G. MEMORY: THE COMPONENTS OF THE CONTROLLER UNIT SHALL BE HOUSED ON A MINIMUM OF TWO CIRCUIT BOARDS. THE CPU/MEMORY AND INPUT/OUTPUT COMPONENTS SHALL NOT BE COMBINED ON THE SAME BOARD. THE RANDOM ACCESS MEMORY (RAM) IN THE TYPE 170E CONTROLLER SHALL BE A MINIMUM OF 2K BYTES.

IV. TIME BASED COORDINATING UNITS

A. GENERAL

1. TIME BASE: THE UNIT SHALL ALLOW TRAFFIC CONTROL EQUIPMENT TO BE COORDINATED WITHOUT REQUIRING THE USE OF INTERCONNECTING CABLES. THE UNIT SHALL COORDINATE TRAFFIC CONTROL EQUIPMENT BASED ON SIGNALS FROM A PRECISE TIME BASE, UTILIZING POWER LINE FREQUENCY AND A BACK-UP SOURCE WHEN POWER IS INTERRUPTED.

2. TIMING PATTERNS: THE UNIT SHALL HAVE A MINIMUM OF THREE OUTPUT PATTERNS IN ORDER TO CHANGE THE SYSTEM SIGNAL PATTERN IN RESPONSE TO PERIODIC, PREDICTABLE CHANGES IN TRAFFIC LEVELS. THE UNIT SHALL ALSO HAVE MEANS TO SWITCH INDEPENDENTLY FROM 1PATTERN OF OUTPUTS TO ANOTHER AT A PREPROGRAMMED TIME IN ORDER TO ACHIEVE THE DESIRED COORDINATION OF THE SIGNALS IN THE SYSTEM.

3. DISPLAY: THE UNIT SHALL HAVE MEANS OF DISPLAYING ANY OF ITS STORED INFORMATION AND HAVING THAT INFORMATION ALTERED, ERASED, OR REPLACED BY OPERATION OF THE UNIT'S FRONT PANEL CONTROLS. THE UNIT SHALL HAVE MEANS TO PREVENT UNAUTHORIZED OPERATORS FROM ALTERING, ERASING, OR ENTERING DATA.

B. VOLTAGE: THE VOLTAGE RANGE SHALL BE 95 TO 135 VOLTS ALTERNATING CURRENT.

C. FREQUENCY RANGE: THE OPERATING FREQUENCY RANGE SHALL BE 60 HERTZ PLUS OR MINUS 3.0 HERTZ.

D. POWER INTERRUPTION: THE UNIT SHALL UTILIZE A MEANS TO RETAIN DATA IN ITS DATA MEMORY AND MAINTAIN THE OPERATION OF ITS INTERNAL TIME REFERENCE WHEN POWER INTERRUPTIONS OCCUR. UPON RESTORATION OF POWER THE UNIT SHALL RESUME OPERATION AS THOUGH THE POWER INTERRUPTION HAD NOT OCCURRED.

E. AMBIENT TEMPERATURE: THE AMBIENT TEMPERATURE RANGE SHALL BE FROM -34 DEGREES CELSIUS TO +74 DEGREES CELSIUS.

V. DETECTOR INSTALLATION

A. INSTALLATION DETAILS: INSTALLATION SHALL CONFORM TO THE DETAILS SHOWN IN THE PLANS.

1. SLOTS: THE LOCATION OF EACH LOOP SHALL BE MARKED ON THE PAVEMENT WITH CRAYON OR SPRAY PAINT. THE CONTRACTOR SHALL OBTAIN THE APPROVAL OF THE ENGINEER PRIOR TO LOOP INSTALLATION. THE CONTRACTOR SHALL DRILL 50 mm DIAMETER HOLES CENTERED ON EACH POINT OF INTERSECTION OF THE LOOP SLOTS PRIOR TO CUTTING THE SLOTS. THE SLOTS SHALL THEN BE CUT USING A SAW EQUIPPED WITH A DEPTH GAUGE AND HORIZONTAL GUIDE TO ASSURE PROPER DEPTH AND ALIGNMENT OF THE SLOT. THE BLADE USED FOR THE SAW CUT SHALL PROVIDE A CLEAN, STRAIGHT, WELL-DEFINED 6 mm TO 20 mm WIDE SAW CUT WITHOUT DAMAGE TO ADJACENT AREAS. A 20 mm WIDE SAW CUT IS REQUIRED WHEN THE THHN LOOP WIRE IS INSERTED INTO POLYVINYL CHLORIDE (PVC) TUBING. THE SAWCUT SHALL HAVE SUFFICIENT DEPTH TO PROVIDE A MINIMUM 25 mm SEALANT COVER ABOVE THE TOP WIRE. WHERE THE LOOP CHANGES DIRECTION, THE SAW CUTS SHALL BE OVERLAPPED TO PROVIDE FULL DEPTH AT ALL POINTS OF INTERSECTION.

