

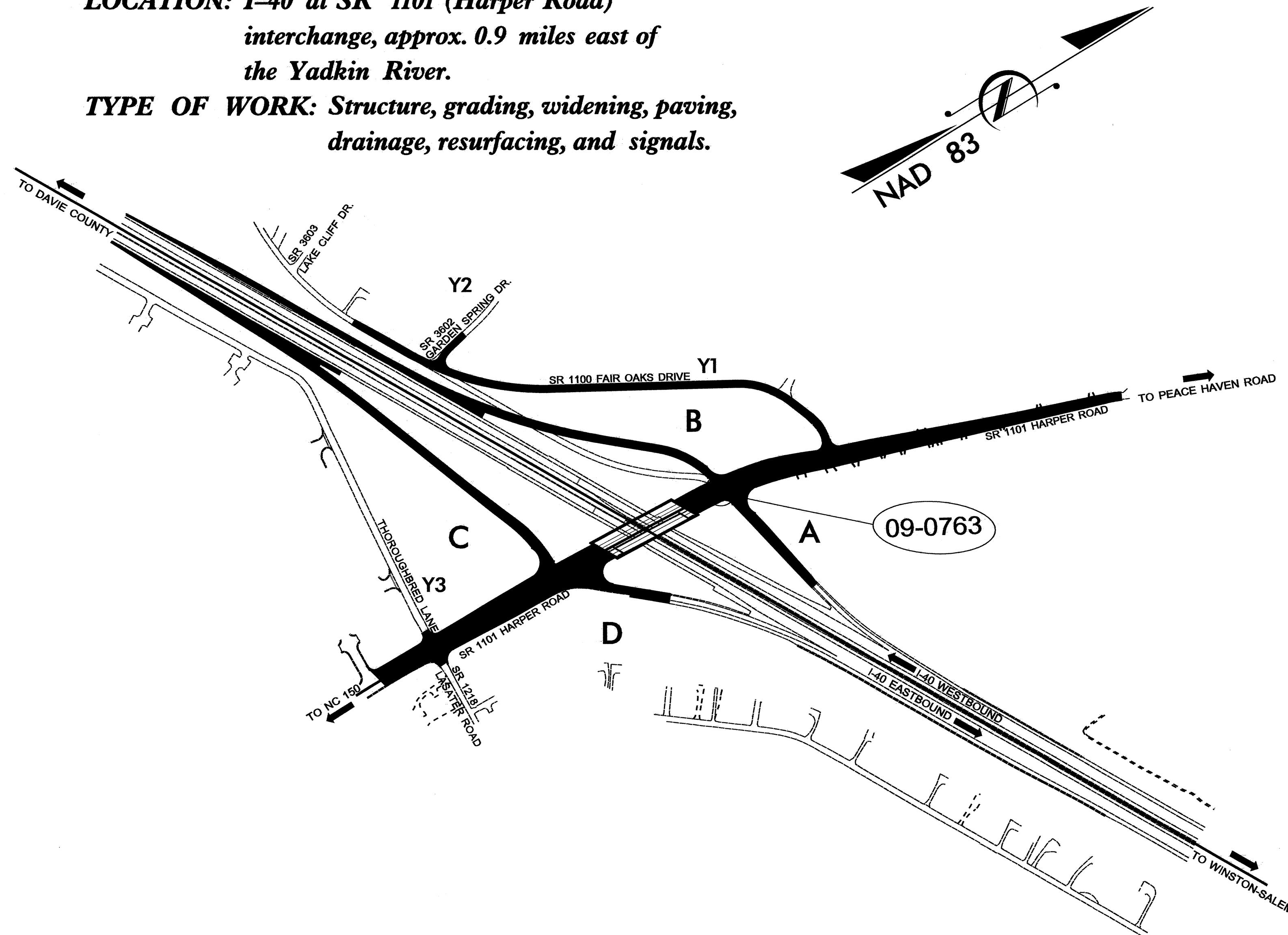
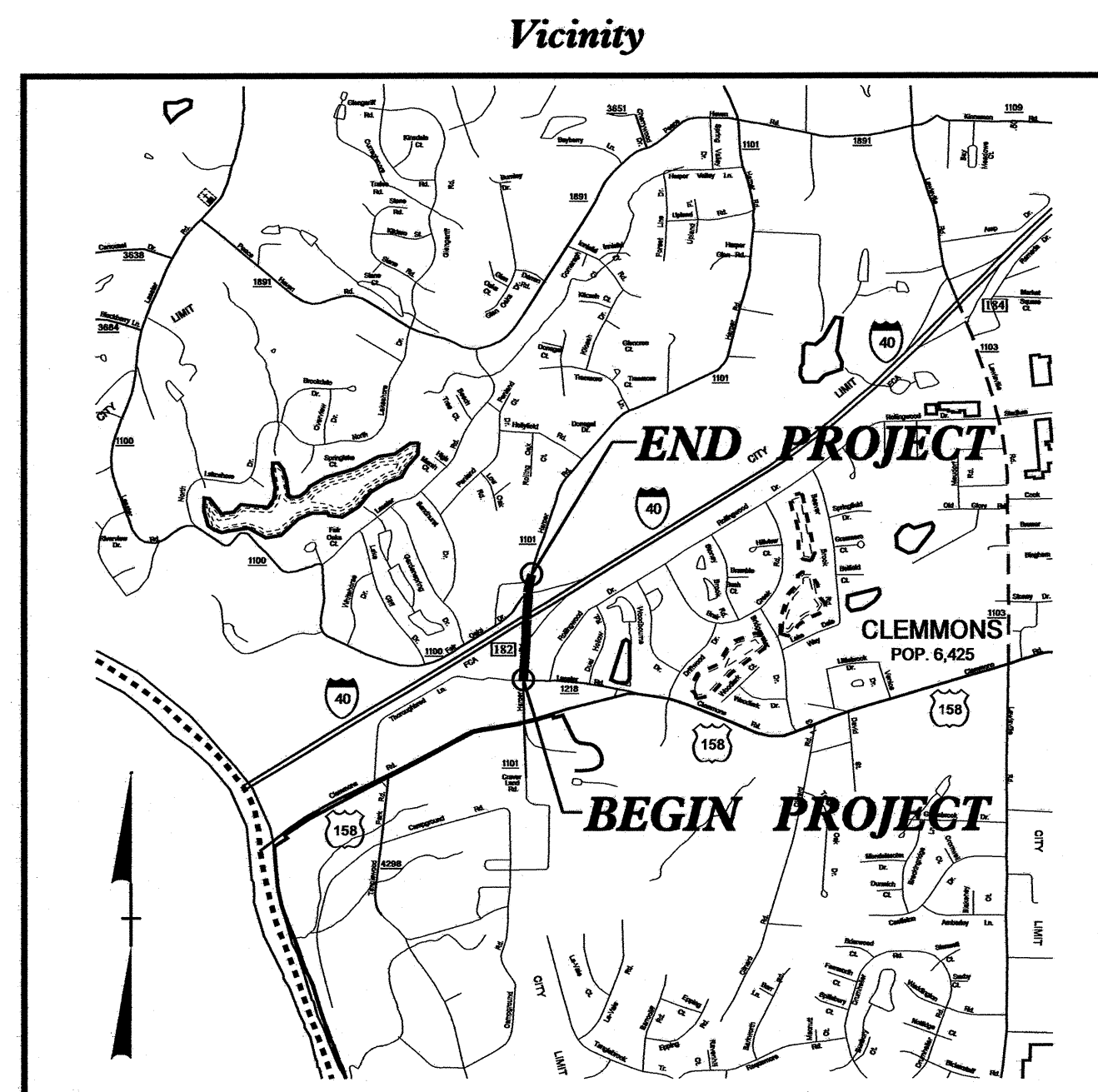
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

Forsyth County

LOCATION: I-40 at SR 1101 (Harper Road) interchange, approx. 0.9 miles east of the Yadkin River.

TYPE OF WORK: Structure, grading, widening, paving, drainage, resurfacing, and signals.

Project: I-2102



Refer to "Roadway Standard Drawings NCDOT" dated January 2002 and "Standard Specifications for Roads and Structures" dated January 2002.

Sheet #	Reference #	Index of Plans	Location/Description
Sig. 1	09-0763	Title Sheet	SR 1101 (Harper Road) at I-40 westbound off ramp
Sig. 2-13		2070 Cabinet Typicals	
Sig. 14			

TRAFFIC MANAGEMENT AND SIGNAL SYSTEMS UNIT

Contacts:

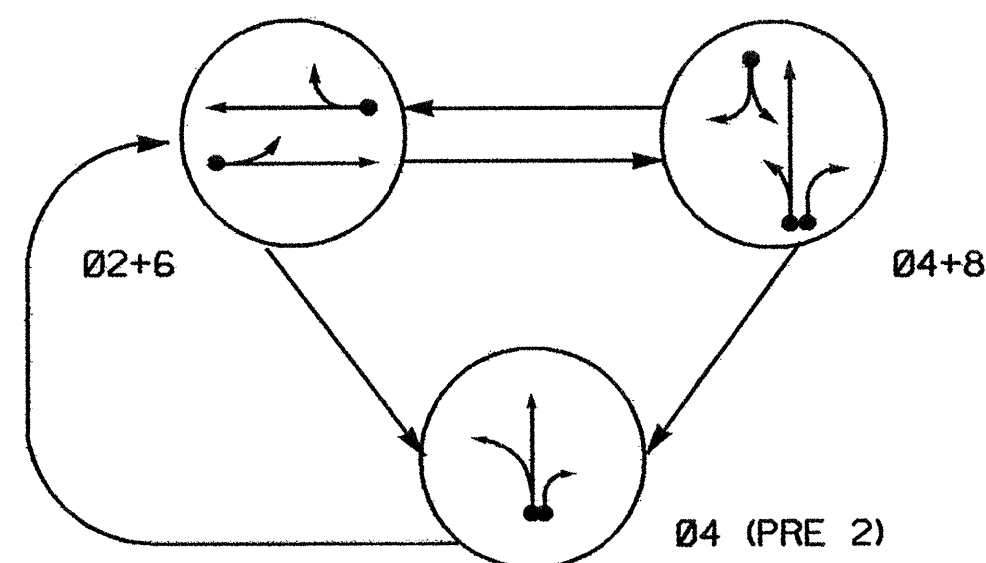
D. Y. Ishak - Signals and Geometrics Contracts Engineer
G. C. Brown, PE - Signal Equipment Design Engineer
G. G. Murr, Jr., PE - Intelligent Transportation Systems Engineer

Prepared In the Office of:
DIVISION OF HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS
BRANCH

122 N. McDowell St., Raleigh, NC 27603

I5-FEB-2006 09:52 s:\sig_signals\workgroups\tp_projects\I-2102\2005-updated_signal\titlesheet.dgn

PHASING DIAGRAM



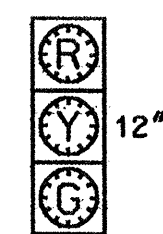
PHASING DIAGRAM DETECTION LEGEND

- ➔ DETECTED MOVEMENT
- ➔ UNDETECTED MOVEMENT (OVERLAP)
- ➔ UNSIGNALIZED MOVEMENT
- ➔ PEDESTRIAN MOVEMENT

SIGNAL FACE	PHASE			
	Ø2+6	Ø4+8	Ø4+2	Ø4+8
21,22	G	R	R	Y
41,42,43	R	G	G	R
61,62	G	R	R	Y
81,82,83	R	G	R	R

SIGNAL FACE I.D.

⊙ Denotes L.E.D.



21,22
41,42,43
61,62
81,82,83

2070L LOOP & DETECTOR INSTALLATION

LOOP	INDUCTIVE LOOPS				DETECTOR PROGRAMMING									
	SIZE (FT)	TURNS	DISTANCE FROM STOPBAR (FT)	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY SYSTEM LOOP	STRETCH TIME	DELAY TIME	QUEUE MAX OCCUPANCY TIME	QUEUE GAP RESET TIME	PREEMPT INDEX FOR QUEUE	NEW CARD
2A	*	*	300	*	2	Y	Y	-	1.8	-	-	-	-	Y
2B	6X6	4	90	Y	2	Y	Y	-	-	-	-	-	-	Y
4A	6X40	2-4-2	0	Y	4	Y	Y	-	-	-	-	-	-	Y
4B	6X40	2-4-2	0	Y	4	Y	Y	-	-	15	-	-	-	Y
6A	6x6	5	300	Y	6	Y	Y	-	1.8	-	-	-	-	Y
6B	6x6	4	90	Y	6	Y	Y	-	-	-	-	-	-	Y
8A	6x40	2-4-2	0	Y	8	Y	Y	-	-	3	-	-	-	Y
8B	6X40	2-4-2	0	Y	8	Y	Y	-	-	15	-	-	-	Y
**Q1	6X6	5	400	Y	PRE 2	-	-	-	-	-	5	0.1	2	Y

* Microwave Detection Zone
** See note 4

2 Phase Fully Actuated with Backup Preemption Isolated

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2002 and "Standard Specifications for Roads and Structures" dated January 2002.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Program controller to initiate backup preemption upon activation of queue backup loops.
- Set all detector units to presence mode.

PLAN QUANTITIES

Pay Item	Feet
Signal Cable	770
Messenger Cable	600
Lead-in Cable	1440

LEGEND

- | | | | |
|-----|---|-----|---|
| ⊙ | Proposed Traffic Signal Head | ⊙ | Existing Traffic Signal Head |
| ⊙ | Proposed Modified Signal Head | N/A | Existing Modified Signal Head |
| ⊙ | Proposed Pedestrian Signal Head With Push Button & Sign | N/A | Existing Pedestrian Signal Head With Push Button & Sign |
| ⊙ | Proposed Signal Pole with Guy | ⊙ | Existing Signal Pole with Guy |
| ⊙ | Proposed Signal Pole with Sidewalk Guy | ⊙ | Existing Signal Pole with Sidewalk Guy |
| ⊙ | Proposed Inductive Loop Detector | ⊙ | Existing Inductive Loop Detector |
| ⊙ | Proposed Controller & Cabinet | ⊙ | Existing Controller & Cabinet |
| ⊙ | Proposed Junction Box | ⊙ | Existing Junction Box |
| ⊙ | Proposed 2-in Underground Conduit | ⊙ | Existing 2-in Underground Conduit |
| N/A | Proposed Right of Way | ⊙ | Existing Right of Way |
| ➔ | Proposed Directional Arrow | ➔ | Existing Directional Arrow |
| ➔ | Proposed Pavement Marking Arrow | ➔ | Existing Pavement Marking Arrow |
| ⊙ | Proposed Microwave Detection Zone | ⊙ | Existing Microwave Detection Zone |
| ⊙ | Proposed Microwave Detector | ⊙ | Existing Microwave Detector |
| ⊙ | Proposed Construction Zone | ⊙ | Existing Construction Zone |
| ⊙ | Proposed "LEFT TURN YIELD ON GREEN" Sign (R10-12) | ⊙ | Existing "LEFT TURN YIELD ON GREEN" Sign (R10-12) |
| ⊙ | Proposed No Right Turn Sign (R3-1) | ⊙ | Existing No Right Turn Sign (R3-1) |
| ⊙ | Proposed No Left Turn Sign (R3-2) | ⊙ | Existing No Left Turn Sign (R3-2) |

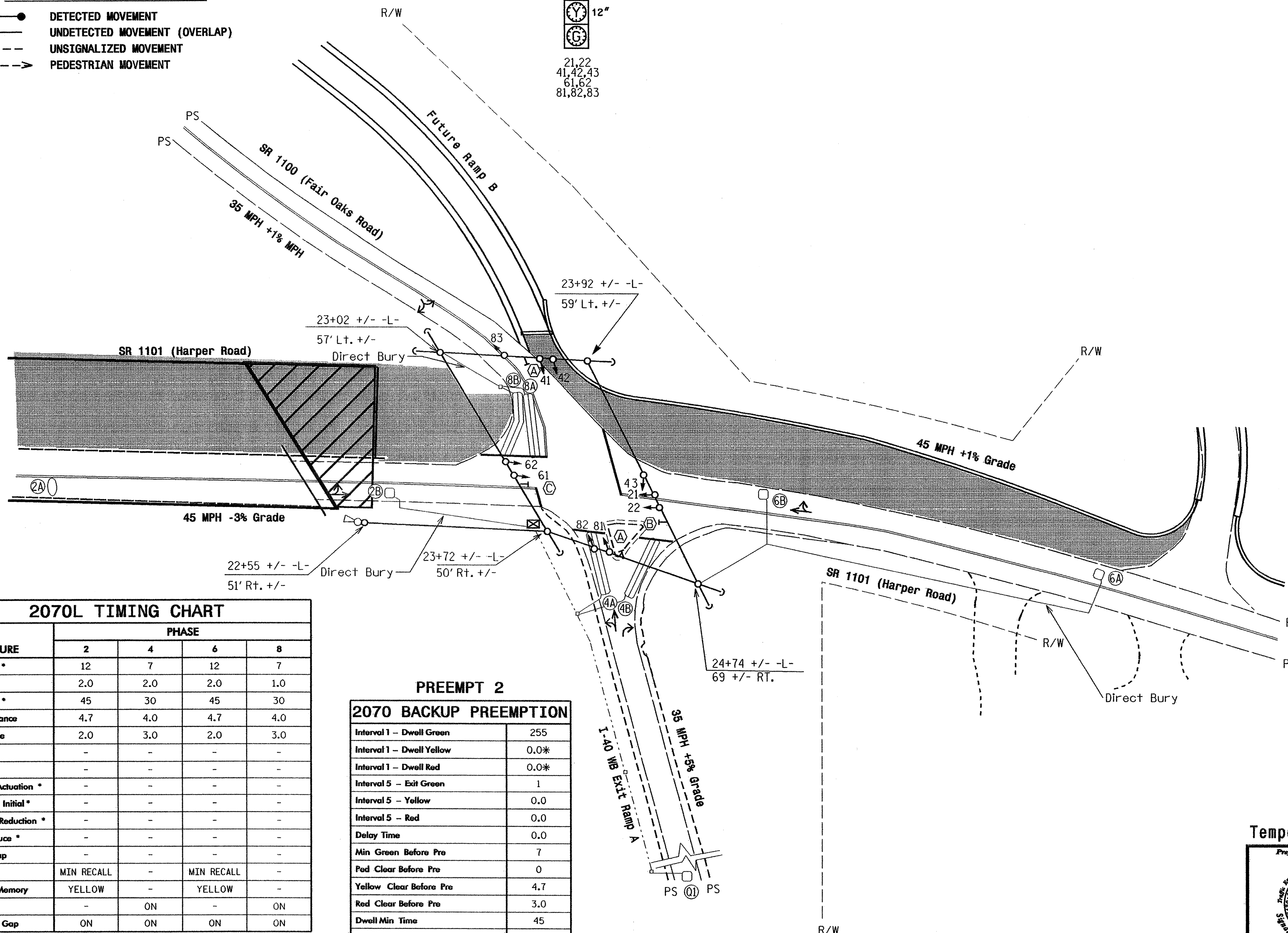
FEATURE	PHASE			
	2	4	6	8
Min Green 1 *	12	7	12	7
Extension 1 *	2.0	2.0	2.0	1.0
Max Green 1 *	45	30	45	30
Yellow Clearance	4.7	4.0	4.7	4.0
Red Clearance	2.0	3.0	2.0	3.0
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	-	-	-	-
Time To Reduce *	-	-	-	-
Minimum Gap	-	-	-	-
Recall Mode	MIN RECALL	-	MIN RECALL	-
Vehicle Call Memory	YELLOW	-	YELLOW	-
Dual Entry	-	ON	-	ON
Simultaneous Gap	ON	ON	ON	ON

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

PREEMPT 2

Interval	Value
Interval 1 - Dwell Green	255
Interval 1 - Dwell Yellow	0.0*
Interval 1 - Dwell Red	0.0*
Interval 5 - Exit Green	1
Interval 5 - Yellow	0.0
Interval 5 - Red	0.0
Delay Time	0.0
Min Green Before Pre	7
Pad Clear Before Pre	0
Yellow Clear Before Pre	4.7
Red Clear Before Pre	3.0
Dwell Min Time	45
Enable Backup Protection	Y
Pad Clear Through Yellow	N

