOW CLEARED

(All accumulators are reset to zero and ready to begin accumulating new totals.)

Function Series 60: Management Report Selection
The Management Report Option (MRO) features the following:

- Function 61: Audit Trail (On/Off)
  Prints a detailed record of every operation including time and date of all batching activity.
- Function 62: Accumulator Report
  Lists usage of each ingredient, production of each formula, all cancelled batches, miscellaneous manual batches, total production, and time/date last cleared.
- Function 63: Setup Report
  Lists all equipment setup and calibration parameters.
- Function 64: Formula Report
  Lists ingredients, net weights, and tolerances for each formula.
- Function 65: Ingredient Report
  Lists relay assignments and operating parameters for flow rates, preact amounts, and jog times.
- Function 66: Setpoint Report
  Lists for each setpoint the relay number assigned, whether it is actuated above or below, weight at which the setpoint is activated, and deadband amount.
- Function 67: Print All Reports
  Prints all reports listed above (Functions 62 - 66).
- Function 68: Set Tabulation (Left Margin: 0 to 40)
  Sets or changes position of the first printed character on the left margin. The system ships with the left margin set at 0. To center a 40-column text on an 80-column printer, set the left margin at 20.

Function 61: To Produce an Audit Trail

Press	**Display Reads**
FUNCTN + 61	
or	
SCROLL (if this function group is already selected)	AUDIT TRAIL FN61
ENTER + SCROLL (to ON)	AUDIT TRAIL> ON
ENTER	GROSS WEIGHT CURRENT TIME

Functions 62-67: To Print Reports

Press	Display Reads
FUNCTN + SCROLL (repeatedly)	REPORT SELECTION FN6X
ENTER + SCROLL	(desired report)
ENTER (Be sure printer is enabled.)	(printing begins)
STOP PAUSE or CANCEL	(to stop printing)

Function 68: To Set or Change the Left Margin

Press	Display Reads
FUNCTN + 68 or SCROLL (if this function group is already selected)	SET TABULATION FN68
ENTER +	
Key in 0-40 (the number you enter corresponds to the number of spaces from the left edge of the paper) + ENTER	GROSS WEIGHT CURRENT TIME (The new left margin is now set.)

Summary of LOCAL Operating Instructions

To enable batcher:	Operator or Setup Access Code + ENTER
To start batch:	FORM + # of Formula to be batched + START / CONT.
To repeat previous batch:	START / CONT. [Available only if Function 29: Fast Start Batch is ON]
To start manual batch:	INGR + ENTER + # of Ingredient to be batched + ENTER + Net Amt. + ENTER + Slow Feed Amt. + ENTER + Tolerance + ENTER + START / CONT.
To stop/pause a batch:	STOP / PAUSE
To restart (continue) a batch:	START / CONT.
To zero tare:	CLEAR + CLEAR
To cancel a batch:	STOP / PAUSE + CANCEL + CANCEL
To disable batcher:	FUNCTN + 11 + ENTER + Operator or Setup Access Code + ENTER
To produce an audit trail:	FUNCTN + 61 + ENTER + SCROLL (to ON) + ENTER
To print a report:	FUNCTN + [62-67] + ENTER (Be sure printer is enabled.)
To display accumulated totals:	ACCUM + SCROLL (to desired total)
To clear accumulated totals:	ACCUM + SCROLL (to clear totals option) + ACCESS + Setup Access Code + ENTER + CLEAR + CLEAR
To display gross weight:	DISPLAY / GROSS

Function Series 90: System Tests
A series of self-tests is built into the batcher. These tests allow the operator to check the following batcher components:

- Function 91: Keyboard
- Function 92: Current Transmitter (Setup Access Code required)
- Function 93: Relay Exerciser (Setup Access Code required)
- Function 94: Sensor Voltmeter
- Function 95: Sensor Raw Data
- Function 96: Display
- Function 98: UART 1 Transmit (Serial Port 1)
- Function 99: UART 2 Transmit (Serial Port 2)

Detailed procedures for each function are outlined below. There is no Function 97.

Function 91: Keyboard Test
This test allows the operator to press each key and identify the key's function on the display. For example, if the ENTER key is pressed during this test, the display reads ENTER KEY.

To run the keyboard test:

Press	**Display Reads**
FUNCTN + 91	
or	
	KEYBOARD TEST FN91
SCROLL (if this function group is already selected)	
ENTER	
	PRESS ANY KEY TO DISPLAY FUNCTION
then	
	PRESS STOP KEY TO STOP TEST

Press any or all of the keys. Each key pressed is identified on the display.

STOP/PAUSE	
	GROSS WEIGHT CURRENT TIME

Function 92: Current Transmitter Test

The 4-20 milliampere analog output (optional) can be made to produce a ramp or step waveform, at a fast or slow rate. This function allows the operator to choose an analog output mode (waveshape), and is useful when setting up testing devices (chart recorder, plotter, etc.) connected to the analog output.

To run the analog output test:

Press	**Display Reads**
FUNCTN + 92	
or	CURRENT TX TEST FN92
SCROLL (if this function group is already selected)	
ENTER	CURRENT TX TEST > SLOW RAMP
ACCESS + Setup Access Code + ENTER +	
SCROLL (to see available analog output waveshapes)	CURRENT TX TEST > FAST RAMP
then	CURRENT TX TEST > SLOW STEP
then	CURRENT TX TEST > FAST STEP
then	CURRENT TX TEST > CONSTANT
When the desired waveshape appears,	
ENTER	A rotating action symbol is displayed. This means the chosen waveshape is appearing on the analog output terminals.
DISPLAY GROSS	GROSS WEIGHT CURRENT TIME

Function 93: Setpoint Relay Test
This test checks setpoint relay outputs by operating selected relays automatically and repeatedly during a duty cycle ("on" time versus "off" time). The operator specifies the number of seconds the relays are on and off. This test is also useful for testing the remote I/O module and communication link in the 1240 Remote Model. This test does not actually move material.

To run the relay test:

Press	**Display Reads**
FUNCTN + 93	
or	
	RELAY EXERCISER FN93
SCROLL (if this function group is already selected)	
ENTER	START RELAY NUMBER > 01
ACCESS + Setup Access Code + ENTER +	
Key In # of first relay to be tested + ENTER	END RELAY NUMBER > 01
Key In # of last relay to be tested + ENTER	RELAY ON TIME > SECONDS
Key In # of seconds (one decimal place) relays are to be on during test + ENTER	RELAY OFF TIME > SECONDS
Key In # of seconds (one decimal place) relays are to be off during test + ENTER	PRESS START KEY TO START TEST
START/CONT	Relays operate as per instructions.
then	PRESS ANY KEY TO STOP TEST
Any Key	GROSS WEIGHT CURRENT TIME

Function 94: Sensor Voltmeter Test
This test displays the voltage output in millivolts. After entering the excitation voltage to the sensors, the voltage of the sensor input channel(s) appears on the batcher display.

To check the input channel voltage:

Press — **Display Reads**

FUNCTN + 94
or
SCROLL (if this function group is already selected)
→ SENSOR VOLTMETER FN94

ENTER
→ INPUT VOLTAGE RED-GREEN MV

(Measure sensor voltage with a digital voltmeter.)

Key in millivolt value (4 digits) appearing across the Red and Shield terminals of the sensor input channel + ENTER
→ VOLTAGE ON WHITE CHAN 1 > MV

then
→ VOLTAGE ON WHITE CHAN 2 > MV (if installed)

then
→ VOLTAGE ON WHITE CHAN 3 > MV (if installed)

then
→ VOLTAGE ON WHITE CHAN 4 > MV (if installed)

(Note the voltage reading of each channel as displayed.)

Any key to stop
→ GROSS WEIGHT CURRENT TIME

Function 95: Sensor Raw Data Test
This test allows the operator to read the raw weight measurement data (output before scaling) applied to the sensor input channel(s) on the display. The test confirms that the sensor(s) and analog to digital converter are functioning.

To read the raw output data:

Press **Display Reads**

FUNCTN + 95

or

SENSOR RAW DATA
FN95

SCROLL (if this function group is already selected)

ENTER

DISPLAY LOADCELL CHANNEL NO.>

\# of input channel
Key in (1 to 4) to be observed + ENTER

LOADCELL CHANNEL NUMBER >

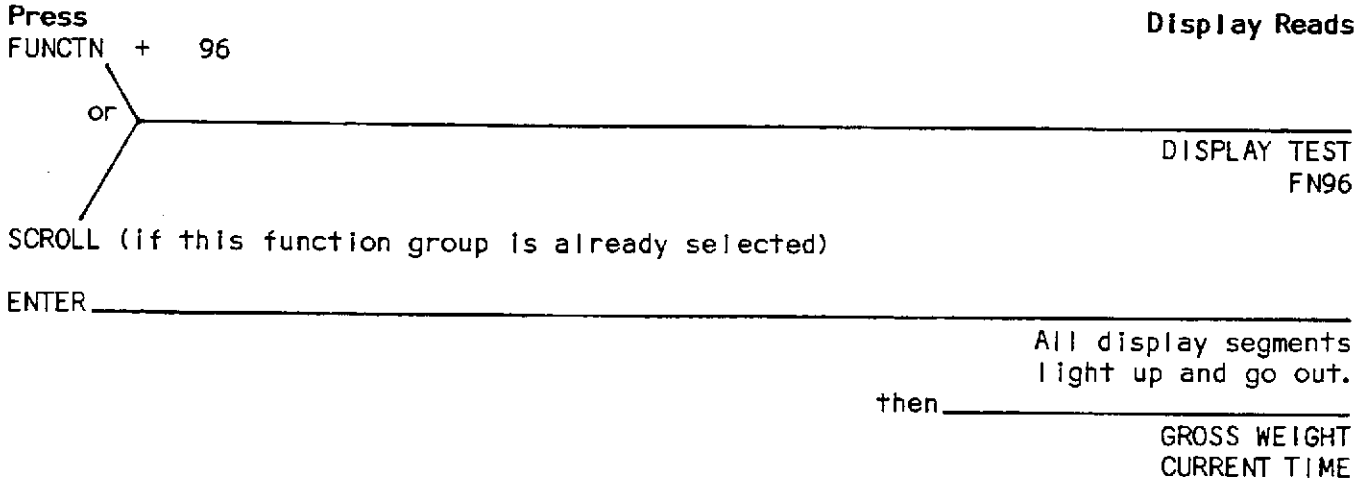
The input channel # and raw data (in counts) provided by the weight sensors connected to input channel are displayed.

DISPLAY
GROSS

GROSS WEIGHT
CURRENT TIME

Function 96: Display Test
This test lights all LED segments of the display for approximately five seconds and allows the operator to check the entire display for defective display elements.

