STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	52 U-1785-01	2003	62	143

REFERENCES NOTED	BY	DATE
REFERENCES CHECKED	M Adams	9-01
	R. Stephen	11-01

CONSTRUCTION AND MATERIAL REQUIREMENTS
FOR PRIORITY CONTROL SYSTEM
(OPTICALLY ACTIVATED, DATA-ENCODED, TRAFFIC SIGNAL PRIORITY CONTROL SYSTEM)

I. SYSTEM DESCRIPTION

THE REQUIRED PRIORITY CONTROL SYSTEM WILL EMPLOY DATA-ENCODED OPTICAL COMMUNICATION TO IDENTIFY THE PRESENCE OF DESIGNATED PRIORITY OR PROBE VEHICLES. A RECORD OF THE VEHICLE BY CLASSIFICATION AND IDENTIFICATION NUMBER SHALL BE CREATED. IN PRIORITY VEHICLE MODE, THE DATA-ENCODED OPTICAL COMMUNICATION WILL REQUEST THE TRAFFIC SIGNAL CONTROLLER TO ADVANCE TO AND/OR HOLD A DESIRED TRAFFIC SIGNAL DISPLAY SELECTED FROM PHASES NORMALLY AVAILABLE. IN PROBE VEHICLE MODE, NO TRAFFIC SIGNAL PRIORITY IS REQUESTED--ONLY A RECORD OF THE PROBE VEHICLE'S PRESENCE IS GENERATED.

THE PRIORITY CONTROL SYSTEM WILL CONSIST OF A MATCHED SYSTEM OF OPTICAL EMITTERS, OPTICAL DETECTORS, OPTICAL DETECTOR CABLE, PHASE SELECTORS AND SYSTEM SOFTWARE. CONTRACTOR SHALL BE REQUIRED TO VERIFY COMPATIBILITY OF EXISTING EMITTERS WITH NEW.

THE OPTICAL SIGNAL WILL BE DETECTED AND RECOGNIZED BY THE OPTICAL DETECTORS AT OR NEAR THE INTERSECTION OVER A LINE-OF-SIGHT PATH OF UP TO 2,500 FT. (762M) UNDER CLEAR ATMOSPHERIC CONDITIONS. THE PHASE SELECTOR WILL PROCESS THE SIGNAL FROM THE DETECTOR TO ENSURE THAT THE SIGNAL (1) IS A VALID BASE FREQUENCY, (2) IS CORRECTLY DATA ENCODED, AND (3) IS WITHIN USER-SETTABLE RANGE. IF THESE CONDITIONS ARE MET, THE PHASE SELECTOR WILL GENERATE A PRIORITY CONTROL REQUEST (I.E., A GREEN LIGHT) FOR THE APPROACHING PRIORITY VEHICLES, OR RECORD THE PRESENCE OF APPROACHING PROBE VEHICLES BY CLASSIFICATION AND IDENTIFICATION NUMBER.

THE SYSTEM WILL REQUIRE NO ACTION FROM THE VEHICLE OPERATOR OTHER THAN TO TURN THE EMITTER ON. THE SYSTEM WILL OPERATE ON A FIRST-COME, FIRST-SERVED BASIS. HIGHER PRIORITY (COMMAND) REQUESTS WILL OVERRIDE LOWER PRIORITY (ADVANTAGE) REQUESTS. THE SYSTEM WILL INTERFACE WITH MOST TRAFFIC SIGNAL CONTROLLERS AND WILL NOT COMPROMISE NORMAL OPERATION OR EXISTING SAFETY PROVISIONS.

EACH PIECE OF EQUIPMENT SUPPLIED AS PART OF THE PRIORITY CONTROL SYSTEM INTENDED FOR USE IN OR ON PRIORITY VEHICLES WILL OPERATE PROPERLY ACROSS THE ENTIRE SPECTRUM OF COMBINATIONS OF ENVIRONMENTAL CONDITIONS (TEMPERATURE RANGE, RELATIVE HUMIDITY, VEHICLE BATTERY VOLTAGE) PER THE INDIVIDUAL COMPONENT SPECIFICATIONS.

II. MATCHED SYSTEM COMPONENTS

THE REQUIRED PRIORITY CONTROL DATA-ENCODED OPTICAL COMMUNICATIONS SYSTEM WILL BE COMPRISED OF FIVE BASIC MATCHED COMPONENTS: OPTICAL EMITTER, OPTICAL DETECTOR, DETECTOR CABLE, PHASE SELECTOR AND SYSTEM SOFTWARE. TO ENSURE SYSTEM INTEGRITY, OPERATION AND COMPATIBILITY, ALL COMPONENTS WILL BE FROM THE SAME MANUFACTURER EXCLUSIVE OF EMITTER. THE SYSTEM SHALL BE COMPATIBLE WITH 170(E) AND ADVANCED 2070 SIGNAL CONTROLLERS.