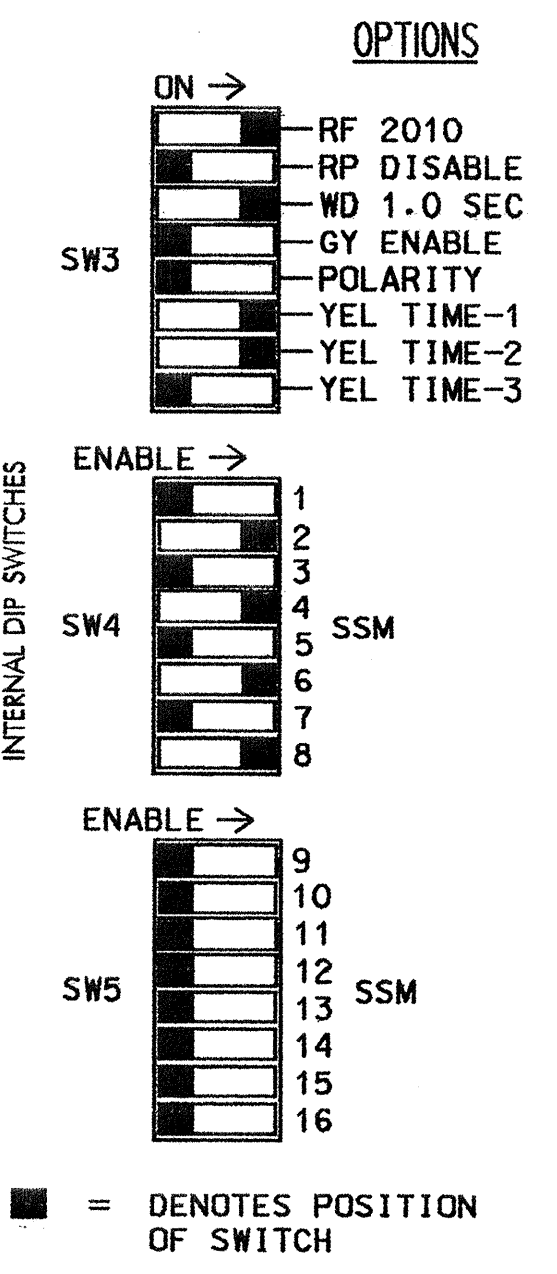
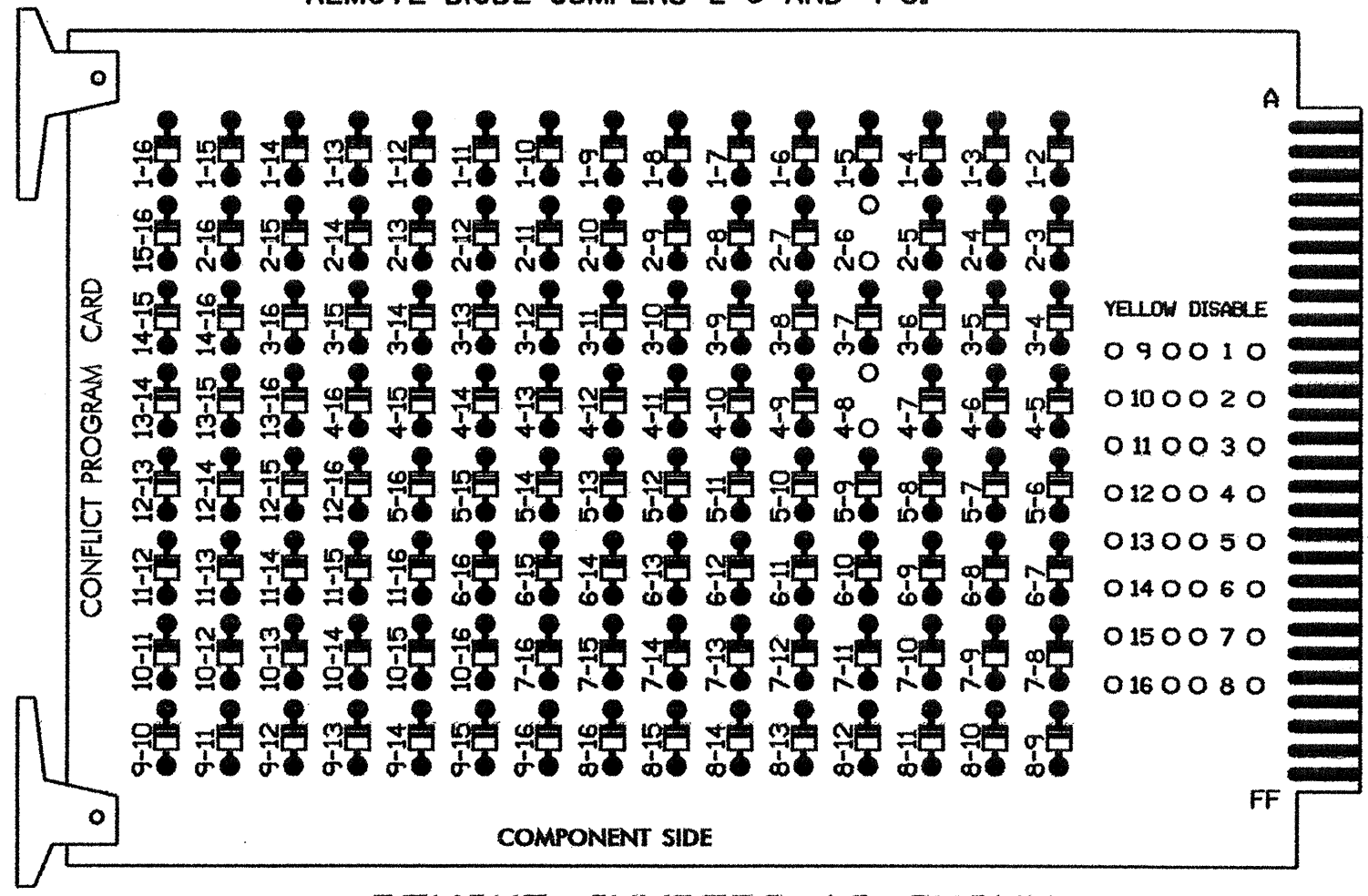
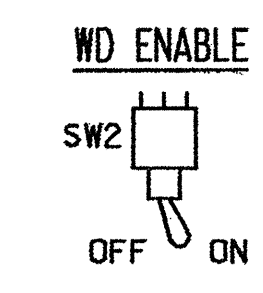
* Clearance time defaults to time used for phase during normal operation.



Temporary Signal 1 - TCP Phase I

	SR 1101 (Harper Road) At I-40 WB Exit Ramp A and SR 1100 (Fair Oaks Road)		
	Division 9 Forsyth County Clemmons		
	PLAN DATE: April 2004	REVIEWED BY: J. P. Galloway	
	PREPARED BY: C.J. Collins	REVIEWED BY:	
REVISIONS:			
SCALE: 1"=40'		INIT. DATE:	
SIGNATURE: <i>Timothy H. Williams</i> DATE: 7/1/04			
SIG. INVENTORY NO. 09-0763 T1			

EDI MODEL 2010ECL CONFLICT MONITOR PROGRAMMING DETAIL



NOTES:

- CARD IS PROVIDED WITH ALL DIODE JUMPERS IN PLACE. REMOVAL OF ANY JUMPER ALLOWS ITS CHANNELS TO RUN CONCURRENTLY.
- MAKE SURE JUMPERS SEL1-SEL5 ARE PRESENT ON THE MONITOR BOARD.

NOTES

- TO PREVENT "FLASH-CONFLICT" PROBLEMS, INSERT RED FLASH PROGRAM BLOCKS FOR ALL UNUSED VEHICLE LOAD SWITCHES IN THE OUTPUT FILE. THE INSTALLER SHALL VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
- ENSURE THAT RED ENABLE IS ACTIVE AT ALL TIMES DURING NORMAL OPERATION. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED RED MONITOR INPUTS 1,3,5, 7,9,10,11,12,13,14,15 & 16 TO LOAD SWITCH AC+ PER THE CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
- ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
- PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DUAL ENTRY.
- IF AN APPROVED EQUIVALENT OF THE TC-26B MICROWAVE DETECTOR IS USED, DISREGARD ASSOCIATED WIRING DETAIL SHOWN ELSEWHERE ON THIS SHEET. INSTALL ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS. SENSOR SHALL BE WIRED SUCH THAT INPUT INTERFACE TO THE CONTROLLER IS ACHIEVED THROUGH ISOLATION CIRCUITRY.

EQUIPMENT INFORMATION

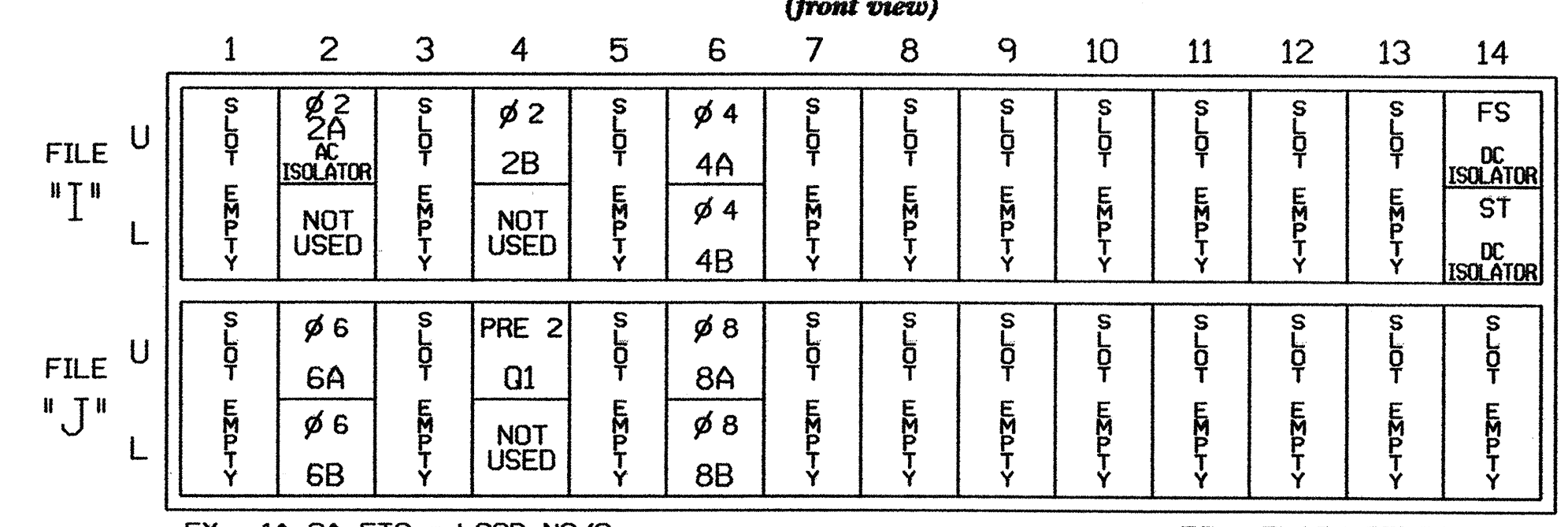
CONTROLLER.....CONTRACTOR SUPPLIED 2070L
 CABINETCONTRACTOR SUPPLIED 332
 SOFTWAREECONOLITE OASIS
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S2,S4,S6,S8
 PHASES USED.....2,4,6,8
 OVERLAPS.....NONE

FIELD CONNECTION HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2	3	4	4	5	6	6	7	8	8
SIGNAL HEAD NO.	NU	21,22	NU	NU	41 42,43	NU	NU	61,62	NU	NU	81 82,83	NU
GREEN		130			103			136			109	
YELLOW		129			102			135			108	
RED		128			101			134			107	
RED ARROW												
YELLOW ARROW												
GREEN ARROW												

NU = NOT USED

INPUT FILE POSITION LAYOUT (front view)



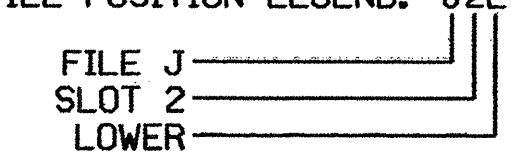
EX. : 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
 ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
2A	*	I2U	39	1	2	2	Y	Y		1.8	
2B	TB4-1,2	I4U	47	9	22	2	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			15
6A	TB3-5,6	J2U	40	2	6	6	Y	Y		1.8	
6B	TB3-7,8	J2L	44	6	16	6	Y	Y			
Q1	TB5-1,2	J4U	46	10	26	PRE 2					
8A	TB5-9,10	J6U	42	4	8	8	Y	Y			3
8B	TB5-11,12	J6L	46	8	18	8	Y	Y			15

* MICROWAVE DETECTOR. SEE WIRING DETAIL (MICROWAVE DETECTOR).
 INPUT FILE POSITION LEGEND: J2L



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-0763 T1
 DESIGNED: APRIL 2004
 SEALED: 07-01-04
 REVISED:

TEMPORARY SIGNAL 1 - SHEET 1 OF 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1101 (HARPER ROAD)
 AT
 I-40 WB EXIT RAMP A AND
 SR 1100 (FAIR OAKS ROAD)

DIVISION 09 FORSYTH COUNTY CLEMMONS

PLAN DATE: JUNE 2004 REVIEWED BY: *R. Peterson*

PREPARED BY: JAMES PETERSON REVIEWED BY:

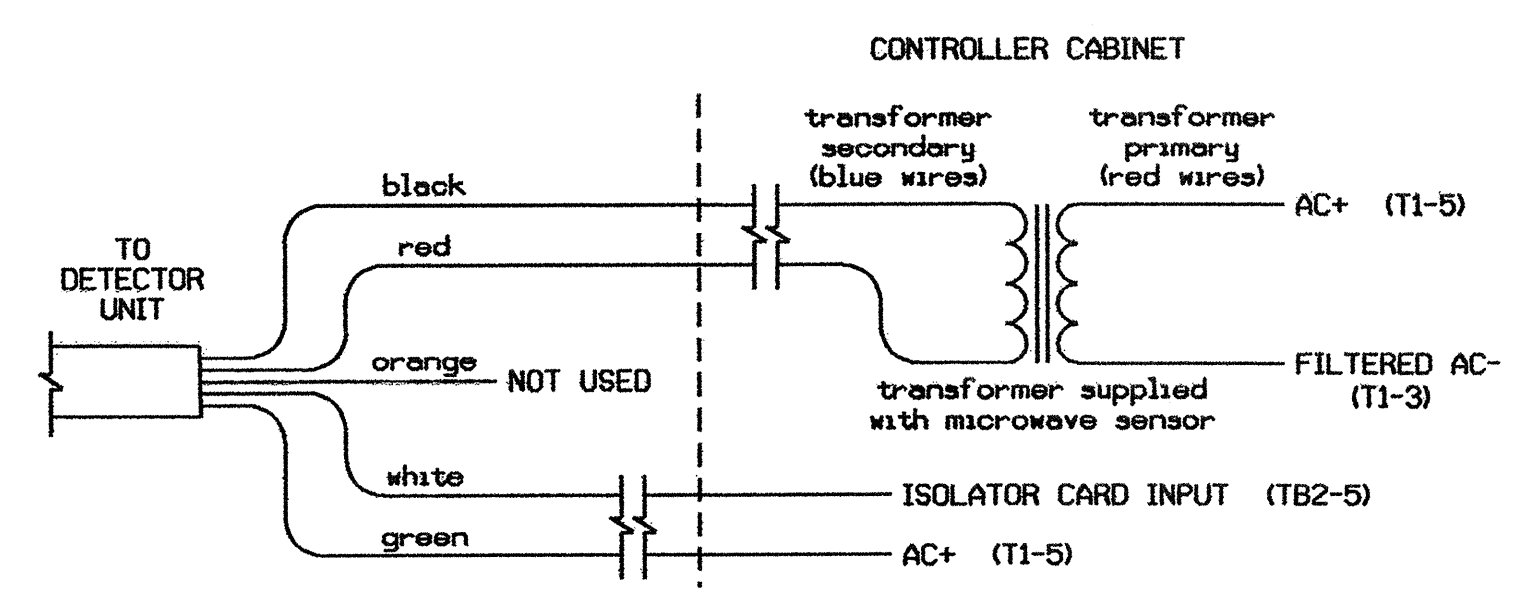
REVISIONS: _____ INT. DATE _____

Signature: *James Peterson* 7/12/04

SIG. INVENTORY NO. 09-0763 T1

MICROWAVE DETECTOR WIRING DETAIL

(wire as shown)



TC26B WIRE LIST

COLOR	FUNCTION
black	12V to 24V AC/DC (no polarity)
red	12V to 24V AC/DC (no polarity)
orange	Output Relay Normally Open
white	Output Relay Normally Closed
green	Output Relay Normally Common

NOTES:

1. SENSOR IS A MICROWAVE SENSORS, INC. MODEL TC-26B MICROWAVE MOTION DETECTOR MOUNTED ON POLES AS INDICATED ON SIGNAL DESIGN PLANS.
2. CONFIGURE AC ISOLATOR CARD TO PLACE CALL UPON REMOVAL OF AC+ FROM THE INPUT.
3. IMPORTANT: FOR PROPER OPERATION OF THE MICROWAVE DETECTOR, REMOVE SURGE PROTECTION FROM TB2-5 AND TB2-6. TIE TB2-6 TO AC NEUTRAL.

QUEUE PREEMPTION PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS 'A' (PREEMPTION), THEN '1' (STANDARD PREEMPTIONS). PRESS '+' UNTIL PREEMPTION #2 IS REACHED.

PREEMPTION #2	INTERVAL/TIMING	SETTINGS (NEXT:1-10)	CLEAR/DWELL PHASES
	GRN YEL RED		12345678910111213141516
1	255 0.0 0.0		X
2	0 0.0 0.0		
3	0 0.0 0.0		
4	0 0.0 0.0		
5	1 0.0 0.0	X X	

EXIT CALLS

OPTIONS

PRIORITY (Y/N TO SELECT)MED
 DELAY TIMER (0-255 SEC)0.0
 MIN GREEN BEFORE PRE (0= DEFAULT)....7
 PED CLEAR BEFORE PRE (0= DEFAULT)....0
 YELLOW CLEAR BEFORE PRE (0= DEFAULT)....4.7
 RED CLEAR BEFORE PRE (0= DEFAULT)....3.0
 DWELL MIN TIMER (0-255 SEC)45
 DWELL MAX TIMER (0=OFF,1-255MIN)0
 DWELL HOLD-OVER TIMER (0-255)0
 LATCH CALL?N
 LINK TO NEXT PREEMPT?N
 ENABLE BACKUP PROTECTION?Y
 HOLD CLEAR 1 PHASES DURING DELAY? ...N
 FAST GREEN FLASH DWELL PHASES?N
 PED CLEARANCE THROUGH YELLOW?N
 INHIBIT OVERLAP GREEN EXTENSION? ...N
 SERVICE DURING SOFTWARE FLASH?Y
 REST IN RED DURING DWELL INTERVAL? ..N
 FLASH DWELL INTERVAL?N
 ALLOW PEDS IN DWELL INTERVAL?N
 RE-TIME DWELL INTERVAL?N
 OVERLAPS: ABCDEFGHIJKLMNOP
 DWELL INT FLASH YELLOW
 OMIT OVERLAPS:

VEHICLE DETECTOR #26 SETTINGS

(program controller as shown below)

FROM MAIN MENU PRESS '7' (DETECTORS), THEN '1' (VEHICLE DETECTOR ASSIGNMENTS). PRESS '+' UNTIL DETECTOR #26 IS REACHED.

VEHICLE DETECTOR #26 SETTINGS (+,-,1-64)

SETTING: (Y/N)

ENABLE DETECTOR.....Y
 ENABLE LOGGING.....Y
 ENABLE DIAGNOSTICS.....Y
 SPEED TRAP.....N
 CALL DETECTOR.....N
 EXTENSION DETECTOR.....N
 MODE 2 STOP BAR.....N
 SWITCHING DETECTOR.....N
 DUPLICATING DETECTOR.....N
 ENABLE FULL TIME DELAY.....Y
 IF FAILED, SET MIN RECALL?.....N
 IF FAILED, SET MAX1 RECALL?.....N
 IF FAILED, SET MAX2 RECALL?.....N
 PHASE# :12345678910111213141516
 PHASES ASSIGNED :
 SWITCH/DUPLICATE:
 LOOP SIZE (0-255 FT).....6
 SPEED TRAP DISTANCE (0-255 FT).....0
 STOP BAR TIME (0-255 SEC).....0
 STRETCH (0-25.5 SEC).....0.0
 DELAY (0-255 SEC).....0
 MAX CALLS/MIN (0-255).....255
 MIN CALLS/DIAGNOSTIC PERIOD (0-255).....0
 MAX OCCUPANCY (0-100%).....100
 EXTENSION DISABLE TIME (0-255 SEC).....0
 QUEUE MAX OCCUPANCY TIME (0-255).....5
 QUEUE GAP RESET TIME (0-25.5).....0.1
 PREEMPTION INDEX FOR QUEUE (0-10)....2

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-0763 T1
 DESIGNED: APRIL 2004
 SEALED: 07-01-04
 REVISED:

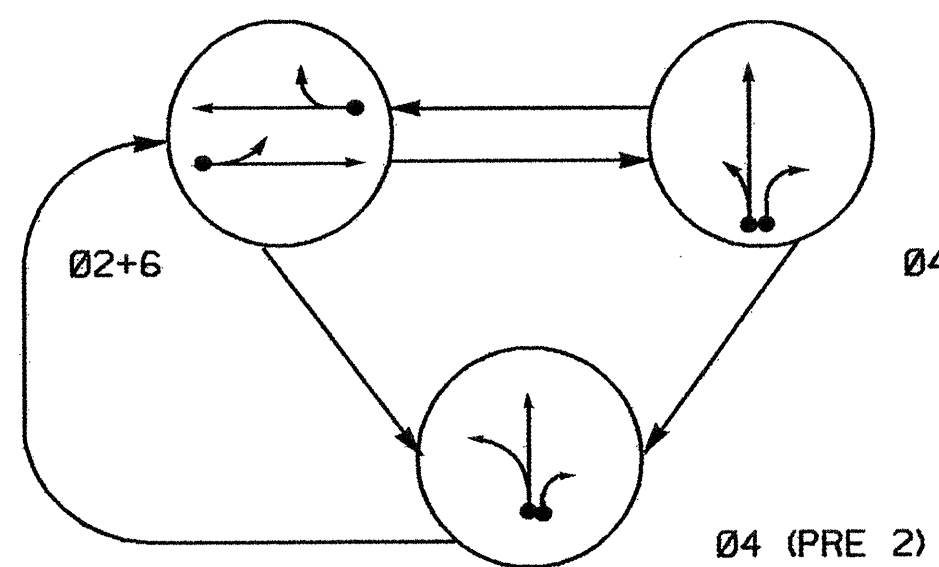
TEMPORARY SIGNAL 1 - SHEET 2 OF 2

	SR 1101 (HARPER ROAD) AT I-40 WB EXIT RAMP A AND SR 1100 (FAIR OAKS ROAD)		
	DIVISION 09 FORSYTH COUNTY CLEMMONS PLAN DATE: JUNE 2004 PREPARED BY: JAMES PETERSON REVIEWED BY: <i>[Signature]</i>	REVIEWED BY: <i>[Signature]</i> REVISIONS INIT. DATE	

122 N. McDowell St., Raleigh, NC 27603

12-JUL-2004 11:31
 J:\090763\...xwe.dgn
 J. Peterson

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

- ◐ → DETECTED MOVEMENT
- ◑ → UNDETECTED MOVEMENT (OVERLAP)
- - - → UNSIGNALIZED MOVEMENT
- ◕ → PEDESTRIAN MOVEMENT

SIGNAL FACE	PHASE			
	PHASE 2	PHASE 4	PHASE 6	PHASE PRE 2
21,22	G	R	R	Y
41,42,43	R	G	G	R
61,62	G	R	R	Y

SIGNAL FACE I.D.

