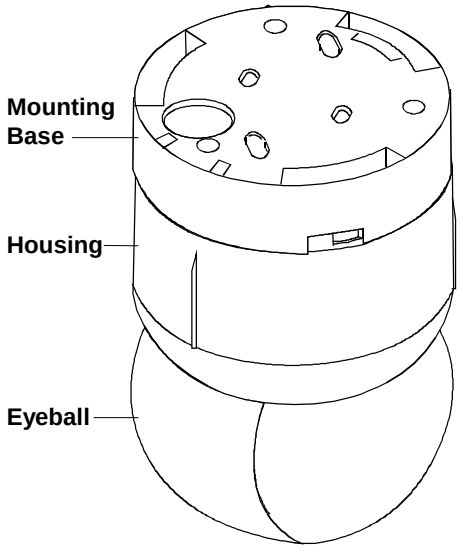
# Installing and Servicing the SpeedDome Ultra® III Camera Dome

**RAS515 and RAS516 Series with On-Screen Menu Programming**

**Figure 1. SpeedDome Ultra III camera dome**






MDR 7/98

## Contents



## About this Guide

This guide explains how to:

- Install the camera dome
- Service the camera dome.

This guide does not explain how to:

- Determine the best location for the camera dome. Because the best location is determined by customer requirements, you will be supplied this information separately.
- Attach the mounting base. See information shipped with the base.
- Assemble indoor housings used with this dome. See information shipped with the housing.
- Install and service the dome outdoors. See information shipped with the outdoor housing.
- Assemble mounting structures used with this dome. See information shipped with the structure.
- Program the dome. See operator's guide shipped with the dome.

# About the Camera Dome

The SpeedDome Ultra® camera dome (Figure 1) mounts indoors or outdoors, and can communicate with the video controller over SensorNet or RS422 communication lines. The dome consists of a mounting base, and a housing and rotating eyeball assembly.

**Note:** Outdoor installation and service instructions are not included in this document. For these instructions, see *Installing the RHODUL Outdoor Housing*, 8000-2573-04.

## Mounting Base

The mounting base attaches directly to a hard or tile ceiling, or indirectly to walls or ceilings using one of many optional housings and mounting structures. As shown in Figure 2, two base types are offered: a RUPTB standard base and a RUIOB base with I/O board.

- **RUPTB Standard Base.** With this base, composite and video cables are inserted through the base and attached to the top of the housing and eyeball assembly, then the assembly is connected to the base. A coiled safety lanyard connects between the base and the housing and eyeball assembly to prevent the acceidental pulling of cables during disassembly.
- **RUIOB Base with I/O Board.** With this base, composite and video cables are pre-connected to the I/O PC board. A round spring-finger connector on the board makes electrical contact with the housing and eyeball assembly as it is connected.

## Housing and Eyeball Assembly

The housing and eyeball assembly (Figure 2) connects to the base using a twist and lock action.

- **Housing.** The housing contains the dome's power supply, pan motor, and electronics used to operate the eyeball. The housing provides one alarm input and one alarm output using the standard base, or four alarm inputs and four alarm outputs using the base with I/O board.
- **Eyeball.** Gloss black and 120mm (4.75") in diameter, the eyeball contains the camera, a tilt motor, and associated electronics. The eyeball can pan and tilt to track a target moving in any direction even as it moves under the dome.

  Two slot covers are part of the eyeball. These covers facilitate access to the camera and incorporate a camouflaged lens. Discard these covers to improve ventilation when the dome is to be used outdoors.

As shown in Table 1, the housing and eyeball assembly can be ordered:

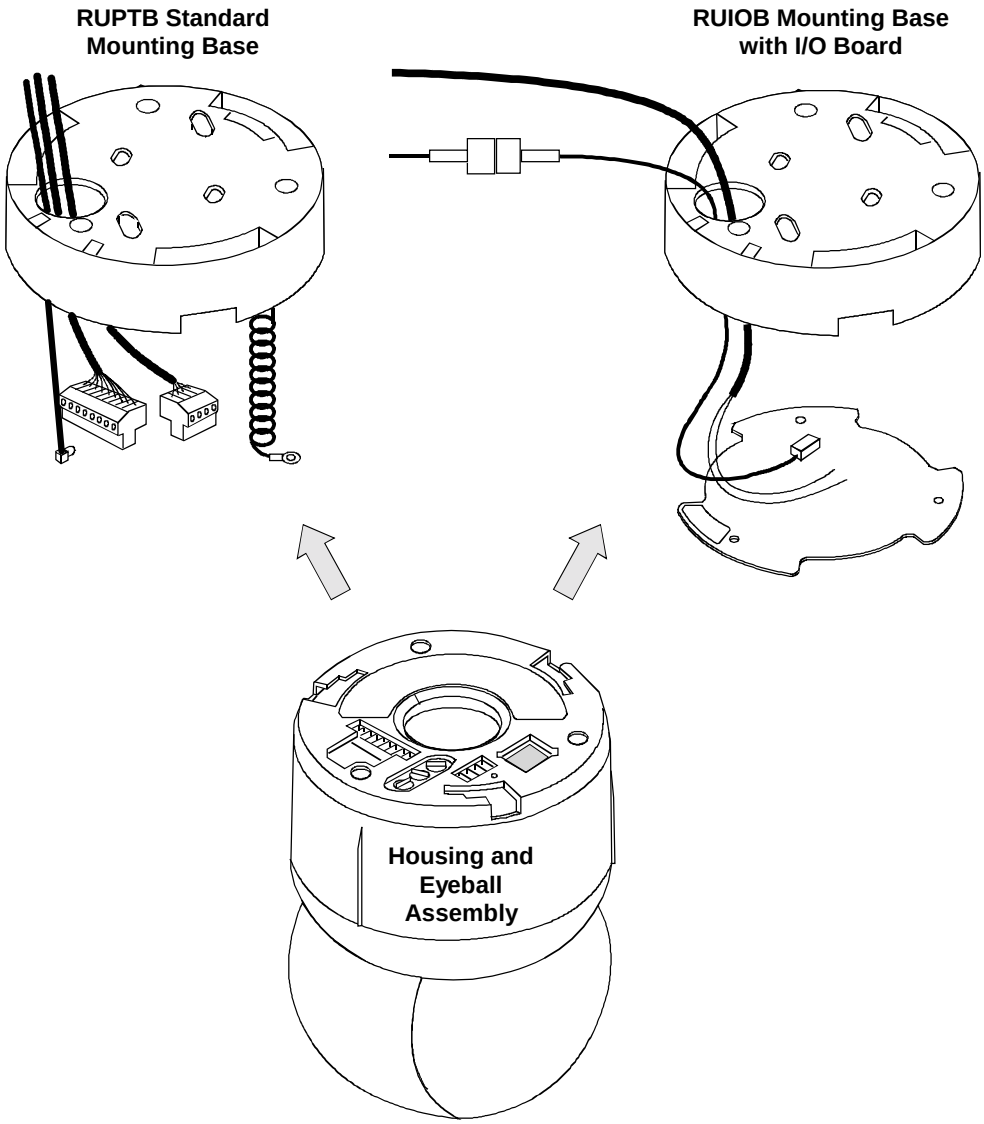
- With no base for existing indoor installations or for mounting outdoors
- With a standard base or base with I/O board for new indoor installations
- With one of four CCD cameras
  - Color NTSC
  - Color PAL
  - Black & White EIA
  - Black & White CCIR.

Each camera provides 12X optical zoom with continuous auto focus and backlight compensation. An electronic zoom provides selectable magnification up to 96X.

**Table 1. Product codes for housing and eyeball assembly configurations**

| | Color NTSC | Color PAL | Black & White EIA | Blk & White CCIR |
|---|---|---|---|---|
| **No Base** | RAS516LS | RAS516LS-1 | RAS515LS | RAS515LS-1 |
| **Standard Base** | RAS516LSP | RAS516LSP-1 | RAS515LSP | RAS515LSP-1 |
| **Base with I/O Bd.** | RAS516LSI | RAS516LSI-1 | RAS515LSI | RAS515LSI-1 |

**Figure 2. Mounting base and housing and eyeball assembly**



# Indoor Mounting

The camera dome attaches to indoor ceilings and walls in a variety of ways. The dome can attach:

- To a hard or tile ceiling
- To a variety of optional mounting structures that mount to a ceiling or wall
- Inside an RHIUTH top hat housing that attaches directly to a ceiling or to most mounting structures. A bubble and trim ring, or a trim ring alone provide concealment.

## Ceiling Mounting

Using hardware shipped with the base, the dome attaches directly to indoor ceilings made of sheet rock, wood, metal, or concrete (Figure 3), or to tile ceiling T-bars where they intersect (Figure 4).

**Figure 3. Surface mounting to hard ceilings**

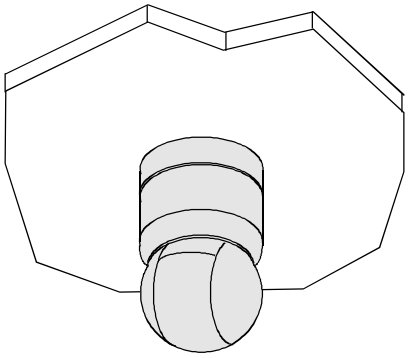
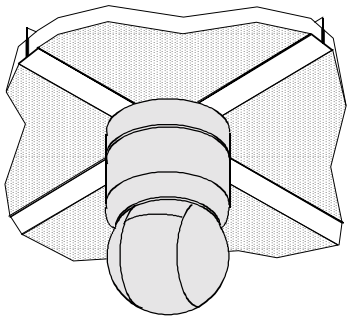


**Figure 4. Surface mounting to tile ceilings**



## Ceiling/Wall Mounting (Optional)

The camera dome attaches to one of the following optional indoor mounting structures (Figure 5).

**Sheet Rock, Plaster or Wood Ceilings**

| | |
|---|---|
| RHIUTH | Top hat housing with trim ring<br>This housing attaches to a ceiling or to an indoor mounting structure.<br>Bubbles used with the housing are: RUCLR (clear), RUSLV (silver), RUSMK (smoked), or RUGLD (gold).<br>Plenum adapter RHPLA may be required to meet local fire codes. |
| RHIUHC | Hard ceiling bracket<br>Enables top hat housing to be recessed in ceiling (requires top hat RHIUTH). |
| RHIUFB* | Fixed bracket<br>Enables top hat housing to be recessed in ceiling (requires top hat RHIUTH). |
| RHIUPNDT† | Pendant mount<br>Suspends dome from ceiling at least a 6m (20') high. |

**Electrical Box in Ceiling**

| | |
|---|---|
| RHIU3X3† | 3 X 3 mounting plate<br>Attaches dome to a standard 3.5 x 3.5 duplex electrical box.<br>**CAUTION:** Do not use the same electrical box used for line voltage mains. |
| RHIU4X4† | 4 X 4 mounting plate<br>Attaches dome to a standard 4 x 4 duplex electrical box.<br>**CAUTION:** Do not use the same electrical box used for line voltage mains. |