To run the display test:



Function 98 and 99: UART Serial Ports 1 and 2 Tests
When activated, the serial test continuously prints (or displays) certain printable ASCII characters to the specified port. If the hardware is installed properly and the communication protocol is set correctly on both the transmitter (12X0 Batcher) and receiver (printer, display), then the receiver prints (or displays) continuously the printable characters. Once the test is in progress, pressing any key will stop the test.

To test the serial communication in the Batch Controller system:

Press	**Display Reads**
FUNCTN + 98/99	
or	
	UART 1 XMIT TEST FN98/FN99
SCROLL (if this function group is already selected)	
ENTER	
Any key to stop this function.	

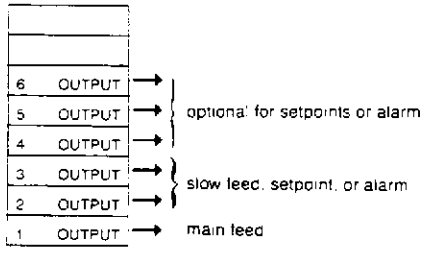
If your system does not include the serial option, the display will read OPTION NOT AVAILABLE when using Functions 98 and 99.

Appendix

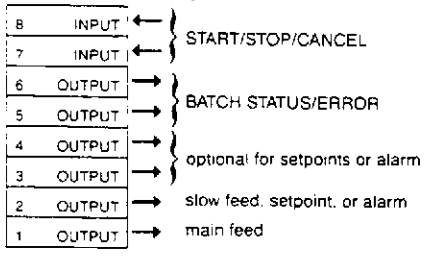
Appendix A: Technical Specifications

Input/Output Usage Table

1200-L Local Control



1200-R Remote Control

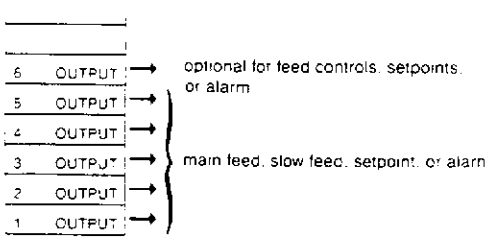


Specifications — 1200 Batch Controller

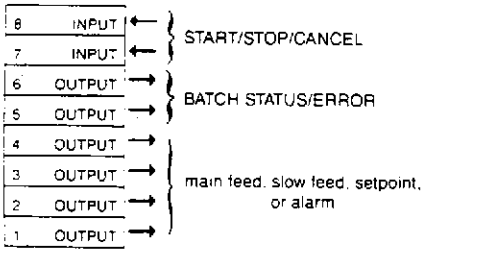
BATCHING CAPABILITIES	
Ingredients	One
Batch Size	Up to nine batch sizes can be stored in memory.
Slow Feed	Automatic, adjustable per batch size
Jog	Automatic, adjustable rates
Preact	Automatic, self-adjusting
Tolerance Checks	Over/under weight check, scale zero prior to batching; display messages and alarm outputs
Feed Rate	Monitored; display messages and tolerance checks
Feed Control Inputs/Outputs	
1200-L Local Control	Three standard, plus three optional. See table.
1200-R Remote Control	Six standard, plus two optional. See table.
Accumulator	Ingredient usage, formula production, canceled batches.
ENCLOSURES	
Rating	Designed to meet NEMA-4 standards, and FCC specifications for RFI/EMI emission.
Mounting	
1200	Wall or panel mount. Purchase panel mounting hardware separately (P/N 39-2017-02).
I/O Box	Wall mount.
Shipping Weight	27 lb. (12 kg)
VOLTAGE RATING	100 Vac ± 10%, 50/60 Hz or 117 Vac ± 10%, 50/60 Hz or 234 Vac ± 10%, 50/60 Hz
SAFETY	For use adjacent to hazardous areas, specify Kistler-Morse Intrinsically Safe Interface. Consult Kistler-Morse for specific approvals.
ENVIRONMENT	
Temperature	
Continuous Operation	14° to 122°F (-10° to 50°C)
Cold Start	32° to 122°F (0° to 50°C)
Storage	-40° to 158°F (-40° to 70°C)
Humidity (Operating and Storage)	0 to 95% (noncondensing inside enclosure)
DISPLAY	
Type	Two-line @ 16-character, alphanumeric vacuum fluorescent, character height of 5 mm
Units	User-selectable engineering units
Resolution	User-selectable
Keyboard	Fully sealed, tactile-response keys
OUTPUTS	
Feed Controls	Solid-state, fully isolated. See table.
Operating Voltage Range	12 to 140 Vac; other voltages available
Current Rating	
Resistive Load	2 amps
Inductive Load	Suitable for 1 amp solenoid or NEMA size 4 contactor
Off state leakage at 120 Vac	5 mA rms.
Serial Interfaces	Optional (RS232C, RS422, RS485)
4-20 mA Current Loop Transmitter	Optional for gross weight. Fully isolated. 500 ohms maximum.
INPUTS	
Balanced Leg Sensor Input	Up to four channels
Sensor	Kistler-Morse direct support sensors or Microcell sensors. Purchase separately.
Voltage	± 6 Vdc
Current	160 mA maximum (1 to 40 sensors)
Control Inputs	Solid-state, fully isolated. See table.
Input Voltage Range	90-140 Vac/Vdc
Input Current at Maximum Line	11 mA
Input Allowed for No Output	3 mA (45 V)

Input/Output Usage Table

1220-L Local Control



1220-R Remote Control

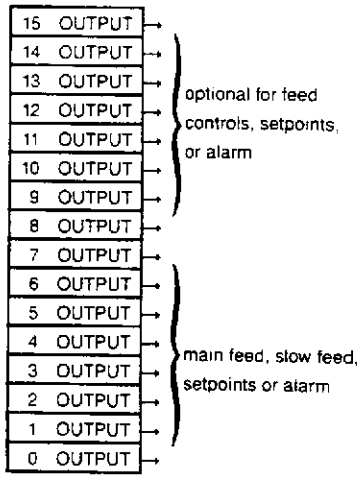


Specifications — 1220 Batch Controller

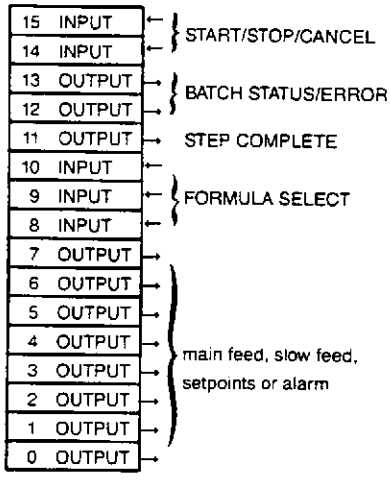
BATCHING CAPABILITIES	
Ingredients	Four
Formulas	Up to nine four-ingredient formulas can be stored in memory.
Slow Feed	Automatic, adjustable per ingredient and formula
Jog	Automatic, adjustable rates
Preact	Automatic, self-adjusting
Tolerance Checks	Over/under weight check, scale zero prior to batching; display messages and alarm outputs
Feed Rate	Monitored; display messages and tolerance checks
Feed Control Inputs/Outputs	
1220-L Local Control	Five standard, sixth optional. See table.
1220-R Remote Control	Eight standard. See table.
Accumulator	Ingredient usage, formula production, canceled batches.
ENCLOSURES	
Rating	Designed to meet NEMA-4 standards, and FCC specifications for RFI/EMI emission.
Mounting	
1220	Wall or panel mount. Purchase panel mounting hardware separately (P/N 39-2017-02).
I/O Box	Wall mount.
Shipping Weight	27 lb. (12 kg)
VOLTAGE RATING	100 Vac ± 10%, 50/60 Hz or 117 Vac ± 10%, 50/60 Hz or 234 Vac ± 10%, 50/60 Hz
SAFETY	For use adjacent to hazardous areas, specify Kistler-Morse Intrinsically Safe Interface. Consult Kistler-Morse for specific approvals.
ENVIRONMENT	
Temperature	
Continuous Operation	14° to 122°F (-10° to 50°C)
Cold Start	32° to 122°F (0° to 50°C)
Storage	-40° to 158°F (-40° to 70°C)
Humidity (Operating and Storage)	0 to 95% (noncondensing inside enclosure)
DISPLAY	
Type	Two-line @ 16-character, alphanumeric vacuum fluorescent, character height of 5 mm
Units	User-selectable engineer units
Resolution	User-selectable
Keyboard	Fully sealed, tactile-response keys
OUTPUTS	
Feed Controls	Solid-state, fully isolated. See table.
Operating Voltage Range	12 to 140 Vac; other voltages available
Current Rating	
Resistive Load	2 amps
Inductive Load	Suitable for 1 amp solenoid or NEMA size 4 contactor
Off state leakage at 120 Vac	5 mA rms.
Serial Interfaces	Optional (RS232C, RS422, RS485)
4-20 mA Current Loop Transmitter	Optional for gross weight. Fully isolated, 500 ohms maximum.
INPUTS	
Balanced Leg Sensor Input	Up to four channels
Sensor	Kistler-Morse direct support sensors or Microcell sensors. Purchase separately.
Voltage	± 6 Vdc
Current	160 mA maximum (1 to 40 sensors)
Control Inputs	Solid-state, fully isolated. See table.
Input Voltage Range	90-140 Vac/Vdc
Input Current at Maximum Line	11 mA
Input Allowed for No Output	3 mA (45 V)

Input/Output Usage Table

1240-L Local Control



1240-R Remote Control



Specifications — 1240 Batch Controller

BATCHING CAPABILITIES	
Ingredients	Eight
Formulas	Up to nine eight-ingredient formulas can be stored in memory.
Slow Feed	Automatic, adjustable per ingredient and formula
Jog	Automatic, adjustable rates
Preact	Automatic, self-adjusting
Tolerance Checks	Over/under weight check, scale zero prior to batching; display messages and alarm outputs
Feed Rate	Monitored; display messages and tolerance checks
Feed Control Inputs/Outputs	
1240-L Local Control	Eight standard, eight optional. See table.
1240-R Remote Control	Sixteen standard. See table.
Accumulator	Ingredient usage, formula production, canceled batches.
ENCLOSURES	
Rating	Designed to meet NEMA-4 standards, and FCC specifications for RFI/EMI emission.
Mounting	
1240	Wall or panel mount. Purchase panel mounting hardware separately (P/N 39-2017-02).
Optional I/O Box	Wall mount.
Shipping Weight	35 lb. (15.9 kg)
VOLTAGE RATING	100 Vac ± 10%, 50/60 Hz or 117 Vac ± 10%, 50/60 Hz or 234 Vac ± 10%, 50/60 Hz
SAFETY	For use adjacent to hazardous areas, specify Kistler-Morse Intrinsically Safe Interface. Consult Kistler-Morse for specific approvals.
ENVIRONMENT	
Temperature	
Continuous Operation	14° to 122°F (-10° to 50°C)
Cold Start	32° to 122°F (0° to 50°C)
Storage	-40° to 158°F (-40° to 70°C)
Humidity (Operating and Storage)	0 to 95% (noncondensing inside enclosure)
DISPLAY	
Type	Two-line @ 16-character, alphanumeric vacuum fluorescent, character height of 5 mm
Units	User-selectable engineering units
Resolution	User-selectable
Keyboard	Fully sealed, tactile-response keys
OUTPUTS	
Feed Controls	Solid-state, fully isolated. See table.
Operating Voltage Range	12 to 140 Vac; other voltages available
Current Rating	
Resistive Load	2 amps
Inductive Load	Suitable for 1 amp solenoid or NEMA size 4 contactor
Off state leakage at 120 Vac	5 mA rms.
Serial Interface	Optional (RS232C, RS422, RS485)
4-20 mA Current Loop Transmitter	Optional for gross weight. Fully isolated, 500 ohms maximum.
INPUTS	
Balanced Leg Sensor Input	Up to four channels
Sensor	Kistler-Morse direct support sensors or Microcell sensors. Purchase separately.
Voltage	± 6 Vdc
Current	160 mA maximum (1 to 40 sensors)
Control Inputs	Solid-state, fully isolated. See table.
Input Voltage Range	90-140 Vac/Vdc
Input Current at Maximum Line	11 mA
Input Allowed for No Output	3 mA (45 V)

