ESL 700 SERIES
Commercial Self-Diagnostic Smoke Detectors

California State Fire Marshal Approved
MEA (New York City) Approved

FM APPROVED

UL LISTED

Installation Instructions

The ESL 700 Series self-diagnostic detectors provide field-replaceable optical chambers, and rate-of-rise heat detectors with fast response algorithms in some models (711UT, 721UT, and 741UT).

Electrical Compatibility

The two-wire units are compatible with a wide range of UL Listed control panels. For information on detector/control unit compatibility, refer to ESL's Compatibility Index. For a copy of the Compatibility Index, call 800-648-7424 or visit the Publication Library at www.ge-security.com.

WARNING!

System may not operate if the detector is not connected to the control unit initiating device circuit as specified in the detector or control unit literature.

For optional four-wire operation, compatibility listings with individual panels are not available from UL, therefore you only need to verify that the voltage range of the detector equals or exceeds the voltage range of the control panel power supply, and sufficient current is available to insure the operation of all detectors.
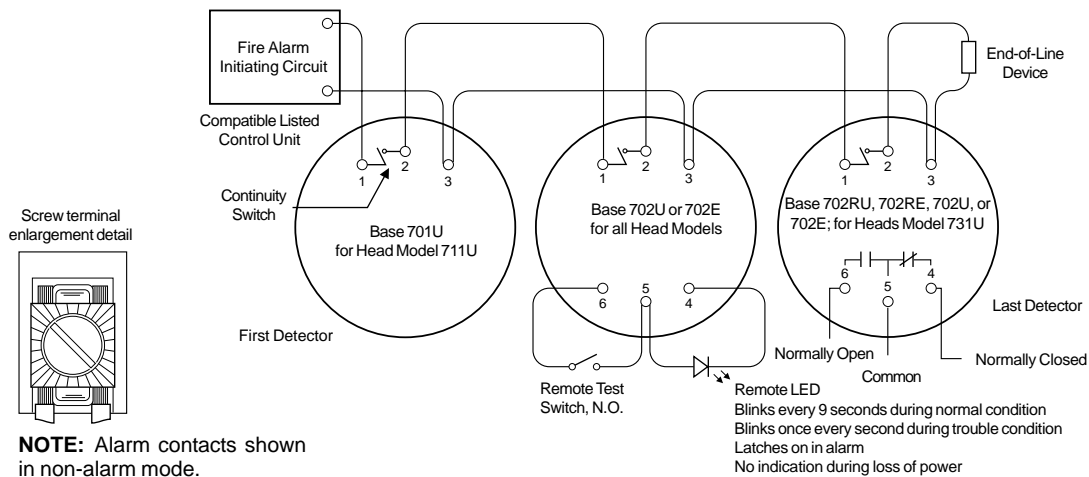
Installation

Placement and Spacing

Use the following location guidelines to optimize performance and reduce the chance of false alarms:

- Locate ceiling-mounted smoke detectors in the center of a room or hallway at least 4 inches (10cm) from any walls or partitions.
- Locate wall-mounted smoke detectors so the top of the unit is 4 to 12 inches (10 to 30cm) below the ceiling. See Figure 1.
- Locate in a suitable environment as follows:
  - Temperature between 32°F (0°C) and 100°F (38°C)
  - Humidity between 0 and 95% non-condensing
- Locate away from air conditioners, heating registers, and any other ventilation source that may interfere with smoke entering the unit.
- Mount units on a firm permanent surface.
- When more than one detector is required, spacing of 30 feet (9.1m) may be used as a guide on smooth ceilings. Other spacing may be used depending on ceiling height, high air movement, and other conditions or response requirements.
- Locate away from kitchens, wood stoves, garages, furnaces, and bathrooms.

700 Series 2-Wire Wiring Diagram

NOTE: Alarm contacts shown in non-alarm mode.