BEFORE INSTALLING THE LOOP WIRE, THE SLOTS SHALL BE CHECKED FOR THE PRESENCE OF JAGGED EDGES OR PROTRUSIONS. SHOULD THESE EXIST, THEY MUST BE REMOVED. THE SLOTS MUST BE CLEANED AND DRIED TO REMOVE CUTTING DUST, GRIT, OIL, MOISTURE OR OTHER CONTAMINANTS. CLEANING SHALL BE ACHIEVED BY FLUSHING THE SLOT WITH A HIGH PRESSURE WATER JET STREAM. THE SLOT SHALL THEN BE CLEARED OF WATER AND DRIED USING OIL-FREE COMPRESSED AIR.

2. DETECTOR LOOPS: LOOP DETECTOR CONDUCTORS SHALL BE INSTALLED IN THE SLOT USING A DULL EDGE WOODEN PADDLE. CONDUCTORS OF ALL LOOPS TO BE OPERATED BY EACH SENSOR UNIT SHALL BE RUN CONTINUOUSLY FROM THE NEAREST JUNCTION OR SERVICE BOX WITH NO SPLICES PERMITTED. ALL LOOPS SHALL BE WOUND IN THE SAME DIRECTION WITH THE START AND END OF EACH CLEARLY MARKED AT THE JUNCTION OR SERVICE BOX. IN ADDITION, EACH LOOP CONDUCTOR SHALL BE IDENTIFIED BY THE LOOP NUMBER SHOWN IN THE PLANS. THE LOOPS SHALL BE JOINED IN THE JUNCTION OR SERVICE BOX IN COMBINATION OF SERIES AND PARALLEL SO THAT OPTIMUM SENSITIVITY AS RECOMMENDED BY THE MANUFACTURER IS OBTAINED AT THE SENSOR UNIT.

3. SPLICES: THE LOOP CONDUCTORS FOR EACH LOOP SHALL BE SPLICED IN THE JUNCTION OR SERVICE BOX TO A DETECTOR LEAD-IN CABLE. THE DETECTOR LEAD-IN CABLE SHALL RUN CONTINUOUSLY FROM THE JUNCTION OR SERVICE BOX TO A SENSOR UNIT IN THE CONTROLLER CABINET WITH NO SPLICES PERMITTED. FINAL SPLICES BETWEEN LOOPS AND LEAD-IN CABLES SHOULD BE TWISTED AND SECURED WITH A WIRE NUT. THE SPLICE SHALL BE CAREFULLY WATERPROOFED INCLUDING THE END OF THE LOOP WIRE TUBING; AN APPROVED SPLICE KIT MAY BE USED. ALL LOOP LEAD-IN AND CABINET WIRING SHALL BE TWISTED A MINIMUM OF 16 TURNS PER METER. LEAD-IN SHIELDING SHOULD BE ELECTRICALLY FLOATING; SHIELD SHALL BE GROUNDED AT THE CABINET END.

4. SEALANTS: AFTER CONDUCTORS ARE INSTALLED IN THE SLOTS CUT IN THE PAVEMENT, THE SLOTS SHALL BE FILLED WITH AN APPROVED SEALANT TO WITHIN 3 mm OF THE PAVEMENT SURFACE. THE SEALANT SHALL BE AT LEAST 25 mm THICK ABOVE THE TOP CONDUCTOR IN THE SAW CUT. BEFORE SETTING, SURPLUS SEALANT SHALL BE REMOVED FROM THE ADJACENT ROAD SURFACES WITHOUT THE USE OF SOLVENTS.

