Operation and Maintenance

Caswell Electric Target System

Models: CEA, CEB

Meggitt Defense Systems
Caswell

2540 2nd Street NE
Minneapolis, MN 55418-3412
Phone: (612) 379-2000
Fax: (612) 379-2367
custserv@mds-caswell.com
www.mds-caswell.com

MEGGITT
smart engineering for extreme environments

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# Table of Contents

1 Safety ......................................................................................................................... 5  
   1.1 Range Safety ........................................................................................................ 5  
   1.2 Safety Icons .......................................................................................................... 6  
2 Introduction .................................................................................................................. 7  
3 Operation ..................................................................................................................... 8  
   3.1 Drive Unit Operation ........................................................................................... 8  
   3.2 Target Carrier Operation ..................................................................................... 8  
      3.2.1 Target Holder Installation ............................................................................ 8  
      3.2.2 Target Loading ............................................................................................ 8  
4 Specifications .............................................................................................................. 9  
5 Physical/Functional Description of System ................................................................. 11  
   5.1 Drive Unit ............................................................................................................ 11  
   5.2 Terminal Stop Assembly ..................................................................................... 11  
   5.3 Target Carrier Assembly ..................................................................................... 11  
   5.4 Intermediate Stop Assembly .............................................................................. 12  
      5.4.1 Intermediate Stop Assembly Setup Procedures ........................................ 12  
   5.5 Trolley Wire ......................................................................................................... 13  
   5.6 Puller Cord .......................................................................................................... 13  
6 Preventive Maintenance ............................................................................................... 14  
   6.1 Daily Maintenance ............................................................................................... 14  
   6.2 Weekly Maintenance ............................................................................................ 14  
   6.3 Monthly Maintenance .......................................................................................... 14  
7 Illustrations .................................................................................................................. 16  

Returned Merchandise Authorization Form ................................................................. 32
List of Figures

Figure 1 - Drive Unit Mounting on Firing Line Crossmember ........................................ 17
Figure 2 - Cas-Electric Drive Unit (PN 66167) ................................................................... 19
Figure 3 - Drive Unit Internal Parts ..................................................................................... 20
Figure 4 - Drive Unit Mounted Control Switch (Optional) .................................................. 21
Figure 5 - E4P Control Panel (PN 17-324) ........................................................................ 22
Figure 6 - Drive Unit Wiring Diagram ................................................................................ 23
Figure 7 - Target Carrier Assembly (PN 16-1500) ............................................................... 24
Figure 8 - Offhand Target Holder Assembly (PN 25-1303) ................................................. 25
Figure 9 - Prone Target Holder Assembly (PN 12-1304) ..................................................... 26
Figure 10 - Wide Target Holder Assembly (PN 25-1305) .................................................... 27
Figure 11 - Typical Downrange Crossmember Affixed with Intermediate Stop ................. 28
Figure 12 - Typical Terminal Stop Crossmember .................................................................. 29
Figure 13 - Typical Downrange Crossmember with Intermediate Stop for High Velocity Rifle Ranges .......................................................... 30
Figure 14 - Typical Terminal Stop Crossmember for High Velocity Rifle Ranges ............... 31

List of Tables

Table 1 - Cas-Electric Target System Specifications ............................................................ 9

Parts Lists

Parts List 1 - Drive Unit Parts ............................................................................................ 18
1 Safety

Read this manual carefully before operating the equipment. Follow all Range Safety and other warnings outlined in this manual.

