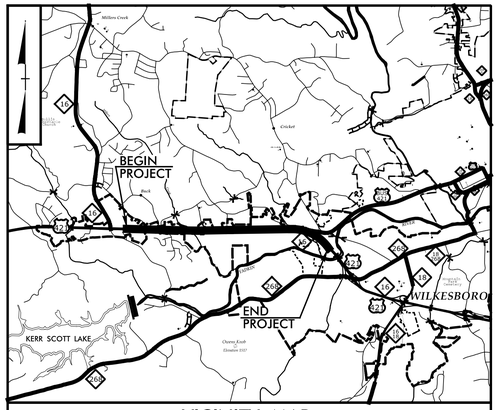
TIP PROJECT: U–5312

CONTRACT:



VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

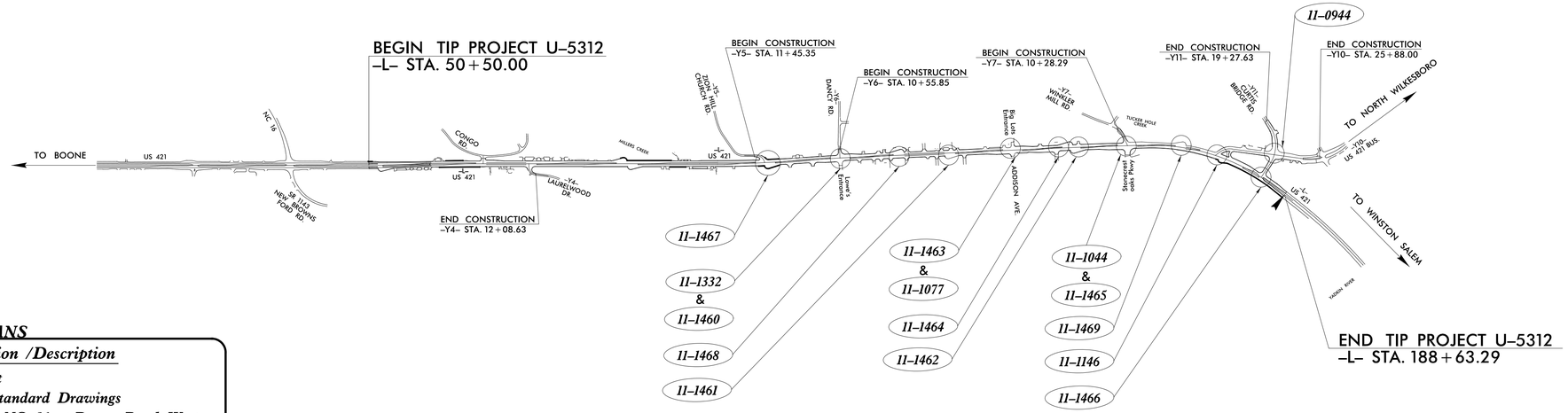
WILKES COUNTY

Project No.	Sheet No.
U–5312	Sig. 1.0

LOCATION: *US 421 FROM EAST OF NC 16 TO US 421 BUSINESS IN WILKESBORO*

TYPE OF WORK: *TRAFFIC SIGNALS AND TRAFFIC SIGNAL COMMUNICATIONS*

NAD 83
NSRS 2007



INDEX OF PLANS

Sheet #	Sig. Inv. No.	Location /Description
Sig. 1.0	———	Title Sheet
Sig 1.1–1.2	———	Revised Standard Drawings
Sig. 2.0–2.5	11–1471	US 421 – NC 16 at Dancy Road West U–Turn
Sig. 3.0–3.13	11–1332 & 11–1460	US 421 – NC 16 at Dancy Road/Lowes Entrance
Sig. 4.0–4.12	11–1468	US 421 – NC 16 at Dancy Road East U–Turn
Sig. 5.0–5.5	11–1461	US 421 – NC 16 at Addison Avenue West U–Turn
Sig. 6.0–6.14	11–1077 & 11–1463	US 421 – NC 16 at Addison Avenue/Big Lots Entrance
Sig. 7.0–7.7	11–1464	US 421 – NC 16 at Addison Avenue East U–Turn
Sig. 8.0–8.7	11–1462	US 421 – NC 16 at SR 1322 (Winkler Mill Road) West U–Turn
Sig. 9.0–9.19	11–1044 & 11–1465	US 421 – NC 16 at SR 1322 (Winkler Mill Road)
Sig. 10.0–10.3	11–1469	US 421 – NC 16 at Winkler Mill Road East U–Turn
Sig. 11.0–11.12	11–1146	US 421 – NC 16 at US 421 Business
Sig. 12.0–12.12	11–0944	US 421 Business at SR 1372 (Curtis Bridge Road)
Sig. 13.0–13.3	11–1466	US 421 at SR 1372 (Curtis Bridge Road)
Sig. M1–M8		Standard Metal Pole Details
SCP. 1–15		Signal Communications Plans
	———	
	———	

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LEGEND

##-#### *SIGNAL INVENTORY NUMBER*

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS UNIT

Contacts:

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Keith M. Mims, PE – Signal Equipment Design Engineer
Gregory A. Green – Signal Communications Project Engineer
Heidi T. Berggren, EI – Signal Communications Project Design Engineer

Prepared for the North Carolina Department of Transportation In the Office of:

vhb
VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

Refer to Roadway Standard Drawings NCDOT" dated January 2018 and Standard Specifications for Roads and Structures" dated January 2018.

Jimmy Goodnight, PE
PROJECT ENGINEER

Srilatha R. Chiluka, PE
Jianxin (Justine) Ma, PE
Matthew L. Stygles, PE
PROJECT DESIGN ENGINEER

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by:
SIGNATURE
5/24/2023
DATE

DIVISION OF HIGHWAYS
TRANSPORTATION MOBILITY AND SAFETY DIVISION

Transportation Mobility and Safety Division · NORTH CAROLINA DEPARTMENT OF TRANSPORTATION · TSMO Unit

750 N. Greenfield Parkway, Garner, NC 27529

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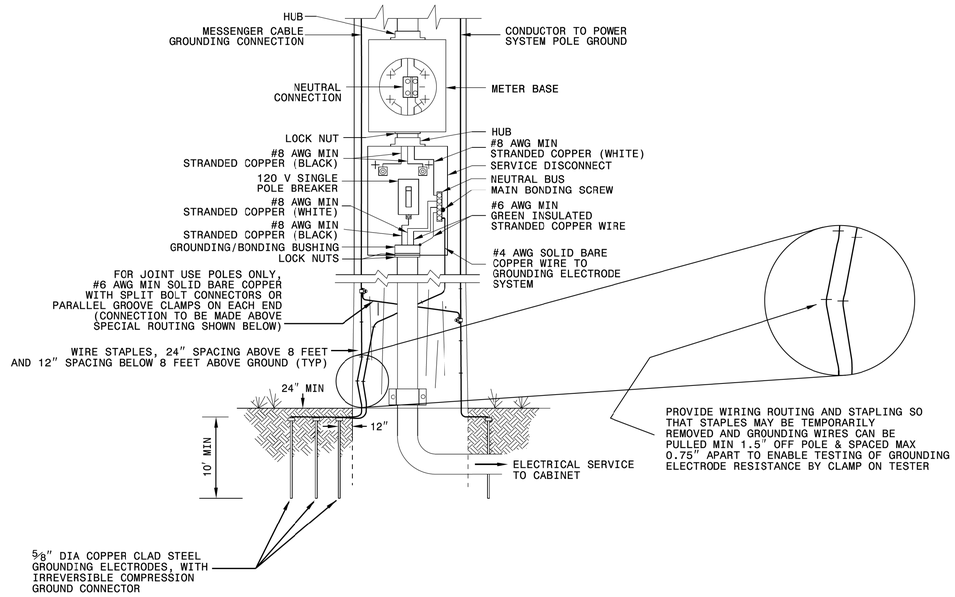
PROJECT NO.	SHEET NO.
	Sig.1.1



1-18 STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.

ENGLISH STANDARD DRAWING FOR

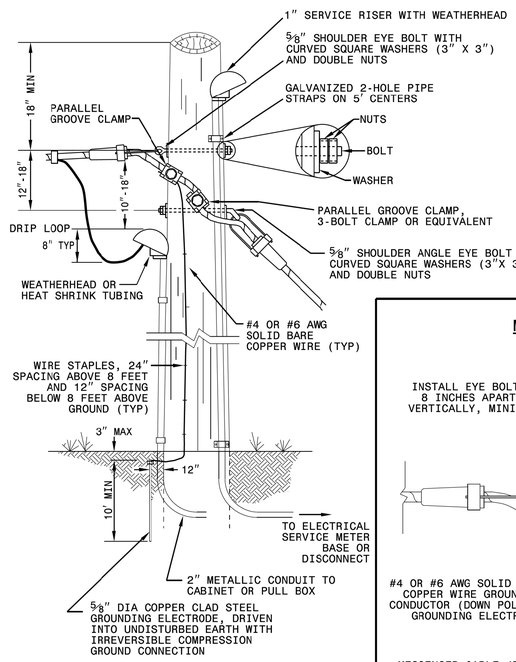
ELECTRICAL SERVICE GROUNDING

GROUNDING AND BONDING

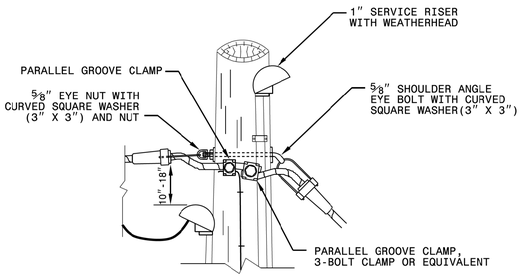
SHEET 1 OF 1

1700D01

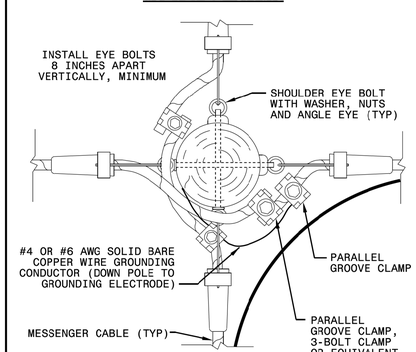
TWO-BOLT METHOD (PREFERRED)



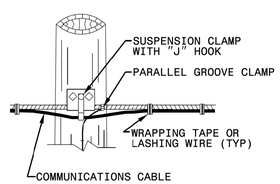
ONE-BOLT METHOD



MULTIPLE SPANS



COMMUNICATIONS CABLE AT INTERMEDIATE POLE



NOTE

FOR CONNECTING MESSENGER TO MESSENGER, USE PARALLEL GROOVE CLAMP, 3-BOLT CLAMP OR EQUIVALENT. FOR CONNECTING COPPER WIRE TO MESSENGER, USE PARALLEL GROOVE CLAMP.

1-18 STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.

ENGLISH STANDARD DRAWING FOR

WOOD POLES

METHODS OF ATTACHMENT AND GROUNDING

SHEET 1 OF 1

1720D01

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See Plate for Title

Prepared in the Offices of:

Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION
ITS & Signals Unit

750 N. Greenfield Parkway
Garner, NC 27529

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 032108 ENGINEER MOHD A. ASLAMI

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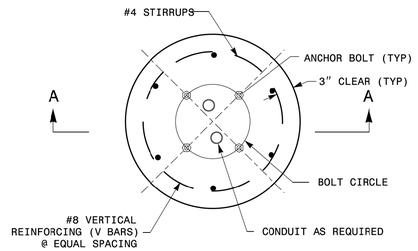
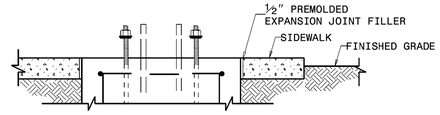
PROJECT NO.	SHEET NO.
U-5312	Sig.1.2



PEDESTAL FOUNDATION - PLAN VIEW

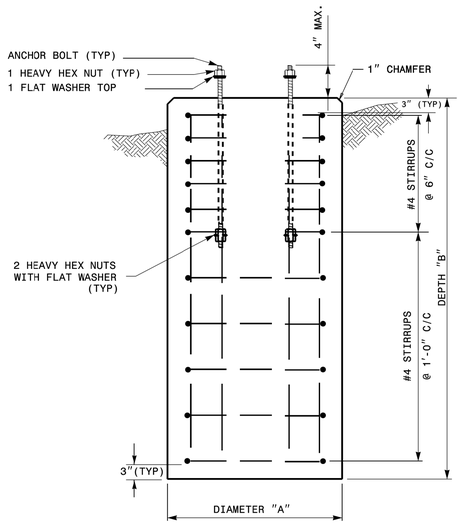


PEDESTAL FOUNDATION DETAILS FOR SIDEWALK

NOTES:

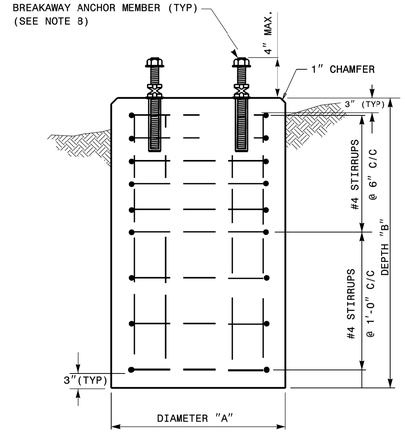
1. CAST FOUNDATION AGAINST UNDISTURBED SOIL WHEREVER CONDITIONS PERMIT. IN UNSTABLE SOIL, CAST-IN-PLACE TUBE FORMS ARE ALLOWED WITH APPROVAL.
2. COMPLY WITH APPLICABLE PROVISIONS OF SECTION 825 FOR CONCRETE CONSTRUCTION.
3. USE CLASS "A" CONCRETE THAT MEETS THE REQUIREMENTS OF SECTION 1000 WITH A COMPRESSION STRENGTH AT 28 DAYS OF F'c= 3000 PSI (MIN.).
4. USE ASTM GRADE 60 DEFORMED BARS FOR ALL REINFORCING STEEL.
5. GRADE IS ASSUMED TO BE (8H:1V) OR FLATTER. FOUNDATION SIZE AND DEPTHS ARE BASED ON THE FOLLOWING SOIL DESIGN PARAMETERS:
   A. SANDY TYPE SOIL
   B. NO GROUND WATER WITHIN 5'-0" OF SURFACE ELEVATION
   C. WIND SPEED NOT TO EXCEED 140 MPH

   IF ACTUAL CONDITIONS VARY SUBSTANTIALLY FROM THOSE ASSUMED, THE FOUNDATION DEPTH MAY BE ADJUSTED. IN THIS CASE, CONTACT THE ENGINEER.
6. MAINTAIN AT LEAST 3" COVER ON ALL REINFORCEMENT.
7. ORIENT CONDUIT AS REQUIRED BY THE DESIGN OR AS DICTATED BY FIELD CONDITIONS.
8. USE ADHESIVE ANCHOR FOR THREADED COUPLING INSERT. FOR TYPE I MINIMUM DEPTH NECESSARY IS 0'-4½" AND FOR TYPE II MINIMUM DEPTH NECESSARY IS 0'-6⅝". FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS.



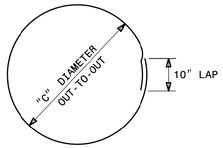
TYPES I, II & III

SECTION A-A

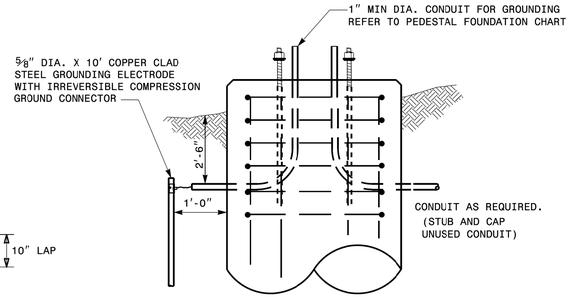


TYPES I & II ONLY

SECTION A-A



CLOSED HOOPS



GROUNDING & CONDUIT DETAIL

PEDESTAL FOUNDATION TYPE AND SIZE

TYPE	PEDESTAL DESCRIPTION	SIZE			ANCHOR BOLT		INSTALL GROUNDING SYSTEM (YES/NO)
		DIAMETER "A" FT	DEPTH "B" FT	CONCRETE VOLUME CY	DIAMETER (MIN.) IN	LENGTH FT-IN	
I	PEDESTRIAN PUSHBUTTON	2'-0"	3'-6"	.41	½	1'-6"	NO
II	NORMAL-DUTY	2'-0"	5'-0"	.58	¾	2'-0"	YES
III	HEAVY-DUTY	2'-6"	7'-0"	1.27	1	4'-0"	YES

REINFORCING STEEL SCHEDULE

TYPE	V-BAR				STIRRUP								TOTAL STEEL WEIGHT LBS
	SIZE #	QTY	LENGTH	WEIGHT LBS	SIZE #	QUANTITY VERTICAL SPACING ON 6" CENTERS	QUANTITY VERTICAL SPACING ON 12" CENTERS	QUANTITY TOTAL	LENGTH	DIAMETER "C" FT	OVERLAP MIN.	WEIGHT LBS	
I	8	6	3'-0"	56	4	0	4	4	5'-7"	1'-6"	0'-10"	15	71
II	8	6	4'-6"	86	4	5	3	8	5'-7"	1'-6"	0'-10"	30	116
III	8	6	6'-6"	122	4	7	4	11	7'-2"	2'-0"	0'-10"	53	175

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

1-18

ENGLISH STANDARD DRAWING FOR

PEDESTALS

FOUNDATIONS

SHEET 1 OF 1

1743D01

See Plate for Title

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Prepared in the Offices of:

Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
ITS & Signals Unit

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Garner, NC 27529

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SEAL
028094
ENGINEER
DEBESH C. SARKAR

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Debesh C. Sarkar
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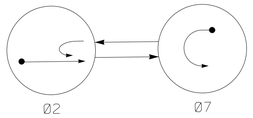
PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.2.0

2 Phase Fully Actuated (Isolated)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.

All Heads L.E.D.

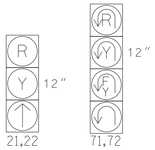
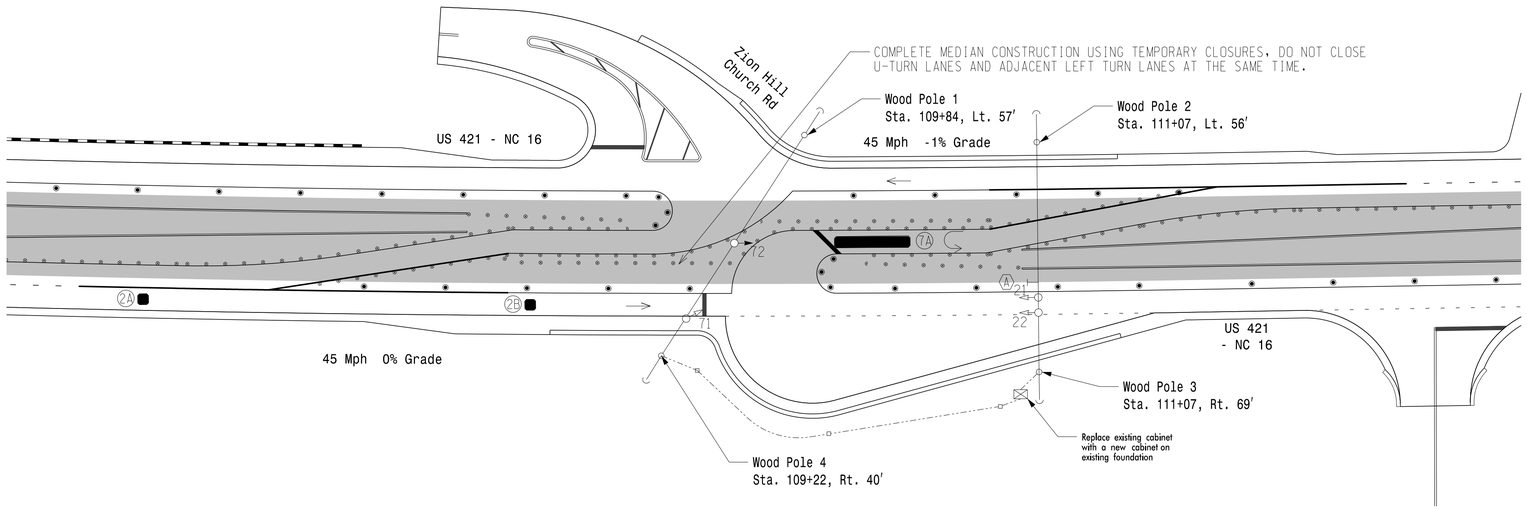


TABLE OF OPERATION			
SIGNAL FACE	PHASE Ø2	PHASE Ø7	FLASH
21,22	↑	R	Y
71,72	↶	↷	Y

MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	✳	300	✳	✳	2	-	1.6	X	-	X	-	✳
2B	✳	90	✳	✳	2	-	-	X	-	X	-	✳
7A	✳	0	✳	✳	7	15.0	-	X	-	X	-	✳

✳ Video Detection Zone



LEGEND

PROPOSED		EXISTING
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Traffic Signal Head	
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Inductive Loop Detector	
	Video Detection Zone	N/A
	Construction Zone	N/A
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
	Right of Way	
E	Temporary Construction Easement	N/A
	Directional Arrow	
	Type II Signal Pedestal	
A	No Left Turn Sign (R3-2)	A
	Drum	N/A
	Skinny Drum	N/A

MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 7
Walk *	–	–
Ped Clear *	–	–
Min Green	12	7
Passage *	2.0	2.0
Max 1 *	60	30
Yellow Change	4.5	3.0
Red Clear	1.1	4.0
Added Initial *	–	–
Maximum Initial *	–	–
Time Before Reduction *	–	–
Time To Reduce *	–	–
Minimum Gap	–	–
Advance Walk	–	–
Non Lock Detector	–	X
Vehicle Recall	MIN RECALL	–
Dual Entry	–	–

* 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.

