TYPE 170, CONTROLLER AND CABINET

PART 1 - GENERAL

1.01 SECTION INCLUDES

170 Controller, 170 cabinet, 170 conflict monitor and auxiliary equipment designated for installation in the project plans or by the Engineer.

PART 2 - PRODUCTS

2.01 CONTROLLER, CABINET, AND AUXILIARY EQUIPMENT

A. Related Specifications: Unless otherwise stated herein, all equipment furnished under this specification shall be new, meeting the requirements of "California/New York Type 170, Traffic Signal Controller System-Hardware Specification," U.S. Department of Transportation, Publication FHWA-IP-78-16, December 1978, with the following exceptions:

1. Any reference to the State of California shall mean the Jurisdiction.

2. Chapter 1, Section II "General" paragraph 3, the second sentence shall be deleted.

3. Chapter 1, Section VIII "Electrical, Environmental and Testing Requirements" shall be modified as follows:
   a. Any reference to the Contractor shall mean equipment manufacturer or supplier.
   b. Paragraph 5.2 shall be changed to read "Two manuals containing the flow chart, listing, and instructions of the test program shall be furnished to the Jurisdiction when the controller unit is delivered."
   c. Paragraph 6.1 the words "State Approval" shall be deleted.
   d. Paragraph 6.2 shall be deleted.
   e. Paragraph 6.3.6 shall be deleted.

4. When specified, the Model 332A Cabinet furnished for the project shall meet the requirements of Chapter 11 "Specifications for Cabinet Model 332A," and the Model 336 Cabinet shall meet the requirements of "Specifications for Cabinet Model 336" dated February 1982, except that the color specified in Section 1, paragraph 3 shall be changed to silver. Molex Flash Blocks shall be provided for all eight vehicle phases to program either red or yellow flashing indications. A detector input panel shall be provided on the rear left side of the cabinet. Cabinet locks as specified in Section I, paragraph 4 shall be changed to Corbin Type 2 locks. An aluminum cabinet shall be furnished.

   The aluminum surface shall have an anodic coating applied. The anodic coating and anodic coating process shall meet the requirements of Section 2.4.1 and 2.4.2 of the "Traffic Signal Control Equipment Specifications," California Business, Transportation and Housing Agency, Department of Transportation, January 1989. Alternative aluminum surface treatments, which produce an equivalent uniformly textured surface, may be substituted as approved by the Engineer.

5. All loop detector amplifier units furnished for this project shall be Model 222, Two-Channel Loop Detector Sensor Units meeting the requirements of Chapter 4 with the following exceptions:
   a. Digital design capable of normal operation when operated with a grounded loop.
   b. Shall comply with all performance requirements when connected to an inductance of from 50 to 1500 microhenries.
   c. Each detector channel shall respond to an absolute inductance change (Delta L) rather than as a percentage of the total inductance (Delta L/L).

6. In Chapter 11, Section III "Cabinet Accessories" paragraph 4, a new subsection will be added "Each vehicular and each pedestrian phase shall be provided with a separate switch pack."

2.01 CONTROLLER, CABINET, AND AUXILIARY EQUIPMENT (Continued)

7. A model 412C prom module shall be provided, configured to the following table:

Memory Socket	Address Range	Device Type	Chip No.*
U1	8000-FFFF	32K EPROM	INT 27256A
U2	3000-4FFF	8K ZPRAM	DAL 1225
U3	7010-7FFF	8K ZPRAM	DAL 1225
U4	1000-2FFF	8K RAM	HD 6264

*or approved equal

8. A Model 242 Two-Channel Isolator shall be provided to introduce stop timing to the controller from the conflict monitor and the manual flash switch.

9. The Model 210 Monitor Unit shall meet the requirements of Chapter 3 with the following additional requirements:
   a. The Monitor Unit shall be capable of RED FAILURE detection in accordance with NEMA specifications. Following a long power outage, (greater than two seconds) the Monitor Unit shall be capable of disabling the RED FAILURE detection, until the signal heads are energized (approximately four seconds).
   b. The Monitor Unit shall have the required circuitry to allow the early detection of a conflict caused by a green or yellow signal "hang up" and shall preclude the presentation of the conflicting signal display at the intersection.
   c. Any additional harnesses or hardware required shall be furnished with the Monitor Unit.