1.1 Range Safety

Although your range may not contain the exact equipment listed, the following apply to firing ranges in general:

- All range personnel shall wear eye protection.
- All range personnel shall wear hearing protection.
- The range and equipment shall be subjected only to weapons and ammunition appropriate for the designated class of service.
- Do not discharge a weapon with its muzzle directly contacting any part of the bullet trap, berm, or target equipment.
- Vary target locations regularly (if possible) to spread out the rounds fired against the bullet trap surfaces.
- Jacketed ammunition may form airborne backsplatter particles upon impact with impenetrable or unprotected range objects. Be aware that this backsplatter can cause injuries.
- Cease fire immediately if encountering backsplatter or ricochets. Adhere strictly to inspection schedules and preventive maintenance procedures of target equipment and bullet trap.
- Cease fire immediately if smoke or sparks are seen where bullets impact.
- Cease fire immediately when detecting a change in appearance of the bullet trap, berm, or other range equipment. This may indicate a problem or malfunction that must be corrected before resuming firing.
- Maintenance personnel shall inspect ranges regularly per the recommended inspection and repair sections of equipment manuals.
- Range safety depends chiefly upon range discipline. A written range safety program should be established and strictly adhered to at all times.
- No food or liquids shall be consumed in the range.
- Smoking should be prohibited in the range.
1.2 Safety Icons

Safety icons are used throughout this manual. Following, are examples and definitions of safety icons used throughout this manual.

**DANGER**

Definition of DANGER icons:

Danger icons warn of a major hazard where an immediate hazard presents the threat of death or serious injury to an employee.

**WARNING**

Definition of WARNING icons:

Warning icons warn against a hazard level between CAUTION and DANGER where unsafe practices present a threat of death or serious injury to an employee.

**CAUTION**

Definition of CAUTION icons:

Caution icons warn against lesser threats of injury than a WARNING icon, minor hazards or warn against unsafe practices.

**NOTE**

Definition of NOTE icons:

Note icons are used to help explain or give examples of procedures and processes.
2 ▶ Introduction

The Meggitt Defense Systems Caswell Electric Target System (Cas-Electric) is an electrically operated non-oscillating "Trolley Wire" target retrieval system.

✓ NOTE

In a Trolley Wire system, a target carrying car is suspended by, and travels along, a tensioned 'trolley wire'.

The Cas-Electric provides target transport form the firing line to predetermined target lines downrange and back again. This allows the shooter to examine or change targets without advancing downrange from the firing line and temporarily halting the shooting of other targets. Target Carrier travel in either direction is initiated by a signal from the Local Control Panel or (optional) Drive Unit Mounted Control switch (Figure 4). You must hold the switch in the desired transport position until the target carrier reaches the predetermined stop. The Target Carrier will remain at the stop until the Drive Unit receives a signal to initiate carrier travel in the opposite direction.

✓ NOTE

Stops are determined by physical stop assemblies mounted to the Drive Unit (Travel Stop), Downrange Crossmember (Intermediate Stop Assembly) and Terminal Stop Crossmember (Terminal Stop Assembly).
3 Operation

Operation of the Cas-Electric Target System is controlled through the E4P Local Control Panel or and optional Drive Unit Mounted Control Switch. Refer to Figure 5 for operating instructions.

3.1 Drive Unit Operation

Operation of the Drive Unit is limited to controlling Drive Motor direction.

All control signals originate from the Local Control Panel or optional Drive Unit Mounted Control Switch. The Drive Unit transports the Target Carrier to predetermined stop locations and returns the Target Carrier to the Firing Line (Home Position).

The optional Drive Unit Mounted Control Switch, Neon Light, and Circuit Breaker are located along the bottom edge of the Drive Unit (Figure 2 and Figure 4). Their functions are as follows:

- *Drive Unit Mounted Control Switch (optional)* - This switch is used to control Drive Unit operation (Target Carrier forward and return movement) when the E4P Local Control Panel is not applicable.
- *Neon Light* - This indicator light illuminates whenever power is applied to the Drive Motor (Drive Motor is running or Target Carrier is moving).
- *Circuit Breaker* - This Circuit Breaker protects the Drive Motor electrical circuit against overloading.

3.2 Target Carrier Operation

The Target Carrier is controlled by a closed-loop Puller Cord driven by the Drive Unit. The cord runs from the front of the Target Carrier to the Drive Unit; around a Cable Pulley on the Drive Shaft; the downrange to the Terminal Stop Assembly where it is routed around a pulley and back to the Target Carrier.

