Audible All Weather Thermoplastic Marker

Information Folder 5.27 **November 2011**

Description

3M™ Audible All Weather Thermoplastic Markers are audible/vibratory warning markers designed to be applied to 3M™ All Weather Thermoplastic. They are applied in-line with the double drop application process used for 3M All Weather Thermoplastic. The markers are effectively dispensed onto the hot thermoplastic line at normal ribbon gun application speeds; prior to application of the bonded core elements and beads to the line. Refer to IF 5.24 for All Weather Thermoplastic application gudelines.

Audible All Weather Thermoplastic Description

Audible markers are composed of all weather thermoplastic materials shaped in the form of disks. These are filled and surface coated with glass beads.

Equipment Description

3M Audible All Weather Thermoplastic Markers are dispensed onto the hot thermoplastic line using a custom-designed dispenser system. This system is available by contacting 3M Traffic Safety Systems Division. Truck requirements for this dispenser are:

- A minimum air supply of 75 psi (maximum 80 psi).
- 12v signal from vehicle timing system.
- 16 inches of clearance between the ribbon gun and the bead dispenser.
- Clear path for the flex hose and feed tube.

Refer to Appendix A for specific instructions on dispenser installation.

Extrusion (or ribbon) - Applied under pressure or by an auger. Minimum application thickness is 100 mils (2.54mm) as measured above the pavement surface.
Note: More open pavement surfaces will require additional thermoplastic to achieve the 110 mil minimum thickness above the pavement surface.

Special Note: For all application methods, the target thickness used will depend on agency requirements and the roughness of the pavement surface.

Melt Vessel - The thermoplastic melt vessel is capable of providing continuous uniform heating to the thermoplastic at normal operating temperatures between 385º F - 440º F and must be equipped with a thermostatic temperature control for maintaining temperature.

The melt vessel must also provide sufficient agitation to the molten thermoplastic material to provide a homogeneous mixture without stratification.

Audible All Weather Thermoplastic Marker Application Process Recommendations

Proper application of the 3M audible all weather thermoplastic markers is essential for completion of a successful project. Below are some recommendations that should be followed.
Note: Contact 3M Technical Service at 800-553-1380 for guidance or questions.

Temperature

Application of 3M all weather thermoplastic system is recommended at the following temperatures:

3M Ribbon (or Extrusion) Application Requirements:

Air and pavement temperature: 50º F (10º C) and rising.

Note: Wind (wind chill) can cause quicker cooling of the all weather thermoplastic line affecting the bond of the audible all weather thermoplastic marker to the line. Application is not recommended at wind chills less than 45º F (7º C). Also be aware that pavement temperature for a shaded area can be lower.

Application Rates For 3M™ All Weather Thermoplastic Markers

Application of 3M™ All Weather Thermoplastic at the proper thickness and proper application of reflective media at the correct application rates is critical to achieve optimal performance of the finished product.

The recommended thermoplastic usage will vary depending on the roughness of the pavement. Note: Very large aggregate sizes for open grade friction course or stone matrix asphalt mixes will require a higher thermoplastic application rate than on smoother pavement surfaces to achieve the same desired thickness above the pavement surface and or prevent voids.

Recommended 3M All Weather Thermoplastic Application Thickness for application of 3M Audible All Weather Thermoplastic Markers

For 3M's all weather thermoplastic system, the recommended minimum binder thickness is 100 mils (2.54 mm) as measured above the pavement surface. Target binder thickness used will depend on agency requirements and the roughness of the pavement surface.
Note: Contact 3M Technical Service at 800-553-1380 for any application less than 100 mil.

Prior to starting a project, apply a line of thermoplastic at a test location and check the thickness of the material.

A method for checking the thickness of the material is to apply a test line to a flat metal sheet and allow the thermoplastic to cool. After cooling, check the thickness of the material using a micrometer or metal plates of known thickness.

Reflective Media Application Rates

Refer to Information Folder IF-5.24 for specific 3M all weather thermoplastic line application requirements.

General Marker Dispenser Equipment Installation and Operating Procedures

Refer to Appendix A for Audible All Weather Thermoplastic Marker Dispenser Installation and Operation Procedures.

