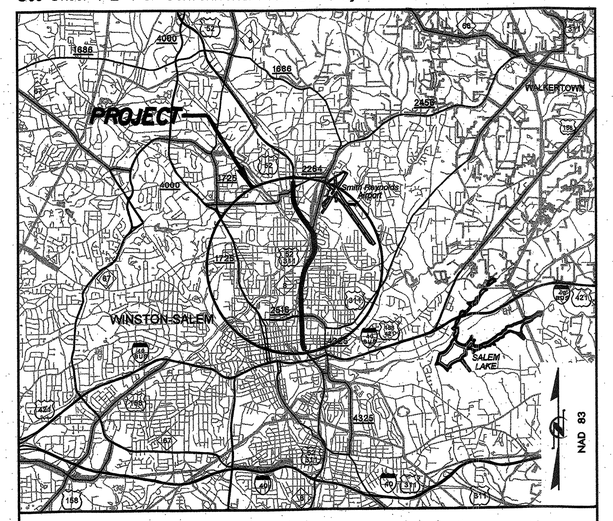
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2826B	1	

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
34871.1.1	NHF-52(4)	P.E.
34871.2.1	NHF-52(18)	R.W
34871.2.1	NHF-52(18)	UTILITY
34871.3.3	NHS-0052(32)	CONSTRUCTION

TIP PROJECT: U-2826B

CONTRACT: C202598

See Sheet 1-A For Index of Sheets
See Sheet 1-B For Conventional Plan Sheet Symbols



VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

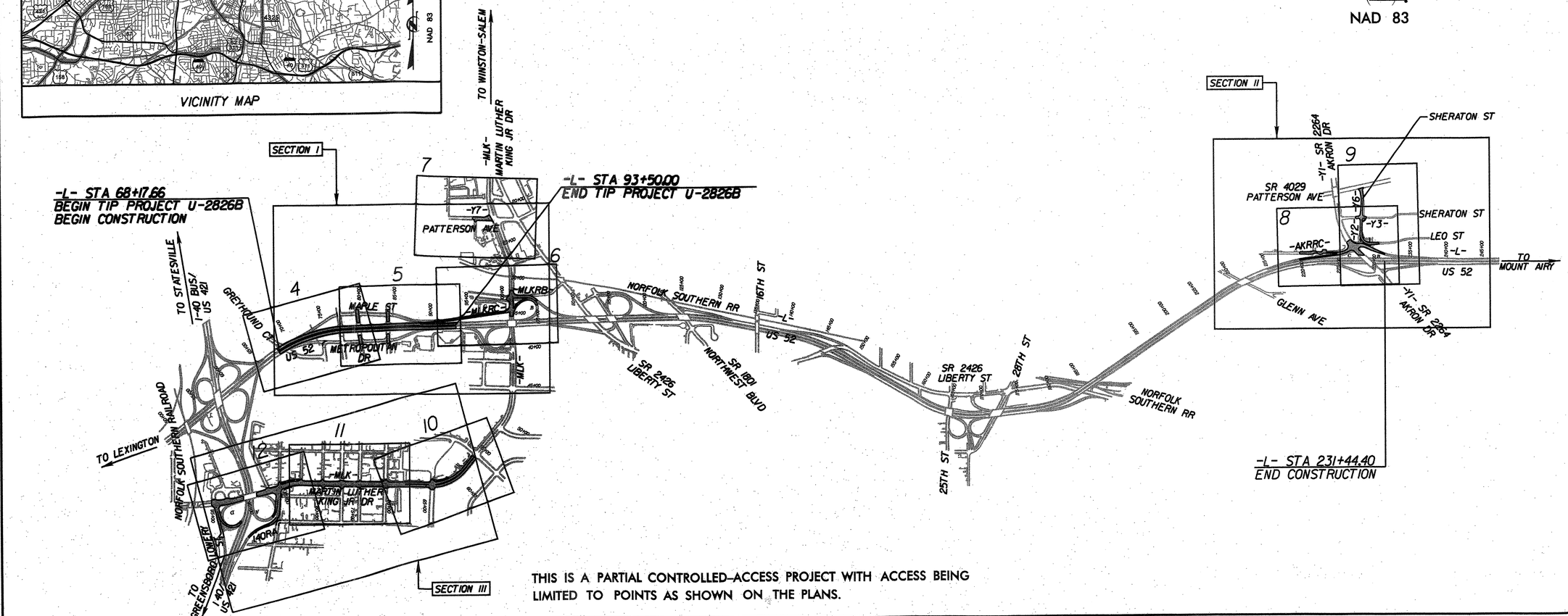
FORSYTH COUNTY

LOCATION: US 52 FROM GREYHOUND COURT TO SR 2264 (AKRON DRIVE), INCLUDING MARTIN LUTHER KING, JR. DRIVE

TYPE OF WORK: GRADING, DRAINAGE, PAVING, SIGNING, RETAINING WALLS, SIGNALS, AND ITS

Part 2 of 2

NAD 83



THIS IS A PARTIAL CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO POINTS AS SHOWN ON THE PLANS.

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

DESIGN DATA

(US 52)

ADT 2010 = 83,850 VPD
ADT 2015 = 87,300 VPD
DHV = 11%
D = 55%
T = 9% *
V = 60 mph

FUNCTIONAL CLASSIFICATION: FREEWAY
*(TTST 5% + DUAL 4%)

DESIGN EXCEPTION:
AUX. LANE WIDTH AND SHOULDER WIDTH

(MARTIN LUTHER KING JR DRIVE)

ADT 2010 = 9,700 VPD
ADT 2015 = 10,400 VPD
DHV = 8%
D = 55%
T = 4% *
V = 40 mph

FUNCTIONAL CLASSIFICATION: URBAN ARTERIAL
* (TTST 2% + DUAL 2%)

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT U-2826B = 0.480 MILES

TOTAL LENGTH TIP PROJECT U-2826B = 0.480 MILES

NCDOT CONTACT: K. ZAK HAMIDI, P.E.
PROJECT ENGINEER – ROADWAY DESIGN UNIT

PLANS PREPARED FOR THE NCDOT BY: Kimley-Horn and Associates, Inc.
© 2011 Post Office Box 33068 Raleigh, North Carolina 27636

2006 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: FEBRUARY 20, 2009

LETTING DATE: APRIL 19, 2011

MATTHEW WEST, PE
PROJECT ENGINEER

R. ERSKINE BROOKS, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 026480 ENGINEER LARRY D. ROBINSON, JR.

SIGNATURE: Larry D. Robinson P.E. 1-31-11

ROADWAY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 029876 ENGINEER MATTHEW S. WEST

SIGNATURE: P.E. 1-31-11

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

Art McMillan P.E.
STATE HIGHWAY DESIGN ENGINEER

K:\RAL_Roadway\01036\52_US 52 - MLK\Roadway\Proj\U-2826B_rdy_1sht.dgn

1/31/2011

Project No.	Sheet No.
U-2826B	Sig. 1

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

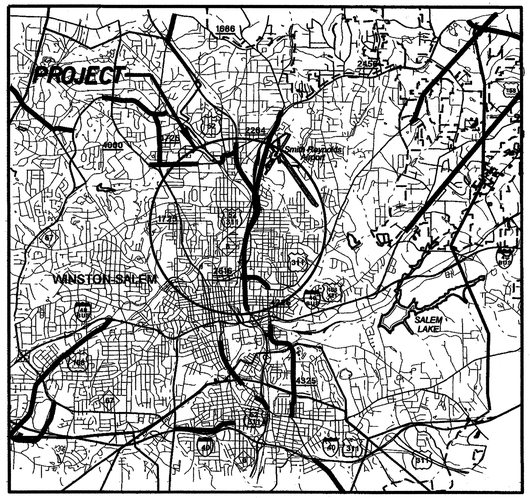
FORSYTH COUNTY

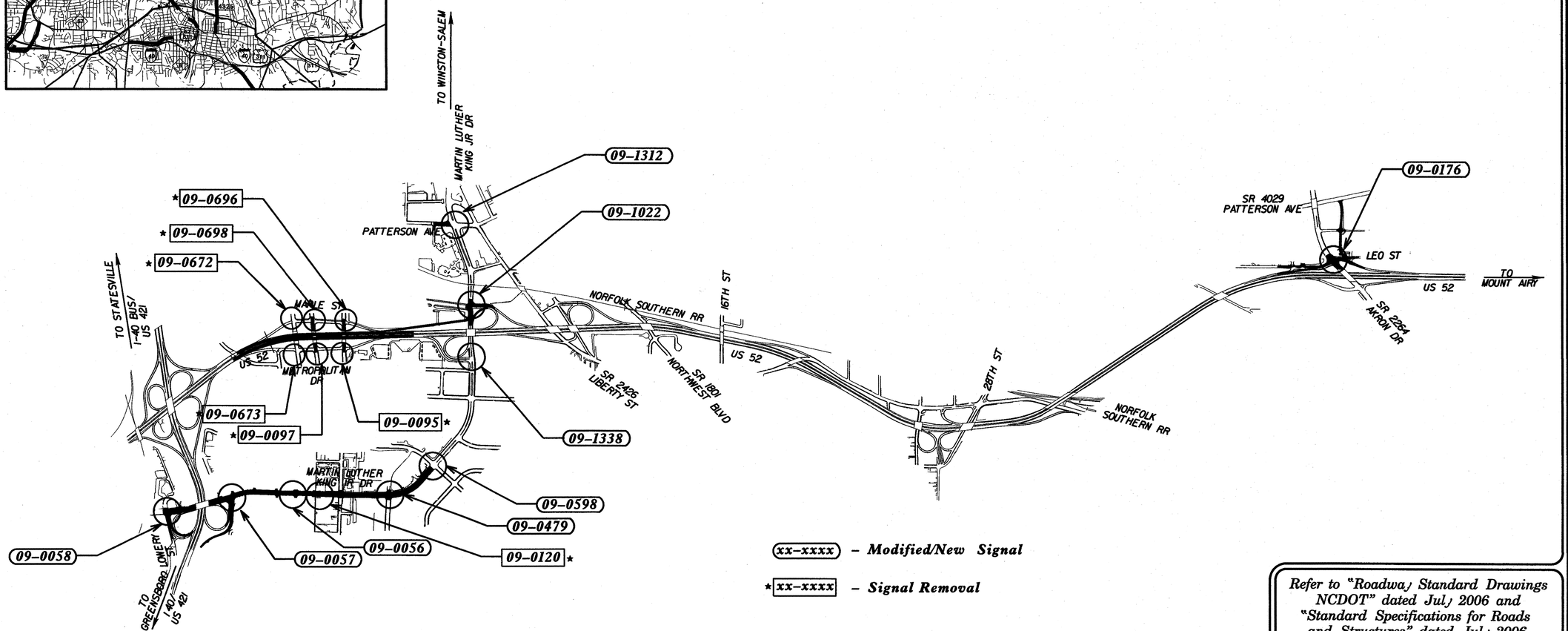
LOCATION: US 52/NC 8 FROM GREYHOUND COURT TO SR 2264 (AKRON DRIVE), INCLUDING MARTIN LUTHER KING, JR. DRIVE

TYPE OF WORK: TRAFFIC SIGNALS AND FIBER OPTIC COMMUNICATIONS SYSTEM

NAD 83

Vicinity





(xx-xxxx) – Modified/New Signal

*(xx-xxxx) – Signal Removal

Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.

Index of Plans

Sheet #	Reference #	Location/Description
Sig. 1		Title Sheet
Sig. 2–10	09–0058	SR 4325 (S. Martin Luther King, Jr. Dr.) at Excelsior Street and I–40 Bus./US 158–421/NC 150 EB Ramp
Sig. 11–18	09–0057	SR 4325 (Martin Luther King, Jr. Dr.) at East 1st Street and I–40 Bus./US 158–421/NC 150 WB Ramp
Sig. 19–22	09–0056	SR 4325 (N. Martin Luther King, Jr. Dr.) at East 3rd Street
Sig. 23–26	09–0479	US 311/SR 4325 (N. Martin Luther King, Jr. Dr.) at US 311(New Walkertown Rd) & East Winston Plaza
Sig. 27–28	09–0598	US 311 (N. Martin Luther King, Jr. Dr.) at File Street/N. Cleveland Avenue
Sig. 29–30	09–1338	US 311/SR 2516 (N. Martin Luther King, Jr. Dr.) at US 52–311/NC 8 NB Ramps
Sig. 31–36	09–1022	SR 2516 (N. Martin Luther King, Jr. Dr.) at US 52/NC 8 SB Ramp and Linden Street
Sig. 37–40	09–1312	SR 2516 (N. Martin Luther King, Jr. Dr.) at Patterson Avenue
Sig. 41–45	09–0176	SR 2264 (Akron Drive) at US 52/NC 8 SB Ramps and Leo Street
Remove	09–0120	SR 4325 (N. Martin Luther King, Jr. Dr.) at East 4th Street
Remove	09–0673	US 52–311/NC 8 NB Ramp/Metropolitan Dr. at East 3rd Street
Remove	09–0672	US 52–311/NC 8 SB Ramp/Maple Ave. at East 3rd Street
Remove	09–0697	Metropolitan Dr. at East 4th Street
Remove	09–0698	Maple Ave. at East 4th Street
Remove	09–0695	US 52–311/NC 8 NB Ramp/Metropolitan Dr. at East 5th Street
Remove	09–0696	US 52–311/NC 8 SB Ramp/Maple Ave. at East 5th Street
Sig. 46–48	N/A	Inductive Loop Standard Drawings
Sig. 49–52	N/A	Communications Cable & Conduit Routing Plans

INTELLIGENT TRANSPORTATION AND SIGNALS UNIT

Contacts:

R. J. Ziemba, PE – Central Region Signals Project Engineer

J. T. Rowe, Jr., PE – Signal Equipment Design Engineer

I. N. Avery – Signal Communication Project Engineer

Prepared In the Office of:
DIVISION OF HIGHWAYS
TRANSPORTATION MOBILITY AND SAFETY DIVISION

Intelligent Transportation Systems & Signals Unit

750 N. Greenfield Parkway, Garner, NC 27529

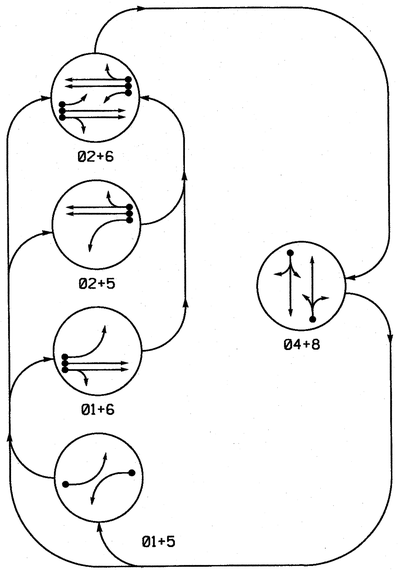
Project: U-2826B

WBS: 34871.1.1

12-JAN-2011 10:26
P:\TIPProjects-U\U2826B\Traffic\Signals\Design\Signals\U2826B_sig_tsh.dgn
rsemmo

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 2

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

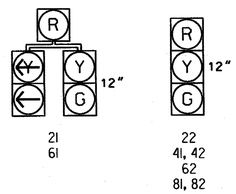
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	04+8	FLASH
21	R	R	G	G	R	Y
22	R	R	G	G	R	Y
41, 42	R	R	R	R	G	R
61	R	G	R	G	R	Y
62	R	G	R	G	R	Y
81, 82	R	R	R	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



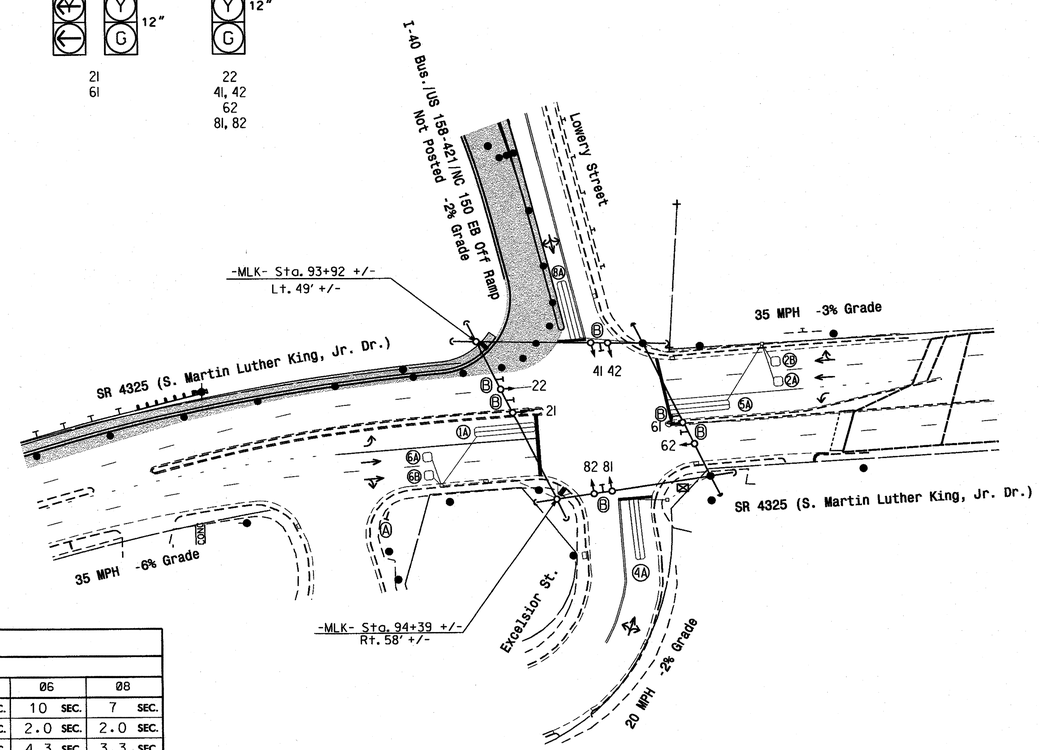
NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN#
1A	6X40	0	2-4-2	X	-	1	X	-	DELAY	15	YES
						6	X	-	-	-	NO
2A, 2B	6X6	70	4	X	-	2	X	-	-	-	NO
4A	6X40	0	2-4-2	X	-	4	X	-	DELAY	5	YES
5A	6X40	0	2-4-2	X	-	5	X	-	DELAY	15	YES
						2	X	-	-	-	NO
6A, 6B	6X6	70	4	X	-	6	X	-	-	-	NO
8A	6X40	0	2-4-2	X	-	8	X	-	DELAY	5	YES

5 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Omit phase 1 during phase 2 on.
4. Omit phase 5 during phase 6 on.
5. Program controller to clear from phase 2+6 to phase 1 and/or 5 by progressing through phase 4+8 (see Electrical Details).
6. Program phase 4 and phase 8 for dual entry.
7. Relocate existing street signs from existing span.
8. Set all detector units to presence mode.
9. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head with Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone	
	Construction Zone Drums	
N/A	Guardrail	
Ⓐ	"STOP" Sign (R1-1)	Ⓐ
Ⓑ	Street Sign	Ⓑ

NEMA TIMING CHART

FEATURE	PHASE 01	02	04	05	06	08
MINIMUM GREEN *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
PASSAGE/GAP *	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.1 SEC.	4.1 SEC.	3.3 SEC.	3.0 SEC.	4.3 SEC.	3.3 SEC.
RED CLEARANCE	2.1 SEC.	1.3 SEC.	2.5 SEC.	2.1 SEC.	1.4 SEC.	2.5 SEC.
MAX. 1 *	15 SEC.	50 SEC.	20 SEC.	15 SEC.	50 SEC.	20 SEC.
RECALL POSTION	NONE	MIN. RECALL	NONE	NONE	MIN. RECALL	NONE
VEHICLE CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	LOCK	NONLOCK
WALK *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

Signal Upgrade - Temporary Design 1 (Construction Phase I)

Prepared In the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SR 4325 (S. Martin Luther King, Jr. Dr.)
at
Excelsior Street and
I-40 Bus./US 158-421/NC 150 EB Ramp

Division 9 Forsyth County Winston-Salem

PLAN DATE: November 2010	REVIEWED BY: T. Thigpen
PREPARED BY: Sterling	REVIEWED BY:

SCALE 0 50 1"=50'

REVISIONS	INIT.	DATE

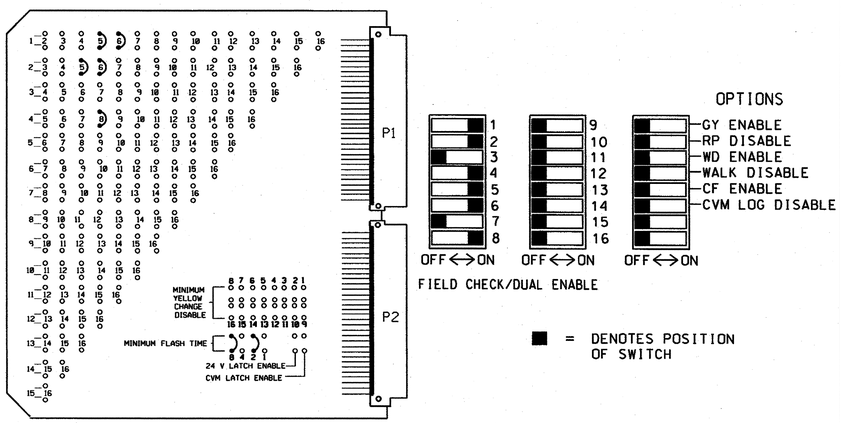
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE DATE 1/5/11
SIG. INVENTORY NO. 09-0058T1

12-JAN-2011 17:21
P:\TIProjects-Uml\2826B\traffic\Signals\Designs\Signals\09-0058\09005BT1-sig_dsn_20110105.dgn
rzziemba

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 3

EDI MODEL MMU-16E
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

■ = DENOTES POSITION OF SWITCH

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 3, 7, 9, 10, 11 & 12 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DUAL ENTRY.
7. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
8. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
9. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	61	21,22	NU	41,42	21	61,62	NU	81,82	NU	NU	NU	NU
RED	*	2R		4R	*	6R		8R				
YELLOW		2Y		4Y		6Y		8Y				
GREEN		2G		4G		6G		8G				
RED ARROW												
YELLOW ARROW	1Y				5Y							
GREEN ARROW	1G				5G							
✋												
🚶												

NU = NOT USED

*DENOTES INSTALL LOAD RESISTOR. SEE LOAD RESISTOR INSTALLATION DETAIL BELOW.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

		CH1	CH1	CH1		CH1					
BIU	SLOT	L1 ø1	L7 ø5	L5 ø2	SLOT	L9 ø6	SLOT	SLOT	SLOT	SLOT	SLOT
		CH2	CH2	CH2		CH2					
	EMPTY	L2 ø6	L8 ø2	L6 ø4	EMPTY	L10 ø8	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

	LOOP NO.	LOOP PANEL TERMINALS	
ADD JUMPERS FROM: L1A TO L2A, AND L1B TO L2B	1A	L1A, L1B	
		L2A, L2B	
	—	L3A, L3B	*
	—	L4A, L4B	*
	2A,2B	L5A, L5B	
	4A	L6A, L6B	
ADD JUMPERS FROM: L7A TO L8A, AND L7B TO L8B	5A	L7A, L7B	
		L8A, L8B	
	6A,6B	L9A, L9B	
	8A	L10A, L10B	
	—	L11A, L11B	
	—	L12A, L12B	
	—	L13A, L13B	
	—	L14A, L14B	
	—	L15A, L15B	
	—	L16A, L16B	

*FUTURE USE

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø1	DELAY	15
2	ø6	—	—
3 *	—	—	—
4 *	—	—	—
5	ø2	—	—
6	ø4	DELAY	5
7	ø5	DELAY	15
8	ø2	—	—
9	ø6	—	—
10	ø8	DELAY	5
11	—	—	—
12	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED ASC/3
CABINET .....CONTRACTOR SUPPLIED TS2 TYPE 1
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....12
LOAD SWITCHES USED.....1, 2, 4, 5, 6, 8
PHASES USED.....1, 2, 4, 5, 6, 8
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

LOAD SWITCH ASSIGNMENT DETAIL

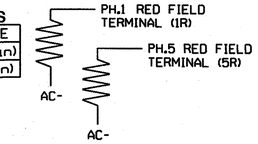
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



NOTE: THE PURPOSE OF THESE RESISTORS IS TO LOAD THE CHANNEL RED MONITOR INPUTS IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON CHANNELS THAT DO NOT USE THE RED DISPLAY IN THE FIELD.

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 09-0058T1
DESIGNED: NOVEMBER 2010
SEALED: 1/5/11
REVISED: N/A

SEE SHEET 2 FOR BACK-UP PROTECTION ENABLE PROGRAMMING

Temporary Design 1 (Construction Phase I)

NEMA Controller/TS-2 Type 1 Cabinet — Electrical Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 4325 (S. Martin Luther King, Jr. Dr.) at Excelsior Street and I-40 Bus./US 158-421/NC 150 EB Ramp

Prepared in the Offices of: Transportation Mobility and Safety Division, Electrical State of North Carolina, Department of Transportation, Signal Management Section, 750 N. Greenfield Pkwy, Garner, NC 27529

Division 09	Forsyth County	Winston-Salem
PLAN DATE: January 2011	REVIEWED BY:	
PREPARED BY: F.E. Russ	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL — NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE — DATE 1-11-11

SIG. INVENTORY NO. 09-0058T1

10-JAN-2011 11:45
S:#TTSASGN#TTS S1gnals#Workgroups#Sig Mgmt#Russ#ts2dwgs#090058_sm.e1e_20110101xx.dgn
fcruss

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 4

ECONOLITE ASC/3-2100 BACKUP PROTECTION ENABLE PROGRAMMING

(program controller as shown below)

FOLLOW PROGRAMMING AS SHOWN BELOW. ON THE 'ENABLE BACKUP PREVENT' SCREEN, MOVE CURSOR TO THE APPROPRIATE FIELD AND PRESS 'O' ON THE CONTROLLER KEYPAD TO TOGGLE FIELD VALUE BETWEEN 'X,B,C' AND 'OFF'.

MAIN MENU

1. CONFIGURATION
2. CONTROLLER
3. COORDINATOR
4. PREEMPTOR/TSP
5. TIME BASED
6. DETECTORS
7. STATUS DISPLAY
8. UTILITIES
9. DIAGONSTICS

PRESS KEYS 1...9 TO SELECT

CONFIGURATION SUBMENU

1. CONTROLLER SEQ
2. PHASE IN USE/PED
3. LOAD SW ASSIGN
4. PORT 1 (SDLC)
5. COMMUNICATIONS
6. ENABLE LOGGING
7. DISPLAY/ACCESS
8. LOGIC PROCESSOR

PRESS KEYS 1...8 TO SELECT

CONTROLLER SEQUENCE SUBMENU

1. PHASE RING SEQUENCE AND ASSIGNMENT
2. PHASE COMPATIBILITY
3. BACKUP PREVENT PHASES
4. SIMULTANEOUS GAP PHASES
5. DIAMOND SEQUENCE 17 TO 20

PRESS KEYS 1...5 TO SELECT

ENABLE BACKUP PREVENT

TMG/BKUP	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6
1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SEE NOTE BELOW ---> 2	B		.	C	.	.	.	C	.	.	.	.	.	.	.	.
3	.	.		.	.	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.		.	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.		.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	C	B		.	C	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.		.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.		.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.		.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.		.	.	.	.	.
12	.	.	.	.	.	.	.	.	.	.	.		.	.	.	.
13	.	.	.	.	.	.	.	.	.	.	.	.		.	.	.
14	.	.	.	.	.	.	.	.	.	.	.	.	.		.	.
15	.	.	.	.	.	.	.	.	.	.	.	.	.	.		.
16	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	

END OF PROGRAMMING

NOTE

'B' WITH A 'C' PROGRAMMED FOR THE TIMING (ROW) PHASE PLACES A DEMAND ON THAT BACKUP (COLUMN) PHASE. THE CONTROLLER WILL THEN SERVICE THE CALLED PHASE AND PROCEED NORMALLY.

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 09-0058T1
DESIGNED: NOVEMBER 2010
SEALED: 1/5/11
REVISED: N/A

Temporary Design 1 (Construction Phase I)

NEMA Controller/TS-2 Type 1 Cabinet — Electrical Detail - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:

Transportation Mobility and Safety Division — Signal Management Section — Department of Transportation — State of North Carolina

750 N. Greenfield Pkwy, Garner, NC 27529

SR 4325 (S. Martin Luther King, Jr. Dr.) at Excelsior Street and I-40 Bus./US 158-421/NC 150 EB Ramp

Division 09 — Forsyth County — Winston-Salem

PLAN DATE: December 2010 — REVIEWED BY: JTR

PREPARED BY: F.E. Russ — REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

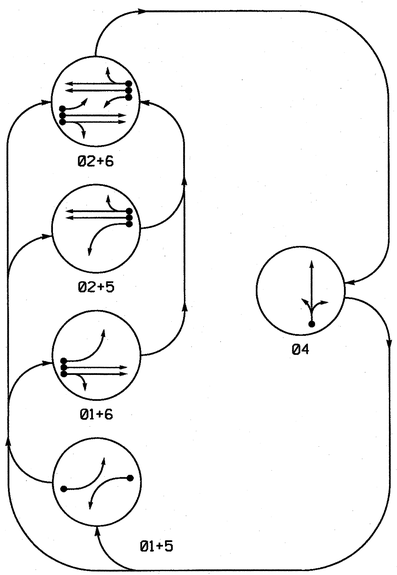
SIGNATURE — DATE 1-11-11

SIG. INVENTORY NO. 09-0058T1

10-JAN-2011 14:14
S:\TMS\SIGNALS\WIts\Signals\Workgroups\Sig Mgmt\Russ\ts2\dgns\09005B_smu_ele_20110101xx.dgn
fenruss

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 5

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	PHASE 01+6	PHASE 02+5	PHASE 02+6	PHASE 04	FLASH
21	R	R	G	G	R	Y
22	R	R	G	G	R	Y
41, 42	R	R	R	R	G	R
61	R	G	R	G	R	Y
62	R	G	R	G	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.

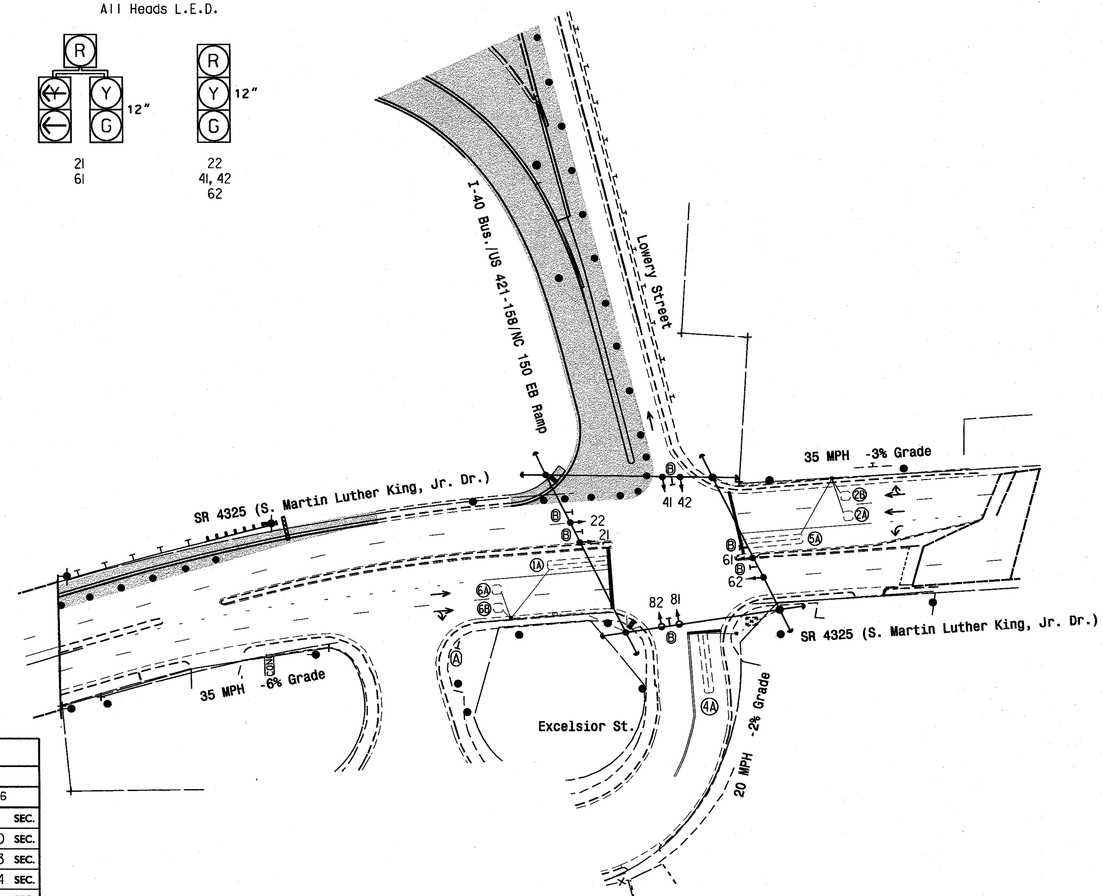
NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?
1A	6X40	0	2-4-2	-	X	1	-	X	DELAY	15	YES
						6	-	X	-	-	NO
2A, 2B	6x6	70	Existing	-	X	2	-	X	-	-	NO
4A	6X40	0	2-4-2	-	X	4	-	X	DELAY	5	YES
5A	6X40	0	2-4-2	-	X	5	-	X	DELAY	15	YES
						2	-	X	-	-	NO
6A, 6B	6X6	70	Existing	-	X	6	-	X	-	-	NO

5 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Omit phase 1 during phase 2 on.
4. Omit phase 5 during phase 6 on.
5. Program controller to clear from phase 2+6 to phase 1 and/or 5 by progressing through phase 4+8 (see Electrical Details).
6. Disconnect and bag signal heads 81 and 82 during this construction phase.
7. Set all detector units to presence mode.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone	
	Construction Zone Drums	
N/A	Guardrail	
Ⓐ	"STOP" Sign (R1-1)	Ⓐ
Ⓑ	Street Sign	Ⓑ

NEMA TIMING CHART

FEATURE	PHASE 01	PHASE 02	PHASE 04	PHASE 05	PHASE 06
MINIMUM GREEN *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	10 SEC.
PASSAGE/GAP *	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.1 SEC.	4.1 SEC.	3.3 SEC.	3.0 SEC.	4.3 SEC.
RED CLEARANCE	2.1 SEC.	1.3 SEC.	2.5 SEC.	2.1 SEC.	1.4 SEC.
MAX. 1 *	15 SEC.	50 SEC.	20 SEC.	15 SEC.	50 SEC.
RECALL POSTION	NONE	MIN. RECALL	NONE	NONE	MIN. RECALL
VEHICLE CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	LOCK
WALK *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

Signal Upgrade - Temporary Design 2 (Construction Phase II)

Prepared In the Offices of:
Transportation Mobility and Safety Division
Traffic Engineering & Safety Systems Branch
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

SR 4325 (S. Martin Luther King, Jr. Dr.)
at
Excelsior Street and
I-40 Bus./US 158-421/NC 150 EB Ramp
Division 9 Forsyth County Winston-Salem

PLAN DATE: November 2010	REVIEWED BY: T. Thigpen		
PREPARED BY: Sterling	REVIEWED BY:		
REVISIONS		INIT.	DATE

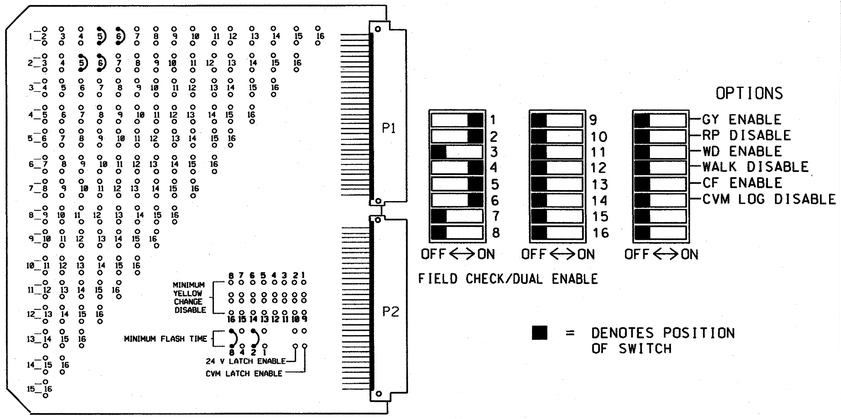
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 5/11 DATE
SIG. INVENTORY NO. 09-0058T2

10-JAN-2011 10:53
P:\RTP\Projects\U-2826B\Traffic\Signals\Design\Signals\09-0058\09005812_sig_dsn_20110105.dgn
ZZ EMBO

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 6

EDI MODEL MMU-16E
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

■ = DENOTES POSITION OF SWITCH

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 3, 7, 8, 9, 10, 11 & 12 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. ! ---> REMOVE DUAL ENTRY PROGRAMMING FROM PHASES 4 AND 8.
7. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
8. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
9. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

REMOVE LOAD SWITCH 8 FROM ITS POSITION AND TIE RED OUTPUT TO AC+ PER NOTE 2 AT LEFT. DISCONNECT FIELD TERMINAL WIRES AND LEAVE FOR FUTURE RE-CONNECTION. HEADS 81,82 WILL NOT BE USED DURING THIS DESIGN PHASE AND ARE TO BE BAGGED.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	61	21,22	NU	41,42	21	61,62	NU	81,82	NU	NU	NU	NU
RED	*	2R		4R	*	6R		8R				
YELLOW		2Y		4Y		6Y		8Y				
GREEN		2G		4G		6G		8G				
RED ARROW												
YELLOW ARROW	1Y				5Y							
GREEN ARROW	1G				5G							
✋												
🚶												

NU = NOT USED

* DENOTES INSTALL LOAD RESISTOR. SEE LOAD RESISTOR INSTALLATION DETAIL BELOW.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

		CH1	CH1	CH1		CH1					
	SLOT	L1 Ø1	L7 Ø5	L5 Ø2	SLOT	L9 Ø6	SLOT	SLOT	SLOT	SLOT	SLOT
BIU		CH2	CH2	CH2		CH2					
	EMPTY	L2 Ø6	L8 Ø2	L6 Ø4	EMPTY	L10 FUTURE USE	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

	LOOP NO.	LOOP PANEL TERMINALS	
ADD JUMPERS FROM: L1A TO L2A, AND L1B TO L2B	1A	L1A, L1B	
		L2A, L2B	
	—	L3A, L3B	*
	—	L4A, L4B	*
	2A,2B	L5A, L5B	
	4A	L6A, L6B	
ADD JUMPERS FROM: L7A TO L8A, AND L7B TO L8B	5A	L7A, L7B	
		L8A, L8B	
	6A,6B	L9A, L9B	
	—	L10A, L10B	*
	—	L11A, L11B	
	—	L12A, L12B	
	—	L13A, L13B	
	—	L14A, L14B	
	—	L15A, L15B	
	—	L16A, L16B	

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	Ø1	DELAY	15
2	Ø6	—	—
3 *	—	—	—
4 *	—	—	—
5	Ø2	—	—
6	Ø4	DELAY	5
7	Ø5	DELAY	15
8	Ø2	—	—
9	Ø6	—	—
10 *	—	—	—
11	—	—	—
12	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

* FUTURE USE

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED ASC/3*
CABINET .....CONTRACTOR SUPPLIED TS2 TYPE 1*
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....12
LOAD SWITCHES USED.....1, 2, 4, 5, 6
PHASES USED.....1, 2, 4, 5, 6
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

*EXISTING INSTALLED UNDER TEMPORARY DESIGN 1

LOAD SWITCH ASSIGNMENT DETAIL

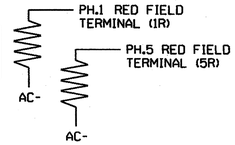
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	Ø1
2	Ø2
3	Ø3
4	Ø4
5	Ø5
6	Ø6
7	Ø7
8	Ø8
9	Ø2 PED
10	Ø4 PED
11	Ø6 PED
12	Ø8 PED

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



NOTE: THE PURPOSE OF THESE RESISTORS IS TO LOAD THE CHANNEL RED MONITOR INPUTS IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON CHANNELS THAT DO NOT USE THE RED DISPLAY IN THE FIELD.