3.2.1 Target Holder Installation

The Target Carrier is designed to accommodate any of the following Target Holder options by pulling a pin and dropping the Target Holder out of the Target Carrier. Reverse the procedure to install a new holder.

- *Offhand Target Holder* - Used for shooting at small targets from the standing position. The Offhand Target Holder is designed to hold a target with the top edge of the target approximately 70 inches above the floor. See Figure 8.
- *Prone Target Holder* - Similar to the Offhand Target Holder, but longer to position small targets closer to the floor for shooting from the prone position. See Figure 9.
- *Wide Target Holder* - The Wide Target Holder has two clips space 18 inches apart to accept wider targets or two smaller target at one time. See Figure 10.

3.2.2 Target Loading

All of the Target Holder options for the Target Carrier are affixed with spring loaded Target Clips which secure the Target to the Target Holder.
Specifications

Table 1 lists critical dimensions, power requirements, and installation specifications for the Cas-Electric system.

**Table 1 - Cas-Electric Target System Specifications**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Firing Line Crossmember:</strong></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>Steel Channel (see Figure 1)</td>
</tr>
<tr>
<td>Length</td>
<td>Varies with installation - 20' 0'' max</td>
</tr>
<tr>
<td>Size</td>
<td>4'' x 5.4 lbs/ft</td>
</tr>
<tr>
<td>Installation (general)</td>
<td>Secured to range sidewalls with brackets. The firing line crossmember is</td>
</tr>
<tr>
<td></td>
<td>supported on vertical masts within shooting stalls. Crossmember tie backs</td>
</tr>
<tr>
<td></td>
<td>required per range design instructions.</td>
</tr>
<tr>
<td><strong>Downrange Crossmember:</strong></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>Steel Angle (see Figure 11 and Figure 12)</td>
</tr>
<tr>
<td>Length</td>
<td>Varies with installation - 20' 0'' max</td>
</tr>
<tr>
<td>Size</td>
<td>2'' x 2'' x 1/4'' x 3.19 lbs/ft</td>
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<tr>
<td>Installation</td>
<td>Secured to range sidewalls with brackets. The crossmember is secured to the</td>
</tr>
<tr>
<td></td>
<td>range ceiling by hanger brackets. Connection of downrange crossmembers is by</td>
</tr>
<tr>
<td></td>
<td>splice brackets (see Figure 11).</td>
</tr>
<tr>
<td><strong>Terminal Stop:</strong></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>Steel Construction (See Figure 12)</td>
</tr>
<tr>
<td>Length</td>
<td>10''</td>
</tr>
<tr>
<td>Height</td>
<td>8 1/2''</td>
</tr>
<tr>
<td>Weight</td>
<td>10.5 lbs</td>
</tr>
<tr>
<td>Installation</td>
<td>Secured to downrange crossmember</td>
</tr>
<tr>
<td><strong>Puller Cord:</strong></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>1/16'' stranded-steel aircraft cable, or 1/16' polypropylene cord</td>
</tr>
<tr>
<td><strong>Trolley Wire:</strong></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>11 gauge galvanized steel wire</td>
</tr>
<tr>
<td><strong>Target Carrier:</strong></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>See Figure 7</td>
</tr>
<tr>
<td>Length</td>
<td>12 1/2''</td>
</tr>
<tr>
<td>Height</td>
<td>4 1/4''</td>
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Operation and Maintenance

