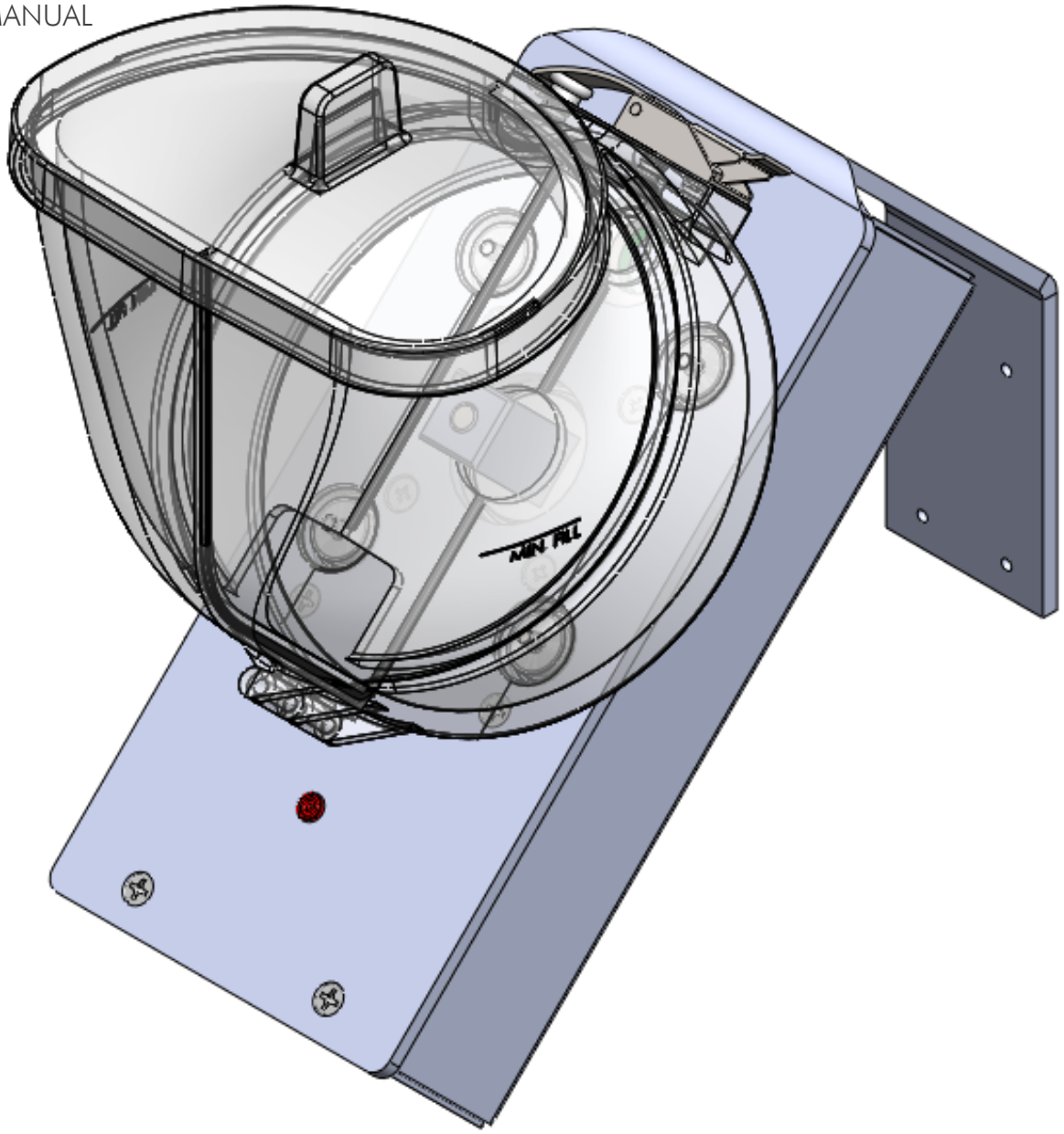
VeriFEED Dispenser

ENV-204

USER MANUAL
DOC- 337
Rev.1.0



Copyright ©2023 All Rights Reserved

Med Associates Inc.
P.O. Box 319
St. Albans, VT 05478
www.med-associates.com

Phone: 802.527.2343
Fax: 802.524.2110

CONTENTS

Copyright ©2023 All Rights Reserved

Med Associates Inc.
P.O. Box 319
St. Albans, VT 05478
Phone: 802.527.2343 Fax: 802.524.2110 www.med-associates.com

CONTENTS

CHAPTER 1 *INTRODUCTION*

Med Associates recommends reading this manual prior to operating the VeriFEED Dispenser.

The *VeriFEED* is a landmark design in pellet dispensers. Reward variability in experiments should be based on experimental design not on performance of equipment. Design features introduced in this model ensure reliable verified repeatable delivery and easy maintenance.

Removable Hopper

The pellet hopper snaps to the *feeder bracket* enclosure with strong magnets and opens into two *hopper halves* with the flip of a *clip*. The upright angled fill mouth and simple *lid* make it easy to see, empty, clean, fill, and weigh.

Feeder Bracket

The Feeder Bracket *stepper motor* has improved torque control, and an Infrared sentry with smart gain technology detects pellets even as dust accumulates. *IR Sentry* and stepper motor protocols coordinate action to ensure delivery, and self-clear most blockages. The VeriFEED sends a verification signal to *Med-PC* after each pellet is counted. In the rare event that it is unable to dispense a pellet, it will signal with a flashing light the user can also have Med-PC notify when no pellet is dropped.

Exchangeable Pellet Discs and Improved Pellet Handling

The precision tooled *ENV-204D-20* (20 mg) or *ENV-204D-45* (45 mg) pellet discs for grain or sucrose provide a gentle profile for handling pellets. The angle of operation reduces interference which could cause grinding together or crumbling of pellets. Pellet discs are sold separately.

Changing of the Guard

The VeriFEED replaces all of our previous 20mg and 45mg dispenser lines.

