

**SHELBY COUNTY, TENNESSEE
SPECIAL PROVISION K
CENTRAL HARDWARE, SOFTWARE AND COMMUNICATIONS EQUIPMENT**

I. DESCRIPTION

This special provision describes central hardware, software, and communications equipment to be installed in the City of Memphis, City of Germantown, and Town of Collierville Traffic Management Centers (TMC). The work in this item includes all integration and configuration required to produce an end-to-end working system that will function and communicate with all of the devices on the fiber optic network installed and connected to as part of this project.

II. MATERIALS

A. Rack Mounted Workstation Computer

The Contractor shall furnish and install a rack mounted desktop computer at the City of Germantown TMC. The workstation computer will allow the City of Germantown traffic engineer to manage and monitor the field equipment installed as part of this project as well as the other existing traffic signal system devices currently installed in the City of Germantown. The computer will also serve as a backup server to run TACTICS software when the communications with the City of Memphis TMC is offline. The workstation shall have the following minimum hardware and software configuration. Exceptions shall be approved in advance by the Engineer:

- Rack mountable in standard EIA 19" equipment rack (maximum 3RU)
- Intel Xeon Processor E5-2637 at 3.5 GHz (minimum)
- 16 GB of RAM
- Operating system: Windows 7 professional 64-bit, with installation media
- Two 1TB 7200RPM SATA 2.5" hard drives in RAID 1 configuration
- Two Gigabit Ethernet Network Interfaces (RJ-45)
- DVD-RW Drive
- 3-year warranty

III. PROCEDURES

A. Software and Hardware Integration

1) General Requirements

The contractor shall provide all incidental parts, including but not limited to Ethernet patch cable, fiber jumper cables, splice trays, fiber splicing, and fiber connectors, which are necessary to complete the system integration. Costs of such incidentals shall be included in bid price for item 725-24.51 – System Integration.

To minimize the down time of the traffic management software and equipment, the contractor shall submit a draft document to outline the construction sequences and anticipated construction durations for each individual step of the installation and integration process. The draft document shall be approved by the Engineer. The Contractor shall give two weeks of advance notice to the City of Germantown City Engineer and the City of Memphis Traffic Signal Maintenance Department before taking any active equipment off-line. The Contractor shall coordinate with City of Germantown Information Technology representatives and the City of Germantown Engineer for equipment installation locations.

Final location and mounting of all equipment shall be approved by the Engineer. When inside the building, the contractor shall route all cabling in raised floor, drop ceiling, cable raceways, or as approved by the Engineer.

The Contractor shall effectively ground all provided equipment in accordance with City of Memphis and City of Germantown specifications and as approved by the Engineer.

2) Fiber Optic Cable Entrance and Routing

The Contractor shall install the proposed fiber optic cables through the existing conduit from the existing pull box outside the building at 1930 Germantown Road South to the Admin Room inside the City Hall building (1930 South Germantown Road).

Inside the City Hall building, the contractor shall terminate the proposed 36-fiber cable at the existing termination unit in the admin room. Inactive fibers shall be capped and sealed in splice trays, and active fibers shall be terminated at the front panel with LC connectors. Any existing fiber optic or other type of communication lines in the Admin Room shall not be disrupted and shall remain fully operational throughout the construction process.

3) TMC Hardware Installation and Integration

In the Server room, the Contractor shall install the proposed rack mounted workstation computer on the existing rack at the location specified by the IT representative or City Engineer. The contractor shall relocate the existing Fiber Termination Unit and Layer 3 Ethernet Switch from the current City Engineering building to the Server room in the City Hall building on the existing rack at the location specified by the IT representative. All existing fibers, optical transmitter/receivers, master controllers, and other equipment in the Server room shall remain. The Contractor shall connect, configure, and fully integrate the existing Ethernet Switch with the existing equipment rack and fiber termination unit.

The Contractor shall fully integrate the Ethernet Core Switch with the workstation and the existing field hub switch located in the hub cabinet at the intersection of Germantown Road and Farmington Boulevard to form a complete IP-based traffic signal control distribution system between intersections on the fiber optic network and the TMC.

The Contractor shall coordinate with the City of Memphis Signal Shop prior to configuration of the workstation and Ethernet switch to obtain IP addressing and LAN parameters prior to installation of Ethernet switch equipment.