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<th>Specification</th>
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<tr>
<td>Weight</td>
<td>3.5 lbs</td>
</tr>
<tr>
<td>Installation</td>
<td>Supported on trolley wire by two cable pulleys. Puller Cord connects to carrier with screw fasteners front and rear.</td>
</tr>
<tr>
<td>Drive Unit:</td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>(Figure 2 and Figure 3)</td>
</tr>
<tr>
<td>Length</td>
<td>13&quot;</td>
</tr>
<tr>
<td>Height</td>
<td>12&quot;</td>
</tr>
<tr>
<td>Width</td>
<td>12&quot;</td>
</tr>
<tr>
<td>Weight</td>
<td>36 lbs</td>
</tr>
<tr>
<td>Installation</td>
<td>Secured to Firing Line crossmember with screw fasteners (Figure 1)</td>
</tr>
<tr>
<td>Electrical:</td>
<td></td>
</tr>
<tr>
<td>Input Power</td>
<td>Nominal 117 VAC, 60 Hz, Single Cycle, 3 Amps max</td>
</tr>
</tbody>
</table>
5. **Physical/Functional Description of System**

The Cas-Electric Target System consists of a Drive Unit assembly fastened to the Firing Line Crossmember (located above the shooter). A Trolley Wire fastened to an eye bolt on the front of the Drive Unit extends downrange to a Terminal Stop assembly where it is attached to another eye bolt (see Figure 12). The Trolley Wire supports and guides the Target Carrier assembly. The Target Carrier is propelled along the Trolley Wire by a Puller Cord driven by the Drive Unit Drive Motor. The Cas-Electric Target System is designed to transport a target downrange to a predetermined target line for shooting and return the target to the Firing Line when required for inspections or target replacement.

5.1 **Drive Unit**

The Drive Unit consists of a welded steel frame (Figure 3) to which the Drive Motor and Drive Line assembly are mounted. The Drive Unit Control Switch (optional), Neon Light, and Circuit Breaker are located on the bottom edge of the Drive Unit (Figure 2). A plastic Cover fastens to the Drive Unit with two Thumbscrews to protect internal components from contaminants. The Drive Unit fastens to the bottom of the Firing Line Crossmember with four screws (Figure 1).

The Drive Unit receives power for Drive Motor operation from range high voltage main lines. The high voltage enters the Drive Unit at a J-Box mounted to the Drive Unit (see Figure 6).

5.2 **Terminal Stop Assembly**

The Terminal Stop Assembly is mounted on a specified crossmember as shown in Figure 12 and Figure 14. The Terminal Stop Assembly is constructed of steel angle and formed plate to provide ballistic security for the Puller Cord Pulley/Tension Adjustment Assembly and Trolley Wire Eye Bolt. A Stabilizer Rod fastens to the back of the Stop Assembly to prevent the crossmember from bending due to Trolley Wire tension.

5.3 **Target Carrier Assembly**

The Target Carrier Assembly consists of a formed steel body to which two pulleys are mounted for traveling on the Trolley Wire (Figure 7). The Firing Line end of the Target Carrier is affixed with a steel angle to deflect misdirected shots and mate with the Travel Stop that is affixed to the Drive Unit (Figure 1).

The Bullet Trap end of the Target Carrier is affixed with a steel angle padded with felt to lessen the impact of the carrier with Intermediate Stop and Terminal Stop assemblies. Clearance holes are located in the angles; allowing the Trolley Wire to pass through and the Puller Cord to connect to the Target Carrier, while maintaining ballistic security for the Target Carrier.

**NOTE**

The Target Carrier must be installed on the Trolley Wire prior to fastening the Trolley Wire to the Drive and Terminal Stop eye bolts.
5.4 Intermediate Stop Assembly

The intermediate Stop Assembly consists of a steel angle mounting bracket affixed with an adjustable Stop Bar (see Figure 11). The Stop Bar is held in position by two thumbscrews. The Intermediate Stop Assembly is installed on Downrange Crossmember at predetermined distances from the Firing Line. Because setup of the Intermediate Stop Assembly requires the shooter downrange to manually lower the Stop Bar. Setup must be accomplished prior to shooting.

![NOTE]

The number of Intermediate Stop Assemblies and their distances form the Firing Line are determined by range layout.

