RODIX INC.
FEEDER CUBE®
FC-90 *Plus Series*
OPEN FRAME

MODEL – FC- 94 *Plus*
P/N 121-000-8240
SUB PANEL MOUNT

Including Model
CFR-94 *Plus*, 121-100-8240

Listed, File No. E183233

Input: 120 VAC
50/60 HZ.
Output: 0-120 VAC
Single Unit Fuse Size: 15 AMPS
80% Duty Cycle at Rated AMPS

ADJUSTMENTS AND SET UP

1. SELECTING 60 OR 120 PULSE OPERATION

A. For 60 pulse output - Set switch (S1) to 60 on the P.C. card (No. 24-476).
B. For 120 pulse output - Set switch (S1) to 120 on the P.C. card.

Note: Readjust MAX pot after changing pulse switch setting.

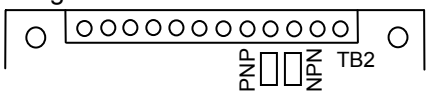
2. INSTALLING THE PART SENSOR

(Photo-sensor or Proximity Switch)

A. Connect a three wire, current-sinking (NPN) or current-sourcing (PNP) sensor as shown on the enclosed wiring diagram. The sensor must be able to operate on 12VDC and be capable of switching at least 3.0 mA.

B. Set switch (S2) for the proper logic. When the switch is in the "NORM" position, the control will run only when the sensor signal is present. The "NORM" position is used with Light-Operate Photoeyes (through beam). When switch (S2) is in the "INV" position, the control runs only when the sensor signal is not present. The "INV" switch position is used with Dark-Operate (reflective) Photoeyes and with Proximity Sensors.

Troubleshooting Tip: On new sensor installations if the sensor LED turns ON and OFF, but the control's output does not turn ON and OFF, turn the time delays all the way down, counter-clockwise. If this problem persists, the sensor may have an internal pull-up or pull-down resistor that is incompatible with the universal sensor input on the control. Dedicate the control's part sensor input to match the sensor's output type. Remove the resistor labeled "R4" and "NPN" when using a NPN sensor. For a PNP sensor remove the resistor labeled "R3" and "PNP." The resistors are located near TB2-4. Use needle-nose pliers to twist and snap the resistor off. Removing the resistor does not void the warranty.



3. LIMITING THE MAXIMUM OUTPUT OF CONTROL

The **MAX** Output trimpot can be adjusted to keep the vibratory feeder from hammering when the control is turned up to full power.

When setting up the MAX output of the feeder control, the output to feeder must be connected and the control set for the proper output frequency (60 or 120 pulse) setting. The Run Contact input must be closed, and the Part Sensor must be calling for parts.

A. Power input should be **OFF** or disconnected.
B. Open cover to allow access to printed circuit card.
C. Adjust the **MAX** Output trimpot counter-clockwise to its minimum setting.
D. Using **CAUTION**, turn power **ON** (no output should be present).
E. Rotate the **MAIN CONTROL DIAL** on front cover to its highest setting.
F. Adjust the **MAX** Output trimpot so that the output to the feeder reaches its desired maximum level when the **MAIN CONTROL DIAL** is turned fully clockwise. Turning the MAX Output trimpot clockwise increases the maximum output level.

4. MAIN CONTROL DIAL

The output power is controlled by the **MAIN CONTROL DIAL**. A special logarithmic-tapered power out curve (non-linear) spreads the power broadly across the **MAIN CONTROL DIAL** to help give maximum "Fine Control" over the output speed of the vibratory feeder.

5. RUN JUMPER INPUT

The Run Jumper comes installed across TB2-7&8. The Run input may also be controlled by a relay contact, switch, or an NPN type of PLC output. Replace the factory-installed jumper with the "Run Signal" at terminals 7(-) and 8(+) of TB2 (small terminal strip). A contact must be able to switch 12VDC at 3.0 mA. The control will then run only when the contact is closed and the part sensor is calling for parts. The PLC's PNP output may be used if it is isolated from the internal power supply. To isolate it remove R24&25 located on the bottom side of the circuit board near TB2-5. Isolation for an NPN PLC output is optional.

6. SETTING THE TIME DELAYS

The sensor time delays can be set for independent OFF delay and ON delay periods. The time delay trimpots can be adjusted to provide the best individual response for the feeder (0 to 12 seconds). By rotating the adjustment clockwise, the delay will become longer.

7. SETTING THE SOFT-START

The start-up of the control output can be adjusted to ramp up to the desired output level instead of starting abruptly. Soft-start keeps parts from falling off the tooling, reduces spring shock, and hammering when the control turns ON. Turn the **SOFT** Start trimpot clockwise for the gentlest start (about a 5 sec. ramp up to full output). Turn the trimpot fully counter-clockwise for no soft start.

8. FEEDER BOWL/HOPPER INTERLOCK OUTPUT

The Feeder Bowl/Hopper Interlock feature (terminals 2 & 3 of TB2) can be connected to a Rodix FC-40 All-Purpose Series control when control of a bulk material hopper is needed. The control interlock will prevent the hopper from operating anytime the bowl is turned OFF or in "STAND BY" mode. The Interlock output is 12 VDC (70 mA). The 12 VDC output is capable of switching 500 mA if an external power supply is used. Download the FC-90 Plus Advanced Application note for more details. The Interlock output can also be used to drive a solid state relay. The solid state relay is then used to operate any auxiliary equipment such as air valves. Two FC-90 ***Plus*** controls can also be interlocked, download the FC-90-2 Application Note for the wiring information.

9. POWER SUPPLY

At the rated line voltage, the power supply is capable of providing a combined total current of 100 mA at 12 VDC. The total current includes the sensor and any auxiliary output accessories that are connected to the Bowl/Hopper Interlock terminals.

10. REMOTE SPEED CONTROL

Remote control of the power level can be accomplished by the following methods:

A. 4-20mA signal from a PLC can be used to remotely vary the output of the control instead of the Main Control Dial. This feature is automatically turned ON whenever a 4-20mA signal is applied to the control (terminals 11 & 12 of TB2). The Main Control dial setting is ignored whenever there is a 4-20mA signal. The 4-20mA input is transformer isolated from the power line.

B. 0-5VDC Analog input signal may be applied in place of the Main Control Dial. For further information download (or request from RODIX) an FC-90 ***Plus Series*** Advanced Application Note.

C. Remote control of the output power level can be accomplished by using an optional **Step Up/Down Remote Speed Interface P/N 123-148**.

11. LINE VOLTAGE COMPENSATION

Fluctuations in the line Voltage can cause a feeder bowl to vary its feed rate. The line voltage compensation feature adjusts the control's output to help compensate for fluctuations in the supply voltage. If it becomes necessary to disable this feature, cut through the circuit board trace labeled J8 using side cutter pliers or a knife.