This includes:

ENV-203-20	Pedestal Dispenser for 20mg Pellets
ENV-203-20IR	Pedestal Dispenser with IR Sentry for 20mg Pellets
ENV-203-45	Pedestal Dispenser for 45mg Pellets
ENV-203-45IR	Pedestal Dispenser with IR Sentry for 45mg Pellets
ENV-203M-20	Modular Dispenser for 20 mg Pellets
ENV-203M-45	Modular Dispenser for 45mg Pellets
ENV-203M-45IR	Modular Dispenser with IR Sentry for 45mg Pellets

Figure 1.1 Connections and Controls

The VeriFEED Dispenser

A = Hopper
B = Status Light
C = Bracket
D = Power and Control Port
E = Post
F = Hopper Lid
G = Pellet Drop Tube
H = Operate Button

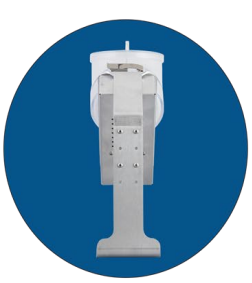
Choice of Mounting Options

The VeriFEED comes ready to be mounted on:

- Any Med Associates modular panel including Classic Mouse, Wide Mouse, or Standard Rat.
- A 90° mount that attaches to the same modular panel but turns the VeriFEED hoper to face the front of the sound attenuating cubicle (SAC).
- A pedestal stand that sets it off to the side and can attach to the environment base.

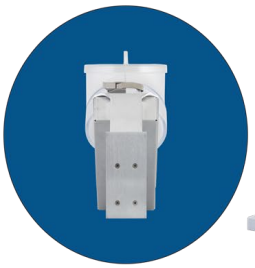
NOTE: Mounting options are sold separately.

Figure 1.2 Mounting and Accessories



ENV-204P	Pedestal Mount

ENV-204M90M	Modular Chamber Panel Mount w/ 90° turn for Classic Mouse
ENV-204M90WM	Modular Chamber Panel Mount w/ 90° turn for Wide Mouse
ENV-204M90R	Modular Chamber Panel Mount w/ 90° turn for Standard Rat

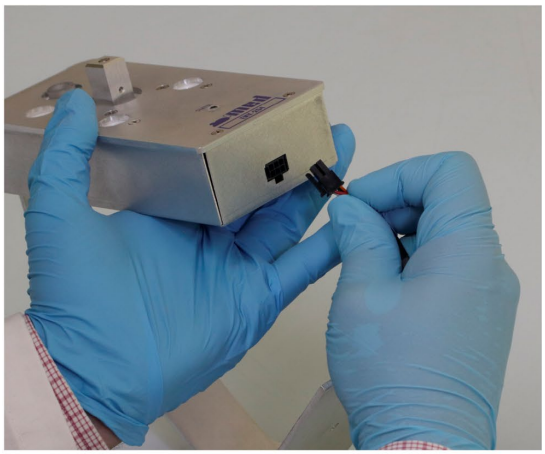


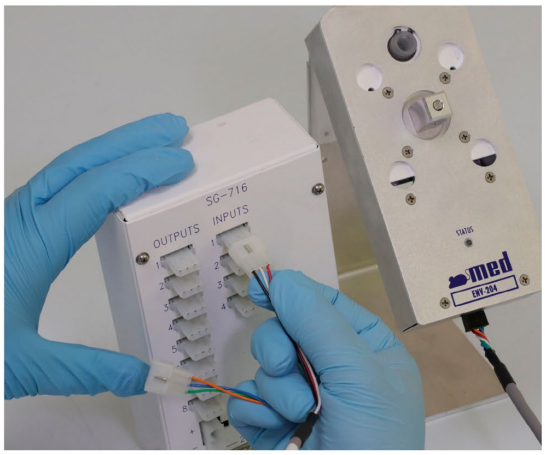
ENV-204MM	Modular Chamber Panel Mount for Classic Mouse
ENV-204MWM	Modular Chamber Panel Mount for Wide Mouse
ENV-204MR	Modular Chamber Panel Mount for Standard Rat

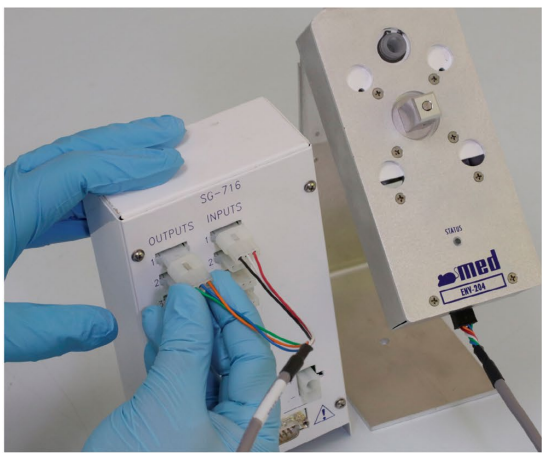
CHAPTER 2 *GETTING SET-UP*

Assembling VeriFEED connections

Figure 2.1 Assembling VeriFEED







The VeriFEED is designed to be controlled through a *MedConnect* style *connection panel* such as the *OC-112* or the *SG-716B*. See the *Omni Control Interface Manual* or the *Smart Control Interface Manual* for more information on that operation. In brief, the power and control port can be found at the lowest part of the bracket *("D" in Figure 1.1 Connections and controls)*. The *SG-224A* cable separates into two connections, a *MedINPUT* and a *MedOPERATE*. Both component connections to the VeriFEED terminate in a *3 pin Molex style connector*.