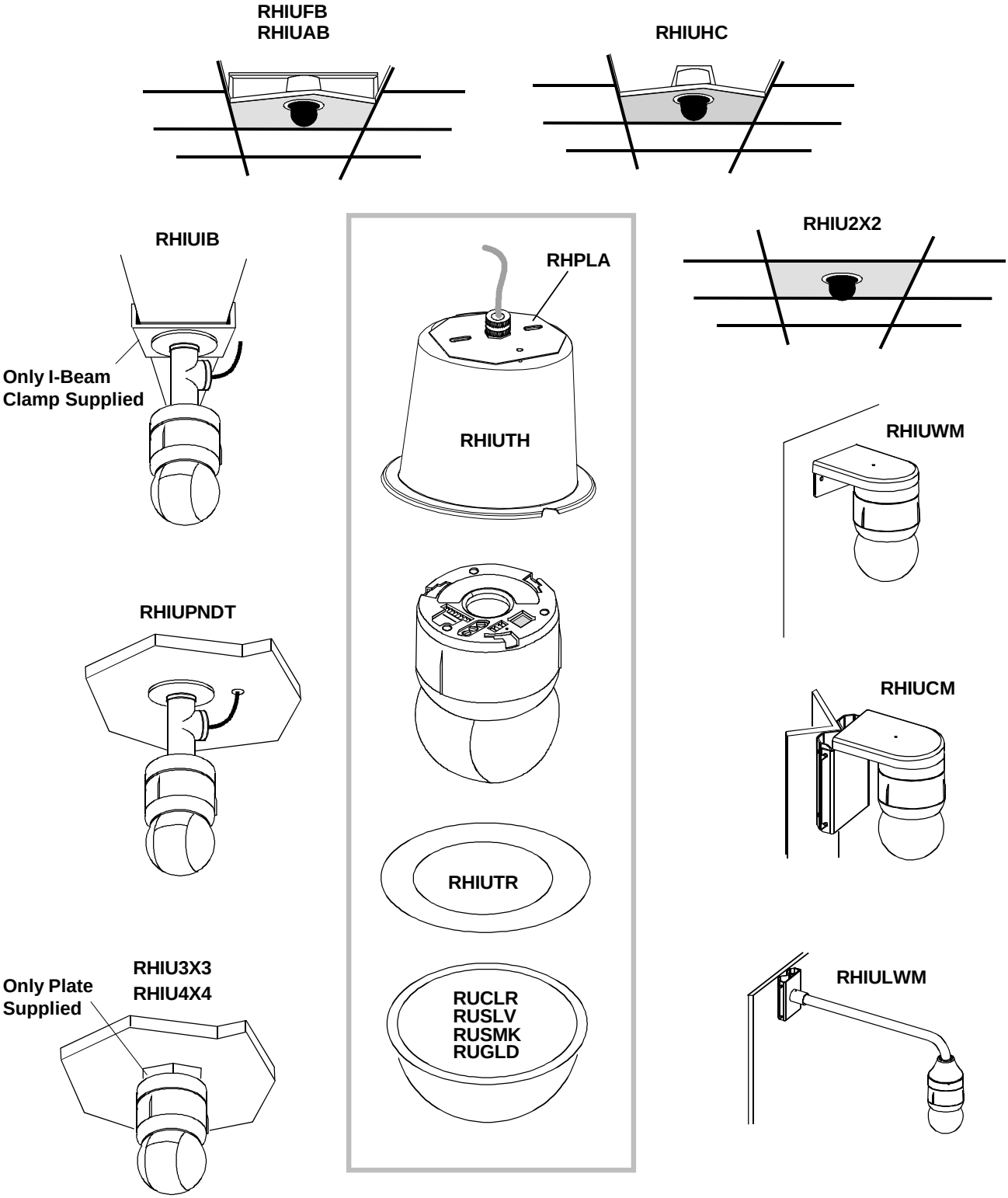
**Structural I-Beams**

| | |
|---|---|
| RHIUIB† | I-beam mount<br>Enables dome to suspend from I-beam at least 6m (20') high. |

* Option in white, but can be painted to match decor.
† Top hat housing/dome assembly also mounts to structure.

*(continued on page 6)*

**Figure 5. Indoor mounting structures (optional)**



**Drop Tile Ceilings**

| | |
|---|---|
| RHIUFB* | Fixed bracket<br>Enables top hat housing to be recessed in a 2x2 tile (requires top hat RHIUTH). |
| RHIUAB* | Adjustable bracket<br>Enables top hat housing to be recessed in a 2x4 tile (requires top hat RHIUTH). |
| RHIU2X2 | 2 X 2 tile mount<br>Enables top hat housing to be recessed in 2x2 openings (incorporates top hat housing). |

**Wall Mounting**

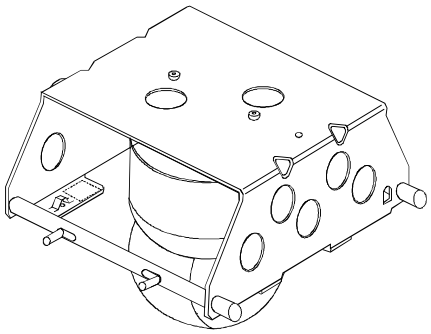
| | |
|---|---|
| RHIUWM* | Wall mount<br>Attaches dome to a flat vertical surface. |
| RHIUCM* | Wall mount with corner feature<br>Attaches dome to attach to a wall, inside corner, or outside corner. |
| RHIULWM*† | Long .6m (24") wall mount<br>Positions dome away from wall to enable it to see over furniture, shelving, and displays. This mounting structure attaches to the wall, inside corner, or outside corner. |

* Option in white, but can be painted to match decor.
† Top hat housing/dome assembly also mounts to structure.

## SpeedDome Housing (Optional)

An RHSDA adapter bracket (Figure 6) enables the camera dome to fit into an existing SpeedDome housing. Locking pins in the bracket enable the dome to swing out for servicing or removal.

**Figure 6. RHSDA adapter bracket (optional)**



## Outdoor Mounting (Optional)

**Note:** Outdoor installation and service instructions are not included in this document. For these instructions, see *Installing the RHODUL Outdoor Housing*, 8000-2573-04.

The camera dome attaches to outdoor walls and ceilings using an RHODUL outdoor housing (Figure 7) and one of the following optional mounting structures (Figure 8):

- RHORM Over Roof Mount
- RHOCM Ceiling Mount
- RHOPM Pole Mount
- RHOWM Wall Mount
- RH170 Corner Bracket.

The outdoor housing contains a fan to cool the camera dome in hot weather, a heater to warm the dome and prevent icing in cold weather, and surge protection circuitry to protect the dome from lightning strikes.

An environmental PC board is used to pre-wire cables. A round spring-finger connector on the board makes electrical contact with the housing and eyeball assembly as it is connected.

**Figure 7. RHODUL outdoor housing (optional)**

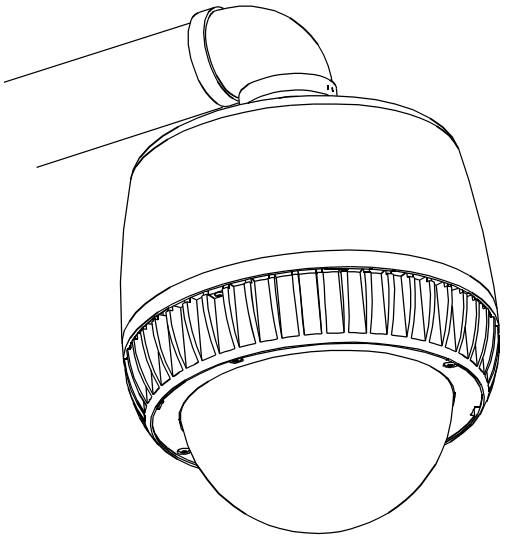
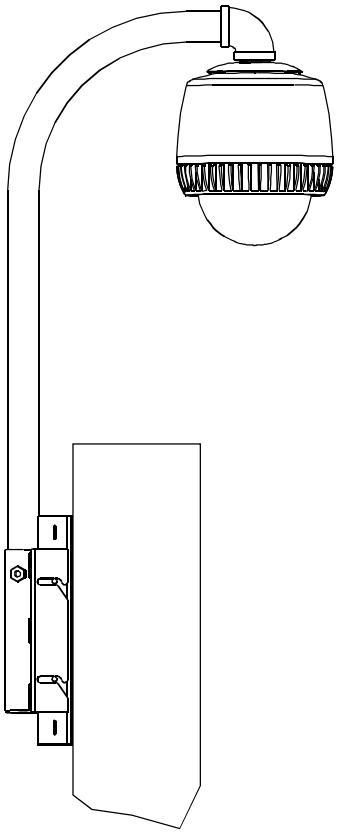
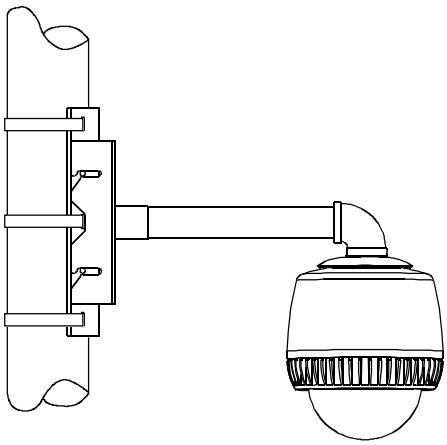


**Figure 8. Outdoor mounting structures (optional)**

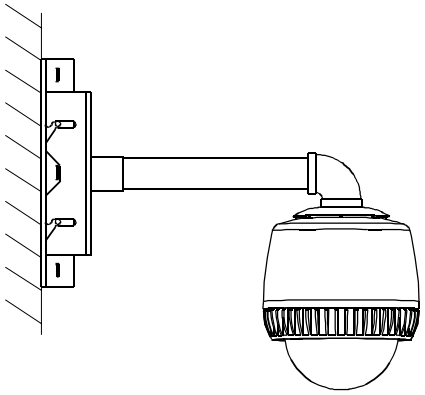
**RHORM over roof mount**



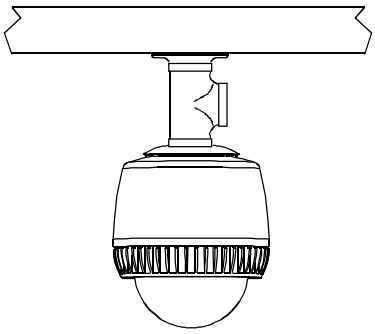
**RHOPM pole mount**



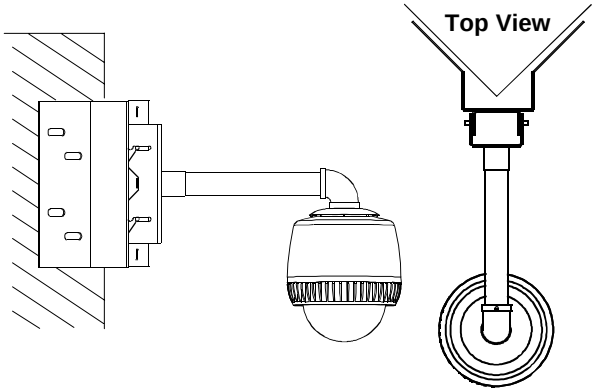
**RHOWM wall mount**



**RHOCM ceiling mount**



**RH170 corner bracket (shown with RHOWM mount)**

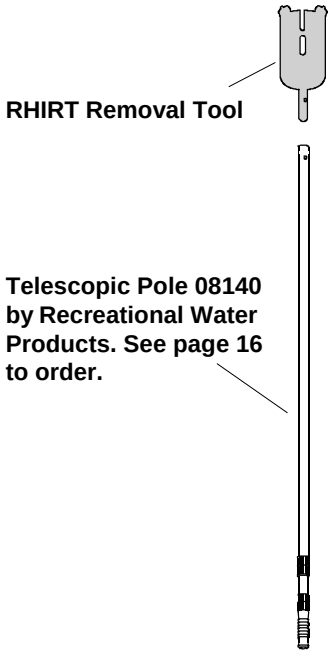


## Installation & Service Features

In alphabetical order:

- **Daisy-chaining.** If using the SensorNet communications protocol, unshielded cable canbe used to daisy chain up to 32 devices. If using RS422, shielded cable can be used to daisy chain up to 10 devices.
- **Dome synchronization.** All domes along the daisy chain can be synchronized to a 50Hz or 60Hz ac source to prevent picture rolling when switching from camera to camera.
- **Easy Installation.** The housing and eyeball easily connects to the mounting base using a twist and lock action.
- **Interchangeability.** The dome can be easily moved from one location to another.
- **Internationally-recognized connectors.** Composite and video cables from the controller connect to internationally-recognized connectors in the dome.
- **Remote manual dome reset.** The dome can be manually reset using keyboard commands from the console.
- **RHIRT indoor install/removal tool.** When using a base with an I/O board, this optional tool (Figure 9) enables you to to connect or disconnect the housing and eyeball assembly, and to attach/detach skirts and bubbles without the need for a ladder. The tool attaches to a telescopic pole (purchased separately). See page 16.
- **Communication and power verification.**
  - If a standard base is used, LEDs in the housing and eyeball assembly enable the installer to check for power and data.
  - If a base with I/O board is used, LEDs on the underside of the mounting base enable the installer to check for power and data. If RS422 communication line is used, other LEDs on the board indicate that wiring is correct, reversed, open, or grounded.
- **Safety.** The camera dome meets all international standards. Electrically, the dome uses low-voltage Class 2 circuitry. Cable connectors are keyed to prevent electrical damage.
- **V-Phase Adjustment.** A V-phase adjustment at the control console enables the dome to synchronize to any line phase.