- ⊙ Denotes L.E.D.
- ⊙ 12"
- ⊙ 21,22
- ⊙ 41,42,43
- ⊙ 61,62

2070L LOOP & DETECTOR INSTALLATION

INDUCTIVE LOOPS					DETECTOR PROGRAMMING										
LOOP	SIZE (FT)	TURNS	DISTANCE FROM STOPBAR (FT)	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	SYSTEM LOOP	STRETCH TIME	DELAY TIME	QUEUE MAX OCCUPANCY TIME	QUEUE GAP RESET TIME	PREEMPT INDEX FOR QUEUE	NEW CARD
2A	*	*	300	*	2	Y	Y	-	-	1.8	-	-	-	-	Y
2B	6X6	4	90	Y	2	Y	Y	-	-	-	-	-	-	-	Y
4A	6X40	2-4-2	0	Y	4	Y	Y	-	-	-	-	-	-	-	Y
4B	6X40	2-4-2	0	Y	4	Y	Y	-	-	-	15	-	-	-	Y
6A	6x6	5	300	Y	6	Y	Y	-	-	1.8	-	-	-	-	Y
6B	6x6	4	90	Y	6	Y	Y	-	-	-	-	-	-	-	Y
**Q1	6X6	5	400	Y	PRE 2	-	-	-	-	-	-	5	0.1	2	-

* Microwave Detection Zone
** See note 4

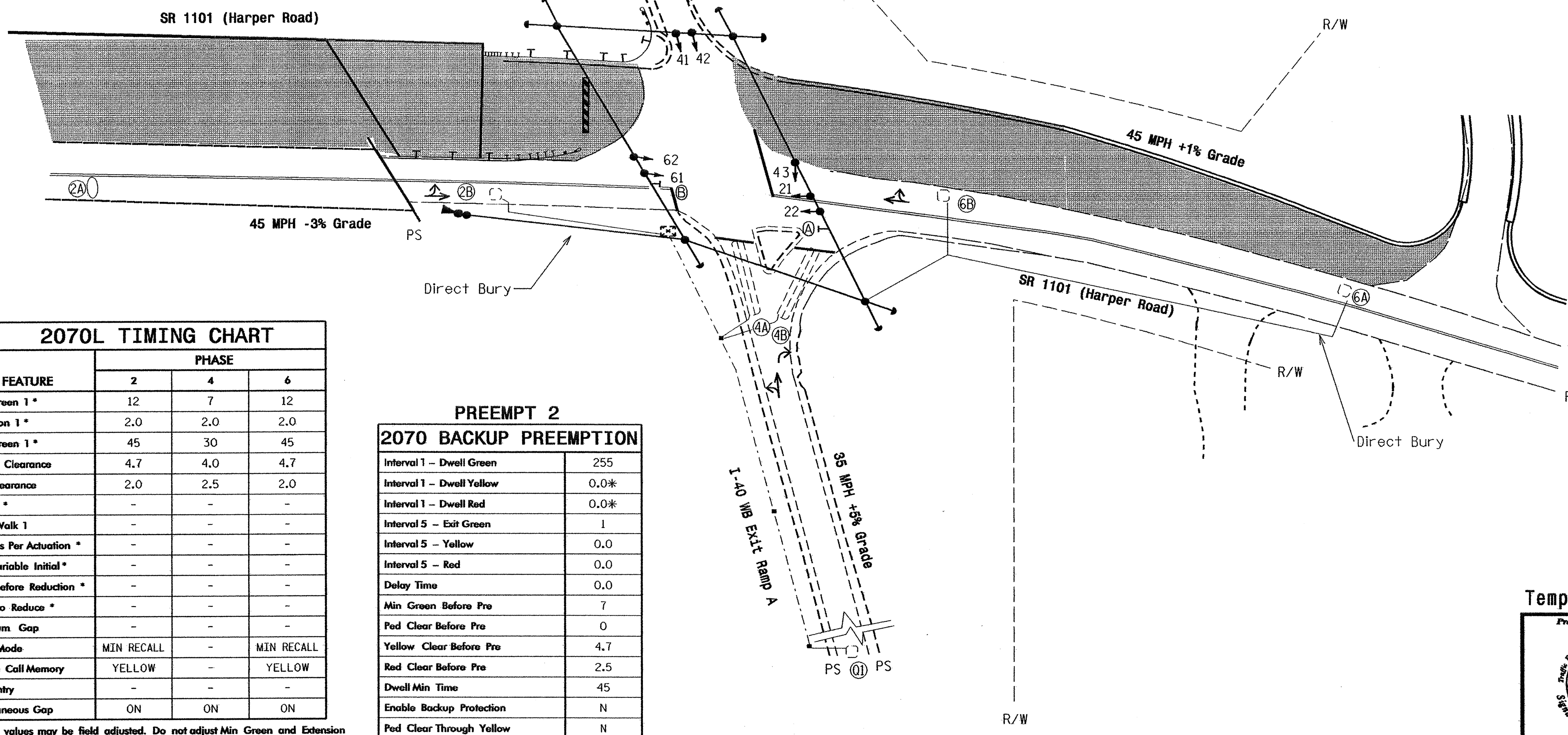
2 Phase Fully Actually with Backup Preemption Isolated

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2002 and "Standard Specifications for Roads and Structures" dated January 2002.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Set all detector units to presence mode.
- Program controller to initiate backup preemption upon activation of of queue backup loops.

PLAN QUANTITIES

Pay Item	Feet
Signal Cable	-
Messenger Cable	-
Lead-in Cable	-



2070L TIMING CHART

FEATURE	PHASE		
	2	4	6
Min Green 1 *	12	7	12
Extension 1 *	2.0	2.0	2.0
Max Green 1 *	45	30	45
Yellow Clearance	4.7	4.0	4.7
Red Clearance	2.0	2.5	2.0
Walk 1 *	-	-	-
Don't Walk 1	-	-	-
Seconds Per Actuation *	-	-	-
Max Variable Initial *	-	-	-
Time Before Reduction *	-	-	-
Time To Reduce *	-	-	-
Minimum Gap	-	-	-
Recall Mode	MIN RECALL	-	MIN RECALL
Vehicle Call Memory	YELLOW	-	YELLOW
Dual Entry	-	-	-
Simultaneous Gap	ON	ON	ON

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

PREEMPT 2

2070L BACKUP PREEMPTION	
Interval 1 - Dwell Green	255
Interval 1 - Dwell Yellow	0.0*
Interval 1 - Dwell Red	0.0*
Interval 5 - Exit Green	1
Interval 5 - Yellow	0.0
Interval 5 - Red	0.0
Delay Time	0.0
Min Green Before Pre	7
Ped Clear Before Pre	0
Yellow Clear Before Pre	4.7
Red Clear Before Pre	2.5
Dwell Min Time	45
Enable Backup Protection	N
Ped Clear Through Yellow	N

* Clearance time defaults to time used for phase during normal operation.

LEGEND

- | PROPOSED | EXISTING |
|--|-------------|
| ◐ → Traffic Signal Head | ◐ → N/A |
| ◑ → Modified Signal Head | ◑ → N/A |
| ◕ → Sign | ◕ → N/A |
| ◕ → Pedestrian Signal Head With Push Button & Sign | ◕ → N/A |
| ⊙ → Signal Pole with Guy | ⊙ → N/A |
| ⊙ → Signal Pole with Sidewalk Guy | ⊙ → N/A |
| ⊙ → Inductive Loop Detector | ⊙ → N/A |
| ⊙ → Controller & Cabinet | ⊙ → N/A |
| ⊙ → Junction Box | ⊙ → N/A |
| - - - → 2-in Underground Conduit | - - - → N/A |
| - - - → Right of Way | - - - → N/A |
| → → Directional Arrow | → → N/A |
| → → Pavement Marking Arrow | → → N/A |
| ◕ → Microwave Detection Zone | ◕ → N/A |
| ◕ → Microwave Detector | ◕ → N/A |
| ◕ → Construction Zone | ◕ → N/A |
| ⊙ (A) → No Right Turn Sign (R3-1) | ⊙ (A) → N/A |
| ⊙ (B) → No Left Turn Sign (R3-2) | ⊙ (B) → N/A |

Temporary Signal 2 - TCP Phase I

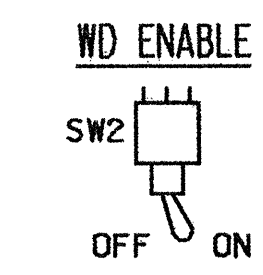
Prepared in the Offices of:

SR 1101 (Harper Road) At I-40 WB Exit Ramp A
 Division 9 Forsyth County Clemmons
 PLAN DATE: April 2004 REVIEWED BY: J. P. Galloway
 PREPARED BY: C.J. Collins REVIEWED BY:
 SCALE: 1"=40'

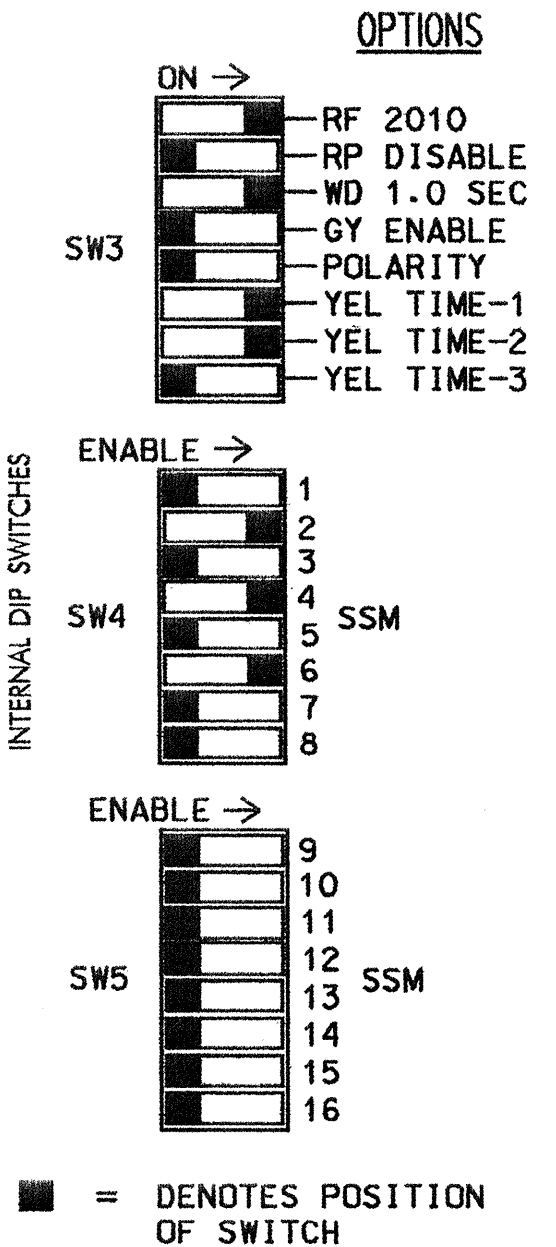
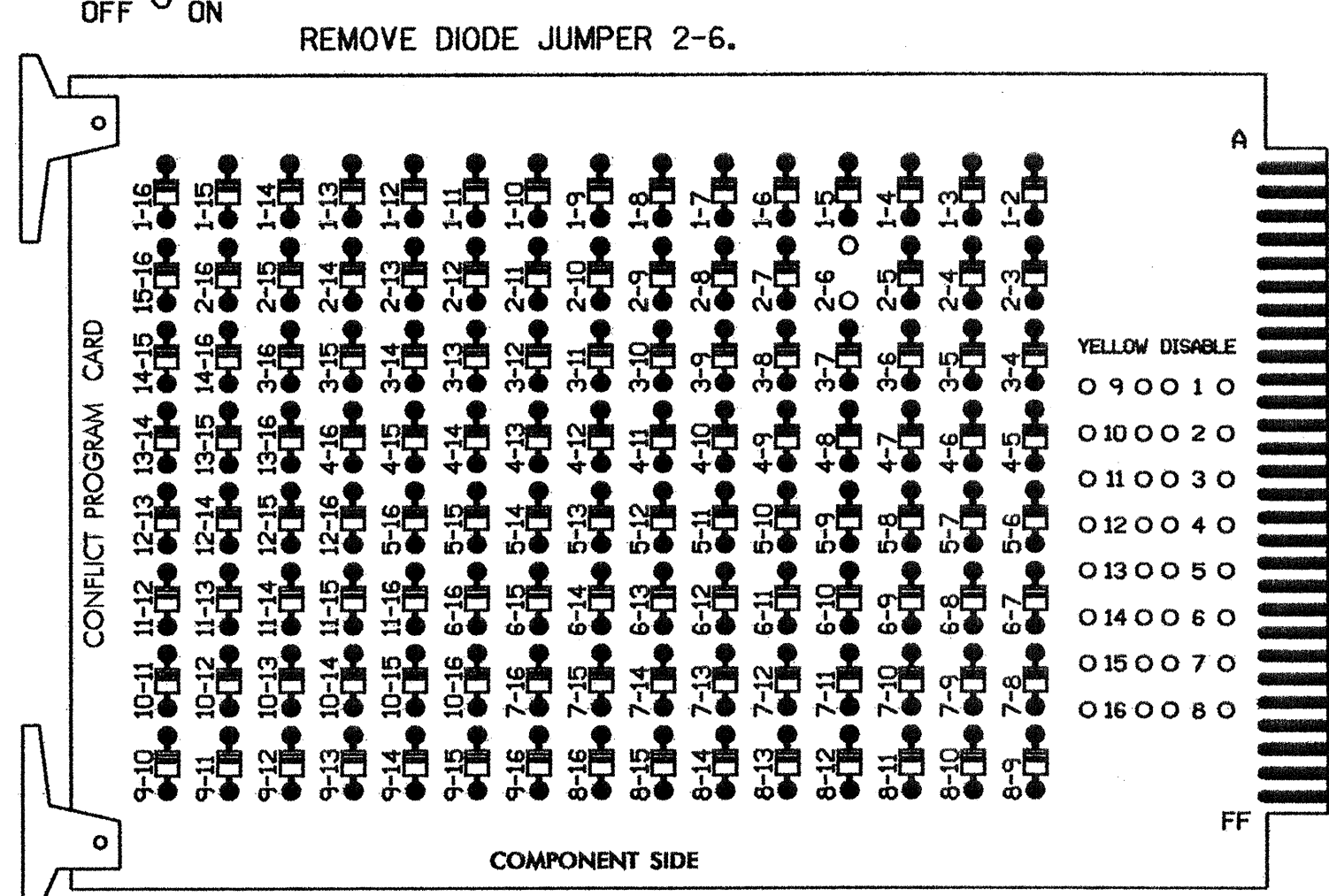
 REVISIONS: _____ INIT. DATE: _____
 SIGNATURE: _____ DATE: 7/1/04
 SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 24393 TWOTHY J. WILLIAMS
 SIG. INVENTORY NO. 09-0763 T2

EDI MODEL 2010ECL CONFLICT MONITOR

PROGRAMMING DETAIL



(remove jumpers and set switches as shown)



NOTES:

- CARD IS PROVIDED WITH ALL DIODE JUMPERS IN PLACE. REMOVAL OF ANY JUMPER ALLOWS ITS CHANNELS TO RUN CONCURRENTLY.
- MAKE SURE JUMPERS SEL1-SEL5 ARE PRESENT ON THE MONITOR BOARD.

NOTES

- TO PREVENT "FLASH-CONFLICT" PROBLEMS, INSERT RED FLASH PROGRAM BLOCKS FOR ALL UNUSED VEHICLE LOAD SWITCHES IN THE OUTPUT FILE. THE INSTALLER SHALL VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
- ENSURE THAT RED ENABLE IS ACTIVE AT ALL TIMES DURING NORMAL OPERATION. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED RED MONITOR INPUTS 1,3,5,7, 8,9,10,11,12,13,14,15 & 16 TO LOAD SWITCH AC+ PER THE CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
- ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
- IF AN APPROVED EQUIVALENT OF THE TC-26B MICROWAVE DETECTOR IS USED, DISREGARD ASSOCIATED WIRING DETAIL SHOWN ELSEWHERE ON THIS SHEET. INSTALL ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS. SENSOR SHALL BE WIRED SUCH THAT INPUT INTERFACE TO THE CONTROLLER IS ACHIEVED THROUGH ISOLATION CIRCUITRY.

FIELD CONNECTION HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	41, 42,43	NU	NU	61,62	NU	NU	NU	NU
GREEN		130			103			136				
YELLOW		129			102			135				
RED		128			101			134				
RED ARROW												
YELLOW ARROW												
GREEN ARROW												

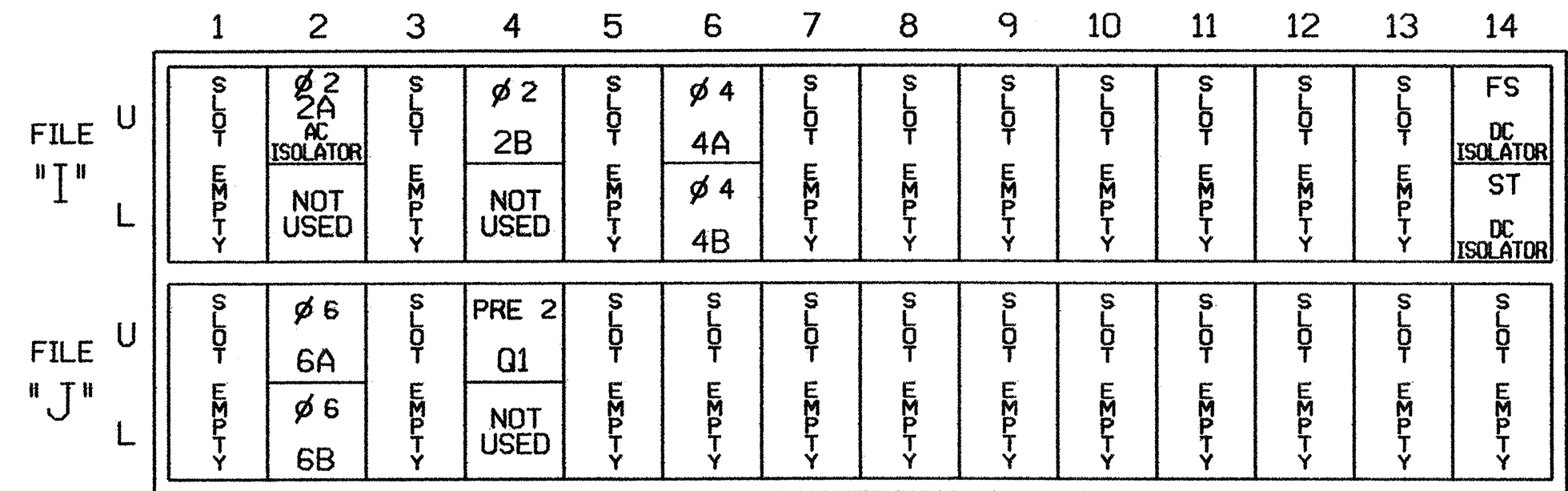
NU = NOT USED

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
 CABINETCONTRACTOR SUPPLIED 332
 SOFTWAREECONOLITE OASIS
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S2,S4,S6
 PHASES USED.....2,4,6
 OVERLAPS.....NONE

INPUT FILE POSITION LAYOUT

(front view)



EX. : 1A, 2A, ETC. = LOOP NO.'S

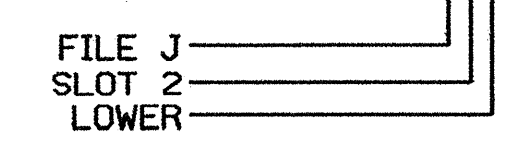
FS = FLASH SENSE
 ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
2A	*	I2U	39	1	2	2	Y	Y		1.8	
2B	TB4-1,2	I4U	47	9	22	2	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			15
6A	TB3-5,6	J2U	40	2	6	6	Y	Y		1.8	
6B	TB3-7,8	J2L	44	6	16	6	Y	Y			
Q1	TB5-1,2	J4U	48	10	26	PRE 2					

*MICROWAVE DETECTOR. SEE WIRING DETAIL (MICROWAVE DETECTOR).

INPUT FILE POSITION LEGEND: J2L



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-0763 T2
 DESIGNED: APRIL 2004
 SEALED: 07/01/04
 REVISED:

TEMPORARY SIGNAL 2 - SHEET 1 OF 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:
 Prepared in the Office of:

 122 N. McDowell St., Raleigh, NC 27603

SR 1101 (HARPER ROAD) AT I-40 WB EXIT RAMP A
 DIVISION 09 FORSYTH COUNTY CLEMMONS
 PLAN DATE: JUNE 2004 REVIEWED BY: P. Hester
 PREPARED BY: JAMES PETERSON REVIEWED BY:
 REVISIONS INIT. DATE

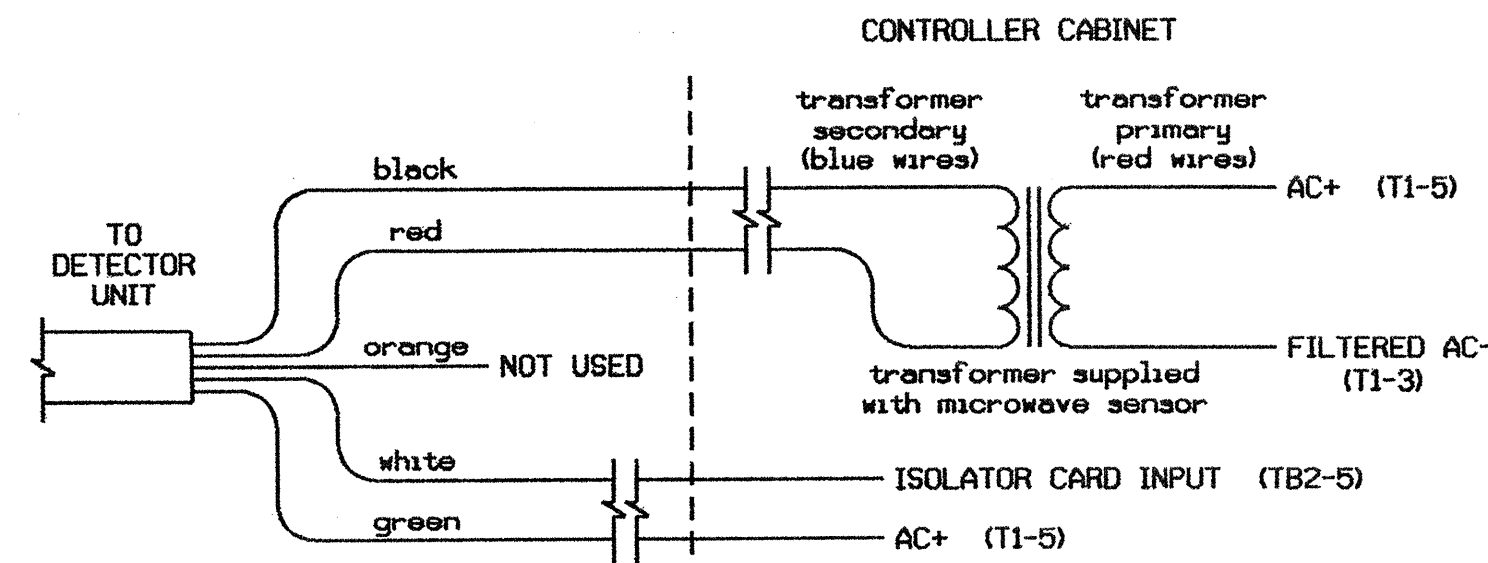
SEAL

 SIGNATURE: George C. Brown DATE: 7/13/04
 SIG. INVENTORY NO. 09-0763 T2

12-JUL-2004 14:32
 U:\090763_xxxx.dgn
 jpeterson

MICROWAVE DETECTOR WIRING DETAIL

(wire as shown)



TC26B WIRE LIST

COLOR	FUNCTION
black	12V to 24V AC/DC (no polarity)
red	12V to 24V AC/DC (no polarity)
orange	Output Relay Normally Open
white	Output Relay Normally Closed
green	Output Relay Normally Common

NOTES:

1. SENSOR IS A MICROWAVE SENSORS, INC. MODEL TC-26B MICROWAVE MOTION DETECTOR MOUNTED ON POLES AS INDICATED ON SIGNAL DESIGN PLANS.
2. CONFIGURE AC ISOLATOR CARD TO PLACE CALL UPON REMOVAL OF AC+ FROM THE INPUT.
3. IMPORTANT: FOR PROPER OPERATION OF THE MICROWAVE DETECTOR, REMOVE SURGE PROTECTION FROM TB2-5 AND TB2-6. TIE TB2-6 TO AC NEUTRAL.