Below are some general operating procedures that should be followed when applying 3M Audible all weather thermoplastic markers.

Audible All Weather Thermoplastic Marker Application Temperature (on the road)

3M™ Audible All Weather Thermoplastic Marker processes at temperatures lower than conventional commercial thermoplastics.
Recommended 3M All Weather Thermoplastic Marker Application Temperature: 400ºF (204ºC)
Maximum Temperature: 440ºF (227ºC)
For application above 420ºF (215ºC) contact 3M Technical Service at 800-553-1380.
Note: Use of a non-contact thermometer is recommended.

Application Speed: 3.5 mph maximum. Control speed to ensure proper marker adhesion to the line.

Audible All Weather Thermoplastic Marker Dispenser Spacing Requirements and Calibration

Marker spacing: A minimum 24 in (61 cm) is recommended. A minimum 30in (76 cm) will allow for retroreflectivity measurements.
Note: Audible all weather thermoplastic markers shall be spaced on the 3M all weather thermoplastic line in accordance with agency requirements to achieve a desired auditory effect.

Minumum thermoplastic line width: 4 inches (10 cm).
Note: Refer to Appendix “A”for instructions on dispenser calibration procedure and trouble shooting.

Marker Test Line Application

Before starting application operations, apply a marker test line in a location where the line can be safely checked to be within product and project specifications.

Choose a location where a test line can be applied to the road surface or place a long, narrow sheet of heavy duty roofing on the road for the test.

After application of the test line, verify that spacing and alignment of the markers are correct.
Note: Repeat calibration steps when visible application change or marker dispenser jam occurs.

Inspection

Inspection of the final applied markers is important to ensure a consistent quality line has been installed. Inspection should include:

1. Marker spacing – correct and consistent – Must conform to agency requirements.

2. Thermoplastic line thickness – Measure using milled bars or plates of a known thickness or by other approved method.
3. Color and physical condition – Must look consistent with no evidence of scorching or marker damage. Also inspect for proper orientation - sloped side of the marker must be "up".

Replacement of 3M Audible All Weather Thermoplastic Markers

Refer to Appendix B for Instructions on the manual replacement of 3M audible all weather thermoplastic.

Application Record

Application records should be kept for the project. This document should include, among other things, the lot identification for the materials used, date of application, location of application, calibration results, weather conditions, temperatures, speed, etc. This record can be helpful should a question arise about this application in the future.

Storage and Material Handling

Review the recommended safety and handling procedures outlined in the 3M Material Safety Data Sheet (MSDS) any applicable supplier documents for non-3M materials.

Store all markers in a clean, dry area. Wet materials must be allowed to dry before use.

Before use, inspect for and remove any box residue, debris, and wrapping material.

Use materials within 12 months after receipt.

Health and Safety Information

Read all health hazard, precautionary, and first aid statements found in the Material Safety Data Sheet (MSDS) and/or product label of chemicals prior to handling or use. Follow all precautions on the MSDS during the filling, use or cleaning of the application equipment. This product is intended for outdoor use. Application in tunnels or enclosed areas may necessitate the use of additional precautions. All vehicles with product on board must have MSDS sheets available for the product being transported.

Disposal

Dispose all materials in accordance with local, state or province, and federal or country requirements.

Appendix A

Audible All Weather Thermoplastic Marker Dispenser Installation and Operation

The 3M™ Audible All Weather Thermoplastic Marker Dispenser installs the preformed markers during the normal installation of 3M™ All Weather Thermoplastic pavement markings. Markers are applied onto the thermoplastic line using a pneumatically-operated dispenser that works in conjunction with the timing system used in most striping trucks. An air supply is fed into the dispenser with a 3/8 inch nylon air line. The Dispenser (Figures 1-3) mounts to the gun carriage using one of two specially designed brackets (figures 4-6). Markers are gravity-fed to the dispenser using a flex hose and feed tube or trough.