**Figure 9. RHIRT indoor install/removal tool**



# Warnings and Cautions

Please review the following warnings and cautions before you begin installation or service.

## WARNINGS

**WARNING!**

ALWAYS USE:

- Proper safety equipment for the location and type of installation.
- Proper lift equipment to reach the installation.
- Safety features of the lift equipment.

BE SURE:

- Electrical power is not connected to the dome when connecting wires. Dome will move when power is applied.
- Electrical power is not connected to nearby fixtures that you might touch during installation.

**WARNING!**

DO NOT install this camera dome in hazardous areas where highly combustible or explosive products are stored or used.

**WARNING!**

**This dome runs on 24Vac.** DO NOT connect line voltage to this dome.

**North America power requirements:** In North America, this device is intended to be supplied from a Class 2 power supply. For outdoor installations, use Class 3 wiring techniques, liquid-tight conduit, or liquid-tight pipe.

This installation should be made by a qualified service person and should conform to all local codes.

**WARNING!**

**EU power requirements:** This product runs on 24Vac. In the EU, it is intended to be powered from a Limited Power Source. A limited power source is a certified source of SELV, and if inherently limited, with 8 amps maximum output current, and a maximum of 100VA available; or if not inherently limited, fused with a maximum value of 3.3 Amps, meeting section 2.11 of IEC950, and a maximum of 250VA available. The power supply can be obtained through Sensormatic or through another source where the provider can furnish the verification. This is required to assure electrical safety in the product.

**Stromanforderungen in der EU:** Dieses Produkt wird mit 24 V Wechselstrom betrieben. In der EU ist es für den Betrieb durch eine begrenzte Stromquelle vorgesehen. Eine begrenzte Stromquelle ist eine zertifizierte SELV-Quelle (Schutzkleinspannung), bei inhärenter Begrenzung mit einem maximalen Ausgangsstrom von 8 A und 100 VA maximaler Verfügbarkeit, bei nicht inhärenter Begrenzung mit einer maximalen Sicherung von 3,3 A gemäß Abschnitt 2.11 der IEC950 und 250 VA maximaler Verfügbarkeit. Das Netzteil kann über Sensormatic oder eine andere Quelle bezogen werden, wobei der Anbieter den Nachweis der Konformität bereitstellen sollte. Dies ist zur Gewährleistung der elektrischen Sicherheit des Produktes erforderlich.

## CAUTIONS

- ❑ If using an RS422 communication line, use shielded cable and do not exceed 10 devices per daisy chain.
- ❑ If using a SensorNet communication line, use unshielded cable and do not exceed 32 devices per daisy chain.
- ❑ The maximum length of power cable allowed between the Class 2 LPS (low voltage) ac source, such as a J-box, and the dome is 250m (820').
- ❑ Do not run the composite cable, or camera power cable (if used), adjacent to or in the same conduit as line voltage mains power.
- ❑ When wiring cables directly to the dome, ALWAYS connect the video cable to the dome before you connect the 9-pin cable (which contains power). If you connect the 9-pin cable first, you risk shorting delicate electronics near the connector.
- ❑ I/O PC board (when used).
  - – If a cable clamp is on this board, remove it, as it could damage cable connectors in the housing during assembly.
  - – Use a jeweler's 2.5mm (0.1") slotted screwdriver to tighten connector screws. Do not overtighten these screws.
  - – Use the dust cover when shipping the I/O board back to the manufacturer. It will protect the spring-finger connector.
- ❑ When connecting the housing and eyeball assembly to an outdoor housing:
  - – Remove both slot covers to keep the camera from overheating.
  - – Keep the composite cable away from the heater assembly.
  - – Place tubing around the BNC connectors to avoid shorting their metal surface to the outdoor housing.
  - – Check heater fans. Both fans must be on to prevent overheating.

  **Note:** For further information, see installation instructions shipped with the outdoor housing.
- ❑ If disassembling the dome:
  - – Dome contains electrostatic-sensitive devices! Use a ground strap when handling PC boards.
  - – Once disassembled, parts of housing and eyeball assembly are "extremely fragile" and may break. Proceed using extreme care!

# Connecting the Dome to a Base Mounted Indoors

This section explains how to connect the housing and eyeball assembly indoors to:

- A standard base
- A base with I/O board.

Read “Before You Begin” before beginning these procedures.

## Before You Begin

This section explains what you must do to ensure a smooth and successful installation, and lists software, tools, and parts that should be on-site.

You must:

❑ Have electrical work comply with latest national electrical code, national fire code, and all applicable local codes and ordinances.

❑ Coordinate work with other trades to avoid interference.

❑ Verify existing site conditions and coordinate with the owner’s representative and appropriate utilities as required.

❑ Obtain copies of all related plans, specifications, shop drawings and addenda to schedule and coordinate related work.

❑ Thoroughly review the project to ensure that all work meets or exceeds the above requirements. Bring alleged discrepancies to the attention of the CCTV Project Coordinator.

## Items You Will Need

You should have on hand the following software, tools, and parts:

❑ Dome software (latest version)

❑ Install/Removal tool to attach and detach domes and bubbles without a ladder (only if using a base with I/O board).

❑ If a mounting base is used, base kit:
  – 0351-1628-01 (base with I/O board), or
  – 0351-1629-01 (standard base).

❑ Housing and eyeball assembly, 0100-2283-XX. The -XX determines the type of camera used.
  -01 = Color NTSC
  -02 = Color PAL
  -03 = Black and White EIA
  -04 = Black and White CCIR

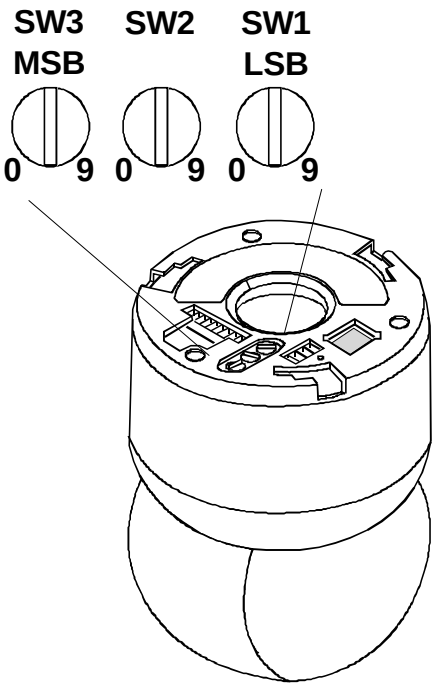
## Connecting to a Standard Base

This procedure explains how to connect the housing and eyeball assembly to a standard base. Perform the following steps on the ground.

**1. Set dome address (Figure 10).**

Recessed at top of housing and eyeball assembly are three rotary address switches. Address range is from 001 to 255.

**Figure 10. Setting address switches**




**2. Attach coiled safety lanyard to cap on housing and eyeball assembly (Figure 11).**

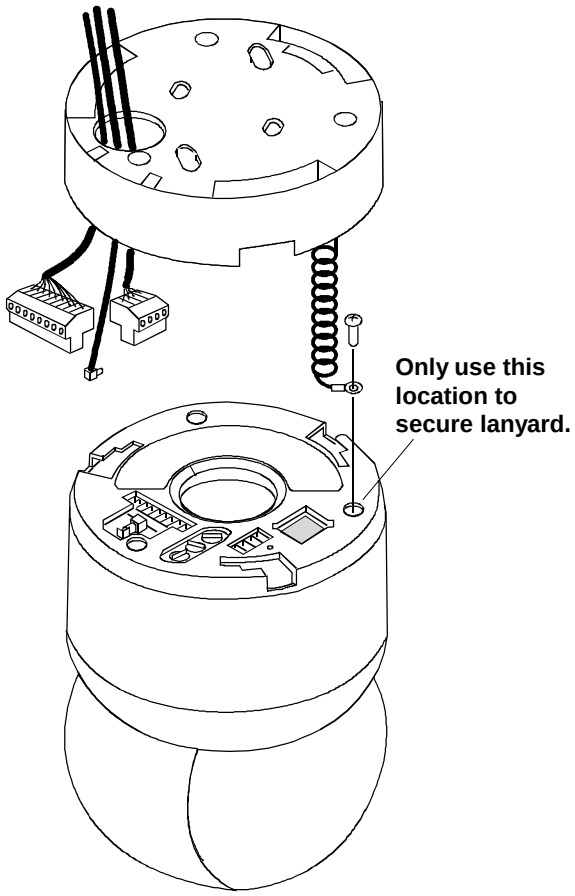
Three screws secure cap to housing. Each screw has a protective ridge around it.

a. Locate screw whose protective ridge is notched.

b. Remove this screw.

c. Use screw to secure lanyard to housing.

**Figure 11. Attaching coiled safety lanyard**



3. **Connect video cable to mini BNC in top of housing and eyeball assembly (Figure 12).**

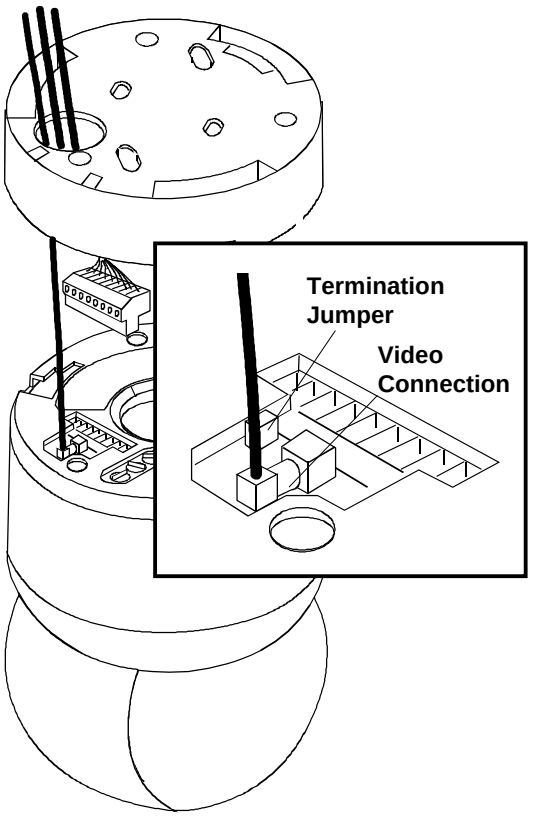
   Press BNCs together. A firm snap indicates a tight connection.

