SECTION 687

CLOSED CIRCUIT TELEVISION (CCTV) FIELD EQUIPMENT

DESCRIPTION

687.01.01 GENERAL: This specification shall govern the furnishing of Closed Circuit Television (CCTV) field equipment of a CCTV microprocessor unit at designated field locations and equipment cabinets as shown on the plans. This equipment will be installed by the Contractor at designated sites, and all hardware, software, and assorted components needed for the proper operation of the units shall be supplied. All materials furnished, assembled, fabricated or installed under this item shall be new, corrosion-resistant and in strict accordance with the specifications. The equipment design and construction shall utilize the latest techniques with a minimum number of parts, subassemblies, circuits, cards, and modules to maximize standardization and commonality. The equipment shall be designed for ease of maintenance. All component parts shall be readily accessible for inspection and maintenance.

MATERIALS/EQUIPMENT

687.02.01 FUNCTIONAL REQUIREMENTS: The CCTV Field Equipment together with the CCTV central equipment in the Traffic Management Center (TMC) will form a complete CCTV system which shall meet the following requirements.

The video camera positioning system shall provide dual mode, day (color) and night (monochrome) video camera with optical zoom lens and a high speed positioning system. The lens has a focal length of 3.4mm to 119mm (35:1) with auto/manual focus. A digital zoom range of up to 12X provides an effective zoom ratio of 350:1. The effective focal length is 3.4mm to 1190mm. The ¼” format Progressive Scan CCD image sensor and lens combination results in an effective horizontal angle of view of 55.8° wide angle to 17° max. telephoto. The camera shall provide Wide Dynamic Range (WDR) by use of dual shutter exposure technique.

In addition, the camera shall be provided with electronic stabilization using the 2 motion frequency selectable stabilization method. The pan function shall provide 360° of continuous rotation, with a variable speed from 0.1° per second to 160° per second. The tilt function shall provide 180° of movement 0° to +90° to -90°, with a variable speed from 0.1° per second to 40° per second. Up to 64 presets shall be available for storing and recalling zoom, pan and tilt positions. The positioner shall be capable of 8 or 16 point compass annotations with primary direction spelled out and intermediate directions abbreviated with 2 letters, and a tour sequence defined using up to 64 preset positions. All camera and pan & tilt functions are operable via RS-422 serial communications. Communications protocol command set shall be the Freeway and Arterial System of Transportation (FAST) protocol.

Features

(a) ¼” Progressive Scan Color Sensor.

(b) Horizontal Resolution of 540 TV Lines.

(c) 35:1 (3.4mm to 119mm) optical zoom lens.

(d) Continuous digital zoom with selectable range from OFF to 10X.
(e) Effective overall focal length of 3.4mm to 1190mm.

(f) Electronic Image Stabilization.

(g) Auto/Manual Focus.

(h) Selectable long term integration to 1/2 second with frame store video output.

(i) Selectable shutter speeds from 1/2 second to 1/30,000 second.

(j) Composite video output; NTSC format.

(k) Adjustable color balance.

(l) Crystal or Internal phase adjust line-lock, software adjustable.

(m) Programmable on screen character generator.

(n) Wide Dynamic Range (WDR) by use of dual shutter exposure technique.

(o) RS-422 serial control protocol command set to FAST protocol.

(p) Camera Addressing via serial control.

(q) 8 or 16 point compass annotation.

(r) 3 ½” diameter Sealed enclosure Pressurized with dry nitrogen.

(s) Continuous rotation capability in either direction.

(t) Variable pan speed from 0.1°/sec. to >160°/sec.(Preset Mode).

(u) Variable tilt speed from 0.1°/sec. to 40°/sec.

(v) 64 zoom, focus, pan & tilt preset positions, each with a unique user programmable Preset ID.

**Camera Specifications**

(a) Imager: Interline Transfer Progressive Scan CCD with mosaic-type color compensating filter.