When the timing system of the truck sends the signal to the dispenser, the solenoid valve on the dispenser actuates, sending air to the air cylinder, which then pushes the bottom marker out of the feed funnel onto the adjustable slide, where it slides down onto the thermoplastic line. When the timing system of the truck stops the signal, the air cylinder retracts, and the next marker will fall into place ready to dispense at the next signal. Wiring the Dispenser into the truck's timing system will vary between trucks and timing systems.
Note: This information is intended as general guidance only. **Always consult your truck and equipment manuals first before wiring the dispenser into the truck timing system.**

Figure 1: Marker Dispenser

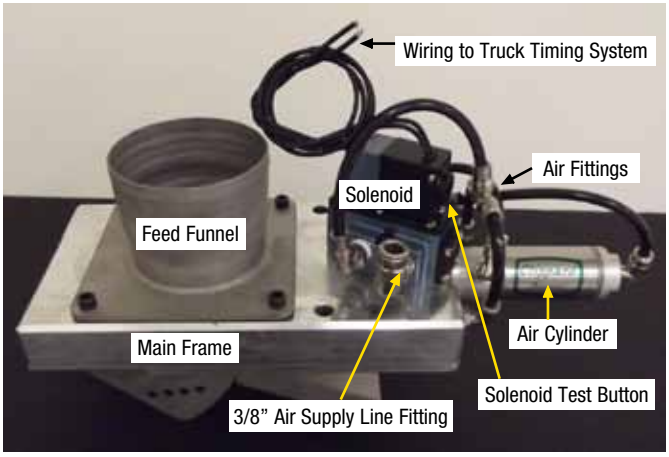


Figure 2: Marker Dispenser - Top View

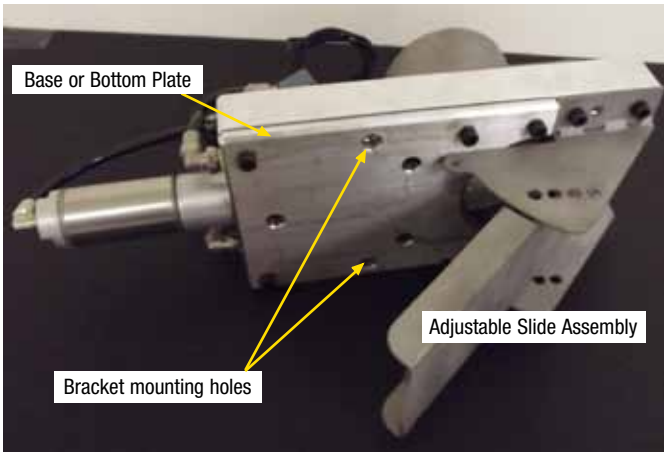


Figure 3: Marker Dispenser - Bottom View

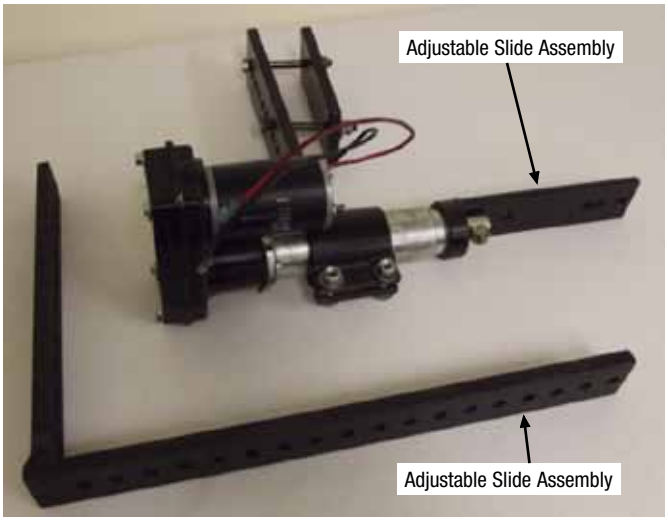


Figure 4: Dispenser mounting brackets

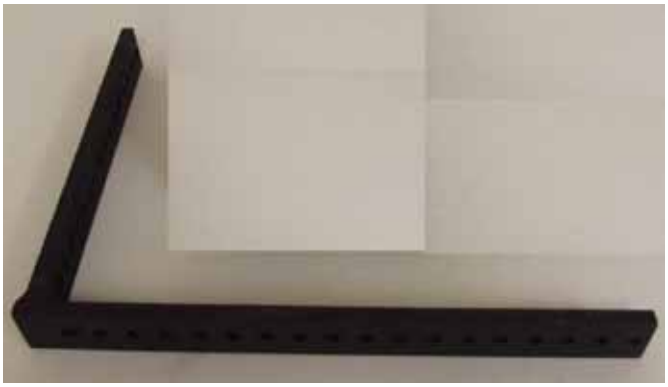


Figure 5: "L" Bracket Mounting

"L" Bracket

Using the "L" bracket, the dispenser mounting position is adjustable in one-inch increments, and is suitable for roads that are straight, have only moderate curves, and with a consistent crown.

Dispenser positioning must be done manually by unbolting and moving the Dispenser in or out to the next mounting hole, and re-bolting to the bracket.