The Intermediate Stop Assembly is designed to provide a positive stop for the Target Carrier when the Stop Bar contacts the Target Carrier. Refer to the following Intermediate Stop Assembly setup procedures:

5.4.1 Intermediate Stop Assembly Setup Procedures

The following procedures for setting up the Stop Assembly pertain to one shooting point only. Repeat the procedures for each additional shooting point.

1. Turn Drive Unit power OFF.

2. Ensure that the Trolley Wire is properly tensioned.


4. Position the Target Carrier slightly forward of the Intermediate Stop Assembly selected for use.

![NOTE]

Only one Intermediate Stop assembly can be used at one time on any given shooting point.

5. Lower the Stop Rod so the Rear Target Carrier Angle contacts at least 3 inches of the Stop Rod. Tighten the two thumbscrews to secure the Stop Rod in position.

6. Return to the Firing Line and apply power to the Drive Unit.

7. Return the Target Carrier to the Firing Line.

8. Transport the Target Carrier "Forward" downrange to the Intermediate Stop Assembly setup in Step 12.
9. The Target Carrier should engage the Intermediate Stop Assembly and stop.

10. Release the Drive Unit Control Switch to turn OFF the Drive Motor.

11. Return the Target Carrier to the Firing Line and repeat Steps 8 through 10 several times to ensure proper operation. Adjust the Intermediate Stop Assembly as required.

### 5.5 Trolley Wire

The Trolley Wire is used to support and guide the Target Carrier. The Trolley Wire is 11 gauge galvanized steel wire that is strung between eye bolts on the Drive Unit and Terminal Stop assemblies. Tensioning of the Trolley Wire is accomplished with the Drive Unit Eye Bolt assembly. Proper tension of the Trolley Wire can be determined by placing the Target Carrier in the center of the range and measuring sag of the Trolley Wire. Sag of the Trolley Wire on a 54 foot range is 4 to 6 inches. Sag of the Trolley Wire on a 65 foot range is 6 to 8 inches.

### 5.6 Puller Cord

The Puller Cord is used to propel the Target Carrier towards and away from the Firing Line. The Puller Cord connects to the Firing Line end of the Carrier and is then routed through the Drive Unit as illustrated in Figure 1; and then out to the Terminal Stop Assembly (Figure 12). The Puller Cord runs beneath the Terminal Stop, up and around the pulley, and out the clearance hole where it is routed to the Bullet Trap end of the carrier and is securely fastened (Figure 7). Tensioning of the Puller Cord is accomplished at the Terminal Stop Assembly (Figure 12). Tension of the Puller Cord should be sufficient to prevent slippage on the Magnet Cable Pulley Assembly only. Over-tightening of the Puller Cord will cause excessive Puller Cord wear.
Preventive Maintenance may be conducted by ordinary maintenance personnel. No special skills are required.

**WARNING**

Prior to inspection or maintenance, always verify that Drive Unit power is OFF.

### 6.1 Daily Maintenance

Prior to range operation, perform the following maintenance procedures:

1. Remove target remnants from Target Holders.
2. Inspect Target Holders for damage. Verify that Target Clips close completely and are securely attached to the Holder Brackets (refer to Figure 8, Figure 9, and Figure 10).
3. Visually inspect the Puller Cords and Trolley Wires for excessive wear (see Figure 1).
4. Visually inspect Drive Units, Target Carriers, and Terminal Stops for loose or missing fasteners and obvious damage.

### 6.2 Weekly Maintenance

Weekly maintenance includes all Daily Maintenance processes (Section 6.1) plus the following procedures:

1. Remove Drive Unit Covers and inspect for loose fasteners, burned or damaged component/wire, etc. (see Figure 3).
2. Operate Target Systems several times, observing for proper operation.

