FUNCTIONAL REQUIREMENTS

1. DETECTOR UNIT SPECIFICATIONS

1.1 DETECTOR UNITS SHALL BE SUPPLIED WITH FIRMWARE VERSION 1.2 OR GREATER OR APPROVED EQUAL.
1.2 DETECTOR UNITS SHALL BE IN FULL COMPLIANCE WITH THE ENVIRONMENTAL, TRANSIENT, AND SIZE REQUIREMENTS OF NEMA STANDARDS TS-1 SECTION 15, TS-2 SECTION 6.5, PLUS CALIFORNIA/NEW YORK TYPE 2070 SPECIFICATIONS AND MEET THE DESIGN, OPERATION, ELECTRICAL, FUNCTIONAL PERFORMANCE REQUIREMENTS OF THIS SPECIFICATION.
1.3 THE DETECTOR UNIT SHALL BE AVAILABLE IN BOTH TWO AND FOUR CHANNEL VERSIONS.
1.3.1 THE FOUR CHANNEL DETECTOR UNIT SHALL OCCUPY THE SPACE OF THE TWO ADJACENT 2-CHANNEL DETECTOR UNITS.
1.3.2 BOTH TWO AND FOUR CHANNEL VERSIONS OF THE DETECTOR UNIT SHALL SHALL BE CAPABLE OF TIMING DELAY AND/OR EXTENSION FUNCTIONS FOR EACH CHANNEL INDEPENDENTLY.
1.4 THE DETECTOR UNIT SHALL BE MICROPROCESSOR CONTROLLED, FULLY DIGITAL, AND SELF TUNING. THE DETECTOR UNIT SHALL BE CONFIGURED AS A RACK MOUNTED PRINTED CIRCUIT BOARD FOR INSERTION INTO A CALIFORNIA/ NEW YORK TYPE 170 INPUT FILE.
1.5 THE DETECTOR UNIT SHALL HAVE TWO (2) SERIAL PORTS. A FRONT PANEL RS-232 PORT AND SEND/RECEIVE PINS ON THE CARD EDGE CONNECTOR. EACH PORT SHALL BE CAPABLE OF PARTY LINE COMMUNICATIONS.
1.6 DETECTOR UNITS SHALL EMPLOY A CONSTANT L THRESHOLD THAT WILL RESPOND TO VEHICLE GENERATED CHANGES OF INDUCTANCE AND PROVIDE A RELATIVELY CONSTANT, PREDICTABLE RESPONSE TO SMALL LICENSED MOTOR VEHICLES WITHOUT HAVING TO CHANGE SENSITIVITY SETTINGS DESPITE ISERIES ADDED NDUCTANCE, I.E. MULTIPLE LOOPS CONNECTED IN SERIES WITH LEAD-IN/HOMERUN FROM 50' TO OVER 1000'.
1.7 DETECTOR UNITS SHALL INCLUDE A 60 HZ FILTER FOR ACCURATE DETECTION THRESHOLDS IN NOISY POWER LINE ENVIRONMENTS.
1.8 DETECTOR UNITS SHALL BE DESIGNED TO OPERATE OVER A VOLTAGE RANGE OF FROM 10.8 VDC TO 37 VDC.
1.9 DETECTOR UNITS SHALL DRAW LESS THAN 50 MA. PER CHANNEL FROM THE DC POWER SOURCE OVER THE INPUT VOLTAGE RANGE.
1.10 THE DETECTOR UNIT FRONT PANEL SHALL BE PROVIDED WITH A HAND PULL TO FACILITATE INSERTION AND REMOVAL OF THE UNIT FROM THE INPUT FILE.
1.11 THE DETECTOR UNIT SHALL INCLUDE OPTICALLY ISOLATED, SOLID STATE OUTPUTS DESIGNED TO PROVIDE A CONTINUOUS "FAILSAFE" (FAIL-CALL) OUTPUT IN THE EVENT OF POWER LOSS TO THE UNIT.