B. MICROLOOPS

1. GENERAL: THE MICROLOOP PROBE SHALL TRANSFORM MAGNETIC FIELD INTENSITY CHANGES INTO INDUCTANCE CHANGES. A MAGNETIC FIELD INTENSITY INCREASE SHALL CAUSE AN INDUCTANCE DECREASE TO BE PLACED BENEATH THE ROAD SURFACE. WHEN THE PROBE IS CONNECTED TO A SENSOR UNIT WITH COMPATIBLE OPERATING SPECIFICATIONS, ALL VEHICLES CONTAINING SIGNIFICANT VERTICAL SECTIONS OF FERROMAGNETIC MATERIAL SHALL BE DETECTABLE.

2. LOCATION:

a. BRIDGE INSTALLATION:

I. PROBES: MICROLOOP PROBES INSTALLED ON BRIDGES SHALL BE LOCATED AS NEAR AS POSSIBLE TO THE LOCATION SHOWN IN THE PLANS. THE FINAL LOCATION OF EACH PROBE SHALL BE VERIFIED IN THE FIELD PER MANUFACTURER'S RECOMMENDED PRACTICE TO ENSURE PROPER DETECTOR PLACEMENT AND OPERATION. EACH PROBE SET SUPPLIED BY THE CONTRACTOR SHALL INCLUDE ENOUGH EXCESS CABLE TO ALLOW ADJUSTMENTS IN THE FINAL PROBE LOCATIONS OF 300 mm PER PROBE AND ONE METER OF EXCESS CABLE IN EACH JUNCTION BOX.

II. JUNCTION BOXES: JUNCTION BOXES USED FOR SPLICING OF THE PROBE CABLE WITH THE DETECTOR LEAD-IN CABLE ARE TO BE MOUNTED TO THE BRIDGE. EACH JUNCTION BOX SHALL BE SIZED TO ACCOMMODATE THE EXCESS CABLE REQUIRED FOR THE INSTALLATION.

b. ROADWAY INSTALLATION: MICROLOOP PROBES SHALL BE LOCATED AS SHOWN IN THE PLANS.

c. SPACING: A MINIMUM OF THREE MICROLOOP PROBES SHALL BE USED IN EACH LANE. THE PROBES SHALL BE CENTERED IN THE LANE AND SPACED AN EQUAL DISTANCE FROM EACH OTHER LEAVING ONE METER FROM THE OUTSIDE PROBES TO THE EDGE OF THE LANE.

3. PHYSICAL

a. PROBES: THE PROBE SHALL BE CYLINDRICAL IN SHAPE WITH A 25 mm NOMINAL OUTSIDE DIAMETER AND 90 mm NOMINAL LENGTH. ASSEMBLY SHALL BE SEALED AGAINST MOISTURE ENTRY.

b. INTERCONNECTING AND LEAD-IN CABLE: THE PROBE INTERCONNECTING AND LEAD-IN CABLE SHALL HAVE 4-#22 AWG CONDUCTORS ENCLOSED IN A POLY URETHANE JACKET WITH A 5 mm OUTSIDE DIAMETER. THE CONDUCTOR COLORS SHALL BE RED, GREEN, BLACK AND WHITE. THE BUNDLED CONDUCTORS SHALL BE TWISTED AT 13 TO 19 TURNS PER METER.

4. ENVIRONMENTAL

a. TEMPERATURE: THE MICROLOOP PROBES SHALL BE CAPABLE OF OPERATION AT TEMPERATURE RANGES FROM -34 DEGREES CELSIUS TO +74 DEGREES CELSIUS.

b. RELATIVE HUMIDITY: THE MICROLOOP PROBES SHALL BE CAPABLE OF OPERATION AT RELATIVE HUMIDITY RANGES FROM 0 PERCENT TO 100 PERCENT, INCLUDING SUBMERSION IN SOLUTIONS OF CHEMICALS TYPICAL OF ROADWAY RUNOFF.

c. NOISE: THE AC MAGNETIC FIELD INTENSITY NOISE MUST BE LESS THAN 10 MILLIOERSTEDS PEAK-TO-PEAK DIVIDED BY THE NUMBER OF PROBES CONNECTED IN SERIES FOR MOST COMMON INSTALLATION CONFIGURATIONS. THE AMBIENT MAGNETIC FIELD INTENSITY SHALL BE 200 TO 600 MILLIOERSTEDS OPERATING MAGNETIC FIELD INTENSITY.