### 6.3 Monthly Maintenance

Monthly maintenance includes all Weekly Maintenance processes (Section 6.2) plus the following procedures:

1. Remove Drive Unit Covers and inspect Drive Belts (see Figure 3) for proper tension and excessive wear. When properly tensioned, the Drive Belt should deflect 1/4" under moderate finger pressure at mid span.
2. Grease Drive Unit Idler Pulley Bearings as required. Use general purpose grease and a needle point grease gun nozzle.
CAUTION

Do not allow grease of oil to get on Drive Belt or Puller Cord.

3. Apply one drop of oil to each of the Bronze Flange Bearings supporting the Drive Shaft.

4. Grease Target Carrier Pulley Bearings (Figure 7) and Terminal Stop Pulley Bearings (Figure 12) in the same manner as describe in Step 2.

5. Apply power to Target Systems and operate systems in both directions several times observing Target Carrier and Drive Unit Operation.

6. Inspect Downrange Crossmembers for vertical or horizontal bow and adjust Stabilizer Rods and Vertical Supports as required (see Figure 12).

7. Inspect Firing Line Crossmember for horizontal bow and adjust Tiebacks as required to correct.

8. Check for proper tension of Trolley Wires and Puller Cords. Refer to Section 5.5 (Trolley Wire) and Section 5.6 (Puller Cord).
This section illustrates the various components that comprise the typical Cas-Electric Target System. Figures and their respective pages are as follows:

Figure 1 - Drive Unit Mounting on Firing Line Crossmember ................................................. 17
Figure 2 - Cas-Electric Drive Unit (PN 66167) ................................................................. 19
Figure 3 - Drive Unit Internal Parts ..................................................................................... 20
Figure 4 - Drive Unit Mounted Control Switch (Optional) ..................................................... 21
Figure 5 - E4P Control Panel (PN 17-324) ........................................................................ 22
Figure 6 - Drive Unit Wiring Diagram .................................................................................. 23
Figure 7 - Target Carrier Assembly (PN 16-1500) ............................................................... 24
Figure 8 - Offhand Target Holder Assembly (PN 25-1303) .................................................. 25
Figure 9 - Prone Target Holder Assembly (PN 12-1304) ...................................................... 26
Figure 10 - Wide Target Holder Assembly (PN 25-1305) .................................................... 27
Figure 11 - Typical Downrange Crossmember Affixed with Intermediate Stop .................. 28
Figure 12 - Typical Terminal Stop Crossmember ................................................................ 29
Figure 13 - Typical Downrange Crossmember with Intermediate Stop for High Velocity Rifle Ranges .................................................. 30
Figure 14 - Typical Terminal Stop Crossmember for High Velocity Rifle Ranges .............. 31
Figure 1 - Drive Unit Mounting on Firing Line Crossmember
# Parts List 1 - Drive Unit Parts

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty</th>
<th>Part No</th>
<th>Description</th>
<th>Reference</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>16-1044</td>
<td>Drive Unit Weldment</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>923705</td>
<td>Motor, 1/12 HP, Emerson</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>16-1036</td>
<td>Shaft</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>92665</td>
<td>Drive Pulley</td>
<td></td>
</tr>
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<td>5</td>
<td>1</td>
<td>92113</td>
<td>V Belt, 4L230</td>
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<td>6</td>
<td>2</td>
<td>92226</td>
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<td>7</td>
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<td>92078</td>
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<td>8</td>
<td>1</td>
<td>16-1039</td>
<td>Cable Pulley</td>
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<td>Barrier Strip, 10 Position</td>
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<td>91493</td>
<td>Box Connector, 90° Angle</td>
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<td>11</td>
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<td>92664</td>
<td>Pulley, Motor - 3X894</td>
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<td>12</td>
<td>1</td>
<td>91550</td>
<td>Circuit Breaker - 3 Amp</td>
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<td>91666</td>
<td>Neon Indicator Light</td>
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<td>Ball Bearing Pulley</td>
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<td>16</td>
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<td>90531Z</td>
<td>Whiz Nut, 1/4&quot;-20</td>
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<td>17</td>
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<td>90305Z1</td>
<td>1/4&quot;-20 X 1&quot; Hex Head Cap Screw</td>
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<td>18</td>
<td>6</td>
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<td>Flat Washer, 1/4&quot;</td>
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<td>Spring Lockwasher, 1/4&quot;</td>
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<td>25-1700</td>
<td>Eye Bolt Assembly</td>
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<td>Handy Box, 4CS 1/2 Applet</td>
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<td>91460</td>
<td>Handy Box Coverplate</td>
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<td>915410</td>
<td>Lock Washer, Internal Star</td>
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<td>16-1035</td>
<td>ABA Cover</td>
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<td>2</td>
<td>92378</td>
<td>Finger Nut, #10-32</td>
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*Refer to Figure 2 and Figure 3 for location and illustration of the above parts.*
Figure 2 - Cas-Electric Drive Unit (PN 66167)