1.12 THE DETECTOR UNIT SHALL CONTAIN A COMMON, SWITCHED, LOOP OSCILLATOR TO ELIMINATE MUTUAL-INTERFERENCE/MAGNETIC-COUPLING (CROSSTALK) FROM MULTIPLE LOOPS IN ADJACENT LANES AND/OR ALLOW THE USE OF OVERLAPPED LOOPS FOR DIRECTIONAL CONTROL AND/OR USE OF MULTI-CONDUCTOR HOMERUN CABLE WHEN CONNECTED TO THE SAME DETECTOR UNIT.
1.13 THE DETECTOR UNIT SHALL CONTAIN A FREQUENCY SWITCH THAT WILL PROVIDE THREE (3) FREQUENCY SELECTIONS PER UNIT TO REDUCE INTERACTION WITH LOOPS CONNECTED TO ANOTHER UNIT. THE UNIT SHALL MAINTAIN THE SAME SENSITIVITY (THRESHOLD IN NANOHENERIES) IN ANY OF THE THREE (3) FREQUENCIES SELECTED.
1.14 THE DETECTOR UNIT SHALL CONTAIN A TOGGLE SWITCH WITH A SPRING LOADES POSITION THAT WILL RESET ALL CHANNELS AND STABLE POSITIONS TO ALLOW SELECTION OF "NORMAL" OR "FAST RECOVERY" MODE TO ENHANCE PERFORMANCE IN THE LEFT TURN LANES OR OTHER QUEUE SITUATIONS.
1.15 THE DETECTOR UNIT SHALL AUTOMATICALLY SELF- TUNE WITHIN TWO (2) SECONDS AFTER APPLICATION OR INTERRUPTION OF SUPPLY VOLTAGE. CHANNEL OUTPUTS SHALL DISPLAY CALLS FOR A PERIOD OF LESS THAN TWO (2) SECONDS AFTER WHICH DETECTION SHALL BE NORMAL.
1.16 THE DETECTOR UNIT SHALL CONTAIN A REMOTE RESET INPUT THAT WILL ALLOW AN EXTERNAL RESET OF ALL CHANNELS.
1.16.1 WHEN THE INPUT VOLTAGE ON PIN C FALLS BELOW 8 VDC FOR OVER 15 MICROSECONDS, THE DETECTOR SHALL RESET ALL ACTIVE CHANNELS AND ESTABLISH A NEW REFERENCE FOR EACH "ON" LOOP WITHIN 2 SECONDS.
1.17 THE DETECTOR UNIT SHALL HAVE A FRONT PANEL MOUNTED RS-232 SERIAL COMMUNICATIONS PORT TO INTERFACE WITH PC'S, OR OTHER DEVICES. THE DESIGN OF THE UNIT SHALL PROVIDE FOR A NUMBER OF USER SELECTABLE CHANGES IN OPERATING CHARACTERISTICS TO ALLOW FOR MODIFICATIONS OF PERFORMANCE FOR UNIQUE OR SPECIAL APPLICATIONS THAT CAN BE OBTAINED BY INVOKING THE OPTIONS FROM A COMPUTER OR OTHER DEVICE CONNECTED TO ONE OF THE RS-232 SERIAL INTERFACES.
1.18 THE DETECTOR UNIT SHALL RECORD THE OCCURRENCE OF AN OPEN LOOP, SHORTED LOOP, OR EXCESS INDUCTANCE CHANGE (>25%). THE TYPE OF ERROR AND TIME OF ERROR SHALL BE MADE AVAILABLE THROUGH THE SERIAL INTERFACE.
1.19 THE DETECTOR UNIT SHALL USE A WINDOWS (TM) BASED USER INTERFACE SOFTWARE FOR THE PC OR OTHER DEVICE CONNECTED TO THE RS-232 INTERFACE
1.20 THE FRONT PANEL OF THE DETECTOR UNIT SHALL INCLUDE ERASABLE, WRITE-ON PADS ADJACENT TO EACH DETECT INDICATOR TO AID IN THE IDENTIFICATION OF ASSOCIATED LANE, FUNCTION, OR PHASE ACTIVITY.