4. **If dome is connected at end of comm. line, set termination jumper JW1 (Figure 12).**

   Jumper JW1 is pre-installed across pins 1–2 (unterminated). These pins are closest to the 9-pin connector. If dome is to be connected at the end of a communications line, place jumper across pins 2–3 (terminated).

   You may need a small slotted screwdriver to gently pry jumper loose. Be careful not the damage the underlying PC board.

**Figure 12. Video cable connection and termination jumper location**




5. **Connect 9-pin and 4-pin plugs to top of housing and eyeball assembly (Figure 13).**

   **CAUTION:** DO NOT connect 9-pin plug unless you have performed step 3 first!

6. **Check LEDs to verify that power and data are reaching dome (Figure 13).**

   LEDs CR2, CR3, and CR4 surround video connection and are visible through opening. LEDs light in the following order:

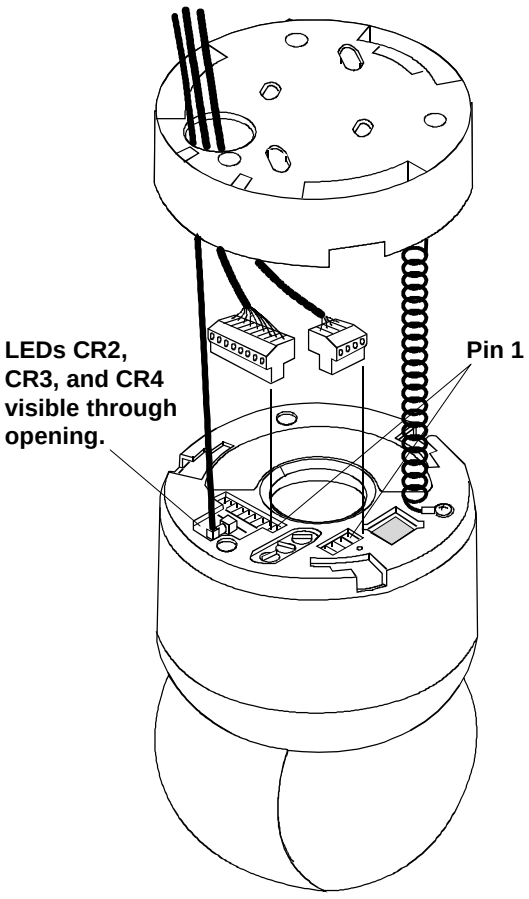
   1. Green CR2 LED blinks indicating data present (RS422 or SensorNet).

      Yellow CR4 LED glows steadily indicating communication between controller and dome (RS422), or glows steadily, turns off, and then blinks (SensorNet).

   2. Red CR3 LED blinks slowly indicating that dome software is operating.

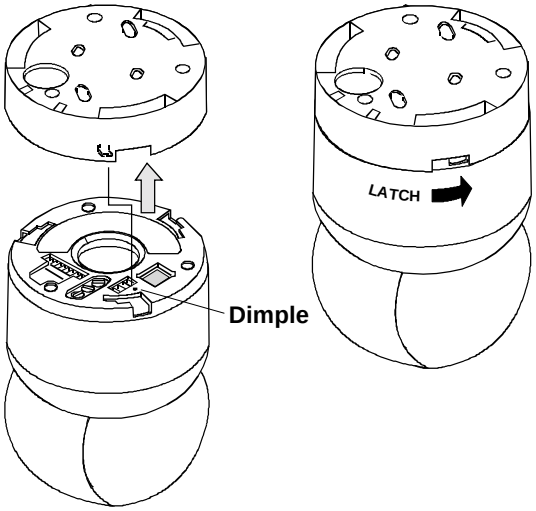
      **Note:** To check RS422 connections, set dome address switch SW3 to 9 and check red and green LEDs. Red should be off, green should blink. If red blinks, RS422 is wired backwards. If red and green are off, there is no RS422 communication. When done with this test, set switch SW3 back to 0 and reset dome from controller.

**Figure 13. 9-pin and 4-pin cable connections**



7. **Connect housing and eyeball assembly to base (Figure 14).**
   a. Align recessed dimple on cap of dome with red dot in base.
   b. Mate housing and eyeball assembly to base and turn it clockwise until you hear a click.

**Figure 14. Connecting housing and eyeball assembly to base (cables and lanyard not shown)**



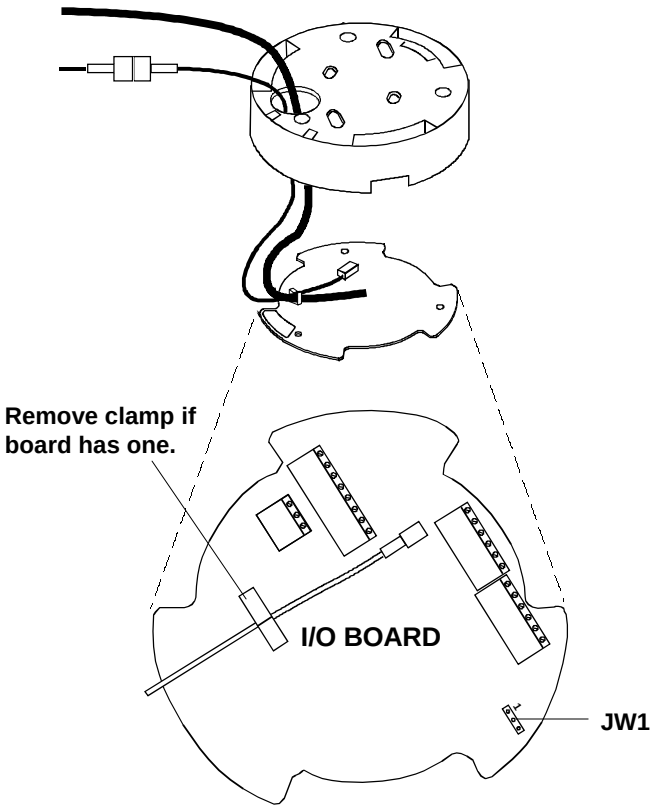

8. **Wait 10 seconds for dome to begin its homing routine.**
   Homing routine indicates that address was placed into dome memory and that dome is ready for programming.

## Connecting to a Base with I/O Board

This procedure explains how to connect the housing and eyeball assembly to a base with I/O board. Perform the following steps on the ground.

1. **Detach and discard cable clamp if I/O board has one, and ensure termination jumper JW1 is set correctly (Figure 15).**
   a. Detach I/O board from base to access cable clamp and jumper JW1.
   b. Detach and remove clamp. If not removed, clamp can damage 9-pin connector in housing and eyeball assembly when you attempt to connect it to base.
   c. Jumper is pre-installed across pins 1–2 (unterminated). If dome is to be connected at the end of a communications line, place jumper across pins 2–3 (terminated).
   d. Reattach I/O board.

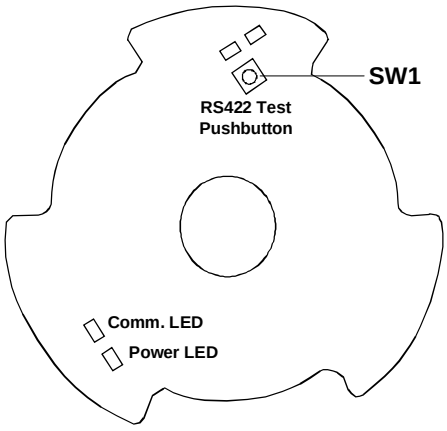
**Figure 15. I/O board cable clamp**



2. **Check LEDs on I/O board to verify power and data are reaching dome (Figure 16).**
   a. Observe green (ac power) and yellow (comm.) LEDs. Green LED glows steadily and yellow LED glows steadily (RS422) or blinks (SensorNet).
   b. For RS422, press and hold data test switch SW1 and observe nearby red and green LEDs; they indicate the following:

| | |
|---|---|
| *Constant green, Blinking red* | RS422 line correctly wired. |
| *Constant green, No red* | RS422 "Data In –" shorted to ground. |
| *Constant red, Blinking green* | "Data In +/ –" wires reversed. |
| *Blinking red, Green off* | "Data In +" shorted to ground. |
| *Both LEDs off* | "Data In +/ –" wires shorted or open. |

**Figure 16. Test switch/LEDs on I/O board**




3. **Set dome address (Figure 17).**
   Recessed at top of housing and eyeball assembly are three rotary address switches. Address range is from 001 to 255.

4. **Connect housing and eyeball assembly to base (Figure 18).**
   a. Align recessed dimple on cap of dome with logo visible on I/O board.
   b. Mate housing and eyeball assembly to base and turn it clockwise until you hear a click.

5. **Wait 10 seconds for dome to begin its homing routine.**
   Homing routine indicates that address was placed into dome memory and that dome is ready for programming.

**Figure 17. Setting address switches**

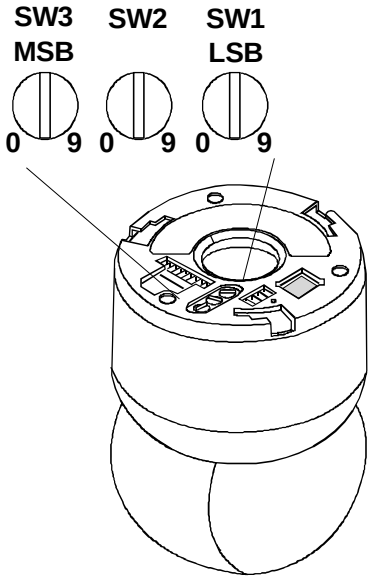
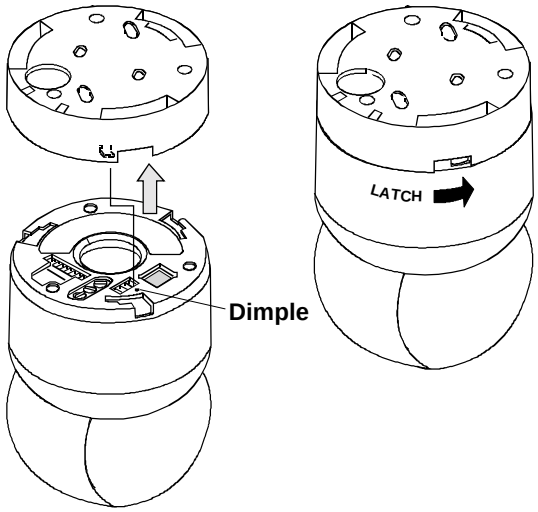



**Figure 18. Connecting housing and eyeball assembly to base**



# Using the Install/Removal Tool

Used only when the dome is connected to a base having an I/O board, the RHIRT install/removal tool eliminates the need for a ladder during routine service. The tool can be used to:

- Detach skirt or bubble from housing, if used. Skirt or bubble remain attached to the housing during service.
- Connect/Disconnect dome from base with I/O board.
- Reattach skirt or bubble.

### Telescopic Pole Required to Use Tool

The tool attaches to a telescopic pole similar to the type used to clean swimming pools. The pole should be 5 feet, 5 inches to 15 feet, 5 inches long and have a 1.170 inch inside diameter to accept the 1.125 inch diameter stem of the tool. If this pole cannot be obtained locally, contact the following manufacturer:

Recreational Water Products
627 E. College Ave.
Decatur, GA 33030

Ask for product code 08140
UPC: 0-14746-58140-2

## Procedure

Referring to Figure 19, maneuver the stem of the tool into the top of the pole until it snaps in place.