12. SUPPLEMENTARY FEATURES

Special supplementary software features can be enabled on the 24-476/24-477 circuit boards with software versions ADV5.0 or greater. The features include: *Constant Feed Rate* regulation (CFR vibration feedback sensor required), *Constant On*, *High/Low Track* level control, *60 pulse polarity reversal, low pulse rate, power conservation mode, MIN. power trimpot,* and *two speed pots*. See the FC-90 ***Plus*** Advanced Application Note for details. The control comes from the factory configured with the "standard program". A different program may be in operation if any of the letters on the chip label are circled: "J8", "H", "POL", "CO" and "CFR".

WARNING:

Fuses should be replaced with Littelfuse 3AB "Fast Acting" type or equivalent of manufacturer's original value.

Mounting this control on a vibrating surface will void the warranty.

WARRANTY

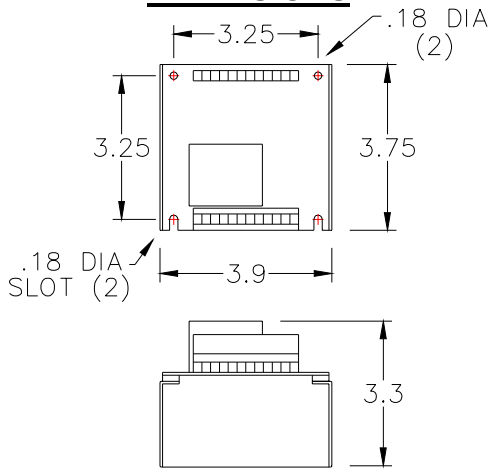
Rodix Control Products are Warranted to be free from defects in material and workmanship under normal use for a period of two years from date of shipment. For the full description of the warranty, terms, and software license, please contact the factory.

For assistance installing or operating your Rodix Control please call the factory or visit our web site. Technical help is available to answer your questions and Fax any needed information. To return a control for IN or OUT of Warranty Service, please ship it prepaid to:

Rodix Inc., ATTN: Repair Department

If under Warranty, Rodix will repair or replace your control at no charge; If out of Warranty, we will repair it and you will be billed for the repair charges (Time and Material) plus the return freight. Quotes for repairs are available upon request. A brief note describing the symptoms helps our technicians address the issue.

DIMENSIONS



RODIX, INC.
4904 Colt Road, Rockford, IL 61109
Toll Free (800) 562-1868, FAX (815) 874-6604
E-mail custserve@rodix.com
www.rodix.com

RODIX INC.
FEEDER CUBE®
CFR *Plus Series*
CONSTANT FEED RATE

1. INSTALLING THE CFR SENSOR

Note: Failure to adequately prepare the feeder's surface properly may result in a Constant Feed Rate (CFR) sensor that will not bond to the feeder. The sensor should not be mounted until step C-6.

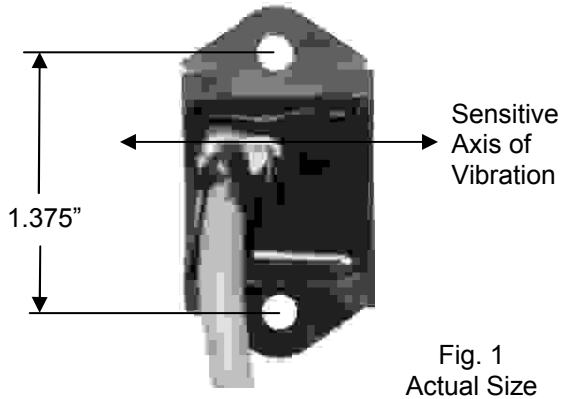


Fig. 1
Actual Size

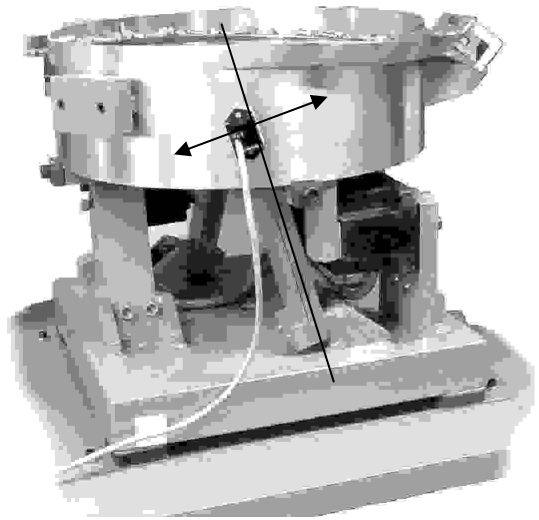


Fig. 2 The arrow shows the direction of vibration which is at a right angle to the spring pack.

A. ORIENT THE SENSOR so that its sensitive axis is in the same direction as the vibration of the feeder. The double-ended arrow in figure 1 shows the sensor's sensitive axis. Align the sensitive axis of the sensor in the same direction as the vibration (see figure 2). The sensor must be oriented correctly for proper operation.

B. CHOOSE A LOCATION for mounting the sensor on the feeder that is smooth and that will allow the adhesive on the sensor to bond. Avoid mounting the sensor over ridges and bumps which can reduce the ability of the adhesive to stick to the feeder. The correct location will also have enough space for the sensor's cable to hang straight down without touching anything else.

C. SURFACE PREPARATION of the feeder is crucial for proper bonding between the sensor and the feeder. Please follow these steps completely.

1) The feeder should be kept between 70° and 100° F for ideal tape application.
2) Clean a three and one-half inch circular area with a solvent like isopropyl alcohol that will not leave a residue. As a rule of thumb, the area can be considered clean when after cleaning the area with a solvent-saturated, white paper-towel, the towel is as clean as it was before wiping.
3) Using a good amount of pressure, polish the cleaned, circular area of the feeder using a scratch pad or steel wool. Repeat step 2, and then go to step 4.
4) Wipe the cleaned surface with an alcohol wipe or with a 50/50 isopropyl alcohol/water combination.
5) Dry the surface thoroughly using a low lint cloth or a clean paper towel.
6) Remove the vibration sensor from its protective packaging. Remove the liner from the adhesive backing. Avoid touching the tape. Align the sensor as shown in figures 1 and 2. Apply the vibration sensor to the prepared area of the feeder. Press the sensor very firmly onto the feeder surface for at least 10 seconds.
7) Allow the vibration sensor at least 20 minutes to cure before operation. Note: It takes 72 hours for the adhesive to fully cure at 70° F.