See Parts List 1 for Item Number cross-reference to description and part number.
Figure 3 - Drive Unit Internal Parts

See Parts List 1 for Item Number cross-reference to description and part number.
Figure 4 - Drive Unit Mounted Control Switch (Optional)
The E4P Control Panel consists of a momentary switch mounted to an aluminum face panel. The wire harness extending from the switch is routed through the shooting stall to the Target System Drive Unit.

When power is supplied to the Drive Unit, control of the Target Carrier is achieved from the E4P. Holding the switch lever to the right transports the Target Carrier downrange toward the Bullet Trap. Holding the switch lever to the left returns the Target Carrier to the Firing Line. Stopping the Target Carrier is achieved by releasing the switch lever.

Refer to Figure 6 for E4P to Drive Unit Connection information.

Figure 5 - E4P Control Panel (PN 17-324)
Figure 6 - Drive Unit Wiring Diagram
Figure 7 - Target Carrier Assembly (PN 16-1500)
Figure 8 - Offhand Target Holder Assembly (PN 25-1303)
Figure 9 - Prone Target Holder Assembly (PN 12-1304)
Figure 10 - Wide Target Holder Assembly (PN 25-1305)
Figure 11 - Typical Downrange Crossmember Affixed with Intermediate Stop
Figure 12 - Typical Terminal Stop Crossmember
Figure 13 - Typical Downrange Crossmember with Intermediate Stop for High Velocity Rifle Ranges
Figure 14 - Typical Terminal Stop Crossmember for High Velocity Rifle Ranges
# Returned Merchandise Authorization Form

For reliable and responsive factory service, submit this form with each part or assembly returned. Please be as specific as possible as this information will allow us to locate problems more quickly and insure quality service.

<table>
<thead>
<tr>
<th>RMA Number:</th>
<th>Contact your MDS Caswell Representative to obtain a Returned Merchandise Authorization # prior to shipment.</th>
</tr>
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<tbody>
<tr>
<td>Customer Name:</td>
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<tr>
<td>Address:</td>
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</tr>
<tr>
<td>Email address:</td>
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<tr>
<td>Telephone Number:</td>
<td>( )</td>
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<td>Name(s) of person(s) with firsthand knowledge of the problem(s):</td>
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<tr>
<td>Item being returned (for example, SIT PCA, Radio, Modem, EV10, etc.):</td>
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<tr>
<td>Model Number:</td>
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<td>Serial Number:</td>
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<tr>
<td>Description of Problem/Fault – Please be as specific as possible (for example, “Radio will not transmit or receive.”, “PCA does not sense hits.”, “Motor fuse consistently blows.”, etc.):</td>
<td></td>
</tr>
</tbody>
</table>

(Additional comments can be recorded on the back of this page.)

Return this form with inoperable item to: Meggitt Defense Systems Caswell
Atttn: RMA
2540 2nd Street NE
Minneapolis, MN 55418-3412
Phone: (612) 379-2000 Fax: (612) 379-2367