A. DATA-ENCODED EMITTER. THE DATA-ENCODED EMITTER WILL TRIGGER THE SYSTEM. IT WILL SEND THE ENCODED INFRARED SIGNAL TO THE OPTICAL DETECTOR. NEW EQUIPMENT SHALL BE COMPATIBLE WITH EXISTING EQUIPMENT.

B. OPTICAL DETECTOR. THE OPTICAL DETECTOR WILL CHANGE THE INFRARED SIGNAL TO AN ELECTRICAL SIGNAL. IT WILL BE LOCATED AT OR NEAR THE INTERSECTION. IT WILL SEND THE ELECTRICAL SIGNAL, VIA THE OPTICAL DETECTOR CABLE, TO THE PHASE SELECTOR.

C. OPTICAL DETECTOR CABLE. THE OPTICAL DETECTOR CABLE WILL CARRY THE ELECTRICAL SIGNAL FROM THE DETECTOR TO THE PHASE SELECTOR.

D. PHASE SELECTOR. THE PHASE SELECTOR WILL ACCOMMODATE DATA-ENCODED COMMUNICATION AND WILL VALIDATE, IDENTIFY, CLASSIFY AND RECORD THE SIGNAL FROM THE DETECTOR. IT WILL BE LOCATED WITHIN THE CONTROLLER CABINET AT THE INTERSECTION. IT WILL REQUEST THE CONTROLLER TO PROVIDE PRIORITY TO THE REQUESTING VEHICLE AND/OR RECORD PRESENCE OF A PROBE VEHICLE.

E. CARD RACK: THE CARD RACK WILL PROVIDE SIMPLIFIED INSTALLATION OF A PHASE SELECTOR INTO CONTROLLER CABINETS THAT DO NOT ALREADY HAVE A SUITABLE CARD RACK.

F. SYSTEM SOFTWARE. THE SYSTEM SOFTWARE WILL BE A WINDOWS 95 AND 98 COMPLIANT PROGRAM. IT SUPPORTS SYSTEM CONFIGURATION AND GATHERING OF OPERATIONAL INFORMATION.

III. SYSTEM COMPONENT SPECIFICATIONS

A. DATA-ENCODED OPTICAL EMITTER (WHEN REQUIRED IN EQUIPMENT SCHEDULE)

THE REQUIRED DATA-ENCODED EMITTER WILL GENERATE THE OPTICAL SIGNAL, WHICH SERVES AS THE TRIGGER TO THE REST OF THE PRIORITY CONTROL SYSTEM. THE OPTICAL SIGNAL GENERATED BY THE EMITTER WILL BE A SERIES OF DATA-ENCODED FLASHES FROM A SINGLE LIGHT SOURCE. THE FLASH SIGNAL WILL CONSIST OF A FIXED FREQUENCY BASE SIGNAL AND A CODED OVERLAY SIGNAL THAT CAN BE USED TO TRANSMIT INFORMATION.

THE DATA-ENCODED EMITTER WILL BE POWERED BY THE DC VOLTAGE SUPPLIED FROM THE VEHICLE'S BATTERY, 10 TO 16 VOLTS DC. THE UNIT WILL BE EQUIPPED WITH A WEATHERPROOF IN-LINE FUSE HOLDER.