2. DETECTOR CHANNEL SPECIFICATIONS

2.1 EACH CHANNEL SHALL TUNE TO AN EXTERNAL LOAD OF 20 TO 2500 MICROHENRIES.
2.2 EACH CHANNEL SHALL PROVIDE A CONTINUOUS, NONRESETTABLE (FAIL-SAFE) OUTPUT AND INDICATION IN RESPONSE TO AN OPEN LOOP AND/OR OPEN LEAD-IN SYSTEM, EXCEPT IN THE OFF POSITION.
2.3 EACH CHANNEL SHALL CONTINUE TO OPERATE WITH POOR QUALITY LOOP SYSTEMS (Q>2) INCLUDING THOSE THAT HAVE A SINGLE POINT SHORT TO GROUND.
2.4 EACH CHANNEL SHALL HAVE A DIP SWITCH THAT WILL INVOKE A SPECIAL MICROLOOP TM MODE. SETTING THIS SWITCH SHALL CHANGE THE OPERATING MODE OF THE DETECTOR TO BE SPECIFIC TO MICROLOOP (TM) PROBES.
2.5 EACH CHANNEL SHALL INCLUDE TWO, WIDE ANGLE, HIGH VISIBILITY LED INDICATORS.
2.5.1 EACH CHANNEL SHALL HAVE A GREEN LED TO DISPLAY CHANNEL DETECT OUTPUT STATUS (OUTPUT STATE AND ALSO THE STATUS OF THE DELAY AND EXTENSION TIMERS) PLUS A RED LED TO DISPLAY LOOP FAULT MONITOR DIAGNOSTICS (OPEN LOOP, SHORTED LOOP, >25% INDUCTANCE CHANGE).
2.5.2 THE GREEN CHANNEL DETECT LED INDICATOR SHALL FLASH AT A RATE OF 4 HZ DURING DELAY TIMING.
2.5.3 THE GREEN CHANNEL DETECT LED INDICATOR SHALL FLASH AT A RATE OF 16 HZ DURING EXTENSION TIMING. TIMING.
2.5.4 DURING FAULT INDICATION THE GREEN CHANNEL DETECT LED SHALL PROVIDE A STEADY OUTPUT INDICATION IN EITHER THE PRESENCE OR PULSE MODE.
2.5.5 THE RED CHANNEL FAULT LED SHALL PROVIDE A CODED FLASHING SEQUENCE TO INDICATE LOOP SYSTEM FAULT TYPE.
2.5.6 THE RED CHANNEL FAULT LED SHALL FLASH AT A RATE OF 1 SECOND ON AND 1 SECOND OFF TO INDICATED >25% CHANGE OF INDUCTANCE.
2.5.7 THE RED CHANNEL FAULT LED SHALL FLASH AT A RATE OF 1 SECOND ON AND 1 SECOND OFF FOLLOWED BY 1/4 SECOND ON AND 1/4 SECOND OFF (2 TIMES) FOR AN OPEN LOOP INDICATION.
2.5.8 THE RED CHANNEL FAULT LED SHALL FLASH AT A RATE OF 1 SECOND ON AND 1 SECOND OFF (2 TIMES) FOLLOWED BY 1/4 SECOND ON AND 1/4 SECOND OFF FOR A SHORTED LOOP INDICATION.
2.6 EACH CHANNEL SHALL BE CONTROLLED BY A DIRECT READING 16 POSITION PUSHWHEEL SWITCH TO SELECT A MINIMUM OF 8 PULSE MODE SENSITIVIES, 7 PRESENCE MODE SENSITIVITIES. CHANNEL RESET, AND AN OFF MODE.
2.6.1 PUSHWHEEL SWITCHES SHALL INCLUDE 8 SENSITIVITY THRESHOLD SETTINGS IN A 2:1 STEPS OVER A RANGE OF 128:1 TO ENABLE PRECISE PREDICTABLE SELECTION OF THE PROPER SENSITIVITY TO DETECT ALL LICENSED MOTOR VEHICLES. EACH NUMERICAL SENSITIVITY SETTING SHALL BE EQUATED TO NANOHENERIES OF INDUCTANCE AS FOLLOWS;