Specifications — Management Report Option

OUTPUT

Interface	RS232C Digital Serial Interface
Available Communication Protocol	
Baud Rate	9600, 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 19.2K
Parity	None, odd, even, mark, space
Stop Bits	One, two
Word Length	7-bit, 6-bit, 8-bit
Interface Cable	5 conductor, shielded. DB25 connector, 50 ft. (16.7 m)

Specifications — Microline 182 Personal Printer

POWER

Voltage Rating	120, 220, or 240 Vac ± 10%, 50/60 Hz

PHYSICAL

Size	14.6 × 10.9 × 3.2 in. (371 × 277 × 81 mm)
Weight	8.8 lbs. (4 kg)

INTERFACE

Serial	RS232C, 9600 baud

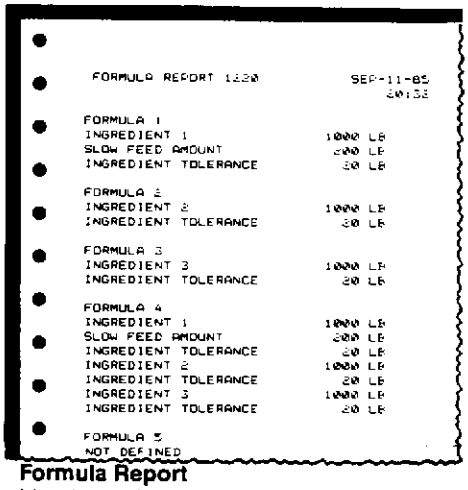
PERFORMANCE

Utility Speed	120 cps
Print Technique	Bidirectional/short line seeking. Dot matrix impact.

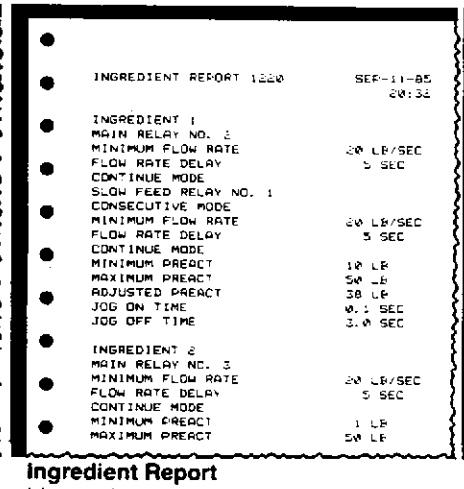
MEDIA

Maximum Width of Paper	
Friction Feed	8.5 in. (216 mm)
Tractor Feed	9.5 in. (241 mm)
Pin Feed	10.0 in. (254 mm)
Paper Path	Rear/bottom
Ribbon	Genuine Okidata cartridge, re-inking

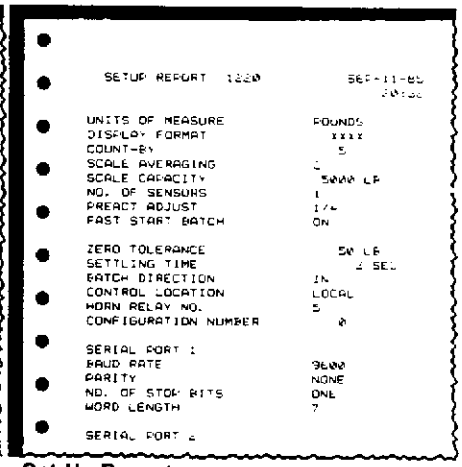
The Management Report Option provides the following reports:



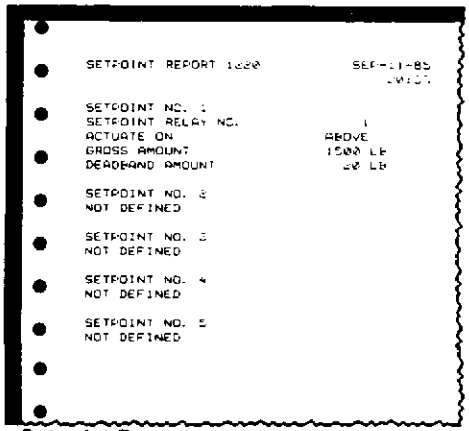
Formula Report
Lists ingredients, net weights, and ingredient tolerances for each formula.



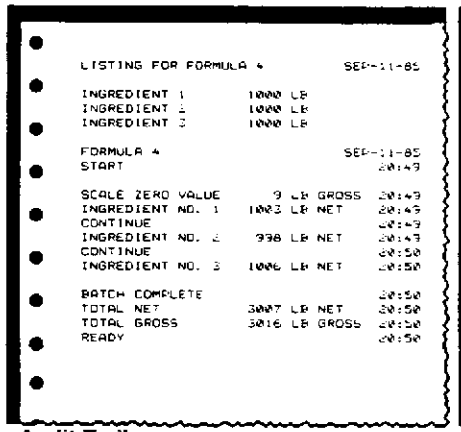
Ingredient Report
Lists relay assignments and operating parameters for flow rate alarm, preact, and jog feed.



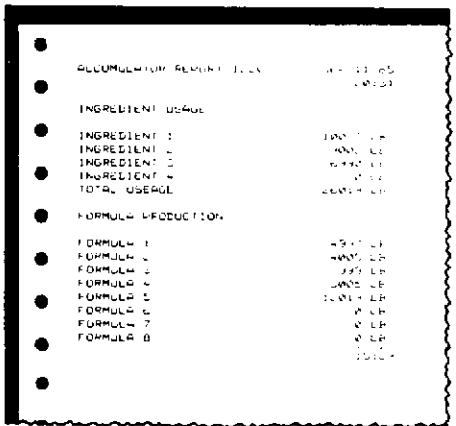
Set-Up Report
Lists all instrument set-up and calibration parameters.



Setpoint Report
Lists for each setpoint the relay number assigned, whether it is actuated above or below, weight at which the setpoint is activated, and deadband amount.



Audit Trail
Prints a detailed record of every batching operation including time and date of each occurrence.



Accumulator Report
Lists usage of each ingredient, production of each formula, cancelled batches, miscellaneous manual batches, total production, and time and date cleared.

Appendix B: Remote Control Interface Information

1200/1220 Batcher [1] Controlled by PLC (Programmable Logic Controller) [2]
The PLC is interfaced to the 12X0 Batch Controller via a parallel I/O module. The 12X0 can control up to four output relays for ingredient batching, configurable to main feed, slow feed, setpoints, or an alarm. The 1200 can batch a single ingredient started by PLC and selected manually by an operator. The 1220 can batch formulas with multiple ingredients.

The PLC can START or continue batch by setting CR7 low (deenergized). It can STOP a batch by deactivating both CR7 and CR8. See Figures 22 and 23 and Table 5. PLC sequencing decisions are made based on information from the batcher, and/or other instruments in the plant. The batcher provides COMPLETE (#6) and NOT ERROR (#5) signals to the PLC. Feed outputs should be monitored by the PLC to provide additional inputs (feedback) to the PLC. For example, STOP from the PLC or an operator will be acknowledged by closing the FEED relay.

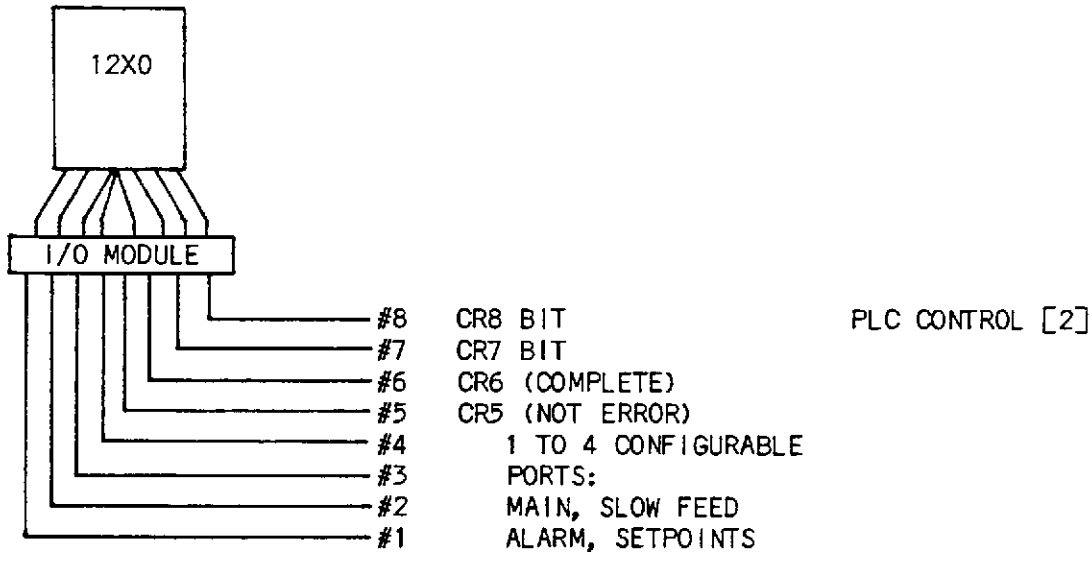


Figure 22. 12X0 I/O Signals

[1] 12X0 denotes 1200 and 1220 Models. 12X0 Remote Model is a superset of 12X0 Local Model.

[2] A PLC is one of many remote devices that can be interfaced with Kistler-Morse batch Controllers. Operator switches, PCs, and other remote control equipment can be connected to the batcher.