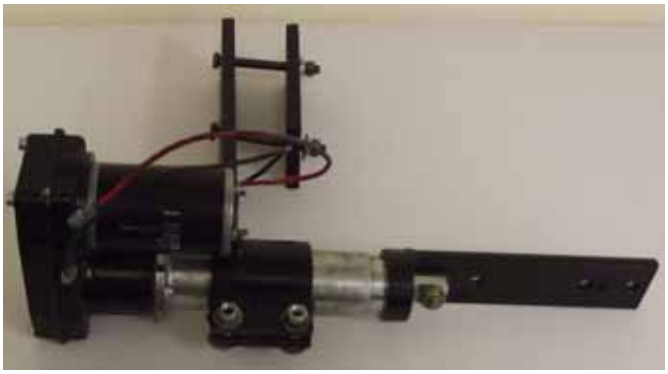


Figure 6: "O" Bracket Mounting with Linear Actuator

"O" Bracket

With Linear Actuator

Using the "O" bracket with linear actuator allows dispenser alignment position to be infinitely adjustable within a 4 inch range, left to right, and can be adjusted by the operator while the truck is striping. This is particularly helpful in keeping the markers in the center of the line when operating on roads with elevated curves or varying levels of road crown. The linear actuator and mount can also be repositioned manually within the "O" bracket by sliding or rotating for additional leveling.

Note: The linear actuator must be connected to a 10A reversible 12v signal using a double-pole double-throw switch. This allows the actuator to be adjusted left or right using the switch.

Audible All Weather Thermoplastic Marker Dispenser Striping Truck Requirements

The following minimum requirements are necessary for the successful installation and operation of the all weather marker (Figure 7):

- A minimum air supply of 75 psi (maximum 80 psi).
- 12v signal from vehicle timing system.
- Clear path for the flex hose and feed tube.
- 16 inches of clearance between the ribbon gun and the bead dispenser.

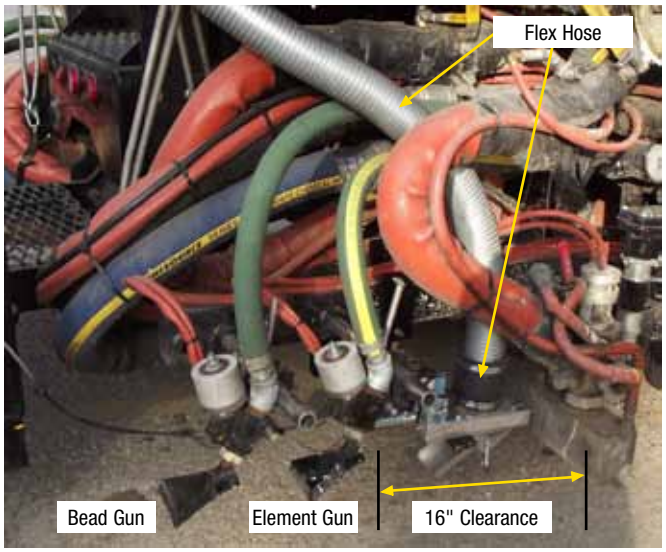


Figure 7: Typical AAWT Dispenser Installation

Bracket and Dispenser Installation Steps

Note: Except for the electrical connection, the brackets install in the same manner.