SENSITIVITY LEVEL SETTING	NANOHENRIES L
C	1024
1	512
2	256
3	128
4	64
5	32
6	16
7	8

2.6.2 PULSE MODE SHALL BE INDICATED ON THE PUSHWHEEL BY A PULSE SYMBOL OVER THE CHANNEL SENSITIVITY NUMERAL.
2.6.3 PULSE MODE SETTINGS SHALL PROVIDE A SINGLE 118 + 2 MS. OUTPUT PULSE IN RESPONSE TO VEHICLES BEING DETECTED.
2.6.4 PRESENCE HOLD TIMES SHALL BE AT LEAST 4 MINUTES FOR SMALL 70CC MOTORCYCLES AND A MINIMUM OF AT LEAST 60 MINUTES FOR AUTOMOBLES OVER 1 TO 8, 6' X 6' 3 TURN LOOPS CONNECTED IN SERIES.
2.6.5 THE OFF POSITION SHALL BE SELECTED BY SELECTING AN "X" ON THE SWITCH. SELECTING THE OFF POSITION SHALL DISABLE CHANNEL OUTPUT AND INDICATORS INCLUDING THE FAULT INDICATIONS.
2.7 EACH CHANNEL SHALL BE CAPABLE OF INDEPENDENTLY TIMING PROGRAMMABLE DELAY AND/OR EXTENSION TIMES.
2.7.1 WHEN DELAY AND/OR EXTENSION TIMING IS SPECIFIED, EACH CHANNEL SHALL INCLUDE A 7 POSITION DIP SWITCH ON THE PRINTED CIRCUIT BOARD TO SELECT DELAY, EXTENSION, OR OFF NO TIMING IS DESIRED.
2.7.1.1 DELAY TIME SHALL BE SELECTABLE FROM 0 TO 31 SECONDS IN 1.0 INCREMENTS AND EXTENSION TIMING SHALL BE SELECTABLE IN 0 TO 7.5 SECONDS IN .25 SECOND INCREMENTS.
2.7.1.2 SELECTION OF "OFF" SHALL DISABLE TIMING IN BOTH PULSE AND PRESENCE MODES.
2.7.2 WHEN DELAY AND/OR EXTENSION TIMING IS SPECIFIED, EACH CHANNEL SHALL INCLUDE AN EXTERNAL INPUT TO CONTROL THE TIMING.
2.7.2.1 A TRUE CONDITION ON THE EXTERNAL INPUT SHALL EXIST WHEN THE VOLTAGE FALLS BELOW 8 VDC FOR >17 MILLISECONDS.
2.7.2.2 EXTENSION SHALL OCCUR ONLY IF THE EXTERNAL INPUT TO THE DETECTOR CHANNEL IS TRUE (LOW/ACTIVE).
2.7.2.3 DELAY SHALL OCCUR ONLY IF THE EXTERNAL INPUT TO THE DETECTOR CHANNEL IS FALSE (HIGH/ACTIVE).
2.8 IF A VEHICLE REMAINS IN THE SENSING ZONE THE CHANNEL SHALL REPHASE AFTER 1.9 SECONDS TO ENABLE DETECTING ADDITIONAL VEHICLES ON UNOCCUPIED PORTIONS OF THE LOOP AFTER 2 SECONDS.
2.9 EACH CHANNEL SHALL HAVE SPECIAL CIRCUITRY TO PREVENT TUNING OUT CONTINUOUS PEAK HOUR TRAFFIC LONG OR MULTIPLE SMALL LOOPS AS THERE IS VEHICLE MOVEMENT INTO THE SENSING ZONE AT LEAST EVERY 10 MINUTES.
2.10 FOR EACH CHANNEL THE MAXIMUM RESPONSE TIME TO AN INSTANTANEOUS BEGINNING OR END OF A SIMULATING INDUCTANCE CHANGE OF TWICE THE MAGNITUDE REQUIRED TO DETECT IN SENSITIVITY LEVELS 1, 2, AND 3, WHEN CONNECTED TO TYPICAL 3 OR 4 TURN 6' X 6' LOOPS WITH FROM 50' TO 1000' OF LEAD-IN/HOMERUN CABLE ATTACHED, SHALL BE LESS THAN 3 MILLISECONDS FOR 2 CHANNEL UNITS, AND LESS THAN 6 MILLISECONDS FOR A 4 CHANNEL UNIT. THIS SHALL PROVIDE A CONSTANT, ACCURATE, OUTPUT DURATION FOR SPEED OR OCCUPANCY MEASUREMENT APPLICATIONS.