700 Series 4-Wire Wiring Diagram 741UT Head

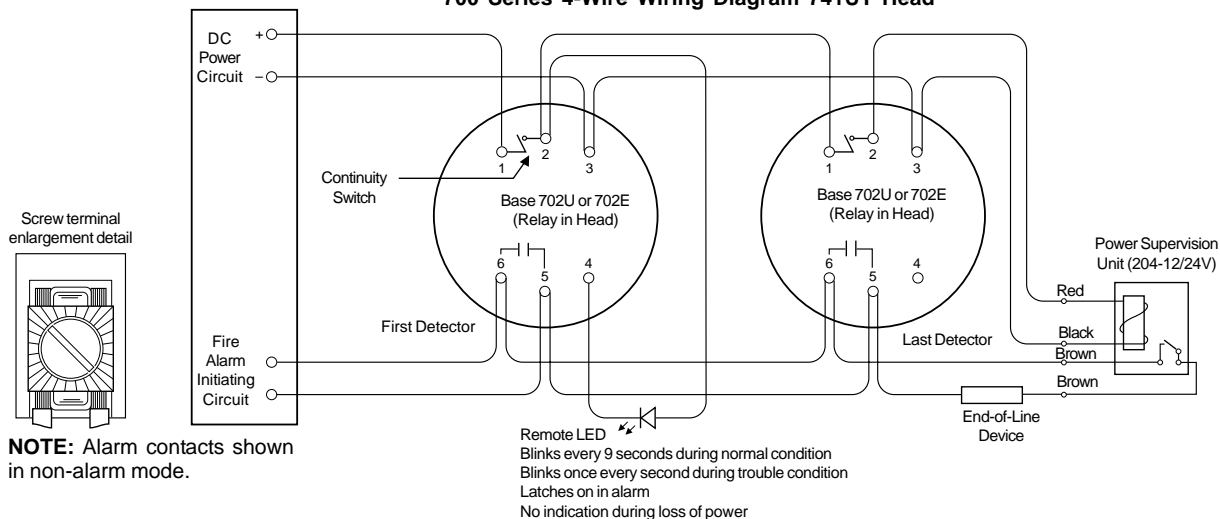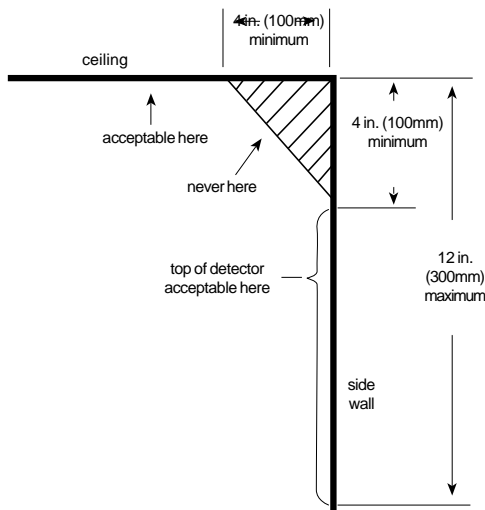**NOTE:** Alarm contacts shown in non-alarm mode.

Figure 1. Wiring diagrams

Figure 2. Fire sensor placement

Consider the Locking Mechanism BEFORE Installation

Each detector head is equipped with a breakaway locking tab slot to prevent unauthorized removal of the detector head (see Figure 3). For installations where unauthorized removal of the detector head is not a concern, the head can be removed by simply turning counterclockwise.

However, when the head must lock to the base, break away the locking tab slot with a pair of pliers. Then, to remove the detector head, insert a small screwdriver into the slot on the side of the base and press in while simultaneously turning the detector head counterclockwise (see Figure 7).

Installing the Universal Base

The 701U and 702U 6-inch diameter universal mounting bases mount directly to standard single-gang electrical boxes, 4-inch square, round, or octagonal boxes, 3.5-inch octagonal boxes, and to WIREMOLD Nos. 5738A or 5739 fixture boxes. The 702E 4-inch diameter universal mounting bases mount only to 3-inch round electrical boxes. Bases may also be mounted without electrical boxes if approved by the AHJ or if codes allow.

The 6-inch diameter bases have two parts; the base itself that mounts to the electrical box or ceiling, and the base cover that conceals the mounting screws (see Figure 4). The 6-inch diameter bases are shipped loosely coupled to the base cover.

1. Mount the base. Align the molded line on the base with the base cover, and twist clockwise to snap in place. To remove the base cover, simply twist counter-clockwise to unsnap (see Figure 4).