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. This intersection uses video detection. Install detectors according to the manufacturer's instructions to schieve the desitred detection.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Refer to Pavement Marking Plans for proposed stop bar locations.

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

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New Installation - Temporary Design 1(Phase 9)

Prepared for the Offices of:
Traffic Engineering Branch
Traffic Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 421-NC 16 at
SR 1323 (Dancy Road)/
Lowe's Entrance
West U-Turn

Divsion 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M.L. Stygles
PREPARED BY:	S.R. Chiluka	REVIEWED BY:	J. Ma

SCALE 1"=40' (0 – 40)

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 047250 ENGINEER SRIVATHA R CHILUKA

Developed by SRChiluka 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1467T

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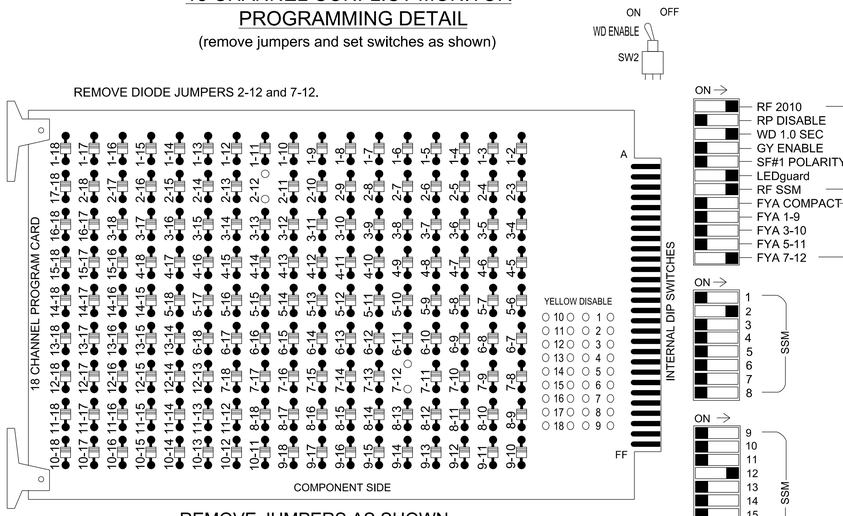
schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.2.1

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S2, S10, AUX S5
Phases Used.....2,7
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....*

*See overlap programming detail on sheet 2.

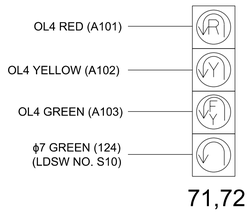
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	NU	NU	NU	NU	NU	NU	71,72 ★	NU	NU	NU	NU	NU	NU	71,72 ★	NU
RED	·	128	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
YELLOW	·	129	·	·	·	·	·	·	·	*	·	·	·	·	·	·	·	·
GREEN	·	130	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
RED ARROW	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	A101	·
YELLOW ARROW	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	A102	·
FLASHING YELLOW ARROW	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	A103	·
GREEN ARROW	·	·	·	·	·	·	·	·	·	124	·	·	·	·	·	·	·	·

NU = Not Used
* Denotes install load resistor. See load resistor installation detail this sheet.
★ See pictorial of head wiring in detail this sheet.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L														ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L														

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

FS = FLASH SENSE
ST = STOP TIME

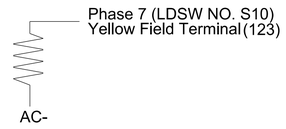
SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	4
Type	FYA 4 - Section
Included Phases	2
Modifier Phases	7
Trail Green	0
Trail Yellow	0.0
Trail Red	0.0

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 11-1467T
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED: N/A

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

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Temporary Installation - Electrical Detail 1 of 1(Phase 9)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 421 - NC 16 at
SR 1323 (Dancy Road)/
Lowe's Entrance
West U-Turn

Division 11 Wilkes County Wilkesboro

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

PLAN DATE:	May 2023	REVIEWED BY:	M.L.Stygles
PREPARED BY:	S.R.Chiluka	REVIEWED BY:	J.Ma

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by: Matthew Stygles 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1467T

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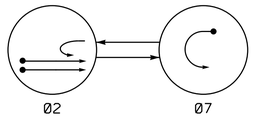
schiluka

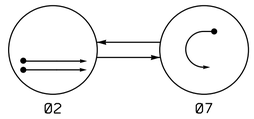
PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.2.2

2 Phase
Fully Actuated
W/ Alternate Phasing Operation
Wilkesboro Closed Loop System

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM



DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2	PHASE Ø7	FLASH
21,22	↑	R	Y
71,72	(R) ↶	↷	(Y)

ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2	PHASE Ø7	FLASH
21,22	↑	R	Y
71,72	(R) ↶	↷	(Y)

MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	5	X	2	-	-	X	X	X	-	X
2B	6X6	300	5	X	2	-	-	X	X	X	-	X
7A	6X40	0	2-4-2	X	7	15.0*	-	X	-	X	-	X
S1	6X6	200	3	-	-	-	-	-	-	-	-	X

* Disable delay during alternate phasing operation

NOTES

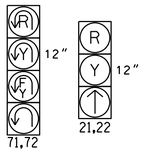
1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
5. The division Traffic Engineer will determine the hours of use for each phasing plan.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Refer to Pavement Marking Plans for proposed stop bar locations.

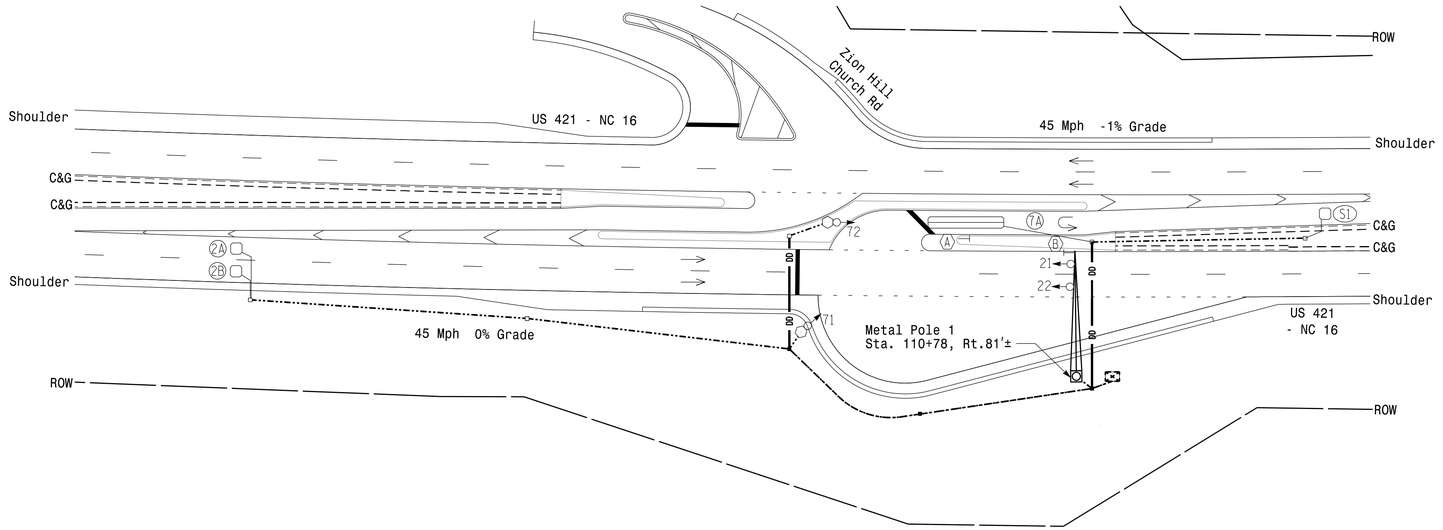
PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.

All Heads L.E.D.





MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 7
Walk *	–	–
Ped Clear *	–	–
Min Green	12	7
Passage *	6.0	2.0
Max 1 *	60	30
Yellow Change	4.5	3.0
Red Clear	1.1	4.0
Added Initial *	1.5	–
Maximum Initial *	34	–
Time Before Reduction *	15	–
Time To Reduce *	30	–
Minimum Gap	3.4	–
Advance Walk	–	–
Non Lock Detector	–	X
Vehicle Recall	MIN RECALL	–
Dual Entry	–	–

* 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	●→
▭	Metal Pole with Mastarm	▭
⬡	Type II Signal Pedestal	⬢
⊣	Sign	⊣
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
-----	2-in Underground Conduit	-----
N/A	Right of Way	———
→	Directional Arrow	→
DD	Directional Drill	N/A
(A)	"Stop Here on Red" Sign (R10-6)	(A)
(B)	No Left Turn Sign (R3-2)	(B)

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New Installation - Final Design

Prepared for 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 421-NC 16 at
SR 1323 (Dancy Road)/
Lowe's Entrance
West U-Turn

Divsion 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M. Stygles
PREPARED BY:	S.R. Chiluka	REVIEWED BY:	J. Ma

SCALE 0 40

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 047250 ENGINEER SRIVATHA R CHILUKA

Designed by: SRChiluka 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1467

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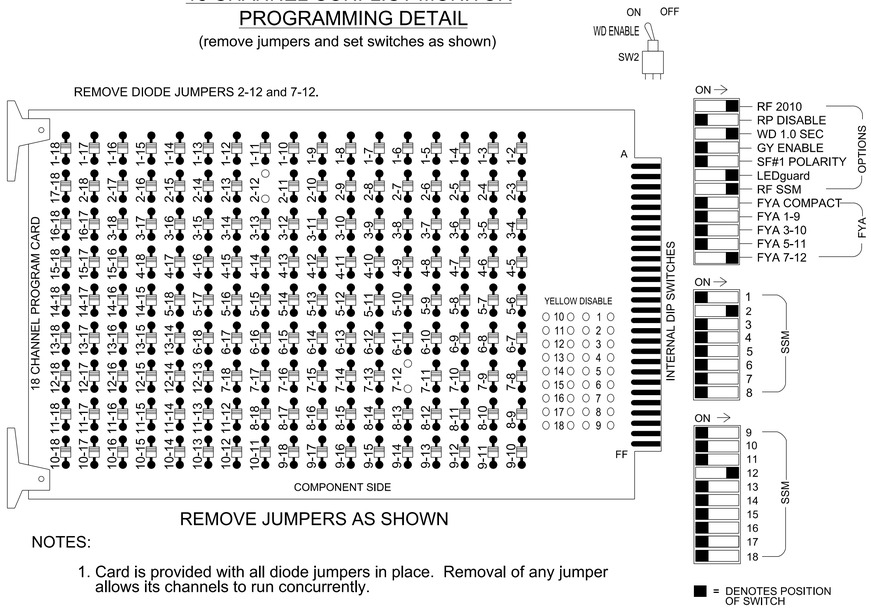
schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.2.3

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the Wilkesboro Closed Loop System.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S2, S10, AUX S5
Phases Used.....2,7
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....*

*See overlap programming detail on sheet 2.

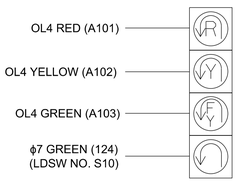
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	NU	NU	NU	NU	NU	NU	71,72 ★	NU	NU	NU	NU	NU	NU	71,72 ★	NU
RED		128																
YELLOW		129								*								
GREEN		130																
RED ARROW																	A101	
YELLOW ARROW																	A102	
FLASHING YELLOW ARROW																	A103	
GREEN ARROW										124								

NU = Not Used
* Denotes install load resistor. See load resistor installation detail this sheet.
★ See pictorial of head wiring in detail this sheet.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	ϕ 2 2A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L		ϕ 2 2B												ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ϕ 7 7A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SYS. DET. S1	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L					NOT USED				NOT USED					

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	QUEUE	CALL	DELAY DURING GREEN
2A	TB2-5,6	I2U	39	1	2	2			X	X		X	
2B	TB2-7,8	I2L	43	5	3	2			X	X		X	
7A	TB5-5,6	J5U	57	19	21	7	15		X			X	
*S1	TB7-9,10	J9U	59	21	27	SYS			X			X	

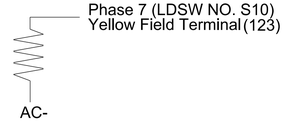
*System detector only. Remove any assigned vehicle phase.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 11-1467
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED: N/A

VHB Engineering NC, P.C. (C-3705)
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Raleigh, NC 27606
919.829.0328

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Electrical Detail Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 421 - NC 16 at
SR 1323 (Dancy Road)/
Lowe's Entrance
West U-Turn

Division 11 Wilkes County Wilkesboro

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

PLAN DATE:	May 2023	REVIEWED BY:	J. Ma
PREPARED BY:	M.L. Stygles	REVIEWED BY:	S.R. Chiluka

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES
DocuSigned by: 5/24/2023
SIGNATURE DATE
SIG. INVENTORY NO. 11-1467

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schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.2.4

MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	4
Type	FYA 4 - Section
Included Phases	2
Modifier Phases	7
Trail Green	0
Trail Yellow	0.0
Trail Red	0.0

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	4
Type	FYA 4 - Section
Included Phases	-
Modifier Phases	7
Trail Green	0
Trail Yellow	0.0
Trail Red	0.0

← NOTICE INCLUDED PHASE

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

To run alternate phasing, select a Pattern that is programmed to run Overlap Plan 2 and Detector Plan 2.
A Pattern can be selected through the scheduler or manually by changing the Operational Mode.

PHASING	OVERLAP PLAN	VEH DET PLAN
ACTIVE PLAN REQUIRED TO RUN DEFAULT PHASING	1	1
ACTIVE PLAN REQUIRED TO RUN ALTERNATE PHASING	2	2

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OF WHAT TAKES PLACE WHEN OVERLAP 2 AND VEHICLE DETECTOR PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

OVERLAP PLAN 2: Modifies overlap included phases for heads 71 and 72 to run protected turns only.

VEH DET PLAN 2: Reduces delay time for phase 7 call on loop 7A to 0 seconds.

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOP 7A

Front Panel
Main Menu >Controller >Detector >Veh Det Plans

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

	Detector	Call Phase	Delay
7A	21	7	-

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

* The Pattern number(s) are to be determined by the Division and/or City Traffic Engineer.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 11-1467
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED: N/A

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Electrical Detail Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 421 - NC 16 at SR 1323 (Dancy Road)/ Lowe's Entrance West U-Turn

Division 11 Wilkes County Wilkesboro

Prepared for 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

PLAN DATE:	May 2023	REVIEWED BY:	J. Ma
PREPARED BY:	M.L. Stygles	REVIEWED BY:	S.R. Chiluka

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by:
SIGNATURE 5/24/2023 DATE

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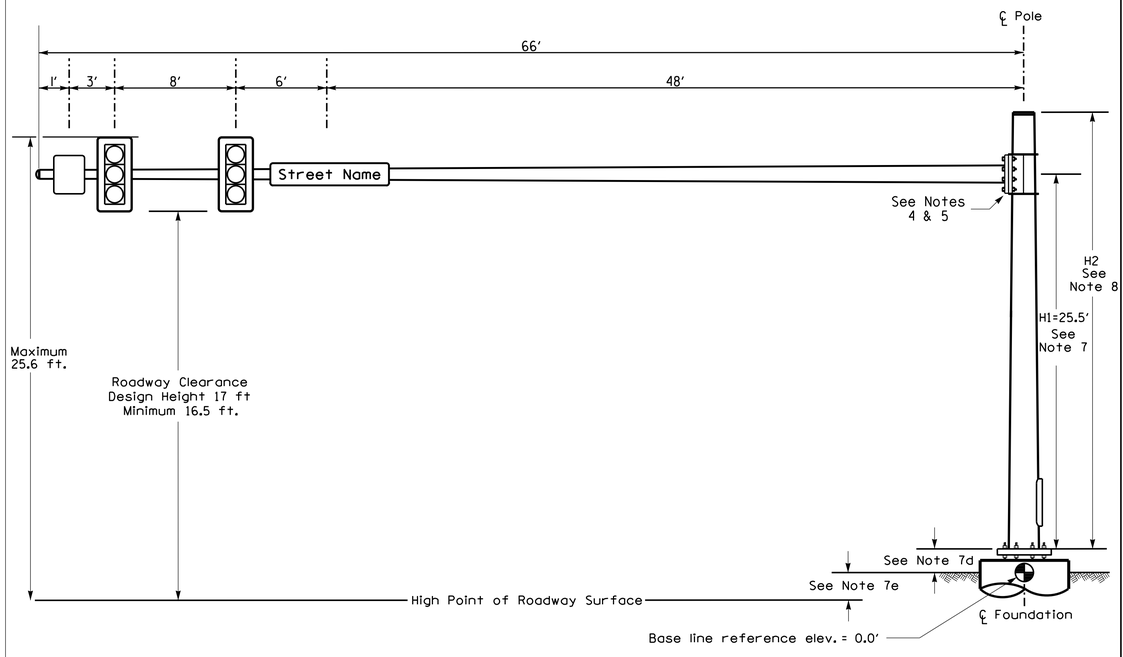
PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.2.5

METAL POLE No. 1

Design Loading for METAL POLE NO. 1



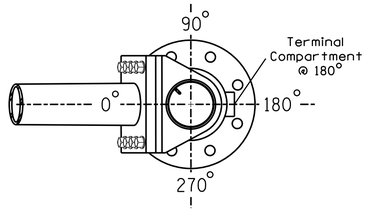
Elevation View

SPECIAL NOTE

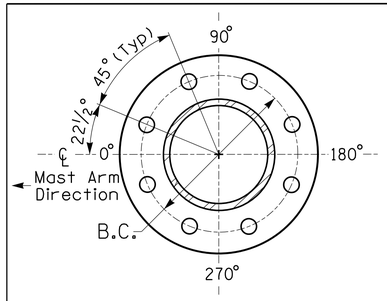
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.
Elevation difference at High point of roadway surface	+4.38 ft.
Elevation difference at Edge of travelway or face of curb	+5.23 ft.

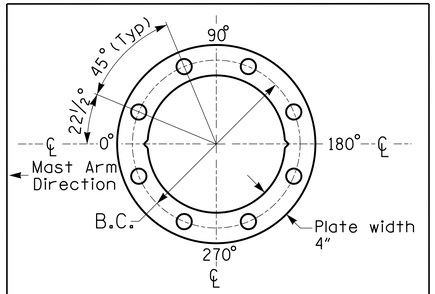


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5"W X 52.5"L	60 LBS
	SIGN RIGID MOUNTED	9.0 S.F.	36.0"W X 36.0"L	20 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0"W X 96.0"L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

1. Design the traffic signal structure and foundation in accordance with:
   - The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2018 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
   - The 2018 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

DESIGN REQUIREMENTS

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

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919.829.0328

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NCDOT Wind Zone 4 (90 mph)

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

US 421-NC 16 at
SR 1323 (Dancy Road)/
Lowe's Entrance
West U-Turn

Divsion 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M. Stygles
PREPARED BY:	S.R. Chiluka	REVIEWED BY:	J. Ma

SCALE 0 N/A

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 047250 ENGINEER SRILATHA R CHILUKA

Digitally signed by SRChiluka
5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1467

10/31/2022 8:48:46 AM
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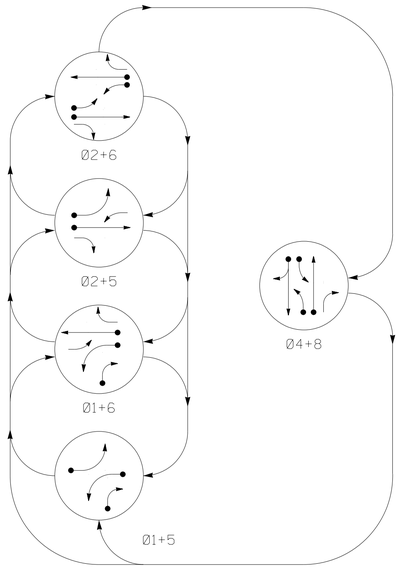
schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.3.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

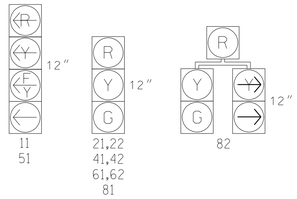
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←	←	←Y	←Y	←R	←Y
21, 22	R	R	G	G	R	Y
41,42	R	R	R	R	G	R
51	←	←Y	←	←Y	←R	←Y
61, 62	R	G	R	G	R	Y
81	R	R	R	R	G	R
82	R/←	R/→	R	R	G	R

SIGNAL FACE I.D.