Alternatively, #8 or M4 screws can be used to mount the sensor to the feeder. The hole centers are 1.375” apart.

D. ROUTE THE SENSOR CABLE to protect it from strain due to vibration. The cable that attaches to the sensor will not break from normal vibration; however, some care should be used when routing the sensor cable from the sensor to the control. The cable should hang straight down from the sensor without touching the feeder bowl or anything else. Then, the sensor cable should curve towards the power control with a bend radius larger than 3 inches.

Use a cable tie and an adhesive-backed mount to attach the sensor cable to the side of the drive base. See Figure 2. Clean the mounting area before applying the adhesive-backed mount.

E. CONNECT THE SENSOR to the control. The sensor's brown wire connects to +12VDC at TB2-9. The blue wire connects to the signal input at TB2-12.

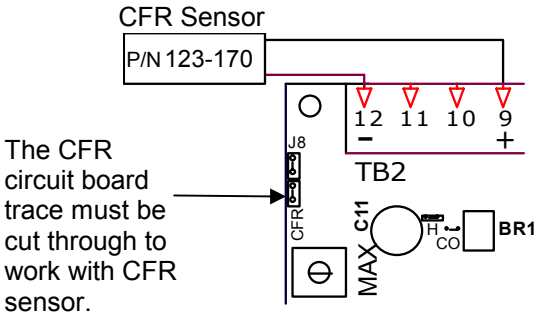


Fig. 3

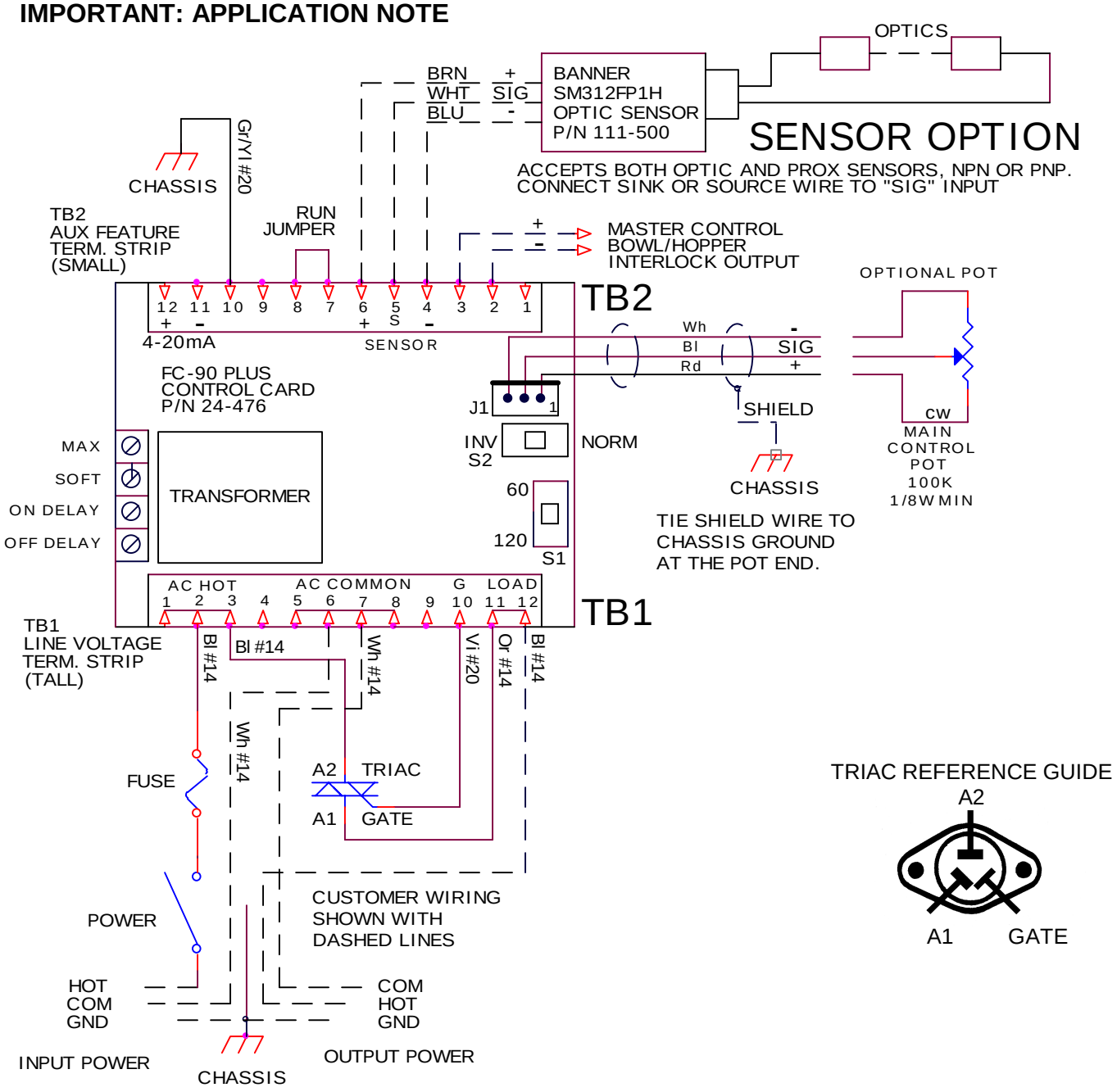
2. CFR Software Program

The FC-90 Plus, P/N 24-476/24-477 circuit boards share the same circuitry as the CFR-90 Plus, 24-502/24-503 circuit boards. The difference for Revision B.1 and higher boards is the fact that the CFR program has been enabled to operate by cutting the CFR jumper on the Board. The CFR circuit board trace is shown in figure 3. It must be cut in order for the CFR sensor, P/N 123-170 to differentiate it from a 4-20mA signal. When converting a FC-90 Plus to enable the CFR function, cut through the CFR trace with a sharp knife. Then circle the CFR designation on the IC's label to show that the CFR software feature has been enabled. If some of the software features have been circled already, download the FC-90 Plus Advanced Application Note from www.rodix.com to find out more of the software installation details.