2. Pull wire through the electrical box, then through the center opening of the 700 Series universal base. Connect the wire to the appropriate terminals according to the wiring diagrams (see Figure 1). Each base is equipped with either three or six clamping type wire terminals and bifurcated contact springs for contact with detector head circuit pins. Each wire clamping terminal will accommodate two conductors up to 2.0 mm in diameter (#12 AWG).

3. Dress the wiring neatly and verify that the continuity switch (jumper wire) is touching both terminal 1 and terminal 2. Securely fasten base with appropriate hardware (see Figure 5).

CHECK ALL WIRING AND MOUNTING CONNECTIONS.

End-of-Line Supervision for Four-Wire Systems

NFPA 72 requires power wiring in four-wire systems to be supervised. This is accomplished by installing a power supervision unit for the appropriate control unit voltage at the end of the detector power circuit. ESL model 204–12/24 V power supervision relay—is recommended for both 12 VDC or 24 VDC operation. See 204–12/24 V installation instructions for more information.
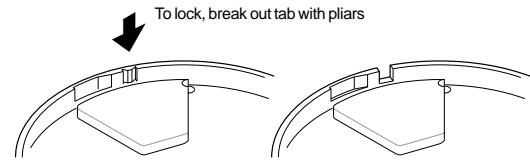
Figure 3. Removing the locking tab slot
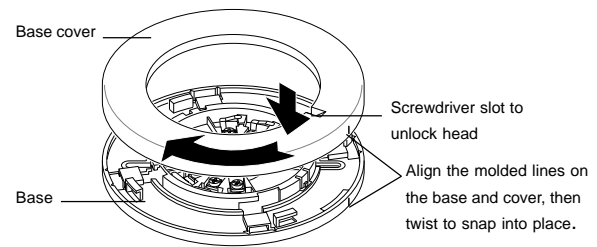
Figure 4. The 6" diameter mounting base

Testing the Wiring for Continuity

After all universal mounting bases are installed, including the end-of-line device, check the system wiring for continuity. Verify that the manually operated continuity switch in each base is in the shorting position — making contact with terminals 1 *and* 2 (for use at initial installation only). Use a screwdriver to reset any unshorted continuity switches (reset by prying the jumper wire out of the plastic stopper). This establishes continuity across the alarm initiating circuit at initial installation. The wiring can now be tested for continuity using an ohmmeter or "megger."

Installing the Detector Head

Base models 702RE and 702RU have a special plastic protrusion built in to prevent insertion of the wrong heads. They are designed specifically for use with only 731U heads, which include auxiliary relay contacts, and are only required when high voltage (i.e. 120 VAC) is connected to the auxiliary relay. This prevents the installer from inserting a low voltage detector head into a base containing damaging high voltages. Standard base models 702E and 702U can be used with the 731U heads when 120 VAC is not present.

Every 700 Series base includes a continuity switch which shorts terminals 1 and 2 together for easy continuity testing. When a 700 Series head is inserted, the continuity switch will be snapped back, out of the way, and will no longer short terminals 1 and 2. The continuity switch can be snapped back into its original position with a screwdriver, if necessary.

To install a detector head, insert the head and rotate it clockwise until it is properly aligned and "sets" into the base (see Figure 6). Then rotate it an additional 15 degrees to lock it in place. This action will automatically "open" the continuity switch in the base and allow continuity in the system to be established by the detector heads.

Removing the Detector Head

To remove the detector head turn it counterclockwise. However, if the locking tab slot has been removed, insert a small screwdriver into the locking tab slot on the side of the base and press in while simultaneously turning the detector head counterclockwise (see Figure 7). When a detector head is removed for cleaning or repair, continuity in the system is broken. Continuity can be re-established by manually resetting the continuity switch on the empty base with a screwdriver.
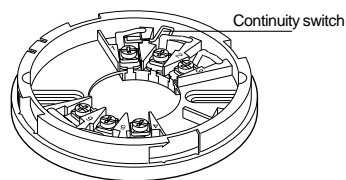
firealarmresources.com
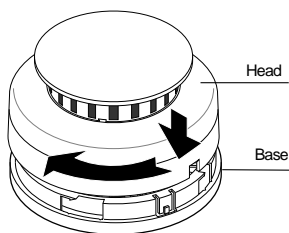
Figure 5. Continuity switch