10. A "PDA-2" Power Distribution Assembly shall be provided in lieu of the PDA-1 and the 24 volt D.C. Supply.

11. A standard print shelf drawer shall be provided and installed above the input file.

12. Two ACIA ports shall be provided.

13. One Model 400 internal modem shall be supplied for each controller to provide for communications between controllers. If a master controller is specified, a Hayes compatible Dial-up modem, designated for plug-in compatibility with 170 series Traffic Controllers, shall be supplied for communications between the master and a central office computer over standard lease or dial-up telephone lines.

14. All components supplied must be on CalTrans Qualified Product Listing and operate successfully with MultiSonics OSAM and BITrans 233 software.

15. Each cabinet shall include two (2) fluorescent lighting fixtures mounted inside the front and back portion of the cabinet. These fixtures shall include a cool white lamp with protective cover and shall operate by a normal power UL listed ballast. Two door actuated switches shall be installed to turn on the cabinet light when the door is open, front door front light back door back light. Each switch should work each individual light.

16. Each cabinet shall be provided with devices to protect the control equipment form surges and over voltages. This shall include incoming power lines, the Input File, the Output File, and communication lines.

    All inductive loop detector inputs shall be protected with a 30V MOV with (30 Joule Rating) P/n ERZ-C20 KE 470 or equal. The output of all load switch outputs shall be protected with a 150V MOV (80 Joule Rating). P/n ERZ-C20 DK 241U or equal. The MOVs shall be connected from the AC positive field terminal to the chassis ground.

2.01 CONTROLLER, CABINET, AND AUXILIARY EQUIPMENT (Continued)

For the 332A cabinet, appropriate input surge protection shall be mounted on the Lower Input Termination Panel (LIP). The power distribution assembly (PDA#2) of each controller cabinet shall include a surge protection unit on the AC Service Input. The protector shall be installed between the applied line voltage and earth ground. The surge protector shall be capable of reducing the effect of lightning transient voltages applied to the AC line. The protection device shall be a two stage series parallel device. It shall include the following features and functions:

a. Maximum AC line voltage: 140 VAC.
b. Twenty pulses of peak current, each of which will rise in 8 microseconds and fall in 20 microseconds to 1/2 the peak: 20000 Amperes.
c. The protector shall be provided with the following terminals:
    1) Main line (AC line first stage terminal).
    2) Main Neutral (AC Neutral input terminal).
    3) Equipment Line Out (AC Line second stage output terminal, 10 Amps.).
    4) Equipment Neutral Out (Neutral terminal to protected equipment).
    5) GND (Earth connection).
    6) The Main AC line in and the Equipment Line out terminals shall be separated by a 200 Microhenry (minimum) inductor rated to handle 10 Amp AC Service. The first stageclamp shall be between Main Line and Ground terminals.
    7) The second stage clamp shall be between Equipment Line out and Equipment Neutral.
    8) The protector for the first and second stage clamp must have a MOV or similar solid state device rate at 20KA and be of a completely solid stage design (i.e., no gas discharge between tubes allowed).
    9) The Main Neutral and Equipment Neutral Out shall be connected together internally and shall have an MOV similar solid state device or gas discharge tubes rated at 20 KA between Main Neutral and Ground terminals.
    10) Peak clamp voltage: 350 Volts at 20 KA (Voltage measured between Equipment Line Out and Equipment Neutral Out terminals. Current applied between Main Line and Ground Terminals with Ground and Main Neutral terminals externally tied together.). Voltage shall never exceed 350 volts.
    11) The Protector shall be epoxy encapsulated in a flame retardant material.
    12) Continuous service current, 10 Amps at 120 VAC RMS.
    13) The Equipment Line Out shall provide power to the Type 170 and to the 24V power supply.
    14) Provide communications line protector with a mounting connector for incoming and outgoing communication line.