VIDEO VEHICLE DETECTION SYSTEM

THIS WORK SHALL CONSIST OF FURNISHING A VEHICLE DETECTION SYSTEM, WHICH DETECTS VEHICLES BY PROCESSING VIDEO IMAGES AND PROVIDING DETECTION OUTPUTS TO A TRAFFIC SIGNAL CONTROLLER. THIS EQUIPMENT SHALL SHALL MEET THE NEMA ENVIRONMENTAL, POWER AND SURGE RATINGS AS SET FORTH IN NEMA TS1 AND TS2 170 AND 2070 SPECIFICATIONS.

OPTION 1:

HARDWARE: THE MACHINE VISION SENSORS SHALL BE FOUR INTEGRATED IMAGING CCD ARRAYS WITH OPTICS, HIGH-SPEED, COLOR, IMAGE-PROCESSING HARDWARE AND A CPU BUNDLED INTO A SEALED ENCLOSURE. THE ENVIRONMENTAL ENCLOSURE SHALL BE WATERPROOF AND DUST-TIGHT TO THE NEMA-4 SPECIFICATIONS. THE ENCLOSURE SHALL ALLOW THE MACHINE VISION SENSOR TO OPERATE SATISFACTORILY OVER AN AMBIENT TEMPERATURE RANGE FROM -34 DEGREES C TO +74 DEGREES C WHILE EXPOSED TO PRECIPITATION AS WELL AS DIRECT SUNLIGHT. THE ENCLOSURE SHALL ALLOW THE IMAGE SENSOR HORIZON TO BE ROTATED DURING FIELD INSTALLATION. THE ENCLOSURE SHALL INCLUDE A PROVISION AT THE REAR OF THE ENCLOSURE FOR CONNECTION OF THE FACTORY-FABRICATED POWER, COMMUNICATIONS AND VIDEO SIGNAL CABLE. INPUT POWER TO TO THE ENVIRONMENTAL ENCLOSURE SHALL BE 24 VAC/DC AND EITHER 50 OR 60 HZ. A HEATER SHALL BE AT THE FRONT OF THE ENCLOSURE TO PREVENT THE FORMATION OF ICE AND CONDENSATION IN COLD WEATHER, AS WELL AS TO ASSURE PROPER OPERATION OF THE LENS IRIS MECHANISM. THE HEATER SHALL NOT INTERFERE WITH THE OPERATION OF THE IMAGE SENSOR ELECTRONICS, AND IT SHALL NOT CAUSE INTERFERENCE WITH THE VIDEO SIGNAL. THE ENCLOSURE SHALL BE LIGHT-COLORED AND SHALL INCLUDE A SUNSHIELD TO MINIMIZE SOLAR HEATING AND GLARE. THE FRONT EDGE OF THE SUNSHIELD SHALL PROTRUDE BEYOND THE FRONT EDGE OF THE ENVIRONMENTAL ENCLOSURE AND SHALL INCLUDE A PROVISION TO DIVERT WATER FLOW TO THE SIDES OF THE SUNSHIELD. THE AMOUNT OF OVERHANG OF THE SUNSHIELD SHALL BE ADJUSTABLE TO PREVENT DIRECT SUNLIGHT FROM ENTERING THE LENS OR HITTING THE FACEPLATE. WHEN OPERATING IN THE ENVIRONMENTAL ENCLOSURE WITH THE POWER, COMMUNICATION AND VIDEO SIGNAL CABLE CONNECTED, THE IMAGE SENSOR SHALL MEET FCC CLASS B AND CE REQUIREMENTS FOR ELECTROMAGNETIC INTERFERENCE EMISSIONS.