RODIX, INC.
4904 Colt Road, Rockford, IL 61109
Toll Free (800) 562-1868, FAX (815) 874-6604
E-mail custserve@rodix.com
www.rodix.com

RODIX INCORPORATED
4904 COLT ROAD, ROCKFORD IL 61109-2644
TOLL FREE (800) 562-1868, FAX (815) 874-6604
E-mail custserve@rodix.com
www.rodix.com

FEEDER CUBE®
FC-94 *Plus* PARTS SENSING
OPEN FRAME MODEL
IMPORTANT: APPLICATION NOTE



MODEL	INPUT VAC	AMPS	OUTPUT
FC-94 *Plus*	120VAC	15A	0-120

RODIX INC.
FEEDER CUBE®
FC-90 Plus Series

FC-90 *Plus Series* ADVANCED APPLICATION NOTE

OVERVIEW

The **FC-90 *Plus Series*** of feeder controls is built around circuit boards 24-476 (120VAC) and 24-477 (230VAC). The input voltage tolerance for the 24-476 board is 90-120VAC +/- 10%. The input voltage tolerance for the 24-477 board is 180-240VAC +/- 10%. Note: vibratory feeders may not feed well at low line conditions. Each board contains two power supplies, phase-angle firing control for the triac, a Sensor input, a "Run" input, one or two speed inputs, one auxiliary output, and logic circuitry to perform on-delays and off-delays.

POWER SUPPLIES

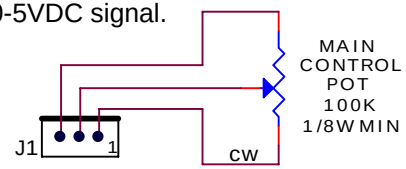
The 5 VDC power supply is for internal use only. The 12 VDC power supply is available for external use having a maximum current capacity of 100mA. Both supplies share the same ground.

0-5VDC & 4-20mA ANALOG INPUTS

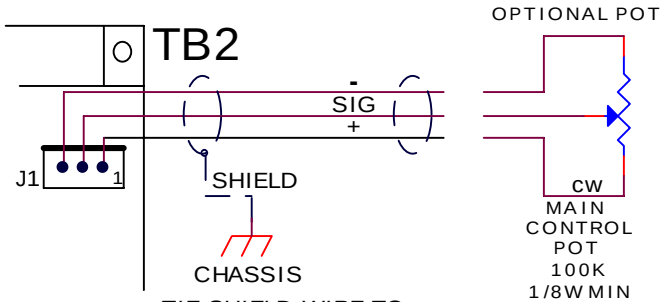
The **FC-90 *Plus Series*** feeder control has a **0-5VDC** analog signal input and a **4-20mA** analog signal input for controlling the vibration level of the feeder bowl.

0-5VDC input: Either a potentiometer or a 0-5VDC input signal can be used to control the output level of the control.

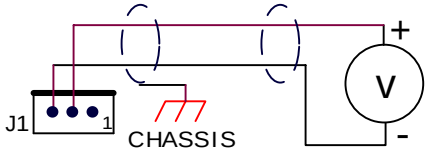
A potentiometer (Main control pot) normally is connected to the analog input of J1 to vary the output level of the control. This pot acts as a voltage divider across the 5VDC power supply providing a 0-5VDC signal.



Remote pot operation can be achieved by using a 3-wire shielded cable connected to J1, the analog input. The shield (drain wire) should be connected to the chassis ground only at the Rodix end of the cable. See the wiring diagram for pot wiring connections.

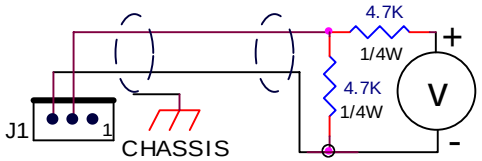


A 0-5VDC signal can be applied to J1, the analog input instead of using the Main pot. The 0-5VDC analog input signal may be applied between terminals 2 and 3 of header J1. Connect the ground to terminal 3 and the signal to terminal 2. To improve noise immunity, remove the wire from pin 1 of connector J1.



0-5VDC Input Diagram

A 0-10VDC signal can be applied to the analog input by using a voltage divider circuit to scale the input voltage to 0-5VDC. See figure below.



0-10VDC Input Diagram

The J1 cable is provided with the **FC-94 *Plus*** control. The cable, P/N 123-145 may be used anytime a remote signal or a remote pot is used. The shield of the "J1" cable should be tied to chassis ground at the Rodix end of the cable.

4-20mA input: a 4-20mA signal is the second type of input signal that can control the output vibration level. This method has a better signal to noise ratio than the 0-5VDC input control. Connect the 4-20mA signal to TB2-11 (GND) and TB2-12 (SIG) to allow the bowl's vibration level to be adjusted remotely.

The Main control pot is automatically disabled whenever the 4-20mA input current is above 4mA. When the 4-20mA input current is at 0mA, control of the vibration level goes back to the J1 Main pot input.

Application Hints:
For Local/Remote control of the vibration level, use a switch to toggle between the 4-20mA input and the control pot. The switch is used to interrupt the 4-20mA current at TB2-12.

To use only the 4-20mA input to control the vibration level, disconnect the pot cable connected to J1.

When an analog input signal is used, the analog input signal should be applied after line power has been applied to the control.

The control produces a special logarithmic-tapered power output curve from the information given by the Main pot or 4-20mA input. The special taper spreads the power curve broadly across the pot range, helping to give maximum fine control over the control's output. For extra fine pot control, five and ten-turn pot kits are available from RODIX.

Please note, on revision B or higher circuit boards the 4-20mA feature is de-activated when the Constant Feed Rate (CFR) feature is used.

Step Up/Down Remote Speed Interface P/N 123-120 allows remote control of output power level, and replaces the Main control pot on the **FC-40 *Plus*** and **FC-90 *Plus Series*** **Feeder Cube®** controls. When used, two customer provided push buttons increase or decrease the output power level of the control. This add-on option is available from Rodix.

RUN INPUT

Remote OFF/ON control normally can be accomplished by using a dry relay contact at terminals TB2-7 and TB2-8. When a contact is unavailable, one of the following can be used.

A PLC having an NPN (current sinking) output can provide remote OFF/ON control to the control's Run input. Connect the PLC's NPN output to TB2-8 (SIG). Connect the PLC's power supply (5-30VDC to TB2-9 (Pos). Apply the signal whenever the control should be enabled. To prevent damage when using this feature, resistors R24 and R25 must be removed from the FC-90 ***Plus*** circuit board. Use pliers to twist and snap off resistors.

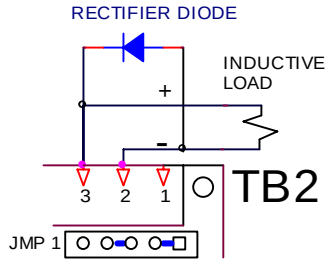
A PLC having a PNP (current sourcing) output can provide remote OFF/ON control to the control's Run input. Connect the PLC's PNP output (5-30VDC) to TB2-8 (SIG). Connect the PLC's ground to TB2-7 (Gnd). Apply the signal whenever the control should be enabled. To prevent damage when using this feature, resistors R24 and R25 must be removed from the FC-90 ***Plus*** circuit board. Use pliers to twist and snap off resistors.