THE FLASH SEQUENCE GENERATED BY THE DATA-ENCODED EMITTER WILL CARRY THREE TYPES OF

1. THE FIRST TYPE WILL BE THE BASE FREQUENCY OF EITHER 9.63855HZ +/- 0.0014HZ FOR AN ADVANTAGE PRIORITY EMITTER, OR 14.03509HZ +/-0.003HZ FOR A COMMAND PRIORITY EMITTER.
2. THE SECOND TYPE OF INFORMATION GENERATED BY THE DATA-ENCODED EMITTER WILL BE A VEHICLE CLASSIFICATION AND IDENTIFICATION CODE THAT IS INTERLEAVED INTO THE BASE FREQUENCY FLASHES. SETTING THE VEHICLE CLASSIFICATION AND IDENTIFICATION CODE WILL BE ACCOMPLISHED THROUGH FOUR, 10-POSITION ROTARY SWITCHES LOCATED IN THE POWER SUPPLY OF THE DATA-ENCODED EMITTER. EACH DATA-ENCODED EMITTER WILL BE CAPABLE OF SETTING A MINIMUM OF 10 DIFFERENT CLASSIFICATIONS WITH 1,000 DIFFERENT IDENTIFICATION NUMBERS PER CLASS FOR COMMAND PRIORITY AND AN EQUAL NUMBER FOR ADVANTAGE PRIORITY, FOR A TOTAL OF 10,000 CODES FOR EACH PRIORITY.
3. THE THIRD TYPE OF INFORMATION GENERATED BY THE DATA-ENCODED EMITTER WILL BE RESERVED FOR SETTING THE INTERSECTION DETECTION RANGE. THE SYSTEM WILL ENABLE THE TRAFFIC ENGINEER TO MANUALLY ACTIVATE THE RANGE CODE FROM HIS/HER VEHICLE USING AN EMITTER ON/OFF SWITCH EQUIPPED WITH A SPECIAL SET RANGE PUSH BUTTON. THE SYSTEM, CONFIGURED WITH A CLEAR LENS, WILL ACCOMMODATE SETTING A SEPARATE RANGE FROM 200 FT (61M) TO 2,500 FT (762M) FOR BOTH COMMAND OR ADVANTAGE PRIORITY SIGNALS. THE SYSTEM, CONFIGURED WITH A VISIBLE LIGHT FILTER, WILL ACCOMMODATE SETTING A SEPARATE RANGE FROM 200 FEET (61M) TO 1,800 FEET (549M) FOR BOTH COMMAND OR ADVANTAGE PRIORITY SIGNALS.

WHILE OPERATING, THE DATA-ENCODED EMITTER WILL CONDUCT SELF-DIAGNOSTICS DESIGNED TO CHECK FOR DATA TRANSMISSION INTEGRITY. ANY FAILURES OF THE SELF DIAGNOSTIC TESTS SHALL BE DISPLAYED BY FLASHING OF THE INDICATOR LIGHT.

EACH DATA-ENCODED EMITTER WILL BE SUPPLIED WITH AN ON/OFF SWITCH. THE SWITCH WILL BE EQUIPPED WITH AN INDICATOR LIGHT PROVIDING INTERNAL DIAGNOSTICS THAT WILL ASSIST IN TROUBLESHOOTING. THE INDICATOR LIGHT WILL OPERATE AS A. STEADY ON WHEN THE DATA-ENCODED EMITTER IS OPERATING B. FLASH AT A 0.5HZ RATE WHEN THE DATA-ENCODED EMITTER IS DISABLED C. FLASH AT A 4HZ RATE WHEN THE EMITTER IS MISSING PULSES.

THE DATA-ENCODED EMITTER WILL BE SUPPLIED COMPLETE WITH ALL CABLES NEEDED FOR INSTALLATION. THE CABLE THAT CONNECTS THE FLASH HEAD TO THE POWER SUPPLY WILL BE PRE-ASSEMBLED WITH CONNECTORS FOR BOTH ENDS; IT WILL BE AVAILABLE IN TWO LENGTHS, 4 FT (1.2M) AND 15 FT (4.6M). THE CABLE THAT CONNECTS THE POWER SUPPLY TO THE VEHICLE BATTERY WILL HAVE A CONNECTOR ON THE POWER SUPPLY END AND NO CONNECTOR ON THE BATTERY END; IT WILL BE AT LEAST 25 FT (7.6M) IN LENGTH.

THE DATA-ENCODED EMITTER WILL BE EQUIPPED WITH A DISABLE INPUT THAT, WHEN ACTIVATED, WILL CEASE UNIT OPERATION, THEREBY ELIMINATING THE POSSIBILITY OF INADVERTENT SIGNAL TRANSMISSION AFTER THE PRIORITY VEHICLE HAS ARRIVED AT ITS DESTINATION. THE UNIT WILL START UP WITH A DISABLE INPUT ACTIVE. THE DATA-ENCODED EMITTER WILL OPERATE OVER A TEMPERATURE RANGE OF -30F (-34C) TO +140F (+60C). THE DATA-ENCODED EMITTER WILL OPERATE OVER A RELATIVE HUMIDITY RANGE OF 5%

TEST EMITTER SHALL BE PORTABLE FOR HAND OPERATION MEETING ABOVE SPECIFICATIONS.