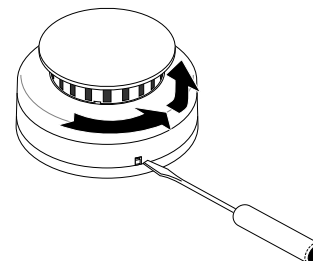**Figure 6. Installing the detector head**

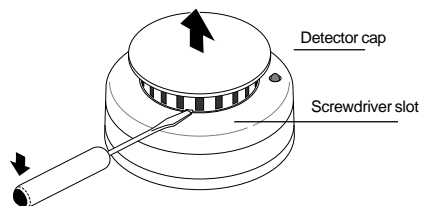**Figure 7. Removing the detector head with the locking tab slot removed**

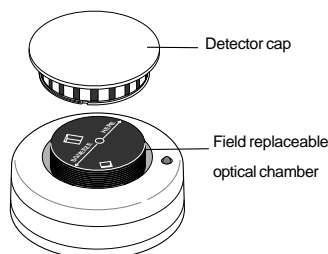**Figure 8. Removing detector cap**

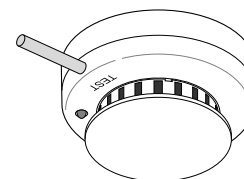**Figure 9. Optical chamber**

Figure 10. Sensitivity level test

Testing the System

After all connections are completed and the wiring is checked per NFPA 72, apply power to the system. There should *not* be an alarm. If there is, power down the system and determine whether a unit is latched or if there is a problem with the wiring. If no alarm has occurred, go to the last unit and check the unit power with a volt meter for the specified voltage.

Testing Each Detector

1. Prior to testing, remove the red dust cover. The units will not work with the dust cover in place.

2. Disconnect alarm notification appliances, releasing service devices, and extinguishing systems prior to detector tests.

3. Be sure to reconnect all devices at the conclusion of testing.

Smoke Test

The units should be tested in place annually using one of the following methods:

1. Use Smoke! in a can® and follow the directions on the can.

   OR

2. Hold a smoldering punk or cotton wick close to the unit and gently direct the smoke into the smoke entry openings for 20 seconds or until an alarm is indicated.

The unit performs a smoke test every 9 seconds while flashing its LED. If smoke is detected, the rate of sampling increases to every 4.5 seconds. Excessive smoke must be detected in three consecutive tests for the alarm to sound. BE SURE TO PROPERLY EXTINGUISH THE SMOKE SOURCE AFTER TESTING!

If it is successful, the LED will remain lit. This is a gross, go/no-go test and is not a reliable indication of unit sensitivity. For in-depth sensitivity testing, see *Sensitivity Test*. To reset the detector, operate the system reset switch for 2 to 3 seconds to remove power from the detectors. Control unit alarm and all ancillary functions should be verified for a complete test of each detector.

Sensitivity Test

1. Hold the magnet near the integral reed switch of the unit for more than one second (see Figure 10). The LED will flash 1 to 9 times.

2. Count the number of LED flashes, then use the following table to determine if any action is necessary.

Flashes

0-1	Indication:	Unservicable hardware fault.
	Action:	Reset and rerun sensitivity test. If the error persists, replace unit.
2-3	Indication:	Unit is becoming insensitive.
	Action:	Clean and reset the unit. Rerun sensitivity test. If the error persists, replace the unit.
4-7	Indication:	Unit is within normal sensitivity range.
	Action:	N/A
8-9	Indication:	Unit is becoming too sensitive.
	Action:	Verify the optical chamber is snapped down securely. Clean the unit and replace the optical chamber.

After the sequence of blinks, if the sensitivity is found to be within limits and if all other tests pass, the detector will go into alarm until reset by the panel. If the sensitivity is not within limits, or an unserviceable hardware fault has been detected, the alarm LED will continue to flash once per second until the detector is reset by the panel. If sensitivity test indicates an unacceptable level, take action recommended above. If action does not result in acceptable sensitivity, replace unit.

Maintenance

If a unit drifts beyond its approved sensitivity range for more than 24 hours, or fails internal diagnostic tests, the unit automatically indicates trouble by flashing its LED every second. This meets field sensitivity testing requirements without the need for external meters.