The Contractor shall establish communications between the new workstation computer and the existing equipment on rack, including master controllers, serial switches, optical transmitter/receivers, and other equipment previously communicating with the old workstation computer. The contractor shall fully integrate the new workstation with the existing equipment and ensure that the existing communications with the master controllers remain fully functional.

4) Software Installation and Integration in City of Memphis TMC

The RDS central software shall communicate with all proposed RDS field devices successfully and reliably. For each proposed RDS unit, the contractor is responsible for adding the RDS unit to the Central Data Collection software.

The Contractor shall configure and test communications with proposed video detection remote management cards. This includes field installation and setting the IP addresses.

The Contractor shall provide a list of MAC addresses for all proposed devices. The Contractor shall obtain a list of MAC addresses for all existing IP-enabled field devices, including M52 controllers, conflict monitors, and video remote management cards up to a maximum of 20 devices. The Contractor shall enter all MAC addresses into the RADIUS server database located in the City of Memphis TACTICS central server in order to deploy MAC authentication bypassing for network security.

At the end of the software and hardware integration, the following communication requirements shall be satisfied:

1) Serial-over-IP communications for traffic signal controllers:

At the following intersection, the existing Port 3 fiber communication interface on the local controller will be disabled. A serial device server and Ethernet cabinet switch will be installed in the cabinet. The controller shall communicate with the serial device server via Port 2. The serial device server will

communicate with the Ethernet cabinet switch. The Ethernet cabinet switch will communicate with the proposed Ethernet hub switches.

- Elvis Presley Boulevard at Holmes Road

2) Pure Ethernet IP communications for traffic signal controllers:

At the following intersection, existing Port 3 fiber communication interface on the local controller will be disabled and the native Ethernet Port on the local controller will be enabled. An Ethernet cabinet switch will be installed in the cabinet. The controller shall communicate with the Ethernet cabinet switch via the native Ethernet port. The Ethernet cabinet switch will communicate with the proposed Ethernet hub switches.

- Elvis Presley Boulevard at Whitehaven Lane

3) Communications for conflict monitors

At all intersections in this project, the signal conflict monitors shall communicate successfully with the ECcom software at the workstation computer. If the existing conflict monitor is IP enabled with RJ-45 Ethernet port, the conflict monitor shall communicate with the Ethernet cabinet switch via the native Ethernet port. If the existing conflict monitor is not IP enabled, the conflict monitor shall communicate with the serial device server via RS-232 port and the serial device server will communicate with the Ethernet cabinet switch.

The following intersection contains an IP enabled conflict monitor that will communicate directly with the Ethernet cabinet switch:

- Elvis Presley Boulevard at Whitehaven Lane

The following intersection contains a conflict monitor that will communicate with the serial device server:

- Elvis Presley Boulevard at Holmes Road

4) Communications for RDS units

The RDS central software shall communicate with all proposed RDS field devices successfully and reliably. All required software functions must be tested and completely operational.

5) Communications for Video Detection Remote Management Cards

At the following intersections, video detection remote management cards shall communicate successfully with software on the workstation computer:

- Elvis Presley Boulevard at Whitehaven Lane
- Elvis Presley Boulevard at Holmes Road

5) Software Installation and Integration in City of Germantown TMC

The Contractor shall install the necessary software from the existing workstation computer on the proposed workstation computer to allow for successful and reliable communication with all existing and proposed field devices. This software includes, but it not limited to, TACTICS, ECcom Signal Monitor Communication Software from EDI, and the Radar Detection System central data collection software.

The Contractor shall install and configure the ECcom Signal Monitor Communication Software from EDI on the workstation computer to display and diagnose malfunction events. The ECcom software shall communicate with all conflict monitors successfully and reliably. All required software functions must be tested and completely operational. The contractor is responsible for adding the conflict monitors to the ECcom software, configuring, and testing the communications.

The Contractor shall install and configure the Radar Detection System (RDS) central data collection software on the proposed workstation computer. The RDS central software shall communicate with all existing and proposed RDS field devices successfully and reliably. All required software functions must be tested and

completely operational. For each supplied RDS unit, the contractor is responsible for adding the RDS unit to the Central Data Collection software.