TO ATTACH SKIRT OR BUBBLE:

Use tool to push up on bubble and to secure it in place. Magnets secure the bubble. Lower pole.

TO DETACH SKIRT OR BUBBLE:

Lifting pole up at an angle, use one of the hooks on tool to catch one of the notches at side of dome and pull down. T-lanyard will prevent skirt or bubble from falling.

TO CONNECT DOME:

1. **Insert dome "eyeball down" into tool's receptacle.**

   Fins on dome mate with slots in tool. Use fins to properly align dimple at top of dome with label on tool.

2. **Align label on tool with logo on I/O board in base. Push dome up into place.**

3. **Turn dome clockwise until it clicks.**

4. **If power is applied, dome should begin its "homing" routine.**

5. **Lower pole.**

TO DISCONNECT DOME:

1. **Raise pole and insert dome "eyeball down" into tool's receptacle.**

2. **Fins on dome mate with slots in tool.**

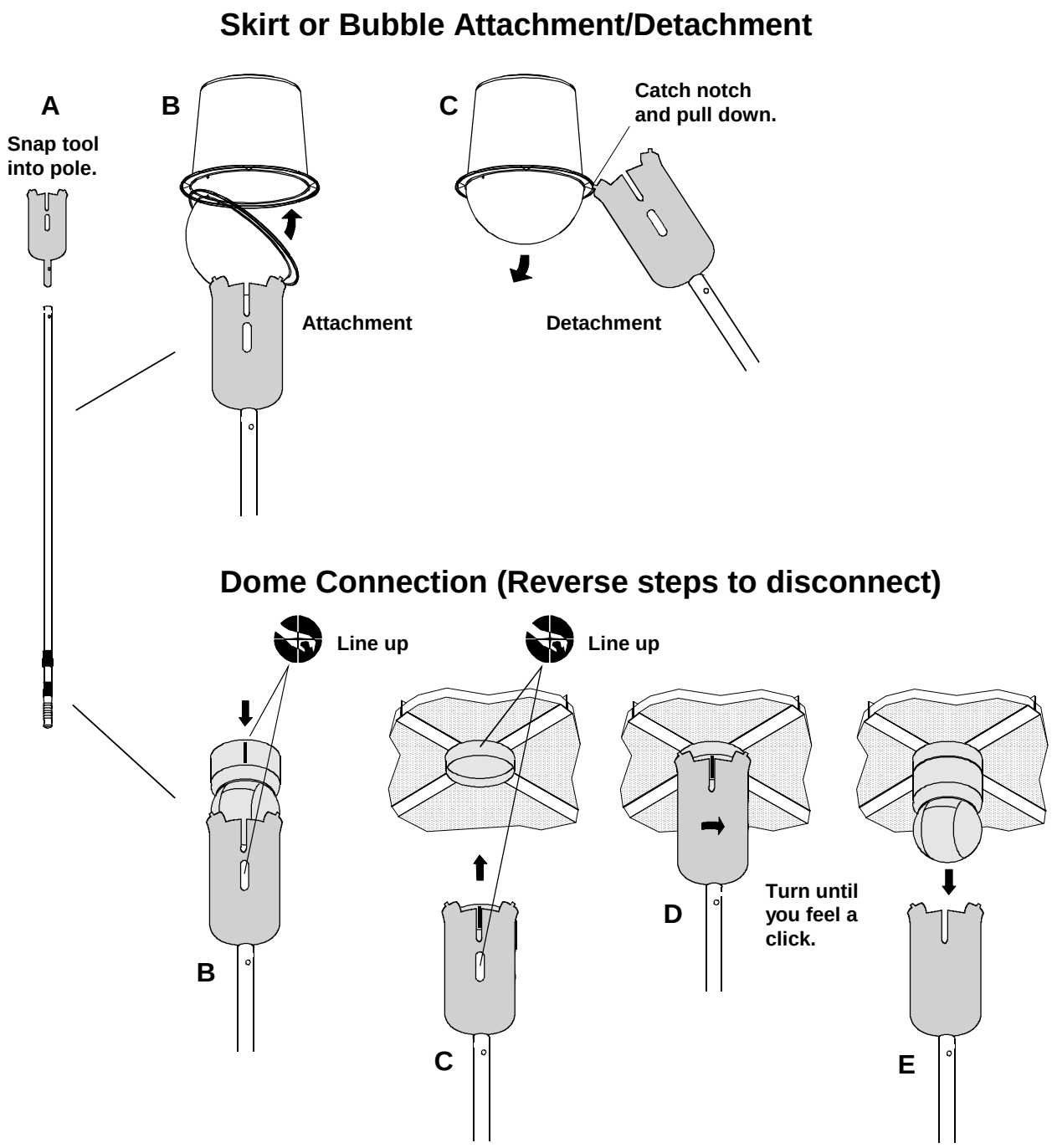
3. **Turn dome counterclockwise until it unlocks.**

4. **Lower pole "vertically" to prevent camera dome from falling out.**

   **CAUTION:** Turning pole horizontally as it is lowered can cause camera dome to fall out of tool and possibly break on floor.

5. **Remove dome for service.**

**Figure 19. How to use the install/removal tool**



# Troubleshooting Indoor Domes

**CAUTION:** This troubleshooting section is for indoor camera domes only! To troubleshoot outdoor domes, see installation and service manual shipped with the outdoor housing.

This chapter contains information on:

- Routine troubleshooting
- Detailed troubleshooting
- Disassembling the dome.

## IMPORTANT!

1. **Try routine troubleshooting first!**

   Use this procedure to isolate the problem without disassembling the housing and eyeball assembly (the base with I/O board is field repairable).

   **CAUTION:** DO NOT troubleshoot if the dome functions but does not pan or tilt (see step 2).

2. **If you cannot isolate the problem, or the dome functions but does not pan or tilt, ship the dome to the National Service Center (NSC).**

   The manufacturer suggests that you ship the entire dome (with base, if it contains an I/O board) to the NSC. For repair authorization, call:

   1-800-543-9740 (CEs)
   1-800-442-2225 (Dealers)
   1-800-241-6678 (End Users).

3. **If you have no choice but to repair the housing and eyeball assembly.**

   Follow the detailed troubleshooting procedure, but use extreme care.

   **CAUTION:** Once disassembled, parts of the housing and eyeball assembly are “extremely fragile” and may break. Proceed using extreme care!

## Items You Will Need

You should have on hand the following items:

- ❑ Dome software (latest version)
- ❑ Phillips-head screwdriver
- ❑ Small slotted screwdriver
- ❑ 2.5mm (0.1") slotted screwdriver (for wire connections). Wider blade widths can damage connectors.
- ❑ Socket wrench with 5” extension and 5.5mm, 6mm, 8mm, and 10mm sockets
- ❑ 14-18 AWG and 20-22 AWG wire strippers
- ❑ Install/Removal tool to connect/disconnect dome to indoor bases with I/O boards, and to attach/detach skirts and bubbles—without a ladder.

## Routine Troubleshooting

Use this procedure if:

- Dome does not respond to commands
- Dome does not produce video
- Quality of the video is poor
- Dome has no lens control.

Read the following CAUTIONS:

**CAUTION:** DO NOT use this procedure if the dome functions but does not pan or tilt (see page 18).

**CAUTION:** If an I/O board is used, use a ground strap when handling the board.

**CAUTION:** When shipping a base having an I/O board to the manufacturer, place the dust cover over the spring finger connector to protect it.

**CAUTION:** Connector screws on the I/O board are delicate. DO NOT overtighten them! Use a 2.5mm (0.1") slotted screwdriver. Wider blade widths can damage connectors.

### Procedure

Follow steps until the problem is corrected.

**1. Check video on monitor.**

No video? Go to step 2.

Contrast or color off?

| | |
|---|---|
| YES | Ship entire dome (base included, if it contains an I/O board) back to the NSC. Place dust cover over spring finger connector on I/O board. |
| NO | Go to step 2. |

Video rolls when switching between monitors?

| | |
|---|---|
| YES | Use video controller or switcher to synchronize video vertical sync phases of all domes to ac line. For specific instructions, see installation and service manual for controller or switcher. |
| NO | Go to step 2. |

**2. Check ac power and video connections at J-box.**

24Vac absent? Video signal absent?

| | |
|---|---|
| YES | Correct problem at J-box. |
| NO | Go to step 3. |

**3. Check dome address switches.**

Detach dome from base and examine address switches. Are they set correctly?

| | |
|---|---|
| YES | If dome still doesn't respond, ship entire dome (base included, if it contains an I/O board) to the NSC. If you must repair the dome, see "Detailed Troubleshooting", next. |
| NO | Set correct address and reattach housing and eyeball assembly. |

**Steps 4–9 are only for bases with I/O boards!**

If the mounting base DOES NOT contain an I/O board, stop here and ship the housing and eyeball assembly to the NSC. See "IMPORTANT!" on page 18 for phone numbers. If mounting base does contain an I/O board, go to step 4.

**4. Isolate problem to housing and eyeball assembly or base.**

Attach dome to another base with I/O board. Does it display video or respond to commands?

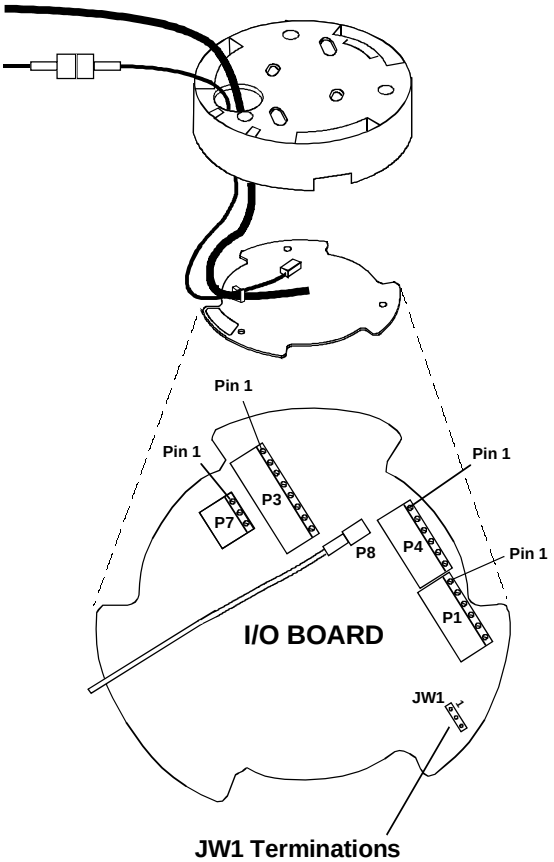
| | |
|---|---|
| YES | Problem is likely cable connections or I/O board if used. Go to step 5. |
| NO | Ship entire dome (base included, if it contains an I/O board) to the NSC. Place dust cover over spring finger connector on I/O board. |

**5. Verify coaxial video cable is securely connected to coax of I/O board (Figure 20).**

Cable disconnected?

| | |
|---|---|
| YES | Connect cable. |
| NO | Go to step 6. |

**Figure 20. I/O board connector and jumper locations**




**JW1 Terminations**

| PINS | FUNCTION |
|---|---|
| 1-2 | Unterminated |
| 2-3 | Terminated |

**6. Observe green power LED on I/O board (Figure 21).**

Green LED off or not on steady?

| | |
|---|---|
| YES | Verify 24Vac cable is properly attached. If O.K., replace I/O board or ship entire dome to the NSC. |
| NO | Go to step 7. |

**P7 Connector (AC in)**

| Pin | Color | Designation |
|---|---|---|
| 1 | N/A | 24 Vac |
| 2 | N/A | Ground |
| 3 | N/A | 24 Vac |