5. ELECTRICAL

a. INDUCTANCE: THE MICROLOOP PROBES SHALL HAVE A NOMINAL INDUCTANCE OF 25 MICROHENRIES. THE INTERCONNECTING AND LEAD-IN CABLE SHALL HAVE A NOMINAL INDUCTANCE OF 21MICROHENRIES PER 30 m CABLE.

b. RESISTANCE: THE PROBES SHALL HAVE A NOMINAL RESISTANCE OF 0.5 OHMS. THE INTERCONNECTING AND LEAD-IN CABLE SHALL HAVE A NOMINAL RESISTANCE OF 3.2 OHMS PER 30 m OF CABLE.

c. SENSITIVITY: THE PROBE SENSITIVITY SHALL BE 3.5 TO 8.0 NANOHENRIES PER MILLIOERSTED AT 40 KHZ AND 400 MILLIOERSTEDS AMBIENT MAGNETIC FIELD INTENSITY. THE SENSITIVITY AT 100 KHZ AND 400 MILLIOERSTEDS AMBIENT MAGNETIC FIELD INTENSITY SHALL BE APPROXIMATELY 60% OF THE SENSITIVITY AT 40 KHZ.

VI. CIRCUIT BREAKER, WIRE, AND CABLE

A. SERVICE CIRCUIT BREAKERS: THE CONTRACTOR SHALL PROVIDE CIRCUIT BREAKERS AS SHOWN ON THE PLAN FOR SECONDARY POWER DROP. THE CIRCUIT BREAKERS SHALL BE SINGLE POLE, MOLDED CASE, OF THE SIZE AND TRIP RATING AS SHOWN ON THE PLAN. THE CIRCUIT BREAKERS SHALL BE PROVIDED IN A SUITABLE WATERTIGHT ENCLOSURE PROVIDED WITH A HASP FOR A PADLOCK. PADLOCKS WILL BE PROVIDED BY OTHERS.

B. GROUNDING: ALL TRAFFIC SIGNAL POLES, PEDESTALS, CONTROLLER CABINETS, AND SERVICE CIRCUIT BREAKERS SHALL BE GROUNDED BY MEANS OF A NO. 6 AMERICAN WIRE GAUGE SOLID BARE COPPER WIRE BOLTED TO THE INSIDE OF THESE DEVICES WITH A 12 mm INTERNAL GROUND LUG. ALL GROUND WIRES SHALL BE ATTACHED BY MEANS OF A GROUND CLAMP TO A COPPER-CLAD STEEL ROD. THE GROUND ROD SHALL BE 20 mm IN DIAMETER AND 3 m LONG. GROUND RODS AT POLE BASES SHOULD BE A MINIMUM OF 600 mm FROM THE POLE BASE AND A MINIMUM OF 300 mm BELOW THE GROUND SURFACE.

C. COLOR CODING: ALL DETECTOR WIRE AND CABLE SHALL BE COLOR CODED ACCORDING TO ONE OF THE FOLLOWING METHODS: THE METHOD APPROVED BY THE INTERNATIONAL MUNICIPAL SIGNAL ASSOCIATION, INC. OR METHOD ONE FOR 2010 AS APPROVED BY THE INSULATED POWER CABLE ENGINEERS' ASSOCIATION.

D. EXCESS CABLE: A MINIMUM OF 2 m OF EXCESS SIGNAL AND DETECTOR LEAD-IN CABLE SHALL BE COILED IN EACH SERVICE BOX.

E. POLE WIRING: EACH SIGNAL HEAD SHALL HAVE A SEPARATE RUN OF SIGNAL CABLE FROM THE TERMINAL BLOCK IN THE POLE TO THE SIGNAL HEAD.