QUEUE PREEMPTION PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS 'A' (PREEMPTION), THEN '1' (STANDARD PREEMPTIONS). PRESS '+' UNTIL PREEMPTION #2 IS REACHED

PREEMPTION #2	SETTINGS (NEXT:1-10)
INTERVAL/TIMING	CLEAR/DWELL PHASES
GRN YEL RED	12345678910111213141516
1 255 0.0 0.0	X
2 0 0.0 0.0	
3 0 0.0 0.0	
4 0 0.0 0.0	
5 1 0.0 0.0	X X

EXIT CALLS

OPTIONS

PRIORITY (Y/N TO SELECT)MED

DELAY TIMER (0-255 SEC)0.0

MIN GREEN BEFORE PRE (0= DEFAULT)....7

PED CLEAR BEFORE PRE (0= DEFAULT)....0

YELLOW CLEAR BEFORE PRE (0= DEFAULT)....4.7

RED CLEAR BEFORE PRE (0= DEFAULT)....2.5

DWELL MIN TIMER (0-255 SEC)45

DWELL MAX TIMER (0-OFF,1-255MIN)0

DWELL HOLD-OVER TIMER (0-255)0

LATCH CALL?N

LINK TO NEXT PREEMPT?N

ENABLE BACKUP PROTECTION?N

HOLD CLEAR 1 PHASES DURING DELAY? ...N

FAST GREEN FLASH DWELL PHASES?N

PED CLEARANCE THROUGH YELLOW?N

INHIBIT OVERLAP GREEN EXTENSION? ...N

SERVICE DURING SOFTWARE FLASH?Y

REST IN RED DURING DWELL INTERVAL? ..N

FLASH DWELL INTERVAL?N

ALLOW PEDS IN DWELL INTERVAL?N

RE-TIME DWELL INTERVAL?N

OVERLAPS: ABCDEFGHIJKLMNOP

DWELL INT FLASH YELLOW

OMIT OVERLAPS:

VEHICLE DETECTOR #26 SETTINGS

(program controller as shown below)

FROM MAIN MENU PRESS '7' (DETECTORS), THEN '1' (VEHICLE DETECTOR ASSIGNMENTS). PRESS '+' UNTIL DETECTOR #26 IS REACHED.

VEHICLE DETECTOR #26 SETTINGS (+,1-64)

SETTING: (Y/N)

ENABLE DETECTOR.....Y

ENABLE LOGGING.....Y

ENABLE DIAGNOSTICS.....Y

SPEED TRAP.....N

CALL DETECTOR.....N

EXTENSION DETECTOR.....N

MODE 2 STOP BAR.....N

SWITCHING DETECTOR.....N

DUPLICATING DETECTOR.....N

ENABLE FULL TIME DELAY.....N

IF FAILED, SET MIN RECALL?.....Y

IF FAILED, SET MAX1 RECALL?.....N

IF FAILED, SET MAX2 RECALL?.....N

PHASE# :12345678910111213141516

PHASES ASSIGNED :

SWITCH/DUPLICATE:

LOOP SIZE (0-255 FT).....6

SPEED TRAP DISTANCE (0-255 FT).....0

STOP BAR TIME (0-255 SEC).....0

STRETCH (0-25.5 SEC).....0.0

DELAY (0-255 SEC).....0

MAX CALLS/MIN (0-255).....255

MIN CALLS/DIAGNOSTIC PERIOD (0-255).....0

MAX OCCUPANCY (0-100%).....100

EXTENSION DISABLE TIME (0-255 SEC).....0

QUEUE MAX OCCUPANCY TIME (0-255).....5

QUEUE GAP RESET TIME (0-25.5).....0.1

PREEMPTION INDEX FOR QUEUE (0-10)....2

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-0763 T2
 DESIGNED: APRIL 2004
 SEALED: 07-01-04
 REVISED:

TEMPORARY SIGNAL 2 - SHEET 2 OF 2

	ELECTRICAL AND PROGRAMMING DETAILS FOR:		SR 1101 (HARPER ROAD) AT I-40 WB EXIT RAMP A	SEAL NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 022013 GEORGE C. BROWN
	DIVISION 09 FORSYTH COUNTY CLEMMONS	PLAN DATE: JUNE 2004		
PREPARED BY: JAMES PETERSON	REVIEWED BY:	REVISIONS	INIT.	DATE
122 N. McDowell St., Raleigh, NC 27603		SIGNATURE: <i>James C. Brown</i> DATE: <i>7/2/04</i>		

SIG. INVENTORY NO. 09-0763 T2

PHASING DIAGRAM

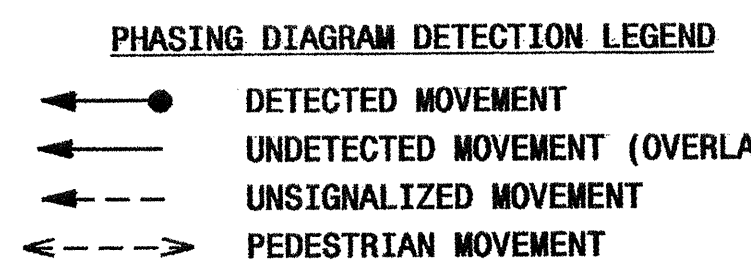
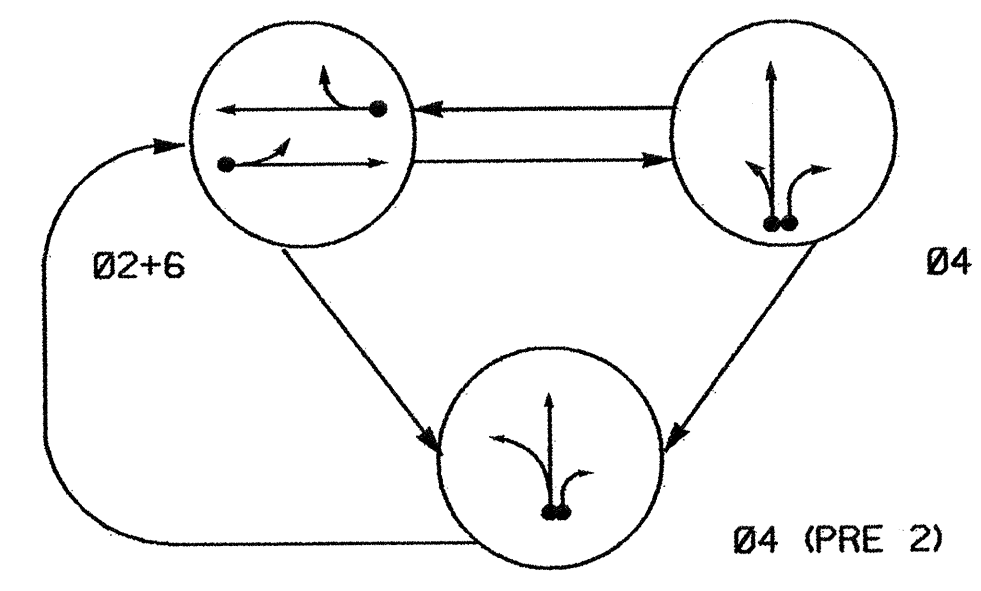
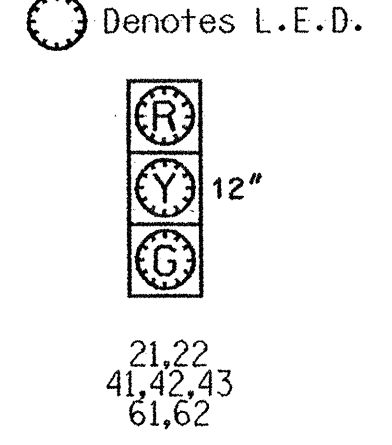


TABLE OF OPERATION

SIGNAL FACE	PHASE			
	SIN+6	04	PRE 2	FLASH
21,22	G	R	R	Y
41,42,43	R	G	G	R
61,62	G	R	R	Y

SIGNAL FACE I.D.



2070L LOOP & DETECTOR INSTALLATION

LOOP	SIZE (FT)	TURNS	DISTANCE FROM STOPBAR (FT)	NEW LOOP	DETECTOR PROGRAMMING											
					PHASE	CALLING	EXTENSION	FULL TIME DELAY	SYSTEM LOOP	STRETCH TIME	DELAY TIME	QUEUE MAX OCCUPANCY TIME	QUEUE GAP RESET TIME	PREEMPT INDEX FOR QUEUE	NEW CARD	
2A	*	*	275	*	2	Y	Y	-	-	1.9	-	-	-	-	-	Y
2B	6X6	4	45	Y	2	Y	Y	-	-	-	-	-	-	-	-	Y
4A	6x40	2-4-2	0	Y	4	Y	Y	-	-	3	-	-	-	-	-	Y
4B	6X40	2-4-2	0	Y	4	Y	Y	-	-	15	-	-	-	-	-	Y
6A	6x6	5	300	Y	6	Y	Y	-	-	1.8	-	-	-	-	-	Y
6B	6x6	4	90	Y	6	Y	Y	-	-	-	-	-	-	-	-	Y
**Q1	6X6	5	460	-	PRE 2	-	-	-	-	-	5	0.1	2	-	-	-

* Microwave Detection Zone
** See note 5

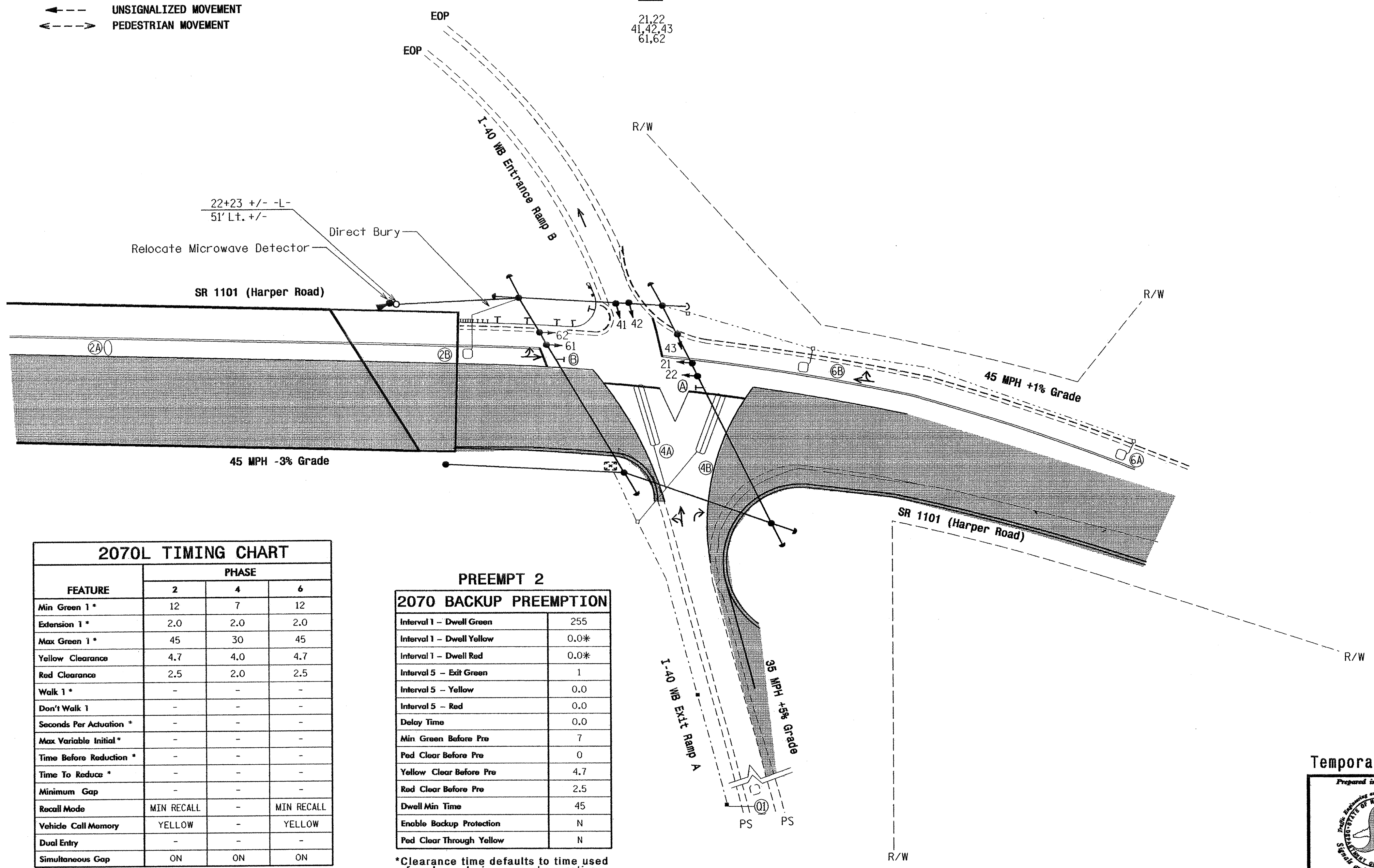
2 Phase Fully Actually with Backup Preemption Isolated

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2002 and "Standard Specifications for Roads and Structures" dated January 2002.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Reposition existing signal heads numbered 21,22,43,61, and 62 and signs A and B.
4. Set all detector units to presence mode.
5. Program controller to initiate backup preemption upon activation of queue backup loops.
6. Relocate existing microwave detector from previous temporary signal.

PLAN QUANTITIES

Pay Item	Feet
Signal Cable	-
Messenger Cable	-
Lead-in Cable	1250



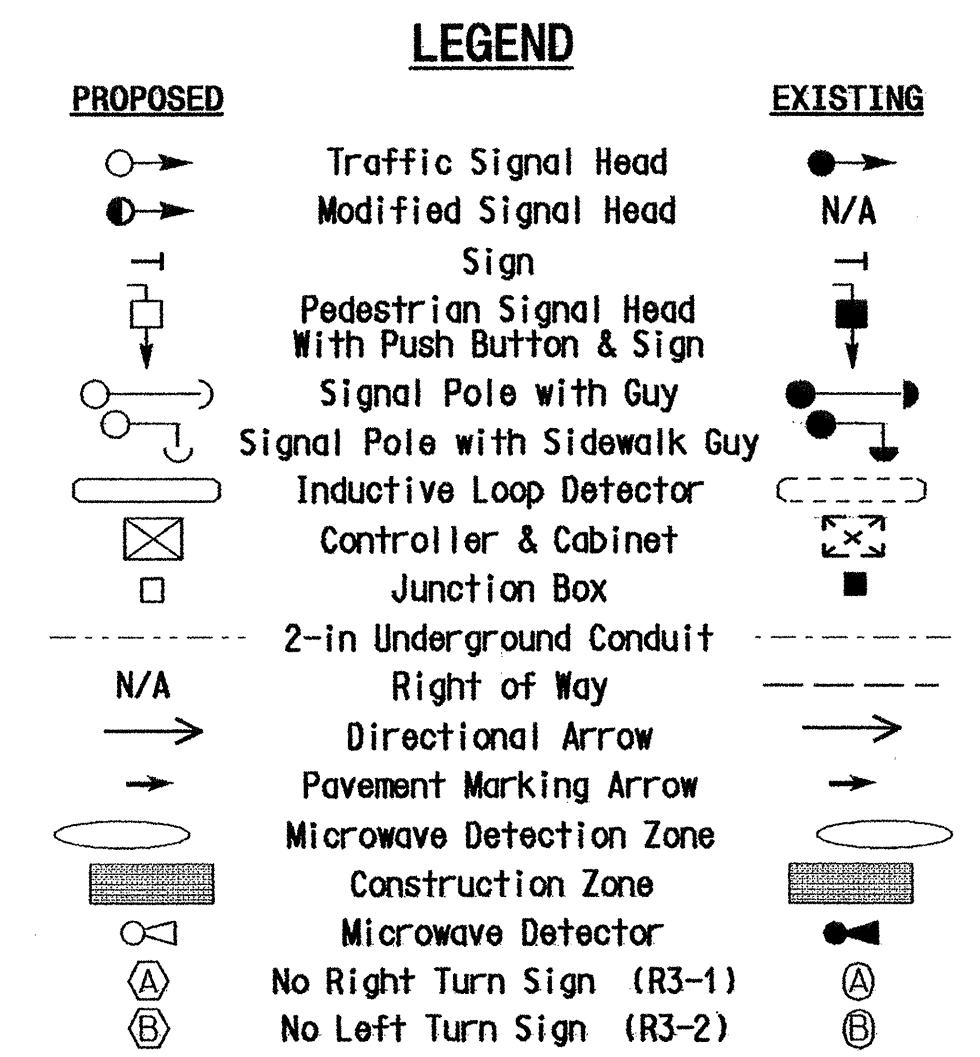
2070L TIMING CHART

FEATURE	PHASE		
	2	4	6
Min Green 1 *	12	7	12
Extension 1 *	2.0	2.0	2.0
Max Green 1 *	45	30	45
Yellow Clearance	4.7	4.0	4.7
Red Clearance	2.5	2.0	2.5
Walk 1 *	-	-	-
Don't Walk 1	-	-	-
Seconds Per Actuation *	-	-	-
Max Variable Initial *	-	-	-
Time Before Reduction *	-	-	-
Time To Reduces *	-	-	-
Minimum Gap	-	-	-
Recall Mode	MIN RECALL	-	MIN RECALL
Vehicle Call Memory	YELLOW	-	YELLOW
Dual Entry	-	-	-
Simultaneous Gap	ON	ON	ON

PREEMPT 2

Interval 1 - Dwell Green	255
Interval 1 - Dwell Yellow	0.0*
Interval 1 - Dwell Red	0.0*
Interval 5 - Exit Green	1
Interval 5 - Yellow	0.0
Interval 5 - Red	0.0
Delay Time	0.0
Min Green Before Pre	7
Ped Clear Before Pre	0
Yellow Clear Before Pre	4.7
Red Clear Before Pre	2.5
Dwell Min Time	45
Enable Backup Protection	N
Ped Clear Through Yellow	N

* Clearance time defaults to time used for phase during normal operation.



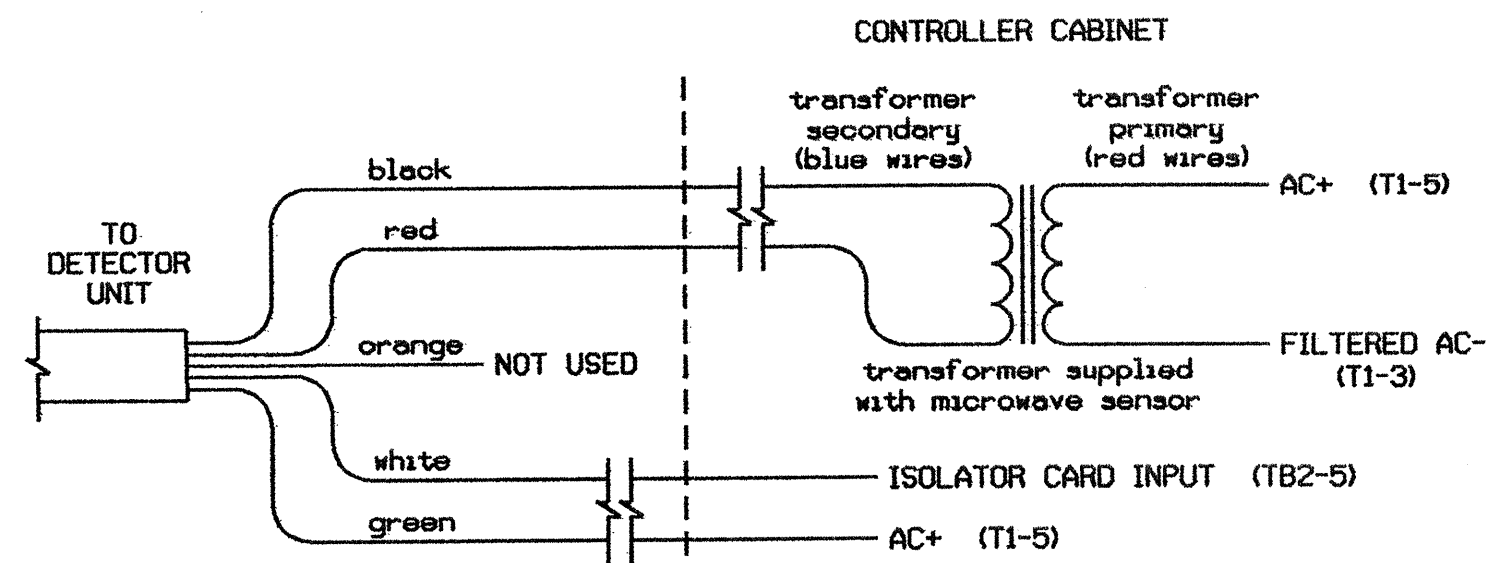
Temporary Signal 3 - TCP Phase II

	<p>SR 1101 (Harper Road) At I-40 WB Exit Ramp A</p>		
	<p>Division 9 Forsyth County Clemmons</p> <p>PLAN DATE: April 2004 REVIEWED BY: J. P. Galloway</p> <p>PREPARED BY: C.J. Collins REVIEWED BY:</p>	<p>SCALE 1"=40'</p> <p>REVISIONS</p> <p>INIT. DATE</p>	
<p>122 N. McDowell St., Raleigh, NC 27603</p> <p>SIG. INVENTORY NO. 09-0763 T3</p>			

15 JUL 2004 10:54
 H:\proj\2004\07\04\sr1101\2004xxx.dgn
 Project: 2102\45\04\sr1101\2004xxx.dgn
 C:\collins

MICROWAVE DETECTOR WIRING DETAIL

(wire as shown)



TC26B WIRE LIST

COLOR	FUNCTION
black	12V to 24V AC/DC (no polarity)
red	12V to 24V AC/DC (no polarity)
orange	Output Relay Normally Open
white	Output Relay Normally Closed
green	Output Relay Normally Common

NOTES:

1. SENSOR IS A MICROWAVE SENSORS, INC. MODEL TC-26B MICROWAVE MOTION DETECTOR MOUNTED ON POLES AS INDICATED ON SIGNAL DESIGN PLANS.
2. CONFIGURE AC ISOLATOR CARD TO PLACE CALL UPON REMOVAL OF AC+ FROM THE INPUT.
3. IMPORTANT: FOR PROPER OPERATION OF THE MICROWAVE DETECTOR, REMOVE SURGE PROTECTION FROM TB2-5 AND TB2-6. TIE TB2-6 TO AC NEUTRAL.

QUEUE PREEMPTION PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS 'A' (PREEMPTION), THEN '1' (STANDARD PREEMPTIONS). PRESS '+' UNTIL PREEMPTION #2 IS REACHED.