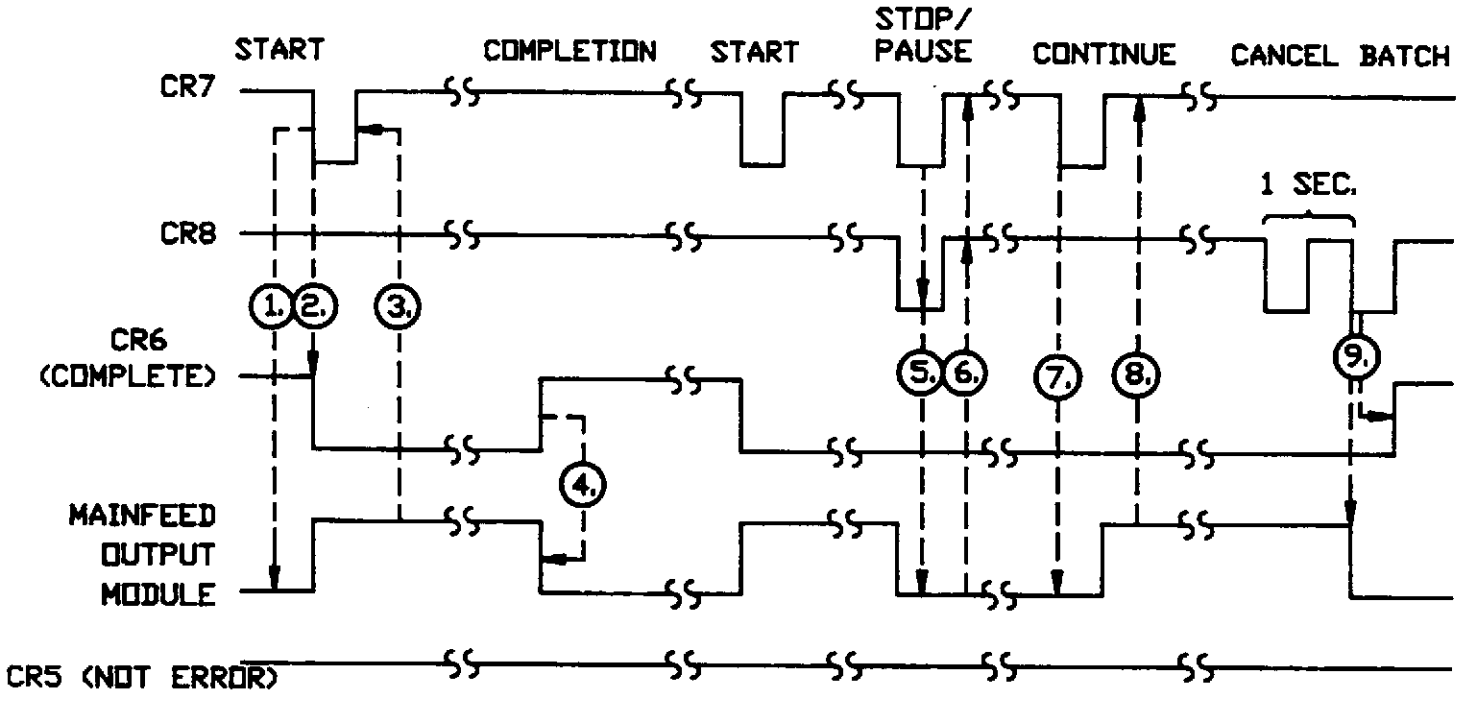


Figure 23. 12X0 Normal Batching Sequence Diagram -- Event Driven

1. Low CR7 starts batch (energizes output module).
2. New cycle is started clearing COMPLETE signal.
3. PLC should set CR7 back to high (idle) when the output is energized.
4. COMPLETE signals to PLC that batch is finished.
5. Both CR7 and CR8 low signals set batch to STOP/PAUSE state.
6. Feed output provides feedback to PLC that STOP/PAUSE was executed. PLC should set both CR7 and CR8 to high (idle) when command is executed by batcher.
7. Another low CR7 continues batch.
8. Feed output could be used to signal to PLC that batching continues and PLC should reset to idle state (both CR7 and CR8 high).
9. Two or more consecutive CR8 low signals (about 1 second apart) while CR7 stays high, cancels the batch in progress. Feed valve is deenergized and COMPLETE provides signal that command was acknowledged. PLC should reset CR7 and CR8 back to idle.

After reset (power up), SLOW FEED and FAST FEED will be cleared. COMPLETE output will be energized. NOT ERROR will be energized, indicating that there are no errors and that the PLC is in control. For the Batch Controller to respond to PLC (START and STOP inputs), Function 34: CONTROL LOCATION must be set to REMOTE. To disable PLC control, Function 34: CONTROL LOCATION must be set to LOCAL. The Batch Controller is shipped with CONTROL LOCATION set to LOCAL (default). COMPLETE and NOT ERROR outputs (indicators) will be updated during batching.

PLC (VIA INPUT MODULE CR7, CR8) CONTROL INPUT PATTERN

DESCRIPTION	INPUT FROM PLC (LED)	
	(CR8)	(CR7)
Start Batch	1	0
Stop Batch	0	0
Cancel Batch	0	1
Idle/Running (No Command)	1	1

Table 5. Summary of Valid Control Bit Patterns from PLC to 12X0 Batcher

START -- Has the same function as START/CONT. key on batcher. START runs the ingredient set by an operator in the 12X0. The Batch Controller should be in initial state with COMPLETE output set. If the batch is successfully started, then the 12X0 responds to the PLC by clearing COMPLETE signal and changing the state of the feed relay(s). The PLC should reset to IDLE after the command is executed by batcher. The Batch Controller will execute the batch, contingent on error conditions. When in REMOTE the feed relay can be energized from the PLC only.

STOP -- Both CR7 and CR8 bits are deenergized. Stop is automatically activated when the PLC fails. STOP input has the same function as STOP/PAUSE key on batcher. FEED RELAYS would provide feedback to PLC when 12X0 is stopped via the PLC, and the PLC should respond by setting CR7 and CR8 to high again (IDLE). Locally, the 12X0 batcher displays "BATCH IN PAUSE" message. Subsequent CONTINUE (START) would continue batch.

CANCEL -- CR8 is set low. The signal must be issued two times (about one second apart). If the batch is cancelled then CR6 (COMPLETE) and CR5 (ERROR) would be issued by the 12X0 and batching would stop. The Batch Controller would stay in the Idle Mode until a new command (i.e. new batch initiation) is received from the PLC.

IDLE/RUNNING -- CR7 and CR8 are energized. Batcher is waiting for start command or executing a batch.

CR5 (NOT ERROR) -- Implemented in negative logic to default to error in case of batcher failure. Two types of errors are distinguished -- warnings and errors requiring operator intervention (Table 6). Illegal commands from the PLC are ignored. PLC can reissue another START/CONT. command to override errors which would not require operator intervention. More prudent action for the PLC would be to let the operator check error message on the batcher. After inspecting/correcting errors, operator should restart PLC to continue the batch.

BATCH STATUS PATTERNS AND DESCRIPTIONS

DESCRIPTION	SIGNAL COMBINATION CR6 COMPLETE	CR5 NOT ERROR
Type 1: Warning or Information Error. (Soft Error) Exceeded Zero Scale Tolerance; Ingredient Completed in 1220 if not in automatic batching mode. Warnings during batch: Ingredient Out of Tolerance, Flow Error. Warnings after batch is completed: Ingred. Batched Out of Tolerance. START/CONTINUE from PLC can override TYPE 1 Error.	0	0
Type 2: Hard Batch or Communication Error. Exceeded Scale Maximum Capacity; Batch Canceled by Operator. In local control, batch stopped by an operator at 12X0 keyboard. Operator must correct Type 2 error locally.	1	0
BATCH COMPLETED: Normal Batch Completion	1	1
ACTIVE: Remote Control is Enabled and Batcher is Active	0	1

Table 6. 12X0 Batch Status Patterns and Descriptions

Processing examples of different error types are found in Figures 24 and 25.

COMPLETE -- Indicates Batch Completion to PLC. With ERROR signal, COMPLETE helps to distinguish warnings and errors.

Error Processing — Soft Errors

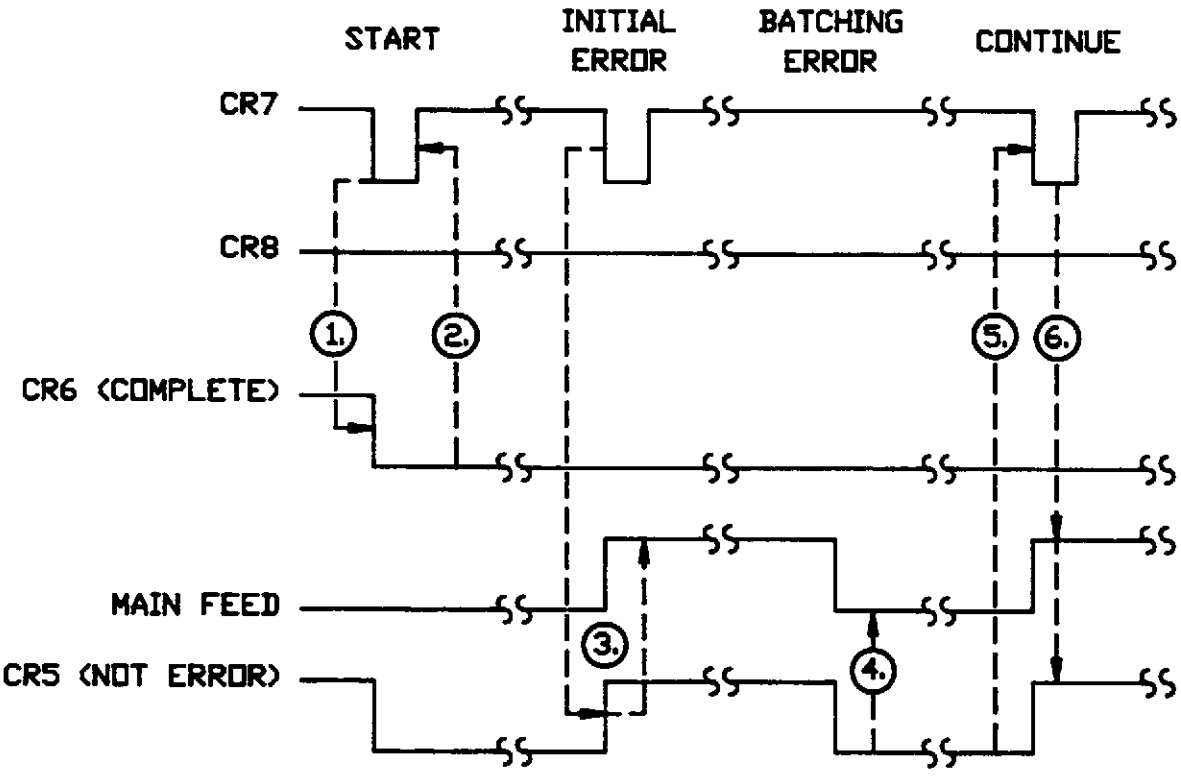


Figure 24. Type 1: 12X0 Errors PLC Can Override

1. Batch is initiated by PLC.
2. Batcher acknowledges START by clearing COMPLETE signal.
3. Another START (CR7 low) clears error and starts batch (main feed is energized.
4. Error during batching stops batch.
5. PLC can override error by issuing another START (CR7 low).
6. ERROR is cleared and batch continues.