(b) Image Area: ¼” Format  3.6mm (H) x 2.7mm (V).

(c) Resolution: 520 horizontal; 350 vertical.

(d) Picture Elements (total) 811 (H) x 508 (V).
(e) Video Output: NTSC, 1 V p-p @ 75 ohms, unbalanced.

(f) Maximum Lens Aperture: f/1.4 (wide) to f/4.2 (tele).

(g) Optical Zoom Range: 35X, 3.4mm to 119mm.

(h) Digital Zoom Range: 1X (Off) through 12X, Smooth transition from Optical to Digital Zoom.

(i) Effective Digital Focal Length: 119 mm to 1190mm.

(j) Optical Zoom Speed: 2 speeds, from approximately 2.9 seconds to 5.8 seconds full range.

(k) Horizontal Angle of View: Optical: 55.8° to 1.7°; At 10X Digital: 55.8° to 0.17°.

(l) Minimum Focus Distance: 40” in tele, 0.4” in wide angle.

(m) Electronic Stabilization: 2 motion-frequency selectable stabilization method.

(n) Digital Compass: 8-point compass annotation with primary direction spelled out and intermediate directions abbreviated with two letters.

(o) Auto Focus: Selectable Auto/Manual.

   (1) Minimum Scene Illumination for Reliable Auto Focus, 30% video.

(p) Manual Focus Speed: One speed, approximately 2.0 seconds to full range.

(q) Zoom & Focus Presets: 64 preset positions, focus is auto, if programmed, shall display the Preset ID.

(r) Flash Memory: Update firmware and new features via serial communication.

(s) Long Term Integration Range: (Short Shutter).

(t) Provides manual selection of integration duration for enhanced sensitivity. Integration times are 1/2 second, 1/4 second, 1/8 second, 1/15 second, and 1/30 second. Frame Store video output provides continuous video output, updated at the integration rate.

(u) Manual Shutter:

   (1) Selectable shutter speeds of 1/60; 1/120; 1/180; 1/250; 1/500; 1/1,000; 1/2,000; 1/4,000; 1/10,000; 1/30,000 second.

(v) Auto Iris:

   (1) Iris automatically adjusts to compensate for changes in scene illumination to maintain constant video level output within sensitivity specifications.

(w) Manual Iris:
(1) Changing the video level shall do the effect of open iris/close iris. To give the effect of open iris, a decrease in the video level value shall change and to give the effect of close iris an increase in the video level shall change.

(x) Gamma: 0.45.

(y) AGC: 028 dB.


(a1) Signal to Noise Ratio: > 50 dB.

(b1) Synchronization: Crystal or Phase-Adjust Line Lock on 60Hz.

(c1) Sensitivity: (3200K): Scene Illumination @ F1.4, Wide Angle:

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<tr>
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<td>Monochrome mode I.R. Cut Off</td>
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Camera Housing

The camera housing shall be a corrosion resistant and tamperproof sealed and pressurized housing with five pounds psi dry nitrogen with Schrader purge fitting and 20 psi relief valve for each camera. The size of the housing shall be 3 1/2” diameter or smaller.

The camera housing shall include a loss of pressure sensor that will trigger an alarm message that will be inserted in the video output signal.

The enclosure shall be constructed from 6061-T6 standard aluminum tubing with a wall thickness of 0.25 inches +/- 0.03 inches. Internal components shall be mounted to a rail assembly. A copper plated spring-steel ring shall be used to ensure electrical bonding of the rail assembly and components to the camera housing. The housing exterior shall be finished by pre-treatment with conversion coating and baked enamel paint. The camera enclosure shall be designed to withstand the effects of sand, dust, and hose-directed water.

The internal humidity of the housing shall be less than 10 percent, when sealed and pressurized. Desiccant packs shall be securely placed inside the housing to absorb any residual moisture and maintain internal humidity at 10 percent or less. A sun shield shall be provided to shield the entire housing from direct sunlight.