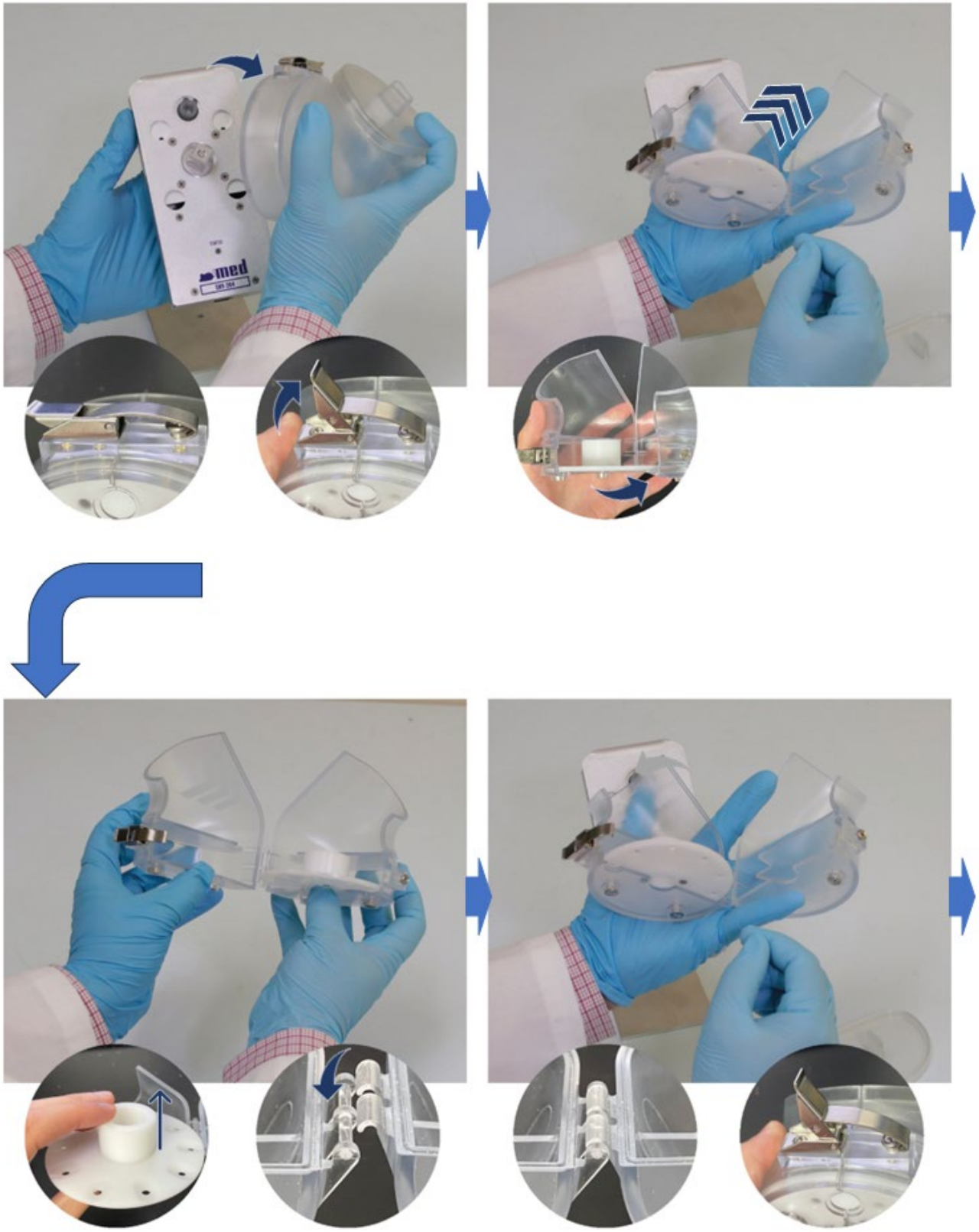
MedINPUT

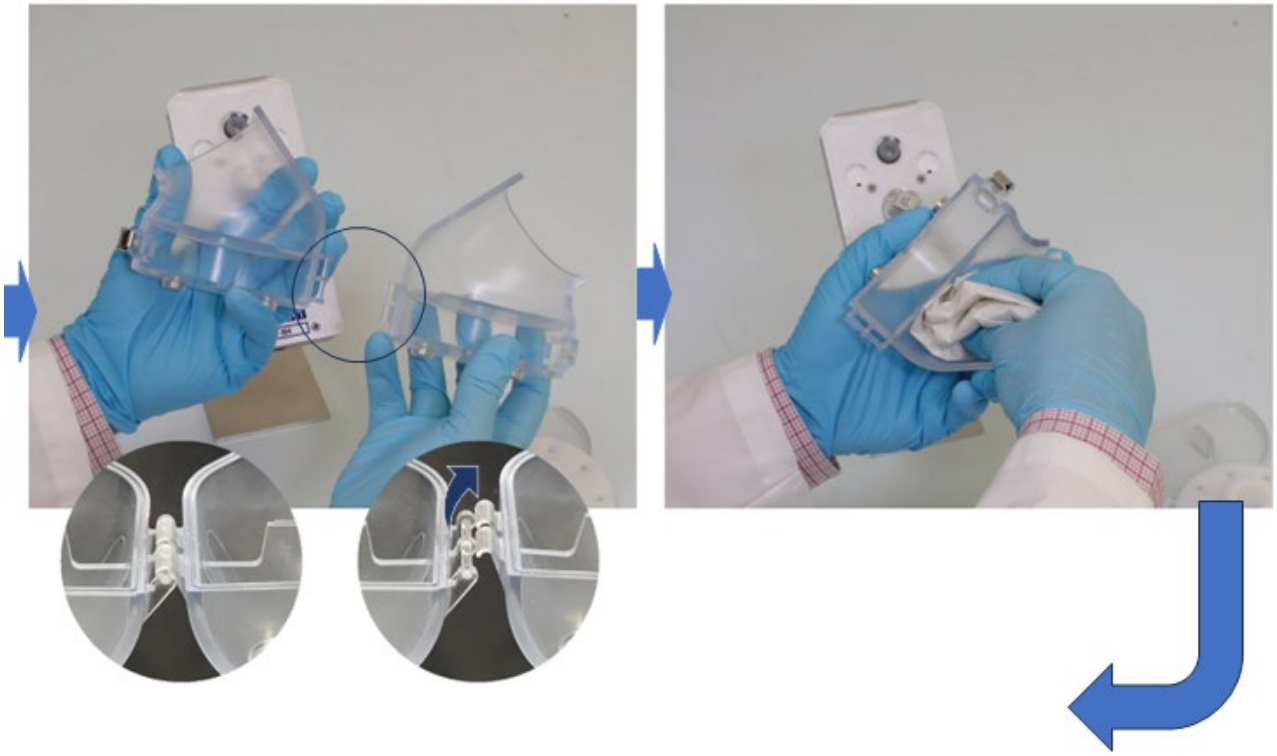
The MedINPUT connector carries simple signals to Med-PC. The VeriFEED dispenser sends a 20 ms pulse to the connection panel when a pellet passes the *IR sentry* through the pellet drop tube. This can then be used to trigger reaction events in *Med State Notation protocols (MSN)* or notify the user that a feeder is empty *(See CHAPTER 3 SAMPLE MED-PC MSN PROGRAMS)*. The feeder will operate normally if the MedINPUT line is not connected but will not send any responses to Med-PC.