The contractor shall configure and test the TACTICS software. The contractor shall update the TACTICS database to reflect the changes to the traffic signal controller COM port or IP addressing requirements. All timing plans and other parameters in the database regarding the affected intersections shall be unmodified. The configuration of the TACTICS software shall include the setup of local intersection graphics and signal and detector status indications overlaid on aerial photography. The configuration shall be performed for all intersections within the City of Germantown identified within this project up to a maximum of 30 intersections.

The Contractor shall configure and test communications with the existing and proposed video detection remote management cards. This includes field installation, setting the IP addresses, and the software setup at the City of Germantown TMC.

The Contractor shall provide a list of MAC addresses for all proposed devices. The Contractor shall obtain a list of MAC addresses for all existing IP-enabled field devices, including M52 controllers, conflict monitors, and video remote management cards up to a maximum of 200 devices. The Contractor shall enter all MAC addresses into the RADIUS server database located in the City of Memphis TACTICS central server in order to deploy MAC authentication bypassing for network security.

At the end of the software and hardware integration, the following communication requirements shall be satisfied:

1) Serial-over-IP communications for traffic signal controllers:

At the following intersections, the existing Port 3 fiber communication interface on the local controllers will be disabled. A serial device server and Ethernet cabinet switch will be installed in these cabinets. The controller shall communicate with the serial device server via Port 2. The serial device server will communicate with the Ethernet cabinet switch. The Ethernet cabinet switch will communicate with the proposed Ethernet hub switches.

- Farmington Boulevard at Brierbrook Road
- Farmington Boulevard at Exeter Road
- Farmington Boulevard at Allenby Road
- Farmington Boulevard at Kimbrough Road
- Germantown Road/West Street at McVay Road / Poplar Pike
- Kimbrough Road at Dogwood Road
- Poplar Pike at Germantown Road / Arthur Road

2) Pure Ethernet IP communications for traffic signal controllers:

At the following intersection, existing Port 3 fiber communication interface on the local controller will be disabled and the native Ethernet Port on the local controller will be enabled. An Ethernet cabinet switch will be installed in the cabinet. The controller shall communicate with the Ethernet cabinet switch via the native Ethernet port. The Ethernet cabinet switch will communicate with the proposed Ethernet hub switches.

- Germantown Road at Stout Road

3) Communications for conflict monitors

At all intersections in this project, the signal conflict monitors shall communicate successfully with the ECcom software at the workstation computer. If the existing conflict monitor is IP enabled with RJ-45 Ethernet port, the conflict monitor shall communicate with the Ethernet cabinet switch via the native Ethernet port. If the existing conflict monitor is not IP enabled, the conflict monitor shall communicate with the serial device server via RS-232 port and the serial device server will communicate with the Ethernet cabinet switch.

The following intersection contains an IP enabled conflict monitor that will communicate directly with the Ethernet cabinet switch:

- Germantown Road at Stout Road

The following intersections contain conflict monitors that will communicate with the serial device server:

- Farmington Boulevard at Allenby Road
- Germantown Road/West Street at McVay Road / Poplar Pike
- Kimbrough Road at Dogwood Road
- Poplar Pike at Germantown Road / Arthur Road

The remaining intersections within the scope of this project contain conflict monitors that do not have a RS-232 port and are not IP enabled and will not be integrated into the network.

4) Communications for RDS units

The RDS central software shall communicate with all proposed RDS field devices successfully and reliably. All required software functions must be tested and completely operational.

5) Communications for Video Detection Remote Management Cards

At the following intersections, video detection remote management cards shall communicate successfully with software on the workstation computer:

- Germantown Road at Stout Road
- Germantown Road / West Street at Poplar Pike / McVay Road
- Poplar Pike at Germantown Road / Arthur Road
- Poplar Avenue at Arthurwood Cove
- Poplar Avenue at Exeter Road
- Poplar Avenue at Germantown Road
- Germantown Road at Neshoba Drive
- Germantown Road at Brierbrook Road
- Germantown Road at Wolf Trail Cove
- Wolf River Boulevard at Kimbrough Road
- Wolf River Boulevard at Farmington Boulevard
- Farmington Boulevard at Allenby Road
- Farmington Boulevard at Kimbrough Road
- Farmington Boulevard at Brierbrook Road
- Farmington Boulevard at Exeter Road
- Kimbrough Road at Dogwood Road
- Poplar Avenue at Johnson Road
- Poplar Avenue at Village Shops Drive
- Wolf River Boulevard at Dogwood Grove
- Poplar Pike at Forest Hill Irene Road
- West Street at Poplar Pike / North Street
- Poplar Avenue at Kimbrough Road
- Poplar Avenue at Forest Hill Irene Road
- Wolf River Boulevard at Johnson Road
- Wolf River Boulevard at Forest Hill Irene Road