Mechanical Specifications (DSP camera assembly)

(a) Weight: 4.2 lbs.

(b) Dimensions:

(1) Length (less connectors): 12.0”.

(2) Housing Diameter: 3.5”.

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(3) Height (Including mounting base): 5.13”.
(c) Mounting: 4 mounting nuts on bottom of base.

Character Generator Specifications

(a) ID Characters are White with a Black border.
(b) A maximum of 6 lines of user programmable alphanumeric text can be displayed, plus 2 fixed lines for low-pressure indicator and Privacy Zones.
(c) Text can only be displayed in uppercase characters.
(d) Camera ID: Up to 2 lines, each up to 24 characters long. If both lines are programmed Line 1 of Camera ID shall always appear above Line 2 of Camera ID regardless of top or bottom selection.
(e) Preset ID: 1 line, up to 24 characters long, user programmable for each of the 64 preset positions. When a preset position is recalled the corresponding preset ID is displayed. The preset ID shall remain displayed until a pan, tilt, zoom, manual focus, auto focus select, or another preset command is received.
(f) Compass Annotation: 8-point or 16-point compass annotation shall be settable for a true north position. Display shall include North, NE, East, SE, South, SW, West, and NW. Position shall be able to be grouped with the site location or separate from site location and shall be user selectable for 3 second time out or permanent display and for enabled/disabled.
(g) Azimuth and Elevation: Position shall be displayed in 0–359 degrees for AZ position and +95 to –95 in EL elevation and shall be user selectable for 3 second time out or permanent display and for enabled/disabled.
(h) Low Pressure Indicator: 1 line, “Low Pressure”, messages can be displayed in “blinking” or “non-blinking” mode and be displayed when activated by low internal pressure. Adjustable set points by altitude shall be provided via the serial port to activate low-pressure. Message shall be enabled or disabled. In maintenance mode readings of the internal pressure of the camera housing shall be displayed from 5 down to 1 psi, in 0.1 psi increments.
(i) Internal Temperature Indicator: 1 line, in degrees C numeric messages can be displayed in “blinking” or “non-blinking” mode. Message shall be enabled or disabled. In maintenance mode, camera readings of the internal temperature of the camera housing in 1 degree increments.
(j) Sector Message: Up to 16 sectors in 360° may be defined with up to 24 characters long. Message shall be programmable via the RS-422 serial communications.

Message Positioning

(a) Right side positioning is accomplished by padding left side of message with spaces.
(b) Messages can be positioned at either the top or the bottom of display.

(c) Blank lines are not displayed. Any programmed line being displayed shall fill in toward the top if top positioning is selected, or toward the bottom if bottom position is selected.

Privacy Zones

Video blanked out for up to 8 privacy zones shall be provided. The video shall be blanked out for privacy. 1 line and numeric messages can be displayed. Message shall be displayed in “blinking” or “non-blinking” mode and be enabled or disabled. Privacy Zones shall be programmed via the RS-422 serial communications.

Communication and Camera Addressing Protocol

(a) Control and addressing shall be via RS-422/RS-232 optically isolated serial communications. Additional protocols shall consist of Cohu, American Dynamics, Javelin, Philips/Bosch, Vicon and Pelco-D. The National Transportation Communications for ITS Protocol (NTCIP) one 1205 protocol communications protocol shall be included as an option. Refer to NTCIP 1205 protocol for detailed description. This allows for migration to the NTCIP standard, while still maintaining operation of existing CCTV system protocols.

(b) Upon receipt of any given command, the Camera Positioning System shall not take longer than 1.0 second to respond.

(c) All programmable functions shall be stored in non-volatile memory and shall not be lost if a power failure occurs. System configurations such as video privacy zones, preset text and sector ID shall be able to be stored in a computer file and a camera personality can be cloned or uploaded into a camera in the event that a camera replacement is necessary.

Pan and Tilt Positioning Specifications

(a) Continuous rotation capability in either direction.