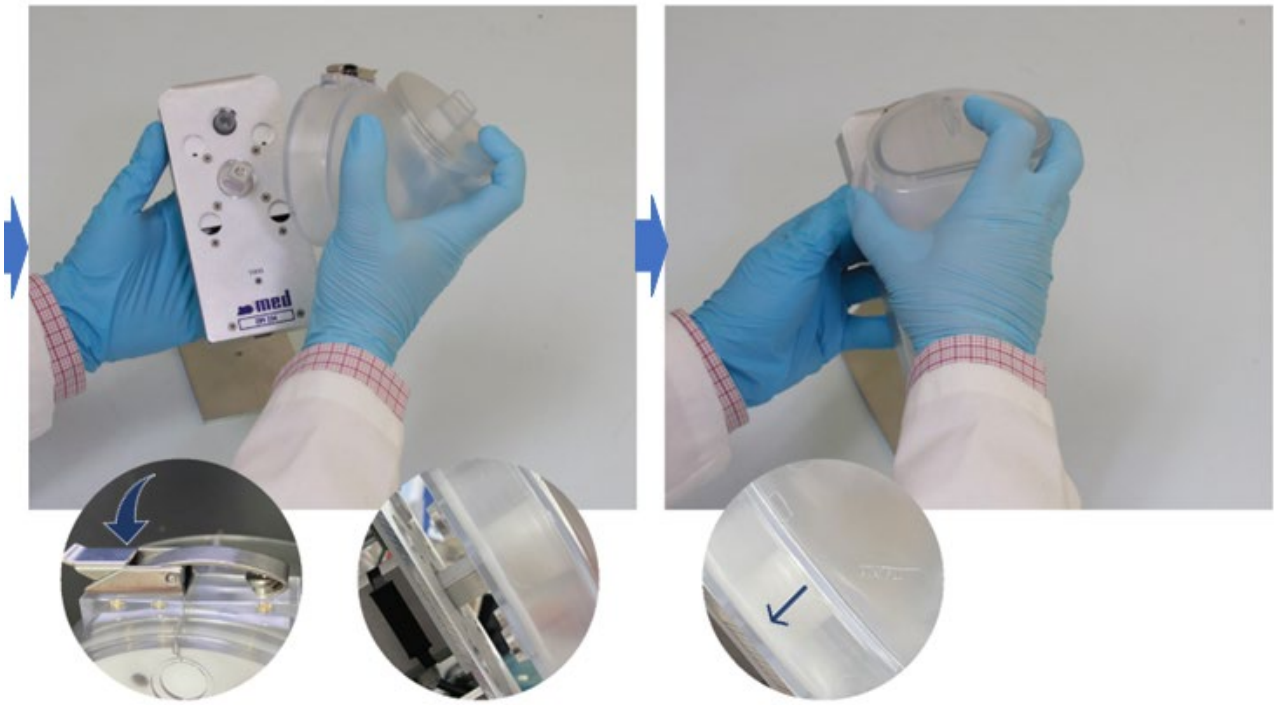
Figure 2.2 The pinout of the 3-pin MedOPERATE and MedINPUT Molex connector

	MedOPERATE		Control Panel connections	VeriFEED connection
1	Output Ground (28 Volt to Ground)	Green	1	1
2	Operate Active low (+28 Volts)	Blue	2	2
3	Unit Power +28 Volts DC	Orange	3	3
	MedINPUT (VeriFEED Pellet signal)			4 5 6
4	Input Ground	Black	4	
5	Signal Line Active low (+28 Volts)	White	5	
6	+28 Volts DC (Connection only)	Red	6	

Figure 2.3 Hopper Removal Cleaning Assembly and Attachment



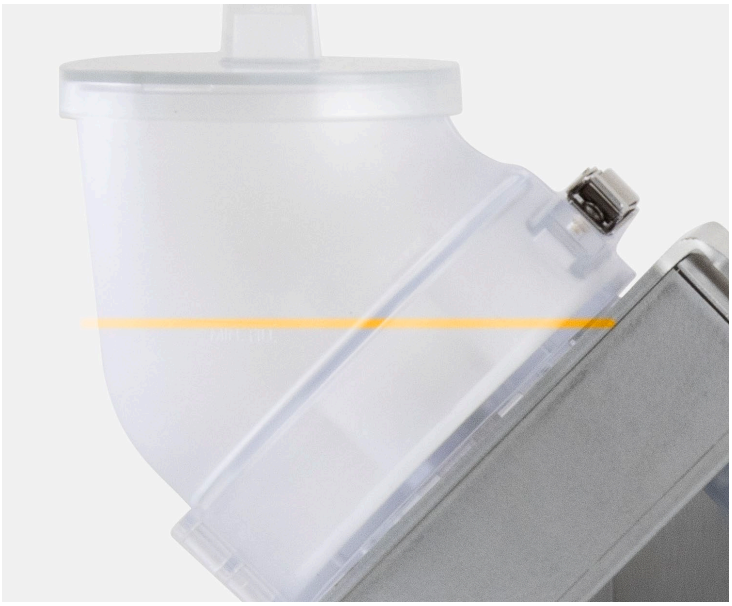




Minimum Fill Line

When the pellet dispenser runs close to empty, some pellet geometry can work against the operation of the machine to create matrixed or linked pellets that lift away from the entry points. The VeriFEED will still dispense pellets with the same accuracy as before, but the time between dispenses may slow as the feeder works to counter this interference. The feeder will run most efficiently when there is some weight of pellets above the entry to the disc portion of the hopper. The minimum fill line on the hopper shows where this point begins, and where less efficient dispensing may start to happen.