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 09-0058T2
DESIGNED: NOVEMBER 2010
SEALED: 1/5/11
REVISED: N/A

SEE SHEET 2 FOR BACK-UP PROTECTION ENABLE PROGRAMMING

Temporary Design 2 (Construction Phase II)

NEMA Controller/TS-2 Type 1 Cabinet — Electrical Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 4325 (S. Martin Luther King, Jr. Dr.) at Excelsior Street and I-40 Bus./US 158-421/NC 150 EB Ramp

Division 09 — Forsyth County — Winston-Salem

PLAN DATE: January 2011 — REVIEWED BY: JP
PREPARED BY: F.E. Russ — REVIEWED BY:

REVISIONS	INIT.	DATE

Prepared in the Offices of: Transportation Mobility and Safety Division, Traffic Engineering Branch, Signal Management Section, Department of Transportation, State of North Carolina
750 N. Greenfield Pkwy, Garner, NC 27529

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE — DATE 1-11-11

SIG. INVENTORY NO. 09-0058T2

10-JAN-2011 11:45
S:\Traffic\Signals\Workgroups\Sig Mgmt\Russ\ts2dwgs\090058_sm.ele.201101xx.dgn
$$$$USER$$$$TS Signals
FERUSS

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 7

ECONOLITE ASC/3-2100 BACKUP PROTECTION ENABLE PROGRAMMING

(program controller as shown below)

FOLLOW PROGRAMMING AS SHOWN BELOW. ON THE 'ENABLE BACKUP PREVENT' SCREEN, MOVE CURSOR TO THE APPROPRIATE FIELD AND PRESS 'O' ON THE CONTROLLER KEYPAD TO TOGGLE FIELD VALUE BETWEEN 'X.B.C' AND 'OFF'.

MAIN MENU

1. CONFIGURATION	6. DETECTORS
2. CONTROLLER	7. STATUS DISPLAY
3. COORDINATOR	8. UTILITIES
4. PREEMPTOR/TSP	9. DIAGONSTICS
5. TIME BASED	

PRESS KEYS 1...9 TO SELECT

CONFIGURATION SUBMENU

1. CONTROLLER SEQ	5. COMMUNICATIONS
2. PHASE IN USE/PED	6. ENABLE LOGGING
3. LOAD SW ASSIGN	7. DISPLAY/ACCESS
4. PORT 1 (SDLC)	8. LOGIC PROCESSOR

PRESS KEYS 1...8 TO SELECT

CONTROLLER SEQUENCE SUBMENU

1. PHASE RING SEQUENCE AND ASSIGNMENT
2. PHASE COMPATIBILITY
3. BACKUP PREVENT PHASES
4. SIMULTANEOUS GAP PHASES
5. DIAMOND SEQUENCE 17 TO 20

PRESS KEYS 1...5 TO SELECT

ENABLE BACKUP PREVENT

SEE NOTE BELOW --->

TMG/BKUP	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6
1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2	B		.	C	.	.	.	.	.	.	.	.	.	.	.	.
3	.	.		.	.	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.		.	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.		.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	C	B		.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.		.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.		.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.		.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.		.	.	.	.	.
12	.	.	.	.	.	.	.	.	.	.	.		.	.	.	.
13	.	.	.	.	.	.	.	.	.	.	.	.		.	.	.
14	.	.	.	.	.	.	.	.	.	.	.	.	.		.	.
15	.	.	.	.	.	.	.	.	.	.	.	.	.	.		.
16	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	

END OF PROGRAMMING

NOTE

'B' WITH A 'C' PROGRAMMED FOR THE TIMING (ROW) PHASE PLACES A DEMAND ON THAT BACKUP (COLUMN) PHASE. THE CONTROLLER WILL THEN SERVICE THE CALLED PHASE AND PROCEED NORMALLY.

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 09-0058T2
DESIGNED: NOVEMBER 2010
SEALED: 1/5/11
REVISED: N/A

Temporary Design 2 (Construction Phase II)

NEMA Controller/TS-2 Type 1 Cabinet — Electrical Detail - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:

Transportation Mobility and Safety Division — Intelligent Transportation Systems Management Section — NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

750 N. Greenfield Pkwy, Garner, NC 27529

SR 4325 (S. Martin Luther King, Jr. Dr.)
at
Excelsior Street and
I-40 Bus./US 158-421/NC 150 EB Ramp

Division 09 — Forsyth County — Winston-Salem

PLAN DATE: January 2011 — REVIEWED BY: JPR

PREPARED BY: F.E. Russ — REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

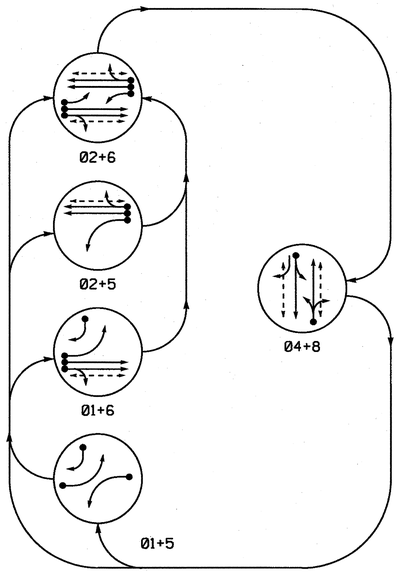
SIGNATURE — DATE: 1-11-11

SIG. INVENTORY NO. 09-0058T2

10-JAN-2011 11:45
S:\TrafficSignals\WorkGroups\Sig Mon\Russ\U2826wgs\090058_sm_elk_20110101xx.dgn
ferruss

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 8

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

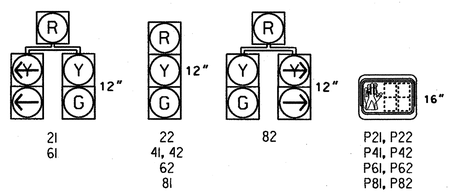
TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	04+8	FLASH
21	R/→	R	G/←	G	R	Y
22	R	R	G	G	R	Y
41, 42	R	R	R	R	G	R
61	R/→	G/←	R	G	R	Y
62	R	G	R	G	R	Y
81	R	R	R	R	G	R
82	R/←	R/→	R	R	G	R
P21, P22	DW	DW	W	W	DW	DRK
P41, P42	DW	DW	DW	DW	W	DRK
P61, P62	DW	W	DW	W	DW	DRK
P81, P82	DW	DW	DW	DW	W	DRK

W - Walk
DW - Don't Walk
DRK - Dark

SIGNAL FACE I.D.

All Heads L.E.D.



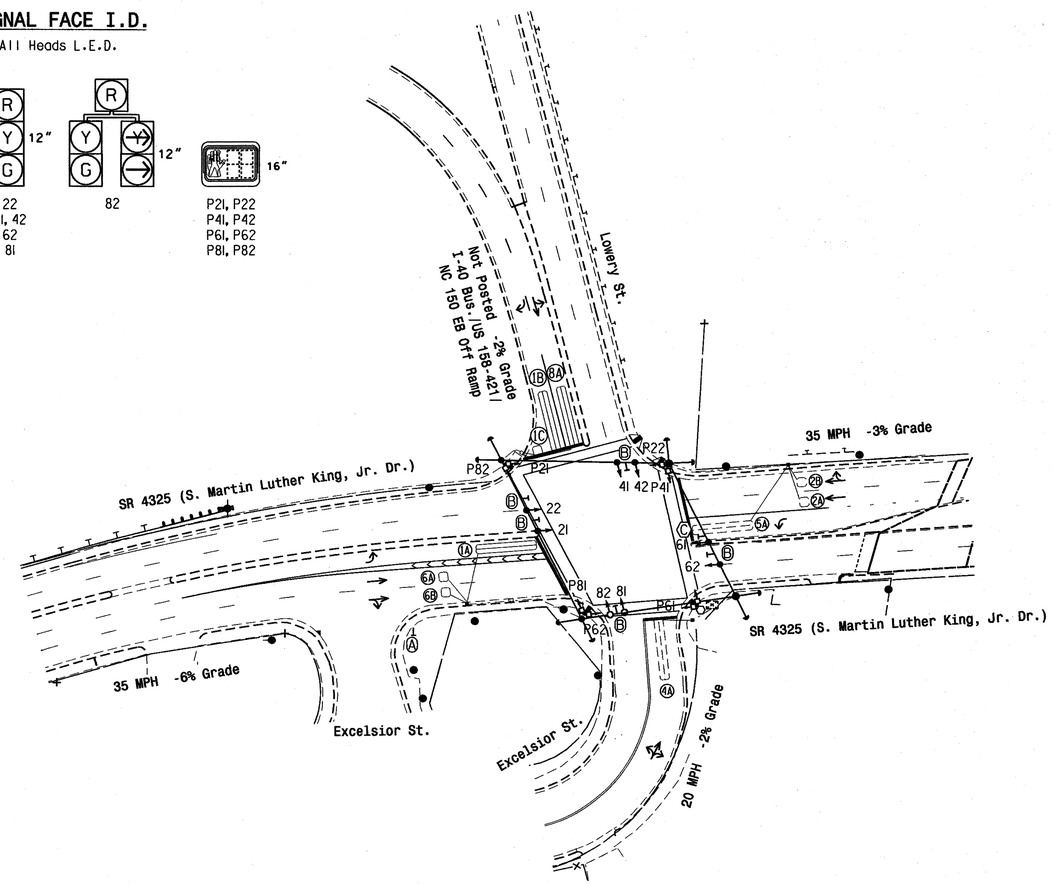
NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS				
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?
1A	6X40	0	2-4-2	X	-	1	-	X	DELAY	15	YES
						6	-	X	-	-	NO
1B	6X40	0	2-4-2	X	-	1	X	-	DELAY	15	YES
1C	6X6	0	3	X	-	1	X	-	DELAY	15	YES
2A, 2B	6X6	70	4	-	X	2	-	X	-	-	NO
4A	6X40	0	2-4-2	-	X	4	-	X	DELAY	5	YES
5A	6X40	0	2-4-2	-	X	5	-	X	DELAY	15	YES
						2	-	X	-	-	NO
6A, 6B	6X6	70	4	X	-	6	-	X	-	-	NO
8A	6X40	0	2-4-2	X	-	8	-	X	-	-	NO

5 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Omit phase 1 during phase 2 on.
4. Omit phase 5 during phase 6 on.
5. Program controller to clear from phase 2+6 to phase 1 and/or 5 by progressing through phase 4+8 (see Electrical Details).
6. Program phase 4 and phase 8 for dual entry.
7. Set all detector units to presence mode.
8. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
9. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pedestal	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
N/A	Guardrail	
Ⓐ	"STOP" Sign (R1-1)	Ⓐ
Ⓑ	Street Sign	Ⓑ
Ⓒ	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	Ⓒ

NEMA TIMING CHART

FEATURE	PHASE 01	02	04	05	06	08
MINIMUM GREEN *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
PASSAGE/GAP *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.1 SEC.	3.0 SEC.	3.0 SEC.	4.1 SEC.	3.3 SEC.
RED CLEARANCE	2.4 SEC.	2.1 SEC.	3.3 SEC.	2.3 SEC.	2.0 SEC.	3.0 SEC.
MAX. 1 *	15 SEC.	50 SEC.	20 SEC.	15 SEC.	50 SEC.	50 SEC.
RECALL POSTION	NONE	MIN. RECALL	NONE	NONE	MIN. RECALL	NONE
VEHICLE CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	LOCK	NONLOCK
WALK *	– SEC.	7 SEC.	7 SEC.	– SEC.	7 SEC.	7 SEC.
FLASHING DON'T WALK	– SEC.	24 SEC.	23 SEC.	– SEC.	14 SEC.	26 SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

Signal Upgrade - Final Design

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

SR 4325 (S. Martin Luther King, Jr. Dr.)
at
Excelsior Street and
I-40 Bus./US 158-421/NC 150 EB Ramp
Division 9 Forsyth County Winston-Salem

PLAN DATE: June 2010	REVIEWED BY: T. Thigpen
PREPARED BY: Sterling	REVIEWED BY:

REVISIONS	INIT.	DATE

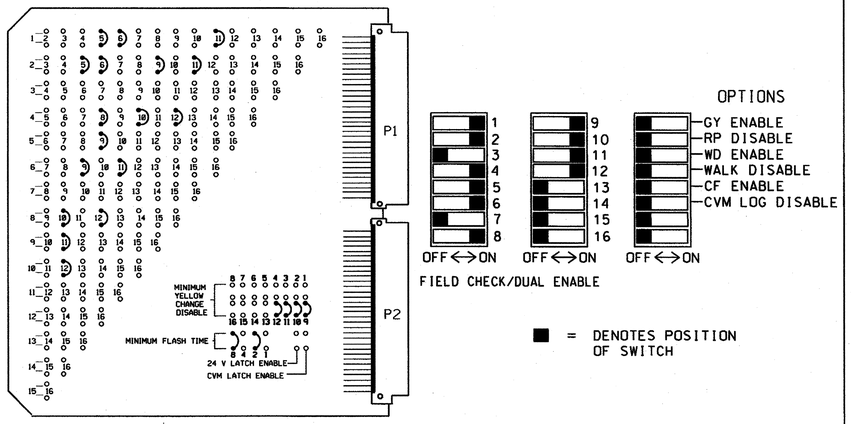
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 1/5/11 DATE
SIG. INVENTORY NO. 09-0058

05-JAN-2011 17:51
P:\TIPProjects\U2826B\Traffic\Signals\Designs\09-0058\09058FINAL_sig.dgn.20110105.dgn
PZIEMBA

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 9

EDI MODEL MMU-16E
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and set switches as shown below)



■ = DENOTES POSITION OF SWITCH

MMU PROGRAMMING CARD

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 3 AND 7 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 WALK.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DUAL ENTRY.
7. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
8. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
9. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	61,82	21,22	NU	41,42	21	61,62	NU	81,82	P21, P22	P41, P42	P61, P62	P81, P82
RED	*	2R		4R	*	6R		8R				
YELLOW		2Y		4Y		6Y		8Y				
GREEN		2G		4G		6G		8G				
RED ARROW												
YELLOW ARROW	1Y				5Y							
GREEN ARROW	1G				5G							
✋									9R	10R	11R	12R
🚶									9G	10G	11G	12G
NU = NOT USED									**	**	**	**

*DENOTES INSTALL LOAD RESISTOR. SEE LOAD RESISTOR INSTALLATION DETAIL BELOW.

**SEE COUNTDOWN NOTE ON 'PEDESTRIAN PUSH-BUTTON WIRING DETAIL' ON SHEET 2.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1 L3 ø1	CH1 L1 ø1	CH1 L7 ø5	CH1 L5 ø2	SLOT EMPTY	CH1 L9 ø6	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 ø1	CH2 L2 ø6	CH2 L8 ø2	CH2 L6 ø4		CH2 L10 ø8					

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

	LOOP NO.	LOOP PANEL TERMINALS
ADD JUMPERS FROM: L1A TO L2A, AND L1B TO L2B	1A	L1A, L1B
		L2A, L2B
	1B	L3A, L3B
	1C	L4A, L4B
	2A,2B	L5A, L5B
	4A	L6A, L6B
ADD JUMPERS FROM: L7A TO L8A, AND L7B TO L8B	5A	L7A, L7B
		L8A, L8B
	6A,6B	L9A, L9B
	8A	L10A, L10B
	—	L11A, L11B
	—	L12A, L12B
	—	L13A, L13B
	—	L14A, L14B
	—	L15A, L15B
	—	L16A, L16B

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø1	DELAY	15
2	ø6	—	—
3	ø1	DELAY	15
4	ø1	DELAY	15
5	ø2	—	—
6	ø4	DELAY	5
7	ø5	DELAY	15
8	ø2	—	—
9	ø6	—	—
10	ø8	—	—
11	—	—	—
12	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED ASC/3*
CABINET .....CONTRACTOR SUPPLIED TS2 TYPE 1*
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....12
LOAD SWITCHES USED.....1, 2, 4, 5, 6, 8, 9, 10, 11, 12
PHASES USED.....1, 2, 4, 5, 6, 8, 2PED, 4PED, 6PED, 8PED
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

*EXISTING INSTALLED UNDER TEMPORARY DESIGN 1

LOAD SWITCH ASSIGNMENT DETAIL

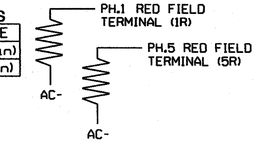
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



NOTE: THE PURPOSE OF THESE RESISTORS IS TO LOAD THE CHANNEL RED MONITOR INPUTS IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON CHANNELS THAT DO NOT USE THE RED DISPLAY IN THE FIELD.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 09-0058
DESIGNED: JUNE 2010
SEALED: 1/5/11
REVISED: N/A

SEE SHEET 2 FOR PEDESTRIAN PUSH-BUTTON WIRING DETAIL AND BACK-UP PROTECTION ENABLE PROGRAMMING

Final Design

NEMA Controller/TS-2 Type 1 Cabinet — Electrical Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 4325 (S. Martin Luther King, Jr. Dr.) at Excelsior Street and I-40 Bus./US 158-421/NC 150 EB Ramp

Division 09 — Forsyth County — Winston-Salem

PLAN DATE: January 2011 — REVIEWED BY: JJP
PREPARED BY: F.E. Russ — REVIEWED BY:

REVISIONS	INIT.	DATE

Prepared in the Offices of: Transportation Mobility and Safety Division, Traffic Engineering Branch, Signal Management Section, State of North Carolina, Department of Transportation
750 N. Greenfield Pkwy, Garner, NC 27529

SEAL — NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE — DATE 1-11-11
SIG. INVENTORY NO. 09-0058

10-JAN-2011 11:44
S:\#TSSGN\#TS Signals\Workgroups\Sig Mon\#Russ\#s2dwgs\#09005B_sm.dgn
ferruss

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 10

ECONOLITE ASC/3-2100 BACKUP PROTECTION ENABLE PROGRAMMING

(program controller as shown below)

FOLLOW PROGRAMMING AS SHOWN BELOW. ON THE 'ENABLE BACKUP PREVENT' SCREEN, MOVE CURSOR TO THE APPROPRIATE FIELD AND PRESS '0' ON THE CONTROLLER KEYPAD TO TOGGLE FIELD VALUE BETWEEN 'X,B,C' AND 'OFF'.

MAIN MENU

1. CONFIGURATION	6. DETECTORS
2. CONTROLLER	7. STATUS DISPLAY
3. COORDINATOR	8. UTILITIES
4. PREEMPTOR/TSP	9. DIAGONSTICS
5. TIME BASED	

PRESS KEYS 1...9 TO SELECT

CONFIGURATION SUBMENU

1. CONTROLLER SEQ	5. COMMUNICATIONS
2. PHASE IN USE/PED	6. ENABLE LOGGING
3. LOAD SW ASSIGN	7. DISPLAY/ACCESS
4. PORT 1 (SDLC)	8. LOGIC PROCESSOR

PRESS KEYS 1...8 TO SELECT

CONTROLLER SEQUENCE SUBMENU

1. PHASE RING SEQUENCE AND ASSIGNMENT
2. PHASE COMPATIBILITY
3. BACKUP PREVENT PHASES
4. SIMULTANEOUS GAP PHASES
5. DIAMOND SEQUENCE 17 TO 20

PRESS KEYS 1...5 TO SELECT

ENABLE BACKUP PREVENT

	TMG/BKUP	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6
	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SEE NOTE BELOW --->	2	B		.	C	.	.	.	C	.	.	.	.	.	.	.	.
	3	.	.		.	.	.	.	.	.	.	.	.	.	.	.	.
	4	.	.	.		.	.	.	.	.	.	.	.	.	.	.	.
	5	.	.	.	.		.	.	.	.	.	.	.	.	.	.	.
	6	.	.	.	C	B		.	C	.	.	.	.	.	.	.	.
	7	.	.	.	.	.	.		.	.	.	.	.	.	.	.	.
	8	.	.	.	.	.	.	.		.	.	.	.	.	.	.	.
	9	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.
	10	.	.	.	.	.	.	.	.	.		.	.	.	.	.	.
	11	.	.	.	.	.	.	.	.	.	.		.	.	.	.	.
	12	.	.	.	.	.	.	.	.	.	.	.		.	.	.	.
	13	.	.	.	.	.	.	.	.	.	.	.	.		.	.	.
	14	.	.	.	.	.	.	.	.	.	.	.	.	.		.	.
	15	.	.	.	.	.	.	.	.	.	.	.	.	.	.		.
	16	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	

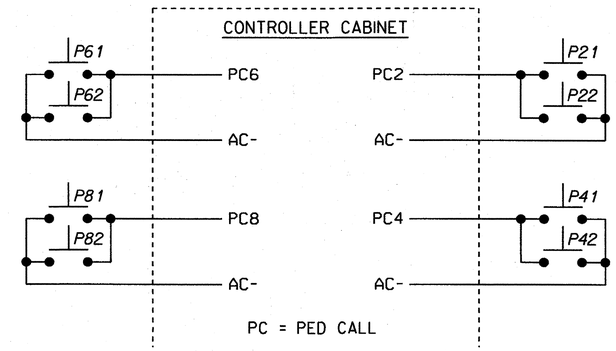
END OF PROGRAMMING

NOTE

'B' WITH A 'C' PROGRAMMED FOR THE TIMING (ROW) PHASE PLACES A DEMAND ON THAT BACKUP (COLUMN) PHASE. THE CONTROLLER WILL THEN SERVICE THE CALLED PHASE AND PROCEED NORMALLY.

PEDESTRIAN PUSH-BUTTON WIRING DETAIL

(wire push-buttons as shown below)



NOTE: COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 09-0058
DESIGNED: JUNE 2010
SEALED: 1/5/11
REVISED: N/A

Final Design

NEMA Controller/TS-2 Type 1 Cabinet — Electrical Detail - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:

Transportation Mobility and Safety Division — State of North Carolina — Department of Transportation — Signal Management Section

750 N. Greenfield Pkwy, Garner, NC 27529

SR 4325 (S. Martin Luther King, Jr. Dr.) at Excelsior Street and I-40 Bus./US 158-421/NC 150 EB Ramp

Division 09 — Forsyth County — Winston-Salem

PLAN DATE: January 2011 — REVIEWED BY: JP

PREPARED BY: F.E. Russ — REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

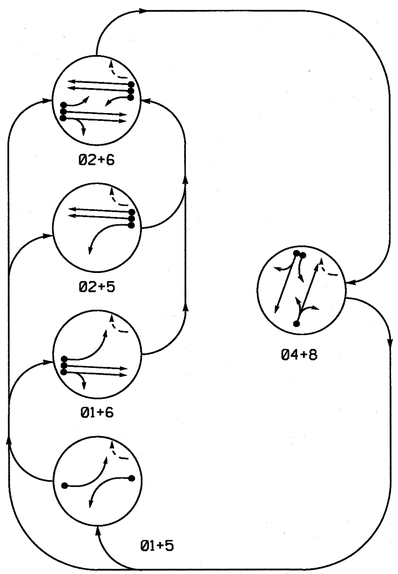
SIGNATURE — DATE 1-11-11

SIG. INVENTORY NO. 09-0058

10-JAN-2011 11:43
S:\TTSASU\TTS Signals\Groups\Sig Mon\fruss\u2826\dwgs\090058_sm_ele_201101xx.dgn
fruss

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 11

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

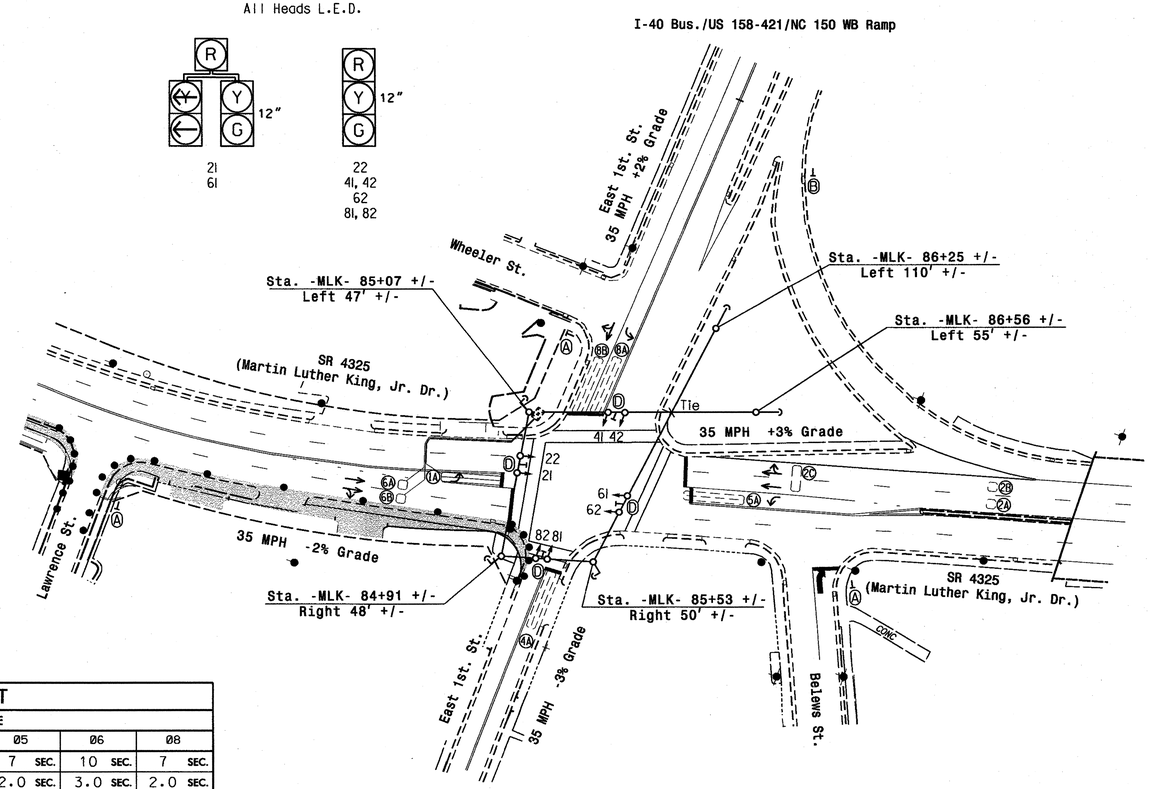
SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	04+8	FLASH
21	R	R	G	G	R	Y
22	R	R	G	G	R	Y
41, 42	R	R	R	R	G	R
61	R	G	R	G	R	Y
62	R	G	R	G	R	Y
81, 82	R	R	R	R	G	R

NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN#
1A	6X40	0	2-4-2	X	-	1	-	X	DELAY	15	YES
						6	-	X	-	-	NO
2A, 2B	6X6	200	Existing	-	X	2	-	X	-	-	NO
2C	6X17	70	Existing	-	X	2	-	X	-	-	NO
4A	6X40	0	2-4-2	-	X	4	-	X	DELAY	5	YES
5A	6X40	+5	2-4-2	-	X	5	-	X	DELAY	15	YES
						2	-	X	-	-	NO
6A, 6B	6X6	70	4	X	-	6	-	X	-	-	NO
8A	6X40	0	2-4-2	-	X	8	-	X	DELAY	3	YES
8B	6X40	0	2-4-2	-	X	8	-	X	DELAY	10	YES

SIGNAL FACE I.D.

All Heads L.E.D.



NEMA TIMING CHART

FEATURE	PHASE 01	02	04	05	06	08
MINIMUM GREEN *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
PASSAGE/GAP *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	3.7 SEC.	4.1 SEC.	3.0 SEC.	4.0 SEC.	3.7 SEC.
RED CLEARANCE	2.4 SEC.	2.6 SEC.	1.9 SEC.	3.3 SEC.	1.7 SEC.	1.8 SEC.
MAX. 1 *	20 SEC.	40 SEC.	20 SEC.	20 SEC.	40 SEC.	20 SEC.
RECALL POSTION	NONE	MIN. RECALL	NONE	NONE	MIN. RECALL	NONE
VEHICLE CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	LOCK	NONLOCK
WALK *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

5 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Omit phase 1 during phase 2 on.
4. Omit phase 5 during phase 6 on.
5. Program controller to clear from phase 2+6 to phase 1 and/or 5 by progressing through phase 4+8. (see Electrical Details).
6. Program phase 4 and phase 8 for dual entry.
7. Relocate existing street signs from previous span.
8. Set all detector units to presence mode.
9. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone	
	Construction Zone Drums	
A	"STOP" Sign (R1-1)	A
B	"YIELD" Sign (R1-2)	B
D	Street Sign	D

Signal Upgrade - Temporary Design 1 (Construction Phase I)

Prepared in the Offices of:
Transportation Mobility and Safety Division
Traffic Engineering Branch
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SR 4325
(Martin Luther King, Jr. Dr.)
at East 1st St. and
I-40 Bus./US 158-421/NC 150 WB Ramp

Division 9 Forsyth County Winston-Salem

PLAN DATE: November 2010 REVIEWED BY: T. Thigpen
PREPARED BY: Sterling REVIEWED BY:

SCALE 0 50 1"=50'

REVISIONS	INIT.	DATE

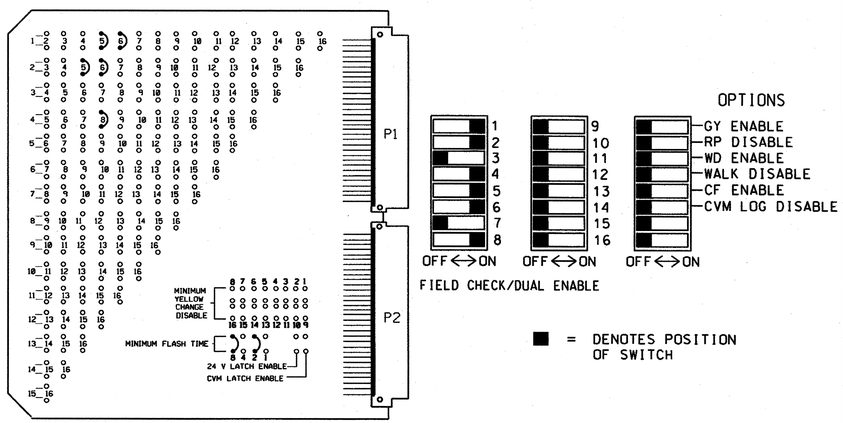
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIENDA
SIGNATURE DATE 1/5/11
SIG. INVENTORY NO. 09-0057T1

10-JAN-2011 16:53
P:\TIPProjects\U2826B\Traffic\Signals\Design\09-0057T1_sig.dgn
rzienda

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 12

EDI MODEL MMU-16E
MALFUCTION MANAGEMENT UNIT
pROGRAMMING DETAIL

(program card and set switches as shown below)



■ = DENOTES POSITION OF SWITCH

MMU PROGRAMMING CARD

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 3, 7, 9, 10, 11, 12, 13, 14, 15 & 16 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DUAL ENTRY.
7. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
8. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
9. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	61	21,22	NU	41,42	21	61,62	NU	81,82	NU	NU	NU	NU	NU	NU	NU	NU
RED	*	2R		4R	*	6R		8R								
YELLOW		2Y		4Y		6Y		8Y								
GREEN		2G		4G		6G		8G								
RED ARROW																
YELLOW ARROW	1Y				5Y											
GREEN ARROW	1G				5G											
✋																
🚶																

NU = NOT USED

*DENOTES INSTALL LOAD RESISTOR. SEE LOAD RESISTOR INSTALLATION DETAIL BELOW.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1 L3 FUTURE USE	CH1 L1 ø1	CH1 L7 ø4	CH1 L5 ø2	CH1 L11 ø6	CH1 L9 ø5	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 ø2	CH2 L2 ø6	CH2 L8 ø8	CH2 L6 FUTURE USE	CH2 L12 ø8	CH2 L10 ø2					

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

	LOOP NO.	LOOP PANEL TERMINALS	
ADD JUMPERS FROM: L1A TO L2A, AND L1B TO L2B	1A	L1A, L1B	
		L2A, L2B	
	—	L3A, L3B	*
	2A,2B	L4A, L4B	
	2C	L5A, L5B	
	—	L6A, L6B	*
	4A	L7A, L7B	
	8B	L8A, L8B	
ADD JUMPERS FROM: L9A TO L10A, AND L9B TO L10B	5A	L9A, L9B	
		L10A, L10B	
	6A,6B	L11A, L11B	
	8A	L12A, L12B	
	—	L13A, L13B	
	—	L14A, L14B	
	—	L15A, L15B	
	—	L16A, L16B	

*FUTURE USE

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø1	DELAY	15
2	ø6	—	—
3 *	—	—	—
4	ø2	—	—
5	ø2	—	—
6 *	—	—	—
7	ø4	DELAY	5
8	ø8	DELAY	10
9	ø5	DELAY	15
10	ø2	—	—
11	ø6	—	—
12	ø8	DELAY	3
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

EQUIPMENT INFORMATION

CONTROLLER.....ECONOLITE ASC/3*
CABINET .....ECONOLITE TS2 TYPE 1*
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....1, 2, 4, 5, 6, 8
PHASES USED.....1, 2, 4, 5, 6, 8
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

*EXISTING TO REMAIN IN USE

LOAD SWITCH ASSIGNMENT DETAIL

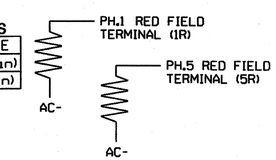
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED
13	OLA
14	OLB
15	OLC
16	OLD

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



NOTE: THE PURPOSE OF THESE RESISTORS IS TO LOAD THE CHANNEL RED MONITOR INPUTS IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON CHANNELS THAT DO NOT USE THE RED DISPLAY IN THE FIELD.