(b) 180° of tilt movement, +90° to -90° unobstructed.

(c) Pan Speed (Operator Control): Variable from 0.1°/sec. to 80°/sec.

(d) Pan Speed (Preset Control): >160°/sec.

(e) Tilt Speed (Operator Control): Variable from 0.1°/sec. to 40°/sec.

(f) Tilt Speed (Preset Control): 40°/sec.

(g) 64 Pan and Tilt preset positions with repeatability within ± 0.5°.

(h) The positioning system shall be invertible for mounting to a ceiling.
Tour Specifications

(a) 8 tour sequence can be defined.

(b) The tour is programmed by selecting the preset position by number, and then selecting a dwell
time. The presets can be used in any order, and the same preset may be used more than
once as long as the total number of preset positions used does not exceed 32.

(c) The dwell time defines the length of time paused at each preset position. It can be from 1 second
to 60 seconds. The dwell time can be changed individually for all stops on the tour.

(d) If the appropriate preset ID is programmed, it shall be displayed for each preset position used
on the tour.

(e) The tour shall stop upon receipt of a pan command.

(f) All programmable functions shall be stored in non-volatile memory.

Power Requirements

(a) Operating Voltage: 89VAC to 135VAC, 120VAC Nominal 50/60 Hz. (±3.0 Hz)
    National Electrical Manufacturers Association (NEMA) standard TS-2 (1998) for traffic control
    system. 2.1.2.
    The line variation specifications shall be tested to meet these specifications by an outside
    agency, other than the camera manufacturer. The tests shall be provided upon request.

(b) Primary Input Power Interruption: This is defined in section 2.1.4 “power interruption” NEMA

Transients Power Service: The CCTV field equipment shall meet the requirements of section 2.1.6
“transients, power service” of the NEMA standard TS-2 (1998). The surge specifications shall be tested to
meet these specifications by an outside agency, other than the camera manufacturer. The tests shall be
provided upon request.

(c) Power consumption shall not exceed a total of 30 Watts for camera/receiver/P&T driver
    (pan & tilt in motion).

Environmental Specifications

(a) Ambient Temperature Limits (Operating): -34°C to +74°C (-30°F to 165°F), NEMA

(b) Ambient Temperature Limits (Storage): -45°C to +85°C (-50°F to 185°F), NEMA 2.1.5.1
(c) The environmental specifications shall be tested to meet these specifications by an outside agency, other than the camera manufacturer. The tests shall be provided upon request.

(d) Humidity: Up to 100% relative humidity (per MIL-E-5400T, paragraph 3.2.24.4), IP 67 Rating.

(e) Other: Withstands exposure to sand, dust, fungus, and salt atmosphere per MIL-E-5400T, paragraph 3.2.24.7, 3.2.24.8, and 3.2.24.9.

(f) Shock: Up to 10G’s, 11ms, in any axis under non-operating conditions, MIL-E-5400T, paragraph 3.2.24.6.

(g) Vibration: Sine vibration from 5 to 30 Hz, 1/2g, 3 axis 1 hour without damage.

(h) Wind Loading: 150 Wind load survivability, operability to 70 mph.

**Mechanical Specifications**

(a) Weight: Shall not exceed 19 lbs.

(b) Dimensions: 11” (h) x 13.3” (w).

**Mounting Configurations**

The Camera Positioning System shall include 5 possible mounting configurations, a wall mount, pole mount, parapet mount, corner mount or pedestal mount version.

**Main Interface Connector**

The main interface connector shall be equivalent to an Amphenol 206036-3 with back shell 206070-1 and mating connector equivalent to an Amphenol 206037-11 with clamp 206070-1.

**687.03.01 LOCAL INTERSECTION CAMERA CONTROL UNIT:** The control unit shall provide convenient on-site camera control of camera positioning systems. The unit shall offer system protocol from most major CCTV camera manufacturers. The unit shall withstand the harsh operating environment associated with roadside installations. Local control functions are accomplished using front panel switches that include: pan and tilt, lens zoom, focus and iris. Focus and iris shall include an auto/manual toggle with LED indication of the current state. Also included is a local/remote switch that transfers control from the central system to the control unit. This function has a built-in five minute timer that automatically transfers control back to the remote mode if left unintentionally in the local mode.