If no power supply is available for a Run input signal, the "on-board" power supply can be used. A current sinking output (NPN) from a PLC can be connected to TB2-8 and ground wire from the PLC connects to TB2-7. Do not remove resistors R24 and R25 when using the "on-board" power supply.

AUXILIARY OUTPUT

The auxiliary output is useful for controlling other feeder controls, solid-state relays, small DC solenoids, and PLC inputs. The auxiliary (interlock) output turns ON whenever the control output is ON.

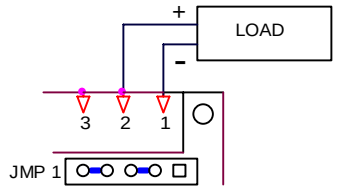
The AUX output comes from the factory configured to sink current from the internal power supply: see the "typical relay wiring" drawing. The AUX output can be configured to sink or source current from the internal power supply which is rated at 100mA or from an external power supply.



Typical relay wiring

The AUX output can be reconfigured to source current by modifying the jumper positions of JMP1. JMP1 is a group of five solder pads, and it is located behind TB2 terminals 1 through 3. Terminal 1 of JMP1 is indicated by a square pad. To source current, cut the printed circuit board traces between pads 1 and 2 and between 3 and 4 of JMP1. Then, use 20 gauge or smaller wire to connect solder pads 2 and 3. Next, solder a wire into pads 4 and 5.

Note: the interlock connections change if the AUX output has been modified to source current. The interlock connections need to be changed from terminal TB2-2 to terminal TB2-1, and from terminal TB2-3 to terminal TB2-2.



JUMPERS RECONFIGURED FOR SOURCING CURRENT

The AUX output is capable of switching 500mA at 24VDC when an external power supply is used. To prevent damage when using this feature, resistors R20 and R21 must be removed from the circuit board. Use pliers to twist and snap off resistors.

Inductive loads or loads with a relay coil connected to the auxiliary output produce a negative voltage spike when the coil is de-energized. In order to protect the on board semi-conductors from a negative voltage, connect a reverse biased diode across the inductive load. A rectifier diode can be connected across the coil by connecting the side of the diode with a band to the positive side of the coil, and connect the side without the band to the negative side of the coil. A 1N4006 diode, P/N 115-31 is available from Rodix.

ISOLATION

The **FC-90 *Plus Series*** control is transformer isolated from the line, the isolation is rated at 2500V. The chassis to ground isolation is 1000V. The sensor input, run input, analog (pot) input and interlock output all share the same power supply common. The sensor input can be optically isolated if resistors R22 and R23 are removed from the circuit board. The sensor power must then be supplied from an external 5-30VDC source. The run input and interlock output are optically isolated only when resistors R20, R21, R24 and R25 are removed, please read all directions before removing them. Use pliers to twist and snap off resistors.

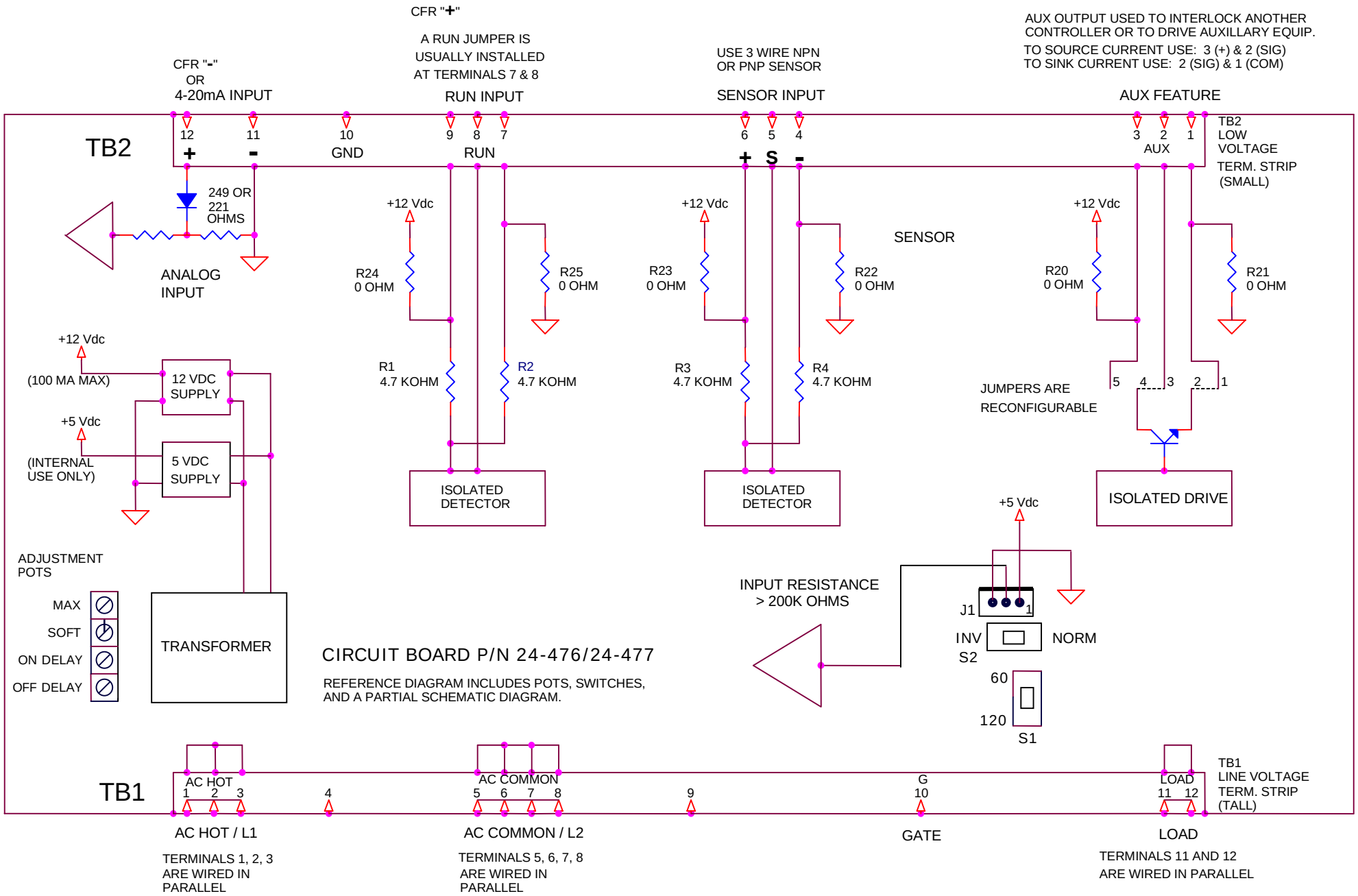
NOISE IMMUNITY

For further details about noise immunity, see the **Feeder Cube®** application note for your model and the Rodix Solution titled Good Wiring Practices for Avoiding Electrical Noise Problems.