**7. Observe yellow communication LED on I/O board (Figure 21).**

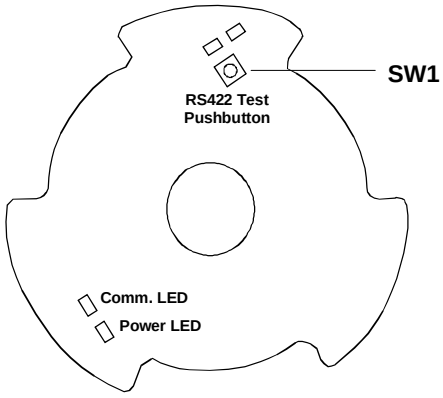
Yellow LED flashing?

| | |
|---|---|
| YES | Go to step 8. |
| NO | Verify RS422 or SensorNet cable is properly attached. If OK, replace I/O board or ship entire dome to NSC. |

**P1 connector (RS422/SensorNet 485 data)**

| Pin | Color | Designation |
|---|---|---|
| 1 | Orange | RS422 Data In High (+) |
| 2 | Green | RS422 Data In Low (–) |
| 3 | Yellow | RS422 Data Out High (+) |
| 4 | Brown | RS422 Data Out Low (–) |
| 5 | Orange | SensorNet 485 |
| 6 | Yellow | SensorNet 485 |

**Figure 21. I/O board switch and LED locations**



**8. If using RS422 protocol and an I/O board is used, check comm. line connections.**

Press and hold data test switch SW1 (Figure 21) and observe nearby red and green LEDs. These LEDs indicate the following:

| | |
|---|---|
| *Constant green, Blinking red* | Comm. line correctly wired. |
| *Constant green, No red* | "Data In –" shorted to ground. |
| *Constant red, Blinking green* | "Data In +/–" wires reversed. |
| *Blinking red, Green off* | "Data In +" shorted to ground. |
| *Both LEDs off* | "Data In +/–" wires shorted or open. |

**9. Check spring finger connector on I/O board.**

Connect housing and eyeball assembly to original base to verify contact between spring fingers and CPU board (under cap). Does dome produce video and respond to commands?

| | |
|---|---|
| YES | Spring fingers may not have seated properly. Reconnect housing and eyeball assembly. |
| NO | Replace I/O board. |

---

If routine troubleshooting did not solve the problem, the manufacturer strongly recommends you ship both the entire dome (including base, if an I/O board is used) to the National Service Center (NSC) for service. See page 18 for phone numbers.

If you must perform detailed troubleshooting, use extreme care when disassembling parts! See "Detailed Troubleshooting," next.

## Detailed Troubleshooting

Use this procedure to determine if the problem is a simple cable connection or a major component.

To perform this procedure, you must open the housing and eyeball assembly. Refer to "Disassembling the Dome" on page 22.

BEFORE YOU BEGIN, read the following cautions:

**CAUTION:** DO NOT use this procedure if the dome functions but does not pan or tilt (see page 18).

**CAUTION:** If you can't perform routine troubleshooting, the manufacturer strongly recommends you ship both the entire dome (including base, if an I/O board is used) to the National Service Center (NSC) for service. If you must perform detailed troubleshooting, use extreme care when disassembling parts!

**CAUTION:** When shipping a base with I/O board back to the NSC, place the dust cover over the spring fingers to protect them.

**CAUTION:** Delicate connector screws on I/O board. DO NOT overtighten them! Use a 2.5mm (0.1") slotted screwdriver. Wider blade widths can damage connectors.

**CAUTION:** Dome contains electrostatic-sensitive PC boards. Use a ground strap when handling boards.

## Procedure

1. **Match symptom to one of the following criteria:**
   - Dome functions but does not pan
   - Dome functions but does not tilt
   - Dome does not “home” or respond to commands even when attached to another dome’s base and its address switches are set correctly (dead dome).

2. **Choose a, b, or c to determine if problem is a cable connection or major component.**

   a. Dome functions but does not pan.

   On CPU board, is pan motor ribbon cable attached to connector P4 and is metal side of its fingers towards contacts of connector?

| | |
|---|---|
| YES | Replace CPU board. If this doesn’t work, replace pan motor. |
| NO | Connect cable(s). |

   b. Dome functions but does not tilt.

   On camera/lens board, is tilt motor cable attached to connector J3? Is slip ring cable attached to connector J2?

| | |
|---|---|
| YES | Replace camera/lens board. If this doesn’t work, replace tilt motor. |
| NO | Connect cable(s). |

   c. Dome does not “home” or respond to commands (dead dome).

   On CPU board, is power supply cable attached to connector P3? Is slip ring cable attached to connector P2?

| | |
|---|---|
| YES | Replace CPU board. if this doesn’t work, replace power supply board. |
| NO | Connect cable(s). |

# Disassembling the Dome

This section explains how to remove the following parts from the camera dome.



**CAUTION**: Once disassembled, parts of dome housing and eyeball assembly are “extremely fragile” and may break. Proceed using extreme care!

This section also explains how to update and reprogram dome software (Page 28).

To order parts, see page 28.

## Tools required

- Phillips-head screwdriver.
- Small slotted screwdriver.

## Removing the CPU Board

Referring to Figure 22.

1. **Remove cap.**
   Remove three Phillips-head screws holding cap, then “gently” lift cap to one side.

2. **Detach connectors.**
   On CPU board, detach 8-pin power supply cable from connector P1, pan motor cable from connector P8, and 14-pin slip ring cable from connector P2.

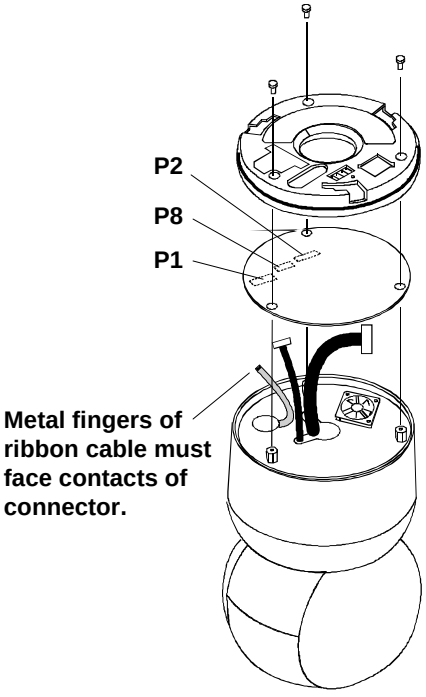
3. **Remove CPU board.**
   Push your finger through large finger connector hole in cap to pop out CPU board.

   **CAUTION:** Electrostatic-sensitive device. Use a ground strap when handling CPU board.

4. **Reverse steps to reassemble.**

   **CAUTION:** Do not to pinch wires! When inserting CPU board into housing, avoid pinching power supply cable wires against standoffs.

**Figure 22. Removing the CPU board**




## Removing the P/S Board

Referring to Figure 23.

1. **Perform procedure “Removing the CPU Board” (this page).**

2. **Remove metal shield.**
   Remove three standoffs holding metal shield, gently remove power supply cable grommet from shield, then “gently” lift shield out of housing.

   **CAUTION:** Do not pull delicate cables attached to power supply board.

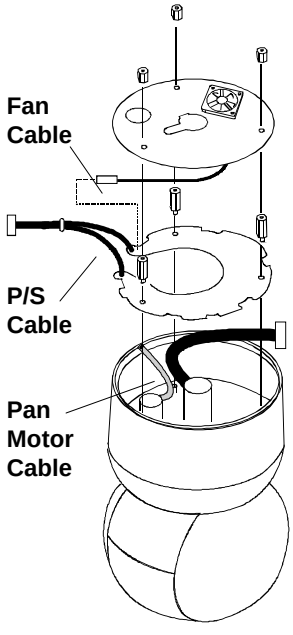
3. **Detach fan motor cable.**
   Cable connects to connector CN3 on power supply board.

4. **Remove power supply board.**
   Remove three standoffs, then remove power supply board from housing.

   **CAUTION:** Electrostatic-sensitive device. Use a ground strap when handling power supply board.

5. **Reverse steps to reassemble.**

**Figure 23. Removing the P/S board**



## Removing the Pan Motor

Referring to Figure 24.

1. **Perform procedure "Removing the CPU Board" (page 23).**

2. **Perform procedure "Removing the P/S Board" (page 23).**

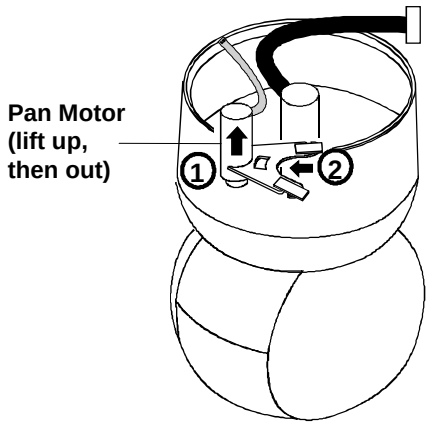
3. **Remove pan motor.**

   Lift motor housing up as shown (1) to disengage motor from pan gear. Then pull motor bracket towards outside of housing (2) to remove.

4. **Reverse steps to reassemble.**

   **CAUTION:** When putting in a new motor, be careful to properly mesh motor and pan gears! Failure to do so can destroy both motor and pan gear. Verify pan gear turns freely!

**Figure 24. Removing the pan motor**




## Removing the Slot Covers

1. **Gently swivel eyeball to totally expose one of two slot covers (Figure 25).**

   **CAUTION:** Swiveling fast can damage gears.

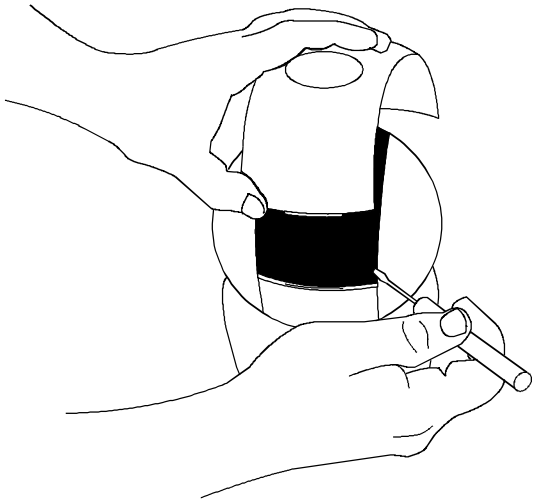
2. **Insert small, thin-bladed screwdriver into space between cover and eyeball.**

3. **Gently pry off slot cover.**

4. **Gently swivel eyeball to totally expose remaining slot cover.**

   With other cover removed, this cover can be easily removed.

**Figure 25. Removing slot covers**



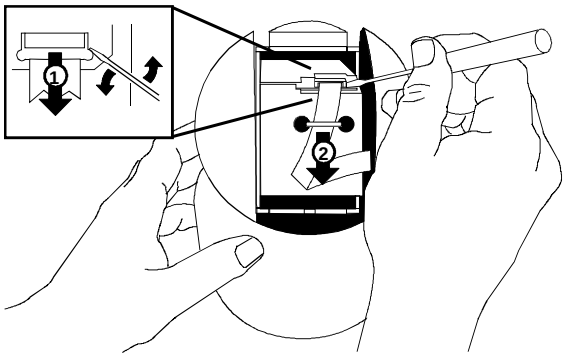
## Removing the Camera

1. **Perform procedure “Removing the Slot Covers” (page 24).**

2. **Remove ribbon cable from camera (Figure 22).**

   Swivel camera yoke to expose camera connector. Then, using a small slotted screwdriver, 1) gently pry camera connector loose from camera, and 2) pull it down through cable tie wrap.