Error Processing -- Hard Errors

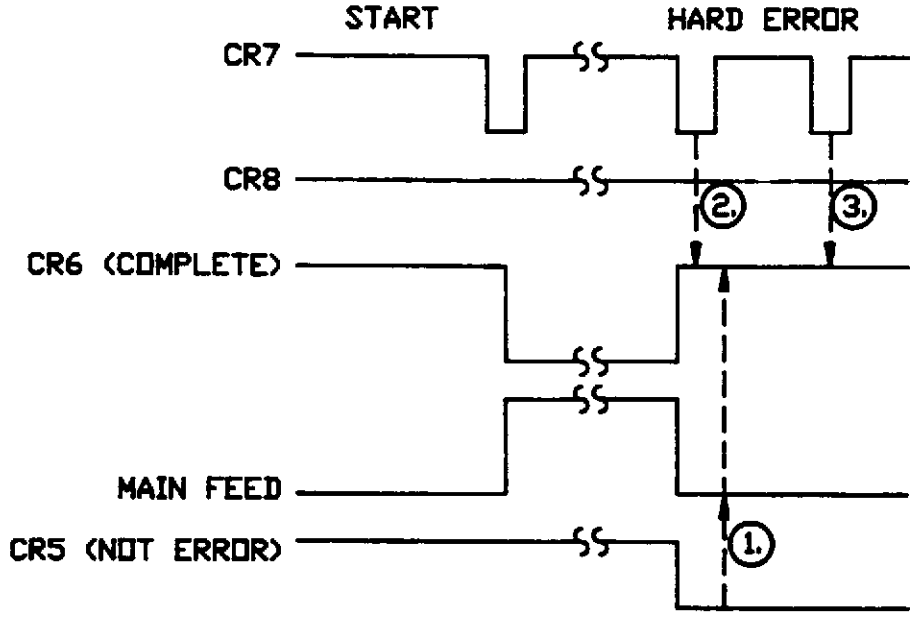


Figure 25. Type 2: 12X0 Errors Requiring Operator Intervention

(1) COMPLETE and NOT ERROR signal Type 2 error. Batching stops.
(2) Error cannot be reset by PLC; Manual intervention is required.
(3) Error cannot be reset by PLC; Manual intervention is required.

Remote Control Location: Keyboard Access in Locked Mode
The Batch Controller keyboard will be monitored with only limited keys active during a batch in remote control, when Function 37 is set to LOCKED.

- Keys Active During Remote Batch Operation

  STOP - Pauses batching, error Type 2 is issued to PLC.

  START/CONTINUE - Pseudo start which ends Stop Key command issued to pause remote batch. Type 2 error is cleared and remote control must issue another Start to continue batch.

  CANCEL - Cancels Remote Batch and puts system in idle state. This is useful for transfer to local mode. See "Keys Active During Idle Remote State." The actual cancel is executed only after a valid Access Code is entered - CANCEL is access protected.

- Keys Active During Idle Remote State

  FORMULA - Selects formula for remote operation. The Access Code is required before formula number is selected.

  FUNCTION - Jumps to Function 34 and lets operator switch to Local mode if correct access code is entered.

  DISPLAY GROSS - Changes display to Gross Weight. FORMULA or FUNCTION keys would continue operation.

  CLEAR - Tares gross weight information (if Function 84: Zero Tare is set to ON). Press clear key twice.

Clock Display Logic to Indicate Local or PLC Control State During Batching
The ticker (clock) in the lower right corner of the batcher display informs operator of CONTROL status (Figure 26). The ticker is a symbol resembling a digital clock with its moving hand indicating an action.

PLC Batching States:

Off (Remote Control is not active) - Clock is not displayed

STOP/PAUSE - Clock is displayed, not moving

Active - Clock is moving

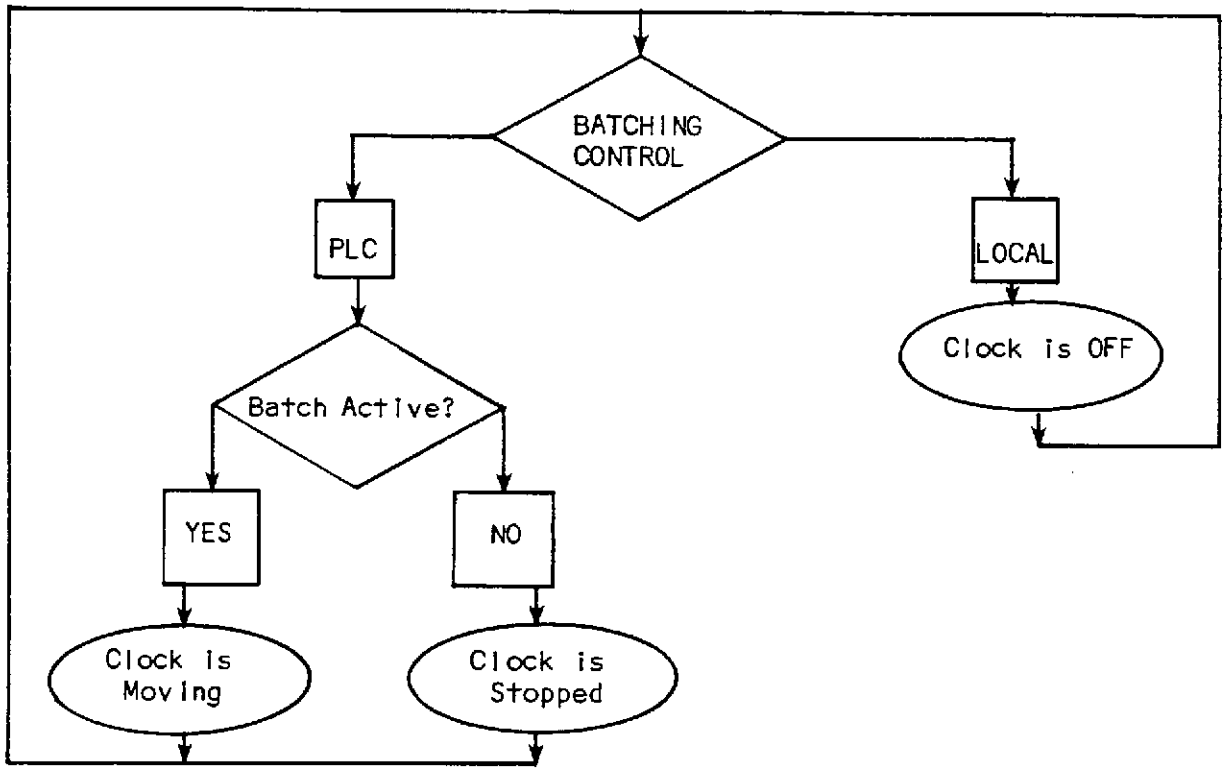


Figure 26. 12X0 PLC/Local Status Indicator

1240 Batcher [1] Controlled by PLC (Programmable Logic Controller) [2]
The PLC is interfaced to the 1240 Batch Controller via a remote I/O module. The Remote 1240 can control eight output relays for ingredient batching, configurable to main feed, slow feed, setpoints, or an alarm. If FORMULA SELECT option (Function 38) is not desirable, then eleven relays are available for the user. In the LOCAL mode all sixteen relays are available to the user.

The PLC can START or CONTINUE batch by setting #14 low (deenergized). It can STOP a batch by deactivating both #14 and #15. See Figures 27 and 28 and Table 7. PLC sequencing decisions are made based on information from the batcher, and/or other instruments in the plant. The batcher provides BATCH COMPLETE (#13), NOT ERROR (#12) and STEP COMPLETE [3] signals to the PLC. Feed outputs should be monitored by the PLC to provide additional inputs (feedback) to the PLC. For example, STOP from the PLC or an operator will be acknowledged by closing the FEED relay.

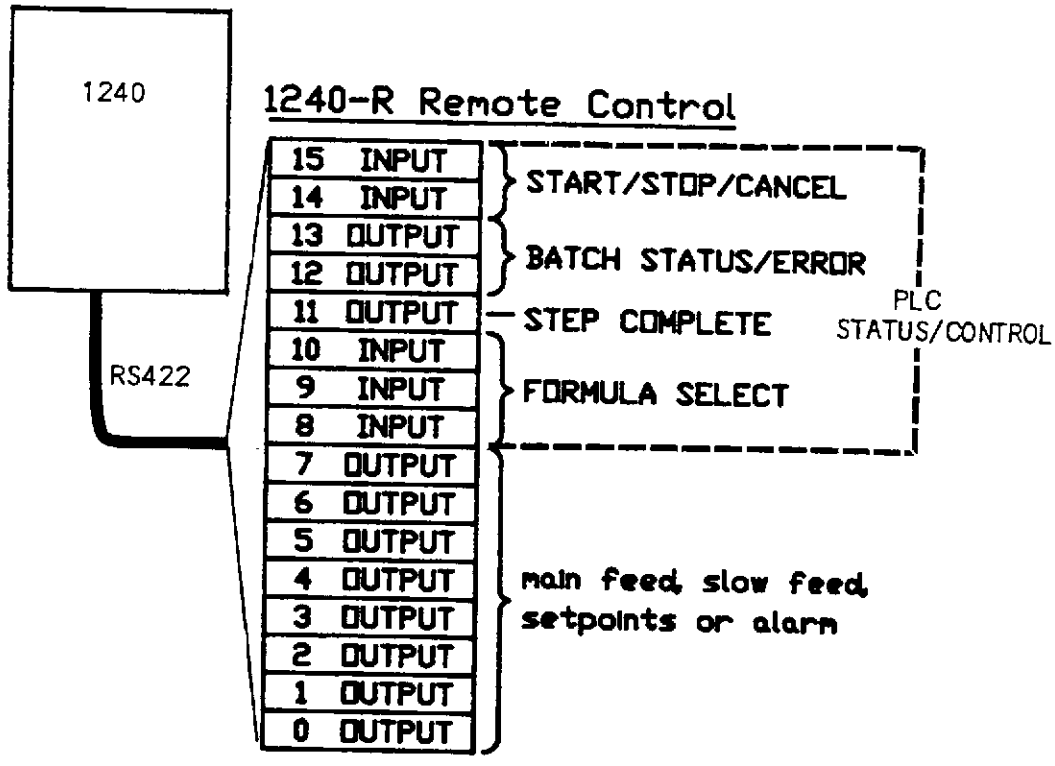


Figure 27. 1240 I/O Signals

[1] 1240 Remote Model is a superset of 1240 Local Model.