B. OPTICAL DETECTOR

THE REQUIRED OPTICAL DETECTOR WILL BE A LIGHTWEIGHT, WEATHERPROOF DEVICE CAPABLE OF SENSING AND TRANSFORMING PULSED OPTICAL ENERGY INTO ELECTRICAL SIGNALS FOR USE BY THE PHASE SELECTION EQUIPMENT. THE OPTICAL DETECTOR WILL BE DESIGNED FOR MOUNTING AT OR NEAR AN INTERSECTION ON MAST ARMS, PEDESTALS, PIPES OR SPAN WIRES. EACH OPTICAL DETECTOR WILL BE SUPPLIED WITH MOUNTING HARDWARE TO ACCOMMODATE INSTALLATION ON MAST ARMS. ADDITIONAL HARDWARE SHALL BE AVAILABLE FOR SPAN WIRE INSTALLATIONS. THE OPTICAL DETECTOR DESIGN SHALL INCLUDE ADJUSTABLE TUBES TO ENABLE THEIR REORIENTATION FOR SPAN WIRE MOUNTING WITHOUT DISASSEMBLY OF THE UNIT. THE OPTICAL DETECTOR WILL ACCEPT OPTICAL SIGNALS FROM ONE OR TWO DIRECTIONS AND WILL PROVIDE SINGLE OR DUAL ELECTRICAL OUTPUT SIGNAL(S).

THE OPTICAL DETECTOR WILL BE AVAILABLE IN THREE CONFIGURATIONS:

1. UNI-DIRECTIONAL WITH ONE OUTPUT CHANNEL.
2. BI-DIRECTIONAL WITH ONE OUTPUT CHANNEL.
3. BI-DIRECTIONAL WITH TWO OUTPUT CHANNELS.

THE OPTICAL DETECTOR WILL ALLOW AIMING OF THE TWO OPTICAL SENSING INPUTS FOR SKEWED APPROACHES OR SLIGHT CURVES. THE OPTICAL DETECTOR WILL HAVE A BUILT-IN TERMINAL BLOCK TO SIMPLIFY WIRING CONNECTIONS. THE OPTICAL DETECTOR WILL RECEIVE POWER FROM THE PHASE SELECTOR AND WILL HAVE INTERNAL VOLTAGE REGULATION TO OPERATE FROM 18 TO 37 VOLTS DC.

THE OPTICAL DETECTOR WILL RESPOND TO A CLEAR LENS DATA-ENCODED OPTICAL EMITTER AT A DISTANCE OF 2,500 FT (762M) UNDER CLEAR ATMOSPHERIC CONDITIONS. IF THE EMITTER IS CONFIGURED WITH A VISIBLE LIGHT FILTER, THE DETECTOR WILL RESPOND AT A DISTANCE OF 1800FEET (549M) UNDER CLEAR ATMOSPHERIC CONDITIONS. THE NOTED DISTANCES SHALL BE COMPARABLE DAY AND NIGHT.

THE OPTICAL DETECTOR WILL DELIVER THE NECESSARY ELECTRICAL SIGNAL TO THE PHASE SELECTOR VIA AN OPTICAL DETECTOR CABLE UP TO 1,000 FT (305M) IN LENGTH.

C. OPTICAL DETECTOR CABLE

THE OPTICAL DETECTOR CABLE SHALL DELIVER SUFFICIENT POWER FROM THE PHASE SELECTOR TO THE OPTICAL DETECTOR AND WILL DELIVER THE NECESSARY QUALITY SIGNAL FROM THE DETECTOR TO THE PHASE SELECTOR OVER A NON-SPLICED DISTANCE OF 1,000 FT (305M).

THE CABLE WILL BE OF DURABLE CONSTRUCTION TO SATISFY THE FOLLOWING INSTALLATION METHODS:

1. DIRECT BURIAL.
2. CONDUIT AND MAST ARM PULL.
3. EXPOSED OVERHEAD (SUPPORTED BY MESSENGER WIRE).

THE OUTSIDE DIAMETER OF THE OPTICAL DETECTOR CABLE WILL NOT EXCEED 0.3 INCHES (7.62MM). THE INSULATION RATING OF THE OPTICAL DETECTOR CABLE WILL BE 600 VOLTS MINIMUM. THE TEMPERATURE RATING OF THE OPTICAL DETECTOR CABLE WILL BE +167 F (+75 C) MINIMUM.

THE CONDUCTORS WILL BE SHIELDED WITH ALUMINIZED POLYESTER AND HAVE AN AWG #20 (7 X 28) STRANDED AND INDIVIDUALLY TINNED DRAIN WIRE TO PROVIDE SIGNAL INTEGRITY AND TRANSIENT PROTECTION.