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 09-0057T1
DESIGNED: NOVEMBER 2010
SEALED: 1/5/11
REVISED: N/A

SEE SHEET 2 FOR BACK-UP PROTECTION ENABLE PROGRAMMING

Temporary Design 1 (Construction Phase I)

NEMA Controller/TS-2 Type 1 Cabinet

Electrical Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 4325
(Martin Luther King, Jr. Dr.)
at East 1st Street and
I-40 Bus./US 158-421/NC 150 WB Ramp

Division 09 Forsyth County Winston-Salem

PLAN DATE:	January 2011	REVIEWED BY:	JP
PREPARED BY:	F.E. Russ	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
John T Rowe 1-11-11
SIGNATURE DATE
SIG. INVENTORY NO. 09-0057T1

10-JAN-2011 10:56
S:\TTSGS\DWTS-Signals\Workgroups\Sig MonRuss\12dwgs\09057_smi_ele_20110lxx.dgn
ferruss

ECONOLITE ASC/3-2100 BACKUP PROTECTION ENABLE PROGRAMMING

(program controller as shown below)

FOLLOW PROGRAMMING AS SHOWN BELOW. ON THE 'ENABLE BACKUP PREVENT' SCREEN, MOVE CURSOR TO THE APPROPRIATE FIELD AND PRESS '0' ON THE CONTROLLER KEYPAD TO TOGGLE FIELD VALUE BETWEEN 'X,B,C' AND 'OFF'.

```
MAIN MENU

[1. CONFIGURATION]      6. DETECTORS
 2. CONTROLLER          7. STATUS DISPLAY
 3. COORDINATOR         8. UTILITIES
 4. PREEMPTOR/TSP       9. DIAGONSTICS
 5. TIME BASED

PRESS KEYS 1...9 TO SELECT
```

```
CONFIGURATION SUBMENU

[1. CONTROLLER SEQ]     5. COMMUNICATIONS
 2. PHASE IN USE/PED    6. ENABLE LOGGING
 3. LOAD SW ASSIGN      7. DISPLAY/ACCESS
 4. PORT 1 (SDLC)       8. LOGIC PROCESSOR

PRESS KEYS 1...8 TO SELECT
```

```
CONTROLLER SEQUENCE SUBMENU

 1. PHASE RING SEQUENCE AND ASSIGNMENT
 2. PHASE COMPATIBILITY
[3. BACKUP PREVENT PHASES]
 4. SIMULTANEOUS GAP PHASES
 5. DIAMOND SEQUENCE 17 TO 20

PRESS KEYS 1...5 TO SELECT
```

```
ENABLE BACKUP PREVENT
TMG/BKUP 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
       1 . . . . . . . . . . . . . . . .
SEE NOTE BELOW ---> 2 B   . C . . . C . . . . . . . .
       3 . .   . . . . . . . . . . . . .
       4 . . .   . . . . . . . . . . . .
       5 . . . .   . . . . . . . . . . .
       6 . . . C B   . C . . . . . . . .
       7 . . . . . .   . . . . . . . . .
       8 . . . . . . .   . . . . . . . .
       9 . . . . . . . .   . . . . . . .
      10 . . . . . . . . .   . . . . . .
      11 . . . . . . . . . .   . . . . .
      12 . . . . . . . . . . .   . . . .
      13 . . . . . . . . . . . .   . . .
      14 . . . . . . . . . . . . .   . .
      15 . . . . . . . . . . . . . .   .
      16 . . . . . . . . . . . . . . .
```

END OF PROGRAMMING

NOTE

'B' WITH A 'C' PROGRAMMED FOR THE TIMING (ROW) PHASE PLACES A DEMAND ON THAT BACKUP (COLUMN) PHASE. THE CONTROLLER WILL THEN SERVICE THE CALLED PHASE AND PROCEED NORMALLY.

THIS ELECTRICAL DETAIL IS FOR THE
TEMPORARY SIGNAL DESIGN: 09-0057T1
DESIGNED: NOVEMBER 2010
SEALED: 1/5/11
REVISED: N/A

Temporary Design 1 (Construction Phase I)

NEMA Controller/TS-2 Type 1 Cabinet — Electrical Detail - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of: Transportation Mobility and Safety Division, Traffic Engineering & North Carolina Department of Transportation, Signals Management Section

750 N. Greenfield Pkwy, Garner, NC 27529

SR 4325
(Martin Luther King, Jr. Dr.)
at East 1st Street and
I-40 Bus./US 158-421/NC 150 WB Ramp

Division 09 — Forsyth County — Winston-Salem

PLAN DATE:	January 2011	REVIEWED BY:	
PREPARED BY:	F.E. Russ	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

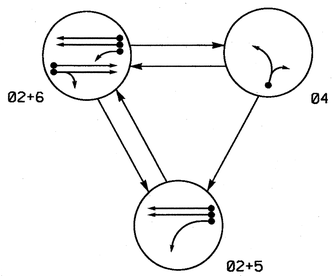
SIGNATURE — DATE 1-1-11

SIG. INVENTORY NO. 09-0057T1

10-JAN-2011 10:56
S:\ITS&SU\ITS Signals\Workgroups\Sig Mgmt\Russ\ts2dwgs\090057_sm.ele.20110lxx.dgn
Groups

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 14

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

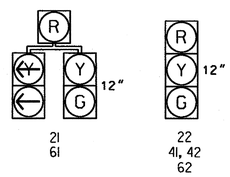
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	PHASE Ø2+6	PHASE Ø4	FLASH
21	G	G	R	Y
22	G	G	R	Y
41, 42	R	R	G	R
61, 62	R	G	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.



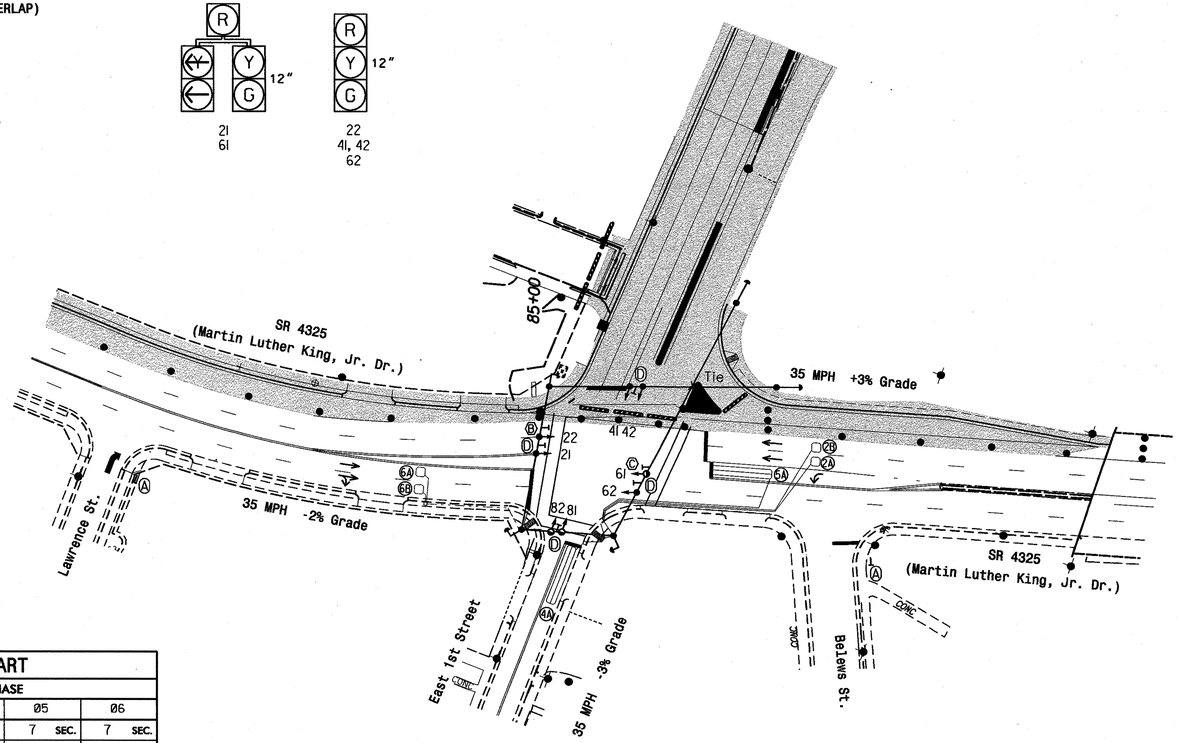
NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?
2A, 2B	6X6	70	4	X	-	2	-	X	-	-	NO
4A	6X40	0	2-4-2	X	-	4	-	X	DELAY	5	YES
5A	6X40	0	2-4-2	X	-	5	-	X	DELAY	15	YES
						2	-	X	-	-	NO
6A, 6B	6X6	70	4	X	-	6	-	X	-	-	NO

3 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 5 may be lagged.
4. Set all detector units to presence mode.
5. Disconnect and bag the arrow sections of existing signal head 61 during this construction phase.
6. Disconnect and bag existing signal heads 81 and 82 during this construction phase.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone	
	Construction Zone Drums	
Ⓐ	"STOP" Sign (R1-1)	Ⓐ
Ⓑ	No Right Turn Sign (R3-1)	Ⓑ
Ⓒ	No Left Turn Sign (R3-2)	Ⓒ
Ⓓ	Street Sign	Ⓓ

NEMA TIMING CHART

FEATURE	PHASE Ø2	PHASE Ø4	PHASE Ø5	PHASE Ø6
MINIMUM GREEN *	7 SEC.	10 SEC.	7 SEC.	7 SEC.
PASSAGE/GAP *	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	3.7 SEC.	3.0 SEC.	3.0 SEC.	4.0 SEC.
RED CLEARANCE	2.6 SEC.	2.3 SEC.	3.3 SEC.	1.7 SEC.
MAX. 1 *	40 SEC.	20 SEC.	20 SEC.	40 SEC.
RECALL POSITION	MIN. RECALL	NONE	NONE	MIN. RECALL
VEHICLE CALL MEMORY	LOCK	NONLOCK	NONLOCK	LOCK
WALK *	– SEC.	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

Signal Upgrade - Temporary Design 2 (Construction Phase II)

Prepared in the Offices of:
Transportation Mobility and Safety Division
Traffic Engineering Branch
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SR 4325
(Martin Luther King, Jr. Dr.)
at
East 1st Street

Division 9 Forsyth County Winston-Salem

PLAN DATE:	November 2010	REVIEWED BY:	T. Thigpen
PREPARED BY:	Sterling	REVIEWED BY:	

SCALE 0 50 1"=50'

REVISIONS	INIT.	DATE

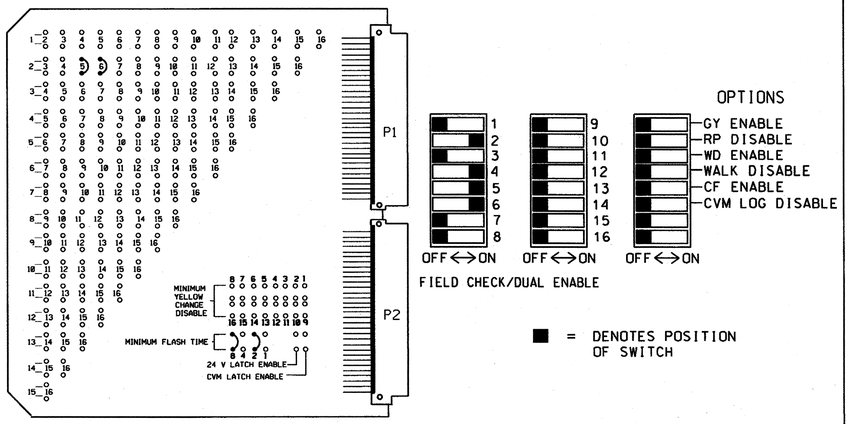
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 1/5/11 DATE
SIG. INVENTORY NO. 09-0057 T2

06-JAN-2011 17:00
P:\TIPProjects\U02826B\Traffic\Signals\Design\Signals\09-0057\09005T2_sig_dsn_20110105.dgn
rziemba

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 15

EDI MODEL MMU-16E
MALFUCTION MANAGEMENT UNIT
pROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

■ = DENOTES POSITION OF SWITCH

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 1, 3, 7, 8, 9, 10, 11, 12, 13, 14, 15 & 16 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. ! ---> REMOVE DUAL ENTRY PROGRAMMING FROM PHASES 4 AND 8.
7. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
8. ! ---> FROM MAIN MENU PRESS '1' (CONFIGURATION), THEN PRESS '1' (CONTROLLER SEQ), THEN PRESS '3' (BACKUP PREVENT PHASES). PRESS '0' ON CONTROLLER KEYPAD TO TOGGLE ALL VALUES 'OFF'.
9. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
10. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

REMOVE LOAD SWITCHES 1 & 8 AND TIE RED OUTPUTS TO AC+ PER NOTE 2 AT LEFT. DISCONNECT FIELD TERMINAL WIRES AND LEAVE FOR FUTURE USE. SIGNAL HEADS 61 (ARROW SECTION) AND 81,82 WILL NOT BE USED DURING THIS TEMPORARY PHASE, AND ARE TO BE BAGGED.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	61	21,22	NU	41,42	21	61,62	NU	81,82	NU	NU	NU	NU	NU	NU	NU	NU
RED	*	2R		4R	*	6R		8R								
YELLOW		2Y		4Y		6Y		8Y								
GREEN		2G		4G		6G		8G								
RED ARROW																
YELLOW ARROW	1Y				5Y											
GREEN ARROW	1G				5G											
✋																
🚶																

NU = NOT USED

*DENOTES INSTALL LOAD RESISTOR. SEE LOAD RESISTOR INSTALLATION DETAIL BELOW.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1 L3 FUTURE USE	SLOT	CH1 L7 ø4	SLOT	CH1 L11 ø6	CH1 L9 ø5	SLOT	SLOT	SLOT	SLOT	SLOT
	CH2 L4 ø2	EMPTY	CH2 L8 NOT USED	EMPTY	CH2 L12 FUTURE USE	CH2 L10 ø2	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS	
—	L1A, L1B	*
—	L2A, L2B	*
—	L3A, L3B	*
2A,2B	L4A, L4B	
—	L5A, L5B	*
—	L6A, L6B	*
4A	L7A, L7B	
—	L8A, L8B	
5A	L9A, L9B	
	L10A, L10B	
6A,6B	L11A, L11B	
—	L12A, L12B	*
—	L13A, L13B	
—	L14A, L14B	
—	L15A, L15B	
—	L16A, L16B	

ADD JUMPERS FROM: L9A TO L10A, AND L9B TO L10B

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

*FUTURE USE

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1 *	—	—	—
2 *	—	—	—
3 *	—	—	—
4	ø2	—	—
5 *	—	—	—
6 *	—	—	—
7	ø4	DELAY	5
8	—	—	—
9	ø5	DELAY	15
10	ø2	—	—
11	ø6	—	—
12 *	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

EQUIPMENT INFORMATION

CONTROLLER.....ECONOLITE ASC/3*
CABINET .....ECONOLITE TS2 TYPE 1*
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....2, 4, 5, 6
PHASES USED.....2, 4, 5, 6
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

*EXISTING TO REMAIN IN USE

LOAD SWITCH ASSIGNMENT DETAIL

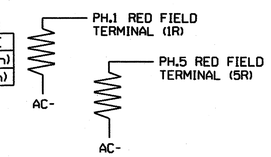
(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED
13	OLA
14	OLB
15	OLC
16	OLD

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



NOTE: THE PURPOSE OF THESE RESISTORS IS TO LOAD THE CHANNEL RED MONITOR INPUTS IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON CHANNELS THAT DO NOT USE THE RED DISPLAY IN THE FIELD.

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 09-0057T2
DESIGNED: NOVEMBER 2010
SEALED: 1/5/11
REVISED: N/A

Temporary Design 2 (Construction Phase II)

NEMA Controller/TS-2 Type 1 Cabinet

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 4325
(Martin Luther King, Jr. Dr.)
at
East 1st Street

Division 09 | Forsyth County | Winston-Salem
PLAN DATE: January 2011 | REVIEWED BY:
PREPARED BY: F.E. Russ | REVIEWED BY:

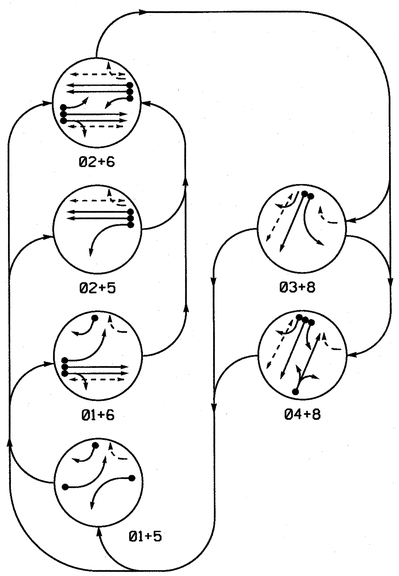
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE | DATE 1-12-11
SIG. INVENTORY NO. 09-0057T2

12-JAN-2011 11:20
S:\TSS2\MTS\Signals\Workgroups\61g Mon\Russ\#12dwgs\090057_sm.ele.201101xx.dgn
ferruss

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 16

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	03+8	04+8	FLASH
21	R	R	G	G	R	R	Y
22	R	R	G	G	R	R	Y
41, 42	R	R	R	R	R	G	R
61	R	G	R	G	R	R	Y
62	R	G	R	G	R	R	Y
81	R	R	R	R	G	G	R
82	R	R	R	R	G	G	R
P21, P22	DW	DW	W	W	DW	DW	DRK
P61, P62	DW	W	DW	W	DW	DW	DRK
P81, P82	DW	DW	DW	DW	W	W	DRK

W - Walk
DW - Don't Walk
DRK - Dark

SIGNAL FACE I.D.

All Heads L.E.D.

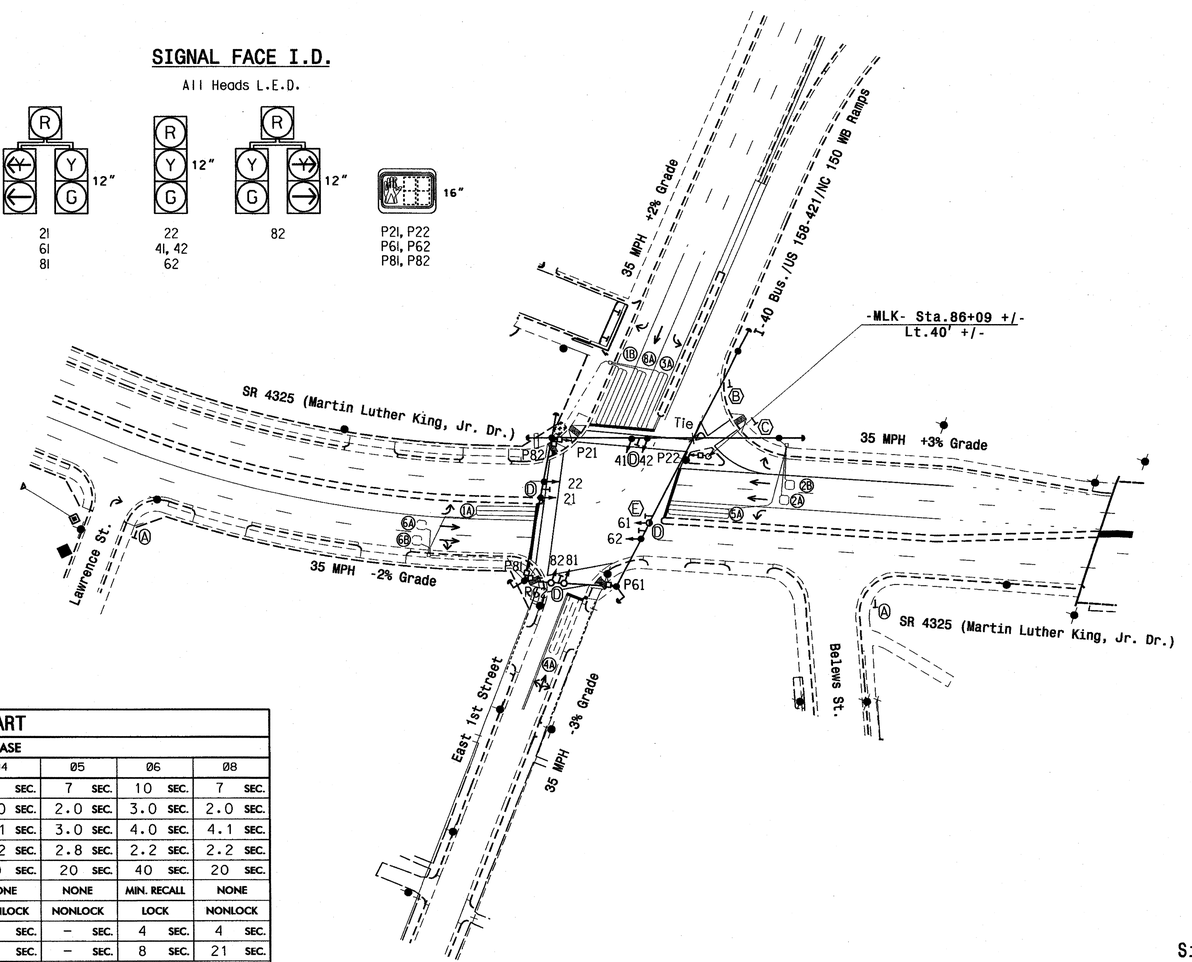
NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?
1A	6X40	0	2-4-2	X	-	1	-	X	DELAY	15	YES
						6	-	X	-	-	NO
1B	6X40	0	2-4-2	X	-	1	-	X	DELAY	15	YES
2A, 2B	6X6	70	4	-	X	2	-	X	-	-	NO
3A	6X40	0	2-4-2	X	-	3	-	X	DELAY	15	YES
						8	-	X	-	-	NO
4A	6X40	0	2-4-2	-	X	4	-	X	DELAY	5	YES
5A	6X40	0	2-4-2	X	-	5	-	X	DELAY	15	YES
						2	-	X	-	-	NO
6A, 6B	6X6	70	4	X	-	6	-	X	-	-	NO
8A	6X40	0	2-4-2	X	-	8	-	X	-	-	NO

6 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Omit phase 1 during phase 2 on.
4. Omit phase 3 during phase 4 on.
5. Omit phase 5 during phase 6 on.
6. Program controller to clear from phase 2+6 to phase 1 and/or 5 by progressing through phase 4+8. (see Electrical Details).
7. Program phase 4 and phase 8 for dual entry.
8. Set all detector units to presence mode.
9. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
10. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
11. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pedestal	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
N/A	Guardrail	
N/A	Wheelchair Ramp	
Ⓐ	"STOP" Sign (R1-1)	Ⓐ
Ⓑ	"YIELD" Sign (R1-2)	Ⓑ
Ⓒ	Pedestrian Crossing Sign (W11-2)	Ⓒ
Ⓓ	Street Sign	Ⓓ

NEMA TIMING CHART

FEATURE	PHASE 01	02	03	04	05	06	08
MINIMUM GREEN *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
PASSAGE/GAP *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	3.7 SEC.	3.0 SEC.	4.1 SEC.	3.0 SEC.	4.0 SEC.	4.1 SEC.
RED CLEARANCE	3.2 SEC.	2.1 SEC.	2.3 SEC.	2.2 SEC.	2.8 SEC.	2.2 SEC.	2.2 SEC.
MAX. 1 *	20 SEC.	40 SEC.	20 SEC.	20 SEC.	20 SEC.	40 SEC.	20 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	NONE	MIN. RECALL	NONE
VEHICLE CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	NONLOCK	LOCK	NONLOCK
WALK *	– SEC.	4 SEC.	– SEC.	– SEC.	– SEC.	4 SEC.	4 SEC.
FLASHING DON'T WALK	– SEC.	19 SEC.	– SEC.	– SEC.	– SEC.	8 SEC.	21 SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

Signal Upgrade - Final Design

Prepared in the Offices of: Transportation Mobility and Safety Division, Intelligent Transportation Systems, Signal Design Section, Dept. of Transportation, State of North Carolina
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

SR 4325
(Martin Luther King, Jr. Dr.)
at East 1st Street and
I-40 Bus./US 158-421/NC 150 WB Ramp

Division 9 Forsyth County Winston-Salem

PLAN DATE:	June 2010	REVIEWED BY:	T. Thigpen
PREPARED BY:	Sterling	REVIEWED BY:	

REVISIONS	INIT.	DATE

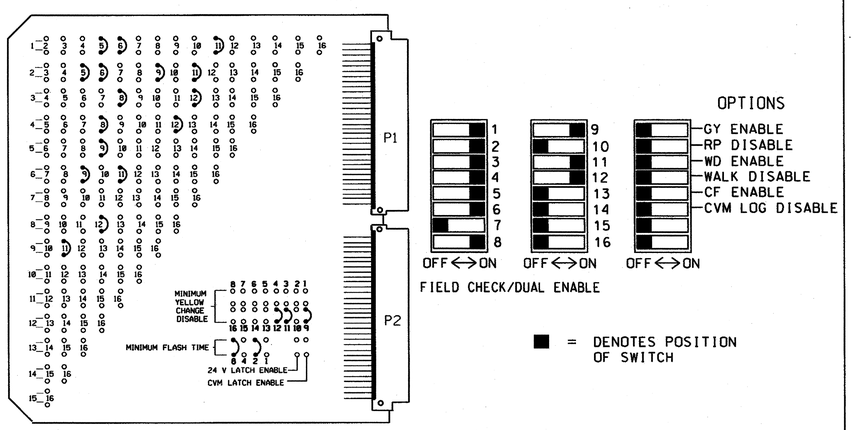
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 1/5/11 DATE
SIG. INVENTORY NO. 09-0057

12-JAN-2011 17:48
R:\Traffic-Projects\U2826B\Traffic\Signals\Design\Signals\09-0057\09005Final_sig_dsn_20110105.dgn
Pete Sterling

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 17

EDI MODEL MMU-16E
MALFUCTION MANAGEMENT UNIT
pROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 7, 10, 13, 14, 15 & 16 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 WALK.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DUAL ENTRY.
7. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
8. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
9. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	61,82	21,22	81	41,42	21	61,62	NU	81,82	P21, P22	NU	P61, P62	P81, P82	NU	NU	NU	NU
RED	*	2R	*	4R	*	6R		8R								
YELLOW		2Y		4Y		6Y		8Y								
GREEN		2G		4G		6G		8G								
RED ARROW																
YELLOW ARROW	1Y		3Y		5Y											
GREEN ARROW	1G		3G		5G											
✋									9R		11R	12R				
🚶									9G		11G	12G				
NU = NOT USED									**		**	**				

*DENOTES INSTALL LOAD RESISTOR. SEE LOAD RESISTOR INSTALLATION DETAIL BELOW.

**SEE COUNTDOWN NOTE ON 'PEDESTRIAN PUSH-BUTTON WIRING DETAIL' ON SHEET 2.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1 L3 ø1	CH1 L1 ø1	CH1 L7 ø4	CH1 L5 ø3	CH1 L11 ø6	CH1 L9 ø5	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 ø2	CH2 L2 ø6	CH2 L8 NOT USED	CH2 L6 ø8	CH2 L12 ø8	CH2 L10 ø2					

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

	LOOP NO.	LOOP PANEL TERMINALS
ADD JUMPERS FROM: L1A TO L2A, AND L1B TO L2B	1A	L1A, L1B
		L2A, L2B
	1B	L3A, L3B
	2A,2B	L4A, L4B
ADD JUMPERS FROM: L5A TO L6A, AND L5B TO L6B	3A	L5A, L5B
		L6A, L6B
	4A	L7A, L7B
	—	L8A, L8B
ADD JUMPERS FROM: L9A TO L10A, AND L9B TO L10B	5A	L9A, L9B
		L10A, L10B
	6A,6B	L11A, L11B
	8A	L12A, L12B
	—	L13A, L13B
	—	L14A, L14B
	—	L15A, L15B
	—	L16A, L16B

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø1	DELAY	15
2	ø6	—	—
3	ø1	DELAY	15
4	ø2	—	—
5	ø3	DELAY	15
6	ø8	—	—
7	ø4	DELAY	5
8	—	—	—
9	ø5	DELAY	15
10	ø2	—	—
11	ø6	—	—
12	ø8	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

EQUIPMENT INFORMATION

CONTROLLER.....ECONOLITE ASC/3*
CABINET .....ECONOLITE TS2 TYPE 1*
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....1, 2, 3, 4, 5, 6, 8, 9, 11, 12
PHASES USED.....1, 2, 3, 4, 5, 6, 8, 2PED, 6PED, 8PED
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

*EXISTING TO REMAIN IN USE

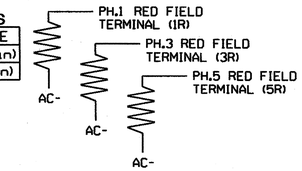
LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED
13	OLA
14	OLB
15	OLC
16	OLD

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES	
VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



NOTE: THE PURPOSE OF THESE RESISTORS IS TO LOAD THE CHANNEL RED MONITOR INPUTS IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON CHANNELS THAT DO NOT USE THE RED DISPLAY IN THE FIELD.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 09-0057
DESIGNED: JUNE 2010
SEALED: 1/5/11
REVISED: N/A

SEE SHEET 2 FOR PEDESTRIAN PUSH-BUTTON WIRING DETAIL AND BACK-UP PROTECTION ENABLE PROGRAMMING

Final Design

NEMA Controller/TS-2 Type 1 Cabinet — Electrical Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 4325
(Martin Luther King, Jr. Dr.)
at East 1st Street and
I-40 Bus./US 158-421/NC 150 WB Ramp

Division 09 — Forsyth County — Winston-Salem

PLAN DATE:	January 2011	REVIEWED BY:	JP
PREPARED BY:	F.E. Russ	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE — DATE 1-11-11
SIG. INVENTORY NO. 09-0057

10-JAN-2011 10:57
S:\ers\SIGNALS\MTS Signals\Workgroups\Sig Mgmt\uss\ts2dwgs\090057_sm.ele.201101xx.dgn
ferruss

ECONOLITE ASC/3-2100 BACKUP PROTECTION ENABLE PROGRAMMING

(program controller as shown below)

FOLLOW PROGRAMMING AS SHOWN BELOW. ON THE 'ENABLE BACKUP PREVENT' SCREEN, MOVE CURSOR TO THE APPROPRIATE FIELD AND PRESS '0' ON THE CONTROLLER KEYPAD TO TOGGLE FIELD VALUE BETWEEN 'X,B,C' AND 'OFF'.

```
MAIN MENU

[1. CONFIGURATION]      6. DETECTORS
2. CONTROLLER           7. STATUS DISPLAY
3. COORDINATOR          8. UTILITIES
4. PREEMPTOR/TSP        9. DIAGONSTICS
5. TIME BASED

PRESS KEYS 1...9 TO SELECT
```

```
CONFIGURATION SUBMENU

[1. CONTROLLER SEQ]     5. COMMUNICATIONS
2. PHASE IN USE/PED     6. ENABLE LOGGING
3. LOAD SW ASSIGN       7. DISPLAY/ACCESS
4. PORT 1 (SDLC)        8. LOGIC PROCESSOR

PRESS KEYS 1...8 TO SELECT
```

```
CONTROLLER SEQUENCE SUBMENU

1. PHASE RING SEQUENCE AND ASSIGNMENT
2. PHASE COMPATIBILITY
[3. BACKUP PREVENT PHASES]
4. SIMULTANEOUS GAP PHASES
5. DIAMOND SEQUENCE 17 TO 20

PRESS KEYS 1...5 TO SELECT
```

```
ENABLE BACKUP PREVENT
TMG/BKUP 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
       1   . . . . . . . . . . . . . . .
       2 B   . C . . . C . . . . . . . .
       3 . .   . . . . . . . . . . . . .
SEE NOTE 1 BELOW ---> 4 . . X   . . . . . . . . . . .
       5 . . . .   . . . . . . . . . . .
SEE NOTE 2 BELOW ---> 6 . . . C B   . C . . . . . . .
       7 . . . . . .   . . . . . . . . .
       8 . . . . . . .   . . . . . . . .
       9 . . . . . . . .   . . . . . . .
      10 . . . . . . . . .   . . . . . .
      11 . . . . . . . . . .   . . . . .
      12 . . . . . . . . . . .   . . . .
      13 . . . . . . . . . . . .   . . .
      14 . . . . . . . . . . . . .   . .
      15 . . . . . . . . . . . . . .   .
      16 . . . . . . . . . . . . . . .
```

END OF PROGRAMMING

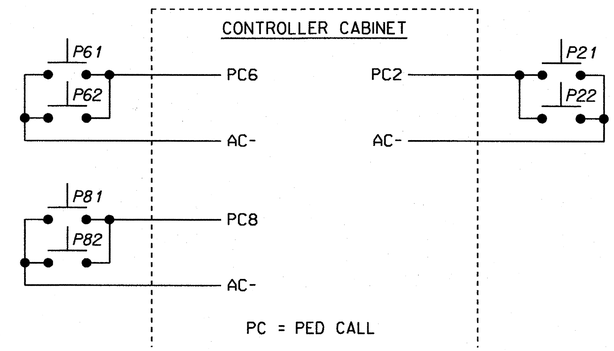
NOTES

1. 'X' INHBITS THE CONTROLLER FROM SERVICING THE BACKUP (COLUMN) PHASE WHEN THE TIMING (ROW) PHASE IS ACTIVE OR NEXT.

2. 'B' WITH A 'C' PROGRAMMED FOR THE TIMING (ROW) PHASE PLACES A DEMAND ON THAT BACKUP (COLUMN) PHASE. THE CONTROLLER WILL THEN SERVICE THE CALLED PHASE AND PROCEED NORMALLY.