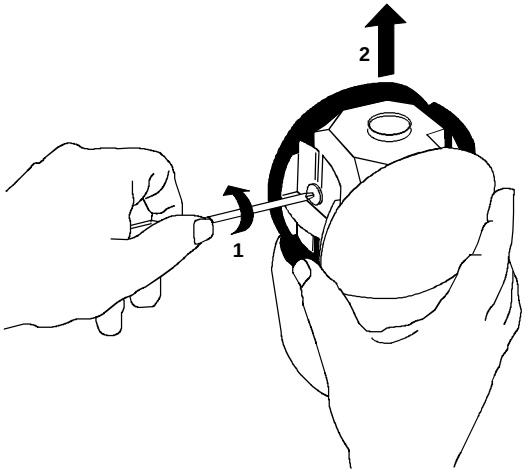
**Figure 26. Removing the ribbon cable**




3. **Remove camera (Figure 27).**

   1) Loosen the screw holding the camera tripod mount, then 2) carefully lift the camera out.

**Figure 27. Removing the camera**




Reverse steps to reassemble. Ensure ribbon cable pins are inserted “face down”.

## Detaching the Eyeball

1. **Perform procedure “Removing the Slot Covers” (page 24).**

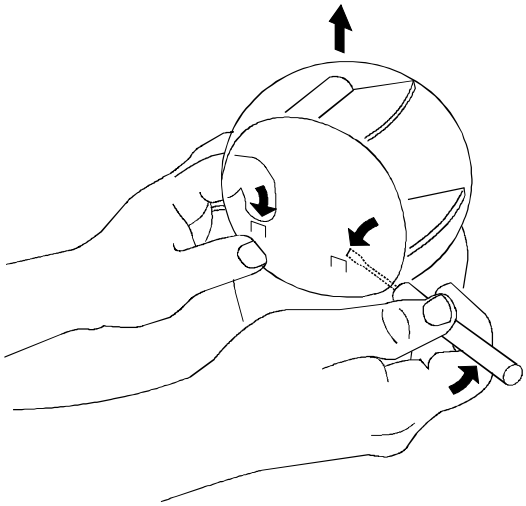
2. **Perform procedure “Removing the Camera” (this page).**

3. **Detach eyeball from housing (Figure 28).**

   a. Turn yoke to access tabs. One tab is more accessible than the other. Use your finger to press this tab while, simultaneously, using a small slotted screwdriver to press the other.

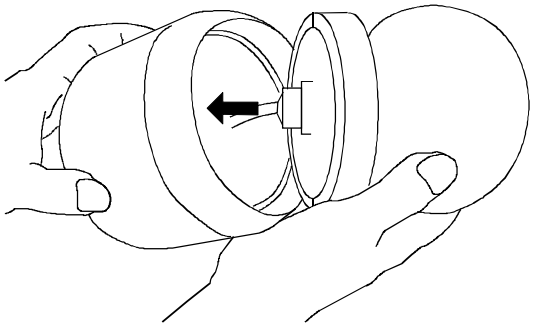
   b. While pressing tabs, push up on eyeball to detach it.

**Figure 28. Loosening the eyeball**



4. **Detach slip ring connector (Figure 29).**

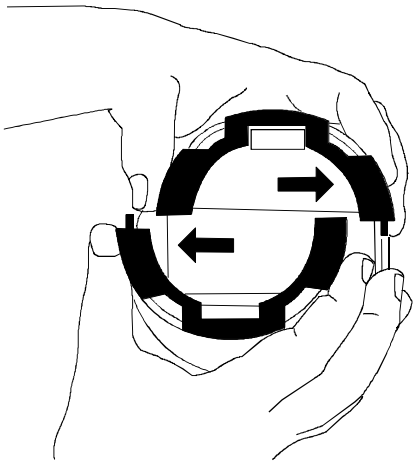
**Figure 29. Detaching the eyeball**



## Removing the Camera/Lens Board

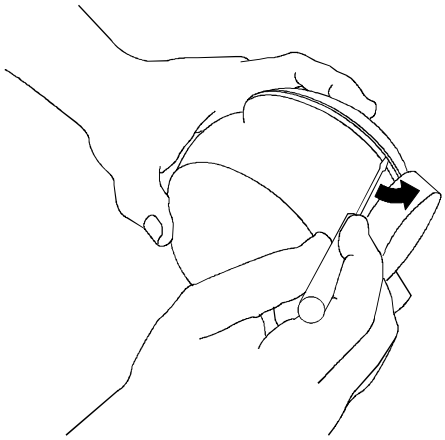
1. **Perform procedure "Removing the Slot Covers" (page 24).**
2. **Perform procedure "Removing the Camera" (page 25).**
3. **Perform procedure "Detaching the Eyeball" (page 25).**
4. **Separate yoke brackets (Figure 30).**

**Figure 30. Separating the yoke brackets**



5. **Gently pry off yoke bracket covering camera/lens board to access bearing assembly (Figure 31).**

**Figure 31. Removing the yoke brackets**

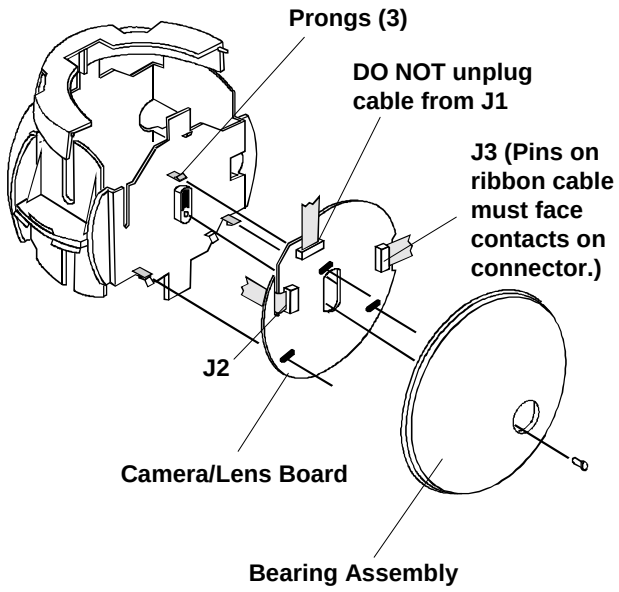


The following steps refer to Figure 32.

6. **Access camera/lens board.**
   To do this, loosen captive retaining screw holding bearing assembly in place and remove this assembly.
7. **Remove cables from camera/lens board.**
   a. Small amber ribbon cable is from tilt motor. Unplug this cable from connector J3 on camera/lens board.
   b. Large gray ribbon cable is from slip ring connector. Unplug this cable from connector J2 on camera/lens board.

   DO NOT unplug small white ribbon cable from connector J1.
8. **Push out on three prongs to detach camera/lens board.**
9. **Reverse steps to reassemble.**

**Figure 32. Removing the camera/lens board**



## Removing the Tilt Motor

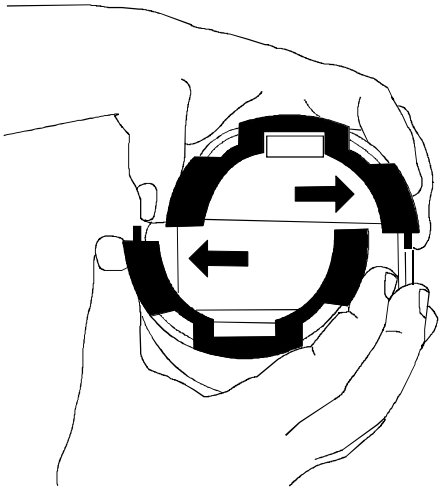
1. **Perform procedure “Removing the Slot Covers” (page 24).**

2. **Perform procedure “Removing the Camera” (page 25).**

3. **Perform procedure “Detaching the Eyeball” (page 25).**

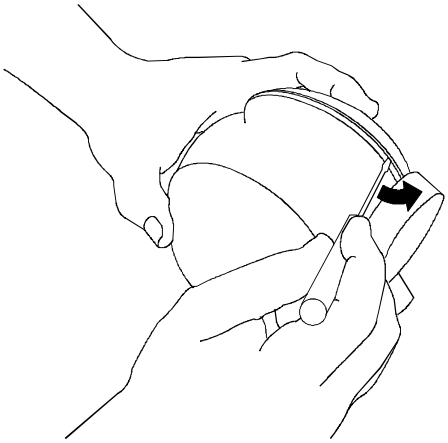
4. **Separate yoke brackets (Figure 33).**

**Figure 33. Separating the yoke brackets**



5. **Gently pry off yoke bracket covering pan gear assembly to access tilt cable assembly (Figure 34).**

**Figure 34. Removing the yoke brackets**



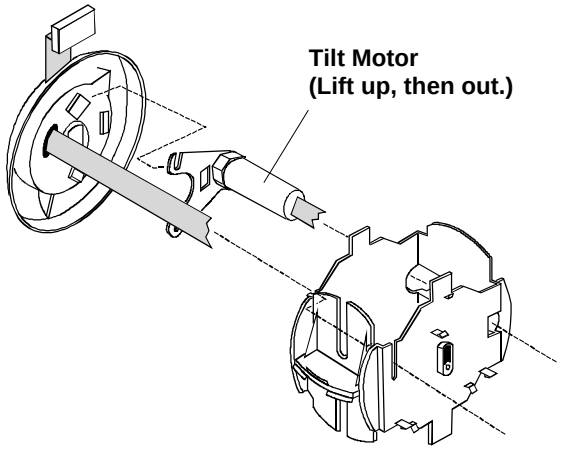
6. **Access tilt motor.**

   To do this, loosen captive retaining screw holding tilt cable assembly in place and gently remove this assembly.

7. **Remove tilt motor (Figure 35).**

   Lift motor housing up as shown (1) to disengage motor from tilt gear. Then pull motor bracket towards outside of cable/tilt assembly (2) to remove motor.

**Figure 35. Removing the tilt motor**




8. **Reverse steps to reassemble.**

   **CAUTION:** When installing a new motor, be careful to properly mesh motor and tilt gears! Failure to do so can destroy both motor and tilt gear. Verify tilt gear turns freely!

## Updating/Reprogramming Dome Software

To update or reprogram dome software:

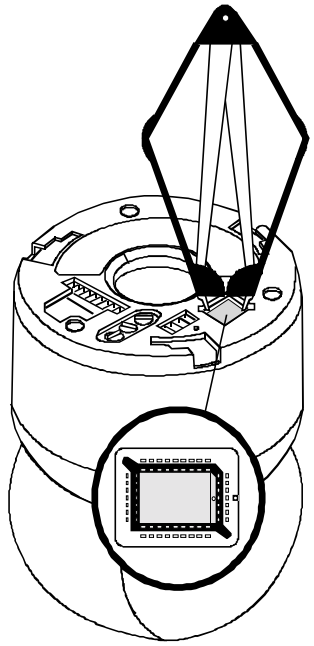
1. **Remove flash memory chip.**
   Insert chip extractor tool into square access hole and squeeze to extract flash memory chip (Figure 36).

   **CAUTION:** Electrostatic-sensitive device. Use a ground strap when handling chip.

2. **Reprogram chip or replace it with new chip.**

3. **Reinsert chip.**
   Align dot on chip with indent on socket, then push down on chip to reinsert it.