THE OPTICAL DETECTOR CABLE WILL HAVE FOUR CONDUCTORS OF AWG #20 (7 X 28) STRANDED, INDIVIDUALLY TINNED COPPER, COLOR-CODED INSULATION AS FOLLOWS:

1. ORANGE FOR DELIVERY OF OPTICAL DETECTOR POWER (+).
2. DRAIN WIRE FOR OPTICAL DETECTOR POWER RETURN (-).
3. YELLOW FOR OPTICAL DETECTOR SIGNAL #1. D. BLUE FOR OPTICAL DETECTOR SIGNAL #2.

THE CHARACTERISTIC IMPEDANCE OF THE DETECTOR CABLE SHALL BE : 0.6OHMS/1000' 14.3UF/1000' THE SHIELD WRAPPING WILL HAVE A 20% OVERLAP TO ENSURE SHIELD INTEGRITY FOLLOWING CONDUIT AND MAST ARM PULLS.

D. PHASE SELECTOR

THE PHASE SELECTOR, DESIGNED TO BE INSTALLED IN THE TRAFFIC CONTROLLER CABINET, WILL ACCOMMODATE DATA-ENCODED SIGNALS AND IS INTENDED FOR USE DIRECTLY WITH NUMEROUS CONTROLLERS. THESE INCLUDE CALIFORNIA/NEW YORK TYPE 170 CONTROLLERS WITH COMPATIBLE SOFTWARE, ALONG WITH THE SYSTEM CHASSIS AND SUITABLE SYSTEM INTERFACE EQUIPMENT AND CONTROLLER SOFTWARE.

THE PHASE SELECTOR WILL BE A PLUG-IN, TWO OR FOUR CHANNEL, MULTIPLE-PRIORITY DEVICE INTENDED TO BE INSTALLED DIRECTLY INTO A CARD RACK LOCATED WITHIN THE CONTROLLER CABINET. THE PHASE SELECTOR WILL BE POWERED FROM 115 VOLT (95 VOLTS AC TO 135 VOLTS AC), 60HZ MAINS AND WILL CONTAIN AN INTERNAL, REGULATED POWER SUPPLY THAT SUPPORTS UP TO TWELVE OPTICAL DETECTORS. PROGRAMMING THE PHASE SELECTOR AND RETRIEVING THE DATA STORED IN IT WILL BE ACCOMPLISHED USING AN IBM PC-COMPATIBLE COMPUTER AND THE SYSTEM INTERFACE SOFTWARE. THE CONNECTION CAN BE MADE EITHER DIRECTLY, VIA THE COMPUTER'S COMMUNICATION (COM) PORT, OR REMOTELY VIA A MODEM. THE COMMUNICATION PORT ON THE PHASE SELECTOR WILL BE AN RS232 INTERFACE LOCATED ON THE FRONT AND BACK OF THE UNIT.

THE PHASE SELECTOR WILL HAVE THE CAPABILITY OF STORING UP TO 1000 OF THE MOST RECENT PRIORITY CONTROL CALLS. WHEN THE LOG IS FULL, THE PHASE SELECTOR WILL DROP THE OLDEST ENTRY TO ACCOMMODATE THE NEW ENTRY. THE PHASE SELECTOR WILL STORE THE RECORD IN NON-VOLATILE MEMORY AND WILL RETAIN THE RECORD IF POWER TERMINATES. EACH RECORD ENTRY WILL INCLUDE NINE POINTS OF INFORMATION ABOUT THE PRIORITY CALL, AS FOLLOWS:

1. CLASSIFICATION: INDICATES THE TYPE OF VEHICLE.
2. IDENTIFICATION NUMBER: INDICATES THE UNIQUE ID NUMBER OF THE VEHICLE.
3. PRIORITY LEVEL: INDICATES WHETHER COMMAND OR ADVANTAGE PRIORITY, OR PROBE FREQUENCY IS REQUESTED BY THE VEHICLE.
4. DIRECTION: CHANNEL A B,C, OR D; INDICATES THE VEHICLE'S DIRECTION OF TRAVEL.
5. CALL DURATION: INDICATES THE TOTAL TIME IN SECONDS THE PRIORITY STATUS IS ACTIVE.
6. FINAL GREENS AT END OF CALL: INDICATES WHICH PHASES ARE GREEN.
7. DURATION OF FINAL GREENS: INDICATES THE TOTAL TIME OF PRIORITY GREENS.
8. TIME AND DATE CALL ENDED: INDICATES THE TIME A PRIORITY STATUS ENDED; PROVIDED IN SECOND, MINUTE, HOUR, DAY, MONTH, YEAR.
9. MAXIMUM SIGNAL INTENSITY: INDICATES THE STRONGEST SIGNAL INTENSITY MEASURED BY THE PHASE SELECTOR DURING CALL.
10. PRIORITY OUTPUT ACTIVE: INDICATES IF THE PHASE SELECTOR REQUESTED PRIORITY FROM THE CONTROLLER FOR THE CALL.