PEDESTRIAN PUSH-BUTTON WIRING DETAIL

(wire push-buttons as shown below)



NOTE: COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 09-0057
DESIGNED: JUNE 2010
SEALED: 1/5/11
REVISED: N/A

Final Design

NEMA Controller/TS-2 Type 1 Cabinet — Electrical Detail - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 4325
(Martin Luther King, Jr. Dr.)
at East 1st Street and
I-40 Bus./US 158-421/NC 150 WB Ramp

Division 09 — Forsyth County — Winston-Salem

PLAN DATE:	January 2011	REVIEWED BY:	
PREPARED BY:	F.E. Russ	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

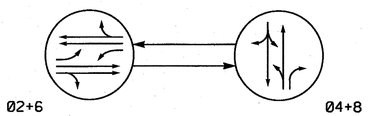
John T. Rowe 1-11-11
SIGNATURE DATE

SIG. INVENTORY NO. 09-0057

10-JAN-2011 10:58
S:\TSG\U\TS Signals\Workgroups\Sig Mgmt\Russ\TS2Dwgs\090057_sm_ele_201101xx.dgn
fergus

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 19

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

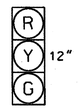
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

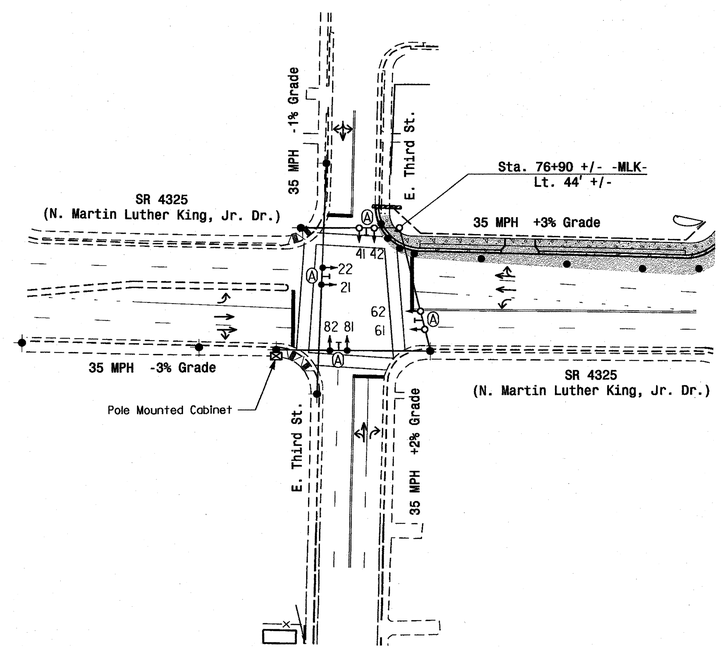
SIGNAL FACE	PHASE 02+6	PHASE 04+8	FLASH
21, 22	G	R	Y
41, 42	R	G	R
61, 62	G	R	Y
81, 82	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



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



2 Phase
Pre-Timed
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Program phase 4 and phase 8 for dual entry.
4. Relocate existing street signs from previous span.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

NEMA TIMING CHART

FEATURE	PHASE 02	PHASE 04	PHASE 06	PHASE 08
MINIMUM GREEN *	10 SEC.	7 SEC.	10 SEC.	7 SEC.
PASSAGE/GAP *	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.7 SEC.	3.7 SEC.	4.1 SEC.	3.9 SEC.
RED CLEARANCE	1.4 SEC.	1.9 SEC.	1.4 SEC.	1.9 SEC.
MAX. 1 *	35 SEC.	25 SEC.	35 SEC.	25 SEC.
RECALL POSITION	MAX RECALL	MAX RECALL	MAX RECALL	MAX RECALL
VEHICLE CALL MEMORY	N/A	N/A	N/A	N/A
WALK *	– SEC.	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone	
	Construction Zone Drums	
N/A	Wheelchair Ramp	
	Street Sign	

Signal Upgrade - Temporary Design (Construction Phase II)

Prepared In the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

SR 4325
(N. Martin Luther King, Jr. Dr.)
at
East Third Street

Sivision 9 Forsyth County Winston-Salem

PLAN DATE:	November 2010	REVIEWED BY:	T. Thiggen
PREPARED BY:	Sterling	REVIEWED BY:	

REVISIONS	INIT.	DATE

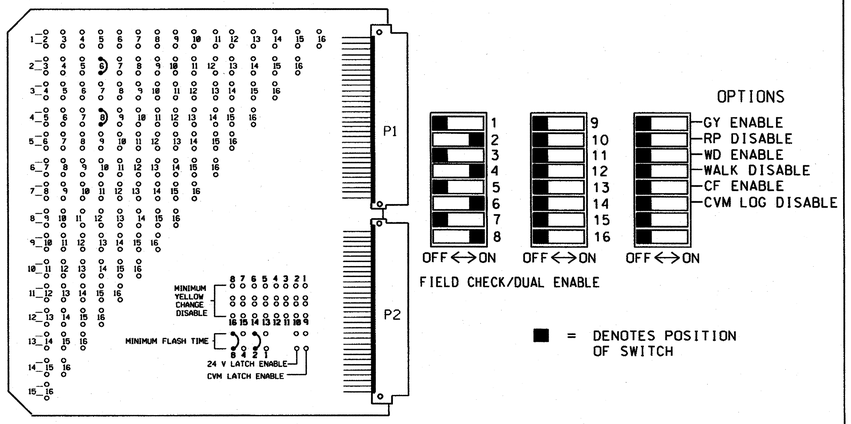
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 12/20/10 DATE
SIG. INVENTORY NO. 09-0056T

20-DEC-2010 16:16
P:\#IProjects\UMU2828B\traffic\Signals\Signals\03-0056\09005 6T_sig_dsn_20101220.dgn
21.0.0.0

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 20

EDI MODEL MMU-16E
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and set switches as shown below)



■ = DENOTES POSITION OF SWITCH

MMU PROGRAMMING CARD

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 1, 3, 5, 7, 9, 10, 11 & 12 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DUAL ENTRY.
7. ! ---> SET RECALL POSITION FOR PHASES 2, 4, 6 AND 8 TO 'MAX RECALL'.
8. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	41,42	NU	61,62	NU	81,82	NU	NU	NU	NU
RED		2R		4R		6R		8R				
YELLOW		2Y		4Y		6Y		8Y				
GREEN		2G		4G		6G		8G				
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋												
🚶												

NU = NOT USED

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED ASC/3
CABINET .....CONTRACTOR SUPPLIED TS2 TYPE 1 (NC-3P)
CABINET MOUNT.....POLE
LOADBAY POSITIONS.....12
LOAD SWITCHES USED.....2, 4, 6, 8
PHASES USED.....2, 4, 6, 8
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

DETECTOR RACK SET-UP DETAIL

BIU	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY

--- NOTE ---

THIS SIGNAL OPERATES PRE-TIMED, AND THEREFORE DOES NOT UTILIZE DETECTOR CARDS. (SEE NOTE 7 ABOVE)

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 09-0056T
DESIGNED: NOVEMBER 2010
SEALED: 12/20/10
REVISED: N/A

Temporary Design (Construction Phase II)

NEMA Controller/TS-2 Cabinet

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
Traffic Engineering Branch
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 4325
(N. Martin Luther King, Jr. Dr.)
at
East Third St.

Division 09 | Forsyth County | Winston-Salem

PLAN DATE: December 2010 | REVIEWED BY:
PREPARED BY: F.E. Russ | REVIEWED BY:

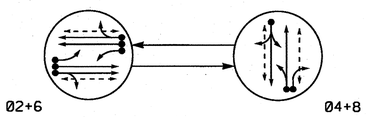
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE | DATE 1-3-11
SIG. INVENTORY NO. 09-0056T

03-JAN-2011 13:48
S:\TMS\SIGNALS\Workgroups\Sig MonRuss\s20dgs\090056_smu_ele_20110101xx.dgn
ferruss

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 21

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

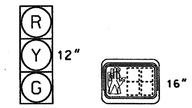
TABLE OF OPERATION

SIGNAL FACE	PHASE 02+6	PHASE 04+8	FLASH
21, 22	G	R	Y
41, 42	R	G	R
61, 62	G	R	Y
81, 82	R	G	R
P21, P22	W	DW	DRK
P41, P42	DW	W	DRK
P61, P62	W	DW	DRK
P81, P82	DW	W	DRK

W - Walk
DW - Don't Walk
DRK - Dark

SIGNAL FACE I.D.

All Heads L.E.D.



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

P21, P22
P41, P42
P61, P62
P81, P82

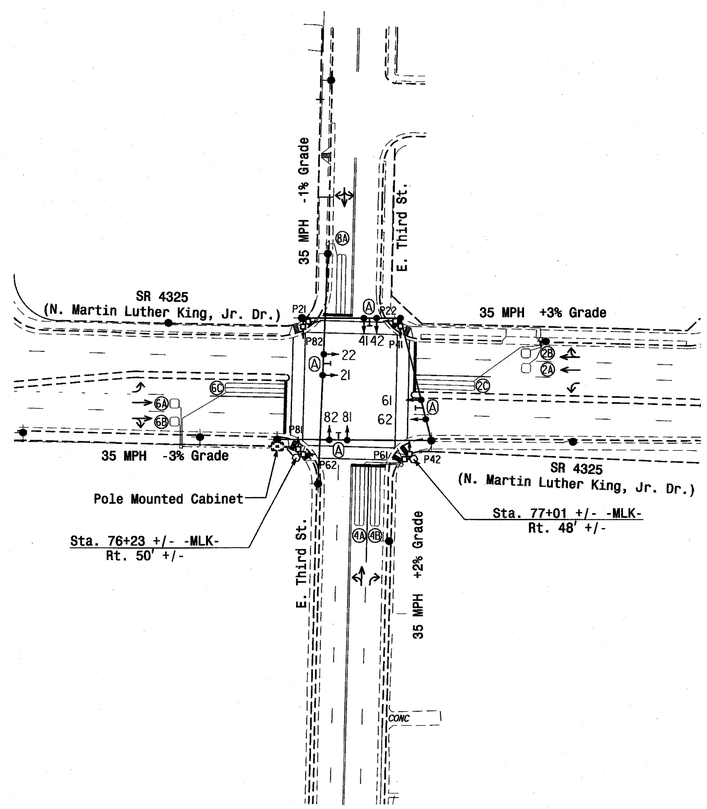
NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?
2A, 2B	6X6	70	4	X	-	2	X	-	-	-	NO
2C	6X40	0	2-4-2	X	-	2	X	-	-	-	NO
4A	6X40	0	2-4-2	X	-	4	X	-	Delay	3	YES
4B	6X40	0	2-4-2	X	-	4	X	-	Delay	15	YES
6A, 6B	6X6	70	4	X	-	6	X	-	-	-	NO
6C	6X40	0	2-4-2	X	-	6	X	-	-	-	NO
8A	6X40	0	2-4-2	X	-	8	X	-	Delay	3	YES

2 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Program phase 4 and phase 8 for dual entry.
4. Set all detector units to presence mode.
5. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
6. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pedestal	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
N/A	Wheelchair Ramp	
	Street Sign	

NEMA TIMING CHART

FEATURE	PHASE 02	PHASE 04	PHASE 06	PHASE 08
MINIMUM GREEN *	10 SEC.	7 SEC.	10 SEC.	7 SEC.
PASSAGE/GAP *	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.7 SEC.	3.7 SEC.	4.1 SEC.	3.9 SEC.
RED CLEARANCE	1.6 SEC.	1.9 SEC.	1.5 SEC.	1.8 SEC.
MAX. 1 *	35 SEC.	25 SEC.	35 SEC.	25 SEC.
RECALL POSITION	MIN. RECALL	NONE	MIN. RECALL	NONE
VEHICLE CALL MEMORY	LOCK	NONLOCK	LOCK	NONLOCK
WALK *	4 SEC.	4 SEC.	4 SEC.	4 SEC.
FLASHING DON'T WALK	13 SEC.	18 SEC.	12 SEC.	17 SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

Signal Upgrade - Final Design

Prepared in the Offices of:
Transportation Mobility and Safety Division
Traffic Engineering Branch
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 1"=50' (0 – 50)

SR 4325
(N. Martin Luther King, Jr. Dr.)
at
East Third St.

Division 9 Forsyth County Winston-Salem

PLAN DATE:	June 2010	REVIEWED BY:	T. Thigpen
PREPARED BY:	Sterling	REVIEWED BY:	

REVISIONS	INIT.	DATE

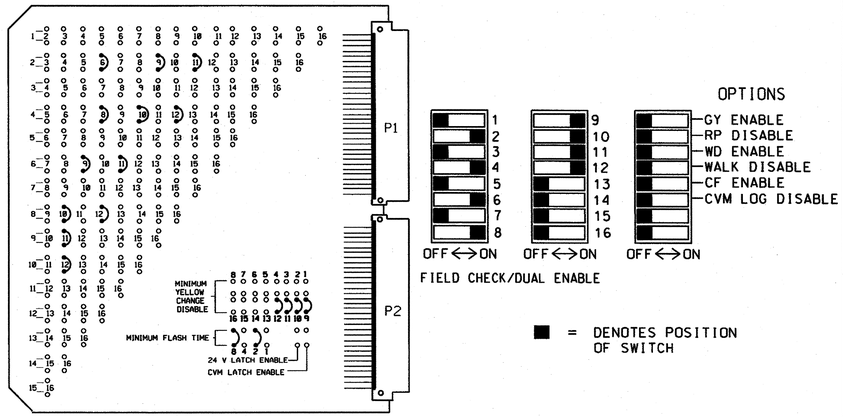
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE DATE 12/20/10
SIG. INVENTORY NO. 09-0056

20-DEC-2010 16:08
P:\Projects\U2826B\Traffic\Signals\Designs\09-0056\09-0056_sig_dsn_20101220.dgn
Fzemba

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 22

EDI MODEL MMU-16E
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 1, 3, 5 AND 7 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 WALK.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DUAL ENTRY.
7. SET ALL DETECTOR CARD UNITS TO 'PRESENCE' MODE.
8. ! ---> RE-SET RECALL POSITION FOR PHASES 2 AND 6 FOR 'MIN RECALL', AND PHASES 4 AND 8 RECALL POSITION AS 'NONE'.
9. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
10. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	41,42	NU	61,62	NU	81,82	P21, P22	P41, P42	P61, P62	P81, P82
RED		2R		4R		6R		8R				
YELLOW		2Y		4Y		6Y		8Y				
GREEN		2G		4G		6G		8G				
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋									9R	10R	11R	12R
🚶									9G	10G	11G	12G
									*	*	*	*

NU = NOT USED

*SEE COUNTDOWN NOTE ON 'PEDESTRIAN PUSH-BUTTON WIRING DETAIL' THIS SHEET.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1 L3 ø4	CH1 L1 ø2	CH1 L7 NOT USED	CH1 L5 ø6	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 ø4	CH2 L2 ø2	CH2 L8 ø8	CH2 L6 ø6							

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
2A,2B	L1A, L1B
2C	L2A, L2B
4A	L3A, L3B
4B	L4A, L4B
6A,6B	L5A, L5B
6C	L6A, L6B
—	L7A, L7B
8A	L8A, L8B
—	L9A, L9B
—	L10A, L10B
—	L11A, L11B
—	L12A, L12B
—	L13A, L13B
—	L14A, L14B
—	L15A, L15B
—	L16A, L16B

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø2	—	—
2	ø2	—	—
3	ø4	DELAY	3
4	ø4	DELAY	15
5	ø6	—	—
6	ø6	—	—
7	—	—	—
8	ø8	DELAY	3
9	—	—	—
10	—	—	—
11	—	—	—
12	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

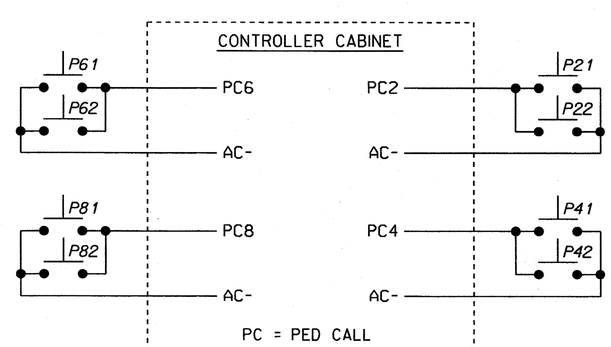
EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED ASC/3*
CABINET .....CONTRACTOR SUPPLIED TS2 TYPE 1 (NC-3P)*
CABINET MOUNT.....POLE
LOADBAY POSITIONS.....12
LOAD SWITCHES USED.....2, 4, 6, 8, 9, 10, 11, 12
PHASES USED.....2, 4, 6, 8, 2PED, 4PED, 6PED, 8PED
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

*EXISTING INSTALLED UNDER TEMPORARY DESIGN

PEDESTRIAN PUSH-BUTTON WIRING DETAIL

(wire push-buttons as shown below)



NOTE: COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-0056
DESIGNED: JUNE 2010
SEALED: 12/20/10
REVISED: N/A

Final Design

NEMA Controller/TS-2 Cabinet

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 4325
(N. Martin Luther King, Jr. Dr.)
at
East Third St.

Division 09 Forsyth County Winston-Salem

PLAN DATE: December 2010	REVIEWED BY:		
PREPARED BY: F.E. Russ	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

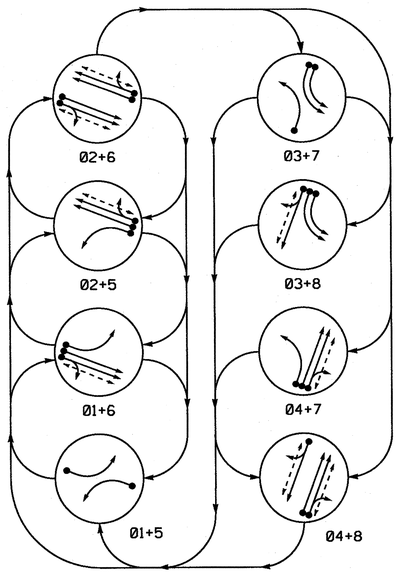
John T. Rowe Jr. 1-3-11
SIGNATURE DATE

SIG. INVENTORY NO. 09-0056

03-JAN-2011 14:20
S:\TSSGN\41TS\Signals\Workgroups\Sig Mon\Plugs*.2dwgs\090056_sm_ele_20110lxx-dgn
ferruss

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 23

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

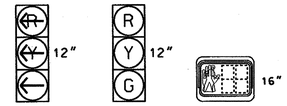
TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	03+7	03+8	04+7	04+8	FLASH
11	~~-~~	~~-~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
21, 22	R	R	G	G	R	R	R	R	Y
31, 32	~~R~~	~~R~~	~~R~~	~~R~~	~~-~~	~~-~~	~~R~~	~~R~~	~~R~~
41, 42	R	R	R	R	R	R	G	G	R
51	~~-~~	~~R~~	~~-~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
61, 62	R	G	R	G	R	R	R	R	Y
71	~~R~~	~~R~~	~~R~~	~~R~~	~~-~~	~~R~~	~~-~~	~~R~~	~~R~~
81, 82	R	R	R	R	R	G	R	G	R
P21, P22	DW	DW	W	W	DW	DW	DW	DW	DRK
P41, P42	DW	DW	DW	DW	DW	DW	W	W	DRK
P61, P62	DW	W	DW	W	DW	DW	DW	DW	DRK
P81, P82	DW	DW	DW	DW	DW	W	DW	W	DRK

W - Walk
DW - Don't Walk
DRK - Dark

SIGNAL FACE I.D.

All Heads L.E.D.



11
31, 32
51
71

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

P21, P22
P41, P42
P61, P62
P81, P82

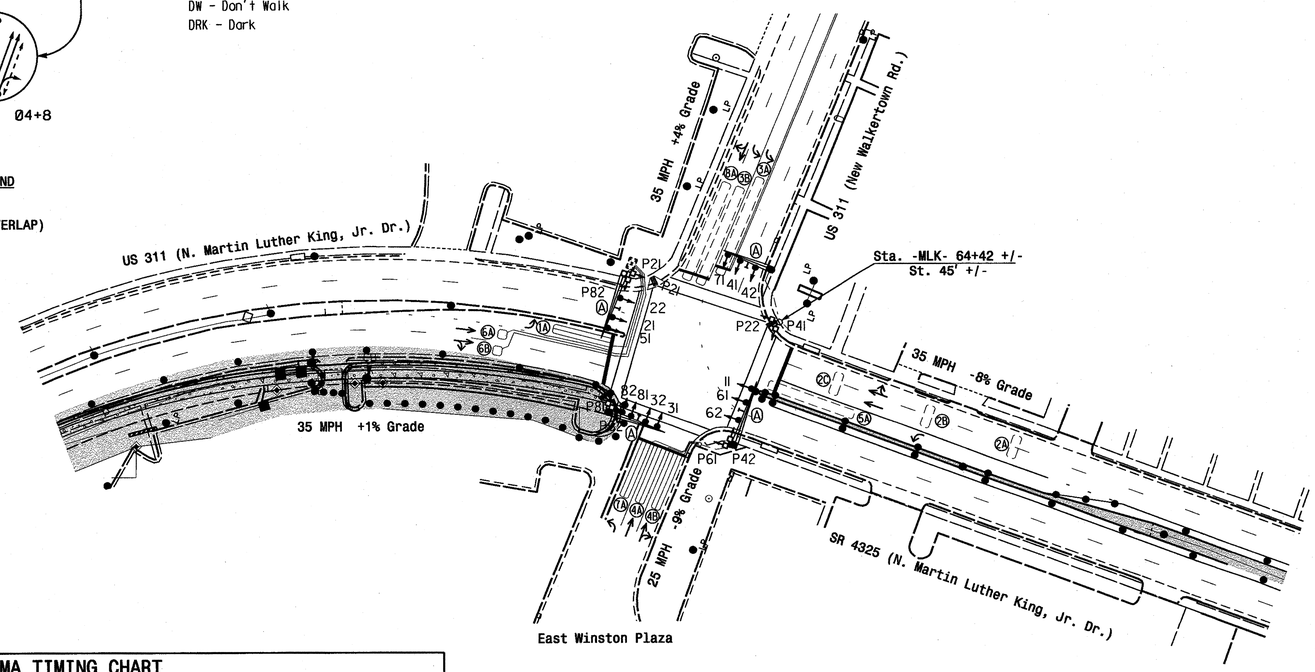
NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREENT
1A	6X40	0	2-4-2	X	-	1	-	X	-	-	NO
2A	6X15	157	Existing	-	X	2	-	X	-	-	NO
2B	6X15	96	Existing	-	X	2	-	X	-	-	NO
2C	6X15	33	Existing	-	X	2	-	X	-	-	NO
3A	6X70	+5	Existing	-	X	3	-	X	DELAY	3	YES
3B	6X70	+5	Existing	-	X	3	-	X	-	-	NO
4A	6X40	0	2-4-2	X	-	4	-	X	-	-	NO
4B	6X40	0	2-4-2	X	-	4	-	X	DELAY	10	YES
5A	6X60	+5	Existing	-	X	5	-	X	-	-	NO
6A, 6B	6X6	70	4	X	-	6	-	X	-	-	NO
7A	6X40	0	2-4-2	X	-	7	-	X	-	-	NO
8A	6X70	+5	Existing	-	X	8	-	X	DELAY	10	YES

8 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Phase 3 and/or phase 7 may be lagged.
5. Set all detector units to presence mode.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
8. Pavement markings are existing unless otherwise noted or shown.
9. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pedestal	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Metal Pole with Mastarm	
	Construction Zone	
	Construction Zone Drums	
	Street Sign	

NEMA TIMING CHART

FEATURE	PHASE 01	02	03	04	05	06	07	08
MINIMUM GREEN *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.	7 SEC.
PASSAGE/GAP *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.5 SEC.	3.0 SEC.	3.8 SEC.	3.3 SEC.	3.8 SEC.	3.3 SEC.	3.6 SEC.
RED CLEARANCE	2.8 SEC.	2.0 SEC.	3.2 SEC.	2.9 SEC.	3.2 SEC.	1.8 SEC.	2.6 SEC.	1.9 SEC.
MAX. 1 *	20 SEC.	50 SEC.	20 SEC.	25 SEC.	20 SEC.	50 SEC.	20 SEC.	25 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	NONE	MIN. RECALL	NONE	NONE
VEHICLE CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	NONLOCK	LOCK	NONLOCK	NONLOCK
WALK *	– SEC.	4 SEC.	– SEC.	4 SEC.	– SEC.	4 SEC.	– SEC.	4 SEC.
FLASHING DON'T WALK	– SEC.	17 SEC.	– SEC.	18 SEC.	– SEC.	16 SEC.	– SEC.	20 SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

Signal Upgrade - Temporary Design (Construction Phase I)

Prepared In the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

US 311/SR 4325
(N. Martin Luther King, Jr. Dr.)
at US 311 (New Walkertown Rd.)
and East Winston Plaza

Division 9 Forsyth County Winston-Salem

PLAN DATE:	December 2010	REVIEWED BY:	T. Thigpen
PREPARED BY:	Sterling	REVIEWED BY:	

REVISIONS	INIT.	DATE

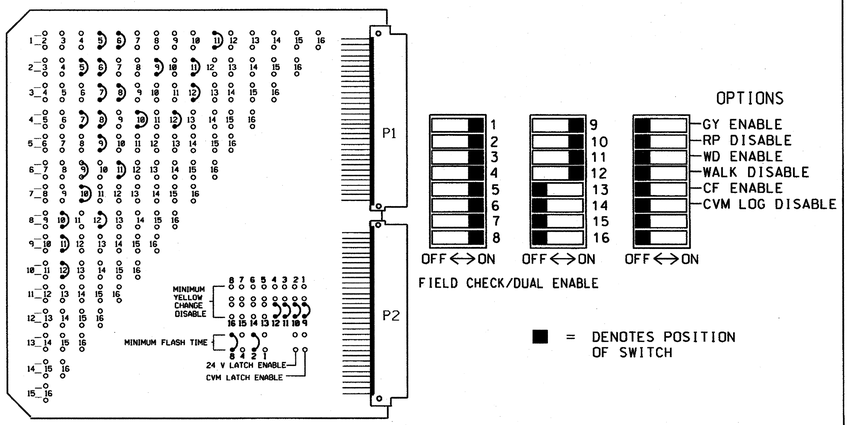
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 1/5/11 DATE
SIG. INVENTORY NO. 09-0479T

05-JAN-2011 15:47
P:*T1Projects-UM2826B*Traffic*Signals*Designs*Signals*09-0479*09047ST_sig.dsn.20110105.dgn
rziemba

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 24

EDI MODEL MMU-16E
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

■ = DENOTES POSITION OF SWITCH

NOTES

! ---> 1. THERE ARE NO UNUSED LOAD SWITCHES THAT WILL NEED TO BE WIRED TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.

! ---> 2. THERE ARE NO UNUSED LOAD SWITCH RED OUTPUTS THAT WILL NEED TO BE JUMPERED TO LOAD SWITCH AC+. MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.

3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 WALK.

4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.

5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.

6. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.

7. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.

8. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	11	21,22	31,32	41,42	51	61,62	71	81,82	P21, P22	P41, P42	P61, P62	P81, P82
RED		2R		4R		6R		8R				
YELLOW		2Y		4Y		6Y		8Y				
GREEN		2G		4G		6G		8G				
RED ARROW	1R		3R		5R		7R					
YELLOW ARROW	1Y		3Y		5Y		7Y					
GREEN ARROW	1G		3G		5G		7G					
✋									9R	10R	11R	12R
🚶									9G	10G	11G	12G
NU = NOT USED									*	*	*	*

*SEE COUNTDOWN NOTE ON 'PEDESTRIAN PUSH-BUTTON WIRING DETAIL' THIS SHEET.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1 L3 ø2 *	CH1 L1 ø1	CH1 L7 ø4	CH1 L5 ø3	CH1 L11 ø7	CH1 L9 ø5	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 ø2 *	CH2 L2 ø2	CH2 L8 ø4	CH2 L6 ø3	CH2 L12 ø8	CH2 L10 ø6					

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS	
1A	L1A, L1B	
2A	L2A, L2B	
2B	L3A, L3B	*
2C	L4A, L4B	*
3A	L5A, L5B	
3B	L6A, L6B	
4A	L7A, L7B	
4B	L8A, L8B	
5A	L9A, L9B	
6A,6B	L10A, L10B	
7A	L11A, L11B	
8A	L12A, L12B	
—	L13A, L13B	
—	L14A, L14B	
—	L15A, L15B	
—	L16A, L16B	

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø1	—	—
2	ø2	—	—
3*	ø2	—	—
4*	ø2	—	—
5	ø3	DELAY	3
6	ø3	—	—
7	ø4	—	—
8	ø4	DELAY	10
9	ø5	—	—
10	ø6	—	—
11	ø7	—	—
12	ø8	DELAY	10
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

*THIS DETECTOR USED ONLY DURING TEMPORARY DESIGN

EQUIPMENT INFORMATION

CONTROLLER.....ECONOLITE ASC/3*
CABINET .....ECONOLITE TS2 TYPE 1*
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....12
LOAD SWITCHES USED.....1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
PHASES USED.....1, 2, 3, 4, 5, 6, 7, 8, 2PED, 4PED, 6PED, 8PED
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

*EXISTING TO REMAIN IN USE

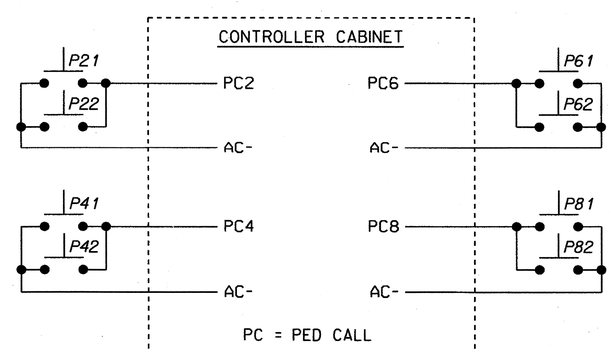
LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED

PEDESTRIAN PUSH-BUTTON WIRING DETAIL

(wire push-buttons as shown below)



NOTE: COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 09-0479T
DESIGNED: DECEMBER 2010
SEALED: 1/5/11
REVISED: N/A

Temporary Design (Construction Phase I)

NEMA Controller/TS-2 Type 1 Cabinet

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 311/SR 4325
(N. Martin Luther King, Jr. Dr.)
at US 311 (New Walkertown Rd.)
and East Winston Plaza

Division 09 Forsyth County Winston-Salem

PLAN DATE:	January 2011	REVIEWED BY:	
PREPARED BY:	F.E. Russ	REVIEWED BY:	

REVISIONS | INIT. | DATE

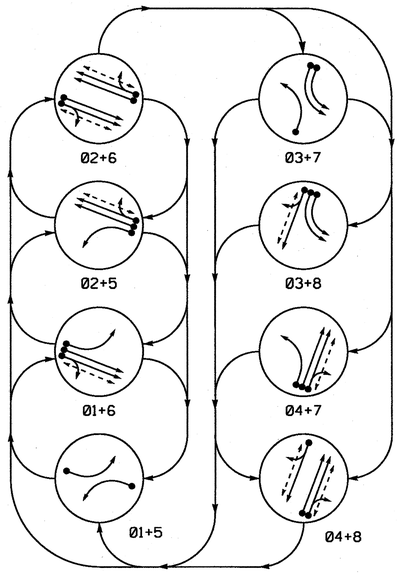
Prepared in the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE DATE 1-11-11
SIG. INVENTORY NO. 09-0479T

10-JAN-2011 11:19
S:\ITS&SI\ITS Signals\workgroups\Sig Mon\russ\ts2dwgs\090479_smu.ele.201101xx.dgn
fcruss

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 25

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

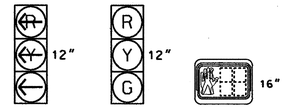
TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	03+7	03+8	04+7	04+8	FLASH
11	—	—	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
21, 22	R	R	G	G	R	R	R	R	Y
31, 32	~~R~~	~~R~~	~~R~~	~~R~~	—	—	~~R~~	~~R~~	~~R~~
41, 42	R	R	R	R	R	R	G	G	R
51	—	~~R~~	—	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
61, 62	R	G	R	G	R	R	R	R	Y
71	~~R~~	~~R~~	~~R~~	~~R~~	—	~~R~~	—	~~R~~	~~R~~
81, 82	R	R	R	R	R	G	R	G	R
P21, P22	DW	DW	W	W	DW	DW	DW	DW	DRK
P41, P42	DW	DW	DW	DW	DW	DW	W	W	DRK
P61, P62	DW	W	DW	W	DW	DW	DW	DW	DRK
P81, P82	DW	DW	DW	DW	DW	W	DW	W	DRK

W - Walk
DW - Don't Walk
DRK - Dark

SIGNAL FACE I.D.

All Heads L.E.D.



11
31, 32
51
71

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

P21, P22
P41, P42
P61, P62
P81, P82

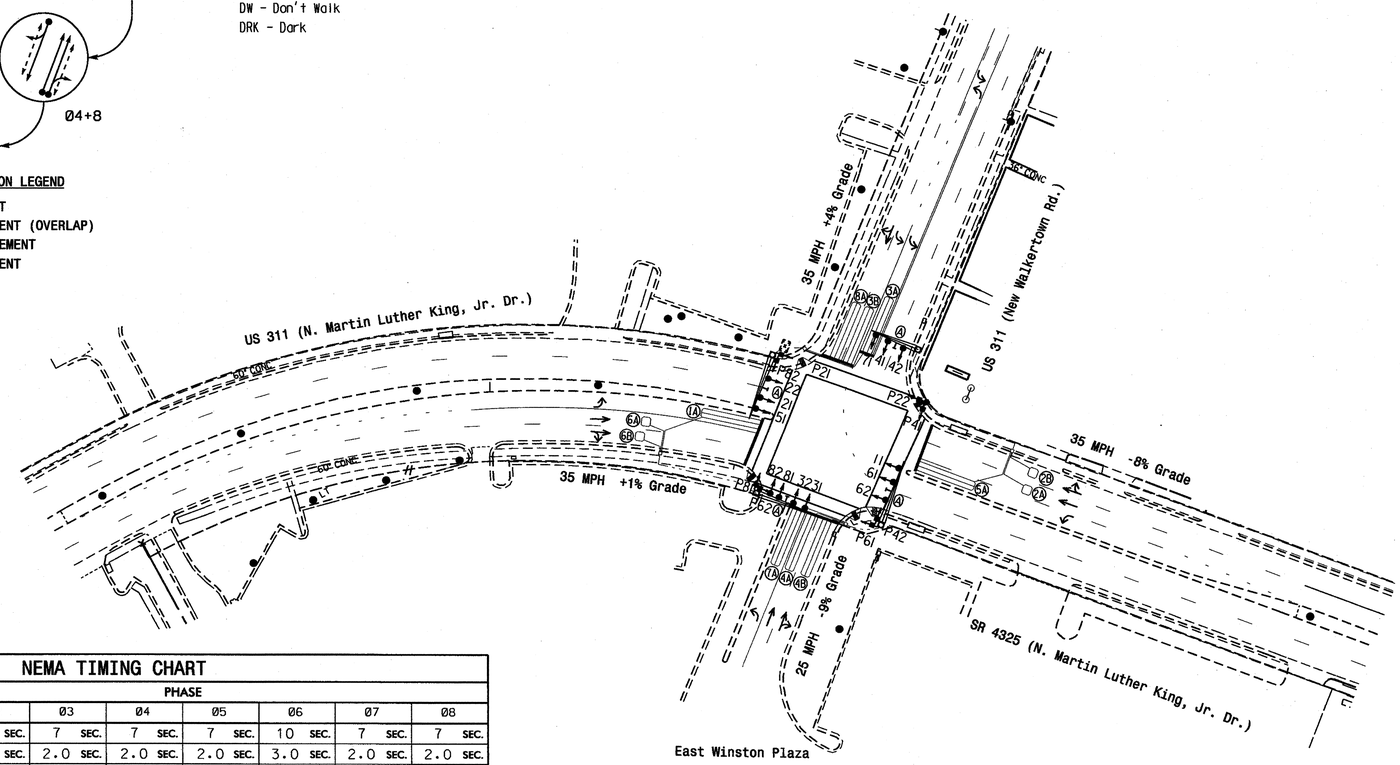
NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?
1A	6X40	0	2-4-2	X	-	1	-	X	-	-	NO
2A, 2B	6X6	70	4	X	-	2	-	X	-	-	NO
3A	6X40	0	2-4-2	X	-	3	-	X	DELAY	3	YES
3B	6X40	0	2-4-2	X	-	3	-	X	-	-	NO
4A	6X40	0	2-4-2	X	-	4	-	X	-	-	NO
4B	6X40	0	2-4-2	X	-	4	-	X	DELAY	15	YES
5A	6X40	0	2-4-2	X	-	5	-	X	-	-	NO
6A, 6B	6X6	70	4	X	-	6	-	X	-	-	NO
7A	6X40	0	2-4-2	X	-	7	-	X	-	-	NO
8A	6X40	0	2-4-2	X	-	8	-	X	DELAY	10	YES

8 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Phase 3 and/or phase 7 may be lagged.
5. Set all detector units to presence mode.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Signal Pedestal	
	Metal Pole with Mastarm	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
N/A	Wheelchair Ramp	
	Street Sign	

NEMA TIMING CHART

FEATURE	PHASE 01	02	03	04	05	06	07	08
MINIMUM GREEN *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.	7 SEC.
PASSAGE GAP *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.5 SEC.	3.0 SEC.	3.8 SEC.	3.3 SEC.	3.8 SEC.	3.3 SEC.	3.6 SEC.
RED CLEARANCE	2.6 SEC.	1.8 SEC.	2.9 SEC.	2.5 SEC.	2.9 SEC.	1.8 SEC.	2.3 SEC.	1.8 SEC.
MAX. 1 *	20 SEC.	50 SEC.	20 SEC.	25 SEC.	20 SEC.	50 SEC.	15 SEC.	25 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	NONE	MIN. RECALL	NONE	NONE
VEHICLE CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	NONLOCK	LOCK	NONLOCK	NONLOCK
WALK *	– SEC.	4 SEC.	– SEC.	4 SEC.	– SEC.	4 SEC.	– SEC.	4 SEC.
FLASHING DON'T WALK	– SEC.	18 SEC.	– SEC.	17 SEC.	– SEC.	16 SEC.	– SEC.	19 SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

Signal Upgrade - Final Design

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

US 311/SR 4325
(N. Martin Luther King, Jr. Dr.) at US 311 (New Walkertown Rd.) and East Winston Plaza

Division 9 Forsyth County Winston-Salem

PLAN DATE:	July 2010	REVIEWED BY:	T. Thigpen
PREPARED BY:	Sterling	REVIEWED BY:	

REVISIONS	INIT.	DATE

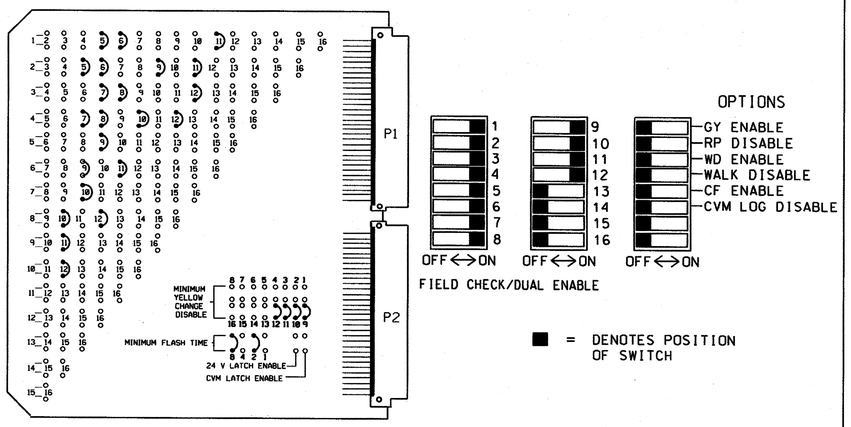
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 1/5/11 DATE
SIG. INVENTORY NO. 09-0479

05-JAN-2011 15:43
P:\TIPPROJects\UK2826B\Traffic\Signals\Design\Signals\09-0479\20479Final_sig_dsn_20110105.dgn
rziemba

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig.26

EDI MODEL MMU-16E
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

NOTES

! ---> 1. THERE ARE NO UNUSED LOAD SWITCHES THAT WILL NEED TO BE WIRED TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.