[2] A PLC is one of many remote devices that can be interfaced with Kistler-Morse batch Controllers. Operator switches, PCs, and other remote control equipment can be connected to the batcher.

[3] STEP COMPLETE is energized at normal completion of an ingredient in a formula if automatic sequencing is disabled and the ingredient is not the last.

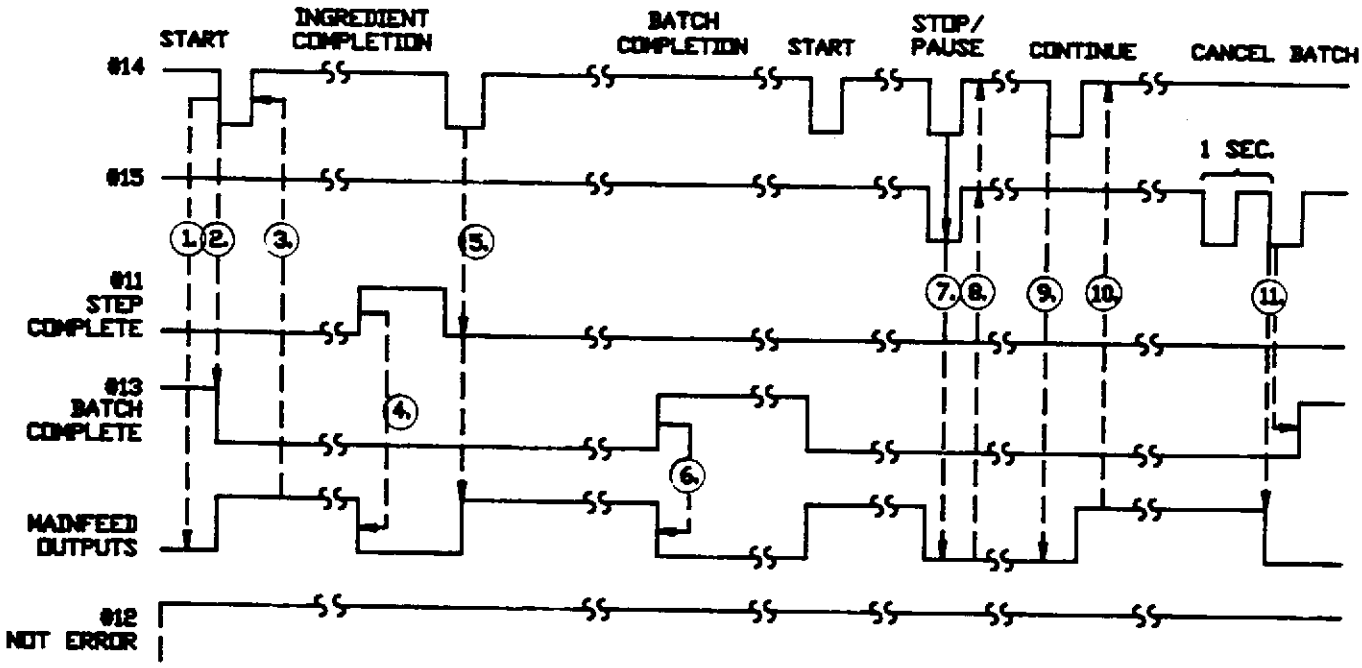


Figure 28. 1240 Normal Batching Sequence Diagram -- Event Driven

1. Low #14 starts batch (energizes output module).
2. New cycle is started clearing COMPLETE signal.
3. PLC should set #14 back to high (idle) when the output* is energized.
4. STEP COMPLETE indicates normal completion of the first ingredient of the multiple-ingredient formula if the automatic sequencing is not selected.
5. START/CONTINUE (low #14) is needed to start next ingredient. Output relay assigned to this ingredient is energized.
6. BATCH COMPLETE signals to PLC that batch is finished.
7. Both #14 and #15 low signals set batch to STOP/PAUSE state.
8. Feed output provides feedback to PLC that STOP/PAUSE was executed. PLC should set both #14 and #15 to high (idle) when command is executed by batcher.
9. Another low #14 continues batch.
10. Feed output could be used to signal to PLC that batching continues and PLC should reset to idle state (both #14 and #15 high).
11. Two or more consecutive #15 low signals (about 1 second apart) while #14 stays high, cancels the batch in progress. Feed valve is deenergized and COMPLETE provides signal that cancel batch command was acknowledged. PLC should reset #14 and #15 back to idle.

* #0 to #7 outputs are configured during system initialization. If the Remote Formula Select option is disabled, outputs #8, #9, and #10 could be assigned to MAIN/SLOW FEED.

After reset (power up), FEED, ALARM and SETPOINTS will be cleared. COMPLETE output will be energized. NOT ERROR will be energized, indicating that there are no errors and that the PLC is in control. For the Batch Controller to respond to PLC (START and STOP inputs), Function 34: CONTROL LOCATION must be set to REMOTE. To disable PLC control, Function 34: CONTROL LOCATION must be set to LOCAL. The Batch Controller is shipped with CONTROL LOCATION set to LOCAL (default). COMPLETE and NOT ERROR outputs (indicators) will be updated during batching.

PLC (VIA INPUT MODULE #14,#15) CONTROL INPUT PATTERN

DESCRIPTION	INPUT FROM PLC (LED)	
	(#15)	(#14)
Start Batch	1	0
Stop Batch	0	0
Cancel Batch	0	1
Idle/Running (No Command)	1	1

Table 7. Summary of Valid Control Bit Patterns from PLC to 1240 Batcher

START -- Has the same function as START/CONT. key on batcher. START runs the formula set by an operator in the 1240 or the batch latched on #8, #9, #10 inputs if Function 38 is enabled (Table 8). The Batch Controller should be in initial state with COMPLETE output set. If the batch is successfully started, then the 1240 responds to the PLC by clearing COMPLETE signal and changing the state of the feed relay(s). The PLC should reset to IDLE after the command is executed by batcher. The Batch Controller will execute the batch, contingent on error conditions. START also initiates next ingredient batch in multiple ingredient formulas if automatic sequencing option is not selected. When in REMOTE mode the feed relay can be energized from the PLC only.

FORMULA SELECT PATTERN (I/O Inputs #8, #9, #10) VIA PLC

FORMULA NUMBER SELECTED	INPUT BIT PATTERN		
	#8	#9	#10
1	0	0	0
2	1	0	0
3	0	1	0
4	1	1	0
5	0	0	1
6	1	0	1
7	0	1	1
8	1	1	1

Table 8. 1240 Remote Formula Select Patterns

STOP -- Both #14 and #15 bits are deenergized. STOP is automatically activated when the PLC fails. STOP input has the same function as STOP/PAUSE key on batcher. FEED RELAYS could provide feedback to PLC when 1240 is stopped via the PLC, and the PLC should respond by setting #14 and #15 to high again (IDLE). Locally, the batcher displays "BATCH IN PAUSE" message. Subsequent CONTINUE (START) would continue batch.

CANCEL -- #15 is set low. The signal must be issued two times about one second apart. If the batch is cancelled then #13 (COMPLETE) and #12 (ERROR) would be issued and batching would stop. The Batch Controller would stay in the Idle Mode until a new command (i.e. new batch initiation) is received from the PLC.

IDLE/RUNNING -- #14 and #15 are energized. Batcher is waiting for start command or executing a batch.

#12 (NOT ERROR) -- Implemented in negative logic to default to error in case of batcher failure. Two types of errors are distinguished -- warnings and errors requiring operator intervention (see Table 9). Illegal commands from the PLC are ignored. PLC can reissue another START/CONT. command to override errors which would not require operator intervention. More prudent action for the PLC would be to let the operator check error message on the batcher. After inspecting/correcting errors, operator can restart PLC to continue the batch.

1240 BATCHER STATUS PATTERNS AND DESCRIPTIONS

DESCRIPTION	SIGNAL COMBINATION #13 BATCH COMPLETE	#12 NOT ERROR	#13 STEP COMPLETE
Type 1: Warning or Information (Soft Error) Examples: Exceeded Zero Scale Tolerance; Flow Error; Ingred. Batched Out of Tolerance. START/CONTINUE from PLC can override Type 1 Error.	0	0	0
Type 2: Hard Batch or Communication Error. Examples: Exceeded Scale Maximum Capacity; Batch Canceled by Operator. In Local Mode: Batch stopped by an operator at 1240 keyboard. Serial Communication link failure. Operator must correct Type 2 Error locally.	1	0	0
BATCH COMPLETE: Normal Batch Completion	1	1	0
ACTIVE: Remote Control is Enabled and Batcher is Active	0	1	0
STEP COMPLETE: Step is Completed. No Automatic Sequencing. START is required to continue next Ingredient.	0	1	1

Table 9. 1240 Batch Status Patterns and Descriptions

Processing examples of different error types are found in Figures 29 and 30.

COMPLETE -- Indicates Batch Completion to PLC. With ERROR signal, COMPLETE helps to distinguish warnings and errors.