1. Check to insure you have 16 inches of clearance between the element gun and ribbon gun (Fig. 1), make adjustments as needed. Note: consult truck supplier manual for additional guidance and any precautions to observe in mounting the dispenser.
2. Bolt on the bracket loosely to the truck's carriage rail between the ribbon gun, and the bead dispenser, so that the bracket can still slide on the carriage rail for final adjustment.
3. Bolt the marker dispenser assembly onto the bracket with the air cylinder facing to the rear of the truck.
4. Center the dispenser (L to R) directly behind the ribbon gun, or slightly to the inside of center if the road to be marked has significant crown.
5. Make sure the adjustable slide on the base of the dispenser is in its second highest setting. Adjust as needed by removing the locking pin, moving the slide, and placing the locking pin in the proper hole.
6. The positioning of the dispenser is critical to its operation. It should be level, and positioned no more than 6 inches behind the ribbon gun, and the bottom of the slide should be approximately 1 to 2 inches above the ground (Fig.2).
7. Tighten the mounting bracket bolts to the carriage.
8. Connect the wire (12-volt signal) from the truck's timing system to the solenoid valve on the dispenser (Fig. 3). Some timing systems have a profile circuit on them and this circuit should be used. If the truck does not have this circuit, it might be required to use a circuit for another ribbon gun or element/bead gun that is not in use. As timing systems are different,


Figure 1

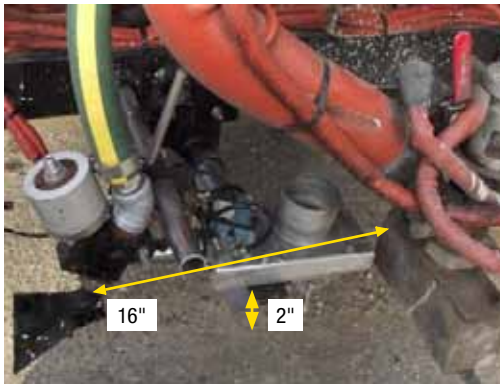


Figure 2


Figure 3

always consult the truck and equipment manuals on how to do this before connecting the dispenser.

Note: For the "O" bracket with linear actuator connect a reversible switched 12v source to the linear actuator.

a. On trucks with a profile circuit, the profile length should be set to as close to one half the spacing as possible.

b. If there is an indent option on the timing system, that setting adjusts the centering of the markers longitudinally on the skips. Decrease the indent, to put the markers closer to the front of the skip, increase it to put the markers closer to the rear of the skip.

c. On trucks without a profile circuit, set the control of the circuit to be used to "Skip" mode. Set the cycle to the desired spacing of the markers, and the skip length of one-half that of the cycle.

10. Connect an air source regulated to 75-80 psi. Excessive pressure can damage the dispenser. Install an inline pressure regulator if needed (Fig.4).