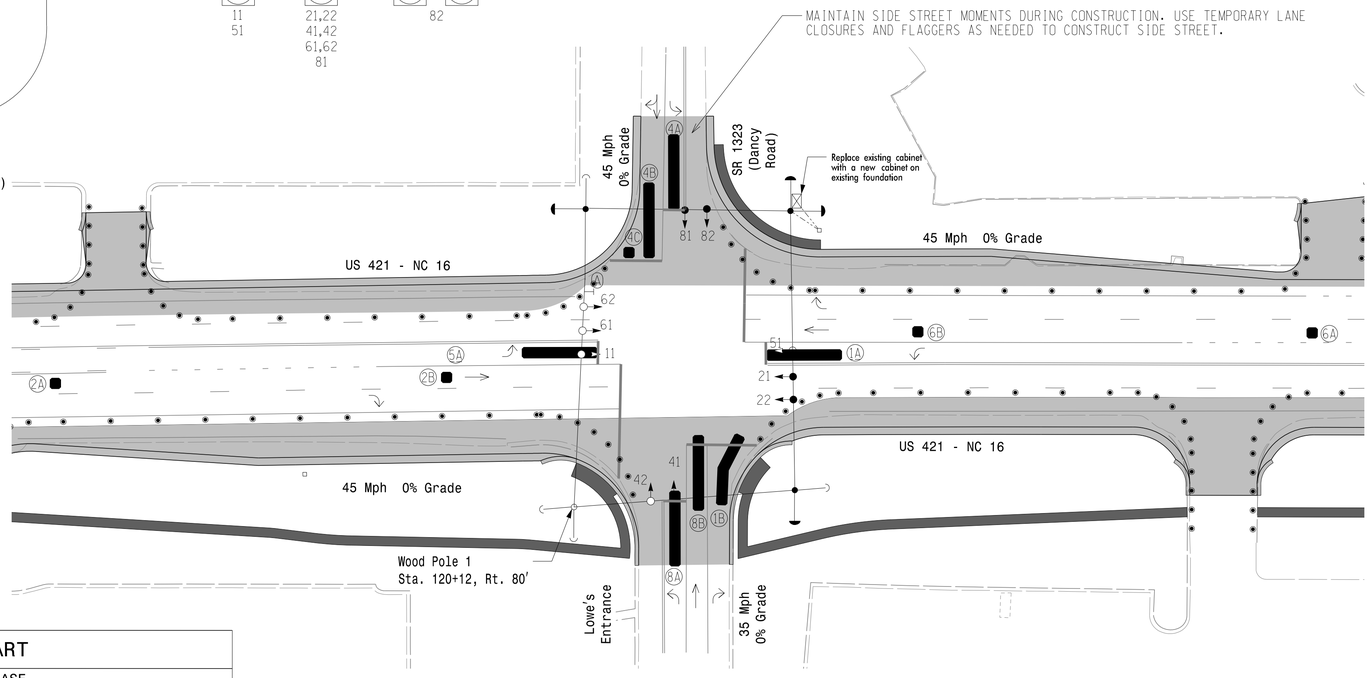
All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	*	0	*	*	1	15.0	-	X	-	X	-	*
					6	3.0	-	X	-	X	-	*
1B	*	+5	*	*	1	15.0	-	X	-	X	-	*
2A	*	300	*	*	2	-	1.6	X	-	X	-	*
2B	*	90	*	*	2	-	-	X	-	X	-	*
4A	*	+5	*	*	4	3.0	-	X	-	X	-	*
4B	*	0	*	*	4	10.0	-	X	-	X	-	*
4C	*	0	*	*	4	15.0	-	X	-	X	-	*
5A	*	0	*	*	5	15.0	-	X	-	X	-	*
					2	3.0	-	X	-	X	-	*
6A	*	300	*	*	6	-	1.6	X	-	X	-	*
6B	*	90	*	*	6	-	-	X	-	X	-	*
8A	*	+5	*	*	8	3.0	-	X	-	X	-	*
8B	*	+5	*	*	8	-	-	X	-	X	-	*

*Video Detection Zone



MAXTIME TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Walk *	–	–	–	–	–	–
Ped Clear *	–	–	–	–	–	–
Min Green	7	12	7	7	12	7
Passage *	2.0	2.0	2.0	2.0	2.0	2.0
Max 1 *	25	60	20	15	60	20
Yellow Change	3.0	4.5	4.5	3.0	4.5	3.8
Red Clear	2.3	1.2	1.2	1.9	1.2	1.4
Added Initial *	–	–	–	–	–	–
Maximum Initial *	–	–	–	–	–	–
Time Before Reduction *	–	–	–	–	–	–
Time To Reduce *	–	–	–	–	–	–
Minimum Gap	–	–	–	–	–	–
Advance Walk	–	–	–	–	–	–
Non Lock Detector	X	–	X	X	–	–
Vehicle Recall	–	MIN RECALL	–	–	MIN RECALL	–
Dual Entry	–	–	X	–	–	X

* 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
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night operation unless otherwise directed by the Engineer.
3. Phase 1 and/or 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. Refer to Pavement Marking Plans for proposed stop bar locations.
7. Reposition existing signal heads as shown on this plan.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
○)	Signal Pole with Guy	●)
○⌐	Signal Pole with Sidewalk Guy	●⌐
○	Video Detector	●
▬	Video Detection Zone	N/A
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
-·-·-	2-in Underground Conduit	-·-·-
N/A	Right of Way	———
→	Directional Arrow	→
▬	Construction Zone	N/A
○	Wood Pole	●
Ⓐ	Right Arrow "ONLY" Sign R3-5R	Ⓐ
●	Drum	N/A
◉	Skinny Drum	N/A

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

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New Installation - Temporary Design 1 (Phase 8)

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

US 421 - NC 16
at
SR 1323 (Dancy Road)/
Lowe's Entrance

Division 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M.L. Stygles
PREPARED BY:	S.R. Chiluka	REVIEWED BY:	J. Ma

REVISIONS	INIT.	DATE

SCALE: 0 40 — 1"=40'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 047250 ENGINEER SRILATHA R CHILUKA

Developed by: SRChiluka 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1332TI

3/1/2023 10:06:10 PM
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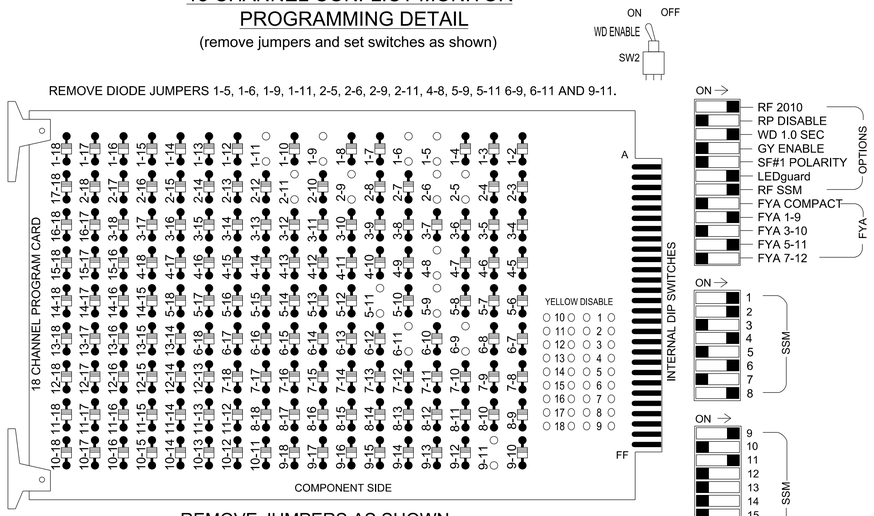
schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.3.1

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program phases 4 and 8 for Dual Entry.
3. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11★	82	21,22	NU	NU	41,42	NU	51★	61,62	NU	NU	81,82	NU	11★	NU	NU	51★	NU	NU
RED	·	*	128	·	·	101	·	·	134	·	·	107	·	·	·	·	·	·	·
YELLOW	·	·	129	·	·	102	·	*	135	·	·	108	·	·	·	·	·	·	·
GREEN	·	·	130	·	·	103	·	·	136	·	·	109	·	·	·	·	·	·	·
RED ARROW	·	·	·	·	·	·	·	·	·	·	·	·	A121	·	·	A114	·	·	·
YELLOW ARROW	·	128	·	·	·	·	·	·	·	·	·	·	A122	·	·	A115	·	·	·
FLASHING YELLOW ARROW	·	·	·	·	·	·	·	·	·	·	·	·	A123	·	·	A116	·	·	·
GREEN ARROW	127	127	·	·	·	·	·	133	·	·	·	·	·	·	·	·	·	·	·

NU = Not Used

*Denotes install load resistor. See load resistor installation detail this sheet.

★See pictorial of head wiring in detail this sheet.

EQUIPMENT INFORMATION

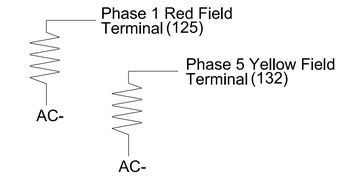
Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1, S2, S5, S7, S8, S11, AUX S1, AUX S2
Phases Used.....1, 2, 4, 5, 6, 8
Overlap "1".....*
Overlap "2".....NOT USED
Overlap "3".....*
Overlap "4".....NOT USED

*See overlap programming detail this sheet

LOAD RESISTOR INSTALLATION DETAIL

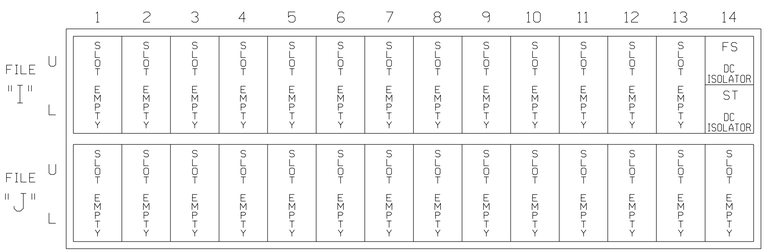
(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



INPUT FILE POSITION LAYOUT

(front view)



SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO ENSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

OVERLAP PROGRAMMING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

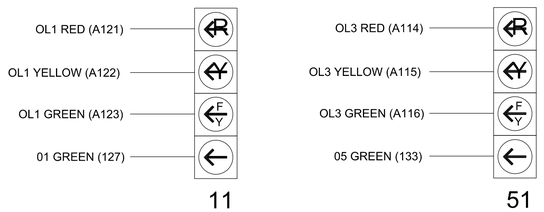
Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	3
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	2	6
Modifier Phases	1	5
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 11-1332T1
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED: N/A

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

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Temporary Installation - Electrical Detail 1 of 1 (Phase 8)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 421 - NC 16
at
SR 1323 (Dancy Rd)/
Lowe's Entrance

Division 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M.L.Styles
PREPARED BY:	S.R.Chiluka	REVIEWED BY:	J.Ma

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

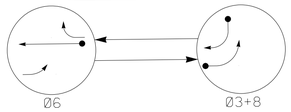
DocuSigned by: 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1332T1

Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.3.2

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.

All Heads L.E.D.

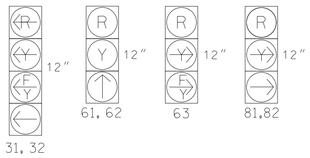


TABLE OF OPERATION			
SIGNAL FACE	PHASE Ø6	PHASE Ø3+8	FLASH
31,32	F Y	←	←Y
61,62	↑	R	Y
63	F Y →	R	Y →
81,82	R	→	R

MAXTIME DETECTOR INSTALLATION CHART

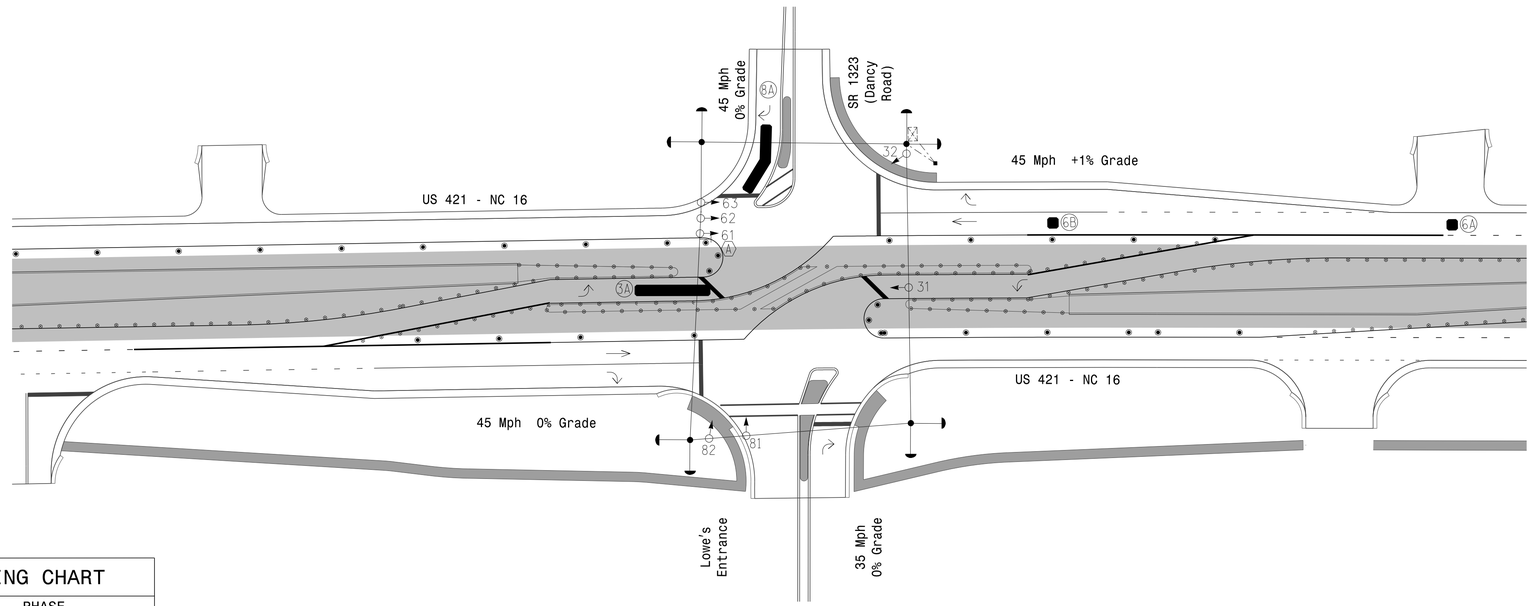
DETECTOR						PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	*	0	*	*	3	15.0	-	X	-	X	-	*
6A	*	300	*	*	6	-	1.6	X	-	X	-	*
6B	*	90	*	*	6	-	-	X	-	X	-	*
8A	*	0	*	*	4	15.0	-	X	-	X	-	*

*Video Detection Zone

2 Phase Fully Actuated (Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. This intersection uses video detection. Install detectors according to the manufacturer's instructions to schieve the desitred detection.
5. Refer to Pavement Marking Plans for proposed stop bar locations.
6. Reposition existing signal heads as shown on this plan.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Video Detector	
	Video Detection Zone	N/A
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone	N/A
	Wood Pole	
	No Left Turn Sign (R3-2)	
	Drum	N/A
	Skinny Drum	N/A

MAXTIME TIMING CHART

FEATURE	PHASE 3	PHASE 6	PHASE 8
Walk *	–	–	7
Ped Clear *	–	–	12
Min Green	7	12	7
Passage *	2.0	2.0	2.0
Max 1 *	30	60	30
Yellow Change	3.0	4.4	3.0
Red Clear	2.4	1.3	1.4
Added Initial *	–	–	–
Maximum Initial *	–	–	–
Time Before Reduction *	–	–	–
Time To Reduce *	–	–	–
Minimum Gap	–	–	–
Advance Walk	–	–	–
Non Lock Detector	X	–	X
Vehicle Recall	–	MIN RECALL	–
Dual Entry	X	–	X

* 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.

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Raleigh, NC 27606
919.829.0328

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Signal Upgrade - Temporary Design 2(Phase 9)

Prepared for the Offices of:
Traffic Engineering Branch
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 421 - NC 16
at
SR 1323 (Dancy Road)

Divsion 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M.L. Stygles
PREPARED BY:	S.R. Chiluka	REVIEWED BY:	J. Ma

SCALE: 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 047250 ENGINEER SRILATHA R CHILUKA

Docusigned by: SRChiluka 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-I332T2

2/14/2023 6:30:44 AM
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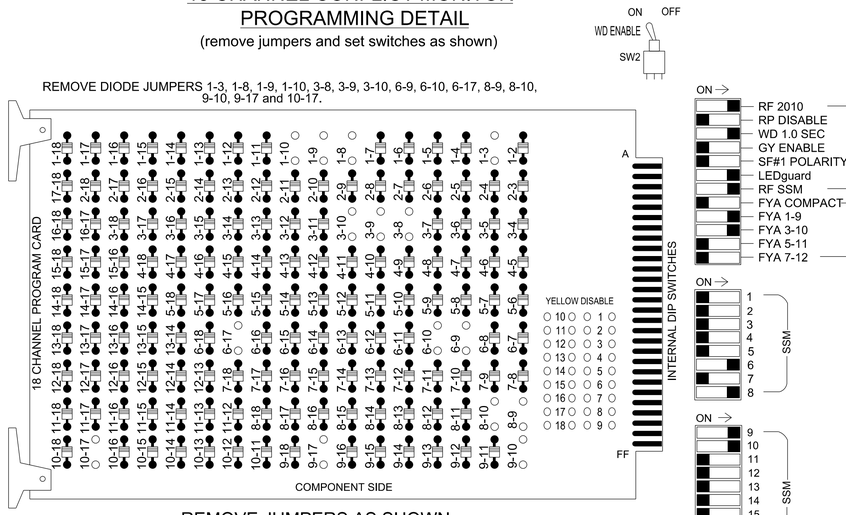
schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.3.3

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



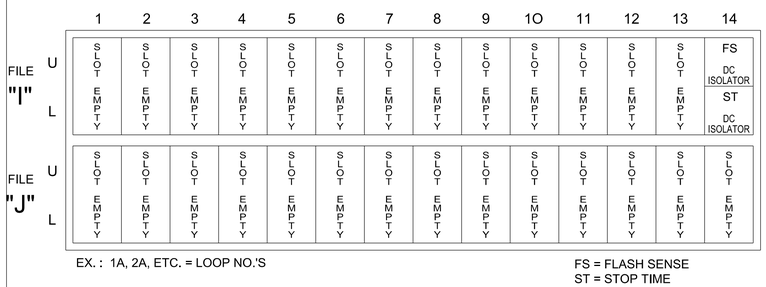
REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

INPUT FILE POSITION LAYOUT

(front view)



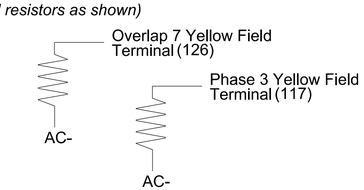
SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1,S4,S8,S11,AUX S1,AUX S2,AUX S3
Phases Used.....3, 6, 8
Overlap "1".....*
Overlap "2".....*
Overlap "3".....NOT USED
Overlap "4".....NOT USED
Overlap "5".....*

*See overlap programming detail on sheet 2.