Error Processing — Soft Errors

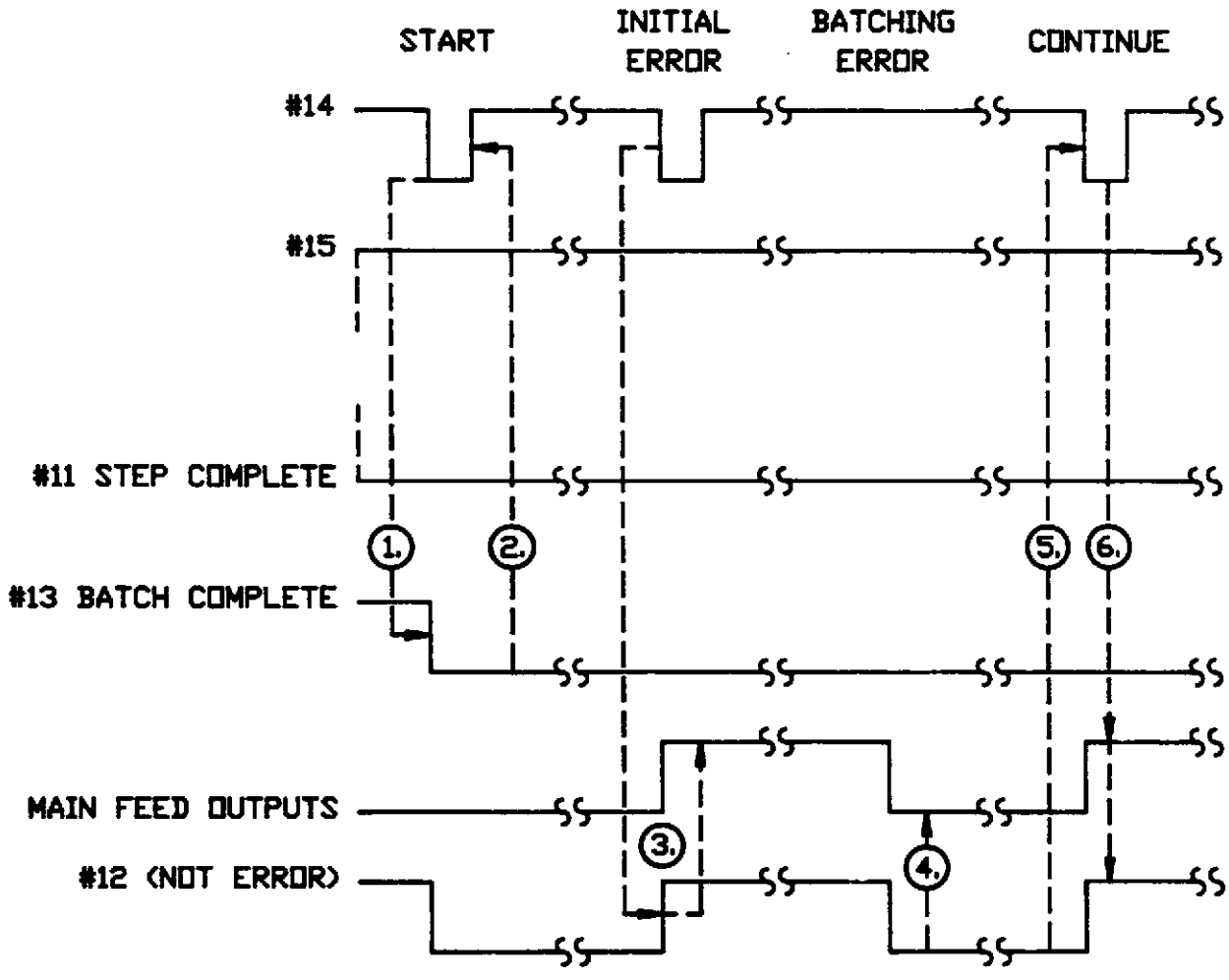


Figure 29. Type 1: 1240 Errors PLC Can Override

1. Batch is initiated by PLC.
2. Batcher acknowledges START by clearing COMPLETE signal.
3. Another START (#14 low) clears error and starts batch (Main feed is energized.
4. Error during batching stops batch.
5. PLC can override error by issuing another START (#14 low).
6. ERROR is cleared and batch continues.

Error Processing -- Hard Errors

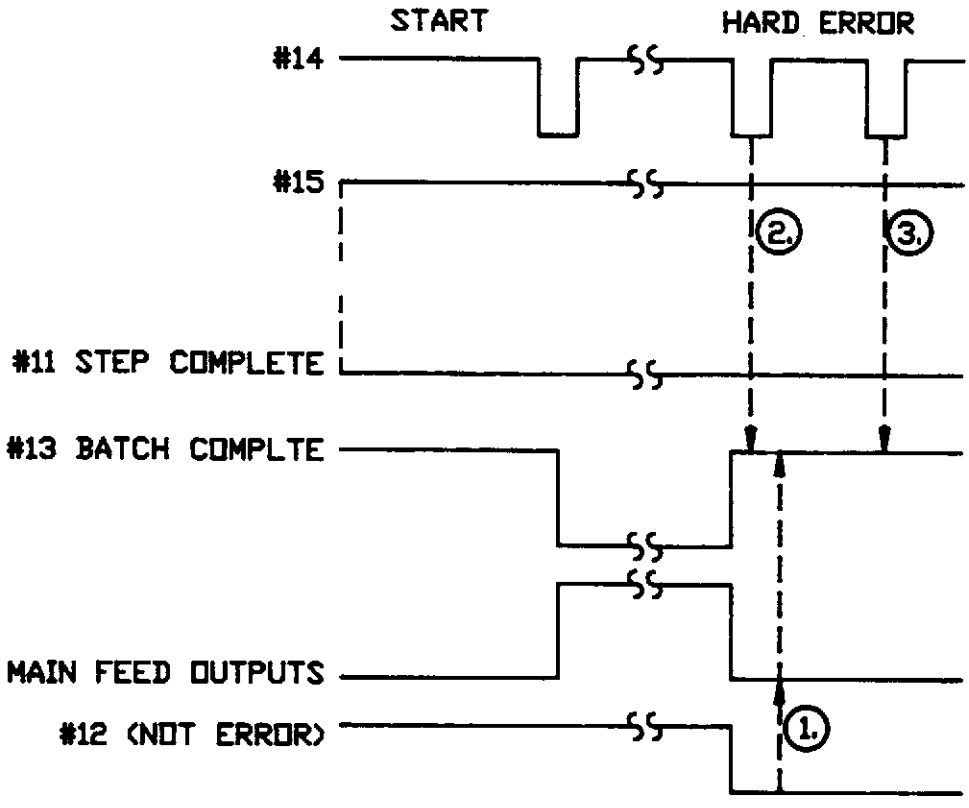


Figure 30. Type 2: 1240 Errors Requiring Operator Intervention

(1) COMPLETE and NOT ERROR signal Type 2 error. Batching stops.
(2) Error cannot be reset by PLC; Manual intervention is required.
(3) Error cannot be reset by PLC; Manual intervention is required.

Remote Control Location: Keyboard Access in Locked Mode
The Batch Controller keyboard will be monitored with only limited keys active during a batch in remote control, when Function 37 is set to LOCKED.

- Keys Active During Remote Batch Operation

  STOP - Pauses batching, error Type 2 is issued to PLC.

  START/CONTINUE - "Pseudo" start which ends STOP key command issued to pause remote batch. Type 2 error is cleared and remote control must issue another START to continue batch.

  CANCEL - Cancels Remote Batch and puts system in idle state. This is useful for transfer to local mode. See "Keys Active during Idle." The actual cancellation is executed only after a valid Access Code is entered - CANCEL is access protected.

- Keys Active During Idle Remote State

  FORMULA - Selects formula for remote operation. The Access Code is required before a formula number can be selected.

  FUNCTION - Jumps to Function 34 and lets operator switch from remote to local mode if correct access code is entered.

  DISPLAY/GROSS - Changes display to Gross Weight. FORMULA or FUNCTION keys would continue operation.

  CLEAR - Tares gross weight information (if Function 84: Zero Tare is set to ON). Press clear key twice to clear.

Clock Display Logic to Indicate Local or PLC Control State During Batching
The ticker (clock) in the lower right corner of the batcher informs operator of CONTROL status (Figure 31). The ticker is a symbol resembling a digital clock with its moving hand indicating an action.

PLC Batching States:

Off (Remote Control is not active) - Clock is not displayed

STOP/PAUSE - Clock is displayed, not moving

Active - Clock is moving

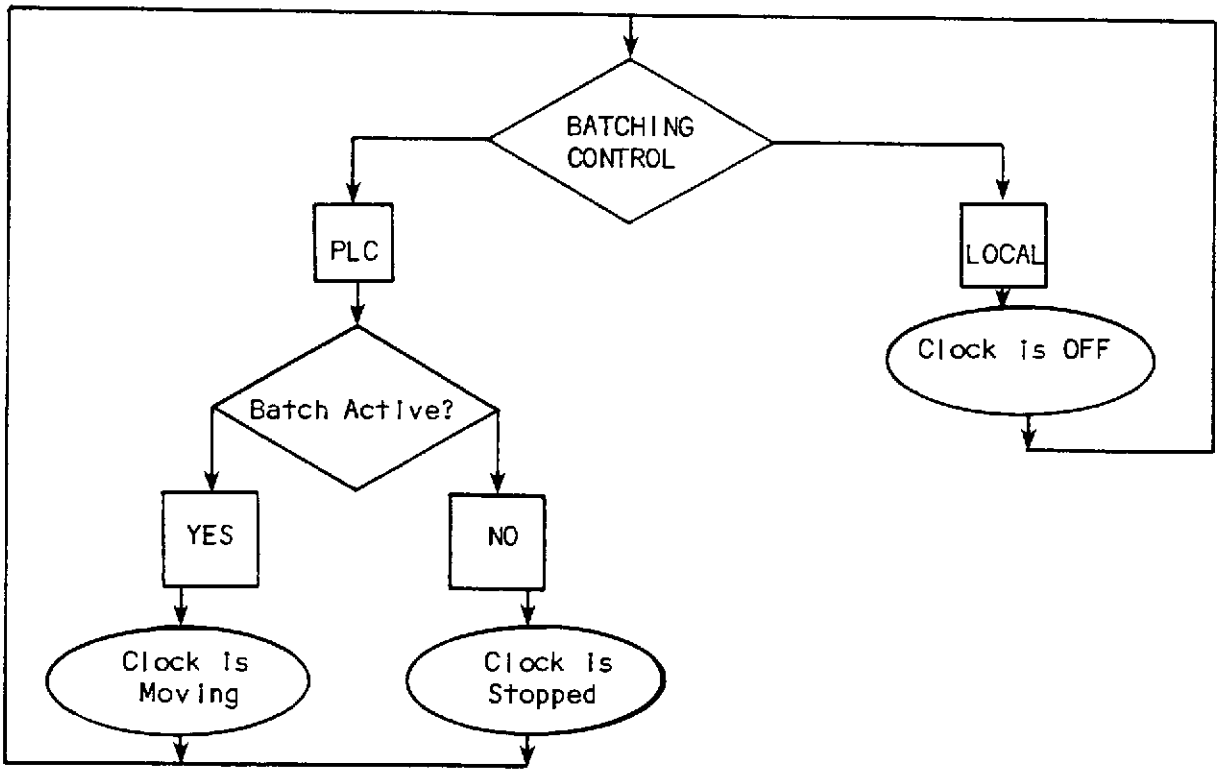


Figure 31. 1240 PLC/Local Status Indicator

Appendix C: Setup and Calibration Checklist

Function Number	Function Name	User Entries
	Access Control	
12	Operator Access Code [Shipped as 0. 1 to 4 digits.]	_____
13	Setup Access Code [Shipped as 0. 1 to 4 digits.]	_____
	Instrument Setup	
21	Time and Date [Hours, minutes, month, day, year]	_____
22	Units of Measure [Units, pounds, tons, kilograms, gallons, metric tons, liters]	_____
23	Display Format [Position of decimal point: xxxx00; xxxx0; xxxx; xxx.x; xx.xx; x.xxx Count-by Factor Resolution: 1, 2, 5]	_____
24	Scale Averaging [Average 1 to 9 readings]	_____
25	Maximum Scale Capacity [1 to 9999]	_____
26	Number of Sensor Inputs [1 to 4]	_____
27	Balance Coefficient [Display only]	_____
28	Auto Preact Adjustment [0 to 1 by 1/8s]	_____
29	Fast Start Batch [On/Off]	_____
	System Setup	
31	Zero Tolerance [Numeric Entry]	_____
32	Settling Time [1 to 900 seconds]	_____
33	Batch Direction [In/Out]	_____
34	Control Location [Local/Remote]	_____
35	Horn Alarm [Relay 1 to 5; 0 = No Horn]	_____
36	Configuration Number [Display only]	_____
37	Remote Mode Access (Remote Models) [Locked/Unlocked]	_____
38	Remote Formula Select (1240 only) [On/Off]	_____