Technical Support

Application notes, troubleshooting guides, and Rodix solution guides are available at www.rodix.com.

RODIX, INC.
4904 Colt Road, Rockford, IL 61109
Toll Free (800) 562-1868
E-mail custserve@rodix.com
FAX (815) 874-6604
www.rodix.com



FC-90 PLUS INTERFACE DIAGRAM

ATTENTION: SENSOR AND/OR FIELD CONNECTIONS HAVE CHANGED FROM PRIOR MODELS.
THIS DIAGRAM IS FOR REFERENCE ONLY, SEE FC-90 PLUS SERIES APPLICATION NOTE FOR INTERCONNECT WIRING.

FC-90 PLUS SERIES EQUIVALENT CIRCUIT

RODIX INC.
FEEDER CUBE®
FC-90 Plus Series
®

Optional software features of the 24-476 / 24-477 Rev. B circuit board

OVERVIEW: The **FC-90 *Plus Series*** of feeder controls are built around the circuit boards P/N 24-476 (120VAC) and 24-477 (230VAC). This section covers the advanced program features of the **revision B circuit boards**. The revision B circuit boards contain five (5) program jumpers that can be cut in order to enable alternate program features. The program features should be chosen based on the customer application. When the "CFR" program is ordered from Rodix, the circuit board is relabeled 24-502 or 24-503.

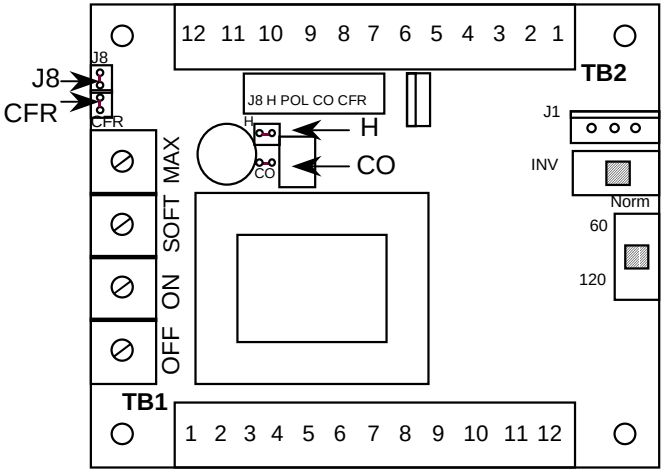
PROGRAMMING: By cutting the correct jumper combination, it is possible to run a desired program instead of the "standard program." The five program jumpers on the circuit board are labeled “J8,” “H,” “POL,” “CO,” and “CFR.” The program jumpers are actually circuit board traces located between two through-hole pads (feed-throughs). The jumpers can be cut through with a sharp knife. Care should be taken to cut the correct jumper or combination of jumpers to enable the desired program feature(s). Record which jumpers were cut for future reference by circling their letters on the label that reads PROGRAM: “J8,” “H,” “POL,” “CO,” and “CFR.” The control comes from the factory configured with the “standard program.” The different program variations and their descriptions are enclosed:

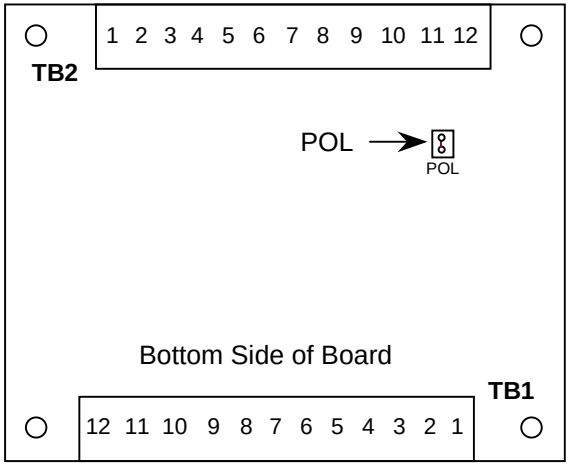
Caution: If more than one software function is desired, please check Table 1 to find the exact programming selections needed; otherwise, the board may run a software program that does not fit the application.

Jumper Programming Chart	Jumper Positions				
Program Description	**“J8”**	**“H”**	**“POL”**	**“CO”**	**“CFR”**
Standard Program (Factory Default)	Norm or Cut	Normal	Normal	Normal	Normal
Standard Program and CFR	Norm or Cut	Normal	Normal	Normal	Cut
Constant ON feeding, Aux. output changes	Normal	Normal	Normal	Cut	Normal
Constant ON and CFR	Normal	Normal	Normal	Cut	Cut
Low Pulse rate - 30 or 15 Pulse per second output	Cut	Normal	Normal	Cut	Normal
Low Pulse rate - 20 or 10 Pulse per second output	Cut	Normal	Cut	Cut	Normal
60 Pulse Polarity Reversal	Norm or Cut	Normal	Cut	Normal	Normal
60 Pulse Polarity Reversal and CFR	Norm or Cut	Normal	Cut	Normal	Cut
Power conservation mode with Soft pot Timer	Normal	Normal	Cut	Cut	Normal
Power conservation mode with Soft pot Timer and CFR	Norm or Cut	Normal	Cut	Cut	Cut
High and Low track sensors	Norm or Cut	Cut	Normal	Normal	Normal
High and Low track sensors and CFR	Norm or Cut	Cut	Normal	Normal	Cut
Minimum power (Soft) pot with fixed soft-start	Norm or Cut	Cut	Normal	Cut	Normal
Minimum power (Soft) pot with fixed soft-start and CFR	Norm or Cut	Cut	Normal	Cut	Cut
High and Low track sensors and Polarity Reversal	Norm or Cut	Cut	Cut	Normal	Normal
Two Speed Pots with Soft pot as 2nd speed	Norm or Cut	Cut	Cut	Normal	Cut
Minimum power and output turns off if Main Pot is zero	Norm or Cut	Cut	Cut	Cut	Normal
Revert to Standard Program	Norm or Cut	Cut	Cut	Cut	Cut

Table 1

Program Jumper Locations:





1. Constant Feed Rate (CFR): A Rodix vibration sensor P/N 123-170 can be added to allow the control to regulate the vibration level of a vibratory feeder. The regulation provides a constant feed rate of parts to the machine process. Activating the "CFR" program converts the 4-20mA speed-control input feature to the CFR input feature. See the "Jumper Programming Chart" for programming details. The CFR sensor attaches to the feeder and its connections are shown in Figure 1. For more information about the CFR feature, call Rodix or download the CFR application note.