A front panel RS-232 port shall be provided to connect to a laptop PC for programming advanced camera site settings, and allows extended camera control functions. 2 rear panel DB9 connectors shall provide both RS-422 and RS-232 formats for control system data connections. The unit shall support most CCTV camera manufacturer's communications protocols.

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Electrical

Operating voltage: 89 VAC to 135 VAC, 47 to 63 Hz, NEMA TS-2 Std 2.1.2.
Mounting: EIA standard 19" cabinet, 1 RU.

Front Panel Controls

Pan: 3 position momentary switch (pan right, stop, pan left).
Tilt: 3 position momentary switch (tilt down, stop, tilt up).
Zoom: 3 position momentary switch (tele, stop, wide).
Focus Mode: 2 position momentary switch (auto-manual) with LED indication of manual mode.
Focus control: 3 position momentary switch (near, stop, far).

Rear Panel Connectors

Camera: single multi-pin AMP for camera video, RS-422 data and 20 VAC power.

687.04.01 WARRANTY: The camera shall include a 2 year warranty that includes parts and labor. The 2 year period shall begin at the time of acceptance of the project.

687.05.01 CABLE HARNESS: The cables used for CCTV control, video, and 120 VAC power shall be installed as an integrated unit. Cohu, model number CA295H wiring harness or approved equal, shall be used. The wiring shall be installed from the CCTV unit to the In-Cabinet Control unit. The contractor shall be responsible for determining the length needed, and order the correct size accordingly. Connectors at both ends of the cable are required.

687.06.01 DOCUMENTATION: Complete documentation of the system, as it is built, shall be provided by the Contractor.

(a) A minimum of 2 copies of descriptive manuals and brochures for each type of electronic equipment and apparatus proposed for this project shall be supplied.

(b) These documents shall contain sufficient technical data for complete evaluation. The quality, function, and capability of each deliverable item shall be described.

(c) Manuals or brochures shall be originals or copies equal to originals.

687.07.01 OPERATIONAL TESTING:

(a) Upon completion of the system integration testing the CCTV Field Equipment shall be required to complete a 30 day period of acceptable operation.

1) The system operational test shall fully and successfully demonstrate all system functions using live data and controlling all system activities.

2) Failure in any hardware item during the test period, with the exception of expendable items such as fuses and minor equipment as determined by the Engineer, shall necessitate restarting the 30 day test period for its full 30 day duration upon repair.

3) Any failure of system software, or discovery of a software deficiency that causes a system malfunction, or discovery of software operation which is not in compliance with the
specifications, shall cause the 30 day test to be restarted in its entirety after correction of the software problem.

4) No intermittent hardware, software, communication or control operation or other malfunctions not related to a specific hardware or software malfunction shall be permitted to persist during the test period. Diagnostic testing which does not result in changes to system hardware or software shall result only in the loss of acceptable test time.

METHOD OF MEASUREMENT

687.08.01 MEASUREMENT: The quantity of CCTV field equipment shall be measured per each. This item shall include the video camera, zoom lens, pan/tilt drive, camera housing, pole mount, receiver/driver, surge protection devices, and all cables, connections and hardware. All pre-assembly of any CCTV equipment shall be considered incidental to CCTV field equipment.

METHOD OF PAYMENT

687.09.01 PAYMENT: The accepted quantity of CCTV field equipment will be paid at the Contract unit price bid per each which shall be full compensation for the equipment, measured as provided under Measurement, complete including warranty, delivery to FAST and testing of the equipment as specified and shown on the Drawings.

Payment will be made under:

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<th>PAY ITEM</th>
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<td>CCTV Field Equipment</td>
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