! ---> 2. THERE ARE NO UNUSED LOAD SWITCH RED OUTPUTS THAT WILL NEED TO BE JUMPERED TO LOAD SWITCH AC+. MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.

3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 WALK.

4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.

5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.

6. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.

7. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.

8. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	11	21,22	31,32	41,42	51	61,62	71	81,82	P21, P22	P41, P42	P61, P62	P81, P82
RED		2R		4R		6R		8R				
YELLOW		2Y		4Y		6Y		8Y				
GREEN		2G		4G		6G		8G				
RED ARROW	1R		3R		5R		7R					
YELLOW ARROW	1Y		3Y		5Y		7Y					
GREEN ARROW	1G		3G		5G		7G					
✋									9R	10R	11R	12R
🚶									9G	10G	11G	12G
NU = NOT USED									*	*	*	*

*SEE COUNTDOWN NOTE ON 'PEDESTRIAN PUSH-BUTTON WIRING DETAIL' THIS SHEET.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	SLOT EMPTY	CH1 L1 ø1	CH1 L7 ø4	CH1 L5 ø3	CH1 L11 ø7	CH1 L9 ø5	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		CH2 L2 ø2	CH2 L8 ø4	CH2 L6 ø3	CH2 L12 ø8	CH2 L10 ø6					

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
1A	L1A, L1B
2A,2B	L2A, L2B
—	L3A, L3B
—	L4A, L4B
3A	L5A, L5B
3B	L6A, L6B
4A	L7A, L7B
4B	L8A, L8B
5A	L9A, L9B
6A,6B	L10A, L10B
7A	L11A, L11B
8A	L12A, L12B
—	L13A, L13B
—	L14A, L14B
—	L15A, L15B
—	L16A, L16B

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø1	—	—
2	ø2	—	—
3	—	—	—
4	—	—	—
5	ø3	DELAY	3
6	ø3	—	—
7	ø4	—	—
8	ø4	DELAY	15
9	ø5	—	—
10	ø6	—	—
11	ø7	—	—
12	ø8	DELAY	10
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

EQUIPMENT INFORMATION

CONTROLLER.....ECONOLITE ASC/3*
CABINET .....ECONOLITE TS2 TYPE 1*
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....12
LOAD SWITCHES USED.....1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
PHASES USED.....1, 2, 3, 4, 5, 6, 7, 8, 2PED, 4PED, 6PED, 8PED
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

*EXISTING TO REMAIN IN USE

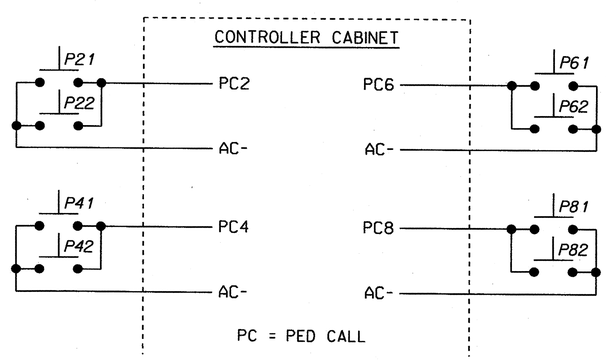
LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED

PEDESTRIAN PUSH-BUTTON WIRING DETAIL

(wire push-buttons as shown below)



NOTE: COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 09-0479
DESIGNED: JULY 2010
SEALED: 1/5/11
REVISED: N/A

Final Design

NEMA Controller/TS-2 Type 1 Cabinet

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 311/SR 4325
(N. Martin Luther King, Jr. Dr.)
at US 311 (New Walkertown Rd.)
and East Winston Plaza

Division 09 Forsyth County Winston-Salem

PLAN DATE:	January 2011	REVIEWED BY:	
PREPARED BY:	F.E. Russ	REVIEWED BY:	

REVISIONS	INIT.	DATE

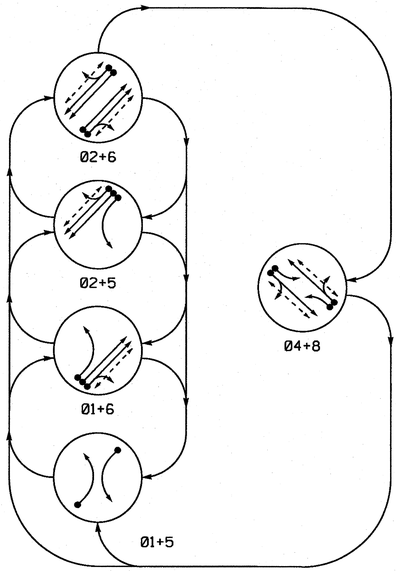
Prepared in the Offices of:
Transportation Mobility and Safety Division
Traffic Engineering Branch
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE DATE 1-11-11
SIG. INVENTORY NO. 09-0479

10-JAN-2011 11:20
S:\ATTSASU\ITS Signals\Workgroups\Sig Mon\Russ\ts2dwgs\090479_smuele_201101xx.dgn
Russ

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 27

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

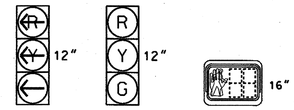
TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	04+8	FLASH
11	←	←	~~R~~	~~R~~	~~R~~	~~R~~
21, 22	R	R	G	G	R	Y
41, 42	R	R	R	R	G	R
51	←	~~R~~	←	~~R~~	~~R~~	~~R~~
61, 62	R	G	R	G	R	Y
81, 82	R	R	R	R	G	R
P21, P22	DW	DW	W	W	DW	DRK
P41, P42	DW	DW	DW	DW	W	DRK
P61, P62	DW	W	DW	W	DW	DRK
P81, P82	DW	DW	DW	DW	W	DRK

W - Walk
DW - Don't Walk
DRK - Dark

SIGNAL FACE I.D.

All Heads L.E.D.



11
51

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

P21, P22
P41, P42
P61, P62
P81, P82

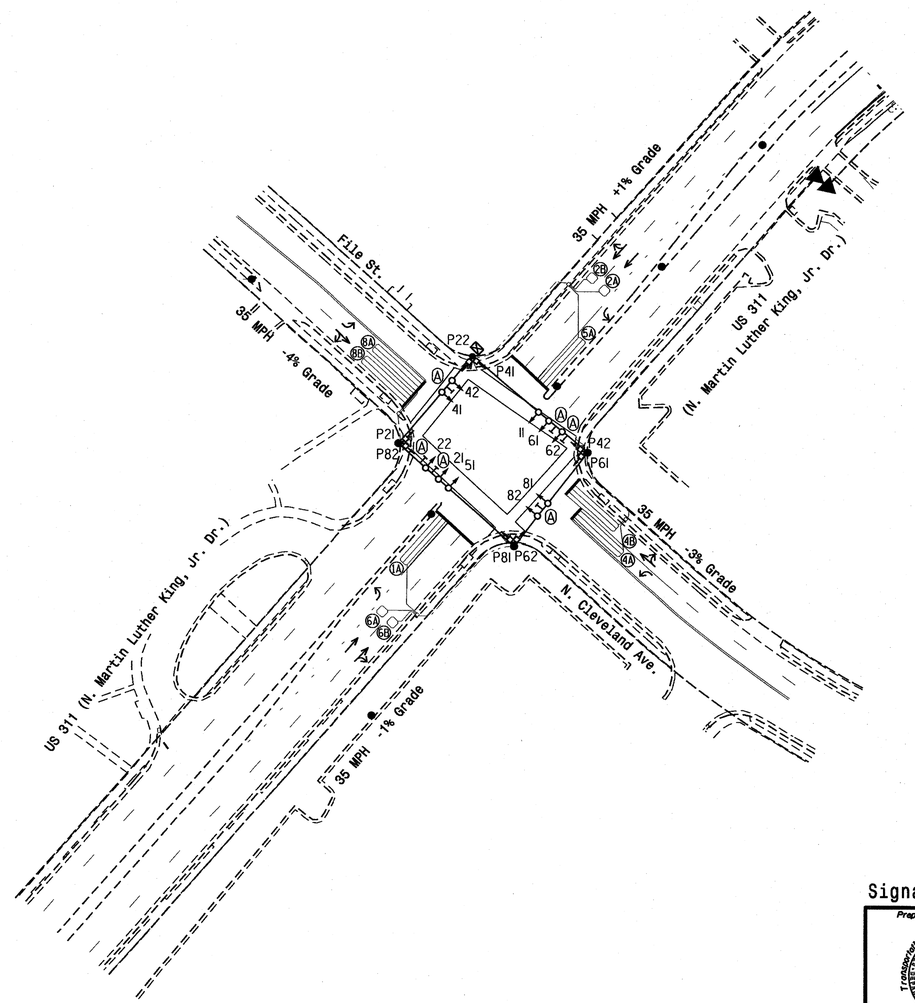
NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS				
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?
1A	6X40	0	2-4-2	X	-	1	X	-	-	-	NO
2A, 2B	6X6	70	4	X	-	2	X	-	-	-	NO
4A	6X40	0	2-4-2	X	-	4	X	-	DELAY	3	NO
4B	6X40	0	2-4-2	X	-	4	X	-	DELAY	10	YES
5A	6X40	0	2-4-2	X	-	5	X	-	-	-	NO
6A, 6B	6X6	70	4	X	-	6	X	-	-	-	NO
8A	6X40	0	2-4-2	X	-	8	X	-	DELAY	3	NO
8B	6X40	0	2-4-2	X	-	8	X	-	DELAY	10	YES

5 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Program phase 4 and phase 8 for dual entry.
5. Set all detector units to presence mode.
6. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
7. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
8. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
9. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Street Sign (R1-1)	

NEMA TIMING CHART

FEATURE	PHASE 01	02	04	05	06	08
MINIMUM GREEN *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
PASSAGE/GAP *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	3.8 SEC.	3.8 SEC.	3.0 SEC.	3.9 SEC.	4.1 SEC.
RED CLEARANCE	2.4 SEC.	1.6 SEC.	2.1 SEC.	2.6 SEC.	1.8 SEC.	2.0 SEC.
MAX. 1 *	15 SEC.	40 SEC.	20 SEC.	15 SEC.	40 SEC.	20 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	MIN. RECALL	NONE
VEHICLE CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	LOCK	NONLOCK
WALK *	– SEC.	4 SEC.	4 SEC.	– SEC.	4 SEC.	4 SEC.
FLASHING DON'T WALK	– SEC.	14 SEC.	22 SEC.	– SEC.	19 SEC.	22 SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

Signal Upgrade - Final Design

Prepared in the Offices of:
Transportation Mobility and Safety Division
Traffic Engineering Branch
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

US 311
(N. Martin Luther King, Jr. Dr.)
at
File St./N. Cleveland Ave.

Division 9 Forsyth County Winston-Salem

PLAN DATE:	July 2010	REVIEWED BY:	T. Thigpen
PREPARED BY:	Sterling	REVIEWED BY:	

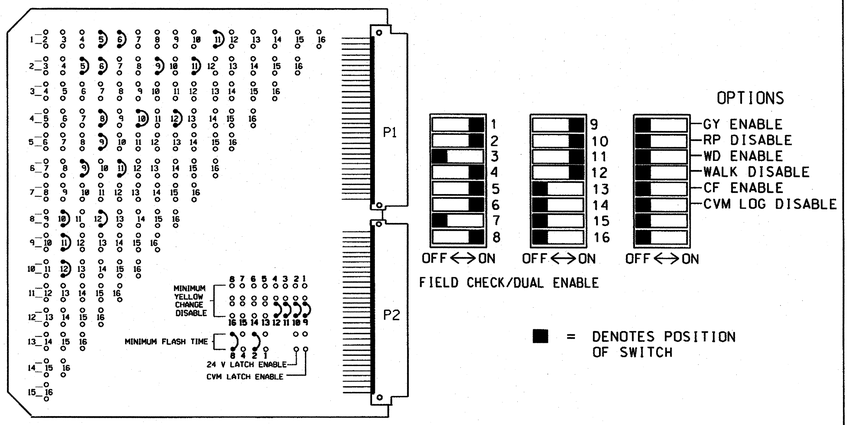
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 12/20/10 DATE
SIG. INVENTORY NO. 09-0598

20-DEC-2010 16:43
P:\TIPProjects\U2826B\Traffic\Signals\Design\Signals\09-0598\09059B_sig_dsn_20101220.dgn
rziemba

EDI MODEL MMU-16E
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 3 AND 7 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 WALK.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DUAL ENTRY.
7. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
8. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
9. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	11	21,22	NU	41,42	51	61,62	NU	81,82	P21, P22	P41, P42	P61, P62	P81, P82
RED		2R		4R		6R		8R				
YELLOW		2Y		4Y		6Y		8Y				
GREEN		2G		4G		6G		8G				
RED ARROW	1R				5R							
YELLOW ARROW	1Y				5Y							
GREEN ARROW	1G				5G							
✋									9R	10R	11R	12R
🚶									9G	10G	11G	12G
NU = NOT USED									*	*	*	*

* SEE COUNTDOWN NOTE ON 'PEDESTRIAN PUSH-BUTTON WIRING DETAIL' THIS SHEET.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1 L3 ø4 *	CH1 L1 ø1	CH1 L7 ø8 *	CH1 L5 ø5	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 ø4	CH2 L2 ø2	CH2 L8 ø8	CH2 L6 ø6							

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
1A	L1A, L1B
2A,2B	L2A, L2B
4A	L3A, L3B
4B	L4A, L4B
5A	L5A, L5B
6A,6B	L6A, L6B
8A	L7A, L7B
8B	L8A, L8B
—	L9A, L9B
—	L10A, L10B
—	L11A, L11B
—	L12A, L12B
—	L13A, L13B
—	L14A, L14B
—	L15A, L15B
—	L16A, L16B

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø1	—	—
2	ø2	—	—
3 *	ø4	DELAY	3
4	ø4	DELAY	10
5	ø5	—	—
6	ø6	—	—
7 *	ø8	DELAY	3
8	ø8	DELAY	10
9	—	—	—
10	—	—	—
11	—	—	—
12	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

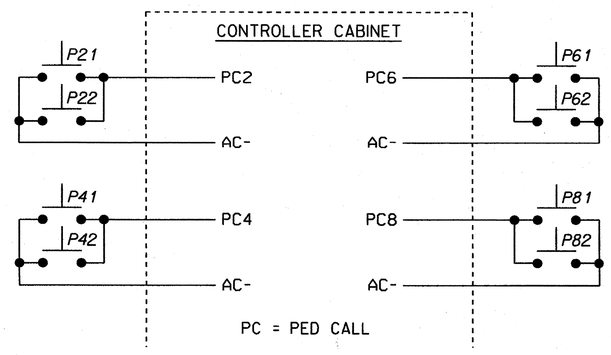
* THIS DETECTOR IS EQUIPPED WITH DELAY AND EXTEND TIMER. PROGRAM DELAY TIMING REQUIRED FOR THIS DETECTOR CHANNEL ON THE DETECTOR UNIT, NOT THE CONTROLLER.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED ASC/3
CABINET .....CONTRACTOR SUPPLIED TS2 TYPE 1
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....12
LOAD SWITCHES USED.....1, 2, 4, 5, 6, 8, 9, 10, 11, 12
PHASES USED.....1, 2, 4, 5, 6, 8, 2PED, 4PED, 6PED, 8PED
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

PEDESTRIAN PUSH-BUTTON WIRING DETAIL

(wire push-buttons as shown below)



NOTE: COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-0598
DESIGNED: JULY 2010
SEALED: 12/20/10
REVISED: N/A

NEMA Controller/TS-2 Type 1 Cabinet

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

US 311
(N. Martin Luther King, Jr. Dr.)
at
File St./N. Cleveland Ave.

Division 09 | Forsyth County | Winston-Salem
PLAN DATE: December 2010 | REVIEWED BY: QP
PREPARED BY: F.E. Russ | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
John T. Rowe Jr. 1-3-11
SIGNATURE DATE
SIG. INVENTORY NO. 09-0598

03-JAN-2011 11:56
S:\TSSGUWITS Signals\Workgroups\Sig Mgmt\Russ\ts2\wps\09598_amole_201101xx.dgn
Russ

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 29

PHASING DIAGRAM

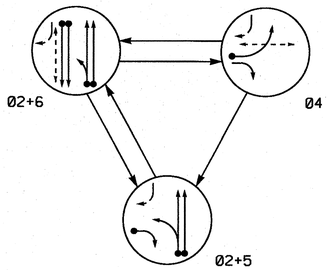


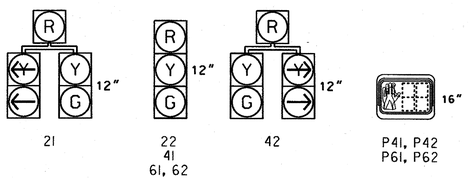
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	PHASE Ø2+6	PHASE Ø4	FLASH
21	G	G	R	Y
22	G	G	R	Y
41	R	R	G	R
42	R	R	G	R
61, 62	R	G	R	Y
P41, P42	DW	DW	W	DRK
P61, P62	DW	W	DW	DRK

W - Walk
DW - Don't Walk
DRK - Dark

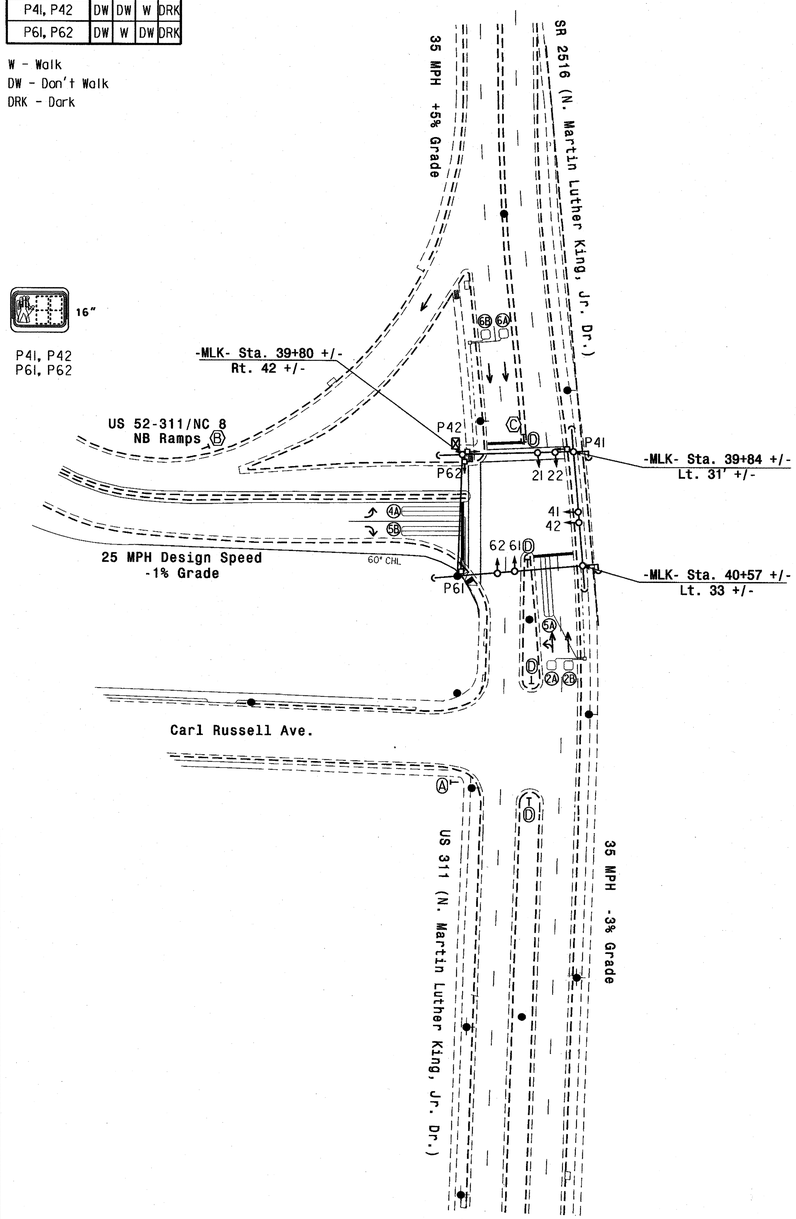
SIGNAL FACE I.D.

All Heads L.E.D.



NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?
2A, 2B	6X6	70	4	X	-	2	X	-	-	-	NO
4A	6X40	0	2-4-2	X	-	4	X	-	-	-	NO
5A	6X40	0	2-4-2	X	-	5	X	-	DELAY	15	YES
5B	6X40	0	2-4-2	X	-	5	X	-	DELAY	15	YES
6A, 6B	6X6	70	4	X	-	6	X	-	-	-	NO



NEMA TIMING CHART

FEATURE	PHASE 02	PHASE 04	PHASE 05	PHASE 06
MINIMUM GREEN *	10 SEC.	7 SEC.	7 SEC.	10 SEC.
PASSAGE/GAP *	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	4.1 SEC.	3.0 SEC.	3.0 SEC.	3.6 SEC.
RED CLEARANCE	1.3 SEC.	2.1 SEC.	2.4 SEC.	1.5 SEC.
MAX. 1 *	45 SEC.	25 SEC.	20 SEC.	45 SEC.
RECALL POSITION	MIN. RECALL	NONE	NONE	MIN. RECALL
VEHICLE CALL MEMORY	LOCK	NONLOCK	NONLOCK	LOCK
WALK *	– SEC.	4 SEC.	– SEC.	4 SEC.
FLASHING DON'T WALK	– SEC.	13 SEC.	– SEC.	18 SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

3 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 5 may be lagged.
4. Set all detector units to presence mode.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
N/A	Wheelchair Ramp	
Ⓐ	"STOP" Sign (R1-1)	Ⓐ
Ⓑ	"YIELD" Sign (R1-2)	Ⓑ
Ⓒ	No U-Turn Sign (R3-4)	Ⓒ
Ⓓ	Keep Right Sign (R4-7)	Ⓓ

New Installation

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 311/SR 2516
(N. Martin Luther King, Jr. Dr.)
at
US 52-311/NC 8 NB Ramps

Division 9 Forsyth County Winston-Salem

PLAN DATE:	July 2010	REVIEWED BY:	T. Thigpen
PREPARED BY:	Sterling	REVIEWED BY:	

SCALE 0 50 1"=50'

REVISIONS	INIT.	DATE

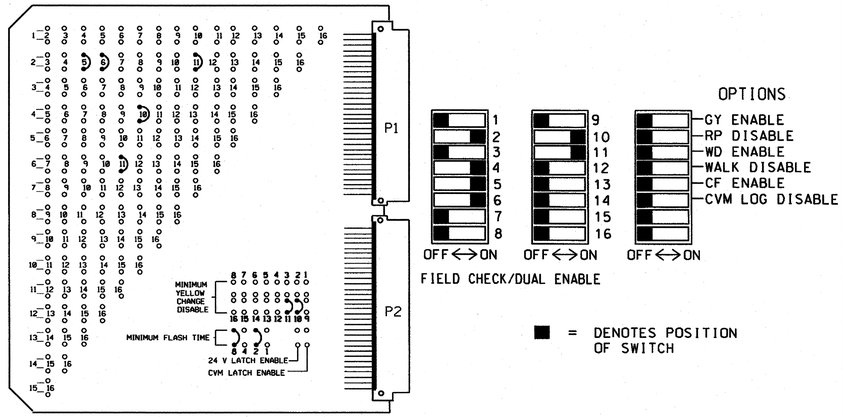
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE DATE 12/20/10
SIG. INVENTORY NO. 09-1338

20-DEC-2010 14:35
P:\TIPProjects\DW28268\Traffic\Signals\Designs\Signals\09-1338\091338_sig_dsn_20101220.dgn
rziemba

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 30

EDI MODEL MMU-16E
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 1, 3, 7, 8, 9 & 12 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASE 2 GREEN AND IN PHASE 6 WALK.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
7. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
8. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	41,42	21,42	61,62	NU	NU	NU	P41, P42	P61, P62	NU
RED		2R		4R	*	6R						
YELLOW		2Y		4Y		6Y						
GREEN		2G		4G		6G						
RED ARROW												
YELLOW ARROW					5Y							
GREEN ARROW					5G							
✋										10R	11R	
🚶										10G	11G	
										**	**	

NU = NOT USED

* DENOTES INSTALL LOAD RESISTOR. SEE 'LOAD RESISTOR INSTALLATION DETAIL' THIS SHEET.

** SEE COUNTDOWN NOTE ON 'PEDESTRIAN PUSH-BUTTON WIRING DETAIL' THIS SHEET.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1 L3 ø5	CH1 L1 ø2	SLOT EMPTY	CH1 L5 ø5	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 NOT USED	CH2 L2 ø4		CH2 L6 ø6							

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
2A,2B	L1A, L1B
4A	L2A, L2B
5A	L3A, L3B
—	L4A, L4B
5B	L5A, L5B
6A,6B	L6A, L6B
—	L7A, L7B
—	L8A, L8B
—	L9A, L9B
—	L10A, L10B
—	L11A, L11B
—	L12A, L12B
—	L13A, L13B
—	L14A, L14B
—	L15A, L15B
—	L16A, L16B

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

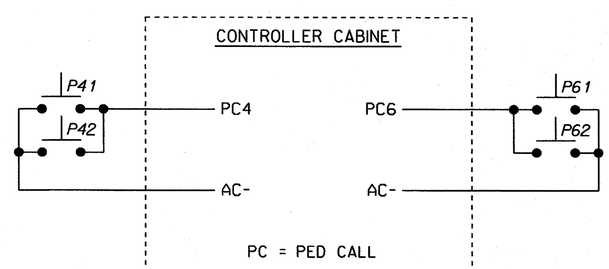
CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø2	—	—
2	ø4	—	—
3	ø5	DELAY	15
4	—	—	—
5	ø5	DELAY	15
6	ø6	—	—
7	—	—	—
8	—	—	—
9	—	—	—
10	—	—	—
11	—	—	—
12	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED ASC/3
CABINET .....CONTRACTOR SUPPLIED TS2 TYPE 1
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....12
LOAD SWITCHES USED.....2, 4, 5, 6, 10, 11
PHASES USED.....2, 4, 5, 6, 4PED, 6PED
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

PEDESTRIAN PUSH-BUTTON WIRING DETAIL

(wire push-buttons as shown below)

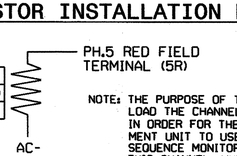


NOTE: COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



NOTE: THE PURPOSE OF THIS RESISTOR IS TO LOAD THE CHANNEL RED MONITOR INPUT IN ORDER FOR THE MALFUNCTION MANAGEMENT UNIT TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON THIS CHANNEL, WHICH DOES NOT USE THE RED DISPLAY IN THE FIELD.

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-1338
DESIGNED: JULY 2010
SEALED: 12/20/10
REVISED: N/A

NEMA Controller/TS-2 Type 1 Cabinet

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
Traffic Engineering Branch
Signal Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

US 311/SR 2516
(N. Martin Luther King, Jr. Dr.)
at
US 52-311/NC 8 NB Ramps

Division 09 | Forsyth County | Winston-Salem

PLAN DATE: December 2010 | REVIEWED BY: JTP
PREPARED BY: F.E. Russ | REVIEWED BY:

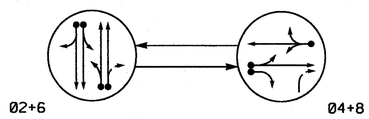
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
John T. Rowe Jr. 1-3-11
SIGNATURE DATE
SIG. INVENTORY NO. 09-1338

03-JAN-2011 10:23
S:\TSGroup\TS Signals\Workgroups\Sig Mon\Russ\ts2dwgs\091338.smu.ele.20110103xx.dgn
Ferruss

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 3i

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

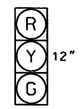
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 02+6	PHASE 04+8	FLASH
21, 22	G	R	Y
41, 42	R	G	R
61, 62	G	R	Y
81, 82	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



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

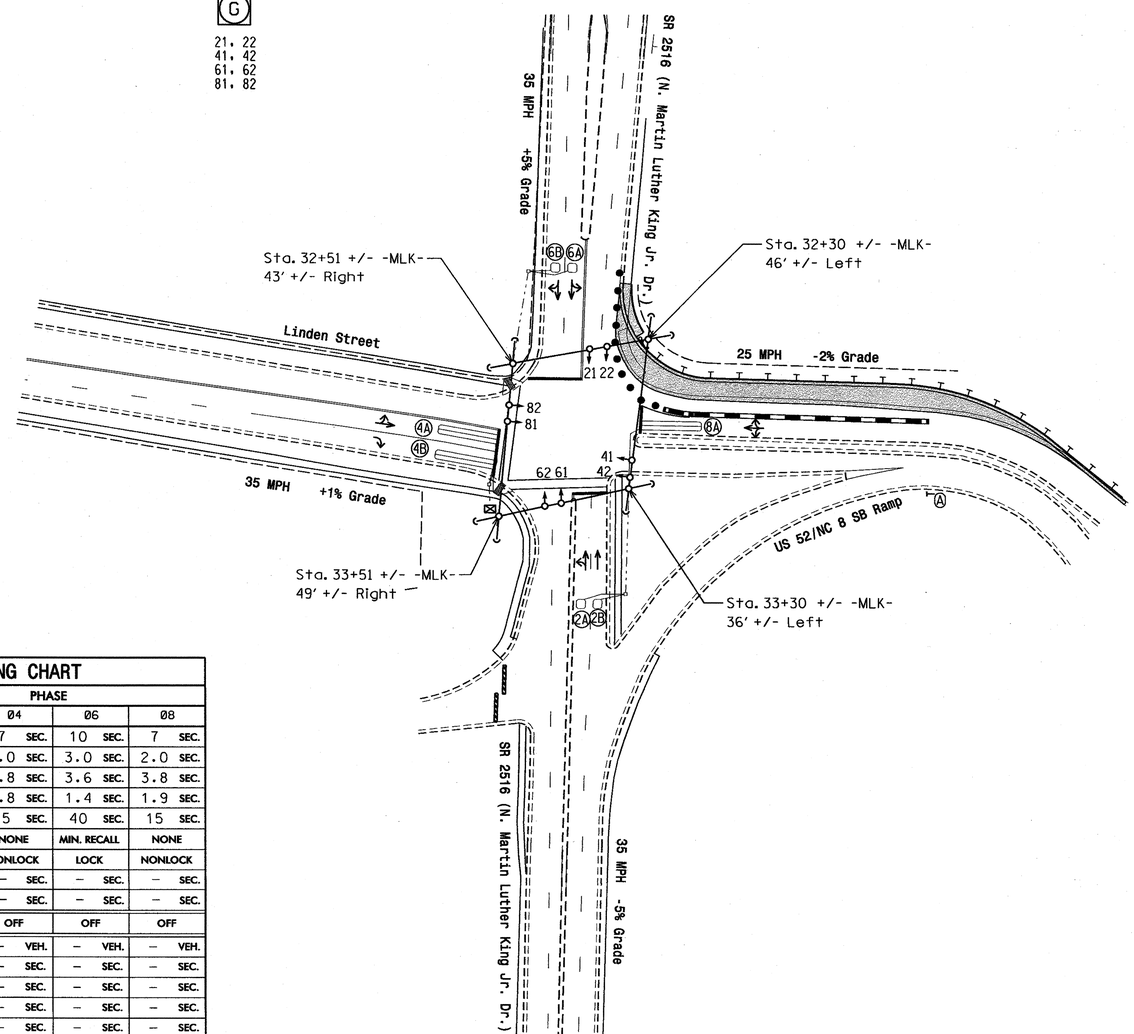
NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?
2A, 2B	6x6	70	4	X	-	2	X	-	-	-	NO
4A	6x40	0	2-4-2	X	-	4	X	-	DELAY	3	YES
4B	6x40	0	2-4-2	X	-	4	X	-	DELAY	15	YES
6A, 6B	6x6	70	4	X	-	6	X	-	-	-	NO
8A	6x40	0	2-4-2	X	-	8	X	-	DELAY	5	YES

2 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Program phase 4 and phase 8 for dual entry.
4. Set all detector units to presence mode.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



NEMA TIMING CHART

FEATURE	PHASE 02	PHASE 04	PHASE 06	PHASE 08
MINIMUM GREEN *	10 SEC.	7 SEC.	10 SEC.	7 SEC.
PASSAGE/GAP *	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	4.0 SEC.	3.8 SEC.	3.6 SEC.	3.8 SEC.
RED CLEARANCE	1.3 SEC.	1.8 SEC.	1.4 SEC.	1.9 SEC.
MAX. 1 *	40 SEC.	15 SEC.	40 SEC.	15 SEC.
RECALL POSITION	MIN. RECALL	NONE	MIN. RECALL	NONE
VEHICLE CALL MEMORY	LOCK	NONLOCK	LOCK	NONLOCK
WALK *	– SEC.	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
N/A	Guardrail	
	Construction Zone	
	Construction Zone Drums	
	"YIELD" Sign (R1-2)	

New Installation - Temporary Design 1 (Construction Phase II)

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

SR 2516
(N. Martin Luther King Jr. Dr.)
at US 52/NC 8 SB Ramp
and Linden Street

Division 9 Forsyth County Winston-Salem

PLAN DATE: August 2010	REVIEWED BY:
PREPARED BY: TS Thigpen	REVIEWED BY:

REVISIONS	INIT.	DATE

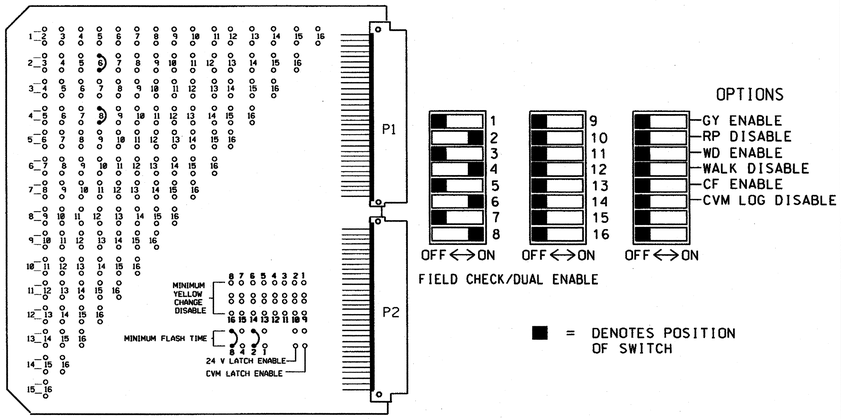
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 1/6/11 DATE
SIG. INVENTORY NO. 09-1022T1

06-JAN-2011 16:04
P:*#IPProjects*UWU2826B*Traffic*Signals*Design*Signals*09-1022*09102271_sig_dsn_20110106.dgn
rziemba

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 32.