THE CCD ARRAYS SHALL BE DIRECTLY CONTROLLED BY THE CPU, THUS PROVIDING HIGH VIDEO QUALITY FOR DETECTION THAT HAS VIRTUALLY NO NOISE TO DEGRADE DETECTION PERFORMANCE. THE OPTICS AND CAMERA ELECTRONICS SHALL BE DIRECTLY CONTROLLED FOR OPTIMAL ILLUMINATION FOR TRAFFIC DETECTION. THE LENS SHALL BE PER-FOCUSED AT THE FACTORY, AS REQUIRED FOR OPERATION. IT SHALL BE POSSIBLE FOR THE USER TO FOCUS THE LENS, AS REQUIRED FOR OPERATION. THE MACHINE VISION SENSOR SHALL OPERATE AT A MINIUM RATE OF 30 FRAMES PER SECOND WHEN CONFIGURE FOR THE NTSC (US) COLOR VIDEO STANDARD. THE MACHINE VISION SENSOR SHALL PROCESS A MINIUM OF TWENTY DETECTOR ZONES PLACED ANYWHERE IN THE FIELD OF VIEW OF THE SENSOR. THE VIDEO OUTPUT SHALL HAVE THE ABILITY TO SELECTIVELY SHOW OVERLAID GRAPHICS INDICATING THE CURRENT REAL-TIME DETECTION DETECTION STATE OF EACH INDIVIDUAL DETECTOR DEFINED IN THE VIDEO. THE SENSOR OUTPUT NTSC COLOR VIDEO SHALL BE VIEWED WITH ANY COMPATIBLE VIDEO-DISPLAY DEVICE.

SENSOR HARDWARE: THE MACHINE VISION SENSOR SHALL USE MEDIUM RESOLUTION COLOR IMAGE SENSORS AS THE VIDEO SOURCE FOR REAL-TIME VEHICLE DETECTION USING EITHER NTSC OR PAL FORMATS. AS A MINIMUM EACH IMAGE SENSOR SHALL PRODUCE IMAGES WITH A CCD SENSING ELEMENT WITH HORIZONTAL RESOLUTION OF AT LEAST 500 LINES AND VERTICAL RESOLUTION OF AT LEAST 350 LINES, IMAGES SHALL BE OUTPUT AS VIDEO CONFORMING TO NTSC OR PAL SPECIFICATIONS AND PROVIDE SOFTWARE JPEG VIDEO COMPRESSION WITH A USEABLE VIDEO AND RESOLVABLE FEATURES IN THE VIDEO IMAGE WHEN THOSE FEATURES HAVE LUMINANCE LEVELS AS LOW AS 0.1 LUX AT NIGHT. USABLE VIDEO AND RESOLVABLE FEATURES IN THE VIDEO IMAGE SHALL ALSO BE PRODUCED WHEN THOSE FEATURES IN HAVE LUNINANCE LEVELS AS HIGH AS 10,000 LUX DURING THE DAY. USABLE VIDEO AND RESOLVABLE IN THE VIDEO IMAGE SHALL BE PRODUCED WHEN THE RATIO OF THE LUMINANCE OF THE RESOLVED FEATURES IN ANY SINGLE VIDEO FRAME IS 300:1. THE SENSOR SHALL PROVIDE DIRECT REAL-TIME IRIS AND SHUTTER SPEED CONTROL, BE USABLE FOR VIDEO SURVEILLANCE, PROVIDE AN OPTICAL FILTER AND APPROPRIATE ELECTRONIC CIRCUITRY IN THE SENSOR TO SUPPRESS "BLOOMING" EFFECTS AT NIGHT, AND HAVE GAMMA FOR THE IMAGE SENSOR PRESET AT THE FACTORY TO A VALUE OF1.0.

SENSOR OPTICS : THE MACHINE VISION SENSOR SHALL BE EQUIPPED WITH AN INTEGRATED ZOOM LENS WITH ZOOM AND FOCUS CAPABILITIES THAT CAN BE CHANGED USING EITHER CONFIGURATION COMPUTER SOFTWARE OR A HAND-HELD CONTROLLER.