THE PHASE SELECTOR WILL INCLUDE SEVERAL CONTROL TIMERS THAT WILL LIMIT OR MODIFY THE DURATION OF A PRIORITY CONTROL CONDITION, BY CHANNEL, AND CAN BE PROGRAMMED FROM A PC-TYPE COMPUTER. THE CONTROL TIMERS WILL BE AS FOLLOWS:

1. MAX CALL TIME: WILL SET THE MAXIMUM TIME A CHANNEL IS ALLOWED TO BE ACTIVE. IT WILL BE SETTABLE FROM 120 TO 65,535 SECONDS IN ONE-SECOND INCREMENTS. ITS FACTORY DEFAULT MUST BE THE MAXIMUM TIME.
2. CALL EXTENSION TIME: WILL SET THE TIME A CALL IS HELD ON A CHANNEL AFTER THE PRIORITY SIGNAL IS NO LONGER BEING RECEIVED. IT WILL BE SETTABLE FROM ONE TO 255 SECONDS IN ONE-SECOND INCREMENTS. ITS FACTORY DEFAULT MUST BE SIX SECONDS. C. CALL DELAY TIME: WILL SET THE TIME A CALL MUST BE RECOGNIZED BEFORE THE PHASE SELECTOR ACTIVATES THE CORRESPONDING OUTPUT. IT WILL BE SETTABLE FROM ZERO TO 255 SECONDS IN ONE-SECOND INCREMENTS. ITS FACTORY DEFAULT MUST BE ZERO SECONDS.

THE PHASE SELECTOR'S DEFAULT VALUES SHALL BE RE-SETTABLE BY THE OPERATOR USING AN IBM PC-COMPATIBLE COMPUTER, OR MANUALLY USING THE SWITCHES LOCATED ON ITS FRONT.

THE PHASE SELECTOR WILL BE CAPABLE OF THREE LEVELS OF DISCRIMINATION OF DATA-ENCODED OPTICAL SIGNALS, AS FOLLOWS:

1. ERIFICATION OF THE PRESENCE OF THE BASE OPTICAL SIGNAL OF EITHER 14.03509HZ %%241 0.01773HZ FOR COMMAND PRIORITY, 9.63855HZ %%241 0.00836HZ FOR ADVANTAGE PRIORITY OR 11.25870HZ %%241 0.01141HZ FOR PROBE FREQUENCY.
2. DETERMINATION OF WHEN THE VEHICLE IS WITHIN THE PREDETERMINED RANGE.
3. VALIDATION OF THE OPTICAL SIGNAL DATA-ENCODED PULSES.

THE PHASE SELECTOR'S CARD EDGE CONNECTOR WILL INCLUDE PRIMARY OPTICAL DETECTOR INPUTS AND POWER OUTPUTS. TWO ADDITIONAL DETECTOR INPUTS PER CHANNEL WILL BE PROVIDED ON A FRONT PANEL CONNECTOR. THE PHASE SELECTOR WILL INCLUDE ONE OPTO-ISOLATED NPN OUTPUT PER CHANNEL THAT PROVIDES THE FOLLOWING ELECTRICAL SIGNAL TO THE APPROPRIATE PIN ON THE CARD EDGE CONNECTOR:

1. 6.25HZ %%241 0.1HZ 50% ON/DUTY SQUARE WAVE IN RESPONSE TO AN ADVANTAGE PRIORITY CALL.
2. A STEADY ON IN RESPONSE TO A COMMAND PRIORITY CALL.

THE PHASE SELECTOR WILL ACCOMMODATE THREE METHODS FOR SETTING THE HIGH AND LOW PRIORITY OPTICAL SENSITIVITY (EMITTER RANGE):

1. USING AN ENCODED EMITTER WITH RANGE-SETTING CAPABILITY.
2. USING ANY OPTICAL EMITTER BY MANIPULATING THE FRONT PANEL SWITCHES.
3. INPUTTING THE INFORMATION VIA THE COMMUNICATION PORT.