F. MULTICONDUCTOR CABLE:

1. GENERAL: ALL CONDUCTOR CABLE FOR INTERSECTION SIGNALIZATION AND INTERCONNECTION SHALL BE NO. 14 AMERICAN WIRE GAUGE MULTICONDUCTOR CABLE FOR OPERATION ON A 600 VOLT MAXIMUM, AND SUITABLE FOR USE AT CONDUCTOR TEMPERATURES NOT EXCEEDING 75 DEGREES CELSIUS. MATERIAL, CONSTRUCTION, AND TESTS SHALL BE IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF THE LATEST EDITION OF THE INTERNATIONAL MUNICIPAL SIGNAL ASSOCIATION, INC. SPECIFICATION 19-1 FOR POLYETHYLENE-INSULATED, POLYVINYL CHLORIDE JACKETED SIGNAL CABLE.

2. ALTERNATE: AS AN ACCEPTABLE ALTERNATE THE CONTRACTOR MAY USE MULTICONDUCTOR, STRANDED CABLE MEETING THE REQUIREMENTS OF THE LATEST EDITION OF THE INSULATED POWER CABLE ENGINEERS' ASSOCIATION STANDARD S-61-402 'THERMOPLASTIC INSULATED WIRE AND CABLE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY' AND AS FOLLOWS:

a. STRANDING: CONDUCTORS SHALL BE STRANDED, ANNEALED UNCOATED COPPER OR ANNEALED COATED COPPER. COPPER WIRE BEFORE INSULATING OR STRANDING SHALL MEET THE REQUIREMENTS OF THE LATEST EDITION OF THE AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) B33 'SPECIFICATION FOR TINNED SOFT OR ANNEALED COPPER WIRE FOR ELECTRICAL PURPOSES' (FOR COATED WIRE) OR ASTM B3 'SPECIFICATION FOR SOFT OR ANNEALED COPPER WIRE' (FOR UNCOATED WIRE). STRANDING SHALL BE CLASS B, IN ACCORDANCE WITH THE LATEST EDITION OF ASTM B8 'SPECIFICATION FOR CONCENTRIC-LAY-STRANDED COPPER CONDUCTORS, HARD, MEDIUM-HARD, OR SOFT'.

b. INSULATION: INSULATION FOR THE INDIVIDUAL CONDUCTORS SHALL CONSIST OF A 0.5 mm THICKNESS OF POLYETHYLENE AND AN INSULATION COVERING OF A POLYVINYL CHLORIDE COMPOUND WITH A 0.25 mm THICKNESS.

I. POLYETHYLENE: THE POLYETHYLENE INSULATION SHALL MEET THE REQUIREMENTS OF PARAGRAPH 3.9 OF THE LATEST EDITION OF THE INSULATED POWER CABLE ENGINEERS' ASSOCIATION STANDARD S-61-402 'THERMOPLASTIC INSULATED WIRE AND CABLE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY' BEFORE APPLICATION TO THE CONDUCTOR, AND PARAGRAPH 3.91 AFTER APPLICATION TO THE CONDUCTOR.

II. POLYVINYL CHLORIDE: THE POLYVINYL CHLORIDE INSULATION COVERING SHALL MEET THE REQUIREMENTS OF PARAGRAPH 4.3.1 OF THE LATEST EDITION OF THE INSULATED POWER CABLE ENGINEERS' ASSOCIATION STANDARD S-61-402 'THERMOPLASTIC INSULATED WIRE AND CABLE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY'.

c. JACKET: THE OVERALL CABLE JACKET SHALL CONSIST OF A POLYVINYL CHLORIDE COMPOUND WHICH WILL PROVIDE A TOUGH HEAT, MOISTURE, OZONE, AND FLAME RESISTANT COVERING MEETING THE REQUIREMENTS OF PARAGRAPH 4.3.1 OF THE LATEST EDITION OF THE INSULATED POWER CABLE ENGINEERS' ASSOCIATION STANDARD S-61-402 'THERMOPLASTIC INSULATED WIRE AND CABLE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY'.

d. JACKET THICKNESS: THE OVERALL JACKET THICKNESS SHALL BE IN ACCORDANCE WITH TABLE 18, PART 4 OF THE LATEST EDITION OF THE INSULATED POWER CABLE ENGINEERS' ASSOCIATION STANDARD S-61-402 'THERMOPLASTIC INSULATED WIRE AND CABLE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY'.