FUNCTIONAL : THE MACHINE VISION SENSOR SHALL BE ABLE TO BE PROGRAMMED WITH A VARIETY OF DETECTOR TYPES THAT PERFORM SPECIFIC FUNCTIONS SELECTABLE BY SOFTWARE. DETECTOR TYPES SHALL INCLUDE STOPLINE DETECTORS CAPABLE OF PROVIDING PRESENCE OF MOVING VEHICLE DETECTION BASED UPON PHASE STATUS, PRESENCE DETECTORS, DIRECTIONAL PRESENCE, AND INPUT DETECTORS. ADDITIONALLY, PHASE GREEN OR RED SHALL BE DISPLAYED. THE UNIT SHALL MONITOR A PROGRAMMABLE CONTRAST DETECTOR AND APPLY VIDEO LOSS TIMING PARAMETERS TO THE OUTPUT BY IMPLEMENTING MINIMUM, MAXIMUM, OR USER DEFINED FIXED TIME RECALL THE ASSIGNED PHASE(S). THE DETECTOR SHALL BE CAPABLE OF HAVING BOOLEAN LOGIC APPLIED TO MULTIPLE DETECTORS OR A MINIMUM NUMBER OF DETECTORS OUT OF A TOTAL PRESENT, PRIOR TO PLACING A CALL.

DETECTOR FEATURES SHALL INCLUDE:
A. COUNT DETECTION - OUTPUTS TRAFFIC VOLUME STATISTICS AND GENERATES TRAFFIC COUNTS AND OCCUPANCY.
B. PRESENCE DETECTION - INDICATE PRESENCE OF A VEHICLE, STOPPED VEHICLE, OR VEHICLES TRAVELING IN THE WRONG DIRECTION.
C. SPEED DETECTION - PROVIDE VEHICLE COUNTS, SPEED, LENGTH, AND CLASSIFICATION.
D. DETECTOR FUNCTION COMBINES - OUTPUTS OF MULTIPLE DETECTORS VIA BOOLEAN LOGIC FUNCTIONS.
E. LABEL DISPLAYS - INFORMATION ON THE MACHINE VISION VIDEO OUTPUT AND PASSES INPUT INFORMATION TO OTHER DETECTORS.
F. DETECTOR STATION - COLLECTS AND REPORTS TRAFFIC DATA GATHERED OVER SPECIFIED TIME INTERVALS.
G. INCIDENT DETECTION - MONITOR TRAFFIC PARAMETERS FOR CONDITIONS THAT INDICATE AN INCIDENT HAS OCCURRED, SUCH AS AN ACCIDENT OR A STALLED VEHICLE THAT RESULTS IN A SUDDEN REDUCTION IN ROADWAY CAPACITY OR THROUGHPUT.
H. SCHEDULERS - DEFINE PLANS THAT CAN BE USED BY OTHER DETECTORS TO SPECIFY DIFFERENT PARAMETERS FOR EACH TIME-OF-DAY PLAN.
I. CONTRAST LOSS DETECTION - MONITOR THE QUALITY OF THE VIDEO IMAGE THAT THE MACHINE VISION SENSOR IS PROCESSING.
J. SPEED ALARM - GENERATES ALARM OUTPUTS BASED ON USER-DEFINED ALGORITHMS USING SPEED.

EXTERNAL INTERFACES : THE EXTERNAL INTERFACES TO THE MACHINE VISION SENSOR SHALL INCLUDE A DETECTOR PORT SPECIFICALLY TO EXCHANGE DETECTOR STATE DATA WITH THE CABINET INTERFACE DEVICES, DIFFERENTIAL COLOR VIDEO OUTPUT, AND 24 VAC/DC POWER TO OPERATE THE SENSOR.

SENSOR FIELD INTERFACE EQUIPMENT : A COMMUNICATIONS PANEL SHALL BE PROVIDED WITH EACH MACHINE VISION SENSOR FOR INSTALLATION. THE COMMUNICATIONS PANEL SHALL PROVIDE A TERMINAL BLOCK FOR TERMINATING POWER AND FOUR TWISTED-PAIR WIRING TO THE IMAGE SENSOR.