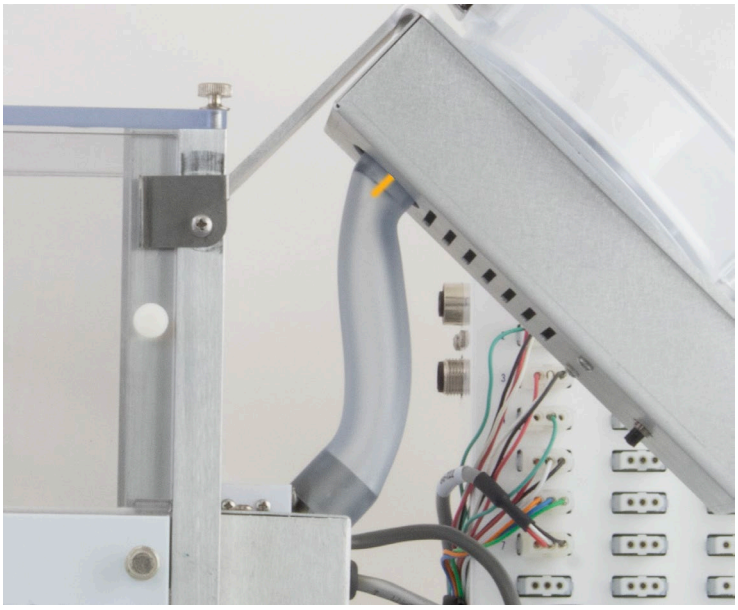
Figure 2.4 Image of Minimum Fill line



Receptacle Hose preparation

A flexible hose line provides a seamless connection between the drop point and the pellet receptacle. It is cut to size to give a secure and un-kinked path to the pellet receptacle. If it becomes necessary to replace this hose the new hose can grip very firmly to the pellet drop tube. We suggest the operator cut a single slit up the last 2-3 cm of line the pellet drop tube will insert into. To remove the hose a firm grip at the base of drop tube and a rocking twist should remove the hose fairly easily. Note when attaching the hose that the pellet drop tube can be lifted upward. Press it down so that the retaining clip comes into contact with the housing and therefore is seated completely into position.

Figure 2.5 Image of Receptacle Hose preparation



MedOPERATE

The MedOPERATE is simultaneously the power for the VeriFEED and the signal for the device to operate.

Med-PC sends active-low operate signals. Meaning that the signal is active when the voltage drops to ground on the operate line. A pulse to operate is produced between the operate signal starting and stopping, meaning power returns to the operate pin from ground. This reduces latency in operation, and helps confirm connection integrity, but care must be taken if damage is done to the operate pin (2) as a short between this line and the Unit Power pin (3) will trigger the feeder.

The VeriFEED is capable of retaining a very large number of sent signals to operate in queue while the feeder dispenses. In laboratory tests it parses signals up to 20 times a second. Barring interference, the feeder will dispense a pellet within one second the majority of the time.

Feeder Empty Alarm

If the pellet dispenser has completed its logic sequence to deliver a pellet, and is still unsuccessful, the status light flashes (See Figure 1.1 Connections and controls p.2). See SAMPLE MED-PC MSN PROGRAMS for information on using this feature to warn you of an empty hopper using your Med-PC protocol.

Confirming operation in MedTest and in place

When the VeriFEED feeder has been connected to the ports the user intends, then the operation can be checked as soon as the chamber is powered by pressing the operation button on the bracket bottom (Figure 1.1 Connections and controls). If the hopper is filled, it will deliver a pellet with each press of the button. You can also stimulate the feeder through MedTest by opening the control panel for the chamber it is attached to and double clicking the port number

Hopper Assembly and Attachment

The Hopper is designed to be intuitively assembled without tools. Insert the curved tabs into the hinge posts and line up the ridges and grooves along the perimeter of the hopper. Insert the pellet disc into the disc housing on either side of the hopper with the spacer post aiming up toward the pellet reservior and the pellet entry holes against the bottom of the hopper. Close the two halves together over the pellet disc. Bring the clip over the screw post and press the tension lever of the pressure clip against the housingto snap into place. To attach the hopper, bring the hopper toward the feeder. Visually align the pellet entry point with the pellet drop tube and the square disc hub bore with the square axle drive of the motor. It may take some movement to find the setting, as the disc rotates freely within the hopper till seated. Slide in till the magnets catch and hold the hopper in place. You can now fill the hopper with appropriately sized pellets and cover the top with the included cap.

Getting Started

Once the feeder is assembled, connected, and filled as described above, it is ready to be used as a verified reliable pellet dispenser in your behavior protocol.

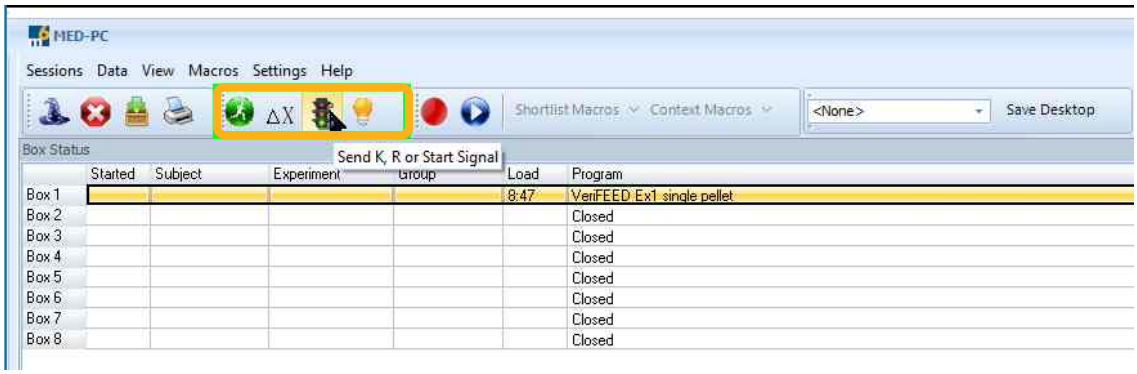
CHAPTER 3 *SAMPLE MED-PC MSN PROGRAMS*

Refer to the Med-PC User's Manual and Med-PC Programmer's Manual for more detailed information and examples for coding Med State Notation protocols.