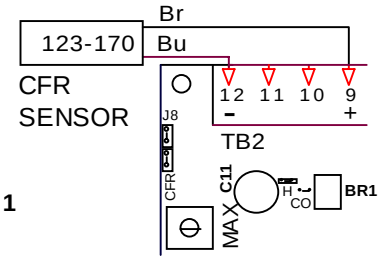


Figure 1

If the 4-20mA analog speed control is needed along with the constant feed rate feature, convert the board to the constant feed rate feature. Then use a P/N 123-164, 4-20mA accessory board to bring the 4-20mA signal into the pot input J1 of the circuit board.

2. Constant On: This software feature allows a high feed rate application to keep the feeder running all of the time (ON). The part sensor is used to switch an auxiliary device like an air valve ON and OFF through the Auxiliary output (TB2-1, 2, & 3). The air valve then blows unwanted parts back into the bowl when the inline has enough parts. An air valve can be operated by the Aux. output by using one of the two connection schemes shown below in Figures 2 & 3. The Constant On feature automatically disables the Line Voltage Compensation feature.

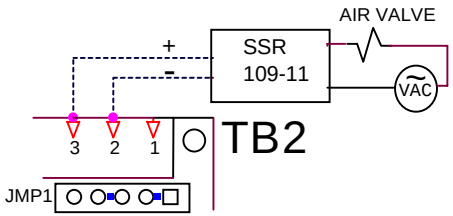


Figure 2

3. **60 Pulse Polarity Reversal**: Normally in the 60 Pulse (half-wave rectified) mode, the output voltage is turned on only during the bottom half of the sine wave. However with the 60 Pulse Polarity Reversal software feature, the top half of the sine wave is used instead of the bottom half.

Use this feature to reduce mechanical interaction between two vibratory feeders. Mechanical interaction can occur when both feeders use the 60 Pulse mode and they share the same machine base. Mechanical interaction can cause the vibration from one feeder to effect the other feeder. A typical symptom of this is when turning one feeder's vibration up causes the vibration to increase or decrease on the other feeder. To solve this problem, more mass can be added to the machine base, or use the Polarity Reversal feature. This feature alters the timing on one feeder so that each feeder is pushing against the machine base at a different time.

A second reason for reversing the polarity of the 60 pulse waveform is to reduce the apparent power when two or more feeders are connected to the same branch of an electrical power distribution circuit. An example is a vibratory feeder system where each unit is set to 60 pulse mode. If there is a hopper feeding at 1.5 Amps, a bowl feeding at 5 Amps, and an inline feeding at 1 Amp, then the measured current of the branch would be 7.5 Amps. But if the 60 pulse waveform were reversed on the bowl, then the apparent current of the branch would be reduced some because the current flows in both directions instead of only one. This would cause the branch step down transformer to operate a little cooler and the measured wattage at the utility meter to decrease. See the "Jumper Programming Chart" for programming details.

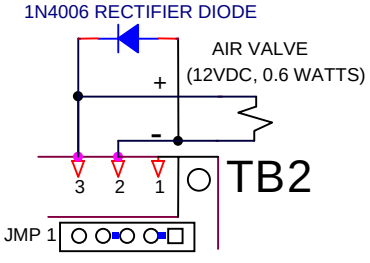


Figure 3

4. High and Low Track Sensors: This option maintains the parts level between a high-level sensor and a low-level sensor on the track. One purpose for this is to keep a consistent reservoir of parts on the track so the machine process does not run out of parts without causing too much back pressure. This feature also can be used to make a feeder bowl run more efficiently because it only turns ON when parts are needed, and it only turns OFF when the track is full of parts. Better efficiency reduces the amount of wear on the tooling of the feeder bowl.

When the parts level drops below the low-level parts sensor, the feeder turns ON after any time delay. The feeder runs until the parts reach the high-level shut off sensor and the timer times out. The feeder stays off until the low-level is reached again. See the "Jumper Programming Chart" for programming details.

Two parts sensors are required. The first sensor connects as normal to the Sensor input. It does not matter whether the high or low level sensor is connected to the Sensor input or the Run input. The wiring for Sensor input is as follows: TB2-4 is ground. TB2-5 is the Signal. TB2-6 is +12VDC. The second parts sensor connects to the Run input. The wiring for the Run input is as follows: TB2-7 is ground. TB2-8 is the Signal. TB2-9 is +12VDC.

5. Power Conservation Mode: Wasted power and unnecessary wear on feeder tooling is the result of "parts jams" and "feeder out of parts" conditions. The "power conservation mode" can turn the feeder OFF, and turn the auxiliary output ON when these conditions occur. Turning the auxiliary output ON allows operators to be notified through a solid-state relay and a light stand or by communicating to a 24VDC PLC input. Note: The auxiliary output must be isolated when connecting it to a 24VDC PLC input. See the FC-90 Plus Advanced Application note for further information.

In the power conservation mode, the Soft-Start trimpot serves as the power conservation timer. It has an adjustable time delay setting of 2 seconds (CCW) to 8.5 minutes (CW). The soft-start function becomes fixed at 1/4 Second. When the power conservation timer expires, the control shuts OFF because it has been running for too long. The conservation timer set point should adjusted so that nuisance time outs do not occur.

Note: When the power conservation timer is used, the Hopper/Bowl Interlock feature no longer functions correctly.

To restart the control after the conservation timer has timed out, cycle it OFF and then back ON again. Use one of the following methods: cycle it at either the Run input (TB2-7, 8, & 9) or the Sensor input (TB2-4, 5 & 6), or turn the power switch OFF and ON, or turn the Main pot to zero and back up again. One easy restart method is to use a momentary Reset Switch (normally closed) wired in series with the Run input at TB2-7. See the "Jumper Programming Chart" for programming details.

6. Two-Speed Pot Operation: Some vibratory feeder applications need to operate at two different speeds. For example: Nail feeders operate on low speed while starting up the machine, and then switch to high speed for normal operation. Packaging machines operate at high speed while filling the package. When the package is nearly full, it switches to low speed to accurately finish filling it.

For the two-speed operation, the Main Pot sets the one speed, and the SOFT trimpot sets the other speed. The soft-start function becomes fixed at 1/4 second. The part sensor is used to switch between the two speeds. See the "Jumper Programming Chart" for programming details.

7. Minimum Power Trimpot: The Minimum Power trimpot feature allows the vibratory feeder to operate at the minimum acceptable feed rate when the Main Pot is at "0". The Soft-Start trimpot serves as the Minimum Power trimpot, and the soft-start function becomes fixed at 1/4 second.