Output Setup

41 Serial Port 1 (optional) _____
[Baud Rate; Parity; Stop Bits; Word Length]

42 Serial Port 2 (optional) _____
[Baud Rate; Parity; Stop Bits; Word Length]

43 Current Transmitter _____
[4-20 mA at 0 to 9999]

44 Handshake Mode _____
[On/Off Only, Modem, Both]

45 Remote Display _____
[Disabled, Ingredient Net, Formula Net, Scale Gross]

Setpoint Setup

51 Setpoint 1 _____
[Relay 1 to 5; Relay On; Gross Amount; Deadband]

52 Setpoint 2 _____
[Relay 1 to 5; Relay On; Gross Amount; Deadband]

53 Setpoint 3 _____
[Relay 1 to 5; Relay On; Gross Amount; Deadband]

54 Setpoint 4 _____
[Relay 1 to 5; Relay On; Gross Amount; Deadband]

55 Setpoint 5 _____
[Relay 1 to 5; Relay On; Gross Amount; Deadband]

Report Selection (Management Report Option)

61 Audit Trail _____
[On/Off]

68 Set Tabulation _____
[Left Margin: 0 to 40]

Calibration

81 Calibrate Span _____
[Add/Remove; Total Added/Removed]

82 Calibrate Offset _____
[Actual Weight]

83 Manual Calibration

Manual Span Raw Value
Channel 1 _____
Channel 2 _____
Channel 3 _____
Channel 4 _____

Actual Span Weight Value _____

Manual Offset Raw Value
Channel 1 _____
Channel 2 _____
Channel 3 _____
Channel 4 _____

Actual Offset Weight Value _____

84 Zero Tare _____
[On/Off]

Ingredient Setup

	INGREDIENT			
	1	2	3	4
Main Feed				
Relay #				
Minimum Flow Rate				
Rate Alarm Delay				
Rate Alarm				
Slow Feed				
Used/Not Used				
Relay #				
Minimum Flow Rate				
Rate Alarm Delay				
Rate Alarm				
Simult/Continuous				
Preact				
Amount				
Minimum Limit				
Maximum Limit				
Jog Time				
On				
Off				

Formula Setup

	FORMULA								
	1	2	3	4	5	6	7	8	9
STEP 1									
Ingredient #									
Net Amount									
Tolerance									
Auto Sequence									
Time Delay									
STEP 2									
Ingredient #									
Net Amount									
Tolerance									
Auto Sequence									
Time Delay									
STEP 3									
Ingredient #									
Net Amount									
Tolerance									
Auto Sequence									
Time Delay									
STEP 4									
Ingredient #									
Net Amount									
Tolerance									
Auto Sequence									
Time Delay									
STEP 5									
Ingredient #									
Net Amount									
Tolerance									
Auto Sequence									
Time Delay									
STEP 6									
Ingredient #									
Net Amount									
Tolerance									
Auto Sequence									
Time Delay									
STEP 7									
Ingredient #									
Net Amount									
Tolerance									
Auto Sequence									
Time Delay									
STEP 8									
Ingredient #									
Net Amount									
Tolerance									
Auto Sequence									
Time Delay									

Appendix D: Batching Glossary

Access Codes: Special codes required to enable batcher and change system parameters. Both the Setup and Operator Access Codes are factory shipped as 0. The 1, 2, 3, or 4 digit codes are set/changed with Function 12 and Function 13.

Accumulators: Data storage registers. The K-M Batching Systems accumulate information on ingredient usage and production. This information can be reviewed at any time by pressing the ACCUM and SCROLL keys.

Balance Coefficient: With the balanced leg feature, the batcher automatically assigns a balance coefficient (sometimes other than 1.00) to the input channels during calibration. This compensates for "as installed" sensor output variations. Function 27 (display only) allows the operator to review the coefficient set up during calibration.

Balanced Leg: The batcher compares, balances, and equalizes the outputs of the sensors thus increasing batching precision. Automatic sensor check is also made possible with the balanced leg capability, since the microprocessor is able to spot irregularities in the sensor outputs. This feature is available only on Kistler-Morse Batch Controllers. It is standard on all models.

Batch Tolerance: Batch tolerance is the range of weight which is acceptable for a batch, usually expressed as ± pounds (tons, etc.). At the conclusion of a batch, the batcher checks to see if the final batch weight is within the established tolerance. With KM batchers, tolerances can be set for each material in each formula for optimum precision and speed. See also Feed Rate Tolerance, Tolerance, and Zero Tolerance.

Control Location: The K-M batching system can be controlled locally by means of the keypad, or by remote means. On remote models, the control location can be set to either remote or local control.

Dribble Feed: See "Slow Feed."

Fast Start Batch: To repeat the previous batch, the operator can enable Function 29: Fast Start, and push only START/CONTINUE to start a new batch.

Feed Rate Tolerance: K-M batchers continually monitor the feed rate of each ingredient as it is batched into the weigh vessel. If the feed rate is too slow, indicating a possible problem with the feed system, the batcher issues an error. stopped.

Formula: The formula describes how much of each ingredient constitutes a batch. In the food industry the formula is called a "recipe." In the concrete industry it is a "mix." K-M batchers hold up to nine different formulas in memory, allowing a great deal of versatility in production.

Fast Feed: Fast feed simply means "main feed." Most of the material is moved as quickly as possible into or out of the weigh vessel. See "Slow Feed."

In-Flight Material: Material that is on its way to or from the weigh vessel at the time the feeding mechanism is shut off by the relay contacts to terminate a batch. ("Freefall" is another term sometimes used for in-flight material.)

Ingredient: The material which is batched. Some batching systems control the movement of only one ingredient, like the Kistler-Morse 1200 Batch Controller. Other batchers control many different ingredients. Use the K-M 1220 Batch Controller for batching up to four ingredients, and the 1240 for batching up to eight ingredients.

Jog: When a K-M batcher has completed the batch, the system checks that the batch was completed in tolerance. If the batch is slightly under the batch weight, the batcher will automatically jog (turn on and off the feed system) until the batch is within tolerance. The jog time, which determines how much material is added, is set during installation, and can be changed at any time.

Offset: For calibration, the actual weight of the contents in the vessel.

PLC: Programmable Logic Controller. Used as a control point to receive input data from several different sources, evaluate the data, and act on the data by initiating appropriate actions.

Preact: The batcher terminates the batch (closes the gate or valve) before the material in the weigh vessel equals the batch weight, in order to account for the in-flight material. With the K-M batchers, preact weight is set when the system is installed. Then the batcher automatically adjusts the preact so that it becomes increasingly more accurate. (This speeds batching by reducing the need for "jogging.") Different preact weights can be set for each ingredient thus increasing accuracy and speed of batching by allowing for different material characteristics and different feed control mechanisms. (Preact may also be called "in-flight compensation.")

RS232C Digital Serial Interface: Industry-standard interface defining connectors, signal levels, and signal locations for communications between computers, modems, and peripheral equipment. The RS232C option can be used to transmit gross weight information from the batch controller to an in-plant computer or PLC.

Scale Averaging: A method of preventing the weight display from changing too often, by taking several weight measurements in a period of a few seconds, then displaying the average of those measurements. Useful for very sensitive weight sensors, since it prevents the weight display from "flickering." K-M batchers allow averaging of one to nine readings.

Scale Capacity: Maximum capacity of the weigh vessel.

Sequencing: Sequencing indicates how a batch is initiated. If a batching system has automatic sequencing, the different ingredients are automatically fed into the weigh vessel, one after the other, in the correct amount with the correct timing. Manual sequencing means that the operator initiates the batching of each ingredient. K-M batchers offer manual batching for careful control over the batching process. The batchers can also be interfaced with PLCs or in-house computers, devices which can sequence the batch so that operator intervention is not required.

Settling Time: The period of time between the completion of a batch and the start of the "jog" action. This pause allows the in-flight material to settle so that an accurate weight measurement can be made prior to the "jog."

Slow Feed: After most of the material has been moved, a batching system will typically slow down the feed rate, so that the final batch will be accurate. Slow feed is sometimes called "dribble feed."

Tolerance: The allowable variation from predetermined batch weight (+ or -). Tolerance checks are the batching system's most important method of assuring accuracy. K-M batchers make Zero Tolerance, Feed Rate Tolerance, and Batch Tolerance checks. If the system is out of tolerance, the batch is stopped, and an operator must intervene to continue batching. This assures batching safety and accuracy. K-M Batchers can also be set to activate an alarm if an out-of-tolerance condition exists. See also Zero Tolerance, Feed Rate Tolerance, and Batch Tolerance.

Zero Tolerance: The allowable weight of material in the weigh vessel at the beginning of a batch.

Appendix E: Kistler-Morse Service

Kistler-Morse (K-M) maintains a fully trained staff of field service engineers who are capable of providing you with complete product assistance. Based in offices located in Redmond, Washington (corporate headquarters) and Antwerp, Belgium (European office), our engineers provide:

- Technical assistance by telephone via toll free number.
- Application assistance on-site or by telephone.
- Start-up assistance on-site.
- Troubleshooting on-site, or by telephone.
- Warranty (replacement) or spare parts assistance.
- Training on-site, or at our corporate service center.
- Equipment updates to our latest configuration.

Additional information on these services follows.

Start-Up and Training

The user must mechanically install the Load Block®, Load Stand®, Load Disc™, or Load Link™ sensors, and perform all field wiring and conduit installation. The electronics (Batch Controller) should be mounted by the user, with AC power connected, but not energized.

Kistler-Morse will install the Microcell® sensors, which includes the preparation of the vessel supports where they are attached, i.e. drilling, surface preparation, mounting, and termination of wiring.

K-M will also check all field wiring for errors. The system will be powered up and checked out for proper electrical operation. Calibration will be performed in those cases where actual material or weight devices can be moved. Simulated calibration will be introduced in the case where weight cannot be added or removed.

Recommendations for the maximum performance of the system will be given. Instruction to plant personnel will be offered to cover maintenance and operation of the system.

Troubleshooting

Our engineers will troubleshoot systems for mechanical, electrical, calibration and wiring errors. Normal component repair and wiring errors will be corrected, including replacement of nonrepairable printed circuit boards.

Scheduling and Rates
Call Kistler-Morse at the Corporate Office or European Office for scheduling and rate information.

Address and Telephone Numbers
Corporate Office
All mail sent to the Corporate Office should be addressed to our post office box:

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