K-pulse (#k)

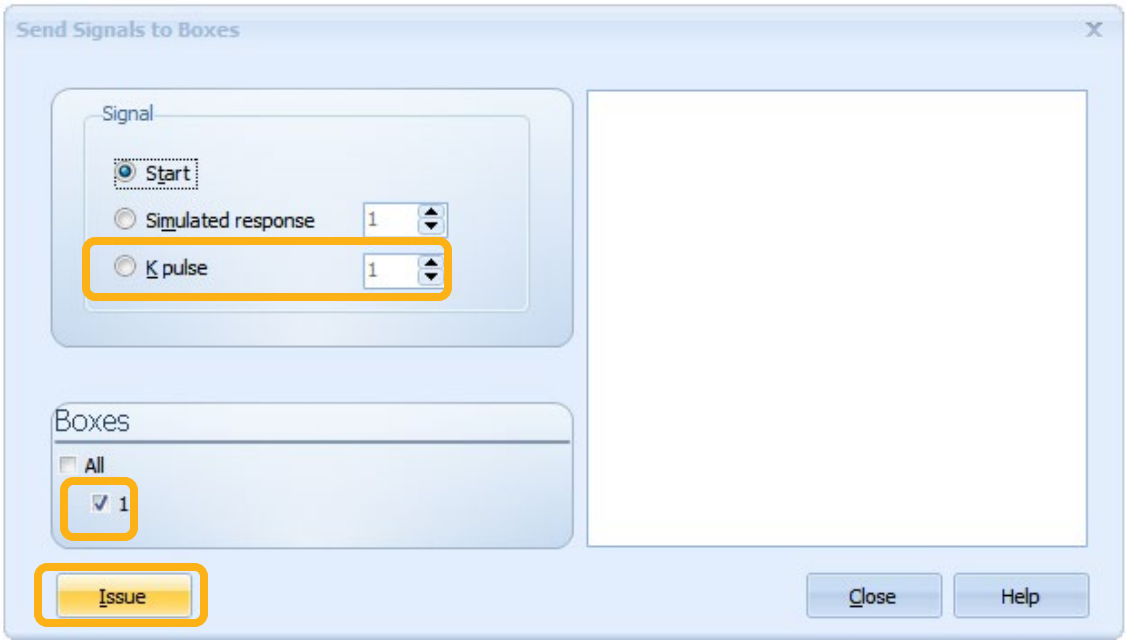
The following five MedState Notation example programs use a "K1 pulse" issued via the "Send Signals to Boxes" dialog. To launch the Send Signals to Boxes dialog, click the "Traffic Light" toolbar icon, or open the "Sessions" menu and select "Signals (START, #K, #R)...".

Figure 3.1 Send K, R or Start Signal Button



Choose the "K pulse" Signal option, select the Box running the example, and click "Issue" to deliver a K1 pulse.

Figure 3.2 Send Signals to Boxes Window



A K1 pulse is excellent for supplying inputs when testing MedState Notation programs in MED-PC without relying on using actual test chamber devices. When the procedure is used in a real scenario, a lever or other input device will replace the K1 pulse.

In each example the ENV-204's Output Line is connected to Output 1, and the Input Line is connected to Input 1 on a SmartCtrl connection panel. The Output Line triggers the operation of the pellet delivery mechanism, and the Input Line indicates the pellet feeder's Infrared pellet detector sensed an object dropping from the feeder.

Examples and Descriptions

The examples are presented in order of increasing complexity like the Tutorials provided with the MED-PC Trans programming utility.

Example 1 (3.1) delivers a single-pellet reward. There is no counting of pellets delivered and pellet delivery verification (no error-checking).

Example 2 (3.2) delivers a multi-pellet reward. As in the first example, there is no counting of pellets delivered nor delivery verification performed.

Example 3 (3.3) delivers a single-pellet and counts the number of pellets delivered by adding a dedicated pellet-counting State Set. This added State Set uses the input sent from the ENV-204 when its Infrared detector "sees" a pellet falling through the delivery chute.

Example 4 (3.4) delivers a multi-pellet reward and displays the number of rewards and pellets delivered.

Example 5 (3.5) delivers a multi-pellet reward, display the number of rewards and pellets delivered, and adds error-checking and reports undelivered pellets.

Example 3.1 Single Pellet Delivery

```
\Example 1: deliver a single-pellet reward with each K1 pulse

\OUTPUTS
^VeriFEED   = 1
\ENV-204 VeriFEED connected to Output 1 on DIG-716B Connection Panel

S.S.1,
\State Set 1
S1,
    0.01": SHOW 1, ISSUE K1 to deliver pellet, 1 ---> S2
    \Instructions for use: issue K1
S2,
    #K1: ON ^VeriFEED ---> S3
    \When K1 pulse received, turn on VeriFEED output
S3,
    0.02": OFF ^VeriFEED ---> S2
    \Turn off VeriFEED output and go back to S2 to look for next K1 pulse
```

Example 3.1 shows the simplest method of using the ENV-204 pellet feeder: turn on the output connected to the feeder, and then turn that output off, repeat as desired. When using this program, experiment by issuing K1 pulses in rapid succession by clicking the "Issue" button on the "Send Signals to Boxes" dialog. You will be able to issue commands to the feeder faster than it can mechanically deliver the pellets. Notice the feeder will keep track of the number of commands it received, and how many pellets it delivered, and perform its delivery protocol until those pellets are delivered. If the pellets are not delivered in about 80 seconds, the feeder enters the "empty hopper" state and flashes its error-indicating LED. This error state is not handled in this example but is managed in Example 3.5.