When very precise adjustment of the Main Pot is needed, increase the MIN trimpot setting and/or decrease the MAX trimpot setting so that the range of the Main Pot is reduced. When this feature is used in conjunction with the CFR feature, the precise Main Pot adjustment aids the operator in setting the desired feed rate. See the "Jumper Programming Chart" for programming details.

8. Min pot and Output turns off if Main pot is zero:
The Minimum Power trimpot feature allows the vibratory feeder to operate at the minimum acceptable feed rate when the Main Pot is set above "0". The Minimum Power trimpot is only operational when the Main Pot is set higher then "0". The Soft-Start trimpot serves as the Minimum Power trimpot, and the soft-start function becomes fixed at 1/4 second.

When very precise adjustment of Main Pot is needed, increase the MIN trimpot setting and/or decrease the MAX trimpot setting so that the range of the Main Pot is reduced. When this feature is used in conjunction with the CFR feature, the precise Main Pot adjustment aids the operator in setting the desired feed rate. See the "Jumper Programming Chart" for programming details.

9. Revert to Standard Program: It is possible to revert back to the "Standard Program" if a program variation is attempted and does not work out as expected. If needed, wire jumpers can also be installed at the Rodix factory to bypass undesired cuts. See the "Jumper Programming Chart" for programming details.

RODIX, INC.
4904 Colt Road, Rockford, IL 61109
Toll Free (800) 562-1868
E-mail custserve@rodix.com
FAX (815) 874-6604
www.rodix.com

10. Low Pulse Rate: 30, 20, 15, or 10 PPS (Pulse-Per-Second) Output: With 60 Hz input power, this option allows the control to produce frequencies of 30, 20, 15, and 10 PPS. (For 50 Hz input power, the frequencies are 25, 16.6, 12.5, and 8.3 PPS). Vibratory feeders with large parts, large tray feeders and a few inline track applications may operate below 60 PPS. A vibratory feeder that is converted to a lower pulse mode will require fewer springs.

The theory behind the "Low Pulse Rate" option is that the output of the control can be turned ON and OFF to simulate the desired low frequency waveform. Current flows through the vibratory feeder electromagnet coils during the ON time, and the coils are OFF the rest of the cycle. The output frequency depends on how low long it takes to complete one ON and OFF cycle. To simulate the desired frequency, the output is turned on (ON time) for a series of 60 Hz pulses, and then it is turned off (OFF time) for the same amount of time. An example of this is shown in the waveform titled "Current Waveform, 10Hz. One second is shown in this window". Since the vibratory feeder is tuned to a resonate frequency, it is stimulated by the desired frequency, but it is unable to respond to the higher 60 Hz modulating frequency.

Simulating 30 Hz or lower with Alternating Current (AC) instead of using Direct Current (DC) will decrease the amount of work that is done by the vibratory feeder coils, which will decrease the feed rate of the machine. This is because the output of the control provides AC, and not DC. DC provides more power than AC during the same amount of time. This is because Direct Current is flowing during the entire ON time, however Alternating Current isn't flowing as much of the time because it periodically goes to 0 amps. The coil size and the coil gap determine the maximum current draw of the vibratory feeder system. When sizing a distribution transformer for this control, the transformer will need to be oversized.

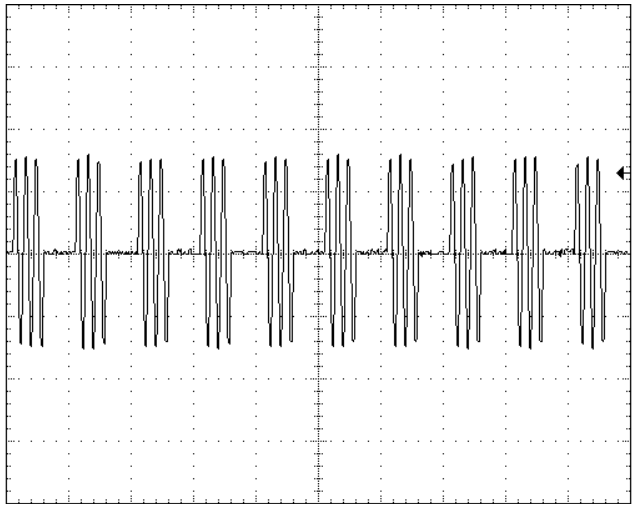
Operation: See the "Jumper Programming Chart" for programming details. Jumper "D" selects which frequency range to use, 30/15 Hz or 20/10 Hz. Next, the pulse mode is selected with the 60/120 switch. Note: The Low Pulse Rate feature disables the Line Voltage Compensation feature.

Pulse mode selection:
When using the 30 Hz/15 Hz range, select "120" on the 60/120 switch for 30 Hz and "60" for 15 Hz.

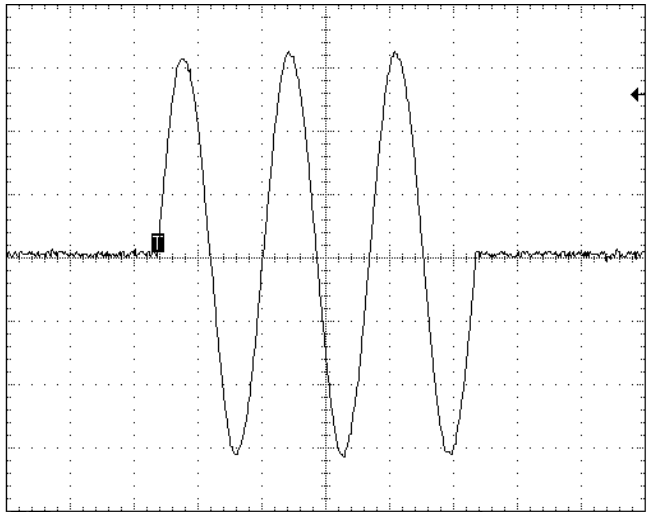
For the 20 Hz/10 Hz range, select "120" on the 60/120 switch for 20 Hz and "60" for 10 Hz.

During the initial operation of the control on the machine it is important to monitor the temperature of the coils on the vibratory feeder. If the coils become too hot to touch, the coil current is too high. Decrease the MAX pot setting and re-apply power when the coils have cooled. Overheating the coils will eventually cause them to short circuit and fail.

Low Pulse Rate Waveforms that produce 10HZ



Current Waveform, 10Hz.
One second is shown in this window. The Off/On cycle repeats 10 times per second to provide 10Hz.



Enlarged Current Waveform, 10Hz.
0.1 Second is shown in this window. The current is on for 3 sine waves then off for 3 sine waves.