EDI MODEL MMU-16E
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 1, 3, 5, 7, 9, 10, 11 & 12 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DUAL ENTRY.
7. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
8. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
9. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	41,42	NU	61,62	NU	81,82	NU	NU	NU	NU
RED		2R		4R		6R		8R				
YELLOW		2Y		4Y		6Y		8Y				
GREEN		2G		4G		6G		8G				
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋												
🚶												

NU = NOT USED

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1 L3 ø4	CH1 L1 ø2	SLOT EMPTY	CH1 L5 ø8	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 ø6	CH2 L2 ø4		CH2 L6 FUTURE USE							

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS	
2A,2B	L1A, L1B	
4A	L2A, L2B	
4B	L3A, L3B	
6A,6B	L4A, L4B	
8A	L5A, L5B	
—	L6A, L6B	*
—	L7A, L7B	*
—	L8A, L8B	
—	L9A, L9B	
—	L10A, L10B	
—	L11A, L11B	
—	L12A, L12B	
—	L13A, L13B	
—	L14A, L14B	
—	L15A, L15B	
—	L16A, L16B	

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø2	—	—
2	ø4	DELAY	3
3	ø4	DELAY	15
4	ø6	—	—
5	ø8	DELAY	5
6 *	—	—	—
7 *	—	—	—
8	—	—	—
9	—	—	—
10	—	—	—
11	—	—	—
12	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

* FUTURE USE

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED ASC/3
CABINET .....CONTRACTOR SUPPLIED TS2 TYPE 1
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....12
LOAD SWITCHES USED.....2, 4, 6, 8
PHASES USED.....2, 4, 6, 8
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED

THIS ELECTRICAL DETAIL IS FOR THE
TEMPORARY SIGNAL DESIGN: 09-1022T1
DESIGNED: AUGUST 2010
SEALED: 1/6/11
REVISED: N/A

Temporary Design 1 (Construction Phase II)

NEMA Controller/TS-2 Type 1 Cabinet

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 2516
(N. Martin Luther King Jr. Dr.)
at US 52/NC 8 SB Ramp
and Linden Street

Division 09 | Forsyth County | Winston-Salem

PLAN DATE: January 2011 | REVIEWED BY:
PREPARED BY: F.E. Russ | REVIEWED BY:

REVISIONS	INIT.	DATE

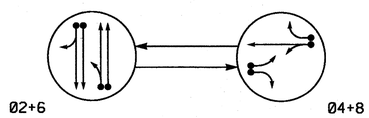
Prepared in the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE | DATE 1-12-11
SIG. INVENTORY NO. 09-1022T1

10-JAN-2011 16:57
S:#TSSG$#TS Signals#workgroups#Sig Mon#Russ#ts2dwgs#091022_smbulb_201101xx.dgn
fenross

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 33

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

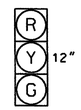
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 02+6	PHASE 04+8	FLASH
21, 22	G	R	Y
41, 42	R	G	R
61, 62	G	R	Y
81, 82	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



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

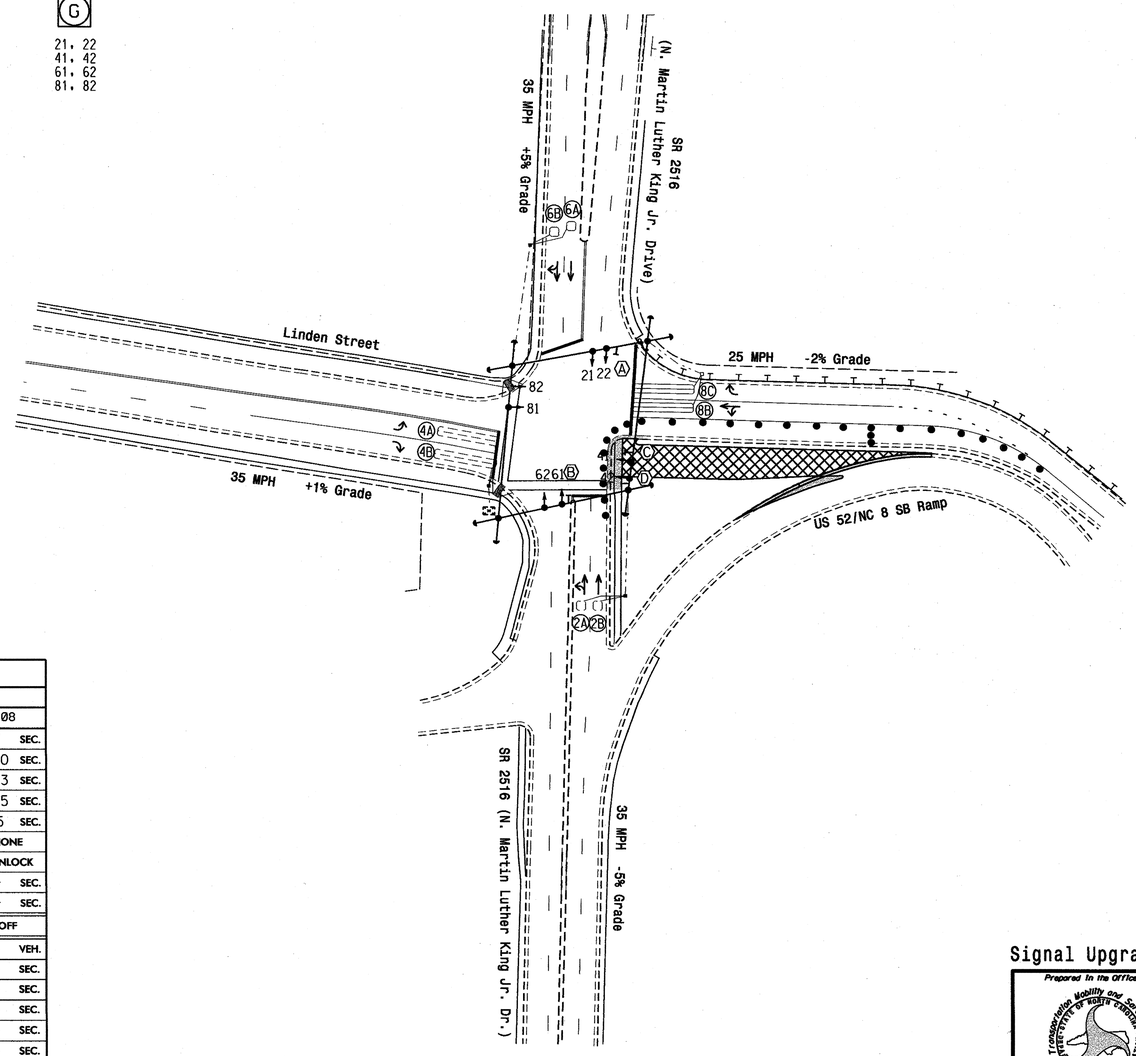
NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?
2A, 2B	6x6	70	4	-	X	2	-	X	-	-	NO
4A	6x40	0	2-4-2	-	X	4	-	X	DELAY	3	YES
4B	6x40	0	2-4-2	-	X	4	-	X	DELAY	15	YES
6A, 6B	6x6	70	4	X	-	6	-	X	-	-	NO
8B	6x40	0	2-4-2	X	-	8	X	-	-	-	NO
8C	6x40	0	2-4-2	X	-	8	-	X	DELAY	15	YES

2 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Repostion existing signal heads numbered 81 and 82.
4. Program phase 4 and phase 8 for dual entry.
5. Set all detector units to presence mode.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



NEMA TIMING CHART

FEATURE	PHASE 02	PHASE 04	PHASE 06	PHASE 08
MINIMUM GREEN *	10 SEC.	7 SEC.	10 SEC.	7 SEC.
PASSAGE/GAP *	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	4.2 SEC.	3.0 SEC.	3.6 SEC.	3.3 SEC.
RED CLEARANCE	1.6 SEC.	2.6 SEC.	1.8 SEC.	2.5 SEC.
MAX. 1 *	40 SEC.	15 SEC.	40 SEC.	15 SEC.
RECALL POSITION	MIN. RECALL	NONE	MIN. RECALL	NONE
VEHICLE CALL MEMORY	LOCK	NONLOCK	LOCK	NONLOCK
WALK *	– SEC.	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Signal Pedestal	
N/A	Guardrail	
	Construction Zone	
	Construction Zone Drums	
A	No Right Turn Sign (R3-1)	A
B	No Left Turn Sign (R3-2)	B
C	Left Arrow "ONLY" Sign (R3-5L)	C
D	Right Arrow "ONLY" Sign (R3-5R)	D

Signal Upgrade - Temporary Design 2 (Construction Phase III)

Prepared in the Offices of:
Transportation Mobility and Safety Division
Traffic Engineering Branch
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

SR 2516
(N. Martin Luther King Jr. Dr.)
at US 52/NC 8 SB Ramp
and Linden Street

Division 9 Forsyth County Winston-Salem

PLAN DATE: August 2010	REVIEWED BY:
PREPARED BY: TS Thigpen	REVIEWED BY:

REVISIONS	INIT.	DATE

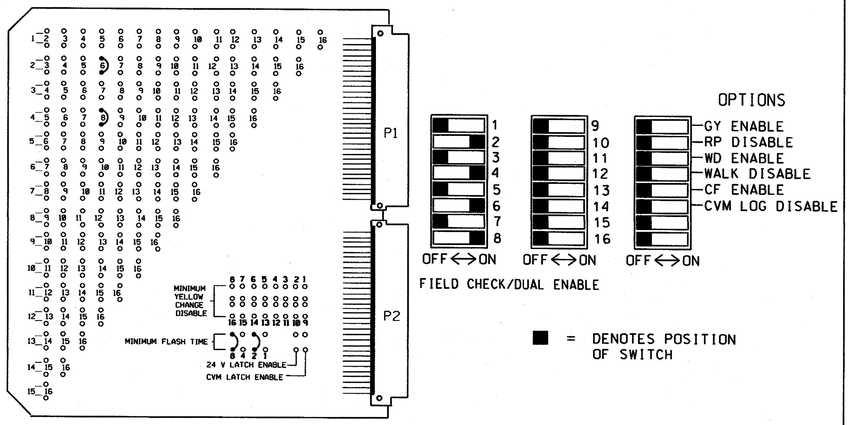
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 1/6/11 DATE
SIG. INVENTORY NO. 09-1022T2

05-JAN-2011 16:14
R:\TMPProjects\B-4\U2826B\Traffic\Signals\Design\Signals\09-1022\09102ZT2_sig_dsn_20110106.dgn
rziemba

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 3A

EDI MODEL MMU-16E
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and set switches as shown below)



■ = DENOTES POSITION OF SWITCH

MMU PROGRAMMING CARD

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 1, 3, 5, 7, 9, 10, 11 & 12 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DUAL ENTRY.
7. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
8. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
9. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	41,42	NU	61,62	NU	81,82	NU	NU	NU	NU
RED		2R		4R		6R		8R				
YELLOW		2Y		4Y		6Y		8Y				
GREEN		2G		4G		6G		8G				
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋												
🚶												

NU = NOT USED

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1 L3 ø4	CH1 L1 ø2	CH1 L7 ø8	CH1 L5 FUTURE USE	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 ø6	CH2 L2 ø4	CH2 L8 NOT USED	CH2 L6 ø8							

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
2A,2B	L1A, L1B
4A	L2A, L2B
4B	L3A, L3B
6A,6B	L4A, L4B
—	L5A, L5B *
8B	L6A, L6B
8C	L7A, L7B
—	L8A, L8B
—	L9A, L9B
—	L10A, L10B
—	L11A, L11B
—	L12A, L12B
—	L13A, L13B
—	L14A, L14B
—	L15A, L15B
—	L16A, L16B

*FUTURE USE

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø2	—	—
2	ø4	DELAY	3
3	ø4	DELAY	15
4	ø6	—	—
5 *	—	—	—
6	ø8	—	—
7	ø8	DELAY	15
8	—	—	—
9	—	—	—
10	—	—	—
11	—	—	—
12	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED ASC/3*
CABINET .....CONTRACTOR SUPPLIED TS2 TYPE 1*
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....12
LOAD SWITCHES USED.....2, 4, 6, 8
PHASES USED.....2, 4, 6, 8
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

*EXISTING INSTALLED UNDER TEMPORARY DESIGN 1

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 09-1022T2
DESIGNED: AUGUST 2010
SEALED: 1/6/11
REVISED: N/A

Temporary Design 2 (Construction Phase III)

NEMA Controller/TS-2 Type 1 Cabinet

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
Traffic Engineering & Management Section
State of North Carolina Department of Transportation
750 N. Greenfield Pkwy, Garner, NC 27529

SR 2516
(N. Martin Luther King Jr. Dr.)
at US 52/NC 8 SB Ramp
and Linden Street

Division 09 Forsyth County Winston-Salem

PLAN DATE:	January 2011	REVIEWED BY:	
PREPARED BY:	F.E. Russ	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

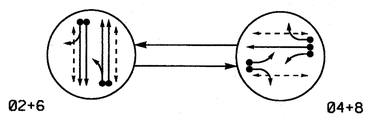
SIGNATURE 1-12-11 DATE

SIG. INVENTORY NO. 09-1022T2

10-JAN-2011 16:58
S:\TSAS\ITS Signals\Workgroups\Sig Mon\Russ\ts2dwgs\091022_smi_ela_20110lxx.dgn
Russ

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 35

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE 02+6	PHASE 04+8	FLASH
21, 22	G	R	Y
41, 42	R	G	R
61, 62	G	R	Y
81, 82	R	G	R
P21, P22	W	DW	DRK
P41, P42	DW	W	DRK
P61, P62	W	DW	DRK
P81, P82	DW	W	DRK

W - Walk
DW - Don't Walk
DRK - Dark

SIGNAL FACE I.D.

All Heads L.E.D.

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

P21, P22
P41, P42
P61, P62
P81, P82

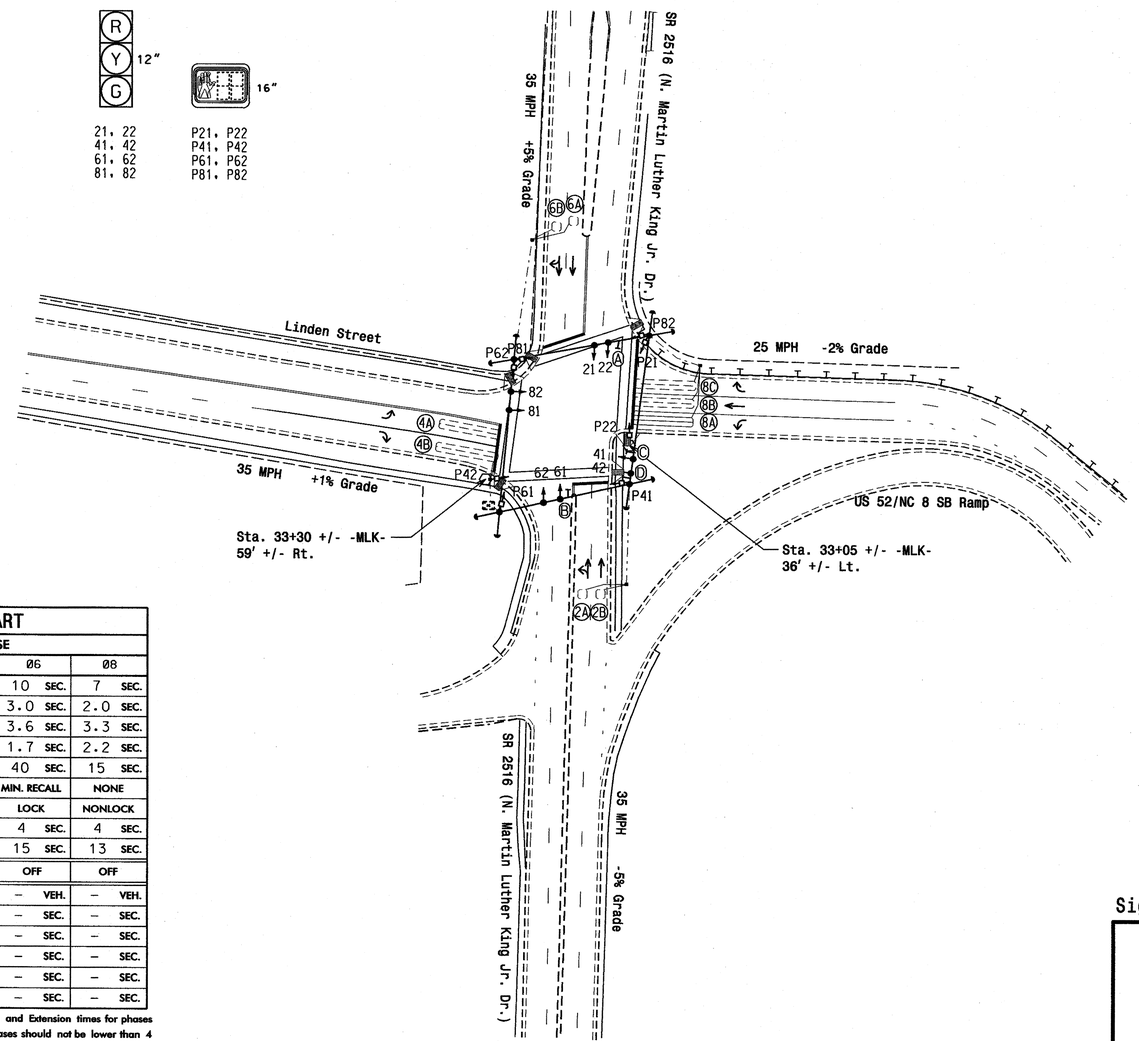
NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN#
2A, 2B	6x6	70	4	-	X	2	-	X	-	-	NO
4A	6x40	0	2-4-2	-	X	4	-	X	DELAY	3	YES
4B	6x40	0	2-4-2	-	X	4	-	X	DELAY	15	YES
6A, 6B	6x6	70	4	-	X	6	-	X	-	-	NO
8A	6x40	0	2-4-2	X	-	8	X	-	-	-	NO
8B	6x40	0	2-4-2	-	X	8	-	X	-	-	NO
8C	6x40	0	2-4-2	-	X	8	-	X	DELAY	15	YES

2 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Reposition existing signal heads 81 and 82.
4. Set all detector units to presence mode.
5. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
6. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
7. Existing Left Arrow "ONLY" (R3-5L) and Right Arrow "ONLY" (R3-5R) signs may be removed at the discretion of the Regional Traffic Engineer.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



NEMA TIMING CHART

FEATURE	PHASE 02	PHASE 04	PHASE 06	PHASE 08
MINIMUM GREEN *	10 SEC.	7 SEC.	10 SEC.	7 SEC.
PASSAGE/GAP *	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	4.2 SEC.	3.0 SEC.	3.6 SEC.	3.3 SEC.
RED CLEARANCE	1.9 SEC.	3.1 SEC.	1.7 SEC.	2.2 SEC.
MAX. 1 *	40 SEC.	15 SEC.	40 SEC.	15 SEC.
RECALL POSITION	MIN. RECALL	NONE	MIN. RECALL	NONE
VEHICLE CALL MEMORY	LOCK	NONLOCK	LOCK	NONLOCK
WALK *	4 SEC.	4 SEC.	4 SEC.	4 SEC.
FLASHING DON'T WALK	16 SEC.	18 SEC.	15 SEC.	13 SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Signal Pedestal	
N/A	Guardrail	
A	No Right Turn Sign (R3-1)	A
B	No Left Turn Sign (R3-2)	B
C	Left Arrow "ONLY" Sign (R3-5L)	C
D	Right Arrow "ONLY" Sign (R3-5R)	D

Signal Upgrade - Final Design

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

SR 2516
(N. Martin Luther King Jr. Dr.)
at US 52/NC 8 SB Ramp
and Linden Street

Division 9 Forsyth County Winston-Salem

PLAN DATE: August 2010 REVIEWED BY:
PREPARED BY: TS Thigpen REVIEWED BY:

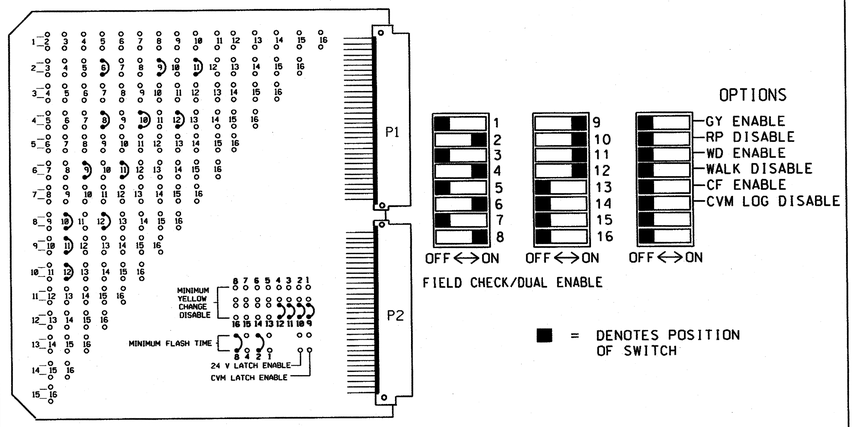
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 9/16/11 DATE
SIG. INVENTORY NO. 09-1022

06-JUN-2011 16:21
P:\TIPProjects-SWU\2826B\Traffic\Signals\Design\Signals\09-1022\09102Final.sig.dsn.20110106.dgn
rziemba

EDI MODEL MMU-16E
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 1, 3, 5 AND 7 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 WALK.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DUAL ENTRY.
7. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
8. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
9. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	41,42	NU	61,62	NU	81,82	P21, P22	P41, P42	P61, P62	P81, P82
RED		2R		4R		6R		8R				
YELLOW		2Y		4Y		6Y		8Y				
GREEN		2G		4G		6G		8G				
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋									9R	10R	11R	12R
🚶									9G	10G	11G	12G
									*	*	*	*

NU = NOT USED

*SEE COUNTDOWN NOTE ON 'PEDESTRIAN PUSH-BUTTON WIRING DETAIL' THIS SHEET.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1 L3 ø4	CH1 L1 ø2	CH1 L7 ø8	CH1 L5 ø8	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 ø6	CH2 L2 ø4	CH2 L8 NOT USED	CH2 L6 ø8							

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
2A,2B	L1A, L1B
4A	L2A, L2B
4B	L3A, L3B
6A,6B	L4A, L4B
8A	L5A, L5B
8B	L6A, L6B
8C	L7A, L7B
—	L8A, L8B
—	L9A, L9B
—	L10A, L10B
—	L11A, L11B
—	L12A, L12B
—	L13A, L13B
—	L14A, L14B
—	L15A, L15B
—	L16A, L16B

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø2	—	—
2	ø4	DELAY	3
3	ø4	DELAY	15
4	ø6	—	—
5	ø8	—	—
6	ø8	—	—
7	ø8	DELAY	15
8	—	—	—
9	—	—	—
10	—	—	—
11	—	—	—
12	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED ASC/3*
CABINET .....CONTRACTOR SUPPLIED TS2 TYPE 1*
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....12
LOAD SWITCHES USED.....2, 4, 6, 8, 9, 10, 11, 12
PHASES USED.....2, 4, 6, 8, 2PED, 4PED, 6PED, 8PED
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

*EXISTING INSTALLED UNDER TEMPORARY DESIGN 1

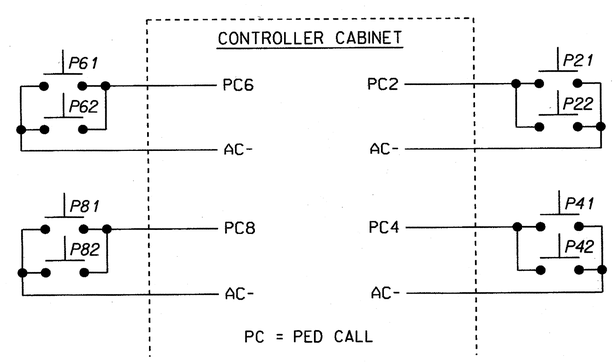
LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED

PEDESTRIAN PUSH-BUTTON WIRING DETAIL

(wire push-buttons as shown below)



NOTE: COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 09-1022
DESIGNED: AUGUST 2010
SEALED: 1/6/11
REVISED: N/A

Final Design

NEMA Controller/TS-2 Type 1 Cabinet

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
Department of Transportation
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 2516
(N. Martin Luther King Jr. Dr.)
at US 52/NC 8 SB Ramp
and Linden Street

Division 09 Forsyth County Winston-Salem

PLAN DATE:	January 2011	REVIEWED BY:	JJP
PREPARED BY:	F.E. Russ	REVIEWED BY:	

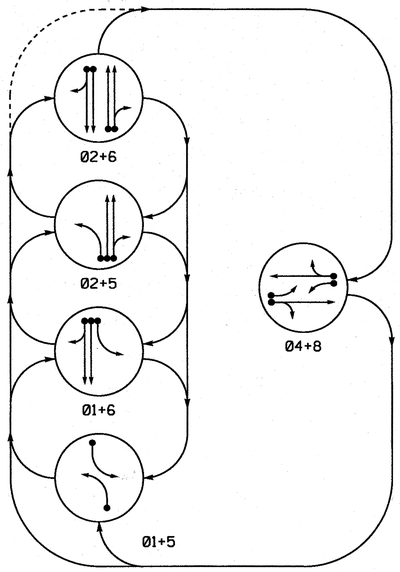
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE John T Rowe Jr. DATE 1-12-11
SIG. INVENTORY NO. 09-1022

10-JAN-2011 16:58
S:*ITS&SU*ITS Signals*workgroups*Sig Mgmt*Russ*ts2dwgs*091022_sm.ele_20110lxx.dgn
fgruss

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 37

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

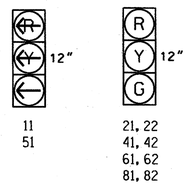
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	04+8	FLASH
11	←	←	~~R~~	~~R~~	~~R~~	~~R~~
21, 22	R	R	G	G	R	Y
41, 42	R	R	R	R	G	R
51	←	~~R~~	←	~~R~~	~~R~~	~~R~~
61, 62	R	G	R	G	R	Y
81, 82	R	R	R	R	G	R

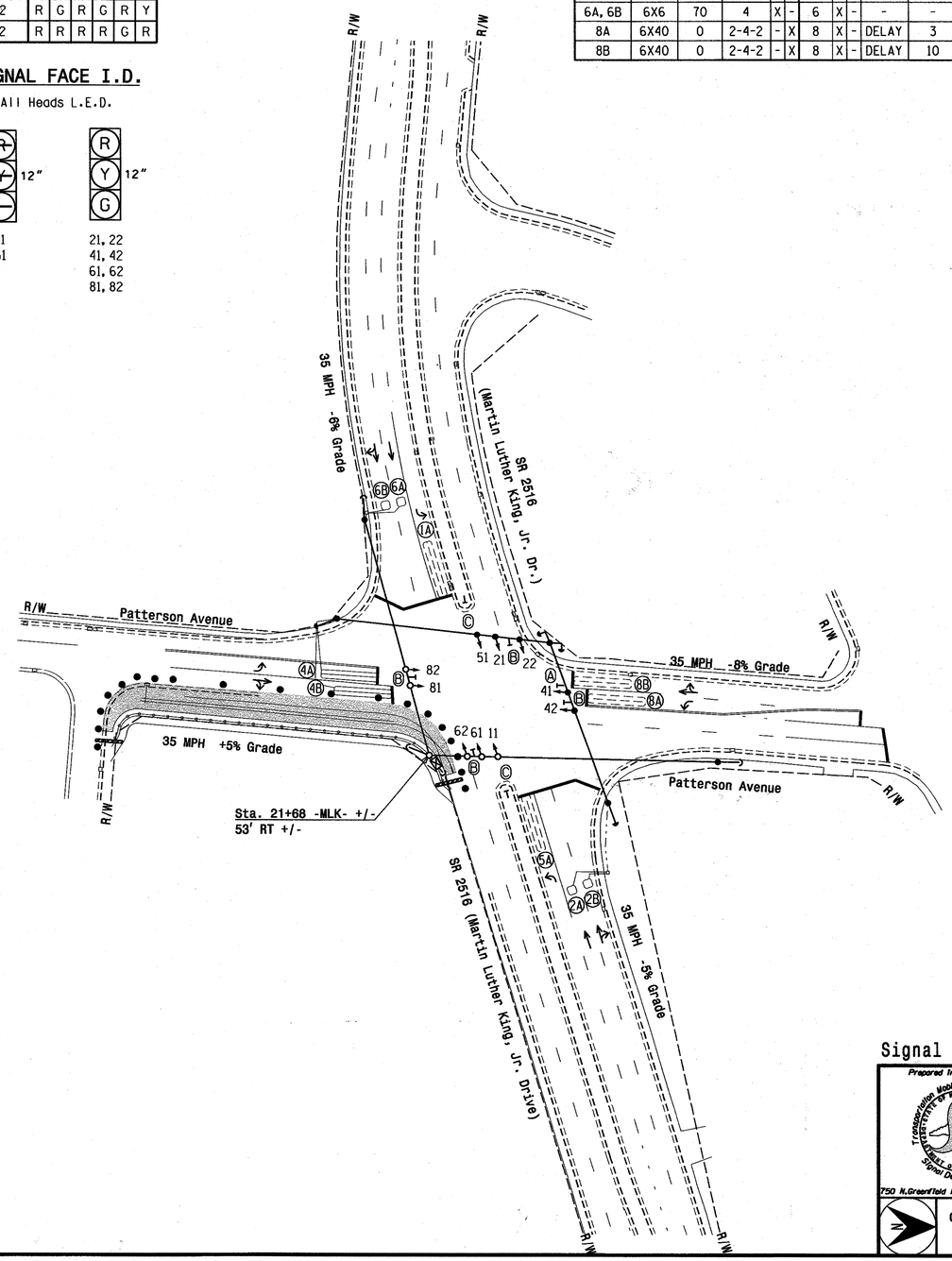
SIGNAL FACE I.D.

All Heads L.E.D.



NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?
1A	6X40	0	2-4-2	-	X	1	X	-	-	-	NO
2A, 2B	6X6	70	4	X	-	2	X	-	-	-	NO
4A	6X40	0	2-4-2	X	-	4	X	-	DELAY	3	YES
4B	6X40	0	2-4-2	X	-	4	X	-	DELAY	10	YES
5A	6X40	0	2-4-2	-	X	5	X	-	-	-	NO
6A, 6B	6X6	70	4	X	-	6	X	-	-	-	NO
8A	6X40	0	2-4-2	-	X	8	X	-	DELAY	3	YES
8B	6X40	0	2-4-2	-	X	8	X	-	DELAY	10	YES



NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Program phase 4 and phase 8 for dual entry.
5. Existing Left Arrow "ONLY" sign (R3-5L) may be removed.
6. Relocate existing street signs from previous span.
7. Set all detector units to presence mode.
8. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
9. Pavement markings are existing.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

5 Phase
Fully Actuated
(Winston-Salem Signal System)

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone Drums	
	Construction Zone	
A	Left Arrow "ONLY" Sign (R3-5L)	A
B	Street Sign	B
C	Keep Right Sign (R4-7)	C

NEMA TIMING CHART

FEATURE	PHASE Ø1	Ø2	Ø4	Ø5	Ø6	Ø8
MINIMUM GREEN *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
PASSAGE/GAP *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.1 SEC.	4.2 SEC.	3.6 SEC.	3.1 SEC.	4.3 SEC.	4.5 SEC.
RED CLEARANCE	3.3 SEC.	1.9 SEC.	2.4 SEC.	3.6 SEC.	1.8 SEC.	2.3 SEC.
MAX. 1 *	15 SEC.	60 SEC.	20 SEC.	15 SEC.	60 SEC.	20 SEC.
RECALL POSITION	NONE	SOFT RECALL	NONE	NONE	SOFT RECALL	NONE
VEHICLE CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	LOCK	NONLOCK
WALK *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

Signal Upgrade - Temporary Design (Construction Phase I)

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SR 2516
(Martin Luther King, Jr. Drive)
at
Patterson Avenue
Division 9 Forsyth County Winston-Salem

PLAN DATE: November 2010 REVIEWED BY:
PREPARED BY: R. Hough REVIEWED BY:

SCALE 0 50 1"=50'

REVISIONS	INIT.	DATE

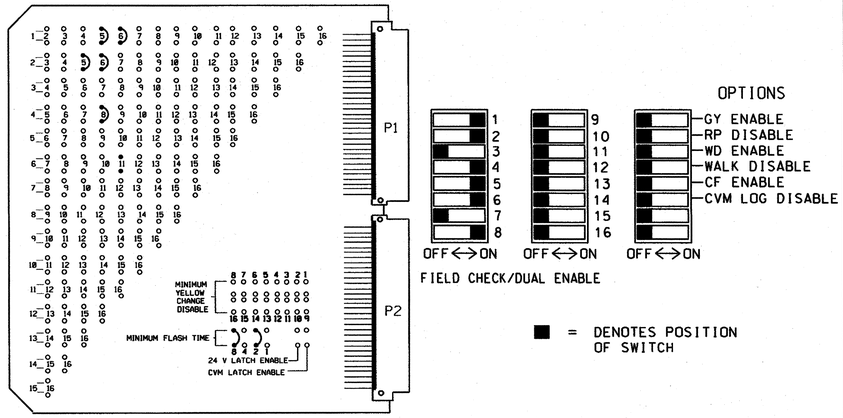
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 12/20/10 DATE
SIG. INVENTORY NO. 09-1312T

10-JAN-2011 17:12
P:\TIPProjects-U\U2826B\Traffic\Signals\Design\Signals\09-1312\09131 2T_sig_dsn_20101220.dgn
rziemba

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 38

EDI MODEL MMU-16E
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 3, 7, 9, 10, 11 & 12 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DUAL ENTRY.
7. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
8. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
9. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	11	21,22	NU	41,42	51	61,62	NU	81,82	NU	NU	NU	NU
RED		2R		4R		6R		8R				
YELLOW		2Y		4Y		6Y		8Y				
GREEN		2G		4G		6G		8G				
RED ARROW	1R				5R							
YELLOW ARROW	1Y				5Y							
GREEN ARROW	1G				5G							
✋												
🚶												

NU = NOT USED

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1 L3 ø4	CH1 L1 ø1	CH1 L7 ø6	CH1 L5 ø5	SLOT EMPTY	CH1 L9 ø8	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 ø4	CH2 L2 ø2	CH2 L8 ø8	CH2 L6 FUTURE USE		CH2 L10 NOT USED					

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
1A	L1A, L1B
2A,2B	L2A, L2B
4A	L3A, L3B
4B	L4A, L4B
5A	L5A, L5B
—	L6A, L6B *
6A,6B	L7A, L7B
8A	L8A, L8B
8B	L9A, L9B
—	L10A, L10B
—	L11A, L11B
—	L12A, L12B
—	L13A, L13B
—	L14A, L14B
—	L15A, L15B
—	L16A, L16B

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø1	—	—
2	ø2	—	—
3	ø4	DELAY	3
4	ø4	DELAY	10
5	ø5	—	—
6 *	—	—	—
7	ø6	—	—
8	ø8	DELAY	3
9	ø8	DELAY	10
10	—	—	—
11	—	—	—
12	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

*FUTURE USE

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED ASC/3
CABINET .....CONTRACTOR SUPPLIED TS2 TYPE 1
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....12
LOAD SWITCHES USED.....1, 2, 4, 5, 6, 8
PHASES USED.....1, 2, 4, 5, 6, 8
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 09-1312T
DESIGNED: NOVEMBER 2010
SEALED: 12/20/10
REVISED: N/A

Temporary Design (Construction Phase I)

NEMA Controller/TS-2 Type 1 Cabinet

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 2516
(Martin Luther King, Jr. Drive)
at
Patterson Avenue

Division 09 Forsyth County Winston-Salem

PLAN DATE: December 2010 REVIEWED BY: JJP

PREPARED BY: F.E. Russ REVIEWED BY:

REVISIONS	INIT.	DATE

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
Signal Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

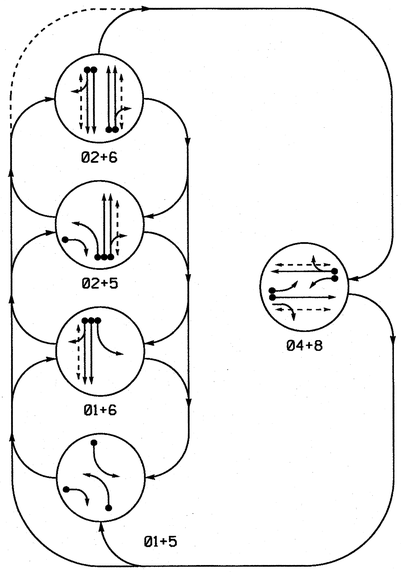
SIGNATURE DATE 1-3-11

SIG. INVENTORY NO. 09-1312T

03-JAN-2011 11:22
S:\Traffic\SSM\TS Signals\Workgroups\Sig MgmtRuss\ts2dwgs\09i312_sm_ele_20101xx.dgn
FERUSS

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 37

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

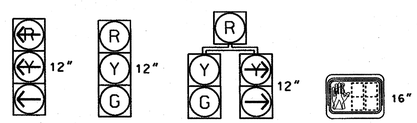
TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	04+8	FLASH
11	←	←	~~R~~	~~R~~	~~R~~	~~R~~
21, 22	R	R	G	G	R	Y
41	R	R	R	R	G	R
42	R/→	R	R/→	R	G	R
51	←	~~R~~	←	~~R~~	~~R~~	~~R~~
61, 62	R	G	R	G	R	Y
81, 82	R	R	R	R	G	R
P21, P22	DW	DW	W	W	DW	DRK
P41, P42	DW	DW	DW	DW	W	DRK
P61, P62	DW	W	DW	W	DW	DRK
P81, P82	DW	DW	DW	DW	W	DRK

W - Walk
DW - Don't Walk
DRK - Dark

SIGNAL FACE I.D.

All Heads L.E.D.