In accordance with NFPA 72, unit sensitivity should be checked within one year of installation and every alternate year thereafter, in commercial installations, or every three years in residential sites.

The unit's replaceable optical block chamber unsnaps for easy field cleaning and service. Whenever the LED indicates cleaning is necessary, follow these steps:

1. Remove the detector cap (see Figure 8), unsnap and throw away the optical block chamber (see Figure 9).

2. Thoroughly blow off the optical base and snap a new optical block chamber (part #211) into place.

   NOTE: Be sure the new optical block chamber is seated all the way down.

3. Replace the detector cap and verify sensitivity. See *Sensitivity Test*.

ESL 700 Series

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Specifications

Voltage	8.5 – 33 VDC, non polarity sensitive
Maximum ripple (pk to pk)	10% (V$_{p-p}$)
Typical average standby current (24V)	
731U, 741UT	100μA
711U, 711UT, 721UT	70μA
Typical alarm current (24V) -2 Wire	up to 60 mA (max), if not limited by control panel
Typical alarm current (24V) -4 Wire	up to 50mA (max) but 15mA (min)
Relay contacts	2 A @ 30 VDC, 1 A @ 120 VAC
Sensitivity	2.85%, + 0.37, – 0.75%
Operating temperature	32°F to 120°F (0° to 49°C)
Operating humidity range	0 to 95% Non-condensing
RFI Immunity	20 V/m minimum; 0-1000 MHz
Color	White head and base
Field wiring size	12-24 AWG
Heat detector specifications	Fixed temperature - 135°F ± 3°F (57°C ± 1.7°C)
(for 711UT, 721UT, and 741UT)	Rate of rise - 15°F/min and > 105°F (8.3°C/min and > 40.6°C), 50 ft. spacing for 711UT/721UT/741UT
UL two-wire compatibility identifier	S10A for all models except 731U/731L, S11A for 731U/731L, S00 for all bases
Remote LED output current	5 mA min, 8.5 mA max
Drift compensation adjustment	1.0%/ft. max for photoelectric models
	0.5%/ft. max for ionization models
Detector head dimensions	4" (10 cm) diameter; 1.75" (4.44 cm) height
Base dimensions	
702E	4" (10 cm) diameter; 0.05" (1.27 cm) height
701U, 702U	6" (15.2 cm) diameter, 0.6" (1.3 cm) height
Total height, head and base together	1.98" (5 cm) height
Remote test input	100 ohm max
Reset voltage	2.5V max
Reset time	1 second minimum
Listings	UL 268, FM, MEA, CSFM

Product Ordering

Detectors	Description
711U	2-wire photoelectric type smoke detector
711UT	2-wire photoelectric type smoke detector with rate-of-rise heat detector and fast response algorithms
721UT	2-wire photoelectric type, with rate-of-rise heat detector with fast response algorithms, remote test, alarm/trouble LED output
731U	2-wire photoelectric type smoke detector, with auxiliary relay (N.C./N.O.) outputs, UL Listed for releasing service
741UT	4-wire photoelectric type smoke detector, alarm relay (N.O.) output and remote alarm/trouble LED output with rate-of-rise heat detector with fast response algorithms
731L	(OEM only, not for resale) See 731U description
Bases	
701U	Base, for 711U heads; 6" (15 cm) base, 3 terminal connectors
702E	Base, for all heads; 4" (10 cm) base, 6 terminal connectors
702U	Base, for all heads; 6" (15 cm) base, 6 terminal connectors
702RE	Base, for 731U relay type smoke detector heads; 4" (10 cm) base, 6 terminal connectors
702RU	Base, for 731U relay type smoke detector heads; 6" (15 cm) base, 6 terminal connectors
Accessories	
204-12/24V	End-of-line, power supervision relay for 4-wire applications
SM-200	Smoke! in a can® (canned smoke) for functional testing of smoke detectors
211	Replacement optical block cover for all models (set of 10)
706U1A	Remote Indicator with red alarm LED, for use with 731U and 741UT
706U2A	Remote Indicator with red alarm LED and keyed remote test, for use with 731U and 741UT
706U3A	Remote Indicator with red alarm LED, keyed remote test and reset, for use with 731U and 741UT

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