THE PHASE SELECTOR WILL HAVE A SOLID STATE POWER ON LED INDICATOR THAT FLASHES TO INDICATE UNIT DIAGNOSTIC MODE AND ILLUMINATES STEADILY TO INDICATE PROPER OPERATION. THE PHASE SELECTOR WILL HAVE INTERNAL DIAGNOSTICS TO TEST FOR PROPER OPERATION. IF A FAULT IS DETECTED, THE PHASE SELECTOR WILL USE THE FRONT PANEL LED INDICATORS TO DISPLAY FAULT INFORMATION.

THE PHASE SELECTOR WILL HAVE A COMMAND (HIGH) AND ADVANTAGE (LOW) SOLID STATE LED INDICATOR FOR EACH CHANNEL TO DISPLAY ACTIVE CALLS. THE PHASE SELECTOR WILL HAVE A TEST SWITCH FOR EACH CHANNEL TO TEST PROPER OPERATION OF COMMAND OR ADVANTAGE PRIORITY. THE PHASE SELECTOR WILL PROPERLY IDENTIFY A COMMAND PRIORITY CALL WITH THE PRESENCE OF 10 ADVANTAGE PRIORITY DATA-ENCODED EMITTER SIGNALS BEING RECEIVED SIMULTANEOUSLY ON THE SAME CHANNEL.

THE PHASE SELECTOR WILL HAVE WRITE-ON PADS TO ALLOW IDENTIFICATION OF THE PHASE AND CHANNEL. 1 THE PHASE SELECTOR WILL HAVE A TEST SWITCH FOR EACH CHANNEL TO TEST PROPER OPERATION OF COMMAND OR ADVANTAGE PRIORITY. THE PHASE SELECTOR SHALL PROVIDE ONE ISOLATED CONFIRMATION LIGHT CONTROL OUTPUT PER CHANNEL. THESE OUTPUTS ARE USER CONFIGURABLE THROUGH SOFTWARE FOR A VARIETY OF CONFIRMATION LIGHT SEQUENCES.

THE PHASE SELECTOR SHALL HAVE THE CAPABILITY OF RECORDING THE PRESENCE OF A VEHICLE TRANSMITTING AT THE SPECIFIED PROBE FREQUENCY. THE PHASE SELECTOR SHALL AT NO TIME ATTEMPT TO MODIFY THE INTERSECTION OPERATION IN RESPONSE TO THE PROBE FREQUENCY. THE PHASE SELECTOR SHALL HAVE THE CAPABILITY OF PROVIDING ADVANTAGE PRIORITY IN A MODE WHERE THE OUTPUT TO THE CONTROLLER IS GATED OR CONTROLLED BY TIMING RELATIONSHIPS WITHIN THE CONTROLLER CYCLE.

THE PHASE SELECTOR SHALL HAVE THE CAPABILITY TO ASSIGN A RELATIVE PRIORITY TO A CALL REQUEST WITHIN COMMAND OR ADVANTAGE PRIORITY. THIS ASSIGNMENT IS BASED ON THE RECEIVED VEHICLE ID CLASS. THE PHASE SELECTOR SHALL HAVE THE CAPABILITY TO DISCRIMINATE BETWEEN INDIVIDUAL ID CODES, AND ALLOW OR DENY A CALL OUTPUT TO THE CONTROLLER BASED ON THIS INFORMATION.

THE PHASE SELECTOR SHALL HAVE THE CAPABILITY TO LOG CALL REQUESTS BY UNAUTHORIZED VEHICLES. THE PHASE SELECTOR SHALL HAVE THE ABILITY TO COMMAND AN EMITTER TO RELAY A RECEIVED CODE TO THE NEXT INTERSECTION.

THE PHASE SELECTOR SHALL HAVE THE CAPABILITY OF FUNCTIONALLY TESTING CONNECTED DETECTOR CIRCUITS AND INDICATING VIA FRONT PANEL LEDS NON FUNCTIONAL DETECTOR CIRCUITS. THE PHASE SELECTOR SHALL INCORPORATE A PRECISION REAL TIME CLOCK SYNCHRONIZED TO THE UTILITY AC POWER LINE FREQUENCY. THE PHASE SELECTOR SHALL INCLUDE AN AUXILIARY INTERFACE PANEL TO FACILITATE INTERCONNECTIONS BETWEEN THE PHASE SELECTOR AND TRAFFIC CABINET WIRING.