PREEMPTION #2	INTERVAL/TIMING	CLEAR/DWELL PHASES	SETTINGS (NEXT:1-10)
1	255 0.0 0.0	GRN YEL RED	12345678910111213141516
2	0 0.0 0.0		X
3	0 0.0 0.0		
4	0 0.0 0.0		
5	1 0.0 0.0		X X

EXIT CALLS

OPTIONS

PRIORITY (Y/N TO SELECT)MED

DELAY TIMER (0-255 SEC)0.0

MIN GREEN BEFORE PRE (0= DEFAULT)....7

PED CLEAR BEFORE PRE (0= DEFAULT)....0

YELLOW CLEAR BEFORE PRE (0= DEFAULT).4.7

RED CLEAR BEFORE PRE (0= DEFAULT)....2.5

DWELL MIN TIMER (0-255 SEC)45

DWELL MAX TIMER (0=OFF,1-255MIN)0

DWELL HOLD-OVER TIMER (0-255)0

LATCH CALL?N

LINK TO NEXT PREEMPT?N

ENABLE BACKUP PROTECTION?N

HOLD CLEAR 1 PHASES DURING DELAY? ...N

FAST GREEN FLASH DWELL PHASES?N

PED CLEARANCE THROUGH YELLOW?N

INHIBIT OVERLAP GREEN EXTENSION?N

SERVICE DURING SOFTWARE FLASH?Y

REST IN RED DURING DWELL INTERVAL? ..N

FLASH DWELL INTERVAL?N

ALLOW PEDS IN DWELL INTERVAL?N

RE-TIME DWELL INTERVAL?N

OVERLAPS: ABCDEFGHIJKLMNOP

DWELL INT FLASH YELLOW

OMIT OVERLAPS:

VEHICLE DETECTOR #26 SETTINGS

(program controller as shown below)

FROM MAIN MENU PRESS '7' (DETECTORS), THEN '1' (VEHICLE DETECTOR ASSIGNMENTS). PRESS '+' UNTIL DETECTOR #26 IS REACHED.

VEHICLE DETECTOR #26 SETTINGS (+,1-64)

SETTING: (Y/N)

ENABLE DETECTOR.....Y

ENABLE LOGGING.....Y

ENABLE DIAGNOSTICS.....Y

SPEED TRAP.....N

CALL DETECTOR.....N

EXTENSION DETECTOR.....N

MODE 2 STOP BAR.....N

SWITCHING DETECTOR.....N

DUPLICATING DETECTOR.....N

ENABLE FULL TIME DELAY.....N

IF FAILED, SET MIN RECALL?.....Y

IF FAILED, SET MAX1 RECALL?.....N

IF FAILED, SET MAX2 RECALL?.....N

PHASE# :12345678910111213141516

PHASES ASSIGNED :

SWITCH/DUPLICATE:

LOOP SIZE (0-255 FT).....6

SPEED TRAP DISTANCE (0-255 FT).....0

STOP BAR TIME (0-255 SEC).....0

STRETCH (0-25.5 SEC).....0.0

DELAY (0-255 SEC).....0

MAX CALLS/MIN (0-255).....255

MIN CALLS/DIAGNOSTIC PERIOD (0-255).0

MAX OCCUPANCY (0-100%).....100

EXTENSION DISABLE TIME (0-255 SEC)..0

QUEUE MAX OCCUPANCY TIME (0-255)....5

QUEUE GAP RESET TIME (0-25.5).....0.1

PREEMPTION INDEX FOR QUEUE (0-10)...2

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-0763 T3
DESIGNED: APRIL 2004
SEALED: 07-01-04
REVISED:

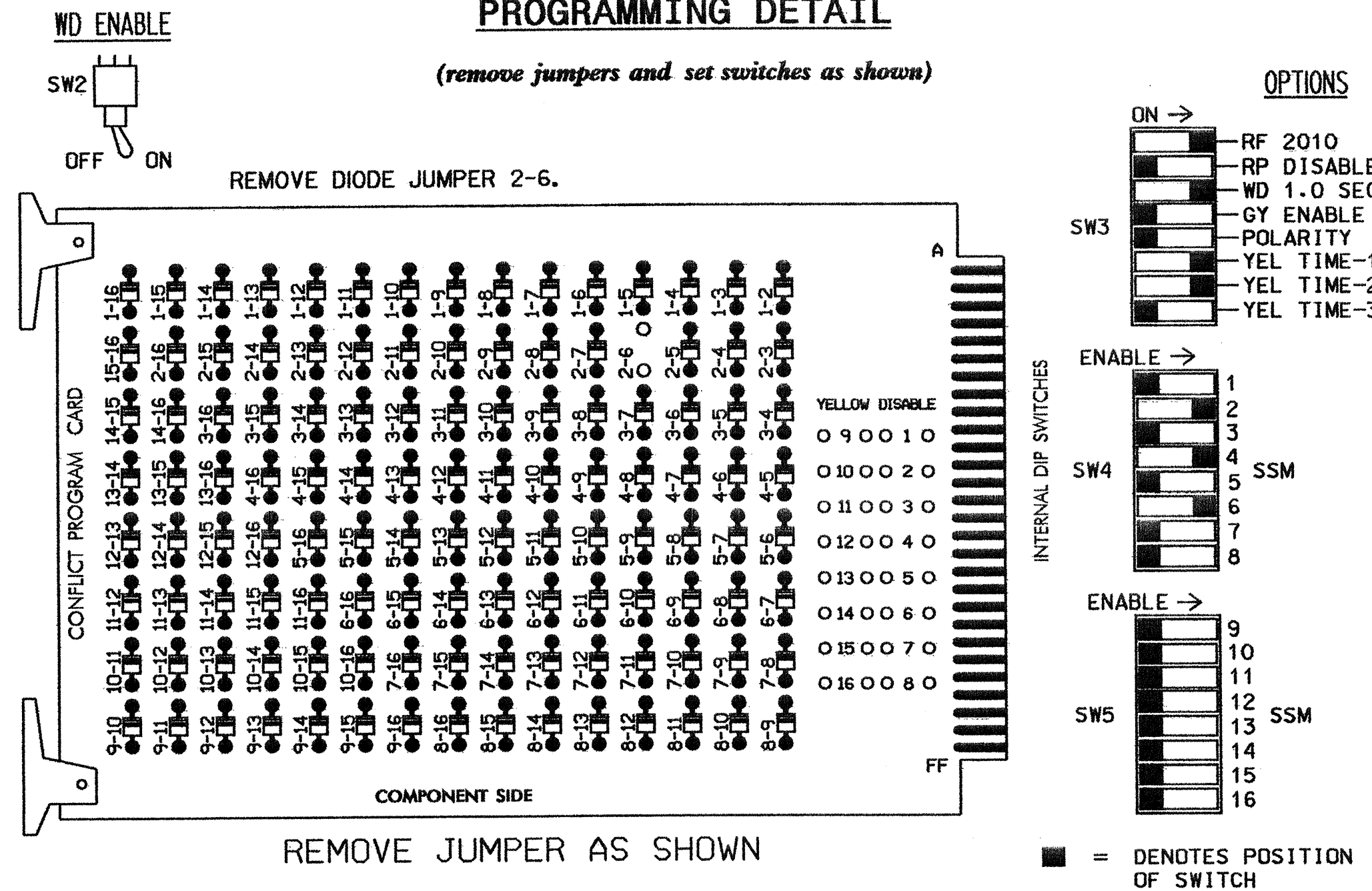
TEMPORARY SIGNAL 3 - SHEET 2 OF 2

<p>122 N. McDowell St., Raleigh, NC 27603</p>	<p>SR 1101 (HARPER ROAD) AT I-40 WB EXIT RAMP A</p>							
	<p>DIVISION 09 FORSYTH COUNTY CLEMMONS</p> <p>PLAN DATE: JUNE 2004 REVIEWED BY: R. H. [Signature]</p> <p>PREPARED BY: JAMES PETERSON REVIEWED BY:</p>	<p>REVISIONS</p> <table border="1"> <thead> <tr> <th>NO.</th> <th>INIT.</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>		NO.	INIT.	DATE		
NO.	INIT.	DATE						

SIG. INVENTORY NO. 09-0763 T3

EDI MODEL 2010ECL CONFLICT MONITOR

PROGRAMMING DETAIL



- NOTES:
- CARD IS PROVIDED WITH ALL DIODE JUMPERS IN PLACE. REMOVAL OF ANY JUMPER ALLOWS ITS CHANNELS TO RUN CONCURRENTLY.
 - MAKE SURE JUMPERS SEL1-SEL5 ARE PRESENT ON THE MONITOR BOARD.

NOTES

- TO PREVENT "FLASH-CONFLICT" PROBLEMS, INSERT RED FLASH PROGRAM BLOCKS FOR ALL UNUSED VEHICLE LOAD SWITCHES IN THE OUTPUT FILE. THE INSTALLER SHALL VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
- ENSURE THAT RED ENABLE IS ACTIVE AT ALL TIMES DURING NORMAL OPERATION. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED RED MONITOR INPUTS 1,3,5,7, 8,9,10,11,12,13,14,15 & 16 TO LOAD SWITCH AC+ PER THE CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
- ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
- IF AN APPROVED EQUIVALENT OF THE TC-26B MICROWAVE DETECTOR IS USED, DISREGARD ASSOCIATED WIRING DETAIL SHOWN ELSEWHERE ON THIS SHEET. INSTALL ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS. SENSOR SHALL BE WIRED SUCH THAT INPUT INTERFACE TO THE CONTROLLER IS ACHIEVED THROUGH ISOLATION CIRCUITRY.

FIELD CONNECTION HOOK-UP CHART

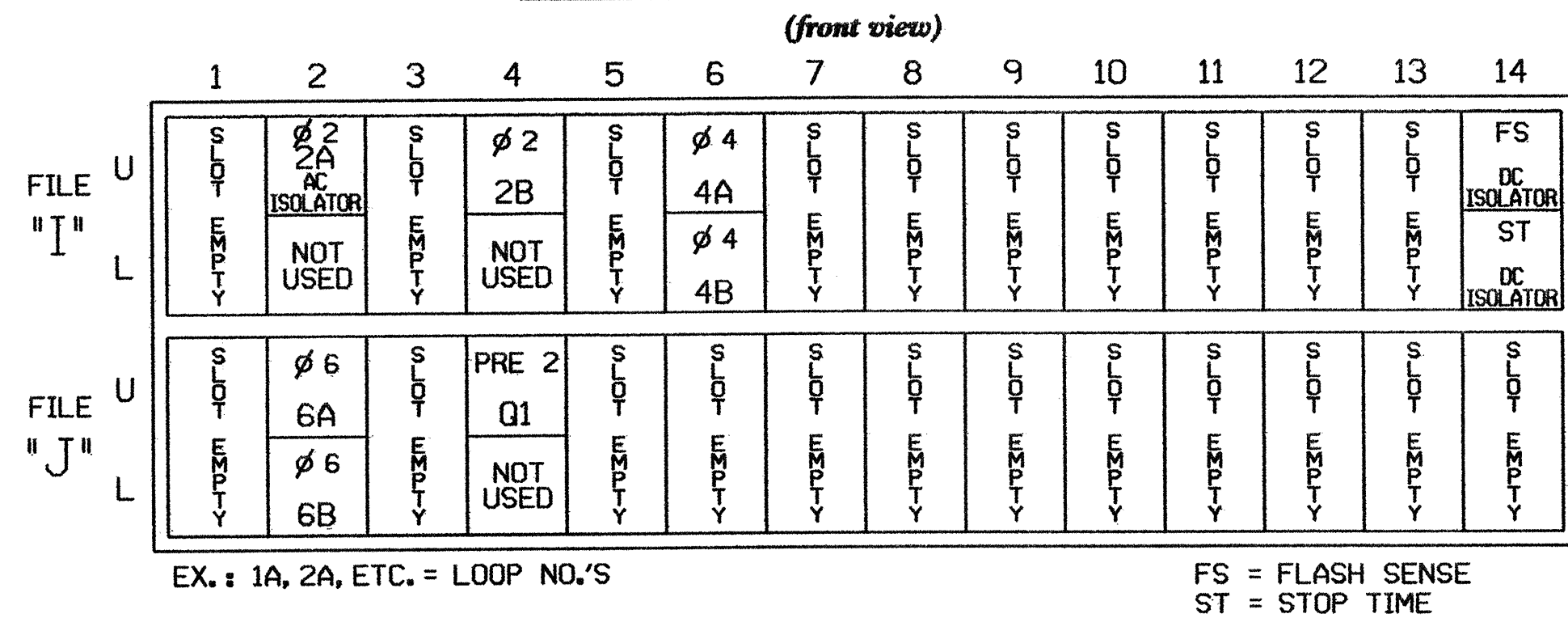
LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	41 42,43	NU	NU	61,62	NU	NU	NU	NU
GREEN		130			103			136				
YELLOW		129			102			135				
RED		128			101			134				
RED ARROW												
YELLOW ARROW												
GREEN ARROW												

NU = NOT USED

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
 CABINETCONTRACTOR SUPPLIED 332
 SOFTWAREECONOLITE OASIS
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S2,S4,S6
 PHASES USED.....2,4,6
 OVERLAPS.....NONE

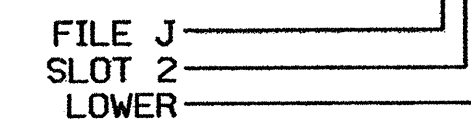
INPUT FILE POSITION LAYOUT



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
2A	*	I2U	39	1	2	2	Y	Y		1.9	
2B	TB4-1,2	I4U	47	9	22	2	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			3
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			15
6A	TB3-5,6	J2U	40	2	6	6	Y	Y		1.8	
6B	TB3-7,8	J2L	44	6	16	6	Y	Y			
Q1	TB5-1,2	J4U	48	10	26	PRE 2					

*MICROWAVE DETECTOR. SEE WIRING DETAIL (MICROWAVE DETECTOR).
 INPUT FILE POSITION LEGEND: J2L



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-0763 T3
 DESIGNED: APRIL 2004
 SEALED: 07-01-04
 REVISED:

TEMPORARY SIGNAL 3 - SHEET 1 OF 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Office of:

 122 N. McDowell St., Raleigh, NC 27603

SR 1101 (HARPER ROAD) AT I-40 WB EXIT RAMP A

DIVISION 09 FORSYTH COUNTY CLEMMONS

PLAN DATE: JUNE 2004 REVIEWED BY: R. H. Hester

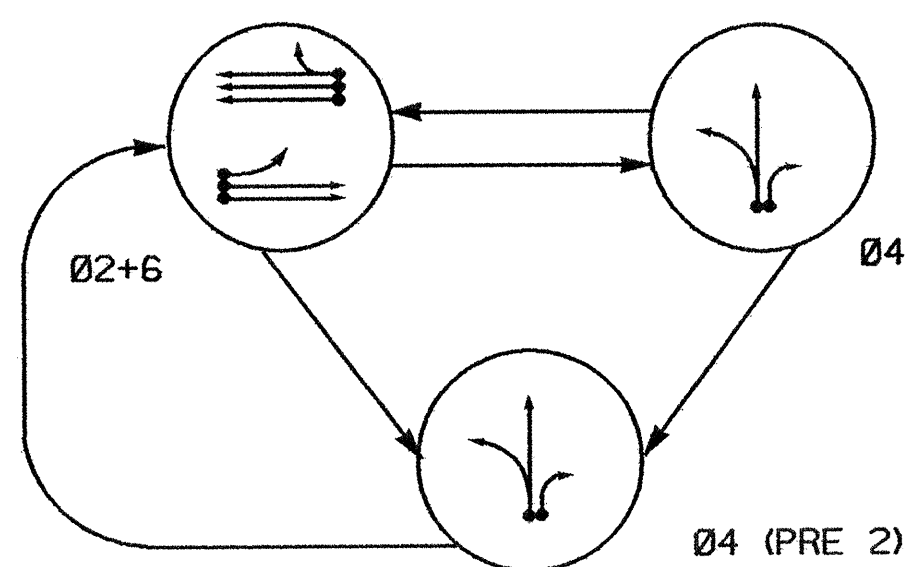
PREPARED BY: JAMES PETERSON REVIEWED BY:

REVISIONS: INIT. DATE

SEAL
 NORTH CAROLINA PROFESSIONAL ENGINEER
 SEAL 022013
 GEORGE C. BROWN
 SIGNATURE DATE: 7/13/04

SIG. INVENTORY NO. 09-0763 T3

PHASING DIAGRAM

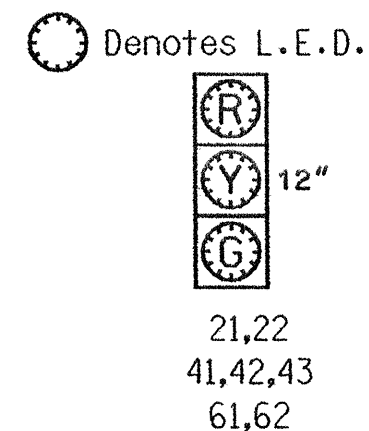


PHASING DIAGRAM DETECTION LEGEND
 ● DETECTED MOVEMENT
 ◀ UNDETECTED MOVEMENT (OVERLAP)
 - - - UNSIGNALIZED MOVEMENT
 <- - - PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE			
	Ø2+6	Ø4	Ø2	Ø4
21,22	G	R	R	Y
41,42,43	R	G	G	R
61,62	G	R	R	Y

SIGNAL FACE I.D.



2070L LOOP & DETECTOR INSTALLATION

INDUCTIVE LOOPS				DETECTOR PROGRAMMING											
LOOP	SIZE (FT)	TURNS	DISTANCE FROM STOPBAR (FT)	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	SYSTEM LOOP	STRETCH TIME	DELAY TIME	QUEUE MAX OCCUPANCY TIME	QUEUE GAP RESET TIME	PREEMPT INDEX FOR QUEUE	NEW CARD
2A	*	*	300	*	2	Y	Y	-	-	-	-	-	-	-	-
2B	6x60	2-4-2	0	Y	2	Y	Y	-	-	-	3	-	-	-	-
4A	6x60	2-4-2	0	Y	4	Y	Y	-	-	-	-	-	-	-	-
4B	6x60	2-4-2	0	Y	4	Y	Y	-	-	-	15	-	-	-	-
6A	6x6	5	300	Y	6	Y	Y	-	-	-	-	-	-	-	-
6B	6x6	4	300	Y	6	Y	Y	-	-	-	-	-	-	-	-
**Ø1	6x6	5	400	-	PRE 2	-	-	-	-	-	-	5	0.1	2	-

* Microwave Detection Zone
 ** See note 4

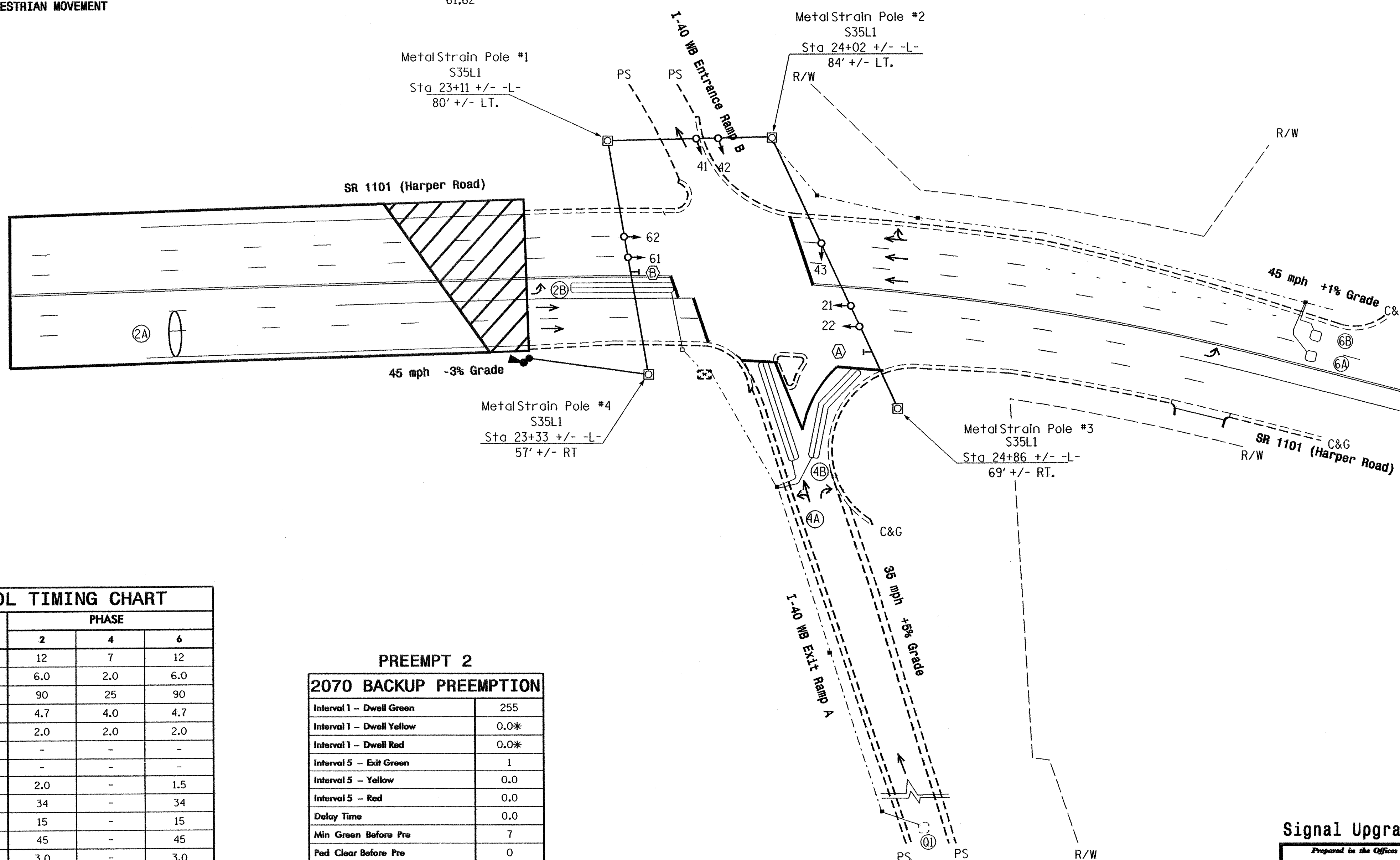
2 Phase Fully Actuated with Backup Preemption Isolated

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2002 and "Standard Specifications for Roads and Structures" dated January 2002.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Set all detector units to presence mode.
- Program controller to initiate backup preemption upon activation of queue backup loops.