**Figure 36. Removing the flash memory chip**

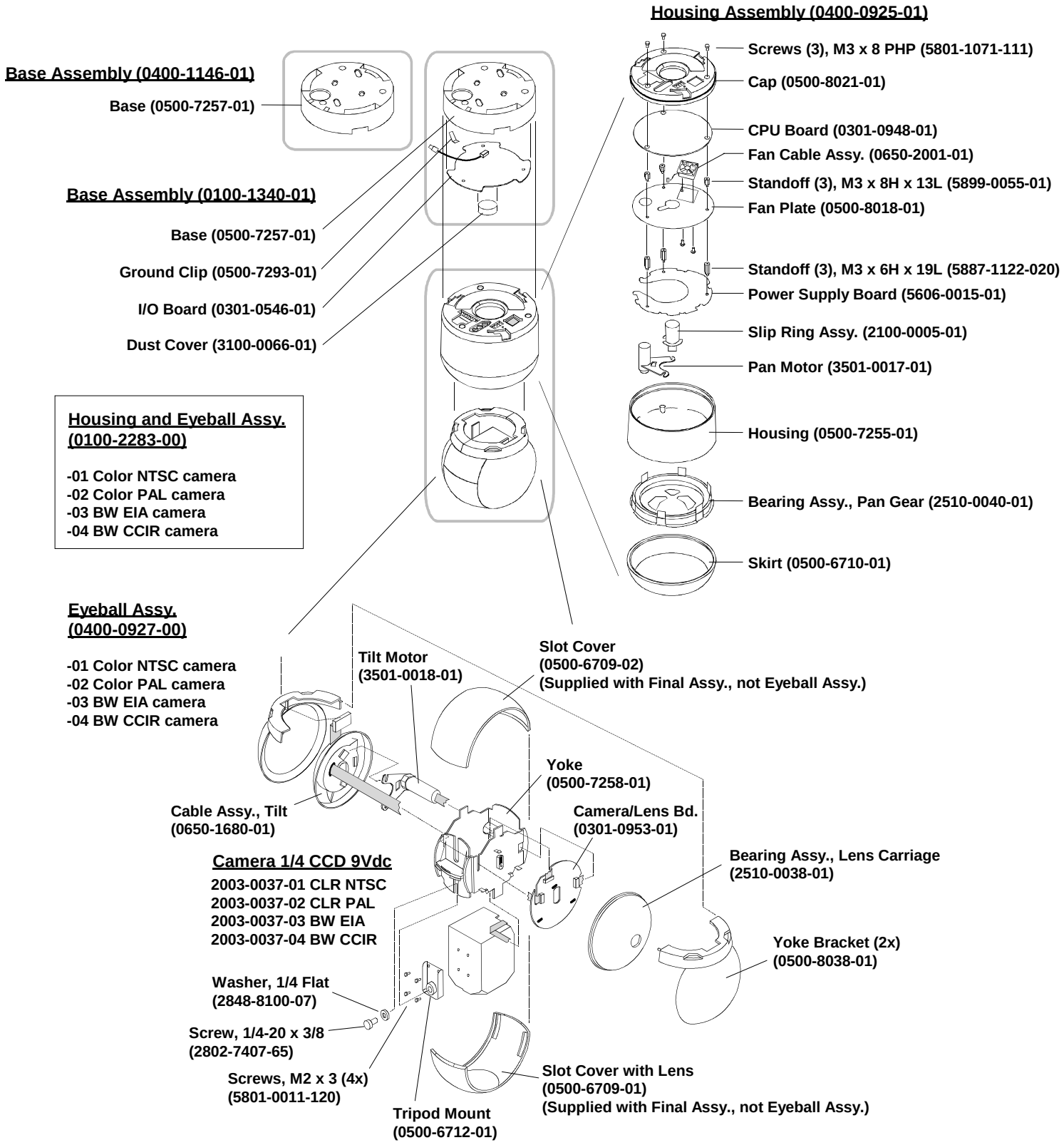


## Ordering Parts

This section helps you to identify parts that make up the base and housing and eyeball assembly. See Figure 37 for parts breakdown.

Order parts through your parts distribution network.

Figure 37. Base, housing, and eyeball assembly



# Specifications—Indoor Dome

## Operational

| | |
|---|---|
| Manual Pan/Tilt Speed | 1° to 100° per second (scaled to zoom position) |
| Preset Pan/Tilt Speed | 280° per second maximum |
| Pan Travel | 360° continuous |
| Tilt Travel | >90° |
| Zoom: | |
| Total Zoom | 96X |
| Optical Zoom | 12X |
| Digital Zoom | 8X |
| Maximum Zoom | 24X–96X, in 12X increments |
| Pan/Tilt Accuracy | ±0.5° |
| Zoom/Focus Accuracy | ±0.5% |
| Camouflage Lens Density | f0 |
| Preset Aquisition Time | <1 second to position at 60% of zoom setting |
| Auto Synchronization: | |
| Line Locked | Remote V-phase adjustment |
| Internal | Built-in sync generator |
| Video Output Connector | Female BNC |
| Address Range | 1-255 |
| Programmable Presets | 16 (AD2083-02A with RS422)<br>64 (AD168)<br>96 (VM16)<br>96 (VM32)<br>96 (ADTT16)<br>Unlimited (VM96) |
| Programmable Patterns | 3 |
| Program Storage | 256 Kbytes of Flash memory |
| Data Storage | 96 Kbytes of SRAM |
| Menu Languages | English, French, German, Spanish, and Portuguese |

## Electrical

| | |
|---|---|
| Input Voltage | 24 to 30 Vac, 50/60 Hz<br>UL Class 2 LPS |
| Design Tolerance | 20 to 36 Vac, 50/60 Hz |
| Current | 0.85 A max. |
| Power On In-Rush Current | 1.5 A |
| Surge Protection: | |
| Video Output | 100 A |
| Power Line | 60 V, 1.5 joules, 250 A |
| RS422 | 5.6 V, 0.1 joules, 40 A |
| SensorNet 485 | Isolated transformer coupled, 10 kA impulse rated gas tube |
| Alarm Inputs | 5.6 V, 0.1 joules, 40 A |
| Alarms Inputs/Control Outputs: | |
| When no I/O board is used: | |
| Inputs | 1 dry contact/3.5 mA sink |
| Outputs | 1 open collector driver @ 12 Vdc, 40 mA |
| When I/O board is used: | |
| Inputs | 4 dry contacts/3.5 mA sink |
| Outputs | 4 open collector drivers @ 12 Vdc, 40 mA |

## Environmental

| | |
|---|---|
| Operating Temperature | –10° to 50°C (14° to 122°F) |
| Relative Humidity | 0 to 95% non-condensing |

## Mechanical

| | |
|---|---|
| Height | 20.8 cm (8") |
| Diameter | 12 cm (4.7") |
| Weight: | |
| Housing and Eyeball | 1.18 kg (2.6 lbs.) |
| Base (standard) | .09 kg (.20 lbs.) |
| Base (with I/O board) | .16 kg (.35 lbs.) |

## Bubble Density

| | |
|---|---|
| RUCLR (Clear) | f0 |
| RUSLV (Silver) | f1.5 to f2 |
| RUSMK (Smoke) | f0.5 |
| RUGLD (Gold) | f1.5 to f2 |

# Specifications—Outdoor Housing

## Electrical
**(combined dome and housing)**

Input Voltage ..... 24 to 30 Vac, 50/60 Hz
UL Class 2 LPS

Design Tolerance ..... 20 to 36 Vac, 50/60 Hz

Power Consumption ..... 80 W max.

Power On In-Rush Current ..... 3 A

Surge Protection ..... Gas discharge tube impulse rated at 10kA (8/20µs impulse discharge current)

Alarm Relay:

- Contact Type ..... Form 1-C
- Isolation ..... 1000 V
- Contact Rating ..... 1 A at 30 Vac/dc

## Environmental

Operating Temperature ..... –40°C to 50°C (–40°F to 122°F)

Relative Humidity ..... 0 to 95% non-condensing

Storage Temperature ..... –10°C to 50°C (–14°F to 122°F)

## Mechanical

Height ..... 32.1 cm (12.6")

Diameter ..... 24.4 cm (9.6")

Weight:

- Housing (alone) ..... 2.6 kg (5.7 lbs.)
- Housing (with dome) ..... 3.8 kg (8.4 lbs.)

# Specifications—Camera

### Monochrome/Color

Type ..... Interline transfer 1/4" CCD array

Scanning System ..... 2:1 interlace

Video Out ..... 1.0 Vp-p/75 ohm composite

Signal-to-Noise ..... 48 dB (typical)

### Monochrome only

Horizontal Resolution ..... 380 lines at center

Minimum Illumination ..... 0.1 lux (AGC on) f0

AGC ..... >24 dB

EIA:

- Pickup Device ..... 510 (H) x 492 (V) pixels
- Scanning ..... 525 lines, 60 fields, 30 frames
- Horizontal ..... 15.734 kHz
- Vertical ..... 59.9 Hz

CCIR:

- Pickup Device ..... 500 (H) x 582 (V) pixels
- Scanning ..... 625 lines, 50 fields, 25 frames
- Horizontal ..... 15.625 kHz
- Vertical ..... 50 Hz

### Color only

Horizontal Resolution ..... >450 lines at center

Minimum Illumination ..... 2.25 lux (AGC on) f0

White Balance ..... Through-the-Lens (TTL) Auto Tracing White balance (ATW)

NTSC:

- Pickup Device ..... 768 (H) x 494 (V) pixels
- Scanning ..... 525 lines, 60 fields, 30 frames
- Horizontal ..... 15.734 kHz
- Vertical ..... 59.9 Hz

PAL:

- Pickup Device ..... 752 (H) x 582 (V) pixels
- Scanning ..... 625 lines, 50 fields, 25 frames
- Horizontal ..... 15.625 kHz
- Vertical ..... 50 Hz

### Lens

Design ..... Aspherical

Focal Length ..... 4 to 48 mm

Aperture ..... f1.6

Viewing Angle*:

- 4 mm ..... 47.0°(H) x 35.2°(V)
- 48 mm ..... 4.0°(H) x 3.0°(V)

* Equivalent to 8 mm to 96 mm on 1/2 inch CCD array or 11 mm to 132 mm on 2/3 inch CCD array.

### Field-of-View Formulas:

$$\frac{\text{3.2 mm* x distance from camera (m)}}{\text{Focal length (mm)}} = \text{Horizontal view (m)}$$

$$\frac{\text{2.4 mm** x distance from camera (m)}}{\text{Focal length (mm)}} = \text{Vertical view (m)}$$

* Horizontal scanning area of pickup device (mm) in camera.
** Vertical scanning area of pickup device (mm) in camera.

**Example:** Wide angle view with lens at 4mm and viewed object at 10 m.

$$\frac{\text{3.2 mm x 10 m}}{\text{4 mm}} = \text{8m horizontal view}$$

$$\frac{\text{2.4 mm x 10 m}}{\text{4 mm}} = \text{6m vertical view}$$

# Declarations

## Regulatory Compliance

EMC ..... 47 CFR, Part 15, Class A
EN55022 CL. B
EN50082-1

Safety ..... UL1950
CSA C22.2 No. 950
EN60950

FCC COMPLIANCE: This equipment complies with Part 15 of the FCC rules for Class A digital devices when installed and used in accordance with the instruction manual. Following these rules provides reasonable protection against harmful interference from equipment operated in a commercial area. This equipment should not be installed in a residential area as it can radiate radio frequency energy that could interfere with radio communications, a situation the user would have to fix at their own expense.

EQUIPMENT MODIFICATION CAUTION: Equipment changes or modifications not expressly approved by Sensormatic Electronics Corporation, the party responsible for FCC compliance, could void the user's authority to operate the equipment and could create a hazardous condition.

## Other Declarations

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