6) Existing fiber communications:

The following intersections will be converted from Serial to Ethernet communication as a part of this project:

- Germantown Road at Stout Road
- Germantown Road / West Street at Poplar Pike / McVay Road
- Poplar Pike at Germantown Road / Arthur Road
- Farmington Boulevard at Allenby Road

- Farmington Boulevard at Kimbrough Road
- Farmington Boulevard at Brierbrook Road
- Farmington Boulevard at Exeter Road
- Kimbrough Road at Dogwood Road

For the intersections listed above where the local controller has a native Ethernet port, the existing Port 3 fiber communication interface will be disabled and the native Ethernet Port on the local controllers will be enabled. An Ethernet cabinet switch will be installed in these cabinets. The controller shall communicate with the Ethernet cabinet switch via the native Ethernet port. The Ethernet cabinet switch will communicate with the proposed Ethernet hub switches.

For the intersections listed above where the local controller only has a Port 3 fiber communication interface, a serial device server and Ethernet cabinet switch will be installed in the cabinet. The controller shall communicate with the serial device server via Port 2. The serial device server will communicate with the Ethernet cabinet switch. The Ethernet cabinet switch will communicate with the proposed Ethernet hub switches.

All other traffic signal controllers and field equipment communicating with the existing traffic management software at the time of installation must be able to communicate successfully and reliably with the new workstation computer.

6) Software Installation and Integration in Town of Collierville TMC

The RDS central software shall communicate with all existing and proposed RDS field devices successfully and reliably. For each proposed RDS unit, the contractor is responsible for adding the RDS unit to the Central Data Collection software.

The contractor shall configure and test the TACTICS software. The contractor shall update the TACTICS database to reflect the changes to the traffic signal controller COM port or IP addressing requirements. All timing plans and other parameters in the database regarding the affected intersections shall be unmodified. The configuration of the TACTICS software shall include the setup of local intersection graphics and signal and detector status indications overlaid on aerial photography. The configuration shall be performed for all intersections within the Town of Collierville identified within this project up to a maximum of 25 intersections.

The Contractor shall configure and test communications with the proposed video detection remote management cards. This includes field installation, setting the IP addresses, and the software setup at the City of Germantown TMC.

The Contractor shall provide a list of MAC addresses for all proposed devices. The Contractor shall obtain a list of MAC addresses for all existing IP-enabled field devices, including M52 controllers, conflict monitors, and video remote management cards up to a maximum of 60 devices. The Contractor shall enter all MAC addresses into the RADIUS server database located in the City of Memphis TACTICS central server in order to deploy MAC authentication bypassing for network security.

At the end of the software and hardware integration, the following communication requirements shall be satisfied:

1) Serial-over-IP communications for traffic signal controllers:

At the following intersections, the existing Port 3 fiber communication interface on the local controllers will be disabled. A serial device server and Ethernet cabinet switch will be installed in these cabinets. The controller shall communicate with the serial device server via Port 2. The serial device server will communicate with the Ethernet cabinet switch. The Ethernet cabinet switch will communicate with the proposed Ethernet hub switches.

- Houston Levee Road at Collierville Road
- Houston Levee Road at S.R. 385
- Houston Levee Road at Shelby Drive

- Houston Levee Road at Winchester Road

2) Pure Ethernet IP communications for traffic signal controllers:

At the following intersections, existing Port 3 fiber communication interface on the local controllers will be disabled and the native Ethernet Port on the local controllers will be enabled. An Ethernet cabinet switch will be installed in these cabinets. The controller shall communicate with the Ethernet cabinet switch via the native Ethernet port. The Ethernet cabinet switch will communicate with the proposed Ethernet hub switches.