PLAN QUANTITIES

Pay Item	Feet
Signal Cable	870
Messenger Cable	490
Lead-in Cable	100



2070L TIMING CHART

FEATURE	PHASE		
	2	4	6
Min Green 1*	12	7	12
Extension 1*	6.0	2.0	6.0
Max Green 1*	90	25	90
Yellow Clearance	4.7	4.0	4.7
Red Clearance	2.0	2.0	2.0
Walk 1*	-	-	-
Don't Walk 1	-	-	-
Seconds Per Actuation*	2.0	-	1.5
Max Variable Initial*	34	-	34
Time Before Reduction*	15	-	15
Time To Reduce*	45	-	45
Minimum Gap	3.0	-	3.0
Recall Mode	MIN RECALL	-	MIN RECALL
Vehicle Call Memory	YELLOW	-	YELLOW
Dual Entry	-	-	-
Simultaneous Gap	ON	ON	ON

PREEMPT 2

2070 BACKUP PREEMPTION

Interval 1 - Dwell Green	255
Interval 1 - Dwell Yellow	0.0*
Interval 1 - Dwell Red	0.0*
Interval 5 - Exit Green	1
Interval 5 - Yellow	0.0
Interval 5 - Red	0.0
Delay Time	0.0
Min Green Before Pre	7
Ped Clear Before Pre	0
Yellow Clear Before Pre	4.7
Red Clear Before Pre	2.0
Dwell Min Time	45
Enable Backup Protection	N
Ped Clear Through Yellow	N

* Clearance time defaults to time used for phase during normal operation.

LEGEND

PROPOSED	EXISTING
○ → Traffic Signal Head	● → Traffic Signal Head
○ → Modified Signal Head	N/A
□ → Sign	□ → Sign
□ → Pedestrian Signal Head With Push Button & Sign	□ → Pedestrian Signal Head With Push Button & Sign
□ → Signal Pole with Guy	□ → Signal Pole with Guy
□ → Signal Pole with Sidewalk Guy	□ → Signal Pole with Sidewalk Guy
□ → Inductive Loop Detector	□ → Inductive Loop Detector
□ → Controller & Cabinet	□ → Controller & Cabinet
□ → Junction Box	□ → Junction Box
□ → 2-in Underground Conduit	□ → 2-in Underground Conduit
N/A → Right of Way	- - - → Right of Way
→ → Directional Arrow	→ → Directional Arrow
→ → Pavement Marking Arrow	→ → Pavement Marking Arrow
□ → Metal Strain Pole	□ → Metal Strain Pole
○ → Microwave Detector	○ → Microwave Detector
⊙ → No Right Turn Sign (R3-1)	⊙ → No Right Turn Sign (R3-1)
⊙ → No Left Turn Sign (R3-2)	⊙ → No Left Turn Sign (R3-2)
○ → Microwave Detection Zone	○ → Microwave Detection Zone

Signal Upgrade

Prepared in the Office of:

 222 N. McDowell St., Raleigh, NC 27603

SR 1101 (Harper Road) At I-40 Westbound Off Ramp

Division 9 Forsyth County Clemmons
 PLAN DATE: April 2004 REVIEWED BY: J.P. Galloway
 PREPARED BY: C.J. Collins REVIEWED BY:

SCALE: 1"=40'

REVISIONS: _____

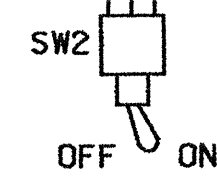
INIT. DATE

Signature: Timothy J. Williams 7/1/04
 DATE: 7/1/04
 SIG. INVENTORY NO. 09-0763

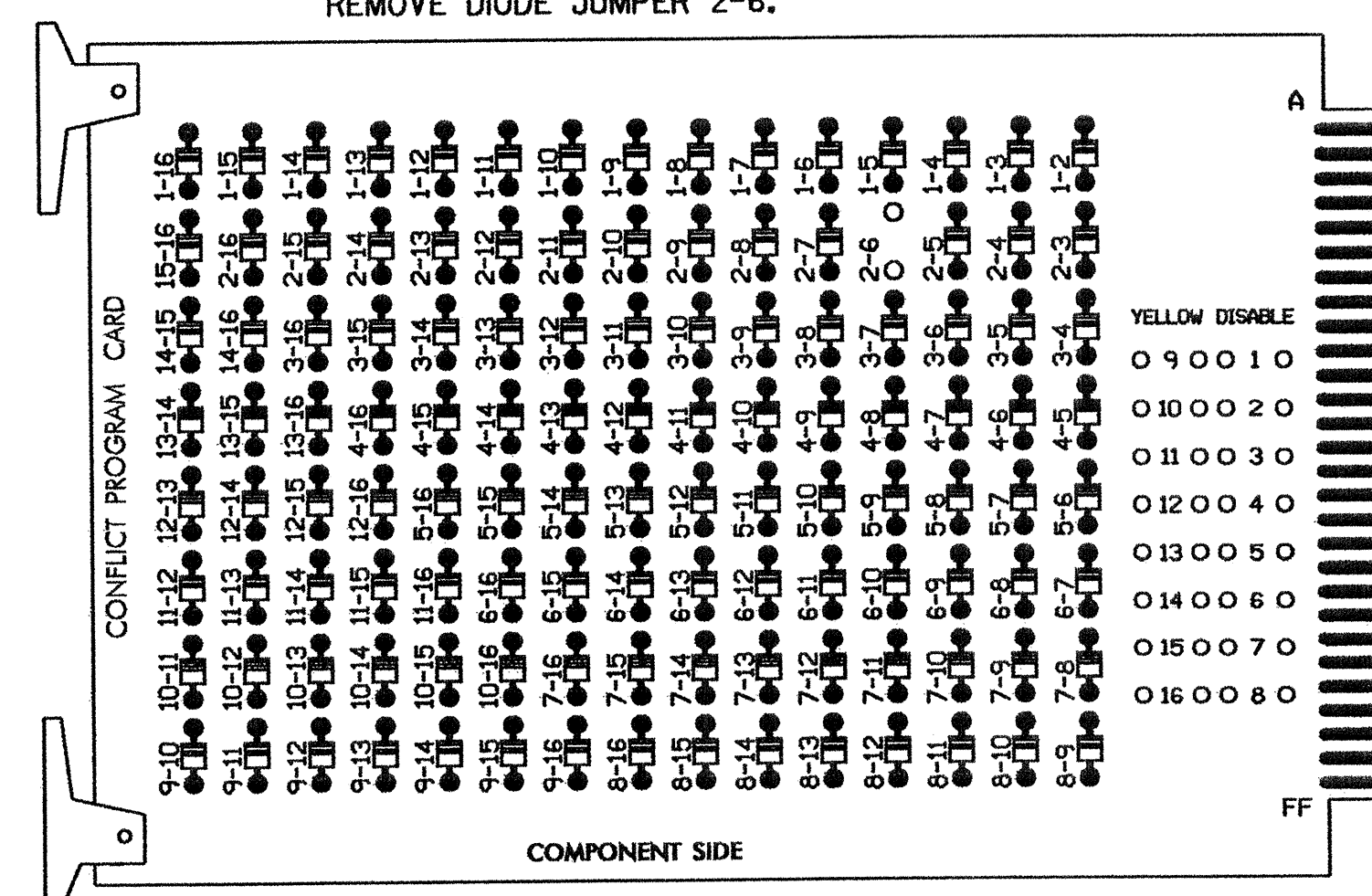
EDI MODEL 2010ECL CONFLICT MONITOR

PROGRAMMING DETAIL

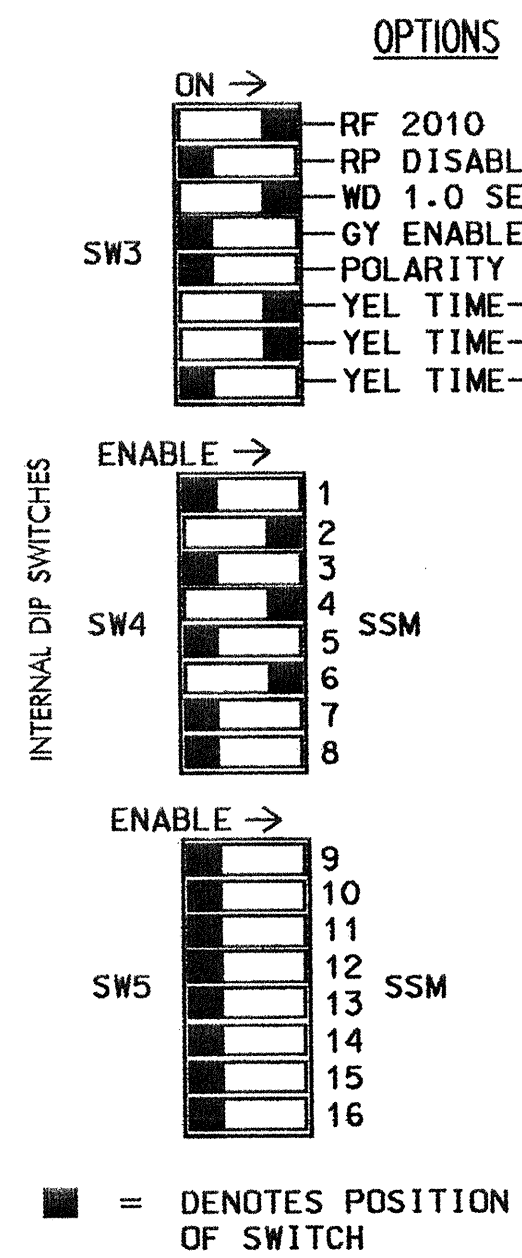
WD ENABLE



(remove jumpers and set switches as shown)



REMOVE JUMPER AS SHOWN



NOTES:

- CARD IS PROVIDED WITH ALL DIODE JUMPERS IN PLACE. REMOVAL OF ANY JUMPER ALLOWS ITS CHANNELS TO RUN CONCURRENTLY.
- MAKE SURE JUMPERS SEL1-SEL5 ARE PRESENT ON THE MONITOR BOARD.

NOTES

- TO PREVENT "FLASH-CONFLICT" PROBLEMS, INSERT RED FLASH PROGRAM BLOCKS FOR ALL UNUSED VEHICLE LOAD SWITCHES IN THE OUTPUT FILE. THE INSTALLER SHALL VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
- ENSURE THAT RED ENABLE IS ACTIVE AT ALL TIMES DURING NORMAL OPERATION. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED RED MONITOR INPUTS 1,3,5,7, 8,9,10,11,12,13,14,15 & 16 TO LOAD SWITCH AC+ PER THE CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
- ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
- PROGRAM PHASES 2 AND 6, ON CONTROLLER UNIT, FOR VARIABLE INITIAL AND GAP REDUCTION.
- IF AN APPROVED EQUIVALENT OF THE TC-26B MICROWAVE DETECTOR IS USED, DISREGARD ASSOCIATED WIRING DETAIL SHOWN ELSEWHERE ON THIS SHEET. INSTALL ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS. SENSOR SHALL BE WIRED SUCH THAT INPUT INTERFACE TO THE CONTROLLER IS ACHIEVED THROUGH ISOLATION CIRCUITRY.

FIELD CONNECTION HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	41, 42,43	NU	NU	61,62	NU	NU	NU	NU
GREEN		130			103			136				
YELLOW		129			102			135				
RED		128			101			134				
RED ARROW												
YELLOW ARROW												
GREEN ARROW												

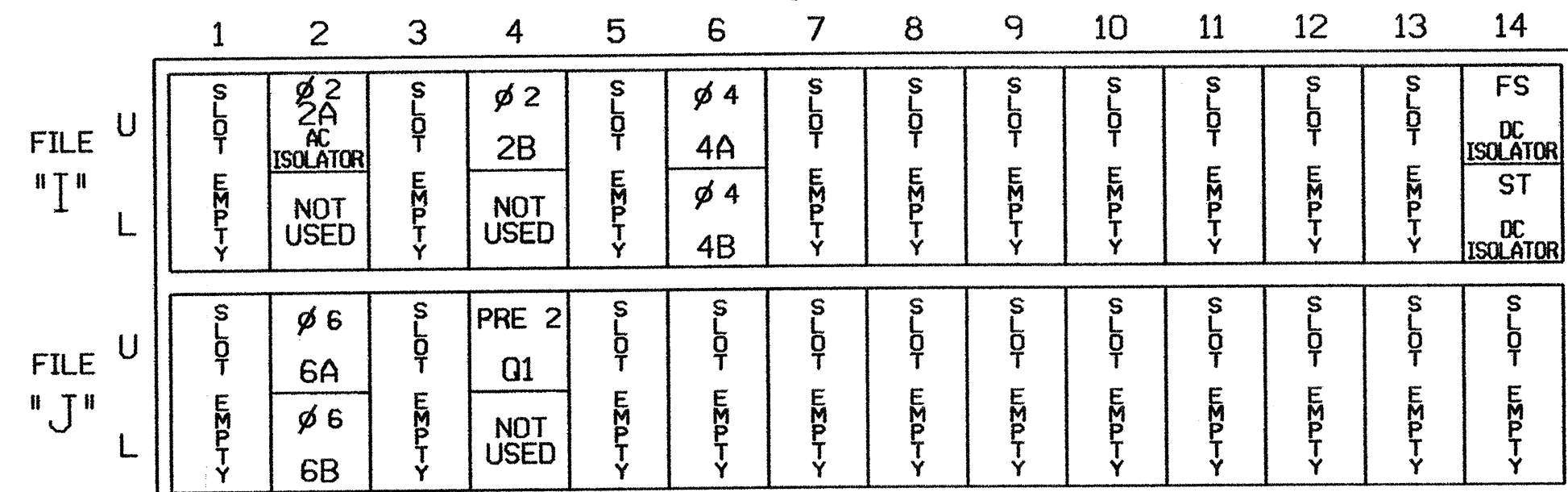
NU = NOT USED

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
 CABINETCONTRACTOR SUPPLIED 332
 SOFTWAREECONOLITE OASIS
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S2,S4,S6
 PHASES USED.....2,4,6
 OVERLAPS.....NONE

INPUT FILE POSITION LAYOUT

(front view)



EX. : 1A, 2A, ETC. = LOOP NO.'S

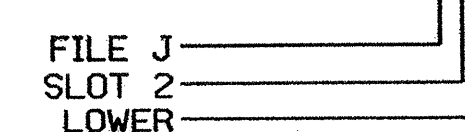
FS = FLASH SENSE
 ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
2A	*	I2U	39	1	2	2	Y	Y			
2B	TB4-1,2	I4U	47	9	22	2	Y	Y	Y		3
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			15
6A	TB3-5,6	J2U	40	2	6	6	Y	Y			
6B	TB3-7,8	J2L	44	6	16	6	Y	Y			
Q1	TB5-1,2	J4U	48	10	26	PRE 2					

*MICROWAVE DETECTOR. SEE WIRING DETAIL (MICROWAVE DETECTOR).

INPUT FILE POSITION LEGEND: J2L



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-0763
 DESIGNED: APRIL 2004
 SEALED: 07-01-04
 REVISED:

SIGNAL UPGRADE - SHEET 1 OF 2

Electrical and Programming Details For:

SR 1101 (HARPER ROAD) AT I-40 WESTBOUND OFF RAMP

DIVISION 09 FORSYTH COUNTY CLEMMONS

PLAN DATE: JUNE 2004 REVIEWED BY: R. Hester

PREPARED BY: JAMES PETERSON REVIEWED BY:

REVISIONS: _____ INIT. DATE

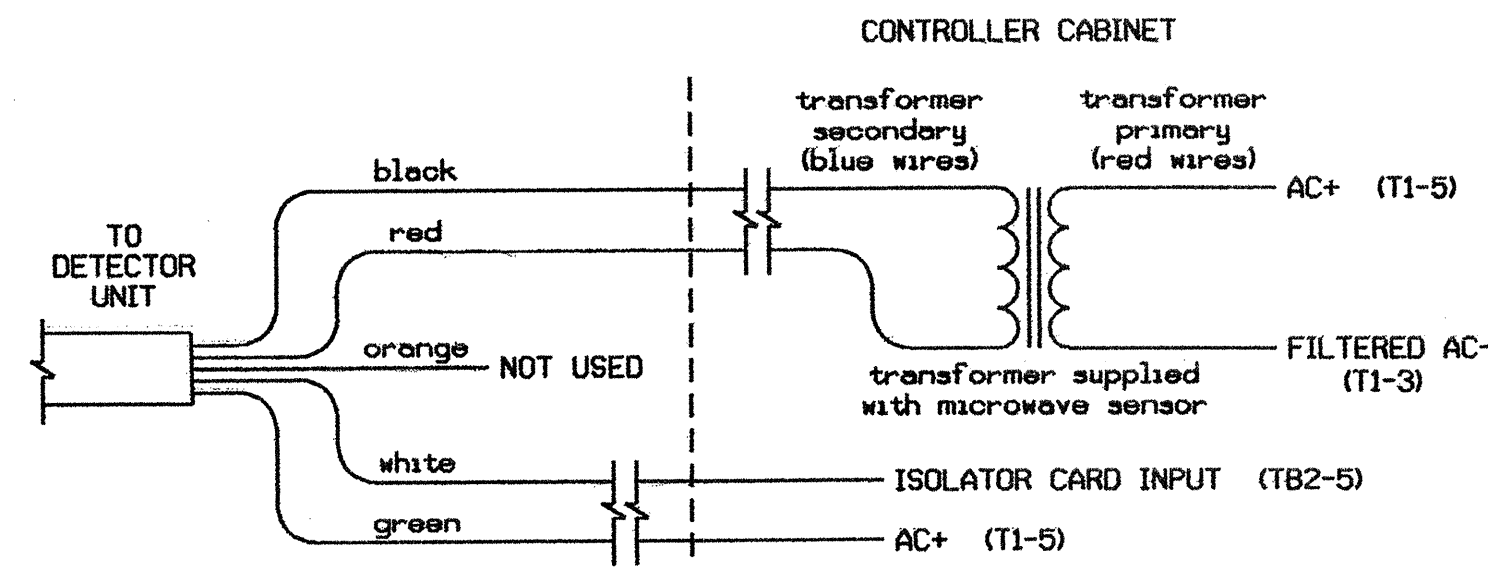
222 N. McDowell St., Raleigh, NC 27603

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 022013 ENGINEER: GEORGE C. BROWN

SIG. INVENTORY NO. 09-0763

MICROWAVE DETECTOR WIRING DETAIL

(wire as shown)



TC26B WIRE LIST

COLOR	FUNCTION
black	12V to 24V AC/DC (no polarity)
red	12V to 24V AC/DC (no polarity)
orange	Output Relay Normally Open
white	Output Relay Normally Closed
green	Output Relay Normally Common

NOTES:

1. SENSOR IS A MICROWAVE SENSORS, INC. MODEL TC-26B MICROWAVE MOTION DETECTOR MOUNTED ON POLES AS INDICATED ON SIGNAL DESIGN PLANS.
2. CONFIGURE AC ISOLATOR CARD TO PLACE CALL UPON REMOVAL OF AC+ FROM THE INPUT.
3. IMPORTANT: FOR PROPER OPERATION OF THE MICROWAVE DETECTOR, REMOVE SURGE PROTECTION FROM TB2-5 AND TB2-6. TIE TB2-6 TO AC NEUTRAL.

QUEUE PREEMPTION PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS 'A' (PREEMPTION), THEN '1' (STANDARD PREEMPTIONS). PRESS '+' UNTIL PREEMPTION #2 IS REACHED.

PREEMPTION #2	INTERVAL/TIMING	GRN	YEL	RED	SETTINGS (NEXT:1-10)	CLEAR/DWELL PHASES
1	255	0.0	0.0	0.0	X	12345678910111213141516
2	0	0.0	0.0	0.0		
3	0	0.0	0.0	0.0		
4	0	0.0	0.0	0.0		
5	1	0.0	0.0	0.0	X X	

EXIT CALLS

OPTIONS

PRIORITY (Y/N TO SELECT)MED

DELAY TIMER (0-255 SEC)0.0

MIN GREEN BEFORE PRE (0= DEFAULT)....7

PED CLEAR BEFORE PRE (0= DEFAULT)....0

YELLOW CLEAR BEFORE PRE (0= DEFAULT).4.7

RED CLEAR BEFORE PRE (0= DEFAULT)....2.0

DWELL MIN TIMER (0-255 SEC)45

DWELL MAX TIMER (0=OFF,1-255MIN)0

DWELL HOLD-OVER TIMER (0-255)0

LATCH CALL?N

LINK TO NEXT PREEMPT?N

ENABLE BACKUP PROTECTION?N

HOLD CLEAR 1 PHASES DURING DELAY? ...N

FAST GREEN FLASH DWELL PHASES?N

PED CLEARANCE THROUGH YELLOW?N

INHIBIT OVERLAP GREEN EXTENSION?N

SERVICE DURING SOFTWARE FLASH?Y

REST IN RED DURING DWELL INTERVAL? ..N

FLASH DWELL INTERVAL?N

ALLOW PEDS IN DWELL INTERVAL?N

RE-TIME DWELL INTERVAL?N

OVERLAPS: ABCDEFGHIJKLMNPO

DWELL INT FLASH YELLOW

OMIT OVERLAPS:

VEHICLE DETECTOR #26 SETTINGS

(program controller as shown below)

FROM MAIN MENU PRESS '7' (DETECTORS), THEN '1' (VEHICLE DETECTOR ASSIGNMENTS). PRESS '+' UNTIL DETECTOR #26 IS REACHED.