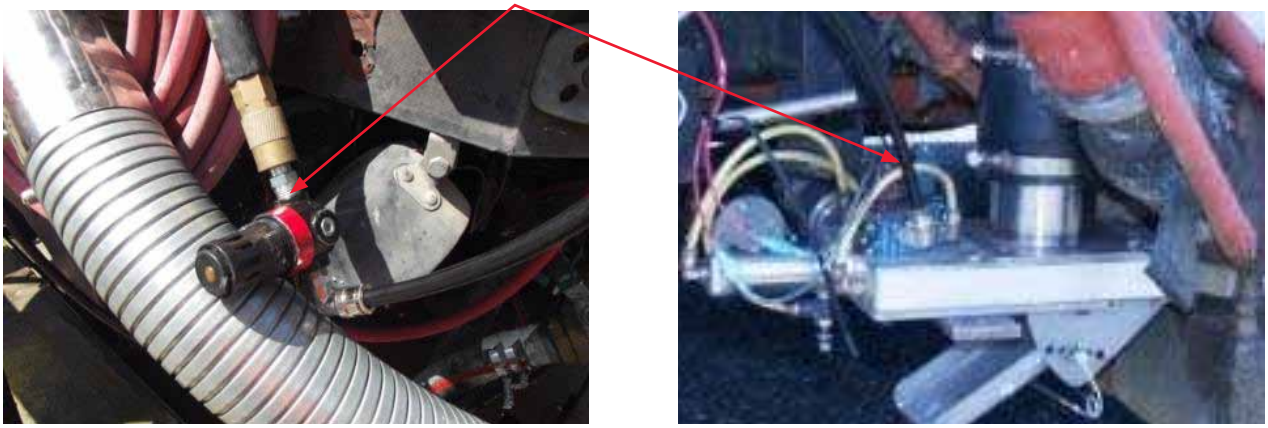


Figure 4

11. With the proper timing circuit and air source turned on, drive the truck forward a few feet to test the dispenser. You should hear the air cylinder actuate for each cycle.

12. Attach the flex hose and feed tube to the dispenser with the clamps provided (Fig. 5-6). The flex hose and feed tube should provide a smooth travel path to the dispenser. They must be installed at an angle that will allow for the markers to be gravity fed down the trough and flex hose, to the dispenser. Additional supports may be required to secure the feed tube and flex hose to the truck. Minor repositioning of material lines may be required to provide a suitable path for the flex hose. Secure feed and flex tubes to prevent movement and ensure gravity feed (Fig. 7).

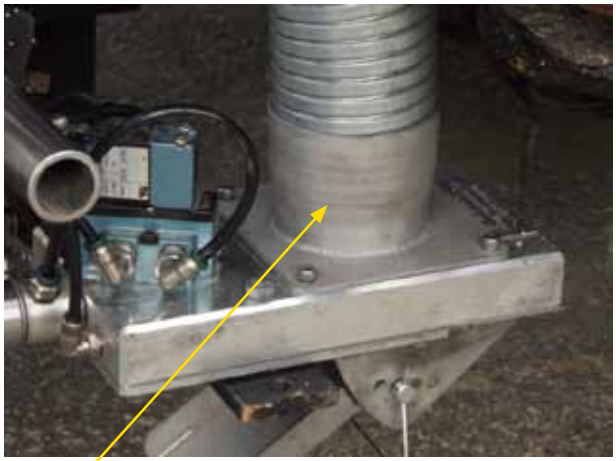


Figure 5: Test fit the flex hose to insure it seats completely inside the funnel on the dispenser. Adjust hose position as needed.

Remove the end of the flex hose from the funnel, add the flexible coupling, and reseat the flex hose.

Figure 6: Final flex tube/feed tube installation views

Figure 7: Securing feed tube and flex tube

The feed tube - or trough - must be fixed and secure to prevent movement.
The flex hose must be positioned to allow gravity feed.
Always Test carriage movement in and out to check installation.

Loading and Operating the Audible All Weather Thermoplastic Marker Dispenser

1. A crew member will be required to load markers into the dispenser and monitor correct installation. This person must be trained to load the dispenser and keep it fed, as well as monitor the placement of the markers on the line.

   Important Note: When working near the dispenser, always make sure the air supply is off and the air has been bled from the system.

2. The preferred method of filling the dispenser involves removing the flex hose from the dispenser, putting several markers in the funnel of the dispenser, and feeding the markers beaded side up, from the bottom of the flex hose, until the stack of markers can be seen coming out into the feed tube (Fig. 8). Then replace the flex hose and tighten the clamp. Continue filling the feed tube from the top – markers are beaded side up - until it is full.

Figure 8: Preferred marker fill method

3. An alternate method for filling the dispenser is to block the bottom end of the feed trough, fill it with markers beaded side up, and then push the stack very quickly down the flex hose so that the markers do not have time to flip over (Fig. 9). Repeat this procedure until markers are visible in the feed trough, then finish filing the trough. Use the solenoid test button to dispense approximately 12 markers from the bottom to ensure that any broken markers are ejected. This second method is quicker and easier than the first, but it can cause a few of the bottom most markers to be damaged.