- Houston Levee Road at Kohl's Driveway
- Houston Levee Road at Merchant's Park Circle
- Poplar Avenue at Highway 72
- Poplar Avenue at Main Street
- Poplar Avenue at Market Street
- Poplar Avenue at Maynard Way

3) Communications for conflict monitors

At all intersections in this project, the signal conflict monitors shall communicate successfully with the ECcom software at the workstation computer. If the existing conflict monitor is IP enabled with RJ-45 Ethernet port, the conflict monitor shall communicate with the Ethernet cabinet switch via the native Ethernet port. If the existing conflict monitor is not IP enabled, the conflict monitor shall communicate with the serial device server via RS-232 port and the serial device server will communicate with the Ethernet cabinet switch.

The following intersection contains an IP enabled conflict monitor that will communicate directly with the Ethernet cabinet switch:

- Poplar Avenue at Highway 72

The following intersections contain conflict monitors that will communicate with the serial device server:

- Houston Levee Road at Collierville Road
- Houston Levee Road at Kohl's Driveway
- Houston Levee Road at Merchant's Park Circle
- Houston Levee Road at Shelby Drive
- Poplar Avenue at Main Street
- Poplar Avenue at Market Street
- Poplar Avenue at Maynard Way

The remaining intersections within the scope of this project contain conflict monitors that do not have a RS-232 port and are not IP enabled and will not be integrated into the network.

4) Communications for RDS units

The RDS central software shall communicate with all proposed RDS field devices successfully and reliably. All required software functions must be tested and completely operational.

5) Communications for Video Detection Remote Management Cards

At the following intersections, video detection remote management cards shall communicate successfully with software on the workstation computer:

- Winchester Road at Houston Levee Road
- Poplar Avenue at Market Boulevard
- Poplar Avenue at Highway 72
- Poplar Avenue at Maynard Way
- Houston Levee Road at Merchants Park Circle
- Poplar Avenue at Houston Levee Road

- Poplar Avenue at Byhalia Road
- Poplar Avenue at Peterson Lake Road

6) Existing fiber communications:

The following intersections will be converted from Serial to Ethernet communication as a part of this project:

- Winchester Road at Houston Levee Road
- Houston Levee Road at Kohl's Driveway
- Poplar Avenue at Bailey Station
- Poplar Avenue at Shea Road
- Poplar Avenue at Bray Station
- Poplar Avenue at Poplar View Parkway
- Poplar Avenue at Market Boulevard
- Poplar Avenue at Byhalia Road
- Poplar Avenue at Highway 72
- Poplar Avenue at Maynard Way
- Poplar Avenue at Main Street
- Poplar Avenue at Peterson Lake
- Houston Levee Road at S.R. 385
- Houston Levee Road at Collierville Road
- Houston Levee Road at Merchants Park Circle
- Houston Levee Road at Shelby Drive
- Shelby Drive at Merchants Park Circle

For the intersections listed above where the local controller has a native Ethernet port, the existing Port 3 fiber communication interface will be disabled and the native Ethernet Port on the local controllers will be enabled. An Ethernet cabinet switch will be installed in these cabinets. The controller shall communicate with the Ethernet cabinet switch via the native Ethernet port. The Ethernet cabinet switch will communicate with the proposed Ethernet hub switches.

For the intersections listed above where the local controller only has a Port 3 fiber communication interface, a serial device server and Ethernet cabinet switch will be installed in the cabinet. The controller shall communicate with the serial device server via Port 2. The serial device server will communicate with the Ethernet cabinet switch. The Ethernet cabinet switch will communicate with the proposed Ethernet hub switches.

All other traffic signal controllers and field equipment communicating with the existing traffic management software at the time of installation must be able to communicate successfully and reliably after installation.

IV. MEASUREMENT AND PAYMENT

System Integration shall be measured and paid on a lump sum basis. This item shall include all work, testing, and documentation required to fully integrate the central traffic control system. This includes all the construction requirements described in the "Procedure" section of this special provision. Payment will be made as follows: 25% upon hardware installation; 50% upon software installation and integration testing; and 25% upon final project acceptance.

Computer for Signal System (Rack Mounted) will be measured per each and paid for at the contract unit price per each. This price shall include the furnishing, installation, and all materials, equipment, labor, tools, storage, shipping, and incidentals necessary to install and make the unit fully operational. Payment will be

made as follows: 25% upon delivery of equipment; 50% upon installation and integration; 25% upon final project acceptance.

Item Number	Description	Pay Unit
725-24.51	System Integration	LS
730-30.02	Computer for Signal System (Rack Mounted)	Each