VEHICLE DETECTOR #26 SETTINGS (+,1-64)

SETTING: (Y/N)

ENABLE DETECTOR.....Y

ENABLE LOGGING.....Y

ENABLE DIAGNOSTICS.....Y

SPEED TRAP.....N

CALL DETECTOR.....N

EXTENSION DETECTOR.....N

MODE 2 STOP BAR.....N

SWITCHING DETECTOR.....N

DUPLICATING DETECTOR.....N

ENABLE FULL TIME DELAY.....N

IF FAILED, SET MIN RECALL?.....Y

IF FAILED, SET MAX1 RECALL?.....N

IF FAILED, SET MAX2 RECALL?.....N

PHASE# :12345678910111213141516

PHASES ASSIGNED :

SWITCH/DUPLICATE:

LOOP SIZE (0-255 FT).....6

SPEED TRAP DISTANCE (0-255 FT).....0

STOP BAR TIME (0-255 SEC).....0

STRETCH (0-25.5 SEC).....0.0

DELAY (0-255 SEC).....0.0

MAX CALLS/MIN (0-255).....255

MIN CALLS/DIAGNOSTIC PERIOD (0-255).0

MAX OCCUPANCY (0-100%).....100

EXTENSION DISABLE TIME (0-255 SEC).0

QUEUE MAX OCCUPANCY TIME (0-255)....5

QUEUE GAP RESET TIME (0-25.5).....0.1

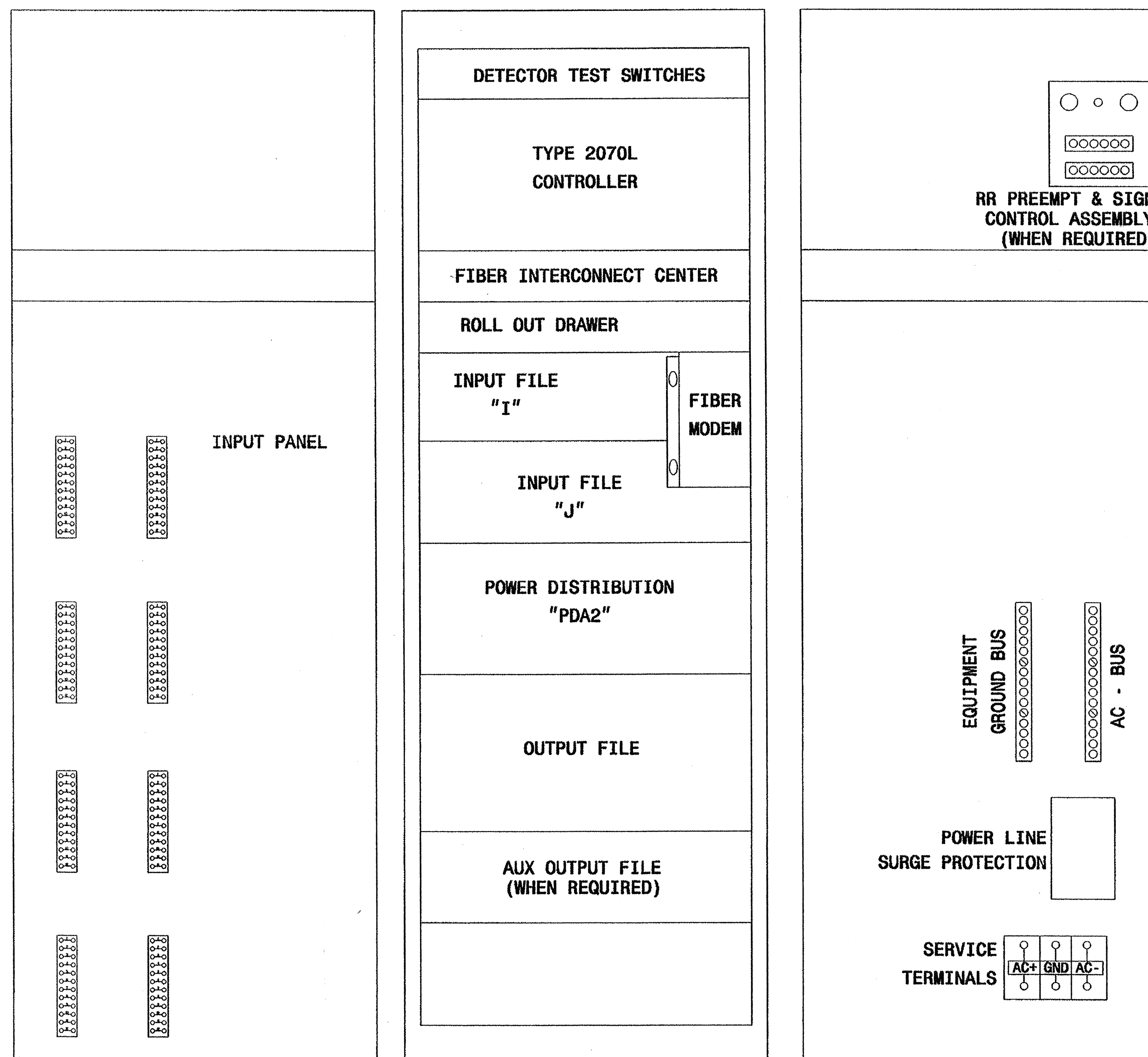
PREEMPTION INDEX FOR QUEUE (0-10)...2

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-0763
 DESIGNED: APRIL 2004
 SEALED: 07-01-04
 REVISED:

SIGNAL UPGRADE - SHEET 2 OF 2

	ELECTRICAL AND PROGRAMMING DETAILS FOR:			
	SR 1101 (HARPER ROAD) AT I-40 WESTBOUND OFF RAMP			
	DIVISION 09 FORSYTH COUNTY CLEMMONS	PLAN DATE: JUNE 2004		REVIEWED BY: P. Henderson
	PREPARED BY: JAMES PETERSON	REVIEWED BY:		REVISIONS:
INIT.	DATE	SIGNATURE: James C. Brown	DATE: 7/3/04	

SIG. INVENTORY NO. 09-0763



332A CABINET
LEFT SIDE

332A CABINET

332A CABINET
RIGHT SIDE

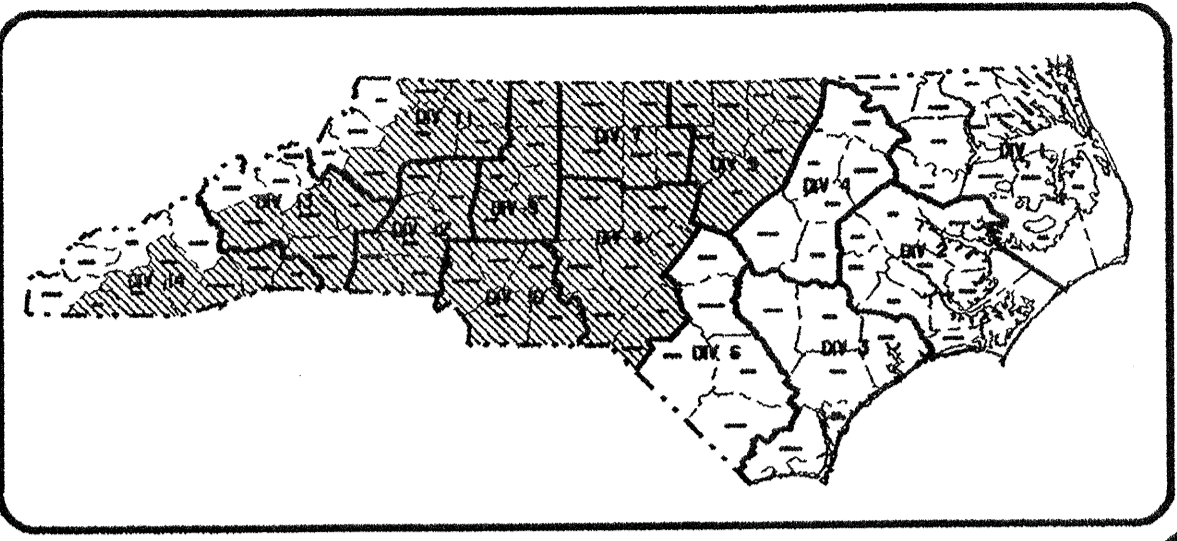
REAR VIEW

NOTE

-PROVIDE A 2 " SPACE BETWEEN THE CONTROLLER AND THE ROLL OUT DRAWER TO ACCOMMODATE A FIBER INTERCONNECT CENTER.

Typical Drawing

	Prepared in the Offices of: 		SEAL NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 16286 MILTON I. DEAN	
	Cabinet Component Layout 170 Cabinet Model 332A with 2070L Controller		PLAN DATE: October 2002	REVIEWED BY:
PREPARED BY: P. L. Alexander		REVISIONS	INIT.	DATE
222 N. McDowell St., Raleigh, NC 27603		SIGNATURE: <i>Milton I. Dean</i>	DATE: 11/13/02	SIG. INVENTORY NO. NA

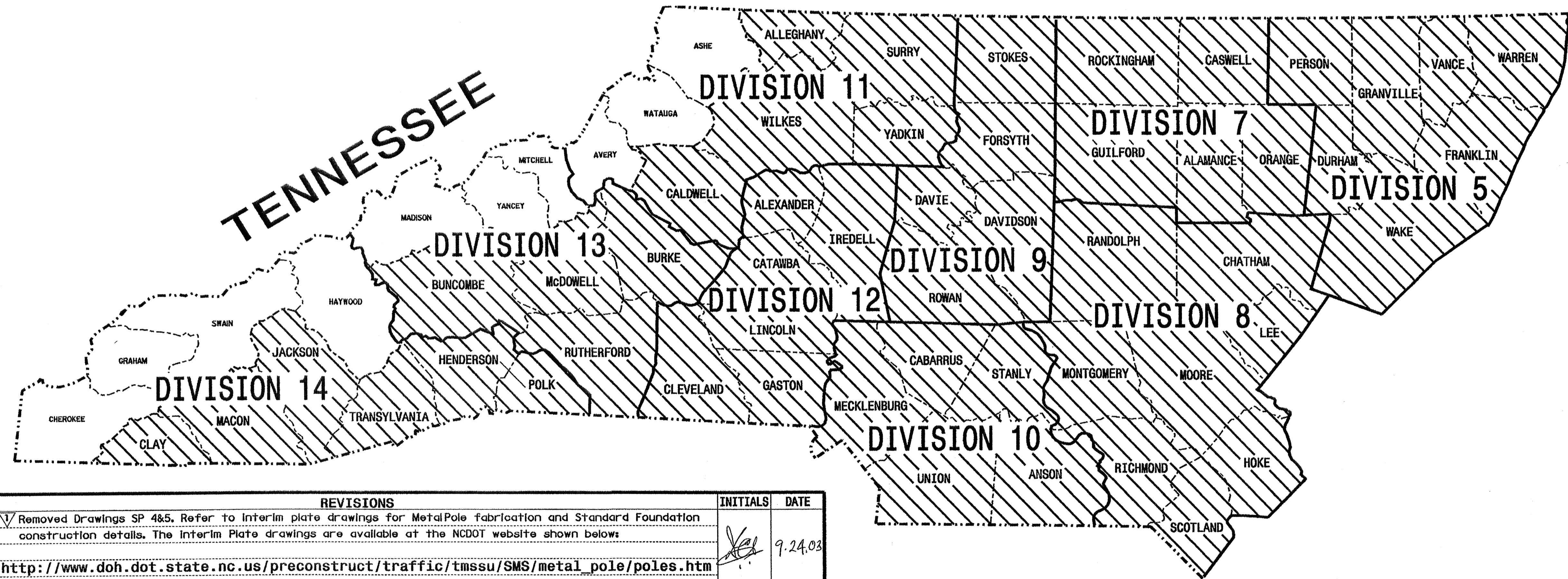


STATE	PROJECT NO.	SHEET NO.
N.C.	I-2102	Sig.15
F.A. PROJ. NO.	PROJECT ID. NO.	
	dwg.SP1	

STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

METAL STRAIN POLE STANDARDS FOR ZONE 4 - 90 mph (40 m/s)

ALL COUNTIES WITHIN DIVISIONS 5, 7, 8, 9, 10, AND 12.
AILEGHANY, CALDWELL, SURRY, WILKES, AND YADKIN COUNTIES IN DIVISION 11.
BUNCOMBE, BURKE, McDOWELL, AND RUTHERFORD COUNTIES IN DIVISION 13.
CLAY, HENDERSON, JACKSON, MACON, POLK, RUTHERFORD, AND TRANSYLVANIA COUNTIES IN DIVISION 14.



REVISIONS	INITIALS	DATE
✓ Removed Drawings SP 4&5. Refer to Interim plate drawings for Metal Pole fabrication and Standard Foundation construction details. The Interim Plate drawings are available at the NCDOT website shown below: http://www.doh.dot.state.nc.us/preconstruct/traffic/tmssu/SMS/metal_pole/poles.htm	[Signature]	9.24.03

Prepared in the Offices of:

122 N. McDowell St., Raleigh, NC 27603

Designed in conformance with the 2002 Interim to the 4th Edition 2001

AASHTO

Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals

INDEX OF PLANS

DRAWING NUMBER	DESCRIPTION
SP1	Title Sheet
SP2	Strain Pole Standard Notes
SP3	Load Case and Design Details
▽ SP4	Fabrication Details
▽ SP5	Standard Foundation Details

NCDOT CONTACTS:

TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

G. A. FULLER, P.E. - TRAFFIC MANAGEMENT & SIGNAL SYSTEMS ENGINEER
R. E. MULLINAX, P.E. - SIGNALS AND GEOMETRICS ENGINEER
D. C. SARKAR, P.E. - SIGNALS AND GEOMETRICS STRUCTURAL ENGINEER
A. M. ESPOSITO, P.E. - SIGNALS AND GEOMETRICS PROJECT ENGINEER
C. F. ANDREWS, JR. - SIGNALS AND GEOMETRICS PROJECT ENGINEER

SEAL

D. Sarkar 2.14.03
 SIGNATURE DATE

STANDARD STRAIN POLE NOTES

GENERAL

- THESE NOTES PROVIDE INFORMATION AND REQUIREMENTS FOR THE DESIGN, FABRICATION, AND INSTALLATION OF STANDARD METAL STRAIN POLES. THEY ARE TO BE USED BY DESIGN ENGINEERS, CONTRACTORS, AND POLE MANUFACTURERS IN THE SELECTION, FABRICATION, AND INSTALLATION OF METAL TRAFFIC SIGNAL SUPPORTS IN NORTH CAROLINA. THE NOTES ARE CATEGORIZED FOR EASE OF USE, AND ARE NUMBERED CHRONOLOGICALLY. NOTES THAT ARE SPECIFIC TO A PARTICULAR SITUATION, DESIGN DETAIL OR REQUIREMENT ARE SHOWN ON THE APPLICABLE PAGE TO CLARIFY INTENT AND UNDERSTANDING.
- THE FOLLOWING STANDARD DESIGNS ARE BASED ON LIGHT AND HEAVY LOADING CASES. NO VARIATIONS, SUBSTITUTION OR RE-DESIGN OF THE SPECIFIED POLES AND FOUNDATIONS WILL BE PERMITTED UNLESS IT IS APPROVED BY THE TRAFFIC ENGINEERING BRANCH.
- THESE METAL POLE STANDARDS MAKE REFERENCE TO THE NCDOT "ROADWAY STANDARD DRAWINGS" DATED JANUARY 2002 HERE IN AFTER REFERED TO AS THE STANDARD DRAWINGS AND TO THE NCDOT "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES" DATED JANUARY 2002 HERE IN AFTER REFERED TO AS THE STANDARD SPECIFICATIONS. IF THERE IS A DISCREPANCY BETWEEN THE STANDARD DRAWINGS/SPECIFICATIONS AND THESE STANDARDS, THEN THESE DRAWINGS AND SPECIFICATIONS SHALL GOVERN.
- POLE CASES PREAPPROVED ON THE DEPARTMENTS QUALIFIED PRODUCTS LIST (QPL) WILL NOT REQUIRE MANUFACTURER'S SHOP DRAWINGS. HOWEVER, CERTIFICATION OF COMPLIANCE WITH THE MANUFACTURER'S PREAPPROVED SHOP DRAWING ON FILE WITH THE DEPARTMENT SHALL BE FURNISHED TO THE ENGINEER. IF POLE CASES ARE NOT ON THE QPL, OR VARIATIONS TO A CASE STANDARD HAS BEEN APPROVED, MANUFACTURER'S SHOP DRAWINGS SHALL BE REQUIRED.

DESIGN CRITERIA

- THE METAL POLE DESIGN SHALL CONFORM TO THE "2002 AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES AND TRAFFIC SIGNALS" AND LATEST APPROVED INTERIM SPECIFICATIONS. DESIGN WIND PRESSURES AND APPLICATIONS ARE IN ACCORDANCE WITH SECTION 3.8 AND 3.9 OF THE 2001 AASHTO SPECIFICATIONS.
- THE THICKNESS OF A SINGLE PLY POLE MAY BE SUBSTITUTED BY USING A 2 PLY POLE AS LONG AS THE POLE BASE DOES NOT EXCEED THE SPECIFIED MINIMUM DIAMETER BY MORE THAN 1.25". NO EXCEPTIONS TO THIS DESIGN PARAMETER WILL BE ALLOWED.
- THESE STRAIN POLE STANDARDS ALLOW FOR SIGNAL HEADS TO BE PLACED ANYWHERE ALONG THE SPANWIRE. THE MOST CRITICAL LOCATIONS ARE SHOWN IN THE TYPICAL INTERSECTION LOADING CASES SHOWN ON DRAWING SP3 (LOAD CASE AND DESIGN DETAILS SHEET) OF THESE STANDARDS. FOR DESIGN PURPOSES, USE 4% SAG FOR THE SPANWIRE. ROADWAY DESIGN CLEARANCE RANGE FROM BOTTOM OF SIGNAL HEADS TO PAVEMENT IS 17 FEET.
- PROVISIONS SHALL BE MADE FOR DRAINAGE OF WATER FROM INSIDE THE METAL POLE.

POLE MATERIALS

- PROVIDE MATERIALS FOR STEEL METAL POLES THAT COMPLY WITH SECTION 1098-15 OF THE STANDARD SPECIFICATIONS. POLE MONOTUBE SHALL:
 - BE GALVANIZED IN ACCORDANCE WITH AASHTO M111.
 - USE ASTM A595 MATERIAL (55 KSI) OR EQUIVALENT AS APPROVED BY THE ENGINEER.
 - HAVE A LINEAR TAPER OF 0.14 IN/FT.
- BASE PLATE SHALL:
 - BE GALVANIZED IN ACCORDANCE WITH AASHTO M111.
 - CONFORM TO AASHTO M270 GRADE 36 OR EQUIVALENT.
- ANCHOR BOLTS, NUTS, AND WASHER MATERIAL:
 - ANCHOR BOLTS - USE AASHTO M 314 GRADE 55 MATERIAL OR EQUIVALENT.
 - NUTS - USE AASHTO M291 GRADE 2H, DH, OR DHS MATERIAL OR EQUIVALENT.
 - WASHERS - USE AASHTO M293 MATERIAL OR EQUIVALENT.
- ALL ANCHOR BOLTS, NUTS, WASHERS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M232 OR M298.

POLE FABRICATION

- ALL OTHER STEEL HARDWARE MATERIAL REQUIRED BUT NOT SPECIFIED ABOVE SHALL COMPLY WITH SECTION 1098-15 OF THE STANDARD SPECIFICATIONS.
- POLE ASSEMBLIES SHALL BE PERMANENTLY TAGGED OR ENGRAVED WITH THE FOLLOWING:
 - POLE MANUFACTURERS NAME
 - MANUFACTURE DATE
 - POLE CASE NUMBER
 - THICKNESS AND GRADE OF STEEL
- CIRCUMFERENTIAL WELDING OF THE POLES ARE ALLOWED PROVIDED THE FOLLOWING CONDITIONS ARE MET:
 - THE METAL POLES SHALL NOT BE SPLICED WITHIN 5 FEET FROM BASE NOR WITHIN 2 FEET FROM ANY CONNECTION.
 - ONLY ONE SPLICE PER UPRIGHT WILL BE PERMITTED.
 - THE QUALITY CONTROL AND WORKMANSHIP OF THE SPLICE WELDS ARE THE SOLE RESPONSIBILITY OF THE POLE MANUFACTURER.
- ALL WELDS SHALL BE IN ACCORDANCE WITH THE LATEST REVISION OF THE AWS D1.1 STRUCTURAL WELDING CODE.
- PROVIDE 2- 3" FACTORY DRILLED HOLES THROUGH THE POLE WALL FOR WIRE ENTRANCE ACCESS TO THE TERMINAL STRIP INSIDE THE TERMINAL COMPARTMENT. THE HOLES SHALL BE IN THE CENTER OF THE TERMINAL COMPARTMENT (0 DEGREES ON THE POLES RADIAL INDEX) LOCATED AT 26" AND 36" FROM THE BASE OF THE POLE. SEE DRAWING SP4 (POLE FABRICATION DETAILS) OF THESE METAL POLE STANDARDS FOR GRAPHIC DETAILS.
- THE METAL POLE SHALL BE FABRICATED WITH 3-2" THREADED HALF COUPLINGS AND 1-1" THREADED HALF COUPLING INSTALLED 9" FROM THE TOP OF THE POLE TO RECEIVE THE WEATHERHEADS FOR SIGNAL WIRE ENTRANCES TO THE POLE. THE HALF COUPLINGS SHALL BE WELDED AT NO LESS THAN A 45 DEGREE ANGLE FROM HORIZONTAL TO PROPERLY INSTALL THE WEATHERHEADS. THE 1" HALF COUPLING FOR ELECTRICAL SERVICE ENTRANCE SHALL BE LOCATED AT 0 DEGREES ON THE POLES RADIAL INDEX. ALL OTHER 2" HALF COUPLINGS SHALL BE LOCATED AT 90 DEGREE INCREMENTS. PROVIDE WEATHER TIGHT BUSHING CAPS FOR ALL HALF COUPLINGS. REFER TO DRAWING SP4 (POLE FABRICATION DETAILS) OF THESE METAL POLE STANDARDS FOR GRAPHIC DETAILS.
- PROVIDE A FACTORY STANDARD "J" HOOK FOR CABLE SUPPORT WELDED INSIDE THE TOP OF THE POLE AT 225 DEGREES ON THE POLES RADIAL INDEX. REFER TO DRAWING SP4 (POLE FABRICATION DETAILS) OF THESE METAL POLE STANDARDS FOR GRAPHIC DETAILS.
- FOR ALL OTHER NON-STRUCTURAL DETAILS AND REQUIREMENTS, REFER TO APPLICABLE SECTIONS OF THESE STANDARDS, THE TRAFFIC SIGNAL PLANS AND SPECIFICATIONS.
- AT THE TIME OF SHIPMENT FROM THE FACTORY, ENSURE THE POLE IS PACKAGED SO THAT WATER CAN NOT GET INSIDE OF THE POLE.
- SHIP ALL POLE ACCESSORIES FOR EACH POLE IN A SEPARATE WATERTIGHT CONTAINER WITH A LABEL THAT IDENTIFIES THE SPECIFIC POLE AND DESCRIBES THE CONTENTS.

SOIL TESTING AND STANDARD POLE FOUNDATIONS

- THE FOUNDATION SIZE FOR POLES IN THESE METAL POLE STANDARDS IS DETERMINED BY CONDUCTING A SUBSURFACE SOIL INVESTIGATION. FOR DETAILS OF THE SUBSURFACE INVESTIGATION, AND PROPER SELECTION/DETERMINATION OF THE METAL POLE FOUNDATIONS, REFER TO AND COMPLY WITH THE "METAL POLE STANDARD FOUNDATIONS" SPECIAL PROVISION WHICH IS TO BE CONSIDERED AN INTEGRAL PART OF THESE METAL POLE STANDARDS.
- STRAIN POLE FOUNDATIONS DEPTHS HAVE BEEN PRE-DESIGNED USING THE CHART SHOWN BELOW. TO DETERMINE THE CORRECT DEPTH OF EACH FOUNDATION:
 - USING THE STATEWIDE COUNTY WIND ZONE CHART ON DRAWING SP3 (LOAD CASE AND DESIGN DETAILS), MAKE SURE YOU HAVE THE APPROPRIATE WIND ZONE SELECTED.
 - SELECT THE SOIL TYPE THAT BEST DESCRIBES THE SOIL CHARACTERISTICS (EITHER CLAY OR SAND)
 - PERFORM A STANDARD PENETRATION TEST AT EACH PROPOSED FOUNDATION SITE TO DETERMINE "N" VALUE. (NUMBER OF BLOWS PER FOOT FROM STANDARD PENETRATION TEST).
 - GET THE APPROPRIATE POLE CASE LOAD NUMBER FROM THE PLANS OR FROM THE DIVISION TRAFFIC ENGINEER.
 - USING THE PREVIOUSLY DETERMINED SOIL TYPE AND "N" VALUE, SELECT THE APPROPRIATE COLUMN IN THE CHART. SELECT THE APPROPRIATE LINE THAT THE POLE LOAD CASE IS SHOWN ON IN THE CHART. THE CORRECT DEPTH OF THE FOUNDATION IS THE VALUE THAT IS SHOWN WHERE THE COLUMN AND THE LINE INTERSECT.
 - FILL OUT AND SUBMIT FOR APPROVAL TO THE DIVISION A "STANDARD FOUNDATION SELECTION FORM" FOR EACH PROPOSED FOUNDATION LOCATION.