Figure 9: Alternate Marker fill method

4. When the truck begins striping, the markers will move down the feed tube to the slide quickly. Open boxes of markers need to be accessible for quick and easy access. Add new markers - beaded side up - to the stack of markers in the feed tube, keeping the feed tube as full as possible.
5. After initial installation and setup of the dispenser, it is important to the test system, to include the timing cycle, prior to attempting installation (Fig. 10). Drive the truck forward, dispensing enough markers to test the required spacing and gravity flow. Make adjustments as needed.


Figure 10: Test the marker dispenser

6. The markers in the feed tube should move downward slightly each time a marker is dispensed. If movement of the markers is not visible, stop the truck and adjust the feed tube angle. Note: It is important not to allow the feed tube to empty. If it does, you will need to stop the truck and refill the tube. Trying to put markers down an empty feed tube, or allowing gaps in the feed supply will cause the markers to flip over; resulting in either a plug in the dispenser, or the dispensing of markers upside down on to the thermoplastic line.
7. If the dispenser jams, stop the truck, turn off the air, and bleed any remaining air from the air line. Make a note of the position of the slide locking pin. Remove the lock pin that holds up the slide and drop the slide. You should be able to remove the cause of the jam from underneath. If not, you can remove the flex hose from the top, and clear it from there. Once cleared, raise the slide and replace the lock pin to its noted position (Fig.11). If no obstruction was found, and the dispenser continues to jam, it may need cleaning.

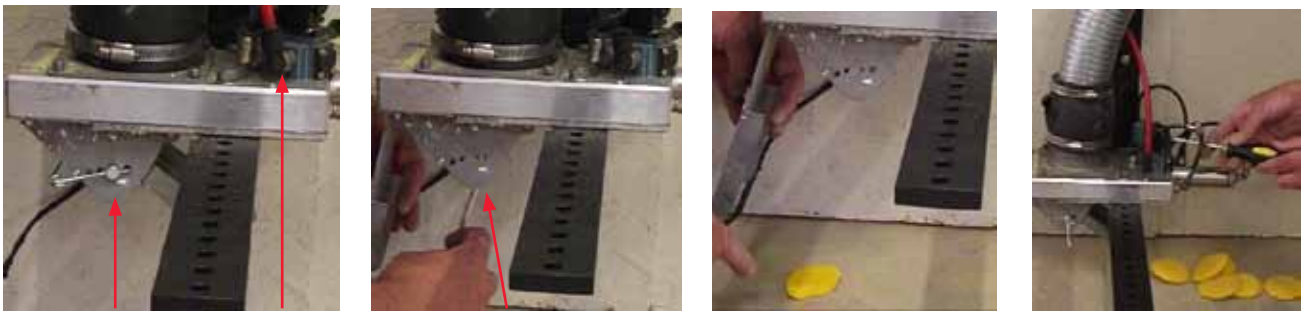


Figure 11: Removing a Marker Dispenser Jam

Remove the locking pin and air supply line, use a screwdriver to clear the jammed marker, then reassemble. The dispenser may be tested using the solenoid test button.