Example 3.2 Multiple Pellet Delivery

```
\Example 2: deliver a multi-pellet reward with each K1 pulse

\OUTPUTS
^VeriFEED   = 1
\ENV-204 VeriFEED connected to Ouput 1 on DIG-716B Connection Panel

\CONSTANTS
^RewardSize = 5  \Deliver 5 pellets per reward

S.S.1,
\State Set 1
S1,
    0.01": SHOW 1, ISSUE K1 to deliver pellets, ^RewardSize ---> S2
    \Instructions for use: issue K1
S2,
    #K1: SET P = 0 ---> S3
    \When K1 pulse received, set counter P to 0
S3,
    0.02": IF P < ^RewardSize [@t, @f]
    \If P less than RewardSize (5 in this example)
       @t: ADD P; ON ^VeriFEED ---> S4  \Then increase P and deliver pellet
      @f: ---> S2                       \Else wait for next K1 pulse
S4,
    0.01": OFF ^VeriFEED ---> S3        \Turn off VeriFEED output
```

Example 3.2 builds upon the previous example by issuing multiple pellets (five) with each K1 pulse. An "If Statement" in State 3 controls the logic and counting of pellets delivered. The code does not look for inputs from the ENV-204 indicating a pellet was physically delivered, but rather uses an internal counter "P" to keep track of pellets delivered.

Example 3.3 Single Pellet with Counter

```
1   \Example 3: deliver a single-pellet reward with each
2   \           K1 pulse and count the number of pellets delivered
3
4   \OUTPUTS
5   ^VeriFEED = 2
6   \ENV-204 VeriFEED connected to Output 1 on DIG-716B Connection Panel
7
8   \INPUTS
9   ^Delivered = 1
10  \ENV-204 VeriFEED read connected to Input 1 on DIG-716B Connection Panel
11
12  \VARIABLES
13  \D - Delivered pellets detected by feeder IR detector
14  S.S.1,
15  S1,
16      0.01": SHOW 1, ISSUE K1 to deliver pellet, 1 ---> S2
17      \Instructions for use: issue K1
18  S2,
19      #K1: ON ^VeriFEED ---> S3
20      \Turn ON VeriFEED output to dispense pellet
21  S3,
22      0.02": OFF ^VeriFEED ---> S2
23      \Turn OFF VeriFEED output to be ready for next delivery
24
25  S.S.2,
26  \State Set 2 looks for an input from the feeder's IR detection line
27  S1,
28      #R^Delivered: ADD D; SHOW 2, Delivered Pellets, D ---> S1
29      \Add to counter, show pellets detected
```

Example 3.3 uses the same State Set 1 as Example 3.1 to deliver a single pellet with each K1 pulse. A constant for the ENV-204 input connector is added on line 9 above. Also, State Set 2 (lines 25-29) is added to monitor the ENV-204 Med Input line. When an input is detected in State Set 2, State 1, the VeriFEED has "seen" a pellet dropping from the dispenser into the pellet delivery tube. SHOW field 1 indicates the number of pellets seen leaving the ENV-204 feeder instead of relying on an internal counter as in Example 3.2.

Example 3.4 Multiple Pellet with Counter

```
\Example 4: deliver a multi-pellet reward with each
\           K1 pulse and count number of pellets delivered

\OUTPUTS
^VeriFEED = 1
\ENV-204 VeriFEED connected to Output 1 on DIG-716B Connection Panel
\INPUTS
^Delivered = 1
\ENV-204 VeriFEED read connected to Input 1 on DIG-716B Connection Panel
\VARIABLES
\D - Delivered pellets detected by feeder IR detector
\P - Pellets per Reward
\R - Rewards issued (5 pellets per Reward)
\CONSTANTS
^RewardSize = 5     \ deliver 5 pellets per reward

S.S.1,
S1,
    0.01": SHOW 1, ISSUE K1 to Reward pellets, ^RewardSize ---> S2
    \ Instructions for use: issue K1
S2,
    #K1: SET P = 0 ---> S3
S3,
    0.02": IF P < ^RewardSize [@t, @f]
    \ If counter is less than pellets to be delivered...
        @t: ADD P; ON ^VeriFEED ---> S4
        \Then increase counter and turn on VeriFEED output
        @f: ---> S2
        \Else wait for next K1 pulse
S4,
    0.01": OFF ^VeriFEED ---> S3
    \Turn off VeriFEED output to be ready for next delivery

S.S.2,
\State Set 2 looks for an input from the feeder's IR detection line
S1,
    #R^Delivered: ADD D; SHOW 2, Pellets Delivered, D ---> S1
    \Show number of pellets detected by IR detector

S.S.3,
\State Set 3 counts the times a multi-pellet reward was requested
S1,
    #K1: ADD R; SHOW 3, Rewards Requested, R ---> S1
    \Show number of rewards requested
```

Example 3.4 builds upon Example 3.2 by adding a pellet-delivered counting routine in State Set 2 and reward-requested counter in State Set 3. Five pellets are delivered with each K1 pulse, the number of K1 pulses is displayed in SHOW field 3, and the number of pellets dispensed is printed in SHOW field 2.

Example 3.5 Multiple Pellet with Counter and Verification

```
\Example 5: delivers a multi-pellet reward with each K1 pulse, counts the delivered
\           pellets, and reports undelivered pellets

\OUTPUTS
^VeriFEED = 1
\ENV-204 VeriFEED connected to Output 1 on DIG-716B Connection Panel

\INPUTS
^Delivered = 1
\ENV-204 VeriFEED read connected to Input 1 on DIG-716B Connection Panel

\VARIABLES
\D – Delivered pellets detected by feeder IR detector
\P – Counter of Pellets per Reward
\R – Rewards issued (5 pellets per Reward)

\CONSTANTS
^RewardSize = 5   \Number of pellets to deliver (5 in this example)

S.S.1,
\State Set 1 controls pellet delivery logic
S1,
    0.01": SHOW 1, ISSUE K1 to Reward pellets, ^RewardSize ---> S2
    \Instructions for use: issue K1
S2,
    #K1: SET P = 0; ADD R; SHOW 3, Rewards Requested, R ---> S3
    \Look for the K1 pulse, reset P counter
S3,
     0.01": IF P < ^RewardSize [@t, @f]
     \If counter is less than pellets to be delivered…
       @t: ADD P; ON ^VeriFEED -→ S4
       \Then increase counter and turn on VeriFEED output
       @f: ---> S2    \else wait for the next K1 pulse
S4,
    0.02": OFF ^VeriFEED -→ S5
    \Turn off VeriFEED output to be ready for next delivery
S5,
    #R^Delivered: ADD D; SHOW 2, Pellets Delivered, D -→ S3
    \If input detected from IR detector, increase counter
    80": ADD X; SHOW 4, ERROR, X -→ S2
    \No input after 80 seconds: increase error counter, wait for K1
```