IV. CARD RACK

THE REQUIRED CARD RACK WILL PROVIDE SIMPLIFIED INSTALLATION OF A PHASE SELECTOR INTO CONTROLLER CABINETS THAT DO NOT ALREADY HAVE A SUITABLE CARD RACK. THE CARD RACK WILL BE FACTORY WIRED TO ONE CONNECTOR, LOCATED UNDER THE CARD SLOT, AND A TERMINAL BLOCK, LOCATED NEXT TO THE PHASE SELECTOR SLOT, ON THE FRONT OF THE CARD RACK. THE CARD RACK CONNECTOR ON THE FRONT, WILL PROVIDE FOR ALL CONNECTIONS TO THE TRAFFIC CONTROLLER. THE CARD RACK WILL PROVIDE LABELED TERMINAL BLOCKS FOR CONNECTING THE PRIMARY OPTICAL DETECTORS TO A PHASE SELECTOR.

V. INTERFACE SOFTWARE

THE PRIORITY CONTROL INTERFACE SOFTWARE WILL BE PROVIDED ON 3.5", 1.44MB DISKETTES TO INTERFACE WITH THE PHASE SELECTOR. IT MUST RUN ON MOST IBM-COMPATIBLE COMPUTERS EQUIPPED WITH AT LEAST 512KB RAM, WINDOWSTM 95 AND 98 AND COLOR VGA DISPLAY CAPABILITY.

THE PRIORITY CONTROL INTERFACE SOFTWARE MUST ACCOMMODATE:

A. SETTING UP AND PRESENTING USER-DETERMINED SYSTEM PARAMETERS.

B. VIEWING AND CHANGING SETTINGS.

C. VIEWING ACTIVITY SCREENS.

D. DISPLAYING AND/OR DOWNLOADING RECORDS OF PREVIOUS ACTIVITY SHOWING CLASS, CODE, PRIORITY, DIRECTION, CALL DURATION, FINAL GREENS AT END OF CALL, DURATION OF FINAL GREENS, TIME CALL ENDED IN REAL TIME PLUS MAXIMUM SIGNAL INTENSITY,(VEHICLE LOCATION INFORMATION). THIS INFORMATION MAY BE USED TO RECONSTRUCT THE ROUTE TAKEN BY A PRIORITY (OR PROBE) VEHICLE TO TRACK THE VEHICLE.

THE PRIORITY CONTROL INTERFACE SOFTWARE MUST ACCOMMODATE OPERATION VIA A MOUSE OR VIA THE KEYBOARD, OR IN COMBINATION.

THE PRIORITY CONTROL INTERFACE SOFTWARE MUST PROVIDE MENU DISPLAYS TO ENABLE:

A. SETTING OF VALID VEHICLE ID CLASSES AND CODES.

B. ESTABLISHING SIGNAL INTENSITY THRESHOLDS (DETECTION RANGES), MODEM INITIALIZATION, INTERSECTION NAME AND TIMING PARAMETERS.

C. SETTING OF DESIRED GREEN SIGNAL INDICATIONS DURING PRIORITY CONTROL OPERATION AND UPLOAD AND DOWNLOAD CAPABILITY TO VIEW.

D. RESETTING AND/OR RETRIEVING LOGGED DATA AND PRIORITY VEHICLE ACTIVITY.

E. ADDRESSING FOR EACH CARD IN A MULTI-DROP CONNECTED SYSTEM.

F. CONFIRMATION LIGHT CONFIGURATION. VII. RELIABILITY ALL EQUIPMENT SUPPLIED AS PART OF THE OPTICAL PRIORITY CONTROL SYSTEM INTENDED FOR USE IN THE CONTROLLER CABINET WILL MEET THE FOLLOWING ELECTRICAL AND ENVIRONMENTAL SPECIFICATIONS SPELLED OUT IN THE NEMA STANDARDS PUBLICATION TS2 1992, PART 2:

1. LINE VOLTAGE VARIATIONS PER NEMA TS2 1992, PARAGRAPH 2.1.2.
2. POWER SOURCE FREQUENCY PER NEMA TS2 1992, PARAGRAPH 2.1.3.
3. POWER SOURCE NOISE TRANSIENTS PER NEMA TS2 1992, PARAGRAPH 2.1.6.1.
4. TEMPERATURE RANGE PER NEMA TS2 1992, PARAGRAPH 2.1.5.1.
5. HUMIDITY PER NEMA TS2 1992, PARAGRAPH 2.1.5.2.
6. SHOCK TEST PER NEMA TS2 1992, PARAGRAPH 3.13.9.
7. VIBRATION PER NEMA TS2 1992, PARAGRAPH 3.13.8.

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Cook, Flatt & Strobel
ENGINEERS, P.A.

KANSAS DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL SPECIFICATIONS
PRIORITY CONTROL SYSTEM
(PREEMPTION)