Marker Dispenser Troubleshooting Guide

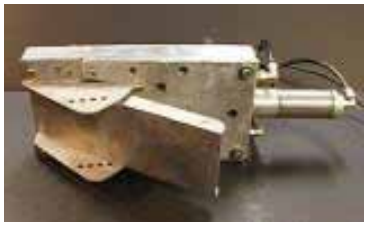
SYMPTOM	SOLUTION
Doesn't do anything, makes no noise.	• Check air supply (75-80psi) • Test solenoid with manual test button, if it actuates, check electrical connections. • If electrical signal and air are correct, replace solenoid coil.
Solenoid makes faint clicking sound, but does not actuate.	• Check air supply (75-80psi) • Replace solenoid valve body
Solenoid actuates but doesn't dispense	• Disconnect air supply, remove ramp pin, drop the ramp, inspect the dispenser for jammed or sideways markers. Remove obstruction, replace ramp, reconnect air supply. • Check feed tube for obstruction or inadequate angle. • Check skip timer settings for adequate cycle time in both directions of air cylinder. • Excessive debris in dispenser, disassemble and clean out debris, do not use any wet lubricants such as oil or WD-40 during reassembly. Ensure solenoid exhaust port is connected to rear ports of dispenser • Replace air cylinder
Dispenser always dispenses to the left or right of the center of the line	• Adjust dispenser on bracket or adjust the ribbon gun on the carriage so that markers are dispensed onto the center of the line
Dispenser occasionally dispenses significantly to the right or the left of the center of the line	• Make sure the dispenser is level • Adjust the ramp one position upward so that the ramp is not as steep. • Make sure the ramp is loosely connected to, and not tightly bound to the dispenser body
Dispenser dispenses markers upside down	• Make sure markers are installed in the feed tube with the flat surface down • Ensure feed tube is at an adequate angle to gravity feed • Dispenser too high. Check to make sure bottom of the dispenser ramp is less than 2 inches off of the ground. • Ramp too steep. Raise the ramp up one adjustment. (Usually, if the marker is upside down in perfect position, it was put in upside down, if it is off to one side, a dispenser adjustment is usually required)
Dispenser dispenses markers with very erratic spacing (>2" variation)	• Ramp is not steep enough, lower ramp on position. • Application speed too fast • Erratic driving accelerating/braking • Dispenser is dirty disassemble and clean
Dispenser jams b/c of sideways markers	• Inadequate feed tube angle allowing slack in feed supply, Increase feed tube angle so that it can gravity feed
Dispenser often jams with markers at the top of the ramp	• Adjust the ramp one position downward • Slow down
Occasionally, a marker does not dispense	• Listen to see if solenoid is actuating. If not check electrical connections • Listen to see if solenoid is actuating If so, disassemble and clean dispenser

Dispenser Maintenance

1. The dispenser should be cleaned weekly, or prior to starting a new job (Fig. 12). To clean the dispenser, remove it from the truck. Clean parts using an air hose or dry cloth. Automotive brake parts cleaner is also effective, but do not to get it on the shaft of the air cylinder or it may fail prematurely. Graphite lubricant may be added to the inside of the dispenser to help parts move easier, but do not use oil or any liquid lubricants, as they will cause debris to collect and jam the dispenser. Replace worn or damaged parts.

Remove the external cap screws on the feed funnel.

Remove the white plastic insert from the main frame.



Remove the slide assembly from the base plate.

Remove the base plate from the main.

Remove the wear plate from the main

Clean and inspect the shoe. **Reassemble in reverse order.**

Figure 12: Marker Dispenser Inspection/Cleaning Method

2. When lubricating the solenoid valve, remove the inlet air and exhaust air lines from the solenoid valve. Add a few drops of Dexron II or Type F transmission fluid into the air inlet port and reconnect the air supply to the air inlet port. Use the solenoid test button 20-25 times to remove excess lubricant, and then reconnect the exhaust air line.

Appendix B

3M Audible All Weather Thermoplastic Marker Manual Repair/Replacement

Repairing broken, missing or upside down markers is simple and can be quickly done with hand tools.

To replace a broken or upside down marker you will need a chisel, hammer, hand propane torch, safety gloves, and safety goggles, glasses, or face shield. Knock the marker to be replaced up using the chisel and hammer. If a hole in the line is created, simply put the pieces in the hole, use the torch to heat the baseline area to the molten point, then press down a replacement marker by hand. **Note:** Always wear appropriate personal protective equipment when working with open flames and molten thermoplastic materials.

The same basic process is used to add a missing marker; heat the baseline to a molten point and press in a marker.

Literature Reference

PB–3M™ All Weather Elements

PB–3M™ All Weather Thermoplastic Pavement Marking

PB–3M™ Audible All Weather Thermoplastic Marker

IF 5.24 Application Guidelines for 3M™ All Weather Thermoplastic

For situations not specifically covered in this folder, or questions regarding application of 3M™ Audible All Weather Thermoplastic Pavement Markers, it is the responsibility of the installer to contact the appropriate 3M Sales Representative or 3M Pavement Marking Technical Service representative at 1-800-553-1380 for guidance.

FOR INFORMATION OR ASSISTANCE CALL:
1-800-553-1380

IN CANADA CALL:
1-800-265-1840

Internet:
www.3M.com/tss

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