Example 3.5 puts all the previous examples together and delivers a multi-pellet reward with each K1 pulse, SHOWs the number of pellets physically delivered, and displays a warning of pellet non-delivery. The ENV-204 will perform a sequence of movements (forwards, backwards, and vibration) to deliver a pellet. The ENV-204 pellet delivery sequence lasts approximately 80 seconds. Example 5, State 5 looks for a pellet delivery for up to 80 seconds. If no pellet is seen after this duration, an error counter "X" is incremented and displayed in SHOW field 4. SHOW field 2 displays the pellets delivered, SHOW field 3 displays the number of rewards requested.

CHAPTER 4 *SAFETY AND FAIL-SAFES*

Cleaning

Do not submerge any portion of the feeder in liquid. Clean feeder parts using a soft cloth that is dampened with water and/or detergent. Clean the pellet drop tube by passing a dry cotton swab through it to remove pellet dust. The feeder bracket enclosure is stainless steel and aluminum. Modular Panels and mounts are stainless steel. The pellet disc and hopper are injection molded polycarbonate with strong nickel-plated neodymium magnets and brass heat insets for firm attachment of screws. Magnets are vulnerable to degradation due to heat and moisture. Should fluids enter the feeder internals, disconnect the power, and invert the feeder to drain. Set the feeder in a warm dry area to air dry thoroughly before restoring power. It is recommended to empty and wipe out the hopper at the end of each use period (See Hopper Assembly and Attachment p.8) to improve the quality of the pellets and how well they are dispensed.

DO NOT AUTOCLAVE

DO NOT SUBMERGE

Warranty & Repair

This device is protected under a limited manufacturer warranty for two years from the date of purchase.

Med Associates continues to support and repair products outside the warranty period indefinitely, for a fee, if we are logistically able. We are proud to continue to support instruments manufactured in our opening production line from 1972.

If you are interested in further information about this device, its component parts, accessories, or integrating it within your application, please contact Med Associates Support (See p.17).

Mechanical Maintenance

High quality pellets and clean pellet preparations improve feeder performance. It is recommended that the hopper be removed, emptied, opened, and wiped out with a clean dry cloth between uses. Parts should be inspected for wear; a worn part should be replaced by Med Associates (Contact Med Associates support see p.17 below).

Table 4.1 Mechanical Properties Table

	WEIGHT*	DIMENSIONS l* x w* x h*	MATERIALS (primarily)
Hopper Left	3 oz / 84 g	4.4 in x 2.2 in x 4.4 in 11 cm x 5.5 cm x 11 cm	Polycarbonate
Hopper Right	3.2 oz / 90 g	5.6 in x 2.2 in x 4.4 in 14(11) cm x 5.5 cm x 11 cm (w/o clip)	Polycarbonate, Aluminum
Hopper Lid	1.7 oz / 48 g	4.2 in x 3 in x 1 in 10.5 cm x 7.5 cm x 2.5 cm	Polycarbonate
Pellet Disc	1.4 oz / 40 g	3.6 in x 3.6 in x 1 in 9 cm x 9 cm x 2.5 cm	Polycarbonate
Total Hopper	8.5 oz / 242 g	4.4 in x 4.4 in x 4.4 in 11 cm x 11 cm x 11 cm	Polycarbonate
Bracket	17.2 oz / 488 g	6.7 in x 5.1(1.6) in x 2.9 in 17 cm x 13(4) cm x 7.5 cm (w/o post)	Steel, Aluminum
VeriFEED (no mount)	25.7oz / 730 g	7.7 in x 4.4 in x 7.5 in 19.5 cm x 11 cm x 19 cm	Steel, Aluminum, Polycarbonate

*Measures are approximated for convenience in space planning and subject to change

MAX DELIVERY RATE 20 mg /min	150 pellets
Max Delivery Rate 45 mg /min	120 pellets
Hopper Capacity 20 mg	4500 pellets
Hopper Capacity 45 mg	3000 pellets
VeriFEED Delivery Accuracy Rate	>99.9%**

**In continuing trials of 1000 expected deliveries, less than 1 delivery is missed.

Contact Information

Please contact Med Associates, Inc. for information regarding any of our products.
Med Associates Support is available to answer technical questions weekdays between 8:00am and 4:30pm ET by phone at 802-527-2343, or email at support@med-associates.com. We look forward to collaborating with you.

Visit our website at www.med-associates.com
For pricing inquiries, email sales@med-associates.com

INDEX

NOTES:

Copyright ©2023 All Rights Reserved

Med Associates Inc.
P.O. Box 319
St. Albans, VT 05478

Phone: 802.527.2343 Fax: 802.524.2110 www.med-associates.com

This Manual was prepared by:
Med Associates Staff
With special thanks to the contributions of

Seth Truran
Application Scientist

Kevin Deutermann
Graphic Designer

Connor Harrigan
Mechanical Engineer

Richard Wheeler
Electrical Engineer

Gary Bamberger
Software Engineer

Andy Lebeis
Software Engineer

Jon Beyor
Support Manager

Bobbi Bushey
Sales Manager

Chris Johnson
Engineering Manager

Copyright ©2023 All Rights Reserved

Med Associates Inc.
P.O. Box 319
St. Albans, VT 05478
www.med-associates.com

Phone: 802.527.2343
Fax: 802.524.2110