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

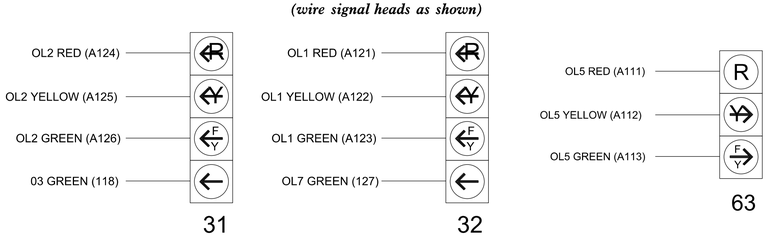
Channel Configuration

ASSIGN CHANNEL 1 TO OVERLAP 7 →

Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
1	Overlap	7	·	X	X	1
2	Phase Vehicle	2	X	·	·	2
3	Phase Vehicle	3	·	X	X	3
4	Phase Vehicle	4	·	X	·	4
5	Phase Vehicle	5	·	X	·	5
6	Phase Vehicle	6	X	·	X	6
7	Phase Vehicle	7	·	X	·	7
8	Phase Vehicle	8	·	X	X	8
9	Overlap	1	X	·	X	9
10	Overlap	2	X	·	X	10
11	Overlap	3	X	·	·	11
12	Overlap	4	·	X	·	12
13	Phase Ped	2	·	·	·	13
14	Phase Ped	4	·	·	·	14
15	Phase Ped	6	·	·	·	15
16	Phase Ped	8	·	·	·	16
17	Overlap	5	X	·	X	17
18	Overlap	6	·	X	·	18

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	OL7	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	32★	NU	NU	31★	NU	NU	NU	61,62	NU	NU	81,82	NU	32★	31★	63★	NU	NU	NU
RED	·	·	·	·	·	·	·	134	·	·	107	·	·	·	A111	·	·	·
YELLOW	★	·	·	★	·	·	·	135	·	·	·	·	·	·	·	·	·	·
GREEN	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
RED ARROW	·	·	·	·	·	·	·	·	·	·	·	·	A121	A124	·	·	·	·
YELLOW ARROW	·	·	·	·	·	·	·	·	·	·	108	·	A122	A125	A112	·	·	·
FLASHING YELLOW ARROW	·	·	·	·	·	·	·	·	·	·	·	·	A123	A126	A113	·	·	·
GREEN ARROW	127	·	·	118	·	·	·	136	·	·	109	·	·	·	·	·	·	·
✋																		
🚶																		

NU = Not Used
★ Denotes install load resistor. See load resistor installation detail this sheet.
★ See pictorial of head wiring in detail this sheet.

OVERLAP PROGRAMMING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	2	5	7
Type	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	Normal
Included Phases	6	6	6	3
Modifier Phases	3	3	-	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 11-1332T2
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED: N/A

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

US 421 - NC 16
at
SR 1323 (Dancy Rd)/

Division 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M.L.Styles
PREPARED BY:	S.R.Chiluka	REVIEWED BY:	J.Ma

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by:
SIGNATURE 5/24/2023 DATE

SIG. INVENTORY NO. 11-1332T2

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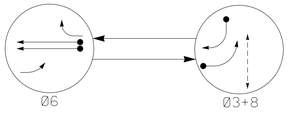
schiluka

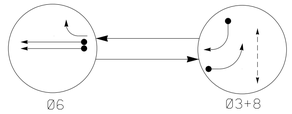
PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.3.4

2 Phase
Fully Actuated
W/ Alternate Phasing Operation
Wilkesboro Closed Loop System

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø6	PHASE Ø3+8	PHASE FLASH
31,32	F Y	←	Y
61,62	↑	R	Y
63	F Y	R	Y
81,82	R	→	R
P81,P82	DW	W	DRK

ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø3	PHASE Ø3+8	PHASE FLASH
31,32	R	←	Y
61,62	↑	R	Y
63	F Y	R	Y
81,82	R	→	R
P81,P82	DW	W	DRK

MAXTIME DETECTOR INSTALLATION CHART

DETECTOR						PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREE	NEW CARD
3A	6X40	0	2-4-2	X	3	15.0*	-	X	-	X	-	X
6A	6X6	300	4	X	6		-	X	X	X	-	X
6B	6X6	300	4	X	6		-	X	X	X	-	X
8A	6X40	0	2-4-2	X	8	15.0	-	X	-	X	-	X
S1	6X6	200	5	X	-	-	-	-	-	-	-	X

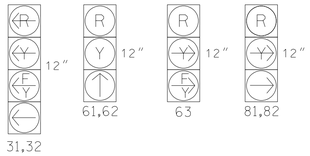
* Disable delay during alternate phasing operation

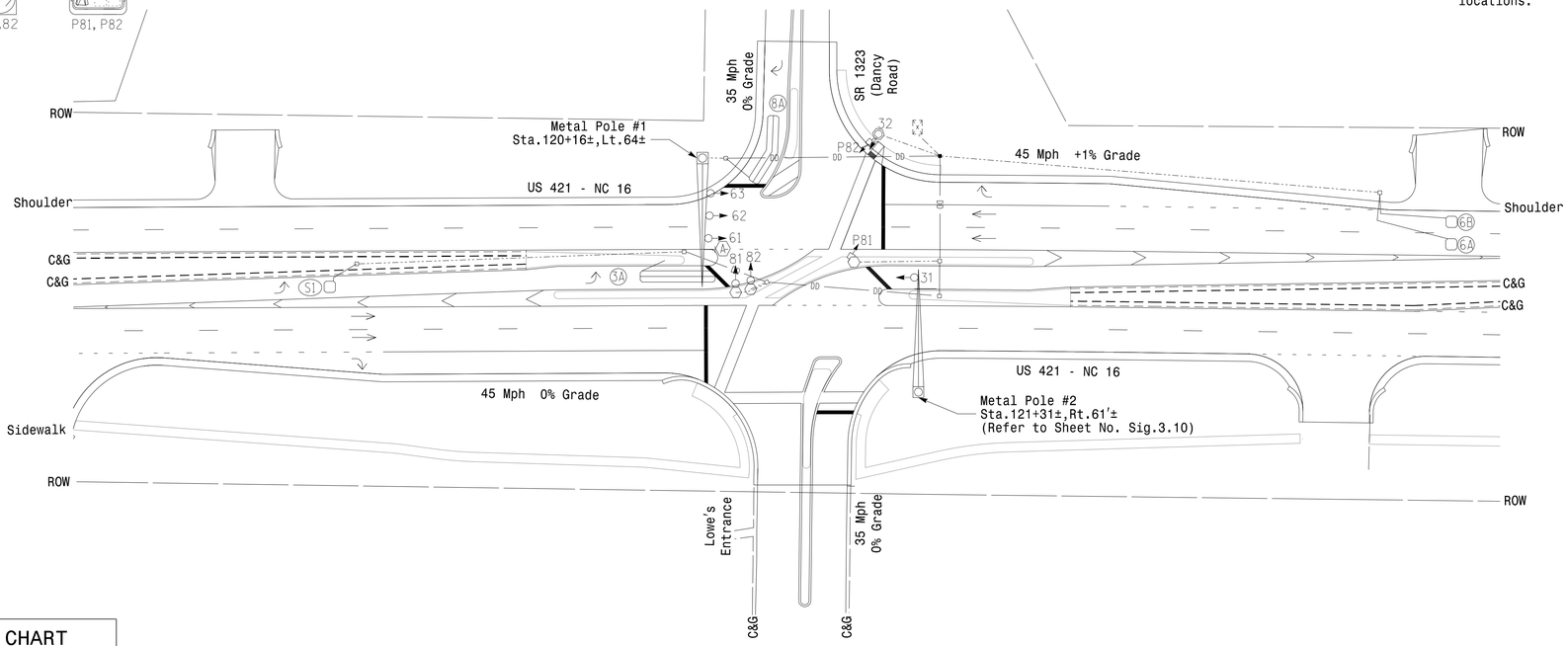
NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. The Division Traffic Engineer will determine the hours of use for each phasing plan.
5. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
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. Refer to Pavement Marking Plans for proposed stop bar locations.

SIGNAL FACE I.D.

All Heads L.E.D.





MAXTIME TIMING CHART

FEATURE	PHASE 3	PHASE 6	PHASE 8
Walk *	–	–	7
Ped Clear *	–	–	12
Min Green	7	12	7
Passage *	2.0	6.0	2.0
Max 1 *	30	60	30
Yellow Change	3.0	4.4	3.8
Red Clear	2.4	1.3	1.0
Added Initial *	–	1.5	–
Maximum Initial *	–	34	–
Time Before Reduction *	–	15	–
Time To Reduce *	–	30	–
Minimum Gap	–	3.4	–
Advance Walk	–	–	–
Non Lock Detector	X	–	X
Vehicle Recall	–	MIN RECALL	–
Dual Entry	X	–	X

* 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	
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Type 11 Signal Pedestal	
	Metal Pole with Mastarm	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
DD	Directional Drill	N/A
	Right of Way	
	Directional Arrow	
A	No Left Turn Sign (R3-2)	A
	Wheelchair Ramp	

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Signal Upgrade - Final Design

Prepared for 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 421-NC 16
at
SR 1323 (Dancy Road)

Divsion 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M. Stygles
PREPARED BY:	S.R. Chiluka	REVIEWED BY:	J. Ma

SCALE 0 40

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 047250 ENGINEER SRILATHA R CHILUKA

Developed by: SRChiluka
SIGNATURE 5/24/2023 DATE

SIG. INVENTORY NO. 11-1332

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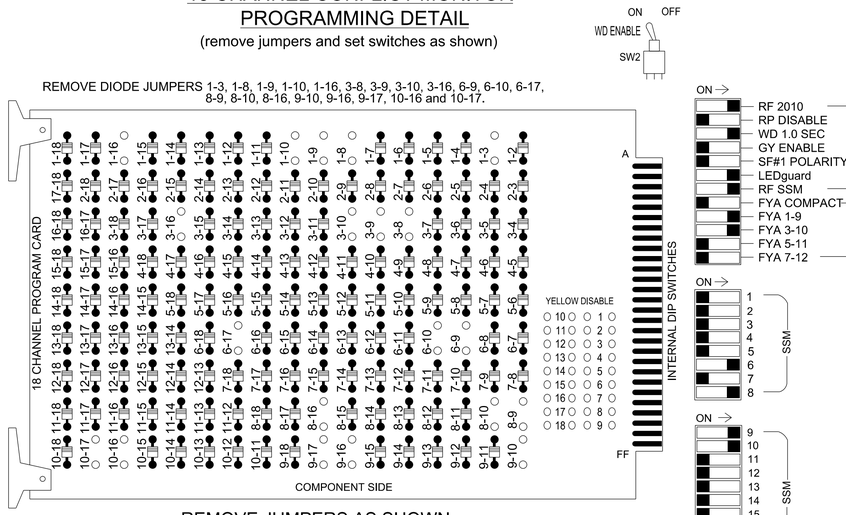
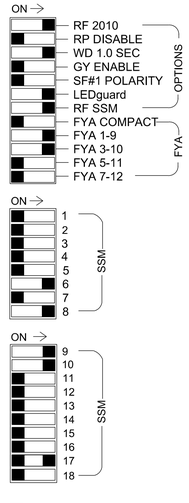
schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.3.5

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)





REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the Wilkesboro Closed Loop System.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1,S4,S8,S11,S12,AUX S1,AUX S2,AUX S3
Phases Used.....3,6,8,8PED
Overlap "1".....*
Overlap "2".....*
Overlap "3".....NOT USED
Overlap "4".....NOT USED
Overlap "5".....*
Overlap "7".....*

*See overlap programming detail on sheet 2.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	OL7	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	OL5	OL3	OL4	SPARE
SIGNAL HEAD NO.	32★	NU	NU	31★	NU	NU	NU	61,62	NU	NU	81,82	P81, P82	32★	31★	63★	NU	NU	NU
RED	·	·	·	·	·	·	·	134	·	·	107	·	·	·	A111	·	·	·
YELLOW	*	·	·	*	·	·	·	135	·	·	·	·	·	·	·	·	·	·
GREEN	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
RED ARROW	·	·	·	·	·	·	·	·	·	·	·	·	A121	A124	·	·	·	·
YELLOW ARROW	·	·	·	·	·	·	·	·	·	·	108	·	A122	A125	A112	·	·	·
FLASHING YELLOW ARROW	·	·	·	·	·	·	·	·	·	·	·	·	A123	A126	A113	·	·	·
GREEN ARROW	127	·	·	118	·	·	·	136	·	·	109	·	·	·	·	·	·	·
✋												104						
🚶												106						

NU = Not Used
* Denotes install load resistor. See load resistor installation detail this sheet.
★ See pictorial of head wiring in detail this sheet.

INPUT FILE POSITION LAYOUT

(front view)

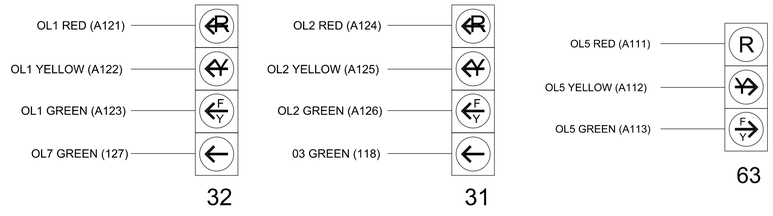
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	∅3 3A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SYS. DET. S1	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	NOT USED	FS DC ISOLATOR
	L					NOT USED				NOT USED				∅8 PED DC ISOLATOR	ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	∅6 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	∅8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L		∅6 6B				NOT USED								

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

FS = FLASH SENSE
ST = STOP TIME

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	QUEUE	CALL	DELAY DURING GREEN
3A	TB4-5,6	I5U	58	20	7	3	15		X			X	
*S1	TB6-9,10	I9U	60	22	13	SYS							
6A	TB3-5,6	J2U	40	2	16	6			X	X		X	
6B	TB3-7,8	J2L	44	6	17	6			X	X		X	
8A	TB5-9,10	J6U	42	4	22	8	15		X			X	
PED PUSH BUTTONS													
P81,P82	TB8-8,9	I13L	70	36	8	PED 8							

NOTE:
INSTALL DC ISOLATOR
IN INPUT FILE SLOT I13.

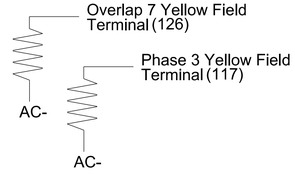
*System detector only. Remove any assigned vehicle phase.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1332
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED:

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

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Electrical Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:

NC Department of Transportation Mobility and Safety Division Traffic Engineering Branch Signals Management Section

750 N.Greenfield Pkwy.Garner,NC 27529

US 421-NC 16
at
SR 1323 (Dancy Road)

Division 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	J. Ma
PREPARED BY:	M.L. Stygles	REVIEWED BY:	S.R. Chiluka

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by: Matthew Stygles 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1332

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schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.3.6

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

To run alternate phasing, select a Pattern that is programmed to run Overlap Plan 2 and Detector Plan 2.
A Pattern can be selected through the scheduler or manually by changing the Operational Mode.

PHASING	OVERLAP PLAN	VEH DET PLAN
ACTIVE PLAN REQUIRED TO RUN DEFAULT PHASING	1	1
ACTIVE PLAN REQUIRED TO RUN ALTERNATE PHASING	2	2

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OF WHAT TAKES PLACE WHEN OVERLAP 2 AND VEHICLE DETECTOR PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

OVERLAP PLAN 2: Modifies overlap included phases for heads 31 and 32 to run protected turns only.

VEH DET PLAN 2: Reduces delay time for phase 3 call on loop 3A to 0 seconds.

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

ASSIGN CHANNEL 1 TO OVERLAP 7 →

Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
1	Overlap	7		X	X	1
2	Phase Vehicle	2	X			2
3	Phase Vehicle	3		X	X	3
4	Phase Vehicle	4		X		4
5	Phase Vehicle	5		X		5
6	Phase Vehicle	6	X		X	6
7	Phase Vehicle	7		X		7
8	Phase Vehicle	8		X	X	8
9	Overlap	1	X		X	9
10	Overlap	2	X		X	10
11	Overlap	3	X			11
12	Overlap	4		X		12
13	Phase Ped	2				13
14	Phase Ped	4				14
15	Phase Ped	6				15
16	Phase Ped	8				16
17	Overlap	5	X		X	17
18	Overlap	6		X		18

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

* The Pattern number(s) are to be determined by the Division and/or City Traffic Engineer.

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOP 3A

Front Panel
Main Menu >Controller >Detector >Veh Det Plans

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

3A

Detector	Call Phase	Delay
7	3	-

MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	2	5	7
Type	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	Normal
Included Phases	6	6	6	3
Modifier Phases	3	3	-	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	1	2	5	7
Type	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	Normal
Included Phases	-	-	6	3
Modifier Phases	3	3	-	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0

← NOTICE INCLUDED PHASE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1332
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED:

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

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Electrical Detail - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 421-NC 16
at
SR 1323 (Dancy Road)

Division 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	J. Ma
PREPARED BY:	M.L. Styles	REVIEWED BY:	S.R. Chiluka

REVISIONS	INIT.	DATE

Prepared for the Offices of:
Traffic Engineering Branch
Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Traffic Engineering & Signals Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by:
5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1332

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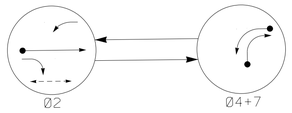
PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.3.7

2 Phase Fully Actuated (Isolated)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE 02	PHASE 04+07	PHASE FLASH
21,23	↑	R	Y
23	FY	R	Y
41,42	R	→	R
71,72	FY	←	Y
P21,P22	W	DW	DRK

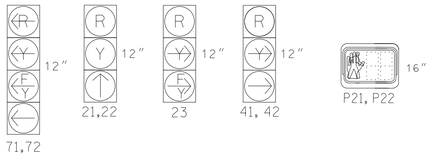
MAXTIME DETECTOR INSTALLATION CHART

DETECTOR						PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP		CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	✳	300	✳	✳		2	-	1.6	X	-	X	-	✳
2B	✳	90	✳	✳		2	-	-	X	-	X	-	✳
4A	✳	0	✳	✳		4	15.0	-	X	-	X	-	✳
7A	✳	0	✳	✳		7	15.0*	-	X	-	X	-	✳

*Video Detection Zone

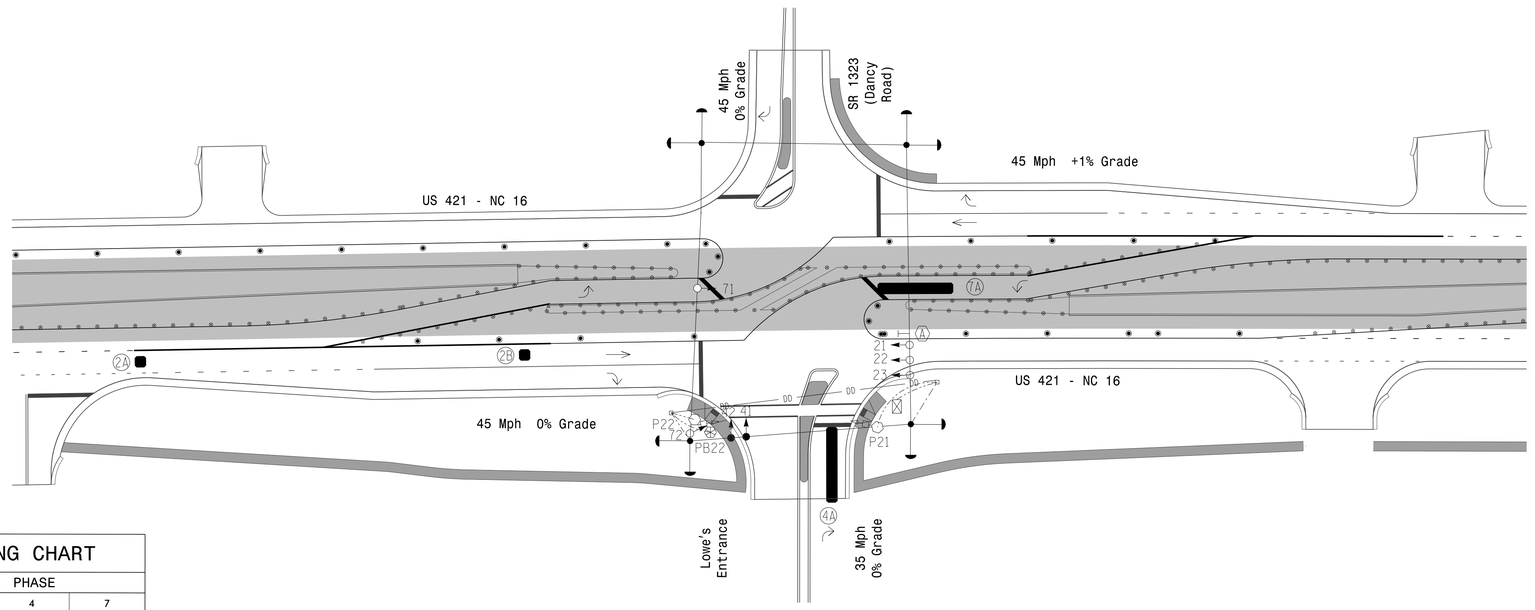
SIGNAL FACE I.D.

All Heads L.E.D.



NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. This intersection uses video detection. Install detectors according to the manufacturer's instructions to schieve the desitred detection.
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 pedestrain heads to countdown the flashing "Don't Walk" time only.
8. To provide a leading pedestrian interval on phase 6, program FYA heads 71,72 and 23 to delay for 3 seconds after the start of the phase 6 walk interval. See electrical details.
9. Refer to Pavement Marking Plans for proposed stop bar locations.
10. Reposition signal heads as shown on this plan.



LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
○	Signal Pole with Guy	●
○	Signal Pole with Sidewalk Guy	●
○>	Video Detector	●>
▬	Video Detection Zone	N/A
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
-----	2-in Underground Conduit	-----
N/A	Right of Way	———
→	Directional Arrow	→
▬	Construction Zone	N/A
○	Wood Pole	●
Ⓐ	No Left Turn Sign (R3-2)	Ⓐ
●	Drum	N/A
⬢	Skinny Drum	N/A

MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 7
Walk *	7	–	–
Ped Clear *	16	–	–
Min Green	12	7	7
Passage *	2.0	2.0	2.0
Max 1 *	60	30	30
Yellow Change	4.5	3.0	3.0
Red Clear	1.3	1.4	2.3
Added Initial *	–	–	–
Maximum Initial *	–	–	–
Time Before Reduction *	–	–	–
Time To Reduce *	–	–	–
Minimum Gap	–	–	–
Advance Walk	**	–	–
Non Lock Detector	–	X	X
Vehicle Recall	MIN RECALL	–	–
Dual Entry	–	X	X

* 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.

** See Note 8

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

New Installation - Temporary Design 1(Phase 9)

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

SCALE 0 40 1"=40'

US 421 - NC 16 at Lowe's Entrance

Divsion 11 Wilkes County Wilkesboro

PLAN DATE: May 2023 REVIEWED BY: M.L. Stygles
PREPARED BY: S.R. Chiluka REVIEWED BY: J. Ma

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 047250 ENGINEER SRILATHA R CHILUKA

DocuSigned by: SRChiluka 5/26/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1460T1

2/14/2012 6:30:44 AM
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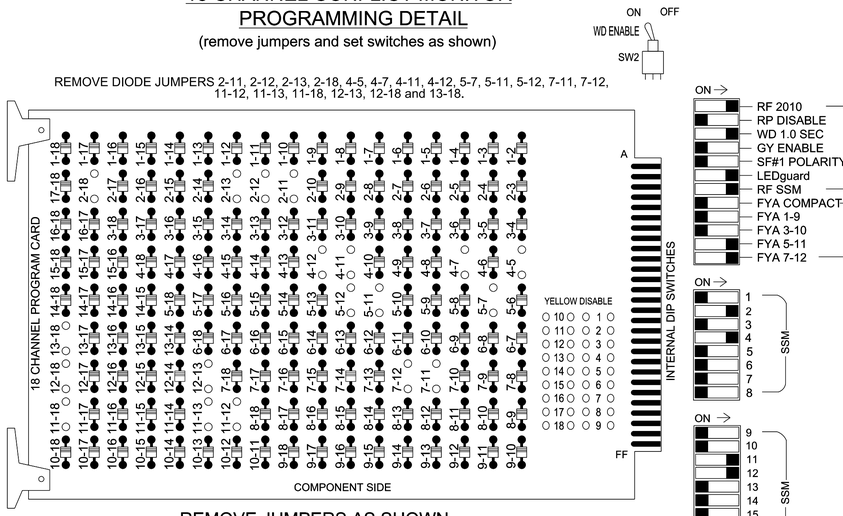
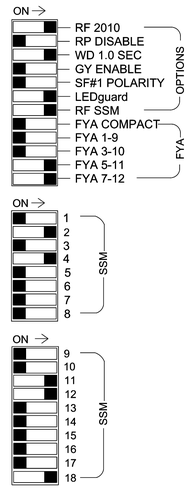
schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.3.8

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)





REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program phases 4 and 7 for Dual Entry.
3. Program controller to start up in phase 2 Green No Walk.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S2,S5,S7,S10,AUX S4,AUX S5,AUX S6
Phases Used.....2, 2 PED, 4, 7
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....*
Overlap "4".....*
Overlap "6".....*
Overlap "7".....*

*See overlap programming detail on sheet 2.

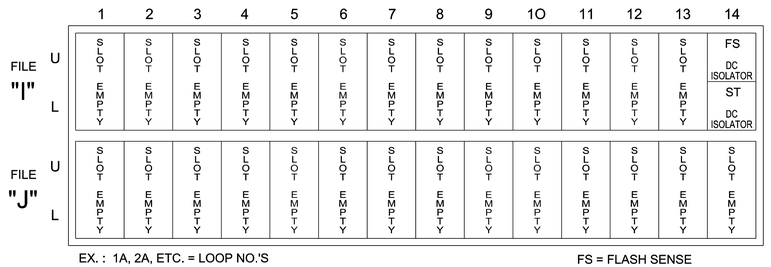
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	OL7	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	OL6
SIGNAL HEAD NO.	NU	21,22	P21, P22	NU	41,42	NU	72★	NU	NU	71★	NU	NU	NU	NU	NU	72★	71★	23★
RED	·	128	·	·	101	·	·	·	·	·	·	·	·	·	·	·	·	A104
YELLOW	·	129	·	·	·	·	✱	·	·	✱	·	·	·	·	·	·	·	·
GREEN	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
RED ARROW	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	A114	A101	·
YELLOW ARROW	·	·	·	·	102	·	·	·	·	·	·	·	·	·	·	A115	A102	A105
FLASHING YELLOW ARROW	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	A116	A103	A106
GREEN ARROW	·	130	·	·	103	·	133	·	·	124	·	·	·	·	·	·	·	·
✋			113															
🚶			115															

NU = Not Used
✱ Denotes install load resistor. See load resistor installation detail this sheet.
★ See pictorial of head wiring in detail this sheet.

INPUT FILE POSITION LAYOUT

(front view)



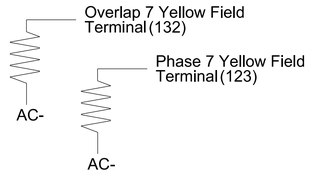
SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

LOAD RESISTOR INSTALLATION DETAIL

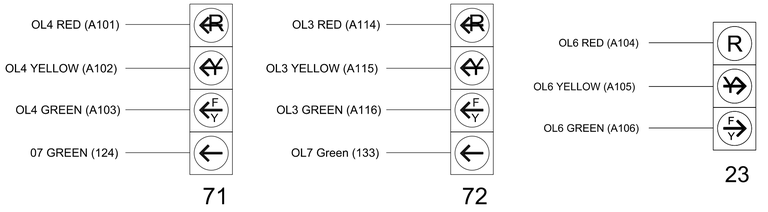
(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1460T
DESIGNED: May 2023
SEALED: 5/26/2023
REVISED:

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

Temporary Installation - Electrical Detail 1 of 2 (Phase 9)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Traffic Engineering Branch - Mobility and Safety Division
NC Department of Transportation
750 N.Greenfield Pkwy,Garner,NC 27529

US 421-NC 16
at
Lowe's Entrance

Division 11 Wilkes County Wilkesboro

PLAN DATE:	MaY 2023	REVIEWED BY:	J. Ma
PREPARED BY:	M.L. Stygles	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by: 5/26/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1460T

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schluko

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.3.9

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

ASSIGN CHANNEL 5 TO OVERLAP 7 →

Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
1	Phase Vehicle	1		X	X	1
2	Phase Vehicle	2	X			2
3	Phase Vehicle	3		X	X	3
4	Phase Vehicle	4		X		4
5	Overlap	7		X		5
6	Phase Vehicle	6	X		X	6
7	Phase Vehicle	7		X		7
8	Phase Vehicle	8		X	X	8
9	Overlap	1	X		X	9
10	Overlap	2		X	X	10
11	Overlap	3	X			11
12	Overlap	4	X			12
13	Phase Ped	2				13
14	Phase Ped	4				14
15	Phase Ped	6				15
16	Phase Ped	8				16
17	Overlap	5		X	X	17
18	Overlap	6	X			18

MAXTIME OVERLAP PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	3	4	6	7
Type	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	Normal
Included Phases	2	2	2	7
Modifier Phases	7	7	7	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0
FYA Ped Delay	3.0	3.0	3.0	0.0

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1460T
DESIGNED: May 2023
SEALED: 5/26/2023
REVISED:

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

Temporary Installation - Electrical Detail 2 of 2 (Phase 9)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:

750 N.Greenfield Pkwy,Garner,NC 27529

US 421-NC 16
at
Lowe's Entrance

Division 11 Wilkes County Wilkesboro

PLAN DATE:	MaY 2023	REVIEWED BY:	J. Ma
PREPARED BY:	M.L. Stygles	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by:
SIGNATURE 5/26/2023
DATE

SIG. INVENTORY NO. 11-1460T

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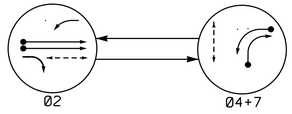
schiluka

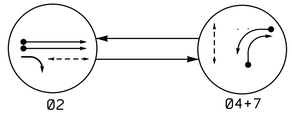
PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.3.10

2 Phase
Fully Actuated
W/ Alternate Phasing Operation
Wilkesboro Closed Loop System

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE 02	PHASE 04+7	PHASE FLASH
21,22	↑	R	Y
23	~~F Y~~	R	~~Y~~
41,42	R	→	R
71,72	~~F Y~~	←	~~Y~~
P21,P22	W	DW	DRK
P41,P42	DW	W	DRK

ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE 02	PHASE 04+7	PHASE FLASH
21,22	↑	R	Y
23	~~F Y~~	R	~~Y~~
41,42	R	→	R
71,72	~~R~~	←	~~Y~~
P21,P22	W	DW	DRK
P41,P42	DW	W	DRK

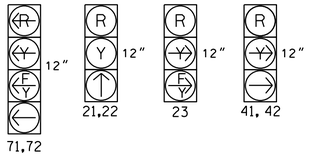
MAXTIME DETECTOR INSTALLATION CHART

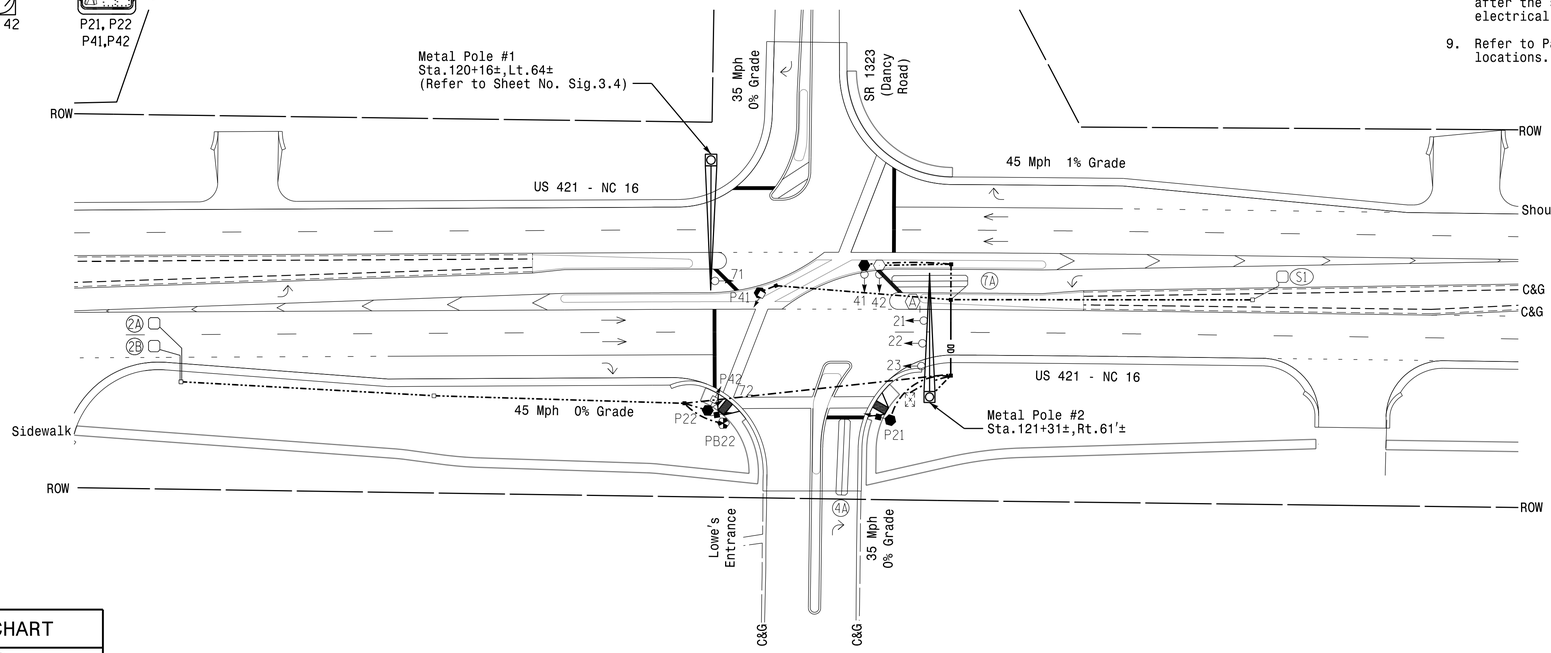
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	5	Y	2		-	X	X	X	-	X
2B	6X6	300	5	Y	2		-	X	X	X	-	X
4A	6X40	0	2-4-2	Y	4	15.0*	-	X	-	X	-	X
7A	6X40	0	2-4-2	Y	7	15.0	-	X	-	X	-	X
S1	6X6	200	3	Y	-	-	-	-	-	-	-	X

* Disable delay during alternate phasing operation

SIGNAL FACE I.D.

All Heads L.E.D.





MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 7
Walk *	7	7	–
Ped Clear *	17	12	–
Min Green	12	7	7
Passage *	6.0	2.0	2.0
Max 1 *	60	30	30
Yellow Change	4.5	3.0	3.0
Red Clear	1.3	1.9	2.3
Added Initial *	1.5	–	–
Maximum Initial *	34	–	–
Time Before Reduction *	15	–	–
Time To Reduce *	30	–	–
Minimum Gap	3.4	–	–
Advance Walk	**	–	–
Non Lock Detector	–	X	X
Vehicle Recall	MIN RECALL	–	–
Dual Entry	–	X	X

* 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.

* * See note 8

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
⊣	Sign	⊣
□↓	Pedestrian Signal Head With Push Button & Sign	■↓
⬡	Type II Signal Pedestal	⬢
⊛	Type I Push Button Post	⊛
○▭	Metal Pole with Mastarm	□▭
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⛶
□	Junction Box	■
-·-·-	2-in Underground Conduit	-·-·-
— DD —	Directional Drill	N/A
- - - -	Right of Way	- - - -
→	Directional Arrow	→
Ⓐ	No Left Turn Sign (R3-2)	Ⓐ
◢	Wheelchair Ramp	◢

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. The Division Traffic Engineer will determine the hours of use for each phasing plan.
5. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
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. To provide a leading pedestrian interval on phase 6, program FYA heads 71, 72 and 23 to delay for 3 seconds after the start of the phase 6 walk interval. See electrical details.
9. Refer to Pavement Marking Plans for proposed stopbar locations.

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

New Installation - Final Design

Prepared for 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 421-NC 16
at
Lowe's Entrance

Divsion 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M. Stygles
PREPARED BY:	S.R. Chiluka	REVIEWED BY:	J. Ma

SCALE 0 40

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 047250 ENGINEER SRINATHA R CHILUKA

Digitally signed by SRChiluka 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1460

5/24/2023 9:39:04 AM
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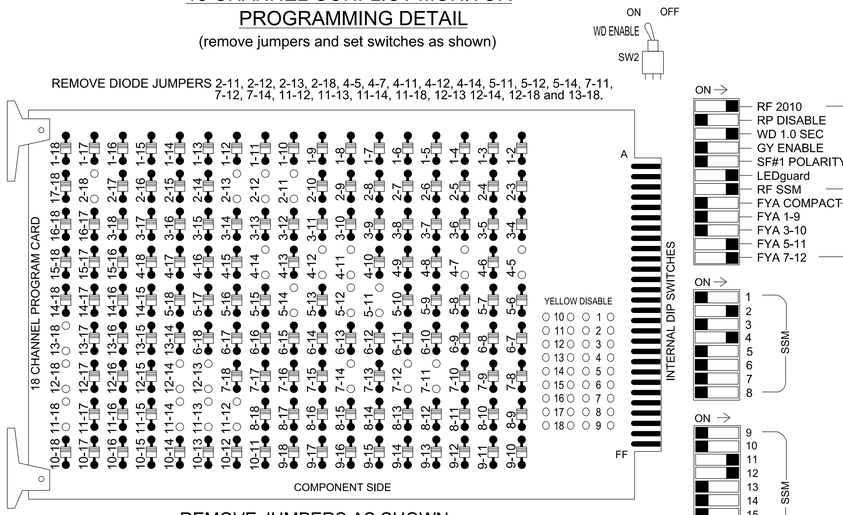
schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.3.11

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program phases 4 and 7 for Dual Entry.
3. Program controller to start up in phase 2 Green No Walk.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
5. The cabinet and controller are part of the Wilkesboro Closed Loop System.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S2,S3,S5,S6,S7,S10,AUX S4,AUX S5, AUX S6
Phases Used.....2, 2PED, 4, 4PED, 7
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....*
Overlap "4".....*
Overlap "6".....*
Overlap "7".....*

*See overlap programming detail on sheet 2.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	OL7	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	OL6
SIGNAL HEAD NO.	NU	21,22	P21, P22	NU	41,42	P41, P42	72★	NU	NU	71★	NU	NU	NU	NU	NU	72★	71★	23★
RED	·	128	·	·	101	·	·	·	·	·	·	·	·	·	·	·	·	A104
YELLOW	·	129	·	·	·	·	*	·	·	*	·	·	·	·	·	·	·	·
GREEN	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
RED ARROW	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	A114	A101	·
YELLOW ARROW	·	·	·	·	102	·	·	·	·	·	·	·	·	·	·	A115	A102	A105
FLASHING YELLOW ARROW	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	A116	A103	A106
GREEN ARROW	·	130	·	·	103	·	133	·	·	124	·	·	·	·	·	·	·	·
✋			113			104												
🚶			115			106												

NU = Not Used
* Denotes install load resistor. See load resistor installation detail this sheet.
★ See pictorial of head wiring in detail this sheet.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	∅2 2A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	∅4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	∅2 PED DC ISOLATOR	SLOT EMPTY	FS DC ISOLATOR
	L		∅2 2B				NOT USED						∅4 PED DC ISOLATOR		ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	∅7 7A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SYS. DET. S1	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L					NOT USED				NOT USED					

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	QUEUE	CALL	DELAY DURING GREEN
2A	TB2-5,6	I2U	39	1	2	2			X	X		X	
2B	TB2-7,8	I2L	43	5	3	2			X	X		X	
4A	TB4-9,10	I6U	41	3	8	4	15		X			X	
7A	TB5-5,6	J5U	57	19	21	7	15		X			X	
*S1	TB7-9,10	J9U	59	21	27	SYS			X			X	
PED PUSH BUTTONS													
P21,P22	TB8-4,6	I12U	67	33	2	PED 2							
P41,P42	TB8-5,6	I12L	69	35	4	PED 4							

NOTE:
INSTALL DC ISOLATOR IN INPUT FILE SLOT I12.

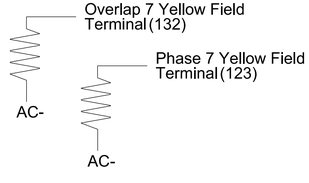
*System detector only. Remove any assigned vehicle phase.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

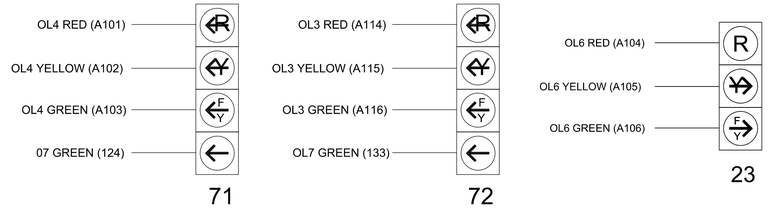
(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1460
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED: N/A

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

Electrical Detail - Sheet 1 of 2

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:

NC Department of Transportation Mobility and Safety Division Traffic Engineering Branch Signals Management Section

750 N.Greenfield Pkwy,Garner,NC 27529

US 421-NC 16
at
Lowe's Entrance

Division 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	J. Ma
PREPARED BY:	M.L. Stygles	REVIEWED BY:	S.R. Chiluka

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by: 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1460

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schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.3.12

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

To run alternate phasing, select a Pattern that is programmed to run Overlap Plan 2 and Detector Plan 2.
A Pattern can be selected through the scheduler or manually by changing the Operational Mode.

PHASING	OVERLAP PLAN	VEH DET PLAN
ACTIVE PLAN REQUIRED TO RUN DEFAULT PHASING	1	1
ACTIVE PLAN REQUIRED TO RUN ALTERNATE PHASING	2	2

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OF WHAT TAKES PLACE WHEN OVERLAP 2 AND VEHICLE DETECTOR PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

OVERLAP PLAN 2: Modifies overlap included phases for heads 71 and 72 to run protected turns only.

VEH DET PLAN 2: Reduces delay time for phase 7 call on loop 7A to 0 seconds.

MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	3	4	6	7
Type	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	Normal
Included Phases	2	2	2	7
Modifier Phases	7	7	-	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0
FYA Ped Delay	3.0	3.0	3.0	0.0

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
1	Phase Vehicle	1	·	X	X	1
2	Phase Vehicle	2	X	·	·	2
3	Phase Vehicle	3	·	X	X	3
4	Phase Vehicle	4	·	X	·	4
5	Overlap	7	·	X	·	5
6	Phase Vehicle	6	X	·	X	6
7	Phase Vehicle	7	·	X	·	7
8	Phase Vehicle	8	·	X	X	8
9	Overlap	1	X	·	X	9
10	Overlap	2	·	X	X	10
11	Overlap	3	X	·	·	11
12	Overlap	4	X	·	·	12
13	Phase Ped	2	·	·	·	13
14	Phase Ped	4	·	·	·	14
15	Phase Ped	6	·	·	·	15
16	Phase Ped	8	·	·	·	16
17	Overlap	5	·	X	X	17
18	Overlap	6	X	·	·	18

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	3	4	6	7	
Type	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	Normal	
Included Phases	-	-	2	7	← NOTICE INCLUDED PHASE
Modifier Phases	7	7	-	-	
Trail Green	0	0	0	0	
Trail Yellow	0.0	0.0	0.0	0.0	
Trail Red	0.0	0.0	0.0	0.0	
FYA Ped Delay	3.0	3.0	3.0	0.0	

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

* The Pattern number(s) are to be determined by the Division and/or City Traffic Engineer.

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOP 7A

Front Panel
Main Menu >Controller >Detector >Veh Det Plans

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

7A

Detector	Call Phase	Delay
21	7	-

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 11-1460
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED: N/A

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

Electrical Detail - Sheet 2 of 2

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 421-NC 16
at
Lowe's Entrance

Division 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	J. Ma
PREPARED BY:	M.L. Stygles	REVIEWED BY:	S.R. Chiluka

REVISIONS	INIT.	DATE

Prepared for the Offices of:
Traffic Engineering Branch
Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Traffic Engineering & Signals Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 046057 MATTHEW L. STYGLES

DocuSigned by: 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1460

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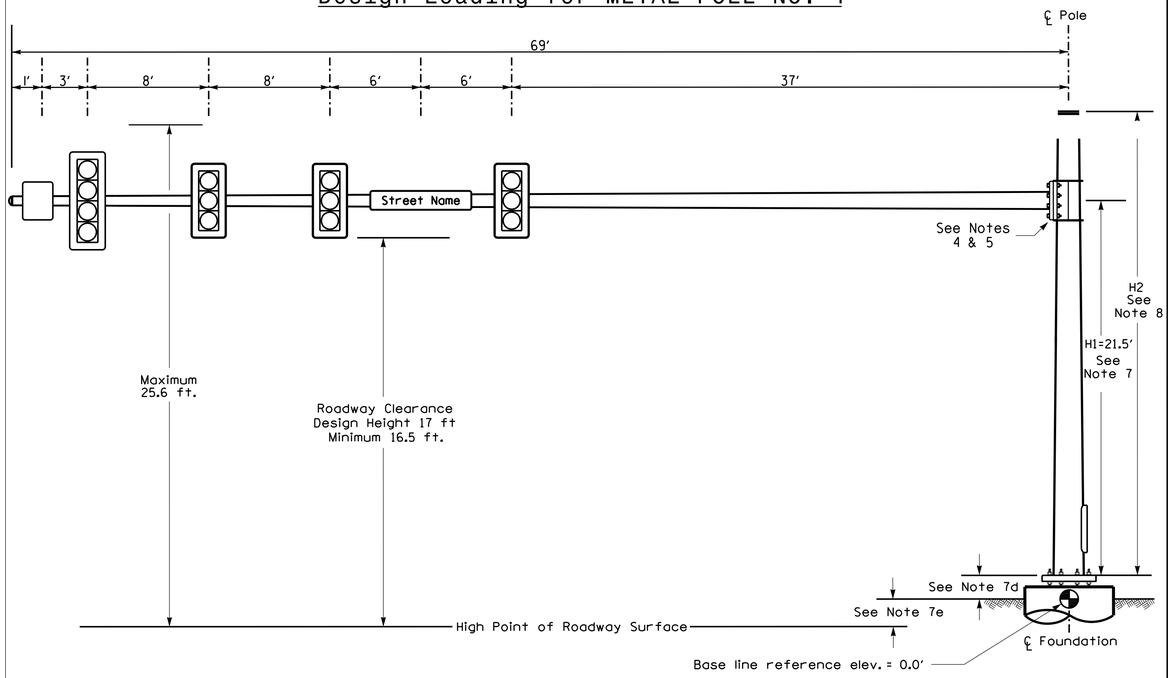
schiluka

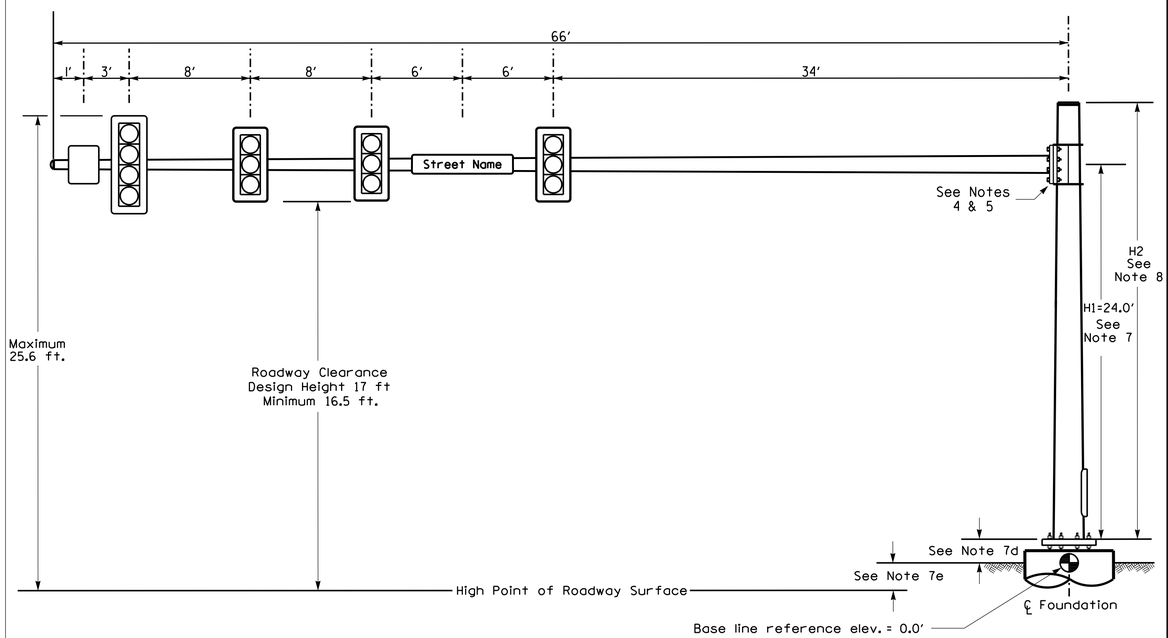
METAL POLE No. 1 and 2

Design Loading for METAL POLE NO. 1



Elevation View

Design Loading for METAL POLE NO. 2



Elevation View

SPECIAL NOTE

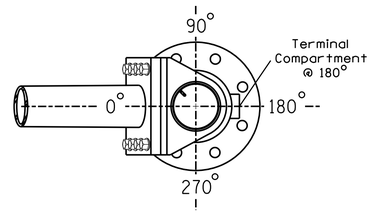
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

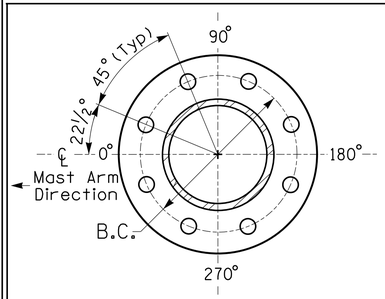
Elevation Differences for:	Pole 1	Pole 2
Baseline reference point at ⊕ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+0.5 ft.	+3.1 ft.
Elevation difference at Edge of travelway or face of curb	-0.4 ft.	+2.3 ft.

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5"W X 66.0"L	74 LBS
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5"W X 52.5"L	60 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0"W X 96.0"L	36 LBS
	SIGN RIGID MOUNTED	9.0 S.F.	36.0"W X 36.0"L	20 LBS

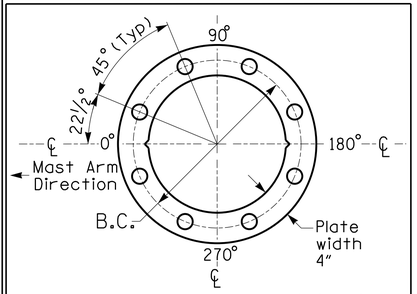


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

NOTES

DESIGN REFERENCE MATERIAL

1. Design the traffic signal structure and foundation in accordance with:
   - The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2018 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
   - The 2018 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

DESIGN REQUIREMENTS

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

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919.829.0328

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NCDOT Wind Zone 4 (90 mph)

Prepared for the Offices of: Transportation Mobility and Safety Division, North Carolina Department of Transportation, Signal Design Section

750 N.Greenfield Pkwy.Garner,NC 27529

US 421-NC 16
at
SR 1323 (Dancy Road)/
Lowe's Entrance

Division 11 | Wilkes County | Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M. Stygles
PREPARED BY:	S.R. Chiluka	REVIEWED BY:	J. Ma

SCALE 0 N/A

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 047250 ENGINEER SRILATHA R CHILUKA

Developed by SRChiluka 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. II-1332/1460

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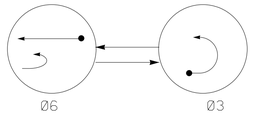
schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.4.0

PHASING DIAGRAM



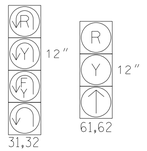
PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION			
SIGNAL FACE	PHASE Ø3	PHASE Ø6	FLASH
31,32			Y
61,62	R	↑	Y

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

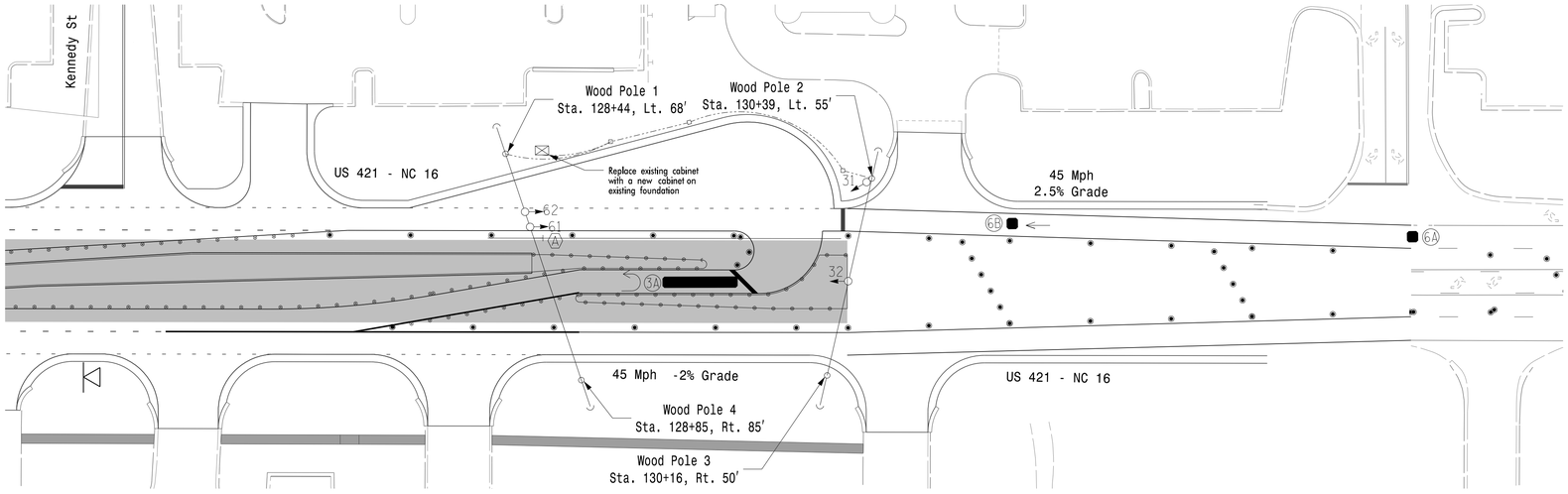
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	✳	0	✳	✳	3	15.0	-	X	-	X	-	✳
6A	✳	300	✳	✳	6	-	1.6	X	-	X	-	✳
6B	✳	90	✳	✳	6	-	-	X	-	X	-	✳

✳Video Detection Zone

2 Phase Fully Actuated (Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. This intersection uses video detection. Install detectors according to the manufacturer's instructions to schieve the desitred detection.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Refer to Pavement Marking Plans for proposed stop bar locations.



LEGEND

PROPOSED		EXISTING
	Curb Ramp	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Traffic Signal Head	
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Inductive Loop Detector	
	Video Detection Zone	N/A
	Construction Zone	N/A
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
	Right of Way	
E	Temporary Construction Easement	N/A
	Directional Arrow	
	Type II Signal Pedestal	
A	No Left Turn Sign (R3-2)	A
	Drum	N/A
	Skinny Drum	N/A

MAXTIME TIMING CHART

FEATURE	PHASE 3	PHASE 6
Walk *	–	–
Ped Clear *	–	–
Min Green	7	12
Passage *	2.0	2.0
Max 1 *	30	60
Yellow Change	3.0	4.3
Red Clear	3.3	1.0
Added Initial *	–	–
Maximum Initial *	–	–
Time Before Reduction *	–	–
Time To Reduce *	–	–
Minimum Gap	–	–
Advance Walk	–	–
Non Lock Detector	X	–
Vehicle Recall	–	MIN RECALL
Dual Entry	–	–

* 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.

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919.829.0328

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New Installation - Temporary Design 1(Phase 9)

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

US 421-NC 16 at SR 1323 (Dancy Road)/ Lowe's Entrance East U-Turn

Divsion 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M.L. Stygles
PREPARED BY:	S.R. Chiluka	REVIEWED BY:	J. Ma

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 047250 ENGINEER SRILATHA R CHILUKA

Developed by SRChiluka 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1468TI

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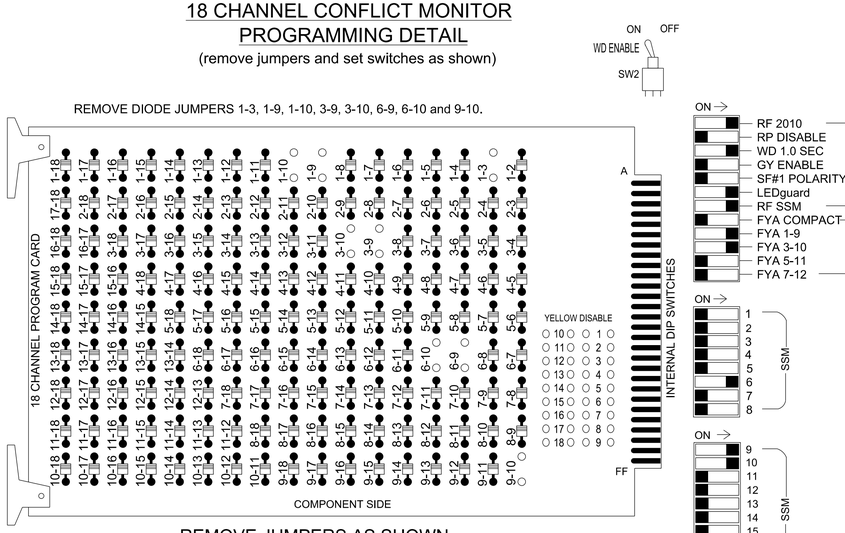
schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.4.1

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1,S4,S8,AUX S1,AUX S2
Phases Used.....3,6
Overlap "1".....NOT USED
Overlap "2".....*
Overlap "3".....NOT USED
Overlap "4".....NOT USED
Overlap "7".....*

*See overlap programming detail on sheet 2.

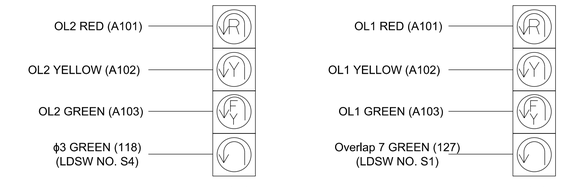
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	OL7	2	2 PED	3	4	4 PED	7	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	32★	NU	NU	31★	NU	NU	NU	61,62	NU	NU	NU	NU	32★	31★	NU	NU	NU	NU
RED	.	.	.	.	.	.	.	134	.	.	.	.	.	.	.	.	.	.
YELLOW	*	.	.	*	.	.	.	135	.	.	.	.	.	.	.	.	.	.
GREEN	.	.	.	.	.	.	.	136	.	.	.	.	.	.	.	.	.	.
RED ARROW	.	.	.	.	.	.	.	.	.	.	.	.	A121	A124	.	.	.	.
YELLOW ARROW	.	.	.	.	.	.	.	.	.	.	.	.	A122	A125	.	.	.	.
FLASHING YELLOW ARROW	.	.	.	.	.	.	.	.	.	.	.	.	A123	A126	.	.	.	.
GREEN ARROW	127	.	.	118	.	.	.	.	.	.	.	.	.	.	.	.	.	.

NU = Not Used
* Denotes install load resistor. See load resistor installation detail this sheet.
★ See pictorial of head wiring in detail this sheet.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L														ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L														

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

FS = FLASH SENSE
ST = STOP TIME

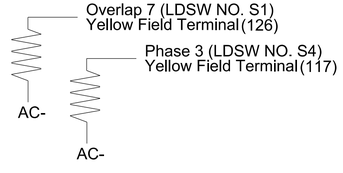
SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1468T1
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED: N/A

Temporary Installation - Electrical Detail 1 of 2
(Phase 9)

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
NC Department of Transportation Mobility and Safety Division Traffic Engineering Branch Signals & Signals Management Section

750 N.Greenfield Pkwy.Garner,NC 27529

US 421 - NC 16 at
SR 1323 (Dancy Road)/
Lowe's Entrance
East U-Turn

Division 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M.L.Stygles
PREPARED BY:	S.R.Chiluka	REVIEWED BY:	J.Ma

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by: Matthew L. Stygles 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1468T1

5/23/2023 3:15:01 PM
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schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.4.2

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

ASSIGN CHANNEL 1 TO OVELAP 7 →

Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
1	Overlap	7		X	X	1
2	Phase Vehicle	2	X			2
3	Phase Vehicle	3		X	X	3
4	Phase Vehicle	4		X		4
5	Phase Vehicle	5		X		5
6	Phase Vehicle	6	X		X	6
7	Phase Vehicle	7		X		7
8	Phase Vehicle	8		X	X	8
9	Overlap	1	X		X	9
10	Overlap	2	X		X	10
11	Overlap	3	X			11
12	Overlap	4		X		12
13	Phase Ped	2				13
14	Phase Ped	4				14
15	Phase Ped	6				15
16	Phase Ped	8				16
17	Overlap	5		X	X	17
18	Overlap	6		X		18

MAXTIME OVERLAP PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	2	7
Type	FYA 4 - Section	FYA 4 - Section	Normal
Included Phases	6	6	3
Modifier Phases	3	3	-
Trail Green	0	0	0
Trail Yellow	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1468T1
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED: N/A

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

Temporary Installation - Electrical Detail 2 of 2
(Phase 9)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 421 - NC 16 at
SR 1323 (Dancy Road)/
Lowe's Entrance
East U-Turn

Division 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M.L.Stygles
PREPARED BY:	S.R.Chiluka	REVIEWED BY:	J.Ma

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by:
5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1468T1

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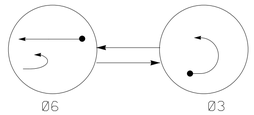
schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.4.3

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

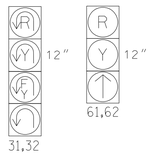
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø3	PHASE Ø6	PHASE FLASH
31,32			
61,62	R	↑	Y

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

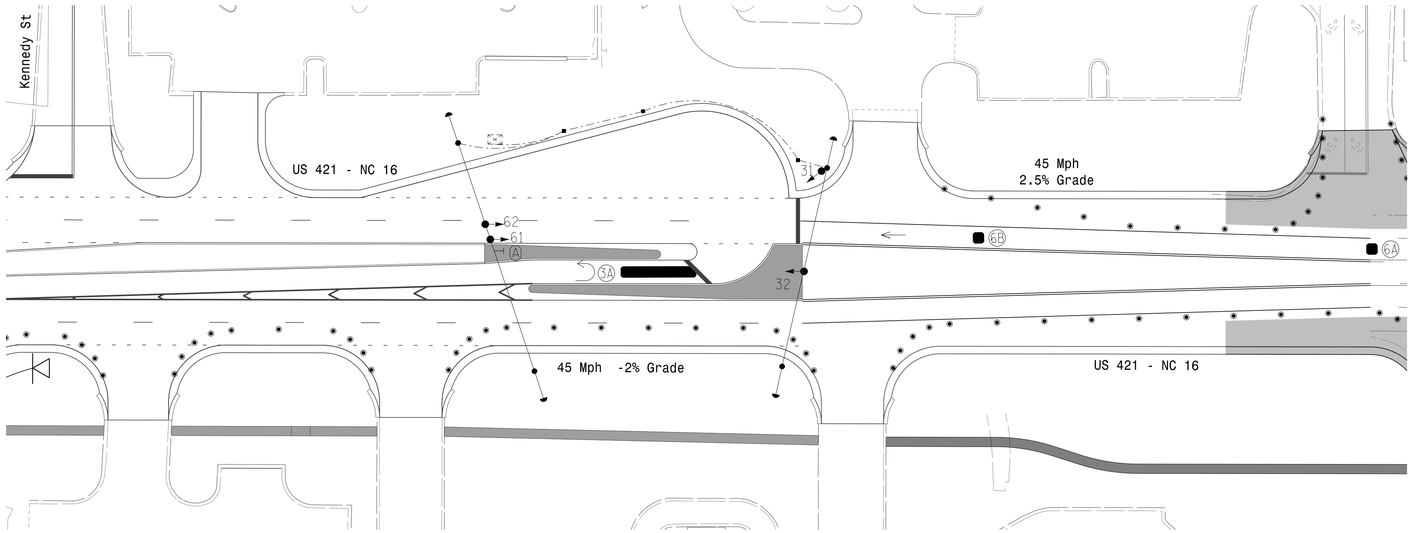
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	*	0	*	*	3	15.0	-	X	-	X	-	*
6A	*	300	*	*	6	-	1.6	X	-	X	-	*
6B	*	90	*	*	6	-	-	X	-	X	-	*

*Video Detection Zone

2 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. This intersection uses video detection. Install detectors according to the manufacturer's instructions to schieve the desitred detection.
5. Refer to Pavement Marking Plans for proposed stop bar locations.



LEGEND

PROPOSED		EXISTING
	Curb Ramp	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Traffic Signal Head	
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Inductive Loop Detector	
	Video Detection Zone	N/A
	Construction Zone	N/A
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
	Right of Way	
E	Temporary Construction Easement	N/A
	Directional Arrow	
	Type II Signal Pedestal	
A	No Left Turn Sign (R3-2)	A
	Drum	N/A
	Skinny Drum	N/A

MAXTIME TIMING CHART

FEATURE	PHASE 3	PHASE 6
Walk *	–	–
Ped Clear *	–	–
Min Green	7	12
Passage *	2.0	2.0
Max 1 *	30	60
Yellow Change	3.0	4.3
Red Clear	3.3	1.0
Added Initial *	–	–
Maximum Initial *	–	–
Time Before Reduction *	–	–
Time To Reduce *	–	–
Minimum Gap	–	–
Advance Walk	–	–
Non Lock Detector	X	–
Vehicle Recall	–	MIN RECALL
Dual Entry	–	–

* 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.

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940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

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Temporary Design 2 (Phase 10)

Prepared for 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 421-NC 16 at
SR 1323 (Dancy Road)/
Lowe's Entrance
East U-Turn

Divsion 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M.L. Stygles
PREPARED BY:	S.R. Chiluka	REVIEWED BY:	J. Ma

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 047250 ENGINEER SRILATHA R CHILUKA

Developed by: SRChiluka 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1468T2

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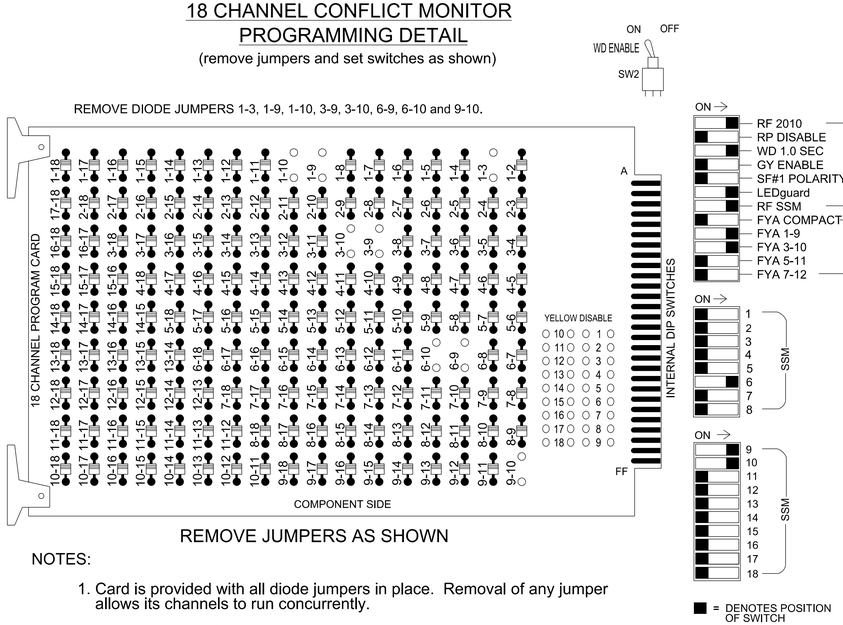
schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.4.4

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

■ = DENOTES POSITION OF SWITCH

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1,S4,S8,AUX S1,AUX S2
Phases Used.....3,6
Overlap "1".....NOT USED
Overlap "2".....*
Overlap "3".....NOT USED
Overlap "4".....NOT USED
Overlap "7".....*

*See overlap programming detail on sheet 2.

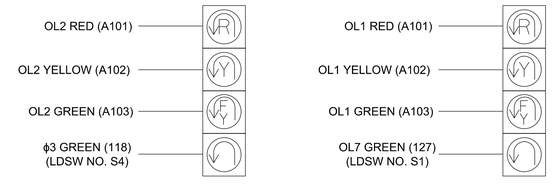
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	OL7	2	2 PED	3	4	4 PED	7	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	32★	NU	NU	31★	NU	NU	NU	61,62	NU	NU	NU	NU	32★	31★	NU	NU	NU	NU
RED	.	.	.	.	.	.	.	134	.	.	.	.	.	.	.	.	.	.
YELLOW	*	.	.	*	.	.	.	135	.	.	.	.	.	.	.	.	.	.
GREEN	.	.	.	.	.	.	.	136	.	.	.	.	.	.	.	.	.	.
RED ARROW	.	.	.	.	.	.	.	.	.	.	.	.	A121	A124	.	.	.	.
YELLOW ARROW	.	.	.	.	.	.	.	.	.	.	.	.	A122	A125	.	.	.	.
FLASHING YELLOW ARROW	.	.	.	.	.	.	.	.	.	.	.	.	A123	A126	.	.	.	.
GREEN ARROW	127	.	.	118	.	.	.	.	.	.	.	.	.	.	.	.	.	.

NU = Not Used
* Denotes install load resistor. See load resistor installation detail this sheet.
★ See pictorial of head wiring in detail this sheet.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L														ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L														

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

FS = FLASH SENSE
ST = STOP TIME

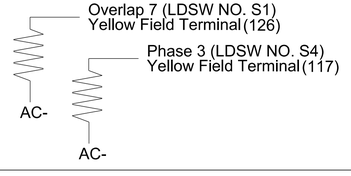
SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1468T2
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED: N/A

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

Temporary Installation - Electrical Detail 1 of 2
(Phase 10)

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
NC Department of Transportation Mobility and Safety Division Traffic Engineering Branch Signals & Management Section

750 N.Greenfield Pkwy,Garner,NC 27529

US 421 - NC 16 at
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East U-Turn

Division 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M.L.Stygles
PREPARED BY:	S.R.Chiluka	REVIEWED BY:	J.Ma

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by: Matthew Stygles 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1468T2

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schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.4.5

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

ASSIGN CHANNEL 1 TO OVELAP 7 →

Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
1	Overlap	7		X	X	1
2	Phase Vehicle	2	X			2
3	Phase Vehicle	3		X	X	3
4	Phase Vehicle	4		X		4
5	Phase Vehicle	5		X		5
6	Phase Vehicle	6	X		X	6
7	Phase Vehicle	7		X		7
8	Phase Vehicle	8		X	X	8
9	Overlap	1	X		X	9
10	Overlap	2	X		X	10
11	Overlap	3	X			11
12	Overlap	4		X		12
13	Phase Ped	2				13
14	Phase Ped	4				14
15	Phase Ped	6				15
16	Phase Ped	8				16
17	Overlap	5		X	X	17
18	Overlap	6		X		18

MAXTIME OVERLAP PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	2	7
Type	FYA 4 - Section	FYA 4 - Section	Normal
Included Phases	6	6	3
Modifier Phases	3	3	-
Trail Green	0	0	0
Trail Yellow	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1468T2
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED: N/A

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

Temporary Installation - Electrical Detail 2 of 2
(Phase 10)

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Prepared for the Offices of:

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DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section

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Division 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M.L.Stygles
PREPARED BY:	S.R.Chiluka	REVIEWED BY:	J.Ma

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by:
SIGNATURE 5/24/2023 DATE

SIG. INVENTORY NO. 11-1468T2

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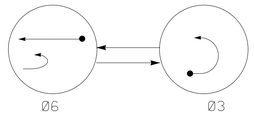
schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.4.6

PHASING DIAGRAM



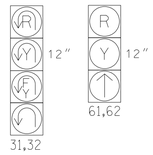
PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION			
SIGNAL FACE	PHASE Ø 3	PHASE Ø 6	FLASH
31,32		Y	Y
61,62	R		Y

SIGNAL FACE I.D.

All Heads L.E.D.



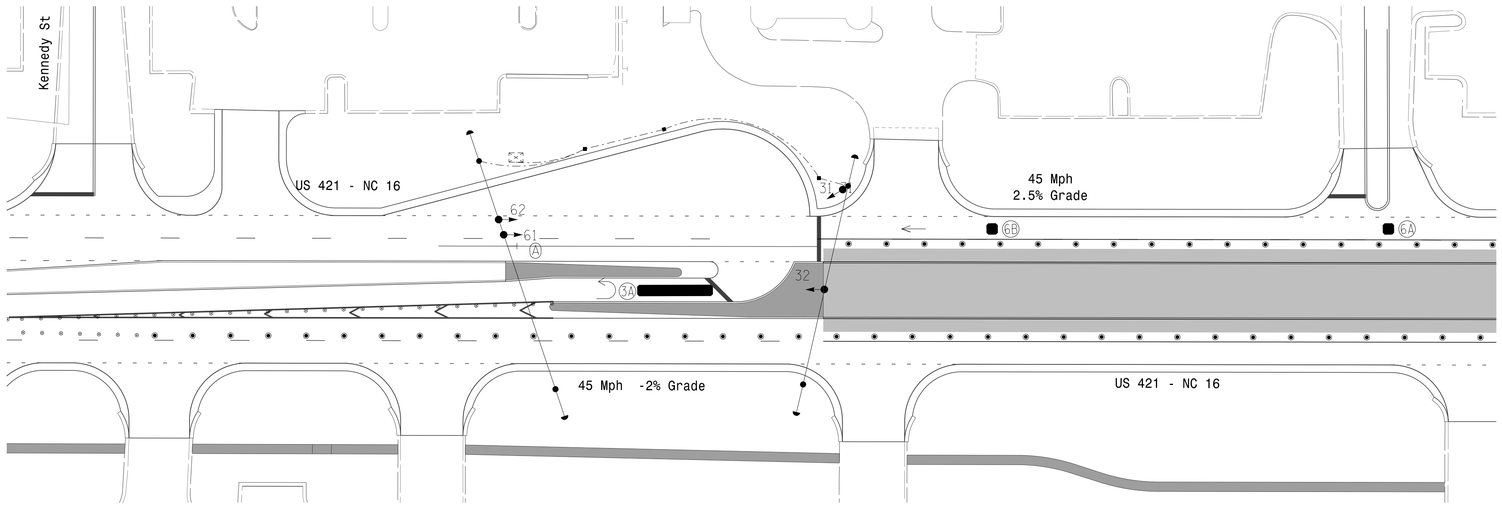
MAXTIME DETECTOR INSTALLATION CHART													
DETECTOR					PROGRAMMING								
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	✳	0	✳	✳	3	15.0	-	X	-	X	-	✳
6A	✳	300	✳	✳	6	-	1.6	X	-	X	-	✳
6B	✳	90	✳	✳	6	-	-	X	-	X	-	✳

✳Video Detection Zone

2 Phase Fully Actuated (Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. This intersection uses video detection. Install detectors according to the manufacturer's instructions to schieve the desired detection.
5. Refer to Pavement Marking Plans for proposed stop bar locations.



MAXTIME TIMING CHART		
FEATURE	PHASE 3	PHASE 6
Walk *	–	–
Ped Clear *	–	–
Min Green	7	12
Passage *	2.0	2.0
Max 1 *	30	60
Yellow Change	3.0	4.3
Red Clear	3.3	1.0
Added Initial *	–	–
Maximum Initial *	–	–
Time Before Reduction *	–	–
Time To Reduce *	–	–
Minimum Gap	–	–
Advance Walk	–	–
Non Lock Detector	X	–
Vehicle Recall	–	MIN RECALL
Dual Entry	–	–

* 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
	Curb Ramp	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Traffic Signal Head	
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Inductive Loop Detector	
	Video Detection Zone	N/A
	Construction Zone	N/A
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
	Right of Way	
E	Temporary Construction Easement	N/A
	Directional Arrow	
	Type II Signal Pedestal	
A	No Left Turn Sign (R3-2)	A
	Drum	N/A
	Skinny Drum	N/A

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Signal Upgrade - Temporary Design 3(Phase 11)

Prepared for 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 421-NC 16 at SR 1323 (Dancy Road)/ Lowe's Entrance East U-Turn

Divsion 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M.L. Stygles
PREPARED BY:	S.R. Chiluka	REVIEWED BY:	J. Ma

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 047250 ENGINEER SRILATHA R CHILUKA

Digitally signed by SRChiluka 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. II-1468T3

2/14/2012 6:30:44 AM
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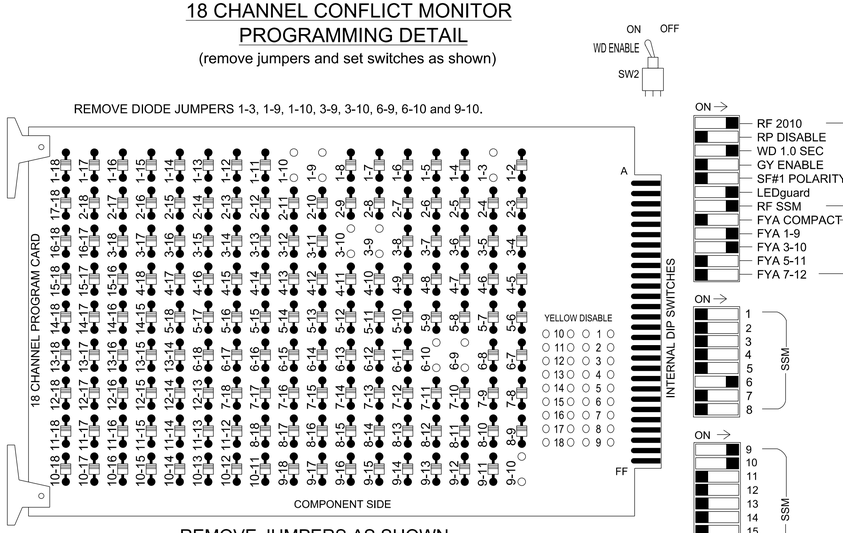
schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.4.7

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



■ = DENOTES POSITION OF SWITCH

REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	OL7	2	2 PED	3	4	4 PED	7	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	32★	NU	NU	31★	NU	NU	NU	61,62	NU	NU	NU	NU	32★	31★	NU	NU	NU	NU
RED	.	.	.	.	.	.	.	134	.	.	.	.	.	.	.	.	.	.
YELLOW	*	.	.	*	.	.	.	135	.	.	.	.	.	.	.	.	.	.
GREEN	.	.	.	.	.	.	.	136	.	.	.	.	.	.	.	.	.	.
RED ARROW	.	.	.	.	.	.	.	.	.	.	.	.	A121	A124	.	.	.	.
YELLOW ARROW	.	.	.	.	.	.	.	.	.	.	.	.	A122	A125	.	.	.	.
FLASHING YELLOW ARROW	.	.	.	.	.	.	.	.	.	.	.	.	A123	A126	.	.	.	.
GREEN ARROW	127	.	.	118	.	.	.	.	.	.	.	.	.	.	.	.	.	.

NU = Not Used
* Denotes install load resistor. See load resistor installation detail this sheet.
★ See pictorial of head wiring in detail this sheet.

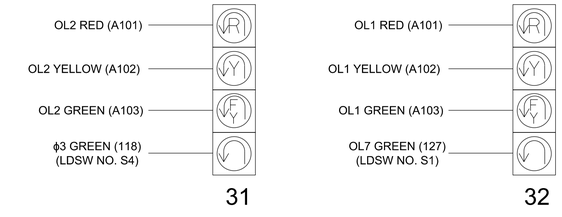
EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1,S4,S8,AUX S1,AUX S2
Phases Used.....3,6
Overlap "1".....NOT USED
Overlap "2".....*
Overlap "3".....NOT USED
Overlap "4".....NOT USED
Overlap "7".....*

*See overlap programming detail on sheet 2.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L														ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L														

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

FS = FLASH SENSE
ST = STOP TIME

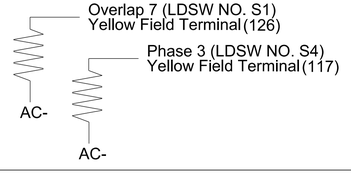
SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 11-1468T3
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED: N/A

Temporary Installation - Electrical Detail 1 of 2 (Phase 11)

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 421 - NC 16 at SR 1323 (Dancy Road)/ Lowe's Entrance East U-Turn

Division 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M.L.Stygles
PREPARED BY:	S.R.Chiluka	REVIEWED BY:	J.Ma

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by: Matthew L Stygles 5/24/2023
3948E0E4F1B4... SIGNATURE DATE

SIG. INVENTORY NO. 11-1468T3

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schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.4.8

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

ASSIGN CHANNEL 1 TO OVELAP 7 →

Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
1	Overlap	7		X	X	1
2	Phase Vehicle	2	X			2
3	Phase Vehicle	3		X	X	3
4	Phase Vehicle	4		X		4
5	Phase Vehicle	5		X		5
6	Phase Vehicle	6	X		X	6
7	Phase Vehicle	7		X		7
8	Phase Vehicle	8		X	X	8
9	Overlap	1	X		X	9
10	Overlap	2	X		X	10
11	Overlap	3	X			11
12	Overlap	4		X		12
13	Phase Ped	2				13
14	Phase Ped	4				14
15	Phase Ped	6				15
16	Phase Ped	8				16
17	Overlap	5		X	X	17
18	Overlap	6		X		18

MAXTIME OVERLAP PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	2	7
Type	FYA 4 - Section	FYA 4 - Section	Normal
Included Phases	6	6	3
Modifier Phases	3	3	-
Trail Green	0	0	0
Trail Yellow	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1468T3
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED: N/A

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
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919.829.0328

Temporary Installation - Electrical Detail 2 of 2
(Phase 11)

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:

Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section

750 N.Greenfield Pkwy,Garner,NC 27529

US 421 - NC 16 at
SR 1323 (Dancy Road)/
Lowe's Entrance
East U-Turn

Division 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M.L.Stygles
PREPARED BY:	S.R.Chiluka	REVIEWED BY:	J.Ma

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by:
SIGNATURE 5/24/2023 DATE

SIG. INVENTORY NO. 11-1468T3

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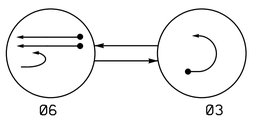
schiluka

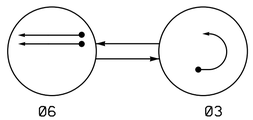
PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.4.9

2 Phase
Fully Actuated
W/ Alternate Phasing Operation
Wilkesboro Closed Loop System

DEFAULT PHASING DIAGRAM



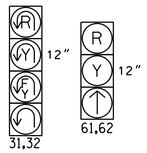
ALTERNATE PHASING DIAGRAM



DETECTED MOVEMENT
UNDETECTED MOVEMENT (OVERLAP)
UNSIGNALIZED MOVEMENT
PEDESTRIAN MOVEMENT

SIGNAL FACE I.D.

All Heads L.E.D.



DEFAULT PHASING TABLE OF OPERATION			
SIGNAL FACE	PHASE Ø3	PHASE Ø6	FLASH
31,32	↶	↑	Y
61,62	R	↑	Y

ALTERNATE PHASING TABLE OF OPERATION			
SIGNAL FACE	PHASE Ø3	PHASE Ø6	FLASH
31,32	↶	R	Y
61,62	R	↑	Y

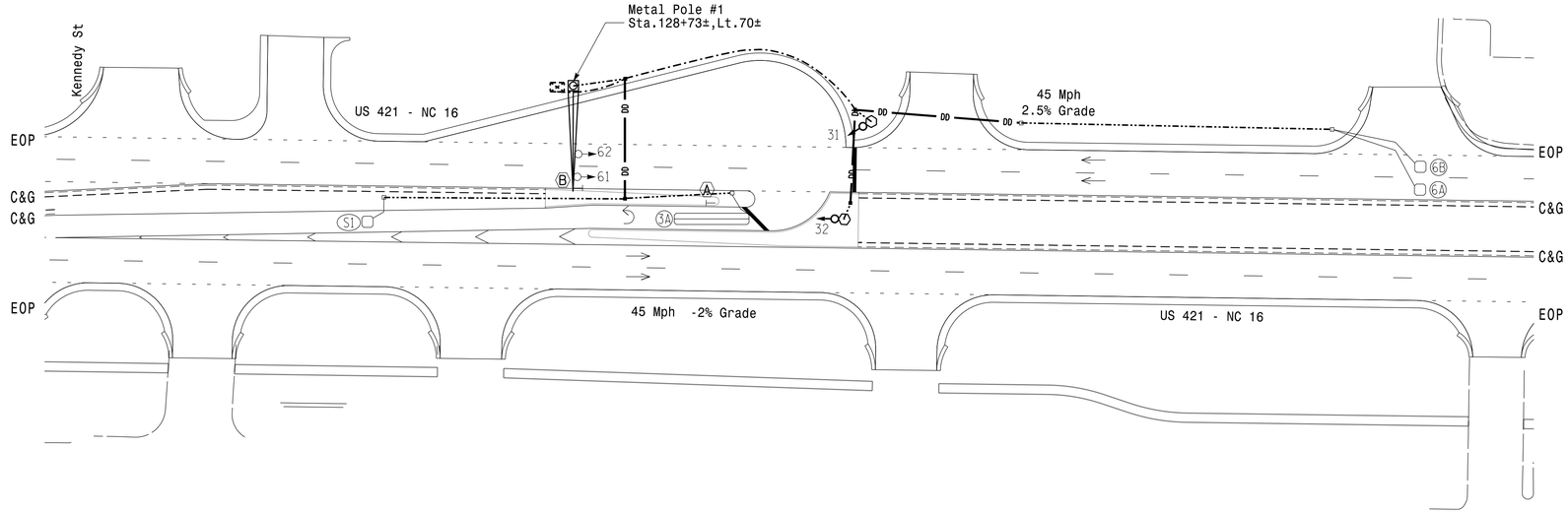
MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	6X40	0	2-4-2	-	3	15.0*	-	X	-	X	-	X
6A	6X6	300	5	-	6	-	-	X	X	X	-	X
6B	6X6	300	5	-	6	-	-	X	X	X	-	X
S1	6X6	200	3	-	-	-	-	-	-	-	-	X

* Disable delay during alternate phasing.

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. The Division Traffic Engineer will determine the hours of use for each phasing plan.
5. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
6. Refer to Pavement Marking Plans for proposed stop bar locations.



MAXTIME TIMING CHART		
FEATURE	PHASE 3	PHASE 6
Walk *	–	–
Ped Clear *	–	–
Min Green	7	12
Passage *	2.0	6.0
Max 1 *	30	60
Yellow Change	3.0	4.3
Red Clear	3.3	1.0
Added Initial *	–	1.5
Maximum Initial *	–	34
Time Before Reduction *	–	15
Time To Reduce *	–	30
Minimum Gap	–	3.4
Advance Walk	–	–
Non Lock Detector	X	–
Vehicle Recall	–	MIN RECALL
Dual Entry	–	–

* 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	●→
▭	Metal Pole with Mastarm	▭
⬡	Type II Signal Pedestal	⬢
⊣	Sign	⊣
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
----------	2-in Underground Conduit	----------
N/A	Right of Way	———
→	Directional Arrow	→
□	Pullbox	■
Ⓐ	"Stop Here on Red" Sign (R10-6)	Ⓐ
Ⓑ	No Left Turn Sign (R3-2)	Ⓑ

VHB Engineering NC, P.C. (C-3705)
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919.829.0328

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New Installation - Final Design

Prepared for 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 421-NC 16 at
SR 1323 (Dancy Road)/
Lowe's Entrance
East U-Turn

Divsion 11 Wilkes County Wilksboro

PLAN DATE:	May 2023	REVIEWED BY:	M. Stygles
PREPARED BY:	S.R. Chiluka	REVIEWED BY:	J. Ma

SCALE 0 40

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 047250 ENGINEER SRILATHA R CHILUKA

Developed by SRChiluka
SIGNATURE 5/24/2023
DATE

SIG. INVENTORY NO. 11-1468

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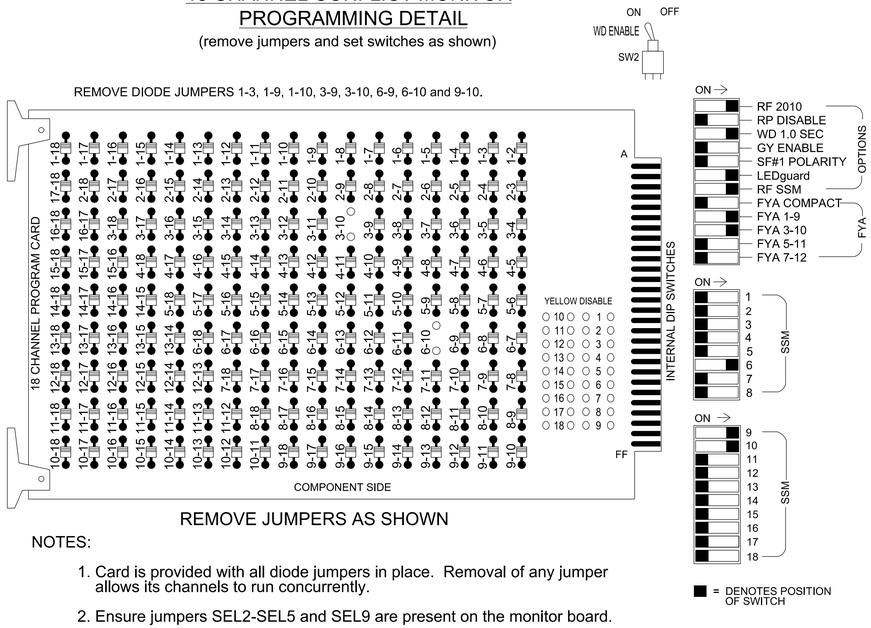
schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.4.10

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the Wilkesboro Closed Loop System.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1,S4,S8,AUX S1,AUX S2
Phases Used.....3,6
Overlap "1".....NOT USED
Overlap "2".....*
Overlap "3".....NOT USED
Overlap "4".....NOT USED
Overlap "7".....*

*See overlap programming detail on sheet 2.

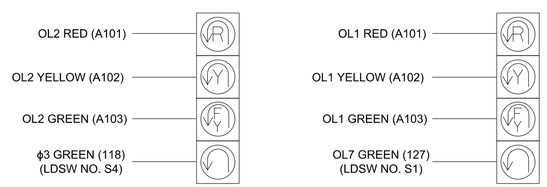
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	OL7	2	2 PED	3	4	4 PED	7	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	32★	NU	NU	31★	NU	NU	NU	61,62	NU	NU	NU	NU	32★	31★	NU	NU	NU	NU
RED								134										
YELLOW	*			*				135										
GREEN								136										
RED ARROW													A121	A124				
YELLOW ARROW													A122	A125				
FLASHING YELLOW ARROW													A123	A126				
GREEN ARROW	127			118														

NU = Not Used
★ Denotes install load resistor. See load resistor installation detail this sheet.
★ See pictorial of head wiring in detail this sheet.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ϕ3 3A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SYS. DET. S1	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L					NOT USED				NOT USED					ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	ϕ6 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L		ϕ6 6B												

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	QUEUE	CALL	DELAY DURING GREEN
3A	TB4-5,6	I5U	58	20	7	3	15		X			X	
*S1	TB6-9,10	I9U	60	22	13	SYS			X			X	
6A	TB3-5,6	J2U	40	2	16	6			X	X		X	
6B	TB3-7,8	J2L	44	6	17	6			X	X		X	

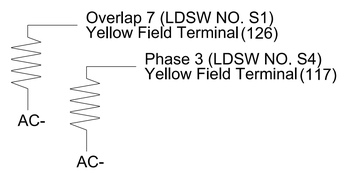
*System detector only. Remove any assigned vehicle phase.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1468
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED: N/A

VHB Engineering NC, P.C. (C-3705)
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Raleigh, NC 27606
919.829.0328

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Electrical Detail Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 421 - NC 16 at
SR 1323 (Dancy Road)/
Lowe's Entrance
East U-Turn

Division 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	J. Ma
PREPARED BY:	M.L. Stygles	REVIEWED BY:	S.R. Chiluka

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by:
SIGNATURE 5/24/2023 DATE

SIG. INVENTORY NO. 11-1468

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

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schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.4.11

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

* The Pattern number(s) are to be determined by the Division and/or City Traffic Engineer.

MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	2	7
Type	FYA 4 - Section	FYA 4 - Section	Normal
Included Phases	6	6	3
Modifier Phases	3	3	-
Trail Green	0	0	0
Trail Yellow	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	1	2	7
Type	FYA 4 - Section	FYA 4 - Section	Normal
Included Phases	-	-	3
Modifier Phases	3	3	-
Trail Green	0	0	0
Trail Yellow	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0

← NOTICE INCLUDED PHASE

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

ASSIGN CHANNEL 1 TO OVELAP 7 →

Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
1	Overlap	7		X	X	1
2	Phase Vehicle	2	X			2
3	Phase Vehicle	3		X	X	3
4	Phase Vehicle	4		X		4
5	Phase Vehicle	5		X		5
6	Phase Vehicle	6	X		X	6
7	Phase Vehicle	7		X		7
8	Phase Vehicle	8		X	X	8
9	Overlap	1	X		X	9
10	Overlap	2	X		X	10
11	Overlap	3	X			11
12	Overlap	4		X		12
13	Phase Ped	2				13
14	Phase Ped	4				14
15	Phase Ped	6				15
16	Phase Ped	8				16
17	Overlap	5		X	X	17
18	Overlap	6		X		18

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

To run alternate phasing, select a Pattern that is programmed to run Overlap Plan 2 and Detector Plan 2.
A Pattern can be selected through the scheduler or manually by changing the Operational Mode.

PHASING	OVERLAP PLAN	VEH DET PLAN
ACTIVE PLAN REQUIRED TO RUN DEFAULT PHASING	1	1
ACTIVE PLAN REQUIRED TO RUN ALTERNATE PHASING	2	2

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OF WHAT TAKES PLACE WHEN OVERLAP 2 AND VEHICLE DETECTOR PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

OVERLAP PLAN 2: Modifies overlap included phases for heads 31 and 32 to run protected turns only.

VEH DET PLAN 2: Reduces delay time for phase 3 call on loop 3A to 0 seconds.

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOP 7A

Front Panel
Main Menu >Controller >Detector >Veh Det Plans

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

3A

Detector	Call Phase	Delay
7	3	-
30	0	-

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 11-1468
DESIGNED: May 2023
SEALED: 5/24/2023
REVISED: N/A

VHB Engineering NC, P.C. (C-3705)
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Electrical Detail Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 421 - NC 16 at
SR 1323 (Dancy Road)/
Lowe's Entrance
East U-Turn

Division 11 Wilkes County Wilkesboro

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

PLAN DATE:	May 2023	REVIEWED BY:	J. Ma
PREPARED BY:	M.L. Stygles	REVIEWED BY:	S.R. Chiluka

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 046057 ENGINEER MATTHEW L. STYGLES

DocuSigned by: 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1468

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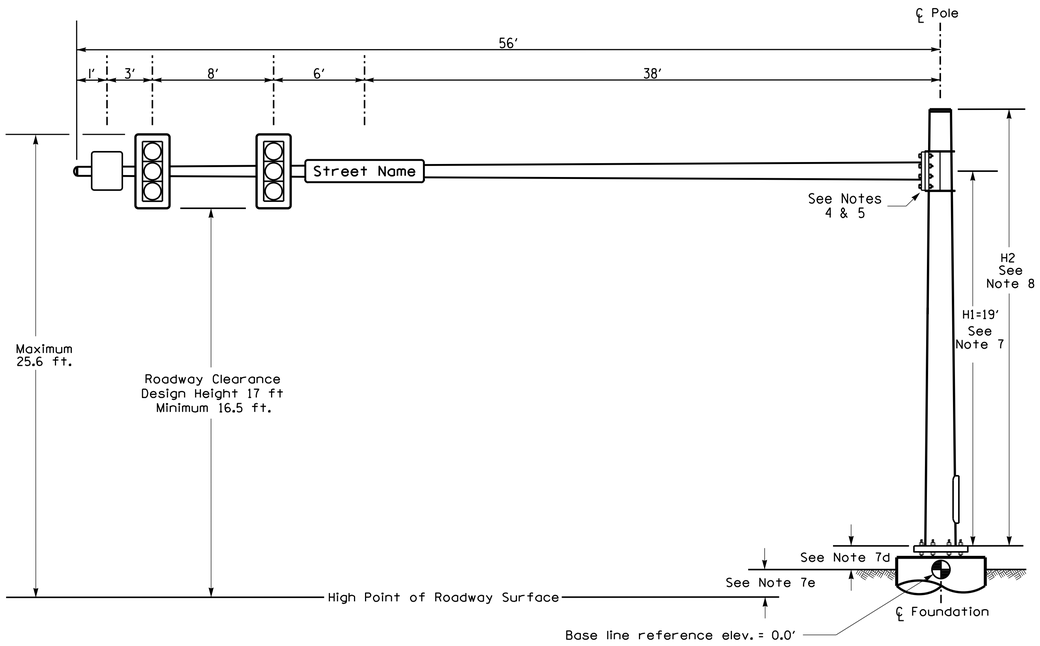
schiluka

PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.4.12

METAL POLE No. 1

Design Loading for METAL POLE NO. 1



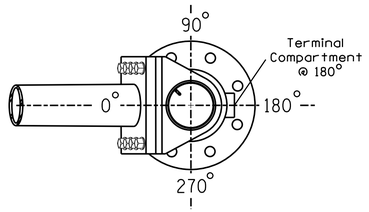
Elevation View

SPECIAL NOTE

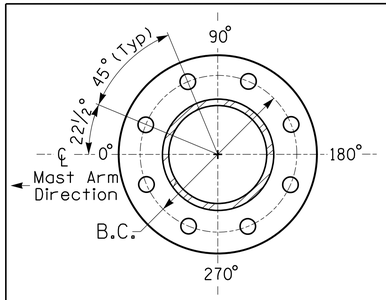
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.
Elevation difference at High point of roadway surface	-1.0 ft.
Elevation difference at Edge of travelway or face of curb	-0.7 ft.

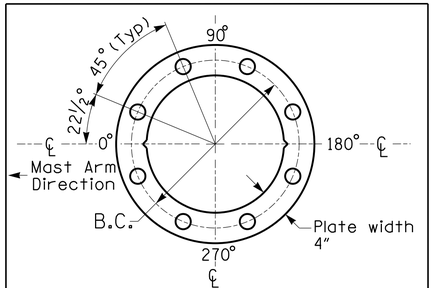


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5"W X 52.5"L	60 LBS
	SIGN RIGID MOUNTED	9.0 S.F.	36.0"W X 36.0"L	20 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0"W X 96.0"L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

1. Design the traffic signal structure and foundation in accordance with:
   - The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2018 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
   - The 2018 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

DESIGN REQUIREMENTS

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

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NCDOT Wind Zone 4 (90 mph)

Prepared for 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 421-NC 16 at
SR 1323 (Dancy Road)/
Lowe's Entrance
East U-Turn

Division 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M. Stygles
PREPARED BY:	S.R. Chiluka	REVIEWED BY:	J. Ma

SCALE 0 N/A

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 047250 ENGINEER SRIVATHA R CHILUKA

Designed by SRChiluka 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1468

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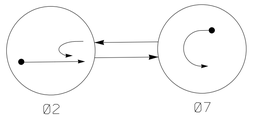
PROJECT REFERENCE NO.	SHEET NO.
U-5312	Sig.5.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.

All Heads L.E.D.

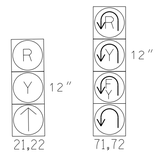


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2	PHASE Ø7	PHASE FLASH
21,22	↑	R	Y
71,72	FLASH Y	↶	FLASH Y

MAXTIME DETECTOR INSTALLATION CHART

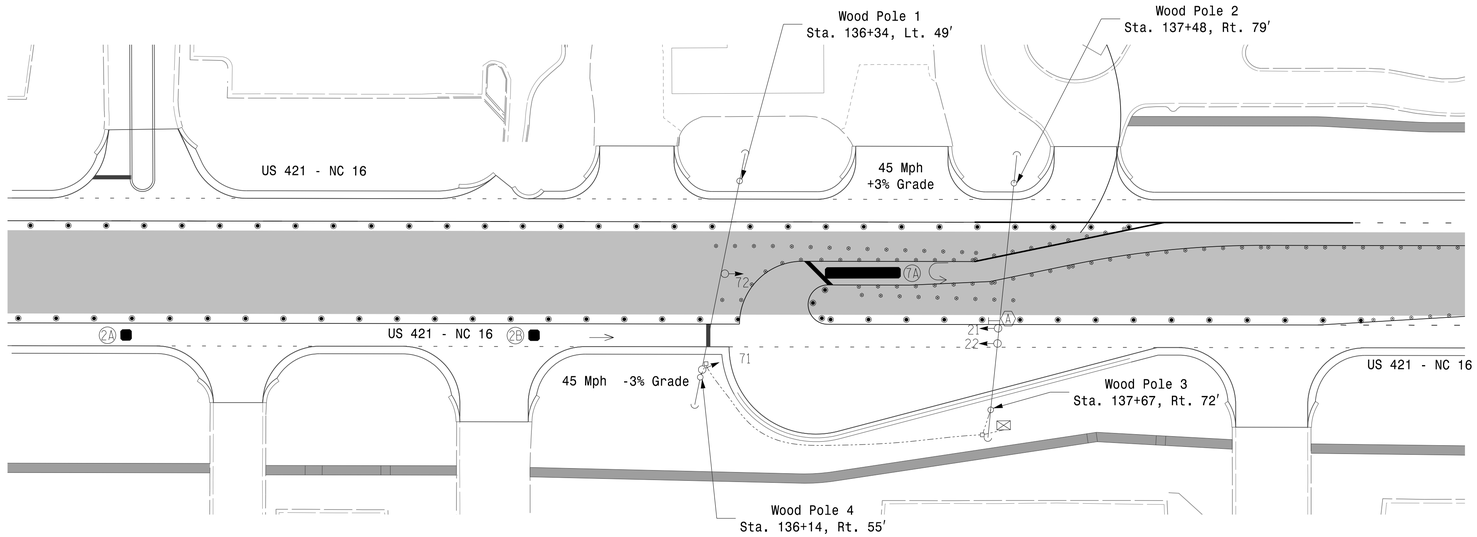
DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	✳	X	2	-	1.6	X	-	X	-	✳
2B	6X6	90	✳	X	2	-	-	X	-	X	-	✳
7A	6X40	0	✳	X	7	15.0	-	X	-	X	-	✳

✳ Video Detection Zone

2 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. This intersection uses video detection. Install detectors according to the manufacturer's instructions to schieve the desitred detection.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Refer to Pavement Marking Plans for proposed stop bar locations.



LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
○	Signal Pole with Guy	●
○	Signal Pole with Sidewalk Guy	●
▷	Video Detector	●
▬	Video Detection Zone	N/A
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
·-·-·	2-in Underground Conduit	·-·-·
→	Directional Arrow	→
▬	Construction Zone	N/A
○	Wood Pole	●
Ⓐ	No Left Turn Sign (R3-2)	Ⓐ
●	Drum	N/A
◉	Skinny Drum	N/A

MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 7
Walk *	–	–
Ped Clear *	–	–
Min Green	12	7
Passage *	2.0	2.0
Max 1 *	60	30
Yellow Change	4.8	3.0
Red Clear	1.0	3.9
Added Initial *	–	–
Maximum Initial *	–	–
Time Before Reduction *	–	–
Time To Reduce *	–	–
Minimum Gap	–	–
Advance Walk	–	–
Non Lock Detector	–	X
Vehicle Recall	MIN RECALL	–
Dual Entry	–	–

* 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.

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919.829.0328

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New Installation - Temporary Design(Phase 11)

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

US 421-NC 16 at Addison Avenue/ Big Lots Entrance West U-Turn

Divsion 11 Wilkes County Wilkesboro

PLAN DATE:	May 2023	REVIEWED BY:	M.L. Stygles
PREPARED BY:	S.R. Chiluka	REVIEWED BY:	J. Ma

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 047250 ENGINEER SRILATHA R CHILUKA

Designed by: SRChiluka 5/24/2023
SIGNATURE DATE

SIG. INVENTORY NO. 11-1461T

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schiluka