SUPERVISOR COMMUNICATIONS PORT : THERE SHALL BE A SUPERVISOR COMMUNICATIONS PORT TO CONFIGURE AND PROVIDE GENERAL COMMUNICATIONS. THE MACHINE VISION SENSOR SHALL USE AN RS-485 MULTI-DROP NETWORK PROTOCOL TO FACILITATE COMMUNICATIONS VIA A NETWORK OF RACK CARDS TO A REMOTE OR LOCAL PC CLIENT/SERVER APPLICATION. THE COMMUNICATIONS PORT SHALL ALLOW THE USER TO UPDATE THE EMBEDDED SOFTWARE WITH A NEW SOFTWARE RELEASE AND INTERACT WITH A PC CLIENT/SERVER APPLICATION FOR ALL OF THE VARIOUS DETECTION REQUESTS SUPPORTED BY THE MACHINE VISION SENSOR. THE COMMUNICATIONS PROTOCOL OVER THE SUPERVISOR COMMUNICATIONS PORT SHALL BE THE UDPIIP MESSAGE PACKET AND ROUTING STANDARD. THIS PROTOCOL SHALL BE USED THROUGHOUT THE FIELD NETWORK OF MACHINE VISION SENSORS, HUBS AND THE HOST PC SERVER APPLICATION.

DETECTOR I/O PORT : THE MACHINE VISION SENSOR DETECTOR PORT SHALL PROVIDE A DEDICATED, RS-485, FULL DUPLEX INTERFACE BETWEEN THE MACHINE VISION SENSOR AND A DETECTOR PORT MASTER SUCH AS A CARD RACK OR TS2 MINI-HUB. THE REAL-TIME STATE OD PHASE INPUTS SHALL BE TRANSMITTED TO THE MACHINE VISION SENSOR. THE MACHINE VISION SENSOR SHALL EXCHANGE INPUT AND OUTPUT STATE DATA WITH THE DETECTOR PORT MASTER EVERY 100 MS. THE COMMUNICATIONS PROTOCOL SHALL BE UDP/IP OVER THE SINGLE TWISTED-PAIR WIRING. A DETECTOR PORT MASTER SUCH AS A TS2 MINI-HUB SHALL SUBSEQUENTLY TRANSLATE THE DETECTION STATES IN AN ELECTRICALLY COMPATIBLE MANNER TO A TRAFFIC SIGNAL CONTROLLER:
(1) THE INTERFACE CARD IMMEDIATELY UPON RECEIPT OF THE STATE CHANGE SHALL APPLY SINGLE PIN STATE OUTPUTS AND EACH ON OR OFF PULSE SHALL BE GUARANTEED A MINIMUM PULSE WIDTH OF 100 MS.
(2) SPEED OUTPUTS FROM 2 PINS SHALL REFLECT THE TRUE OUTPUT OF THE DELAY PROPORTIONAL TO MEASURED SPEED WITHIN +/- L MS.

DIFFERENTIAL VIDEO : THE MACHINE VISION SENSOR SHALL OUTPUT FULL MOTION VIDEO USING A DIFFERENTIAL VIDEO PORT IN EITHER NTSC OR PAL FORMAT. THE DIFFERENTIAL VIDEO SHALL BE TRANSMITTED OVER A SINGLE TWISTED PAIR.

POWER : THE MACHINE VISION SENSOR SHALL OPERATE ON 24 VAC/DC, 50/60 HZ AT A MAXIMUM OF 25 WATTS. THE CAMERA AND PROCESSOR ELECTRONICS SHALL CONSUME A MAXIMUM OF 10 WATTS. THE REMAINING 15 WATTS SHALL SUPPORT AN ENCLOSURE HEATER.

CABLE : BELTON 9556 VIDEO DETECTION CABLE OR APPROVED EQUAL. ANY SURPLUS CABLE FROM THE ROLL SHALL BE RETURNED TO THE CITY.

NO.	DATE:	REVISION	BY:	APP'D
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STANDARD DETAILS

TRAFFIC SIGNAL SPECIFICATIONS

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