B. Manufacturers: The controller units, cabinets, and auxiliary control equipment furnished under this specification shall be from a manufacturer whose Type 170 Controller System has been approved and purchased by either the State of California or the State of New York. The Jurisdiction may allow exceptions to this requirement provided that the equipment to be furnished has been successfully operated on the street by a public agency for more than one year and has been certified by an independent testing laboratory as meeting the requirements of Chapter 1, Section VIII, U.S. Department of Transportation, Publication FHWA-IP-78-16.

C. Software: The software for this project will be provided by the Jurisdiction. The Contractor shall supply two (2) blank 27256 PROM chips per controller.

D. Operational Modifications: When specified on the Plans, the following operational modifications shall be made by the equipment manufacturer through either software changes to the "Local Intersection Program," through hardware changes, or as determined by the manufacturer. Any changes to the software or hardware not already detailed on the Plans shall receive approval of the Engineer prior to implementation.

2.01 CONTROLLER, CABINET, AND AUXILIARY EQUIPMENT (Continued)

For those locations providing for protected/permissive display of the left turn indication, the operation shall be such that the protected left turn arrow is displayed only when there are a sufficient number of left turning vehicles queued to actuate the left turn phase calling detector. In the absence of left turn phase detector actuations, left turn demand is to be accommodated by displaying only the circular green permitting a permissive left turn to be made.

E. Auxiliary Control Equipment:

1. Cabinets shall be furnished with all necessary auxiliary control equipment to properly operate eight signal phases and four pedestrian phases, which includes conflict monitor unit, isolation modules, detector sensing units as specified on contract documents, and load switch packs.

2. A heavy-duty clear plastic envelope, minimum dimensions of 9" x 12", shall be attached inside the cabinet for storing timing and maintenance records, electrical prints, etc.

F. Certification: In addition to the testing certification required in Chapter 1, Section VIII "Electrical, Environmental and Testing Requirements," paragraph 6, the Engineer shall be furnished with a certification from the equipment manufacturer or supplier stating that the equipment furnished under this specification complies with all provisions of this specification. With prior approval of the Engineer, minor exceptions to this specification may be allowed, provided these exceptions are detailed on the certification.

G. Warranty: All Type 170 Controllers and auxiliary equipment furnished under this specification shall have a warranty to be free from defects in materials for eighteen (18) months from date of shipment, or twelve (12) months from date of installation. Any parts found to be defective shall, upon concurrence of the defect by the manufacturer, be replaced free of charge.

H. Manufacturer or Supplier: A representative from the manufacturer and/or supplier of the Type 170 Controllers shall be at the project site when the controllers are ready to be turned on, to provide technical assistance including, as a minimum, programming of all necessary input data. All required signal timing data shall be provided by the Jurisdiction.

PART 3 - EXECUTION

3.01 CONTROLLER, CABINET, AND AUXILIARY EQUIPMENT

A. A minimum of one week prior to the scheduled "turn-on", the Contractor or supplier shall deliver the controller(s), (not including the cabinets), to the Jurisdiction′s Traffic Signal Shop. Since staff are not always present at this shop, it is the responsibility of the deliverer to call ahead and make sure someone will be present.

B. The Jurisdiction will install and verify the specified software and timings. Should any controllers be found faulty at the shop, the person/company who delivered the equipment will be contacted. The Signal Shop is not responsible for trouble shooting this equipment nor is any part of this process intended to replace "burn-in" responsibilities of the manufacturer.

C. The Contractor/Supplier is responsible for picking up the controller(s) from the Signal Shop and is solely responsible for bringing the controller(s) to full operation at the intersection(s). No assistance will be provided by the Signal crew once the software is working correctly and the signal timings have been verified in the Signal Shop. Having a knowledgeable representative at the project site(s) when the controller(s) is ready to be turned on is paramount to the safety and efficiency of this operation.

END OF SECTION