11
51

21, 22
41
61, 62
81, 82

42

P21, P22
P41, P42
P61, P62
P81, P82

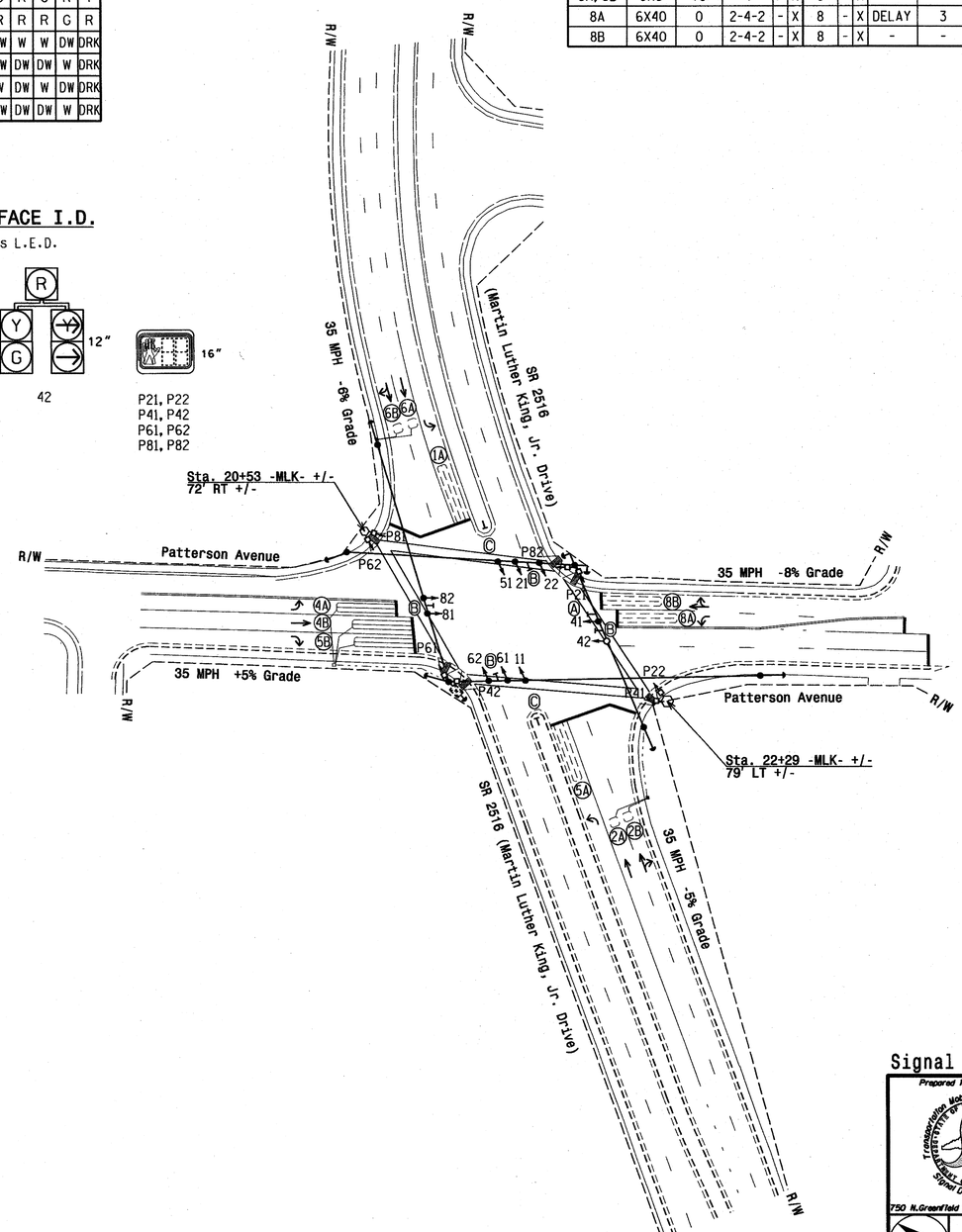
NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?
1A	6X40	0	2-4-2	-	X	1	-	X	-	-	NO
2A, 2B	6X6	70	4	-	X	2	-	X	-	-	NO
4A	6X40	0	2-4-2	X	-	4	-	X	DELAY	3	YES
4B	6X40	0	2-4-2	X	-	4	-	X	DELAY	10	YES
5A	6X40	0	2-4-2	-	X	5	-	X	-	-	NO
5B	6X40	0	2-4-2	X	-	5	X	-	DELAY	15	YES
6A, 6B	6X6	70	4	-	X	6	-	X	-	-	NO
8A	6X40	0	2-4-2	-	X	8	-	X	DELAY	3	YES
8B	6X40	0	2-4-2	-	X	8	-	X	-	-	NO

5 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Program phase 4 and phase 8 for dual entry.
5. Reposition existing signal head number 41.
6. Existing Left Arrow "ONLY" sign (R3-5L) may be removed.
7. Set all detector units to presence mode.
8. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
9. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Signal Pedestal	
Ⓐ	Left Arrow "ONLY" Sign (R3-5L)	Ⓐ
Ⓑ	Street Sign	Ⓑ
Ⓒ	Keep Right Sign (R4-7)	Ⓒ

NEMA TIMING CHART

FEATURE	PHASE 01	02	04	05	06	08
MINIMUM GREEN *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
PASSAGE/GAP *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.1 SEC.	4.2 SEC.	3.6 SEC.	3.1 SEC.	4.3 SEC.	4.5 SEC.
RED CLEARANCE	3.6 SEC.	2.1 SEC.	2.6 SEC.	3.7 SEC.	2.2 SEC.	2.6 SEC.
MAX. 1 *	15 SEC.	60 SEC.	20 SEC.	15 SEC.	60 SEC.	20 SEC.
RECALL POSITION	NONE	SOFT RECALL	NONE	NONE	SOFT RECALL	NONE
VEHICLE CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	LOCK	NONLOCK
WALK *	– SEC.	4 SEC.	4 SEC.	– SEC.	4 SEC.	4 SEC.
FLASHING DON'T WALK	– SEC.	22 SEC.	31 SEC.	– SEC.	23 SEC.	29 SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

Signal Upgrade - Final Design

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

SR 2516
(Martin Luther King, Jr. Drive)
at
Patterson Avenue

Division 9 Forsyth County Winston-Salem

PLAN DATE: July 2010 REVIEWED BY:
PREPARED BY: TS Thigpen REVIEWED BY:

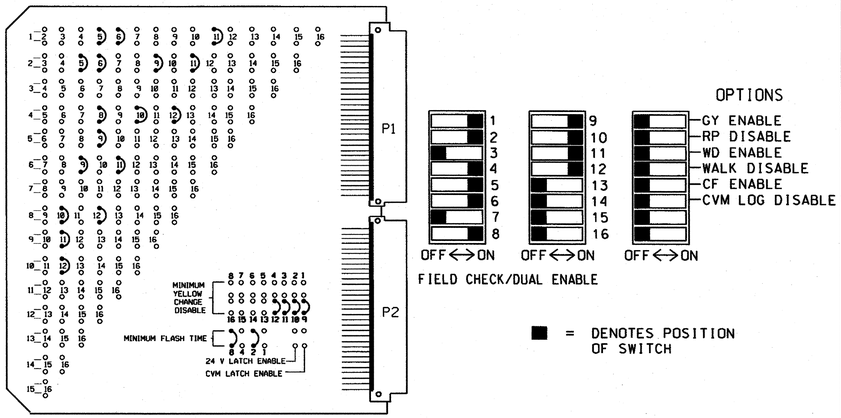
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 12/20/10 DATE
SIG. INVENTORY NO. 09-1312

03-JAN-2011 15:19
R:\Traffic\Projects\09-1312\Signals\09-1312W091312_sig_dgn_20101220.dgn
Pzieman

EDI MODEL MMU-16E MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 3 AND 7 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 WALK.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DUAL ENTRY.
7. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
8. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
9. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5		6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	11	21,22	NU	41,42	42	51	61,62	NU	81,82	P21, P22	P41, P42	P61, P62	P81, P82
RED		2R		4R			6R		8R				
YELLOW		2Y		4Y			6Y		8Y				
GREEN		2G		4G			6G		8G				
RED ARROW	1R					5R							
YELLOW ARROW	1Y				5Y	5Y							
GREEN ARROW	1G				5G	5G							
✋										9R	10R	11R	12R
🚶										9G	10G	11G	12G
										*	*	*	*

NU = NOT USED

*SEE COUNTDOWN NOTE ON 'PEDESTRIAN PUSH-BUTTON WIRING DETAIL' THIS SHEET.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1 L3 ø4	CH1 L1 ø1	CH1 L7 ø6	CH1 L5 ø5	SLOT EMPTY	CH1 L9 ø8	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 ø4	CH2 L2 ø2	CH2 L8 ø8	CH2 L6 ø5		CH2 L10 NOT USED					

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
1A	L1A, L1B
2A,2B	L2A, L2B
4A	L3A, L3B
4B	L4A, L4B
5A	L5A, L5B
5B	L6A, L6B
6A,6B	L7A, L7B
8A	L8A, L8B
8B	L9A, L9B
—	L10A, L10B
—	L11A, L11B
—	L12A, L12B
—	L13A, L13B
—	L14A, L14B
—	L15A, L15B
—	L16A, L16B

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø1	—	—
2	ø2	—	—
3	ø4	DELAY	3
4	ø4	DELAY	10
5	ø5	—	—
6	ø5	DELAY	15
7	ø6	—	—
8	ø8	DELAY	3
9	ø8	—	—
10	—	—	—
11	—	—	—
12	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

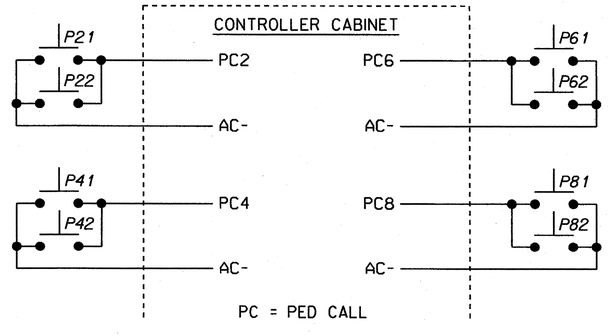
EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED ASC/3*
CABINET .....CONTRACTOR SUPPLIED TS2 TYPE 1*
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....12
LOAD SWITCHES USED.....1, 2, 4, 5, 6, 8, 9, 10, 11, 12
PHASES USED.....1, 2, 4, 5, 6, 8, 2PED, 4PED, 6PED, 8PED
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

*EXISTING INSTALLED UNDER TEMPORAY DESIGN

PEDESTRIAN PUSH-BUTTON WIRING DETAIL

(wire push-buttons as shown below)



NOTE: COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-1312
DESIGNED: JULY 2010
SEALED: 12/20/10
REVISED: N/A

Final Design

NEMA Controller/TS-2 Type 1 Cabinet

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 2516
(Martin Luther King, Jr. Drive)
at
Patterson Avenue

Division 09 Forsyth County Winston-Salem

PLAN DATE: December 2010 REVIEWED BY:
PREPARED BY: F.E. Russ REVIEWED BY:

REVISIONS	INIT.	DATE

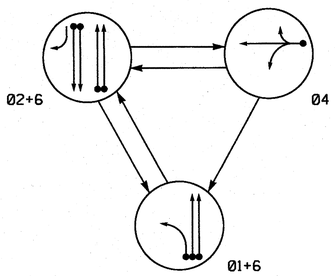
Prepared in the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE DATE 1-4-11
SIG. INVENTORY NO. 09-1312

04-JAN-2011 09:28
S:\TSSCOM\TS Signals\Workgroups\Sig Mon\fuss\s2dwgs\091312.sm_ele.201101xx.dgn
fenuss

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 41

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

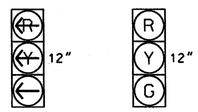
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 01+6	PHASE 02+6	PHASE 04	FLASH
11	~~G~~	~~R~~	~~R~~	~~R~~
21, 22	R	G	R	Y
41, 42	R	R	G	R
61, 62	G	G	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.



11 — 21, 22, 41, 42, 61, 62

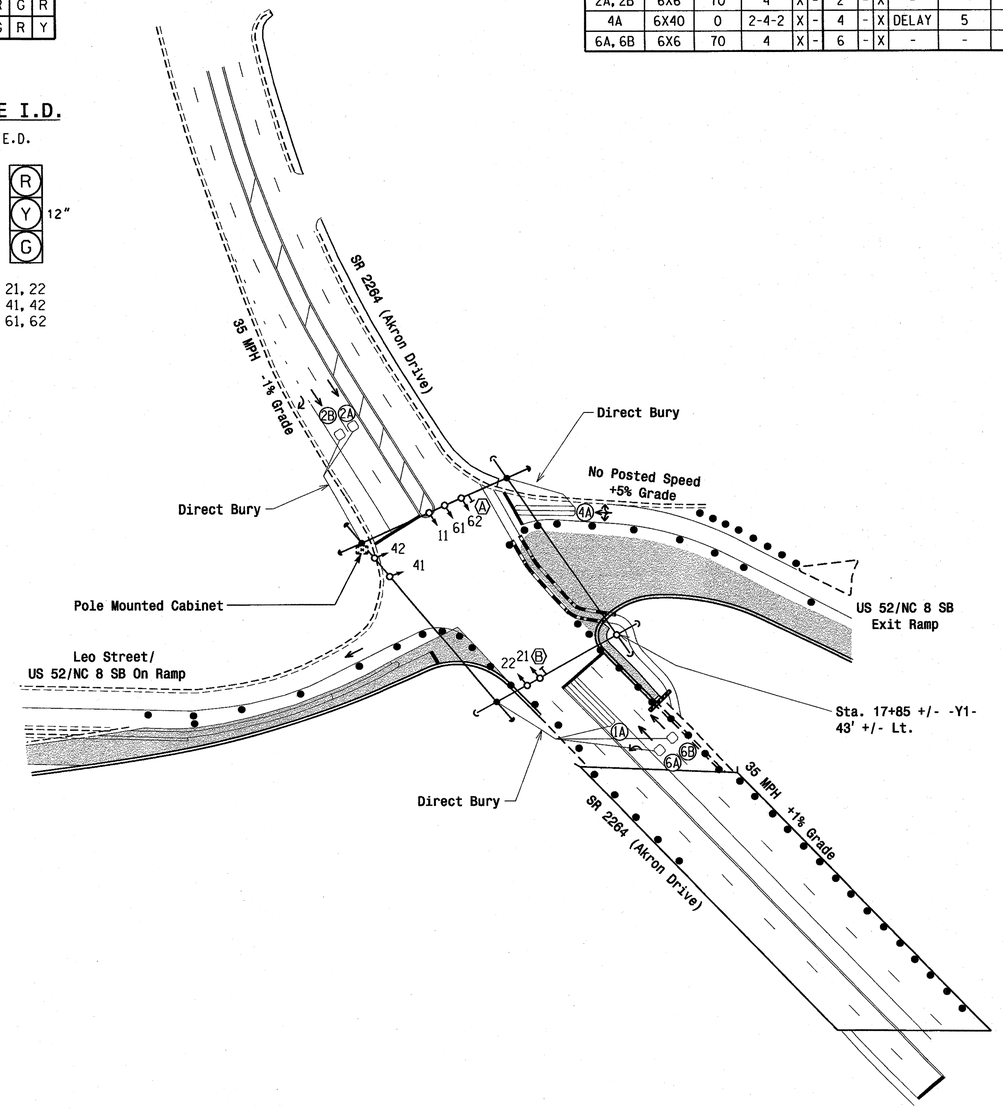
NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS				
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?
1A	6X40	0	2-4-2	X	-	1	-	X	DELAY	3	YES
2A, 2B	6X6	70	4	X	-	2	-	X	-	-	NO
4A	6X40	0	2-4-2	X	-	4	-	X	DELAY	5	YES
6A, 6B	6X6	70	4	X	-	6	-	X	-	-	NO

3 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 may be lagged.
4. Set all detector units to presence mode.
5. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

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

NEMA TIMING CHART

FEATURE	PHASE 01	PHASE 02	PHASE 04	PHASE 06
MINIMUM GREEN *	7 SEC.	10 SEC.	7 SEC.	10 SEC.
PASSAGE/GAP *	2.0 SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	3.9 SEC.	3.6 SEC.	3.8 SEC.
RED CLEARANCE	3.4 SEC.	1.4 SEC.	2.0 SEC.	2.6 SEC.
MAX. 1 *	20 SEC.	45 SEC.	20 SEC.	45 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	MIN. RECALL
VEHICLE CALL MEMORY	NONLOCK	LOCK	NONLOCK	LOCK
WALK *	– SEC.	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

Signal Upgrade - Temporary Design 1 (Construction Phase I)

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

SR 2264 (Akron Drive) at Leo St./US 52-NC 8 SB Ramp

Division 9 Forsyth County Winston-Salem

PLAN DATE:	June 2010	REVIEWED BY:	
PREPARED BY:	TS Thippen	REVIEWED BY:	

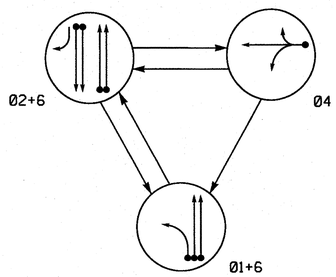
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE DATE 12/20/10
SIG. INVENTORY NO. 09-0176T1

10-JAN-2011 16:37
P:\TIPProjects\U2826B\Traffic\Signals\Design\Signals\09-0176\09017ET1_sig.dgn_20101220.cgn
rziemba

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 42

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

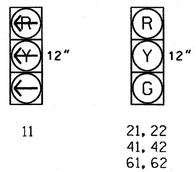
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 01+6	PHASE 02+6	PHASE 04	FLASH
11	←	~~R~~	~~R~~	~~R~~
21, 22	R	G	R	Y
41, 42	R	R	G	R
61, 62	G	G	R	Y

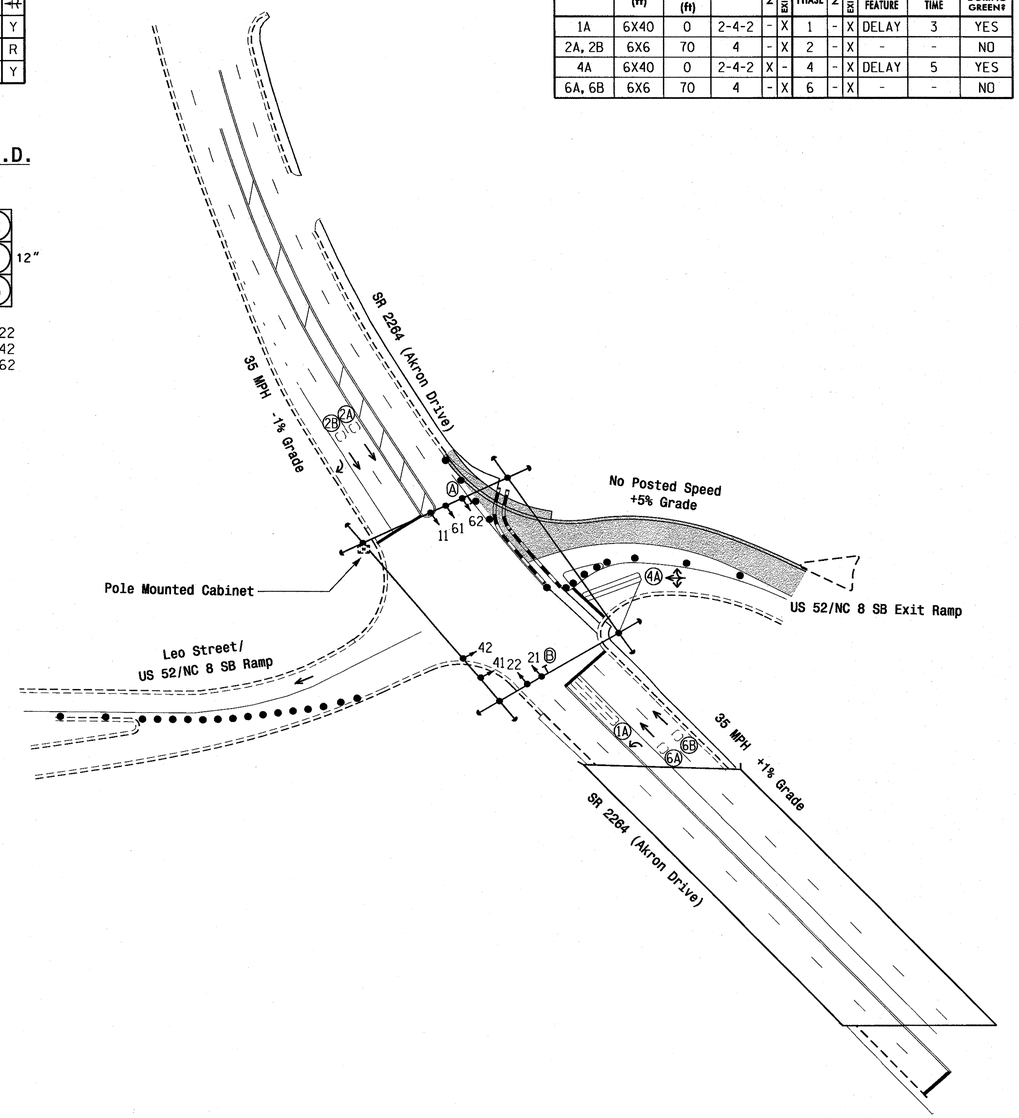
SIGNAL FACE I.D.

All Heads L.E.D.



NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?
1A	6X40	0	2-4-2	-	X	1	-	X	DELAY	3	YES
2A, 2B	6X6	70	4	-	X	2	-	X	-	-	NO
4A	6X40	0	2-4-2	X	-	4	-	X	DELAY	5	YES
6A, 6B	6X6	70	4	-	X	6	-	X	-	-	NO



3 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 may be lagged.
4. Repostion existing signal heads numbered 41 and 42.
5. Set all detector units to presence mode.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone Drums	
	Construction Zone	
	No Right Turn Sign (R3-1)	
	No Left Turn Sign (R3-2)	

NEMA TIMING CHART

FEATURE	PHASE 01	PHASE 02	PHASE 04	PHASE 06
MINIMUM GREEN *	7 SEC.	10 SEC.	7 SEC.	10 SEC.
PASSAGE/GAP *	2.0 SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	3.9 SEC.	3.6 SEC.	3.8 SEC.
RED CLEARANCE	3.2 SEC.	2.7 SEC.	2.0 SEC.	2.1 SEC.
MAX. 1 *	20 SEC.	45 SEC.	20 SEC.	45 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	MIN. RECALL
VEHICLE CALL MEMORY	NONLOCK	LOCK	NONLOCK	LOCK
WALK *	– SEC.	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.

* 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 not1 be lower than 4 seconds.

Signal Upgrade - Temporary Design 2 (Construction Phase II)

Prepared in the Offices of:
Transportation Mobility and Safety Division
Intelligent Transportation Systems
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SR 2264 (Akron Drive) at Leo St./US 52-NC 8 SB Ramp

Division 9 Forsyth County Winston-Salem

PLAN DATE: August 2010 REVIEWED BY:
PREPARED BY: TS Thigpen REVIEWED BY:

SCALE 0 50 1"=50'

REVISIONS	INIT.	DATE

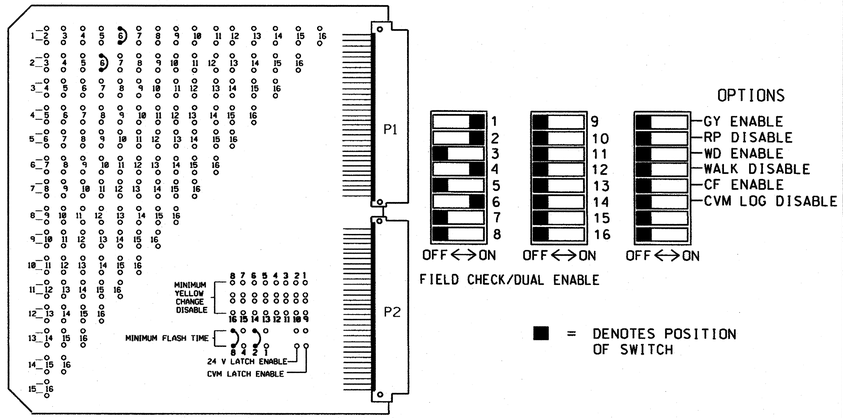
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE DATE 12/20/10
SIG. INVENTORY NO. 09-017612

21-DEC-2010 16:20
P:\TPROJECTS\UMU2826B\TrafficSignals\Design\09-017612_sig_dsn_20101220.dgn
Fletcher

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 43

EDI MODEL MMU-16E
MALFUCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 3, 5, 7 AND 8 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. SET ALL DETECTOR CARD UNITS TO 'PRESENCE' MODE.
7. ! ---> RE-WIRE LOAD SWITCH 6 TO FLASH YELLOW IN CONTROLLER FLASH.
8. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
9. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

CHANNEL	1	2	3	4	5	6	7	8
PHASE	1	2	3	4	5	6	4 PED	6 PED
SIGNAL HEAD NO.	11	21,22	NU	41,42	NU	61,62	NU	NU
RED		2R		4R		6R		
YELLOW		2Y		4Y		6Y		
GREEN		2G		4G		6G		
RED ARROW	1R							
YELLOW ARROW	1Y							
GREEN ARROW	1G							
✋								
🚶								

NU = NOT USED

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1 L3 ø4	CH1 L1 ø1	SLOT EMPTY	CH1 L5 FUTURE USE	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 FUTURE USE	CH2 L2 ø2		CH2 L6 ø6							

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS	
1A	L1A, L1B	
2A,2B	L2A, L2B	
4A	L3A, L3B	
—	L4A, L4B	*
—	L5A, L5B	*
6A,6B	L6A, L6B	
—	L7A, L7B	
—	L8A, L8B	
—	L9A, L9B	
—	L10A, L10B	
—	L11A, L11B	
—	L12A, L12B	
—	L13A, L13B	
—	L14A, L14B	
—	L15A, L15B	
—	L16A, L16B	

*FUTURE USE

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø1	DELAY	3
2	ø2	—	—
3	ø4	DELAY	5
4*	—	—	—
5*	—	—	—
6	ø6	—	—
7	—	—	—
8	—	—	—
9	—	—	—
10	—	—	—
11	—	—	—
12	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

EQUIPMENT INFORMATION

CONTROLLER.....ECONOLITE ASC/3*
CABINET .....ECONOLITE TS2 TYPE 1*
CABINET MOUNT.....POLE
LOADBAY POSITIONS.....8
LOAD SWITCHES USED.....1, 2, 4, 6
PHASES USED.....1, 2, 4, 6
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

*EXISTING TO REMAIN IN USE

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø4 PED
8	ø6 PED

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGNS: 09-0176T1, 09-0176T2
DESIGNED: T1 - JUNE 2010, T2 - AUGUST 2010
SEALED: 12/20/10
REVISED: N/A

Temporary Design 1 (Construction Phase I)
Temporary Design 2 (Construction Phase II)

NEMA Controller/TS-2 Cabinet

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 2264 (Akron Drive)
at
Leo St./US 52-NC 8 SB Ramp

Division 09 | Forsyth County | Winston-Salem
PLAN DATE: December 2010 | REVIEWED BY: JJP
PREPARED BY: F.E. Russ | REVIEWED BY:

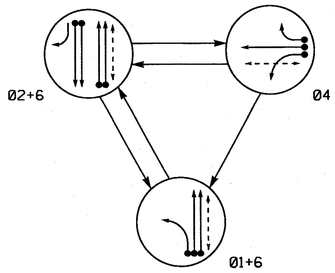
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE John T. Rowe Jr. DATE 1-4-11
SIG. INV. NO. 09-0176T1,T2

03-JAN-2011 14:50
S:*TSS$WITS Signals*Workgroups*Sig Mon*Russ*ts2dwgs*090176_smule.201101xx.dgn
Feruss

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 44

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

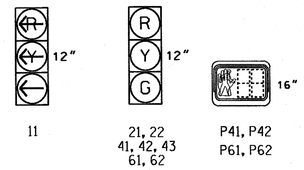
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+6	PHASE Ø2+6	PHASE Ø4	FLASH
11	←	~~R~~	~~R~~	~~R~~
21, 22	R	G	R	Y
41, 42, 43	R	R	G	R
61, 62	G	G	R	Y
P41, P42	DW	DW	W	DRK
P61, P62	W	W	DW	DRK

W - Walk
DW - Don't Walk
DRK - Dark

SIGNAL FACE I.D.

All Heads L.E.D.



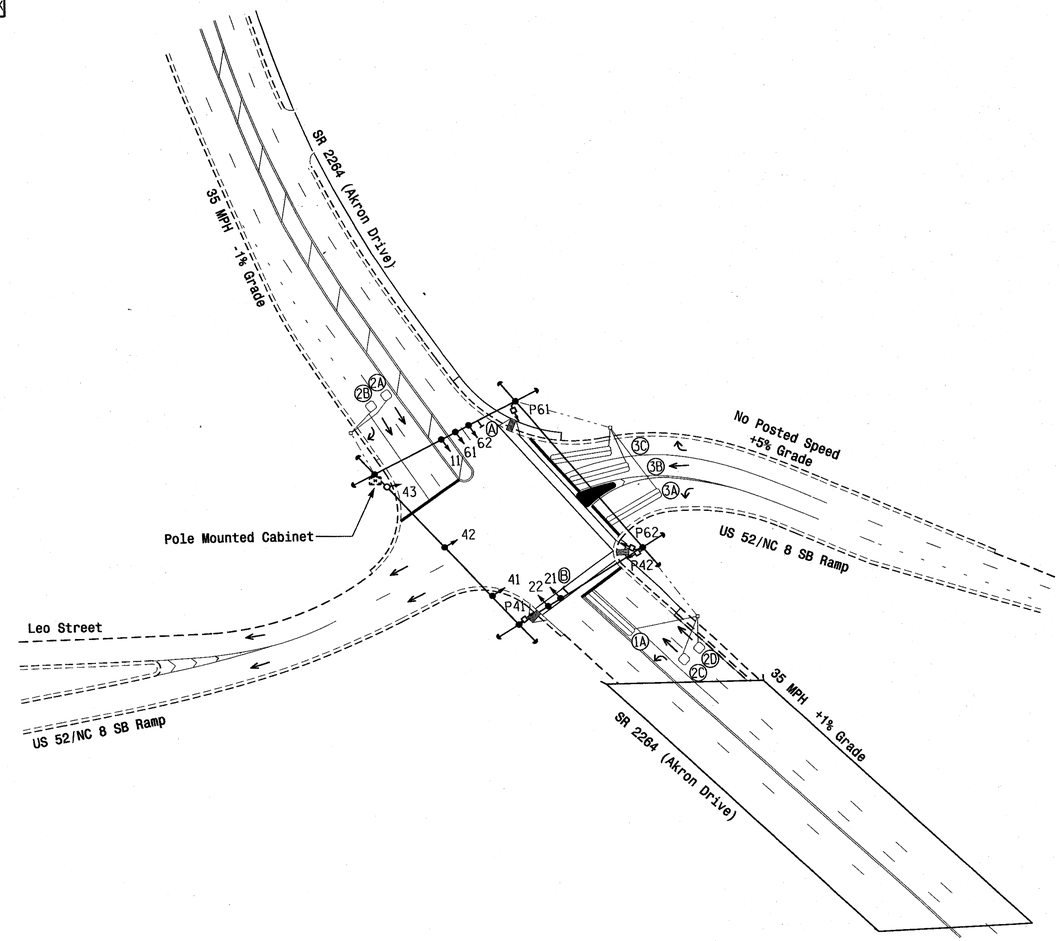
NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN#
1A	6X40	0	2-4-2	X	-	1	-	X	DELAY	3	YES
2A, 2B	6X6	70	4	X	-	2	-	X	-	-	NO
4A	6X40	0	2-4-2	X	-	4	-	X	-	-	NO
4B	6X40	0	2-4-2	X	-	4	X	-	-	-	NO
4C	6X40	0	2-4-2	X	-	4	X	-	DELAY	15	YES
6A, 6B	6X6	70	4	X	-	6	-	X	-	-	NO

3 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 may be lagged.
4. Reposition existing signal heads numbered 41 and 42.
5. Set all detector units to presence mode.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



NEMA TIMING CHART

FEATURE	PHASE 01	PHASE 02	PHASE 04	PHASE 06
MINIMUM GREEN *	7 SEC.	10 SEC.	7 SEC.	10 SEC.
PASSAGE/GAP *	2.0 SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	3.9 SEC.	3.6 SEC.	3.8 SEC.
RED CLEARANCE	3.2 SEC.	2.0 SEC.	1.9 SEC.	1.9 SEC.
MAX. 1 *	20 SEC.	45 SEC.	20 SEC.	45 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	MIN. RECALL
VEHICLE CALL MEMORY	NONLOCK	LOCK	NONLOCK	LOCK
WALK *	– SEC.	– SEC.	4 SEC.	4 SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	15 SEC.	26 SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION *	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION *	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE *	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.