G. DETECTOR LOOP WIRE

1. GENERAL: THE CONDUCTOR SHALL BE SOFT DRAWN COPPER WIRE WITH CLASS C STRANDING PER THE LATEST EDITION OF THE AMERICAN SOCIETY FOR TESTING AND MATERIALS SPECIFICATION B8 'SPECIFICATION FOR SOFT ANNEALED COPPER WIRE'. THE WIRES SHALL HAVE POLYVINYL CHLORIDE INSULATION PER UNDERWRITERS' LABORATORY SUBJECT 83 FOR THHN AT 90 DEGREES CELSIUS, THWN AT 75 DEGREES CELSIUS AND A POLYAMIDE NYLON ARMOR JACKET.

2. CABLE REQUIREMENTS: IN ADDITION, THE CABLE SHALL MEET THE FOLLOWING REQUIREMENTS:

- WIRE SIZE: NO. 14 AMERICAN WIRE GAUGE (STRANDED)
- INSULATION THICKNESS: 0.381 mm
- JACKET THICKNESS: 0.102 mm
- NOMINAL OUTSIDE DIAMETER: 3.048 mm
- CONDUCTOR COLOR CODE: BLACK
- SUGGESTED WORKING VOLTAGE: 600 VOLTS

3. TUBING: THE THHN LOOP WIRE SHALL BE INSERTED INTO POLYVINYL CHLORIDE OR POLYETHYLENE TUBING PRIOR TO INSTALLATION (ONE THHN WIRE PER SECTION OF TUBING). THE TUBING SHALL HAVE A NOMINAL 5 mm INSIDE DIAMETER, A NOMINAL WALL THICKNESS OF 0.7 mm AND SHALL BE CONTINUOUS.

H. SHIELDED DETECTOR LEAD-IN CABLE

1. GENERAL: THE CONDUCTOR AND DRAIN WIRES SHALL BE TINNED COPPER WIRES. THE CONDUCTORS SHALL BE SHIELDED BY A LAYER OF ALUMINUM BONDED TO POLYESTER FILM. ALL WIRES SHALL HAVE POLYETHYLENE INSULATION AND A JACKET OF VINYL. IN ADDITION, THE CABLE SHALL MEET THE FOLLOWING REQUIREMENTS:

- WIRE SIZE: NO. 14 (19 X 29) AMERICAN WIRE GAUGE (STRANDED)
- DRAIN WIRE: NO. 18 AMERICAN WIRE GAUGE (STRANDED)
- INSULATION THICKNESS: 0.635 mm
- JACKET THICKNESS: 0.762 mm
- NOMINAL OUTSIDE DIAMETER: 7.0 mm
- CONDUCTOR COLOR CODE: BLACK & CLEAR
- SHIELD COVERAGE: 100 PERCENT
- NOMINAL CAPACITANCE BETWEEN CONDUCTORS: 24 PICOFARADS PER 300 mm
- NOMINAL CAPACITANCE BETWEEN ONE CONDUCTOR AND THE OTHER CONDUCTOR CONNECTED TO SHIELD: 47 PICOFARADS PER 300 mm
- SUGGESTED WORKING VOLTAGE: 600 VOLTS

2. ALTERNATE: AS AN ACCEPTABLE ALTERNATIVE, THE SHIELDED DETECTOR LEAD-IN ELECTRICAL CABLE SHALL MEET THE LATEST EDITION OF THE INTERNATIONAL MUNICIPAL SIGNAL ASSOCIATION, INC. SPECIFICATION #50-2 FOR LEAD-IN CABLE.

NO.	DATE	REVISIONS	BY	APP'D
3				
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1				

KANSAS DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL SPECIFICATIONS

151/202

TE120CSI 04/05/95

FHWA APPROVAL		06/08/95	APP'D	James E. Tobaben	
DESIGNED	C.J.M.	DETAILED	C.J.M.	QUANTITIES	TRACED
DESIGN CK.	L.O.V.	DETAIL CK.	L.O.V.	QUAN. CK.	TRACE CK.

Plotted By : FISCHER
Plot File : e:\trafstd\tel20csi.dgn
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