FOUNDATION SELECTION TABLE

42" Diameter Drilled Pier Length (L) - Feet

LOAD CASE	WIND ZONE 4 - SOIL TYPES						
	Clay				Sand		
	Medium Design N-Value 4-8	Stiff Design N-Value 9-15	Very Stiff Design N-Value 16-30	Hard Design N-Value >30	Loose Design N-Value 4-10	Medium Design N-Value 11-30	Dense Design N-Value >30
S26L1	18.0	13.0	10.5	9.0	16.5	14.5	13.0
S30L1	18.5	13.0	10.5	9.0	17.0	15.0	13.5
S35L1	19.0	13.5	11.0	9.0	17.5	15.5	14.0
S30H1	22.0	15.0	12.0	9.5	19.5	17.0	15.0
S35H1	23.0	15.5	12.5	10.0	20.0	17.5	15.5

CONCRETE VOLUME (cubic yards)=.356xl

- A "STANDARD FOUNDATION SELECTION FORM" FOR EACH PROPOSED FOUNDATION IS REQUIRED TO BE SUBMITTED AND APPROVED PRIOR TO ANY DRILLING IN THE FIELD. THIS FORM AS WELL AS THE STANDARD FOUNDATION SPECIAL PROVISIONS CAN BE OBTAINED AT THE FOLLOWING WEBSITE:

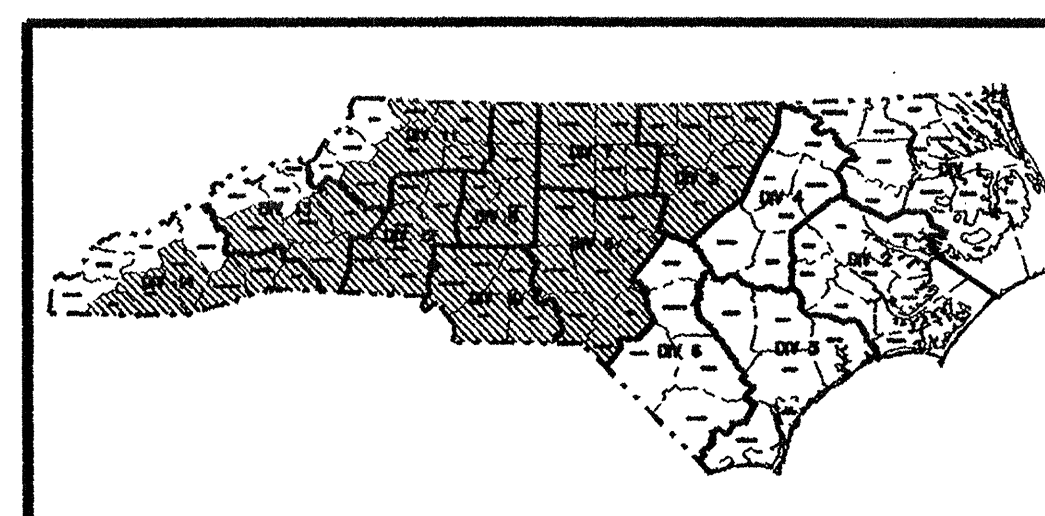
http://www.doh.dot.state.nc.us/preconstruct/highway/dsn_srvc/soils/form/default.htm

- COMPLY WITH THE PROVISIONS OF SECTION 1742 OF THE STANDARD SPECIFICATIONS FOR INSTALLATION.
- REFER TO STANDARD DRAWING 1742.01 FOR FOUNDATION INSTALLATION DETAILS.
- REINFORCING STEEL SHALL BE DEFORMED AND CONFORM TO ASTM A615 GRADE 60. TIES MAY BE DEFORMED OR PLAIN.
- CIRCULAR TIE REINFORCING RINGS MAY BE VERTICALLY ADJUSTED BY +/- 3" AT A DEPTH BETWEEN 2'-0" AND 3'-0" TO FACILITATE THE INSTALLATION OF ELECTRICAL CONDUIT ENTERING IN THE CAGE.
- THE CONCRETE SHALL BE DRILL PIER CONCRETE WITH A MINIMUM COMPRESSIVE STRENGTH OF 4500 PSI AT 28 DAYS IN ACCORDANCE WITH SECTION 1000 OF THE NORTH CAROLINA STANDARD SPECIFICATIONS. FOR DETAILS, SEE SPECIAL PROVISIONS.
- THE TRAFFIC SIGNAL SUPPORT STRUCTURE SHALL NOT BE ERCTED BEFORE THE CONCRETE IN THE FOUNDATION HAS ATTAINED A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI.
- NON-SHRINK GROUT SHALL BE A MIX CONSISTING OF 1 PART CEMENT, 3 PARTS SAND BY WEIGHT, AND 2 GRAMS OF ALUMINUM POWDER PER 94 LBS. OF CEMENT USED. WATER SHALL BE LIMITED TO THAT AMOUNT REQUIRED TO PRODUCE A WORKABLE MIX. PROVIDE SMALL PIPE TO DRAIN WATER PER STANDARD SPECIFICATIONS.
- THE TOP OF EACH FOUNDATION SHALL BE PERMANENTLY MARKED (WITH STAMP OR EMBEDDED PLATE) TO IDENTIFY THE TYPE OR DEPTH OF THE FOUNDATION.
- FOR OTHER DETAILS REGARDING CONSTRUCTION OF CONCRETE FOUNDATION, SEE PROJECT SPECIAL PROVISIONS.

POLE INSTALLATION

- COMPLY WITH THE PROVISIONS OF SECTION 1072 & 1742 OF THE STANDARD SPECIFICATIONS FOR INSTALLATION.
- REFER TO STANDARD DRAWING 1742.01 FOR POLE AND HARDWARE INSTALLATION DETAILS.
- SIGNAL HEADS CAN BE PLACED ANYWHERE ALONG THE SPANWIRE. THE MOST CRITICAL LOCATIONS ARE SHOWN IN THE TYPICAL INTERSECTION LOADING CASE. FOR DESIGN PURPOSES, USE 4% SAG FOR THE SPANWIRE.
- WHEN ATTACHING POLE TO FOUNDATION, THE DISTANCE BETWEEN THE BOTTOM OF THE LEVELING NUT TO THE TOP OF THE CONCRETE FOUNDATION SHOULD NOT BE GREATER THEN ONE ANCHOR NUT HEIGHT. THE TOP OF EACH ANCHOR BOLT SHOULD NOT EXTEND MORE THAN ONE ANCHOR NUT HEIGHT ABOVE TOP NUT TO FACILITATE THE INSTALLATION OF A THREADED NUT COVER.
- STRAP ALL SIGNAL CABLES TO THE SIDE OF THE POLE WHEN THE DISTANCE BETWEEN THE SPANWIRE ATTACHMENT CLAMP ON THE POLE AND THE WEATHER HEADS EXCEEDS 36". USE 3/4" STAINLESS STEEL STRAPS TO LASH WIRE TO THE POLE. SEE DRAWING SP4 (POLE FABRICATION DETAILS) OF THESE STANDARDS FOR GRAPHIC DETAILS.
- FOR OTHER DETAILS REGARDING METAL POLE INSTALLATION, SEE PROJECT SPECIAL PROVISIONS.

WIND ZONE 4 (90 MPH)



Prepared in the Office of:

122 N. McDowell St., Raleigh, NC 27603

METAL POLE STANDARD NOTES

PLAN DATE: SEPTEMBER 2002 REVIEWED BY: R. E. MULLINAX
 PREPARED BY: C. F. ANDREWS REVIEWED BY: D. C. SARKAR

REVISIONS	INIT.	DATE

SEAL

2.14.03

METAL STRAIN POLES

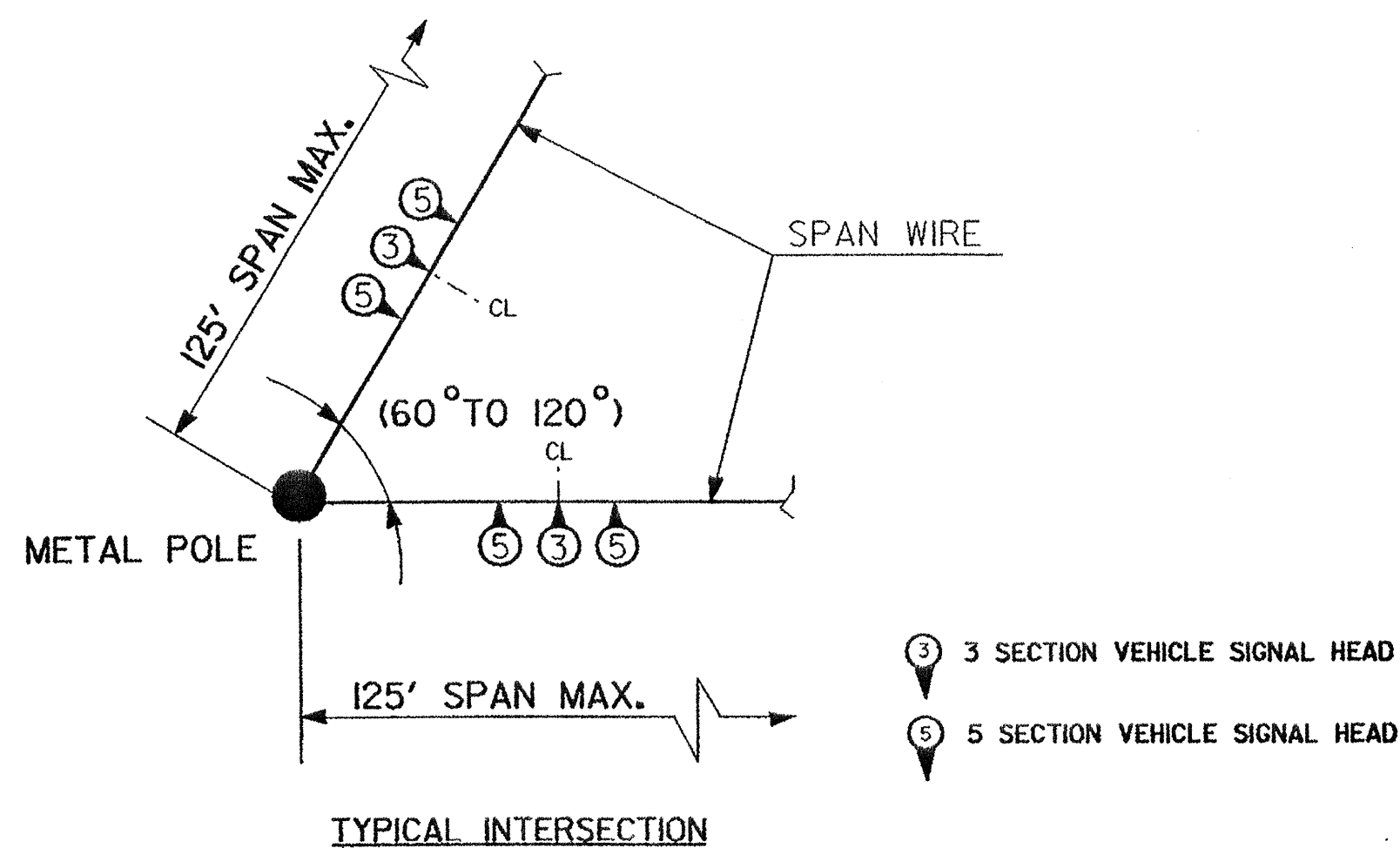
ZONE 4 (90 MPH)

LIGHT LOADING

(FOR ONE POLE AND ONE FOUNDATION)

CASE No.	POLE HEIGHT IN (FT.)	METAL POLE			BASE PLATES			ANCHOR BOLTS	CONCRETE FOOTING			REINFORCING BARS		
		WALL THICKNESS TH GAGE, (IN.)	BASE DIAMETER (IN.)	D (IN.)	BC (IN.)	T (IN.)	DIAMETER X TOTAL LENGTH (IN.)	DIAMETER d (IN.)	DEPTH L (FT.)	VOLUME (CU. YDS.)	BAR	NO.	SIZE	
S26L1	26	.5	13	28	22	2 1/2	2 X 66	42	*	*	V	10	#8	
											CT	*	#4	
S30L1	30	.5	14	28	22	2 1/2	2 X 66	42	*	*	V	10	#8	
											CT	*	#4	
S35L1	35	.5	15	28	22	2 1/2	2 X 66	42	*	*	V	10	#8	
											CT	*	#4	

* SEE NOTE 23 AND 24 ON SHEET 2 OF THE STANDARD NOTES.



HEAVY LOADING

(FOR ONE POLE AND ONE FOUNDATION)

CASE No.	POLE HEIGHT IN (FT.)	METAL POLE			BASE PLATES			ANCHOR BOLTS	CONCRETE FOOTING			REINFORCING BARS		
		WALL THICKNESS TH GAGE, (IN.)	BASE DIAMETER (IN.)	D (IN.)	BC (IN.)	T (IN.)	DIAMETER X TOTAL LENGTH (IN.)	DIAMETER d (IN.)	DEPTH L (FT.)	VOLUME (CU. YDS.)	BAR	NO.	SIZE	
S30H1	30	.5	16	31	25	2 1/2	2 X 66	42	*	*	V	10	#8	
											CT	*	#4	
S35H1	35	.5	18	31	25	2 1/2	2 X 66	42	*	*	V	10	#8	
											CT	*	#4	

* SEE NOTE 23 AND 24 ON SHEET 2 OF THE STANDARD NOTES.

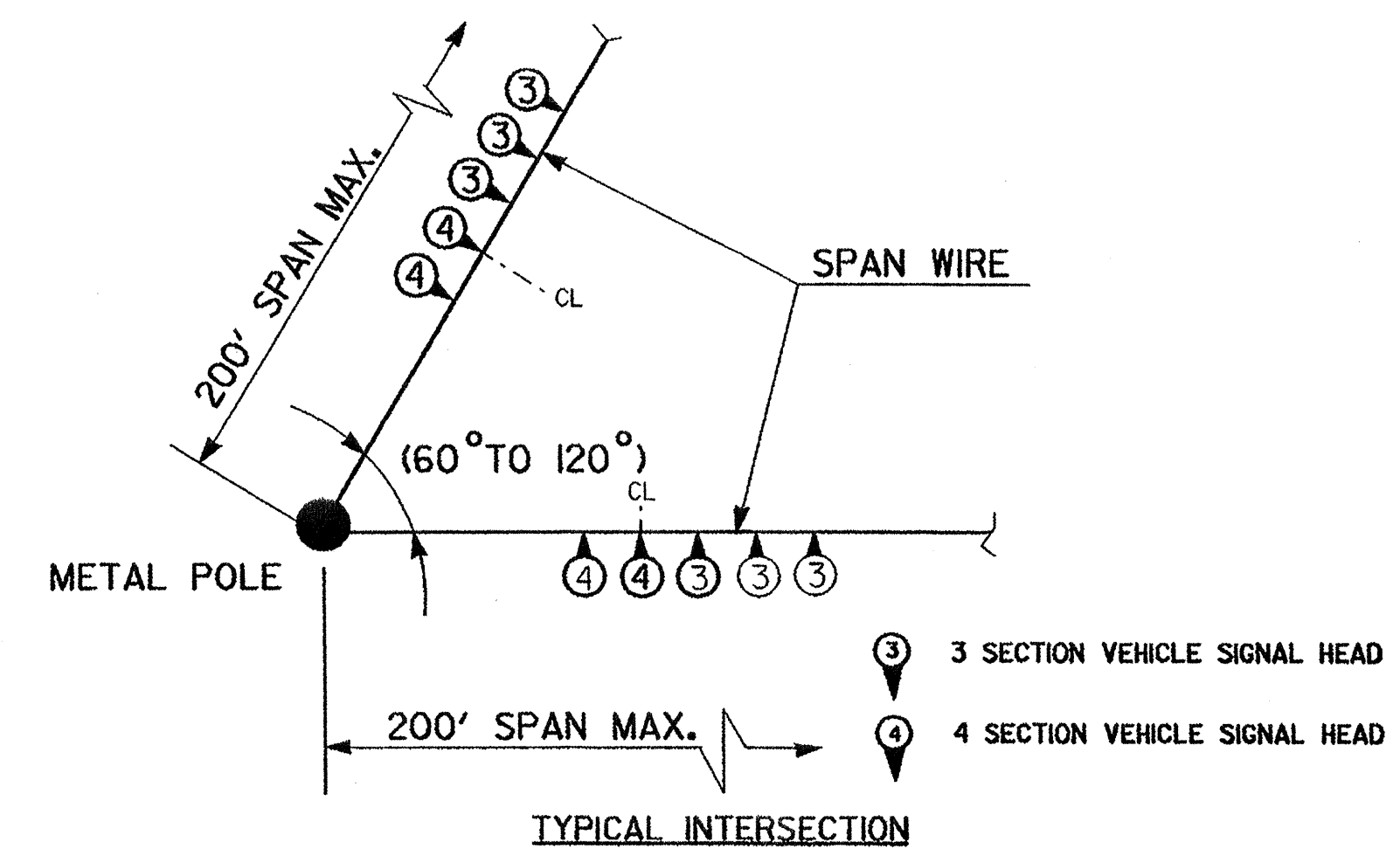
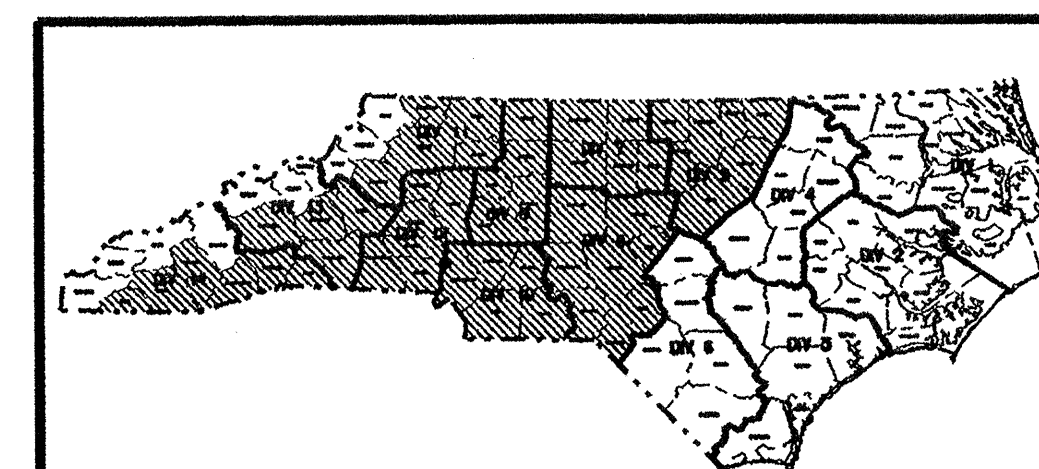


TABLE OF STATEWIDE COUNTY WIND ZONES

ZONE 1 140 mph / 63 m/s	ZONE 2 130 mph / 58 m/s		ZONE 3 110 mph / 49 m/s	ZONE 4 90 mph / 40 m/s				ZONE 5 120 mph / 58 m/s
CURRITUCK (1) DARE (1) HYDE (1)	BERTIE (1) CAMDEN (1) CHOWAN (1) CURRITUCK (1) DARE (1) GATES (1) HERTFORD (1) HYDE (1) PASQUOTANK (1) NORTHAMPTON (1) MARTIN (1) PERQUIMANS (1) TYRRELL (1) WASHINGTON (1)	BEAUFORT (2) CARTERET (2) CRAVEN (2) GREEN (2) JONES (2) LENOIR (2) PAMLICO (2) PITT (2) BRUNSWICK (3) DUPLIN (3) ONSLow (3) NEW HANOVER (3) PENDER (3) SAMPSON (3)	EDGEcombe (4) HALIFAX (4) JOHNSTON (4) NASH (4) WAYNE (4) WILSON (4) BLADEN (6) COLUMBUS (6) CUMBERLAND (6) HARNETT (6) ROBESON (6)	DURHAM (5) FRANKLIN (5) GRANVILLE (5) PERSON (5) VANCE (5) WARREN (5) WAKE (5) ALAMANCE (7) CASWELL (7) GUILFORD (7) ORANGE (7) ROCKINGHAM (7) SCOTLAND (8)	CHATHAM (8) HOKE (8) LEE (8) MONTGOMERY (8) MOORE (8) RANDOLPH (8) RICHMOND (8) DAVIDSON (9) DAVIE (9) FORSYTH (9) ROWAN (9) STOKES (9) ANSON (10)	CABARRUS (10) MECKLENBURG (10) STANLY (10) UNION (10) ALLEGHANY (11) CALDWELL (11) SURRY (11) WILKES (11) YADKIN (11) ALEXANDER (12) CATAWBA (12) CLEVELAND (12) GASTON (12)	IREDELL (12) LINCOLN (12) BUNCOMBE (13) BURKE (13) MCDOWELL (13) RUTHERFORD (13) CLAY (14) HENDERSON (14) JACKSON (14) MACON (14) POLK (14) TRANSYLVANIA (14)	ASHE (11) AVERY (11) WATAUGA (11) MADISON (13) MITCHELL (13) YANCEY (13) CHEROKEE (14) GRAHAM (14) HAYWOOD (14) SWAIN (14)



Prepared in the Office of:
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
222 N. McDowell St., Raleigh, NC 27603

SCALE: NONE

**WIND ZONE 4
LOAD CASE AND DESIGN
DETAILS**

PLAN DATE: SEPTEMBER 2002 REVIEWED BY: D.C. SARKAR
PREPARED BY: C.F. ANDREWS REVIEWED BY: R.E. MULLINAX

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA
REGISTERED PROFESSIONAL ENGINEER
SEAL 028094
DEBESH C. SARKAR

D. Sarkar 2.14.03
SIGNATURE DATE

13-FEB-2003 15:30
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conf:rev

METAL STRAIN POLES