* 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 not1 be lower than 4 seconds.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
A	No Right Turn Sign (R3-1)	A
B	No Left Turn Sign (R3-2)	B

Signal Upgrade - Final Design

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

SR 2264 (Akron Drive) at Leo St./US 52-NC 8 SB Ramp

Division 9 Forsyth County Winston-Salem

PLAN DATE:	June 2010	REVIEWED BY:	
PREPARED BY:	TS Thigpen	REVIEWED BY:	

REVISIONS	INIT.	DATE

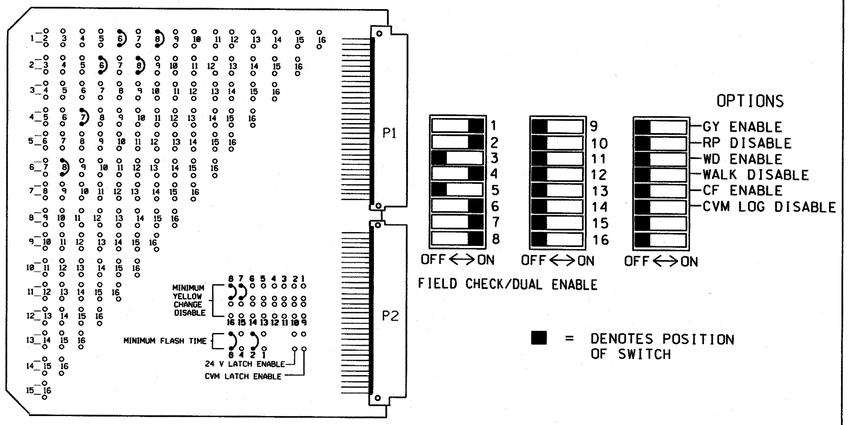
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 12/20/10 DATE
SIG. INVENTORY NO. 09-0176

21-DEC-2010 16:19
P:\TIPProjects-UMI2826B\Traffic\Signals\Design\Signals\09-0176\09-0176_sig_dsn_20101220.dgn
rziemba

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 45

EDI MODEL MMU-16E
MALFUCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 3 AND 5 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASE 2 GREEN AND IN PHASE 6 WALK.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. SET ALL DETECTOR CARD UNITS TO 'PRESENCE' MODE.
7. ! ---> RE-WIRE LOAD SWITCH 6 TO FLASH YELLOW IN CONTROLLER FLASH.
8. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
9. THIS CONTROLLER AND CABINET ARE PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

CHANNEL	1	2	3	4	5	6	7	8
PHASE	1	2	3	4	5	6	4 PED	6 PED
SIGNAL HEAD NO.	11	21,22	NU	41,42, 43	NU	61,62	P41, P42	P61, P62
RED		2R		4R		6R		
YELLOW		2Y		4Y		6Y		
GREEN		2G		4G		6G		
RED ARROW	1R							
YELLOW ARROW	1Y							
GREEN ARROW	1G							
✋							7R	8R
🚶							7G	8G
NU = NOT USED							*	*

*SEE COUNTDOWN NOTE ON 'PEDESTRIAN PUSH-BUTTON WIRING DETAIL' THIS SHEET.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1 L3 ø4	CH1 L1 ø1	SLOT EMPTY	CH1 L5 ø4	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 ø4	CH2 L2 ø2		CH2 L6 ø6							

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
1A	L1A, L1B
2A,2B	L2A, L2B
4A	L3A, L3B
4B	L4A, L4B
4C	L5A, L5B
6A,6B	L6A, L6B
—	L7A, L7B
—	L8A, L8B
—	L9A, L9B
—	L10A, L10B
—	L11A, L11B
—	L12A, L12B
—	L13A, L13B
—	L14A, L14B
—	L15A, L15B
—	L16A, L16B

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø1	DELAY	3
2	ø2	—	—
3	ø4	—	—
4	ø4	—	—
5	ø4	DELAY	15
6	ø6	—	—
7	—	—	—
8	—	—	—
9	—	—	—
10	—	—	—
11	—	—	—
12	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

EQUIPMENT INFORMATION

CONTROLLER.....ECONOLITE ASC/3*
CABINET .....ECONOLITE MODEL TS2-1*
CABINET MOUNT.....POLE
LOADBAY POSITIONS.....8
LOAD SWITCHES USED.....1, 2, 4, 6, 7, 8
PHASES USED.....1, 2, 4, 6, 4PED, 6PED
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

*EXISTING TO REMAIN IN USE

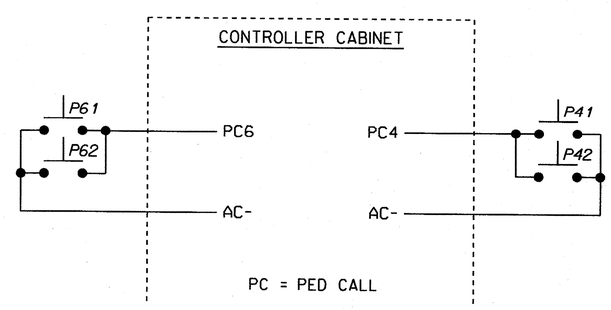
LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø4 PED
8	ø6 PED

PEDESTRIAN PUSH-BUTTON WIRING DETAIL

(wire push-buttons as shown below)



NOTE: COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 09-0176
DESIGNED: JUNE 2010
SEALED: 12/20/10
REVISED: N/A

Final Design

NEMA Controller/TS-2 Cabinet

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 2264 (Akron Drive)
at
Leo St./US 52-NC 8 SB Ramp

Division 09 | Forsyth County | Winston-Salem

PLAN DATE: December 2010 | REVIEWED BY: JTP
PREPARED BY: F.E. Russ | REVIEWED BY:

REVISIONS	INIT.	DATE

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE | DATE 1-4-11
SIG. INVENTORY NO. 09-0176

03-JAN-2011 14:50
S:\#TSASGU\ITS Signals\Workgroups\Sig Mon\Russ\1520wgs\W090176_sm_ele_201101xx.dgn
Russ

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 46

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

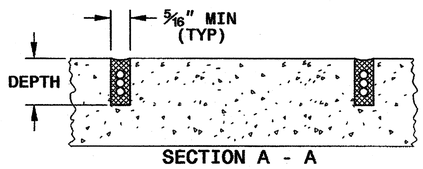
11-08

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS

CONVENTIONAL 4-SIDED LOOP

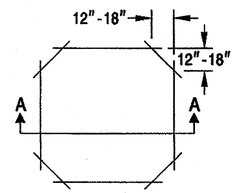
SAW SLOT DEPTH CHART

DEPTH (IN)	NO. OF WIRE TURNS				
	2	3	4	5	6
CONCRETE	2.0	2.0	2.5	2.5	3.0
ASPHALT	2.0	2.5	3.0	3.0	3.0

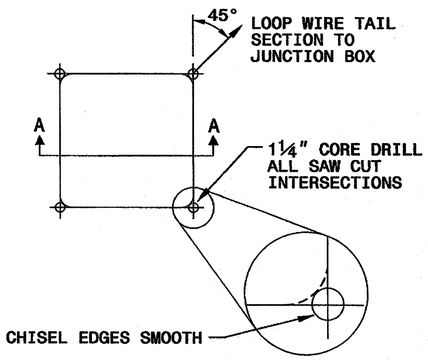


SAW CUT OPTIONS

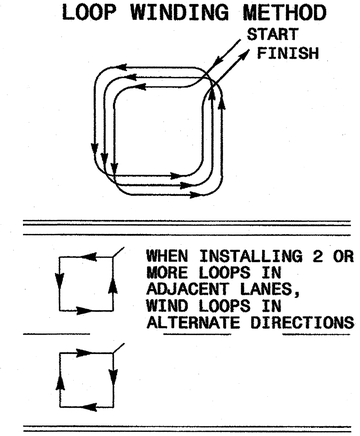
OPTION 1



OPTION 2
(POOR PAVEMENT)

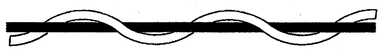


LOOP WINDING METHOD



LOOP WIRE TWISTING METHOD

INCORRECT WAY TO TWIST WIRE



CORRECT WAY TO TWIST WIRE

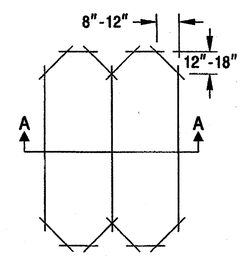
NOTES

1. OVERLAP SAW CUTS AT CORNERS AND INTERSECTION POINTS TO ENSURE UNIFORM SAW SLOT DEPTH.
2. MAINTAIN 12" SPACING BETWEEN LOOP WIRE TAIL SECTIONS.
3. WIRE LOOPS CONNECTED TO THE SAME DETECTOR CHANNEL IN SERIES.
4. LOCATE LOOPS IN CENTER OF LANES UNLESS OTHERWISE SHOWN ON PLANS OR APPROVED BY ENGINEER.

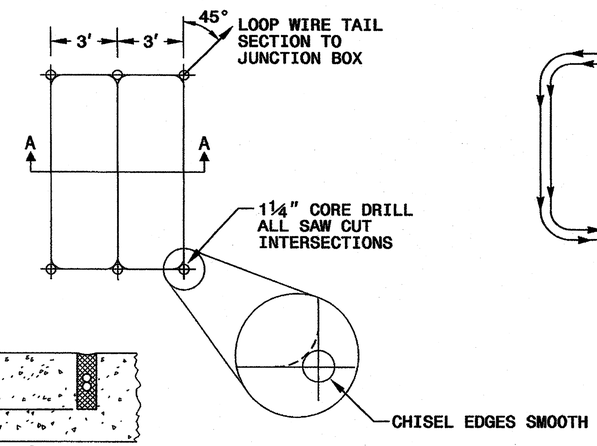
QUADRUPOLE LOOP

SAW CUT OPTIONS

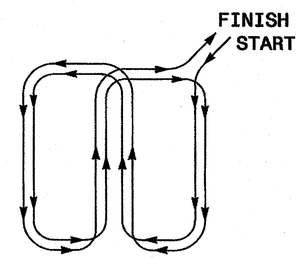
OPTION 1

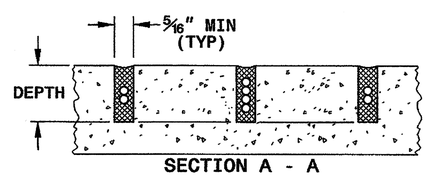


OPTION 2
(POOR PAVEMENT)



LOOP WINDING METHOD





DEPTH IS 2.5" FOR CONCRETE AND 3.0" FOR ASPHALT

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

11-08

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS

SHEET 1 OF 3
1725D01

SHEET 1 OF 3
1725D01

See Plate for Title

Prepared in the Offices of:
Intelligent Transportation Systems & Signals Unit
750 N. Greenfield Parkway
Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 16286 ENGINEER MILTON I. DEAN

SIGNATURE — DATE 11/24/08

24-NOV-2008 09:28
d:\work files\sso-standard plate sheets\1725101_mo\2307.dgn
zmittle

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	Sig. 47

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

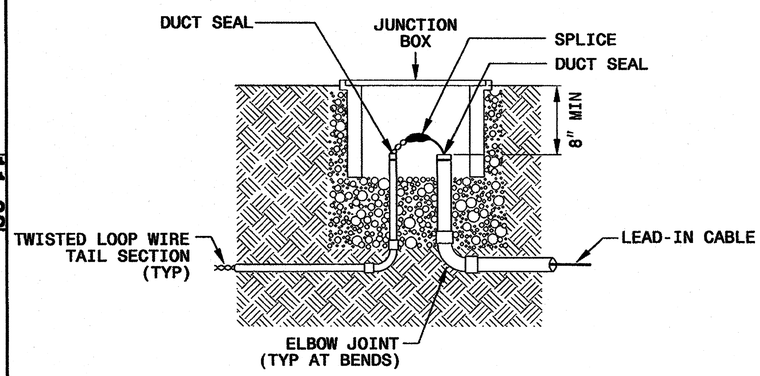
11-08

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
LOOP WIRE DETAILS

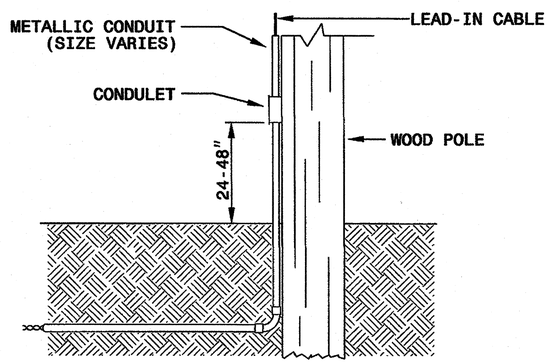
SHEET 2 OF 3
1725D01

LOOP WIRE SPLICE POINT DETAILS

LOOP WIRE AT JUNCTION BOX



LOOP WIRE AT POLE

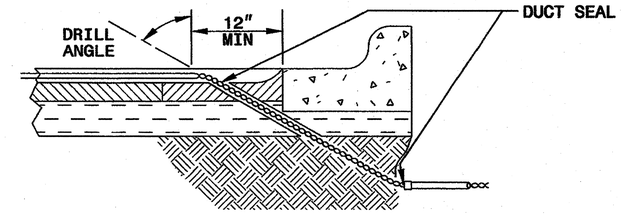


NOTE

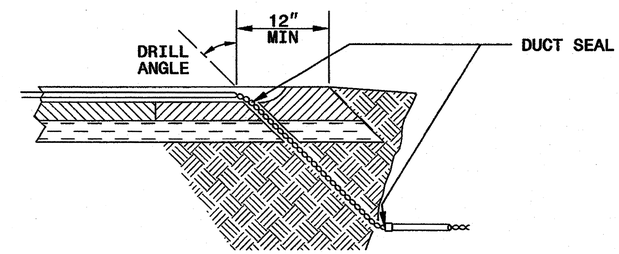
SPLICE ALL LOOP WIRE TAIL SECTIONS/LEAD-IN CABLE IN JUNCTION BOXES OR APPROVED CONDULETS.

LOOP WIRE PAVEMENT EDGE DETAILS

LOOP WIRE AT CURB & GUTTER SECTION



LOOP WIRE AT PAVEMENT SECTION



NOTES

1. DO NOT EXCAVATE UNDER CURB AND GUTTER SECTIONS FOR CONDUIT INSTALLATION.
2. TWIST LOOP WIRE TAIL SECTIONS FROM WHERE LOOP WIRE TAIL LEAVES SAW CUT TO JUNCTION BOX, INCLUDING THROUGH CONDUIT.
3. BEFORE SEALING LOOPS, INSTALL DUCT SEAL WHERE LOOP WIRE TAIL SECTION LEAVES SAW CUT IN PAVEMENT AND AT ENTRANCE OF CONDUIT TO JUNCTION BOX.

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

11-08

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
LOOP WIRE DETAILS

SHEET 2 OF 3
1725D01

See Plate for Title

Prepared in the Offices of:
Intelligent Transportation Systems & Signals Unit
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
750 N. Greenfield Parkway
Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 16286 ENGINEER MILTON I. DEAN

Milton I. Dean 11/24/08
SIGNATURE DATE

24-NOV-2008 09:23
c:\pwworkfiles\0-standard plate sheets\1725d102_mdy2301.dgn
mlittle

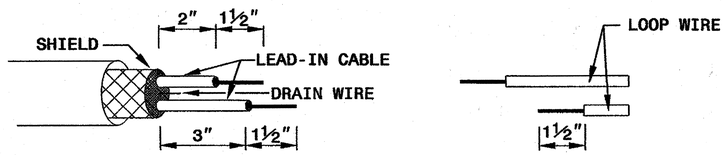
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

11-08

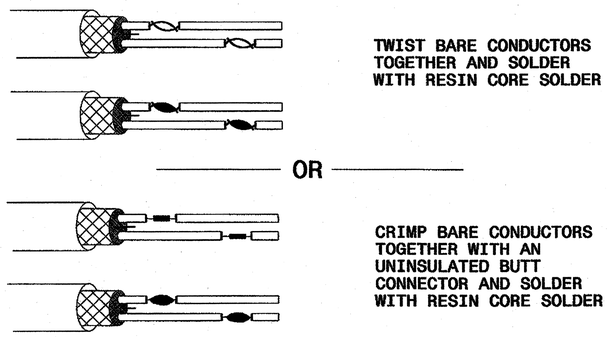
ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
SPLICING FOR LEAD-IN CABLE AND LOOP WIRE

SHEET 3 OF 3
1725D01

STEP 1. STRIP LOOP WIRE AND LEAD-IN CABLE



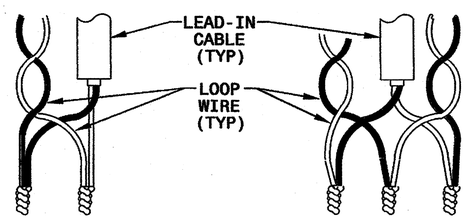
STEP 2. CONNECT AND SOLDER



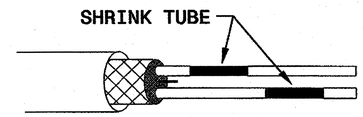
BOND SHIELD DRAIN WIRE AT SPLICE SECTIONS (DO NOT GROUND)

LOOP WIRE AND LEAD-IN CABLE CONNECTION DETAILS

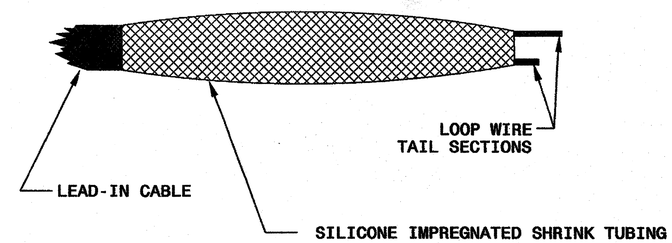
SINGLE CONNECTION SERIES CONNECTION



STEP 3. INSULATE EACH SOLDER JOINT SEPARATELY



STEP 4. ENVIRONMENTALLY PROTECT SPLICE



STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

11-08

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
SPLICING FOR LEAD-IN CABLE AND LOOP WIRE

SHEET 3 OF 3
1725D01

See Plate for Title

Prepared in the Offices of:
Intelligent Transportation Systems & Signals Unit
750 N. Greenfield Parkway
Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 16286 ENGINEER WILTON DEAN

Wilton J. Dean 11/24/08
SIGNATURE DATE

24-NOV-2008 09:36
d:\temp files\0-standard plate sheets\1725d103_nov2307.dgn
dwilkie

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	SIG. 49

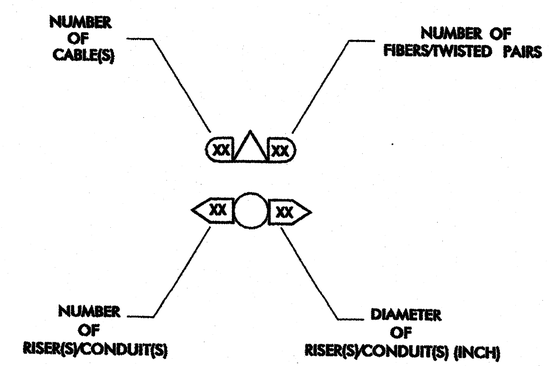
1. INSTALL REA, PE – 22, SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
2. INSTALL REA, PE – 38, (FIGURE 8) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
3. INSTALL REA, PE – 39, (UNDERGROUND) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
4. INSTALL SMFO CABLE
5. INSTALL MMFO CABLE
6. INSTALL FIBER OPTIC DROP CABLE
7. INSTALL TRACER WIRE
8. TRENCH
9. INSTALL PVC CONDUIT
10. INSTALL RIGID, GALVANIZED STEEL CONDUIT
11. INSTALL RIGID, GALVANIZED STEEL RISER WITH WEATHERHEAD
12. INSTALL RIGID, GALVANIZED STEEL RISER WITH FIBER OPTIC CABLE SEAL
13. INSTALL OUTER-DUCT POLYETHYLENE CONDUIT
14. INSTALL POLYETHYLENE CONDUIT
15. DIRECTIONAL DRILL CONDUIT
16. BORE AND JACK CONDUIT
17. INSTALL CABLE(S) IN EXISTING CONDUIT
18. INSTALL CABLE(S) IN NEW CONDUIT
19. INSTALL CABLE(S) IN EXISTING RISER
20. INSTALL CABLE(S) IN NEW RISER
21. INSTALL CABLE(S) IN EXISTING CONDUIT STUB-OUTS
22. INSTALL NEW CONDUIT INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB-OUTS WHEN AVAILABLE)
23. INSTALL NEW RISER INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB-OUTS WHEN AVAILABLE)
24. INSTALL NEW CONDUIT INTO EXISTING POLE MOUNTED CABINET
25. INSTALL NEW RISER INTO EXISTING POLE MOUNTED CABINET
26. TERMINATE COMMUNICATIONS CABLE ON EXISTING TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
27. INSTALL NEW TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
28. INSTALL INTERCONNECT CENTER, PATCH PANEL, JUMPERS AND FUSION SPLICE CABLE IN CABINET
29. INSTALL UNDERGROUND SPLICE ENCLOSURE
30. INSTALL AERIAL SPLICE ENCLOSURE
31. INSTALL POLE MOUNTED SPLICE CABINET
32. INSTALL BASE MOUNTED SPLICE CABINET
33. REMOVE EXISTING SPLICE CABINET
34. INSTALL CABINET FOUNDATION
35. REMOVE EXISTING CABINET FOUNDATION
36. INSTALL CCTV CAMERA ASSEMBLY
37. INSTALL CCTV CAMERA WOOD POLE
38. INSTALL CCTV CAMERA METAL POLE AND FOUNDATION
39. INSTALL JUNCTION BOX
40. INSTALL OVERSIZED JUNCTION BOX
41. REMOVE EXISTING JUNCTION BOX
42. INSTALL WOOD POLE
43. REMOVE EXISTING WOOD POLE
44. INSTALL AERIAL GUY ASSEMBLY
45. INSTALL STANDARD GUY ASSEMBLY
46. INSTALL SIDEWALK GUY ASSEMBLY
47. INSTALL MESSENGER CABLE
48. REMOVE EXISTING COMMUNICATIONS AND MESSENGER CABLE
49. REMOVE EXISTING MESSENGER CABLE
50. INSTALL TELEPHONE SERVICE
51. INSTALL CABLE STORAGE RACKS (SNOW SHOES) AND STORE 100 FEET OF CABLE
52. INSTALL DELINEATOR MARKER
53. STORE 20 FEET OF COMMUNICATIONS CABLE
54. LASH CABLE(S) TO EXISTING SIGNAL/COMMUNICATIONS CABLE
55. LASH CABLE(S) TO EXISTING MESSENGER CABLE
56. LASH CABLE(S) TO NEW MESSENGER CABLE
57. MODIFY EXISTING ELECTRICAL SERVICE
58. INSTALL NEW ELECTRICAL SERVICE

LEGEND

- FO — NEW FIBER OPTIC COMMUNICATIONS CABLE
- TWIST PR — NEW TWISTED PAIR COMMUNICATIONS CABLE
- EXI — EXISTING COMMUNICATIONS CABLE
- REM — EXISTING COMMUNICATIONS CABLE TO BE REMOVED
- NEW AERIAL GUY ASSEMBLY
- NEW CONDUIT
- EXISTING CONDUIT
- DD — NEW DIRECTIONAL DRILLED CONDUIT
- B&J — NEW BORED AND JACKED CONDUIT
- NEW JUNCTION BOX
- EXISTING JUNCTION BOX
- NEW WOOD POLE
- EXISTING WOOD POLE
- S — AERIAL SPLICE ENCLOSURE
- NEW METAL POLE
- EXISTING METAL POLE
- NEW CCTV ASSEMBLY
- NEW STANDARD GUY ASSEMBLY
- NEW SIDEWALK GUY ASSEMBLY
- NEW CABLE STORAGE RACKS (SNOW SHOES)
- X — EXISTING CONTROLLER AND CABINET
- S — EXISTING SPLICE CABINET
- S — NEW SPLICE CABINET
- SP — SIGNAL POLE
- XX-XXXX — SIGNAL INVENTORY NUMBER

CONSTRUCTION NOTE SYMBOLOGY KEY

- XX — INDICATES NUMBER OF CABLES, LOOPS, ETC.
- XX — INDICATES NUMBER OF FIBERS PER CABLE, TWISTED PAIRS PER CABLE, ETC.
- XX — INDICATES NUMBER OF RISER(S)/CONDUIT(S)
- XX — INDICATES DIAMETER OF RISER(S)/CONDUIT(S) (INCH)



Prepared in the Office of: Traffic Management Systems, Traffic Engineering and Safety Systems Branch, Division of Highways, N.C. Department of Transportation, 122 N. McDowell St., Raleigh, NC 27603

CONSTRUCTION NOTES

PLAN DATE:	REVIEWED BY:
PREPARED BY:	REVIEWED BY: G. A. FULLER

SCALE: 0

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

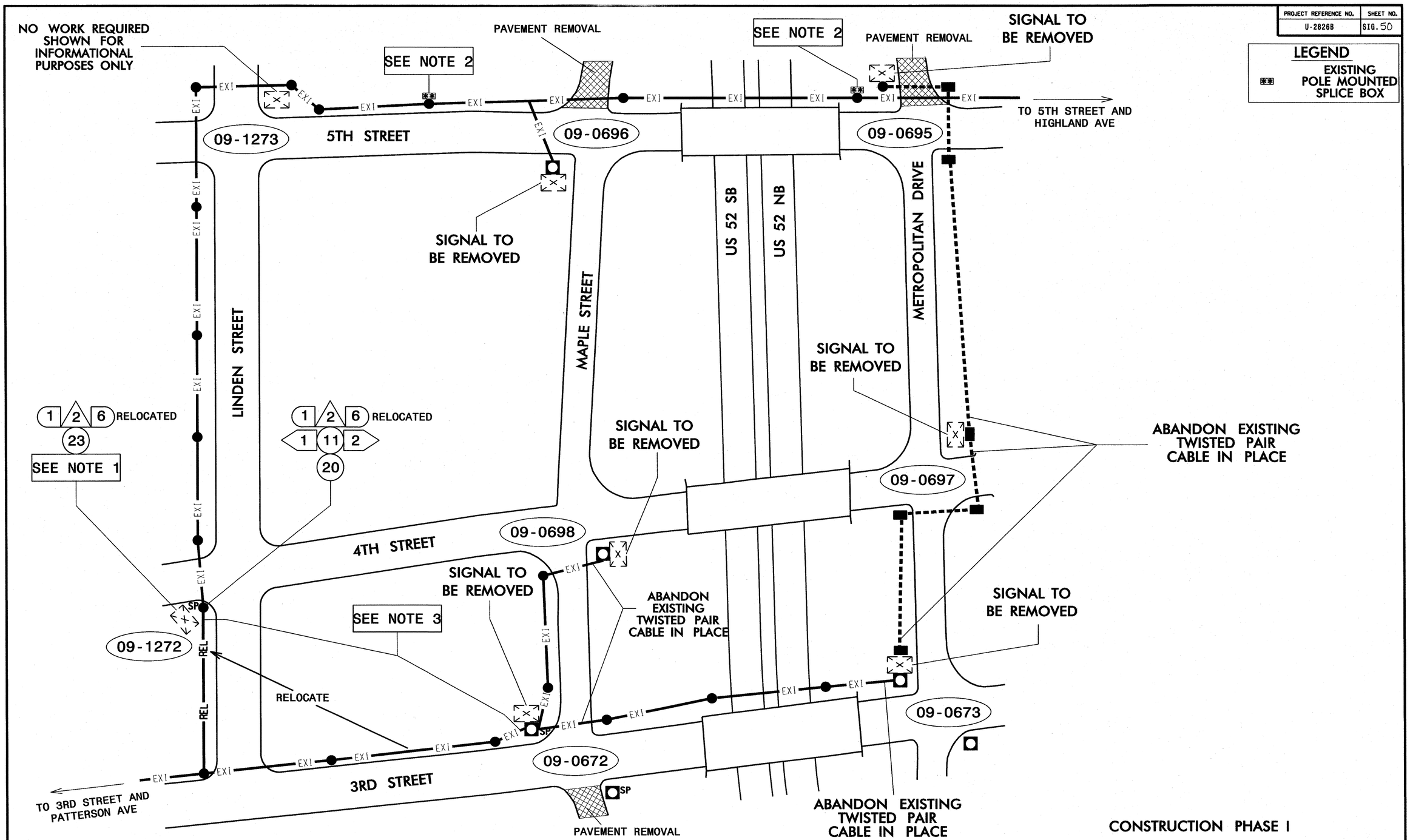
SIGNATURE — DATE 10/31/02

CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	SIG. 50

LEGEND

EXISTING POLE MOUNTED SPLICE BOX



CONSTRUCTION PHASE I

NOTES:

1. ALL TERMINATIONS FOR TWISTED PAIR CABLE IN SIGNAL CABINETS TO BE PERFORMED BY CITY OF WINSTON-SALEM. CONTACT LARRY WALKER, CITY OF WINSTON-SALEM TRAFFIC ENGINEER (336-747-6879) PRIOR TO BEGINNING ANY WORK.
2. REMOVE TWISTED PAIR DROP CABLE FROM SPLICE BOX TO SIGNAL CABINET. CONTRACTOR TO RE-TERMINATE TRUNK CABLES FOR THROUGH CONNECTION /COMMUNICATIONS.
3. REMOVE EXISTING TWISTED PAIR COMMUNICATIONS CABLE FROM SIGNAL CABINET AT 09-0672 AND BACK PULL TO 3RD STREET AND LINDEN STREET. RE-ROUTE TO SIGNAL CABINET 09-1272 AND INSTALL IN CABINET. TERMINATIONS IN CABINET TO BE PERFORMED BY THE CITY OF WINSTON-SALEM.

Prepared in the Offices of: Transportation Mobility and Safety Division, STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION, Intermodal Transportation Building, Raleigh, Series
750 N. Greenfield Pkwy., Garner, NC 27529

SCALE 0

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS

DIVISION 09	FORSYTH COUNTY		WINSTON-SALEM
PLAN DATE:	JANUARY 2011	REVIEWED BY:	I.N. AVERY
PREPARED BY:	S.C. WARDLE	REVIEWED BY:	G.A. FULLER

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

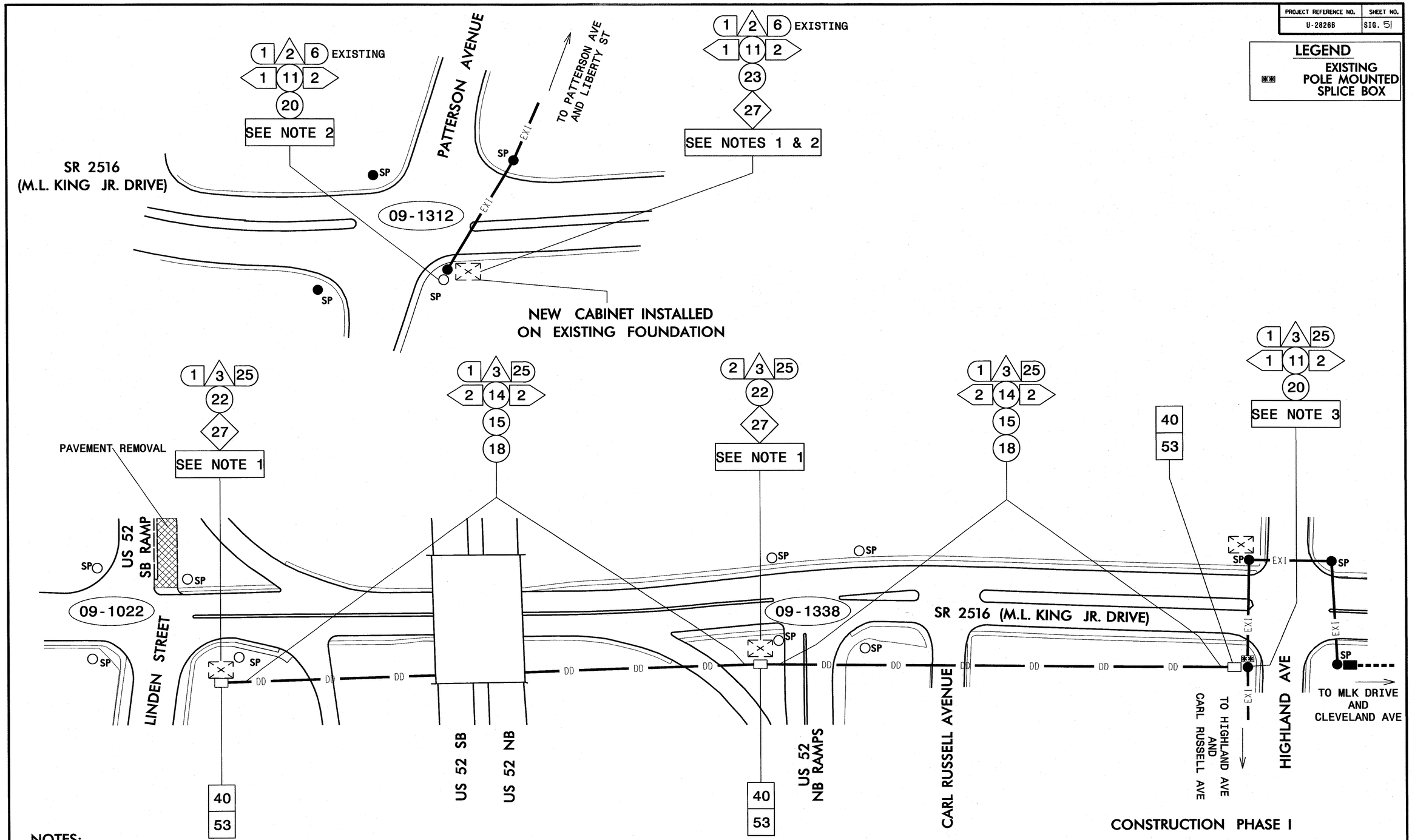
SIGNATURE Gregory A. Fuller DATE 1-5-11

CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	SIG. 51

LEGEND

EXISTING POLE MOUNTED SPLICE BOX



NOTES:

1. ALL TERMINATIONS FOR TWISTED PAIR CABLE IN SIGNAL CABINETS TO BE PERFORMED BY CITY OF WINSTON-SALEM. CONTACT LARRY WALKER, CITY OF WINSTON-SALEM TRAFFIC ENGINEER (336-747-6879) PRIOR TO BEGINNING ANY WORK.
2. REMOVE EXISTING TWISTED PAIR COMMUNICATIONS CABLE FROM SIGNAL POLE AND CABINET. INSTALL NEW RISER ON NEW SIGNAL POLE AND INSTALL CABLE IN NEW CABINET WITH NEW TELEMETRY INTERFACE PANEL.
3. INSTALL NEW 25 PAIR CABLE IN NEW RISER AND COIL ON POLE NEAR EXISTING POLE MOUNTED SPLICE BOX. DO NOT TERMINATE. TERMINATIONS TO BE PERFORMED BY CITY OF WINSTON-SALEM.

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Transportation Building Raleigh
750 N. Greenfield Pkwy., Garner, NC 27529

SCALE 0

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS

DIVISION 09	FORSYTH COUNTY		WINSTON-SALEM
PLAN DATE:	JANUARY 2011	REVIEWED BY:	I.N. AVERY
PREPARED BY:	S.C. WARDLE	REVIEWED BY:	G.A. FULLER

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

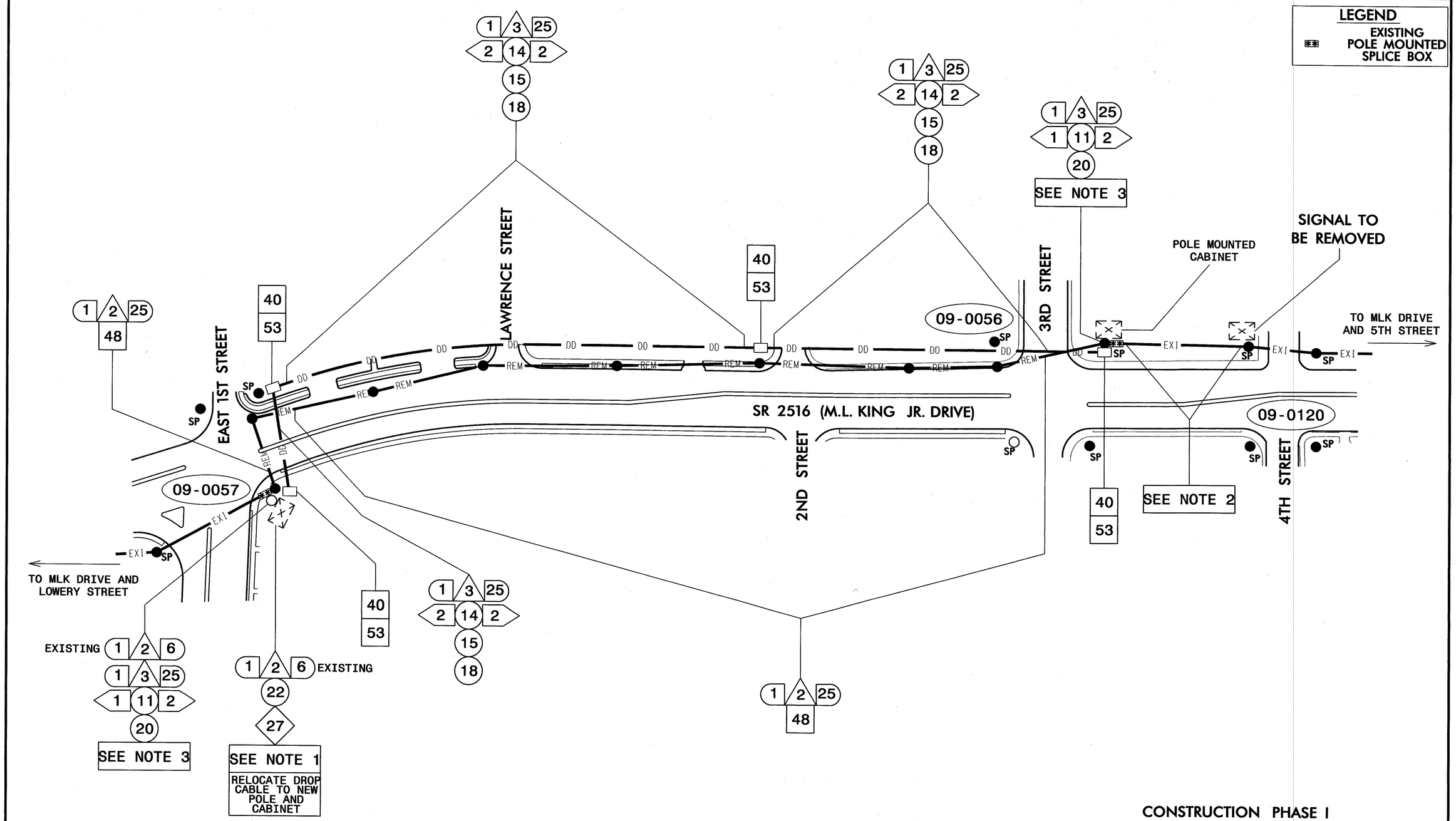
SIGNATURE 1-5-11 DATE

CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
U-2826B	SIG. 52

LEGEND

EXISTING POLE MOUNTED SPLICE BOX



CONSTRUCTION PHASE I

NOTES:

1. ALL TERMINATIONS FOR TWISTED PAIR CABLE IN SIGNAL CABINETS TO BE PERFORMED BY CITY OF WINSTON-SALEM. CONTACT LARRY WALKER, CITY OF WINSTON-SALEM TRAFFIC ENGINEER (336-747-6879) PRIOR TO BEGINNING ANY WORK.
2. REMOVE /ABANDON 6 PAIR DROP CABLE BETWEEN 09-0056 AND 09-0120. DO NOT REMOVE 25 PAIR TRUNK CABLE.
3. EXTEND NEW TRUNK CABLE TO EXISTING POLE MOUNTED SPLICE BOX. CONTRACTOR TO RE-TERMINATE TRUNK CABLE FOR THROUGH CONNECTION /COMMUNICATIONS.

Prepared in the Offices of: Transportation Mobility and Safety Division — Intelligent Transportation Systems Section — NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
750 N. Greenfield Pkwy., Garner, NC 27529

SCALE 0

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS

DIVISION 09	FORSYTH COUNTY	WINSTON-SALEM
PLAN DATE: JANUARY 2011	REVIEWED BY: I.N. AVERY	
PREPARED BY: S.C. WARDLE	REVIEWED BY: G.A. FULLER	

REVISIONS	INIT.	DATE

SEAL — NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

SIGNATURE — DATE 1-5-11

CADD Filename: