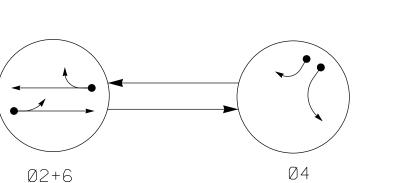
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This file or an individual page shall not be considered a certified document.





PHASING	DIAGRAM	DETECTION	LEGEND

←	DETECTED MOVEMENT
←	UNDETECTED MOVEMENT (OVERLAP)
lacktriangledown — —	UNSIGNALIZED MOVEMENT
<>	PEDESTRIAN MOVEMENT

TABLE OF	0	PER	ATI	ON
		Р	HAS	E
SIGNAL FACE		Ø2+6	Ø 4	FLASH
21,22		G	R	Y
41,42		R	G	R
61,62		G	R	Y

SIGNAL	FACE	I.D.

All Heads L.F.D.

	Heads L.E.D
	R Y 12"
	21,22 41,42 61,62

RADAR DETECTION SYSTEM						
FUNCTION	Sensor 1 ②A	Sensor 2 (6A)				
Channel	1	2				
Phase	2	6				
Direction of Travel	EB	WB				
Detection Zone (ft)	100-500	100-500				
Enable Speed	Y	Y				
Speed Range (mph)	35-100	35-100				
Enable Estimated Time of Arrival	Y	Y				
Estimate Time of Arrival (sec)	2.5-6.5	2.5-6.5				

	* Multi	izone	Micro	wave	Dete	ction	Zones
--	---------	-------	-------	------	------	-------	-------

* 300 | * | Y | 6 | Y | Y

INDUCTIVE LOOPS

SIZE FROM
(FT) STOPBAR

* 300

2 · A

2·B

OASIS 2070 LOOP & DETECTOR INSTALLATION CHART

* | Y | 4 | Y | Y |

TURNS

DETECTOR PROGRAMMING

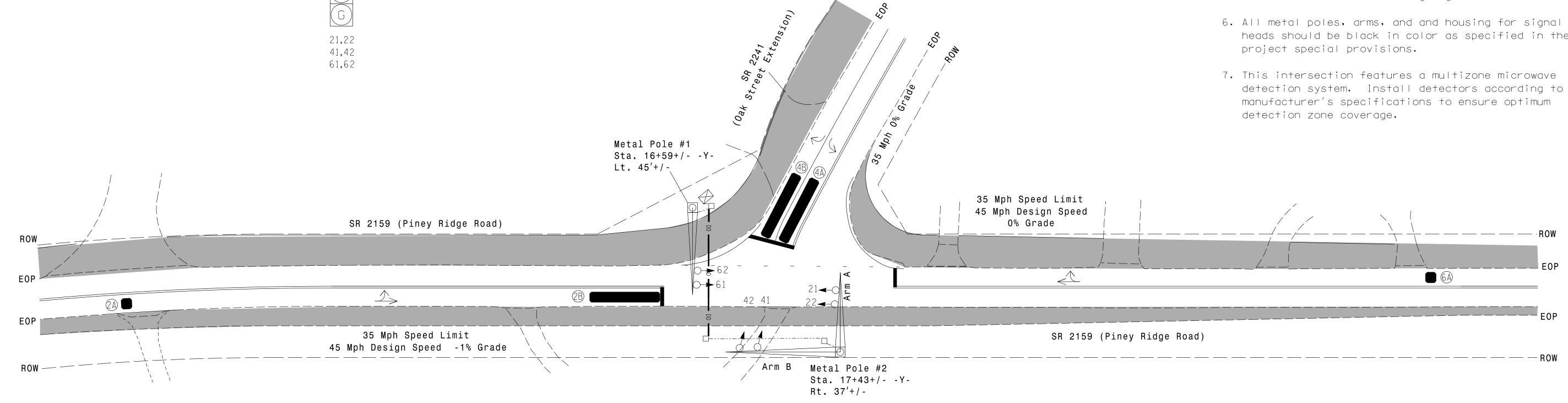
2 Phase Fully Actuated Isolated **NOTES**

PROJECT REFERENCE NO.

U-5833

Sig 1 0

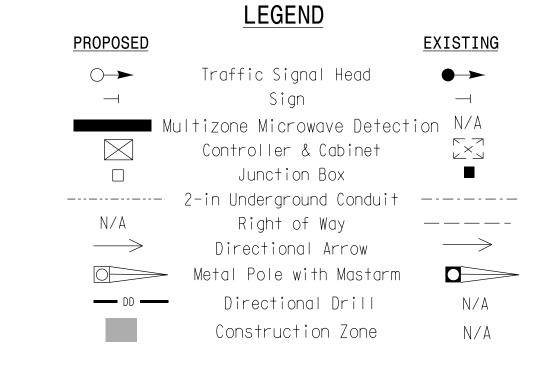
- 1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
- 2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- 3. Set all detector units to presence mode.
- 4. All pavement markings are existing.
- 5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- heads should be black in color as specified in the project special provisions.

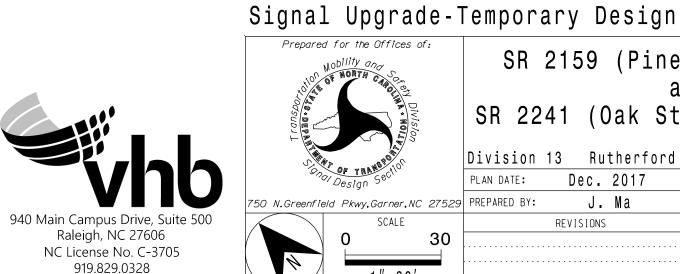


OASIS 20	70 TIM	ING CH	ART				
	PHASE						
FEATURE	2	4	6				
Min Green 1 *	12	7	12				
Extension 1 *	6.0	2.0	6.0				
Max Green 1 *	90	30	90				
Yellow Clearance	4.6	3.0	4.5				
Red Clearance	1.7	1.8	1.6				
Red Revert	2.0	2.0	2.0				
Walk 1 *	-	-	-				
Don't Walk 1	-	-	-				
Seconds Per Actuation *	2.5	-	2.5				
Max Variable Initial *	34	-	34				
Time Before Reduction *	15	-	15				
Time To Reduce *	30	-	30				
Minimum Gap	3.0	-	3.0				
Recall Mode	MIN RECALL	-	MIN RECALL				
Vehicle Call Memory	YELLOW	-	YELLOW				
Dual Entry	-	-	_				
Simultaneous Gap	ON	ON	ON				

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

NC Dept of Transportation Division of Highways Final Drawing Date: DocuSigned by:
R. N. Zinser ITS & Signals Unit





SR 2159 (Piney Ridge Road)

SR 2241 (Oak Street Extension)

	st City	Fores	Countv	utherford	13 Ru	vision
			REVIEWED BY:	2017		AN DATE:
	3.09	38536	VHB PROJECT NO.:	Ma	J.	EPARED BY:
Jia	DATE	INIT.		S	REVISIONS	
SI						



DOCUMENT NOT CONSIDERED

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 Plans.
- 2. Enable Simultaneous Gap-Out for all phases.
- 3. Program phases 2 and 6 for Variable Initial and Gap Reduction.
- 4. Program phases 2 and 6 for Start Up In Green.
- 5. Program phases 2 and 6 for Yellow Flash.

EQUIPMENT INFORMATION

CONTROLLER	
SOFTWARE	ECONOLITE OASIS
CABINET MOUNT	BASE
OUTPUT FILE POSITIONS	18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED	S2,S5,S8
PHASES USED	. 2 , 4 , 6
OVERLAPS	NONE

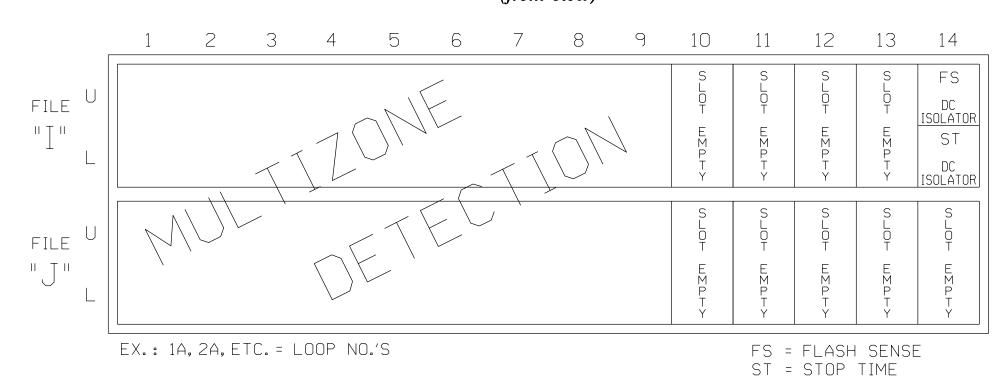
PROJECT REFERENCE NO. Sig.1.1 U-5833

	SIGNAL HEAD HOOK-UP CHART																	
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S1Ø	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	1Ø	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42	NU	NU	61,62	P61, P62	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		128			1Ø1			134										
YELLOW		129			102			135										
GREEN		130			103			136										
RED ARROW																		
YELLOW ARROW																		
FLASHING YELLOW ARROW																		
GREEN ARROW																		
*																		
×																		

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)



3. Ensure that 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.

SPECIAL DETECTOR NOTE

Install a multizone microve detection zone 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.

NC Dept of Transportation Division of Highways Final Drawing Date: 1/12/2018

R. N. Zinser ITS & Signals Unit F1388973472248F...

> THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-1241T DESIGNED: Dec. 2017 SEALED: 12/15/2017 REVISED: N/A

Electrical Detail-Temporary Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



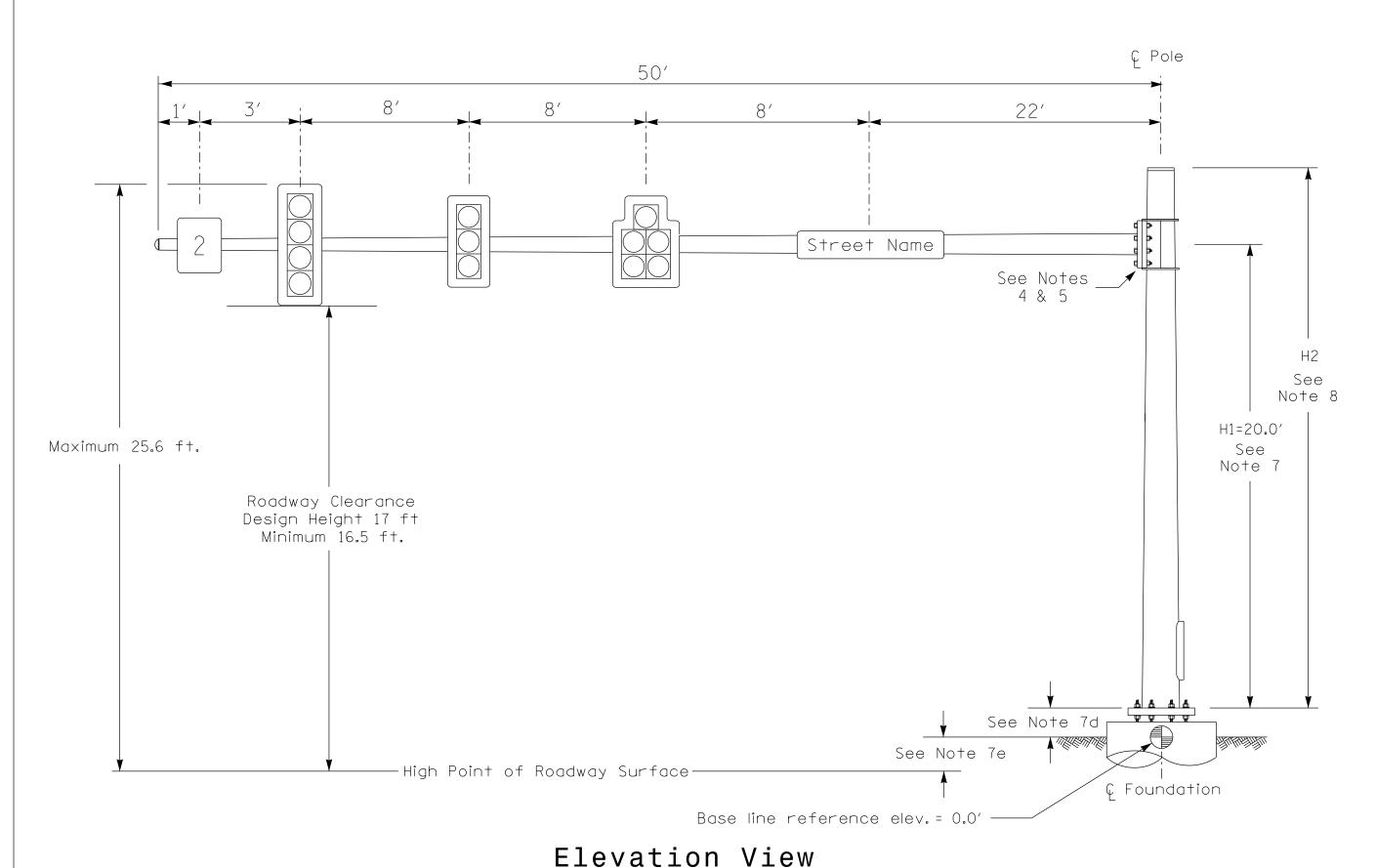
SR 2159 (Piney Ridge Road) SR 2241 (Oak Street Extension)

Division 13		Rutherfo	rd County	For	est City
PLAN DATE:	Dec.	2017	REVIEWED BY:	J.L. Le	wis
PREPARED BY:	J.	Ma	VHB PROJECT NO.	: 38536.	09
	REVISIONS			INIT.	DATE

SIGNATURE

SIG. INVENTORY NO. 13-1241T

Raleigh, NC 27606 NC License No. C-3705

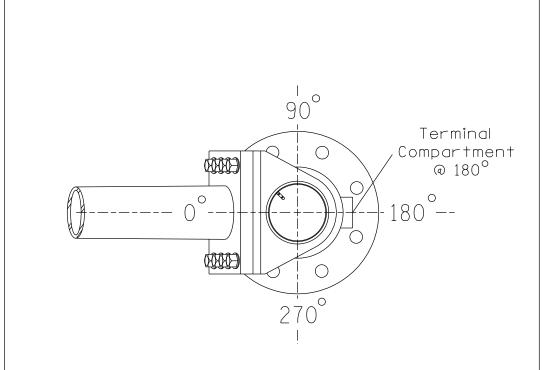


SPECIAL NOTE

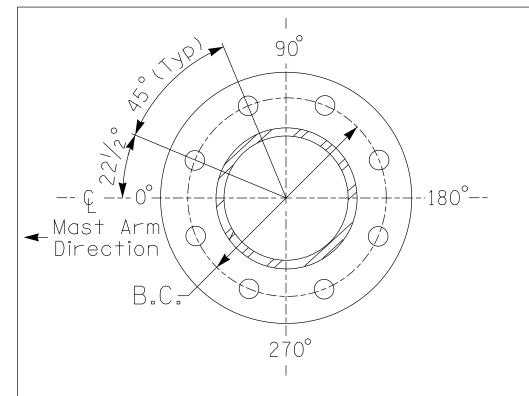
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

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	+0.5 ft.
Elevation difference at Edge of travelway or face of curb	+0.2 ft.

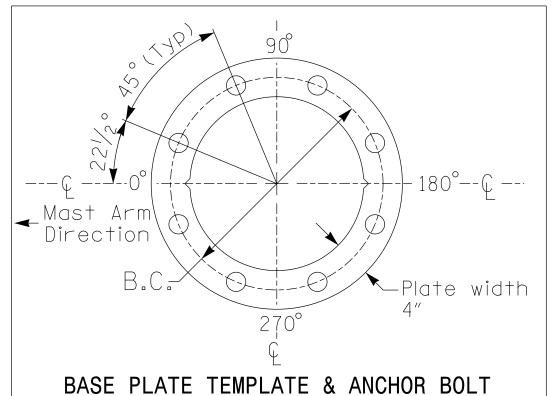


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



METAL POLE No. 1

U-5883 Sig 1 2

	MAST ARM LOADING SC	HEDU	LE	
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
	RIGID MOUNTED SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE	16.3 S.F.	42.0"W X 56.0"L	103 · LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0" W X 96.0"L	36 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0" W X 36.0"L	14 LBS

NOTES

DESIGN REFERENCE MATERIAL

- 1. Design the traffic signal structure and foundation in accordance with:
- The 6th Edition 2013 AASHTO "Standard Specifications for StructuralSupports 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 signalproject specialprovisions.
- The 2018 NCDOT Roadway Standard Drawings.
- The traffic signalproject plans and specialprovisions.
- The NCDOT "MetalPole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

DESIGN REQUIREMENTS

- 2. Design the traffic signalstructure 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 signalplans for the actualloads 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. Signalheads 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 leveland 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 totalheight 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 SignalDesign Section Senior StructuralEngineer 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 signalheads over the roadway.
- 11. The contractor is responsible for providing soilpenetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

All metalpoles and arms, pedestals, and signal head housings should be black in color as specified in the project special provisions.

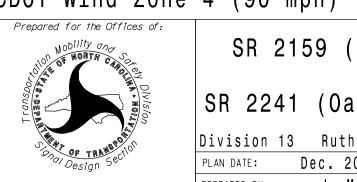


NC License No. C-3705

919.829.0328

NCDOT Wind Zone 4 (90 mph)

N/A



SR 2159 (Piney Ridge Road) SR 2241 (Oak Street Extension)

Division 13 Rutherford County Forest City Dec. 2017 REVIEWED BY: J. L. Lewis 750 N.Greenfield Pkwy,Garner,NC 27529 PREPARED BY: VHB PROJECT NO.: 38536.09 J. Ma REVISIONS

SEAL 033108 Jianxin Ma 12017.12.15 SIGNATURE DATE

SIG. INVENTORY NO. 13-1241T

DOCUMENT NOT CONSIDERED

FINAL UNLESS ALL SIGNATURES COMPLETED

NC Dept of Transportation Division of Highways Final Drawing Date:

R. N. Zinser ITS & Signals Unit

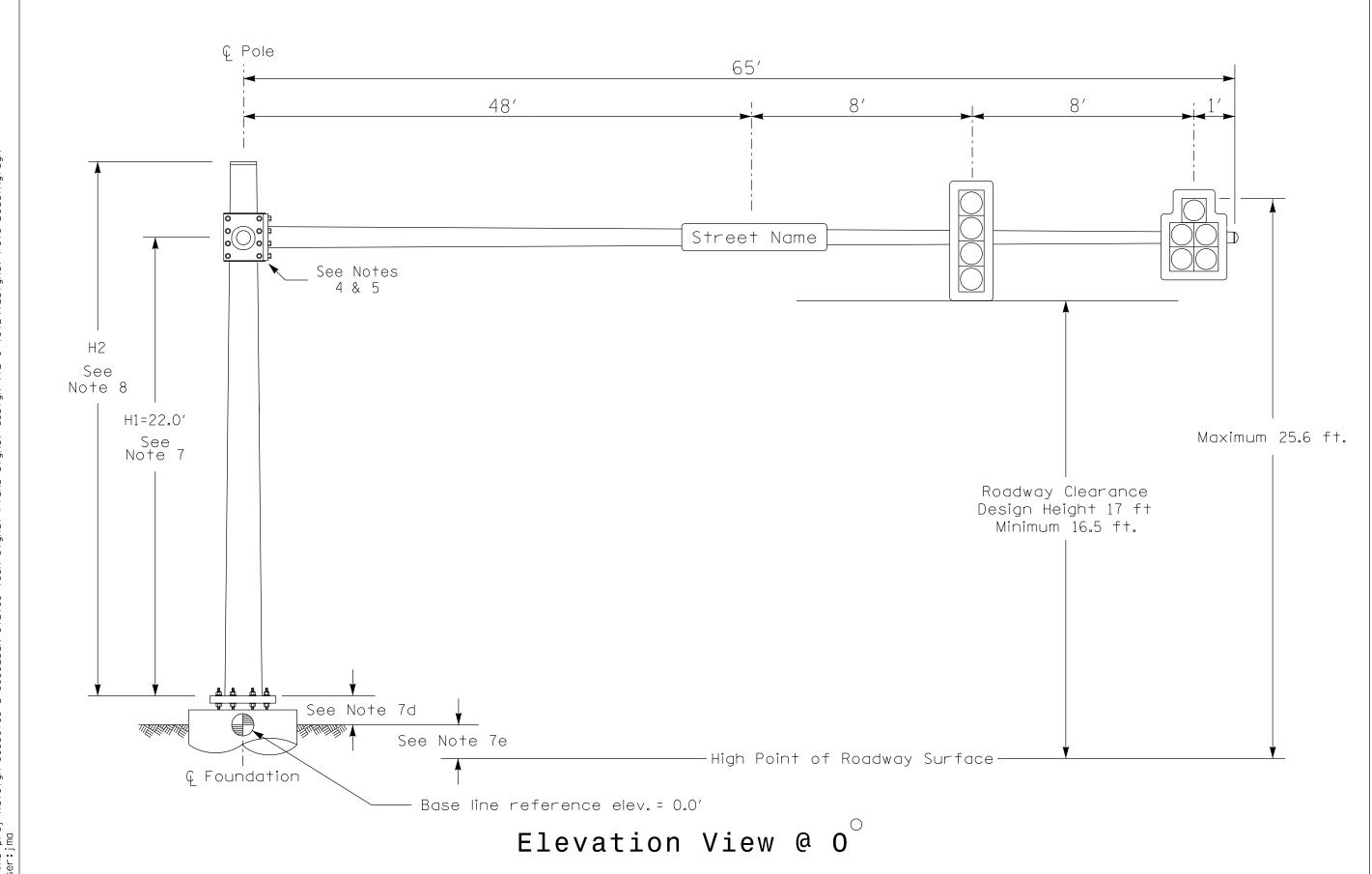
LOCK PLATE DETAIL For 8 Bolt Base Plate

Design Loading for METAL POLE NO. 2, MAST ARM A Street Name See Notes 4 & 5 Н2 See Note 8 H1=22.0' Maximum 25.6 ft. Note 7 Roadway Clearance Design Height 17 ft Minimum 16.5 ft. See Note 7d See Note 7e -High Point of Roadway Surface-

Design Loading for METAL POLE NO. 2, MAST ARM B

Elevation View @ 270

Base line reference elev. = 0.0'

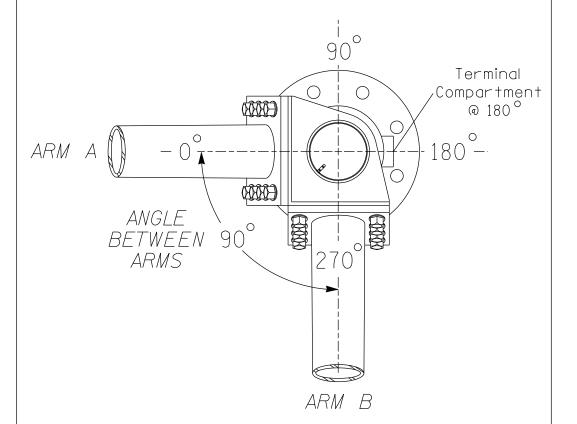


SPECIAL NOTE

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.

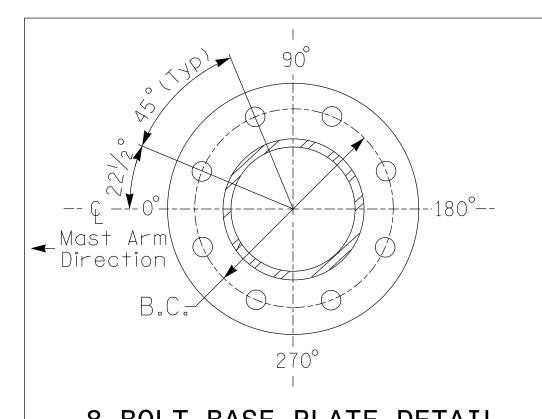
Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm A	Arm B
Baseline reference point at © Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+2.2 ft.	+2.2 ft.
Elevation difference at Edge of travelway or face of curb	+1.2 ft.	+1.2 ft.



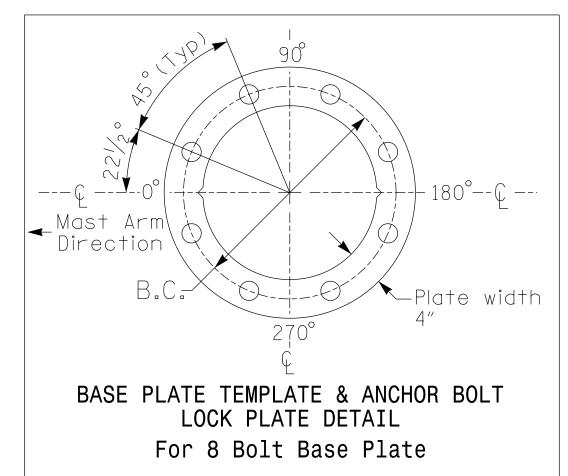
POLE RADIAL ORIENTATION

` Foundation



8 BOLT BASE PLATE DETAIL

See Note 6



METAL POLE No. 2

U-5883 Sig 1 3

	MAST ARM LOADING SC	HEDU	LE	
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"-5 SECTION-WITH BACKPLATE	16.3 S.F.	42.0"W X 56.0"L	103 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

<u>NOTES</u>

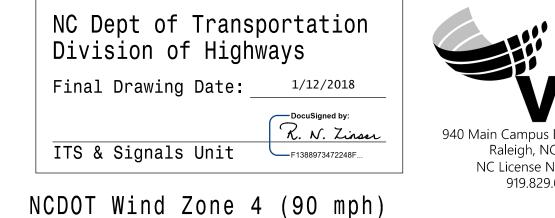
DESIGN REFERENCE MATERIAL

- 1. Design the traffic signalstructure 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 signalproject specialprovisions.
- The 2018 NCDOT Roadway Standard Drawings.
- The traffic signalproject plans and specialprovisions.
- The NCDOT "MetalPole Standards" located at the following NCDOT website:

https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx DESIGN REQUIREMENTS

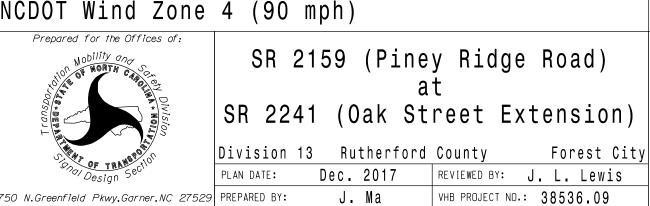
- 2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signalplans for the actualloads 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. This requires staggering the connections. Use elevation data for each arm to determine appropriate arm connection points.
- 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. Signalheads 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 leveland 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 totalheight 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 signalheads over the roadway.
- 11. The contractor is responsible for providing soilpenetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

All metalpoles and arms, pedestals, and signal head housings should be black in color as specified in the project specialprovisions.





N/A

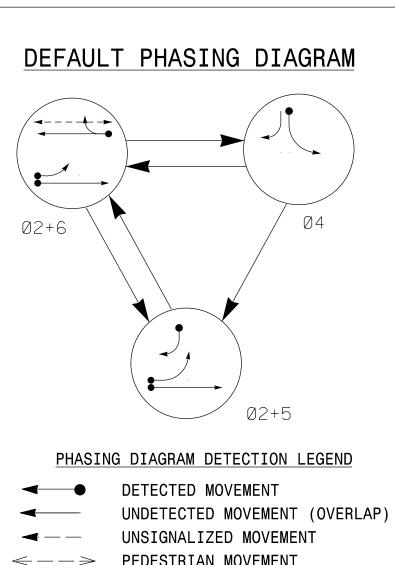


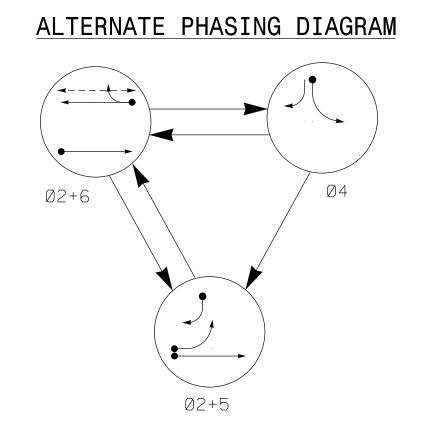
REVISIONS

SEAL 033108

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Jianxin Ma 10:12:46 -05'00' SIGNATURE SIG. INVENTORY NO. 13-1241T





DEFAULT TABLE OF				N
		PHA	4SE	
SIGNAL FACE	Ø 2 + 5	Ø2+6	Ø 4	FLASH
21, 22	G	G	R	Υ
41	R	R	G	R
42	R/	R	G	R
51	-	F Y		→
61, 62	R	G	R	Y
P61, P62	DW	W	DW	DRK

ALTERNAT	E F	PHA:	SIN	G		OASIS	2070	L00P	& DET	EC	TOR	ΙN	IST	AL	LATI	ON CH	AR ⁻	Γ
TABLE OF	ŊΡ	FR∆	TT	NC		1I	INDUCTIVE LOC				DET	DETECTOR PROGRAMMING						
SIGNAL	Ø	PHA Ø		F		LOOP	SIZE (FT)	DISTANCE FROM STOPBAR	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
FACE	2	2	Ø	LAS				(FT)		Ž			<u> </u>	FULL			SYS	Ż
	5	6	'	S H		2A	6X6	300	5	Υ	2	Υ	Υ	-	-	-	-	Υ
21, 22	G	G	R	Y		4 A	6X40	0	2-4-2	Υ	4	Υ	Υ	_	-	3	-	Y
41	R	R	G	R	_	5A	6X40	0	2-4-2	V	5	Υ	Υ	_	-	15**	_	Υ
	R/				-) JA	0 0 0 0		Z - 4 - Z 		2*	Υ	Y	Υ	_	3	-	Υ
4:2	<u></u>	R	G	R		5B	6X40	0	2-4-2	Υ	5	Υ	Υ	_	_	15	_	Υ
51	-		≺R	*		6A	6X6	300	5	Υ	6	Υ	Υ	-	-	-	-	Y
61, 62	R	G	R	Y								l						
P61, P62	DW	W	DW	DRK		Disable * Beduce	•			_						• .		11

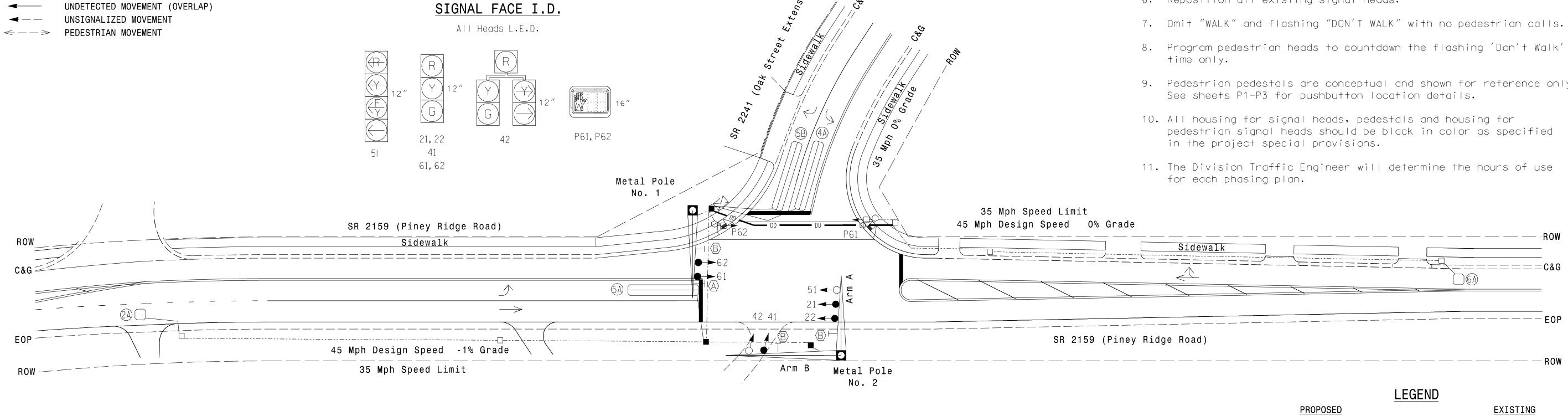
** Reduce delay to 3 sec during Alternate Phasing operation.

3 Phase Fully Actuated Isolated

Sig 2 0 U-5833

NOTES

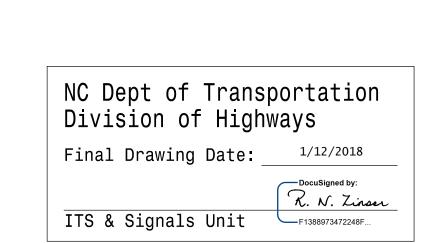
- 1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
- 2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- 3. Enable Backup Protect for phase 2 to allow the controller to clear from phase 2+6 to phase 2+5 by progressing through an all red display.
- 4. Phase 5 may be lagged.
- 5. Set all detector units to presence mode.
- 6. Reposition all existing signal heads.
- 9. Pedestrian pedestals are conceptual and shown for reference only.



OASI	S 2070	TIMIN	G CHAR	T
		PHA		
FEATURE	2	4	5	6
Min Green 1 *	12	7	7	12
Extension 1 *	6.0	2.0	2.0	6.0
Max Green 1 *	90	30	20	90
Yellow Clearance	4.6	3.0	3.0	4.6
Red Clearance	1.8	2.1	2.4	1.8
Red Revert	5.0	2.0	2.0	2.0
Walk 1 *	-	-	_	7
Don't Walk 1	-	-	_	20
Advance Walk Time	-	-	-	-
Seconds Per Actuation *	2.5	-	_	2.5
Max Variable Initial *	34	-	_	34
Time Before Reduction *	15	-	_	15
Time To Reduce *	30	-	-	30
Minimum Gap	3.0	-	-	3.0
Recall Mode	MIN RECALL	-	-	MIN RECALL
Vehicle Call Memory	YELLOW	-	-	YELLOW
Dual Entry	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON

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

83'
STOPBAR AND CROSSWALK LOCATIONS



\dashv	Sign	\dashv
	Pedestrian Signal Head With Push Button & Sign	•
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
\longrightarrow	Directional Arrow	\longrightarrow
	Metal Pole with Mastarm	0
\bigcirc	Type II Signal Pedestal	•
—— DD ———	Directional Drill	N/A
	Curb Ramp	
$\langle A \rangle$	No U-Turn Sign (R 3-4)	A
B	Street Name Sign (D3-1)	lacksquare

Traffic Signal Head





SR 2159 (Piney Ridge Road)

SR 2241 (Oak Street Extension)

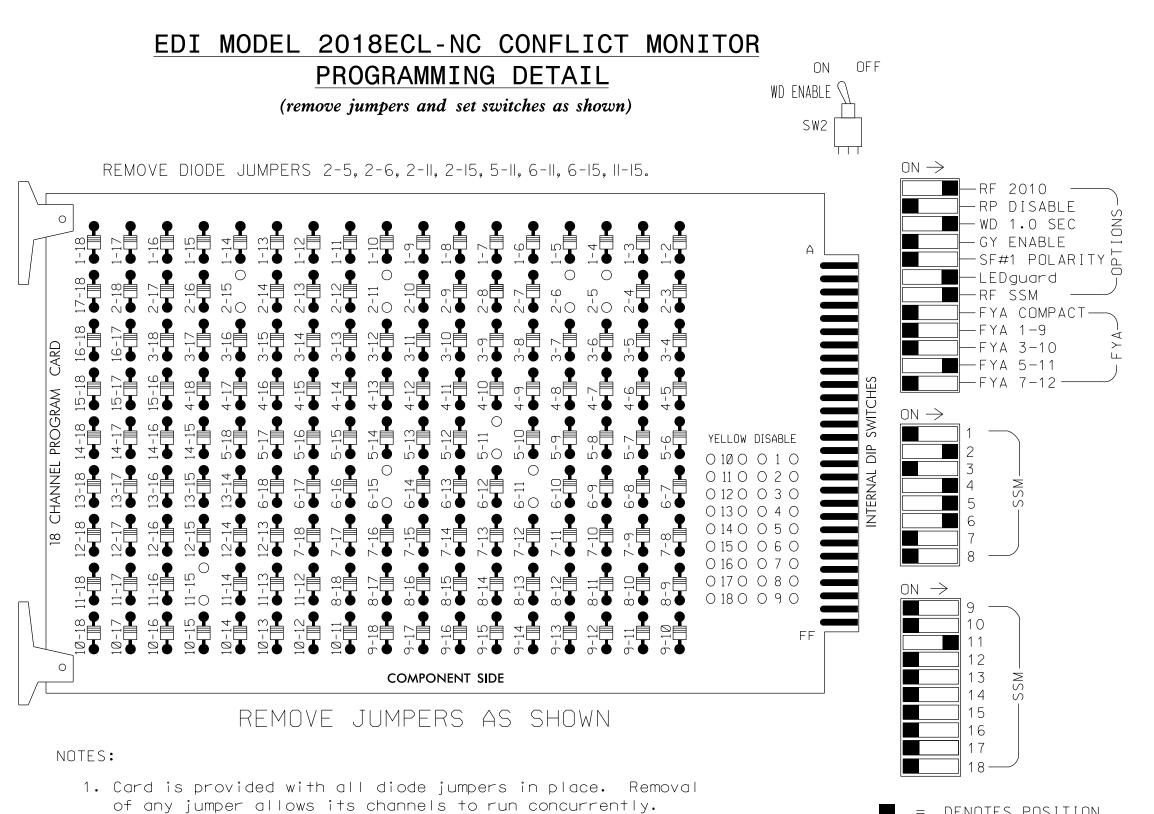
	Division	13 Ruth	erford County	Fores	st Cit
Onol Design Section	PLAN DATE:	Dec. 20	117 REVIEWED BY:	J. L. L	ewis
Greenfield Pkwy,Garner,NC 27529	PREPARED BY:	J. Ma	YHB PROJECT I	NO.: 38536.	.09
SCALE		REVISIONS		INIT.	DATE

 \bigcirc

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SEAL

SIG. INVENTORY NO. |3-|24|



controller. Ensure conflict monitor communicates with 2070.

FILE

FILE

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

[⊗] Wired Input - Do not populate slot with detector card

INPUT FILE POSITION LAYOUT

(front view)

9 10 11 12 13 14

USED

FS = FLASH SENSE ST = STOP TIME

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 Plans.
- 2. Enable Simultaneous Gap-Out for all phases.
- 3. Program phases 2 and 6 for Variable Initial and Gap Reduction.
- 4. Program phases 2 and 6 for Start Up In Green.
- 5. Program phase 6 for "STARTUP PED CALL".
- 6. Program phases 2 and 6 for Yellow Flash.

EQUIPMENT INFORMATION

CONTROLLER	2070
CABINET	
SOFTWARE	
CABINET MOUNT	
	18 WITH AUX, OUTPUT FILE
	S2,S5,S7,S8,S9,AUX S4
PHASES USED	
OVERLAP "A"	
OVERLAP "B"	
OVERLAP "C"	5+6

PROJECT REFERENCE NO. Sig.2.1 U-5833

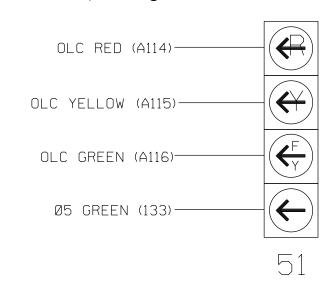
					S	IG	VAL	H	EAD	Н	OOK	-UI	> C	HAF	RT				
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S	7	S8	S9	S1Ø	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	Ç	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED		5	6	6 PED	7	8	8 PED	OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42	Z	★	42	61,62	P61, P62	NU	NU	NU	NU	NU	NU	51 ★	NU	NU
RED		128			1Ø1			*	134										
YELLOW		129			102				135										
GREEN		130			103				136										
RED ARROW																	A114		
YELLOW ARROW								132									A115		
FLASHING YELLOW ARROW																	A116		
GREEN ARROW							133	133											
₩										119									
Ķ										121									

NU = Not Used

- * Denotes install load resistor. See Load Resistor Installation Detail this sheet.
- ★ See pictorial of head wiring in detail below.

4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

ELECTRICAL AND PROGRAMMING

Prepared for the Offices of:

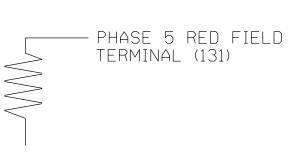
750 N.Greenfield Pkwy,Garner,NC 27529

The sequence display for this signal requires special logic programming. See sheet 2 of 4 for programming instructions.

LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)

ACCEPTABLE VALUES VALUE (ohms) | WATTAGE 1.5K - 1.9K 25W (min) 2.ØK - 3.ØK | 1ØW (mın)



Electrical Detail-Final Design-Sheet 1 of 4

SR 2159 (Piney Ridge Road)

SR 2241 (Oak Street Extension)

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Division	Division 13	Ruther	ford County	For	est (
1	PLAN DATE:	Dec. 2017	REVIEWED BY:	J.L. Le	wis
ction	PREPARED BY:	J. Ma	VHB PROJECT NO.:	38536	.09
r		REVISIONS	·	INIT.	DA

Jianxin Ma 10:14:25 -05'00' SIGNATURE

SIG. INVENTORY NO. 13-1241

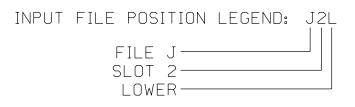
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INPUT FILE CONNECTION & PROGRAMMING CHART

OVERLAP "D".....NOT USED

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
2A	TB2-5,6	I2U	39	1	2	2	Υ	Υ			
4A	TB4-9,10	I6U	41	3	4	4	Υ	Υ			3
	TB3-1,2	J1U	55	17	5	5	Υ	Υ			15
5A ¹	_	I4U	47	9 ★	22	2	Υ	Υ	Υ		3
	_	J1U	55	17 ★	55	5	Υ	Υ			3
5B	TB3-5,6	J2U	40	2	6	5	Υ	Υ			15
6A	TB3-7,8	J2L	44	6	16	6	Υ	Υ			
PED PUSH BUTTONS							NOTE				
P61,P62	TB8-7,9	I13U	68	3Ø	PED 6	6 PED	INSTALL DC ISOLATORS				
						•	ΙN	INPUT	FILE	SLOT I1	3.

¹Add jumper from J1-W to I4-W, on rear of input file. ★ See Input Page Assignment programming details on sheet 3.



NC Dept of Transportation Division of Highways

Final Drawing Date: 1/12/2018

R. N. Zinser ITS & Signals Unit

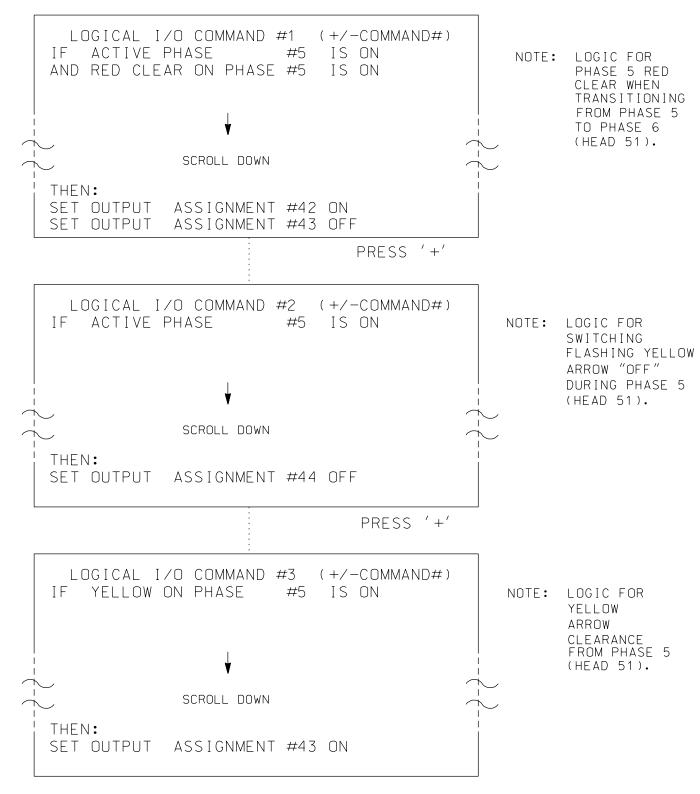
THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-1241 DESIGNED: Dec. 2017 SEALED: 12/15/2017 REVISED: N/A

Raleigh, NC 27606 NC License No. C-3705

= DENOTES POSITION OF SWITCH 2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board. 3. Ensure that Red Enable is active at all times during normal operation. 4. Connect serial cable from conflict monitor to comm. port 1 of 2070

(program controller as shown below)

- 1. FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE ACT LOGIC COMMANDS 1, 2, AND 3.
- 2. FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '3' (LOGICAL I/O PROCESSOR).



LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

OUTPUT REFERENCE SCHEDULE

OUTPUT 42 = Overlap C Red OUTPUT 43 = Overlap C Yellow OUTPUT 44 = Overlap C Green

PROJECT REFERENCE NO. Sig.2.2 U-5833

OVERLAP PROGRAMMING DETAIL

FOR DEFAULT PHASING

(program controller as shown below)

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS).

PRESS '+' TWICE PRESS '+' TWICE PAGE 1: VEHICLE OVERLAP 'C' SETTINGS PAGE 2: VEHICLE OVERLAP 'C' SETTINGS 12345678910111213141516 PHASE: 12345678910111213141516 VEH OVL PARENTS: | XX VEH OVL PARENTS: X VEH OVL NOT VEH: | VEH OVL NOT VEH: | VEH OVL NOT PED: | VEH OVL NOT PED: | VEH OVL GRN EXT: | VEH OVL GRN EXT: | STARTUP COLOR: _ RED _ YELLOW _ GREEN STARTUP COLOR: _ RED _ YELLOW _ GREEN FLASH COLORS: _ RED _ YELLOW X GREEN FLASH COLORS: _ RED _ YELLOW _ GREEN SELECT VEHICLE OVERLAP OPTIONS: (Y/N) SELECT VEHICLE OVERLAP OPTIONS: (Y/N) FLASH YELLOW IN CONTROLLER FLASH?...Y FLASH YELLOW IN CONTROLLER FLASH?...Y GREEN EXTENSION (0-255 SEC)..... GREEN EXTENSION (0-255 SEC)..... YELLOW CLEAR (O=PARENT, 3-25.5 SEC)..0.0 YELLOW CLEAR (O=PARENT,3-25.5 SEC)..0.0 RED CLEAR (0=PARENT, 0.1-25.5 SEC)...0.0 RED CLEAR (0=PARENT, 0.1-25.5 SEC)...0.0 OUTPUT AS PHASE # (0=NONE, 1-16)....0 OUTPUT AS PHASE # (0=NONE, 1-16)....0

OVERLAP PROGRAMMING COMPLETE

OVERLAP PROGRAMMING COMPLETE

OVERLAP PROGRAMMING DETAIL

FOR ALTERNATE PHASING - PAGE 2

(program controller as shown below)

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1'

(VEHICLE OVERLAP SETTINGS). PRESS 'NEXT' TO ADVANCE TO PAGE 2.

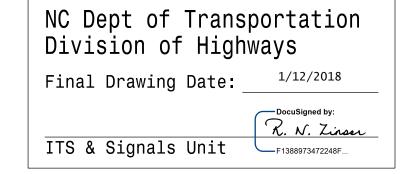
BACKUP PROTECTION NOTE

(program controller as shown below)

From Main Menu press '2' (Phase Control), then "1' (Phase Control Functions). Program phase 2 for 'Backup Protect'. Make sure the Red Revert times shown on the Signal Design Plans are programmed in the 'Phase Timing' menu.

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-1241 DESIGNED: Dec. 2017 SEALED: 12/15/2017 REVISED: N/A

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SIGNATURE

SIG. INVENTORY NO. 13-1241

Electrical Detail-Final Design-Sheet 2 of 4

UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING SR 2159 (Piney Ridge Road) Prepared for the Offices of: SR 2241 (Oak Street Extension) Division 13 Rutherford County PLAN DATE:

Dec. 2017 REVIEWED BY: J.L. Lewis J. Ma VHB PROJECT NO.: 38536.09 REVISIONS

PREPARED BY: Jianxin Ma 20 ነ ት.12.15



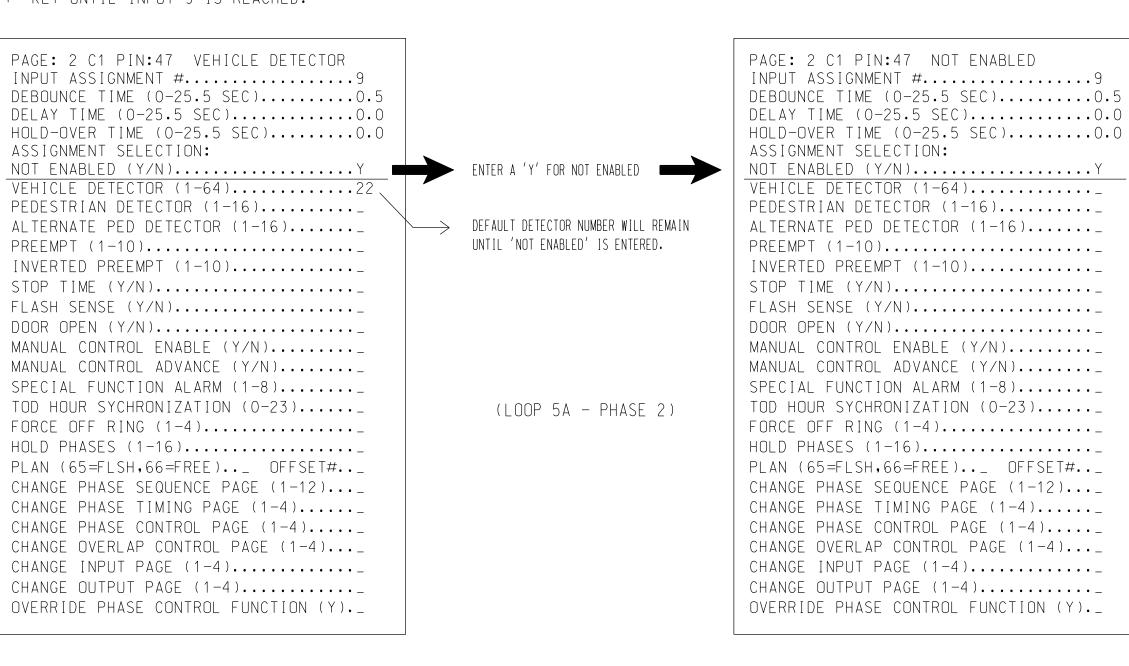
INPUT PAGE 2 ASSIGNMENT PROGRAMMING DETAIL FOR ALTERNATE PHASING - LOOP 5A

(program controller as shown below)

- NOTES: 1. THIS PROGRAMMING APPLIES FOR INPUT PAGE 2 ONLY. INPUT PAGE 1 WILL USE STANDARD DEFAULT SETTINGS. THIS PROGRAMMING IS NECESSARY FOR PROPER DETECTOR OPERATION DURING ALTERNATE PHASING OPERATION.
 - 2. THE FIRST TASK THIS PROGRAMMING ACCOMPLISHES IS THE DISABLING OF INPUT #9 (DETECTOR 22) SO THAT A VEHICLE CALL WILL NOT BE PLACED TO PHASE 2 DURING ALTERNATE PHASING OPERATION. THE SECOND TASK THIS PROGRAMMING ACCOMPLISHES IS THAT IT REASSIGNS DETECTOR 55 TO INPUT #17 SO THAT THE DELAY ON LOOP 5A CAN BE REDUCED FROM 15 SECONDS TO 3 SECONDS.

PRESS '+' TO ADVANCE TO INPUT 17

FROM MAIN MENU PRESS '5' (INPUTS), THEN PRESS 'NEXT' TO GET TO INPUT PAGE '2'. PRESS THE '+' KEY UNTIL INPUT 9 IS REACHED.



PAGE: 2 C1 PIN:55 VEHICLE DETECTOR DELAY TIME (0-25.5 SEC)............. HOLD-OVER TIME (0-25.5 SEC).........0.0 ASSIGNMENT SELECTION: NOT ENABLED (Y/N)..... VEHICLE DETECTOR (1-64)......5 PEDESTRIAN DETECTOR (1-16)..... ALTERNATE PED DETECTOR (1-16)..... PREEMPT (1-10)..... INVERTED PREEMPT (1-10)..... STOP TIME (Y/N)..... FLASH SENSE (Y/N)..... DOOR OPEN (Y/N)..... MANUAL CONTROL ENABLE (Y/N)..... MANUAL CONTROL ADVANCE (Y/N)..... SPECIAL FUNCTION ALARM (1-8)..... TOD HOUR SYCHRONIZATION (0-23)..... FORCE OFF RING (1-4)..... HOLD PHASES (1-16)..... PLAN (65=FLSH,66=FREE)... OFFSET#... CHANGE PHASE SEQUENCE PAGE (1-12)..._ CHANGE PHASE TIMING PAGE (1-4)..... CHANGE PHASE CONTROL PAGE (1-4).... CHANGE OVERLAP CONTROL PAGE (1-4)..._ CHANGE INPUT PAGE (1-4)..... CHANGE OUTPUT PAGE (1-4)..... OVERRIDE PHASE CONTROL FUNCTION (Y)._

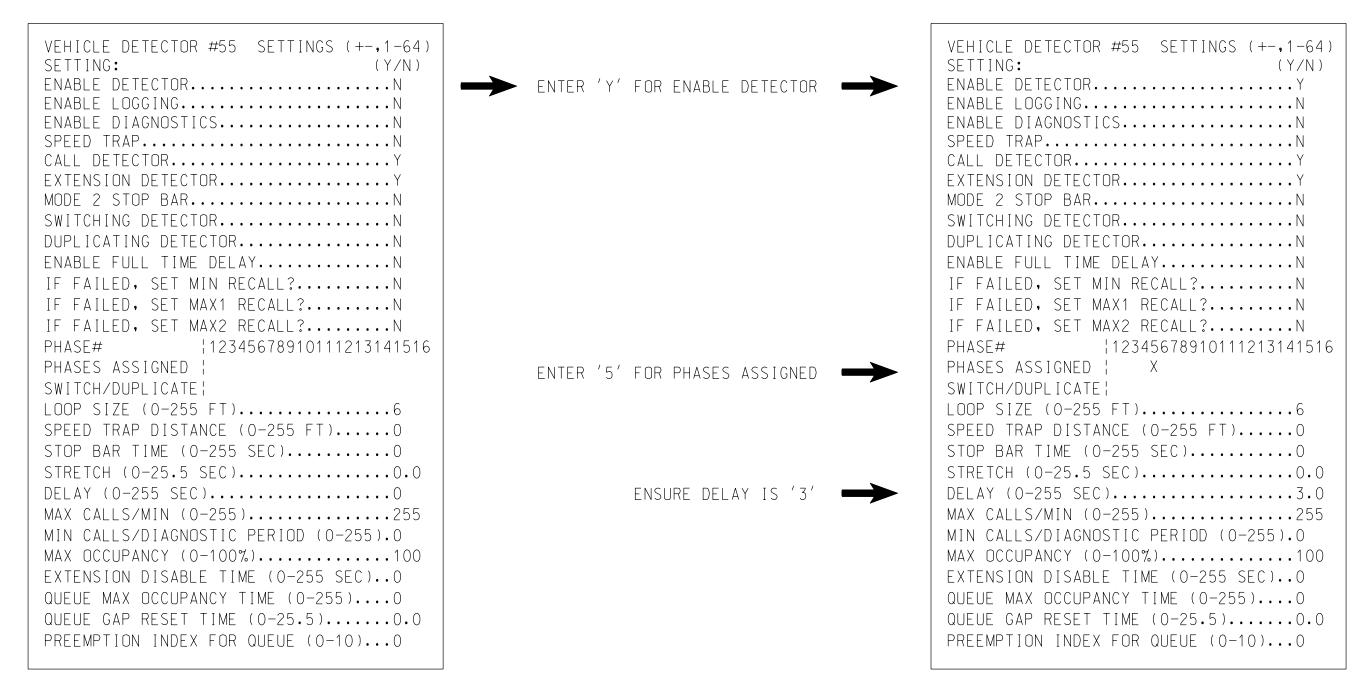
PAGE: 2 C1 PIN:55 VEHICLE DETECTOR DEBOUNCE TIME (0-25.5 SEC).....0.5 DELAY TIME (0-25.5 SEC)................ HOLD-OVER TIME (0-25.5 SEC).........0.0 ASSIGNMENT SELECTION: NOT ENABLED (Y/N)..... VEHICLE DETECTOR (1-64).........55 PEDESTRIAN DETECTOR (1-16)..... ALTERNATE PED DETECTOR (1-16)..... PREEMPT (1-10)..... INVERTED PREEMPT (1-10)...... STOP TIME (Y/N)..... FLASH SENSE (Y/N)..... DOOR OPEN (Y/N)..... MANUAL CONTROL ENABLE (Y/N)..... MANUAL CONTROL ADVANCE (Y/N)..... SPECIAL FUNCTION ALARM (1-8)..... TOD HOUR SYCHRONIZATION (0-23)..... FORCE OFF RING (1-4)..... HOLD PHASES (1-16)..... PLAN (65=FLSH,66=FREE)... OFFSET#... CHANGE PHASE SEQUENCE PAGE (1-12)... CHANGE PHASE TIMING PAGE (1-4).... CHANGE PHASE CONTROL PAGE (1-4).... CHANGE OVERLAP CONTROL PAGE (1-4)..._ CHANGE INPUT PAGE (1-4)..... CHANGE OUTPUT PAGE (1-4)..... OVERRIDE PHASE CONTROL FUNCTION (Y)._

PROGRAMMING COMPLETE

SPECIAL DETECTOR PROGRAMMING DETAIL - LOOP 5A (ALT.)

(program controller as shown below)

FROM MAIN MENU PRESS '7' (DETECTORS), THEN PRESS '1' FOR VEHICLE DETECTORS. PRESS THE '-' KEY TO GET TO VEHICLE DETECTOR #55.



DETECTOR PROGRAMMING COMPLETE

NOTE: DETECTOR IS PROGRAMMED PER THE INPUT FILE CONNECTION AND PROGRAMMING CHART SHOWN ON SHEET 1.

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> > 919.829.0328

NC Dept of Transportation Division of Highways Final Drawing Date: 1/12/2018

ENTER '55' TO REASSIGN

FOR THIS INPUT

THE VEHICLE DETECTOR

(LOOP 5A - PHASE 5)

ITS & Signals Unit

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-1241 DESIGNED: Dec. 2017 SEALED: 12/15/2017 REVISED: N/A

Electrical Detail-Final Design-Sheet 3 of 4 ELECTRICAL AND PROGRAMMING

R. N. Zinser

DETAILS FOR Prepared for the Offices of: 750 N.Greenfield Pkwy,Garner,NC 27529

SR 2159 (Piney Ridge Road) SR 2241 (Oak Street Extension)

Division 13 Rutherford County Dec. 2017 REVIEWED BY: J.L. Lewis PLAN DATE: PREPARED BY: J. Ma VHB PROJECT NO.: 38536.09 REVISIONS INIT. DATE

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UNLESS ALL SIGNATURES COMPLETED

SIGNATURE DATE SIG. INVENTORY NO. 13-1241

PROJECT REFERENCE NO. Sig.2.4 U-5833

ALTERNATE PHASING ACTIVATION DETAIL

TO RUN ALT, PHASING DURING <u>COORDINATION</u> — SELECT ALL PAGE CHANGES (AS SHOWN BELOW) WITHIN COORDINATION PLAN PROGRAMMING.

TO RUN ALT, PHASING DURING <u>free run</u> — program page changes (shown below) in separate time of day EVENTS. IF PAGE 1 IS USED, NO EVENT PROGRAMMING IS NECESSARY FOR THAT PARTICULAR PAGE.

PHAS ING	INPUTS PAGE	OVERLAPS PAGE
ACTIVE PAGES REQUIRED TO RUN <u>DEFAULT PHASING</u>	1	1
ACTIVE PAGES REQUIRED TO RUN <u>ALTERNATE PHASING</u>	2	2

NOTE: PAGES NOT SHOWN (i.e. sequence, phase control, etc.) SHOULD REMAIN AS '1', OR AS DEFINED BY TIMING ENGINEER.

IMPORTANT: IF ALT, PHASING IS USED DURING FREE RUN AND COORDINATION, DO NOT OPERATE TIME OF DAY PAGE CHANGE EVENTS CONCURRENTLY WITH COORDINATION PLAN EVENTS IN THE EVENT SCHEDULER. (EX. FREE RUN PAGE CHANGE EVENT SHOULD END BEFORE COORDINATION PLAN EVENT STARTS AND VICE-VERSA).

ALTERNATE PHASING PAGE CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OF WHAT TAKES PLACE WHEN THESE OVERLAP/INPUT PAGE CHANGES ACTIVATE TO CALL THE "ALTERNATE PHASING":

OVERLAPS PAGE 2: Modifies overlap parent phases for head 51 to run protected turn

INPUTS PAGE 2: Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 3 seconds.

> NC Dept of Transportation Division of Highways

Final Drawing Date: 1/12/2018

750 N.Greenfield Pkwy, Garner, NC 27529

R. N. Zinser ITS & Signals Unit F1388973472248F...

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-1241 DESIGNED: Dec. 2017 SEALED: 12/15/2017 REVISED: N/A

Electrical Detail-Final Design-Sheet 4 of 4

ELECTRICAL AND PROGRAMMING Prepared for the Offices of: Division 13 PREPARED BY: J. Ma

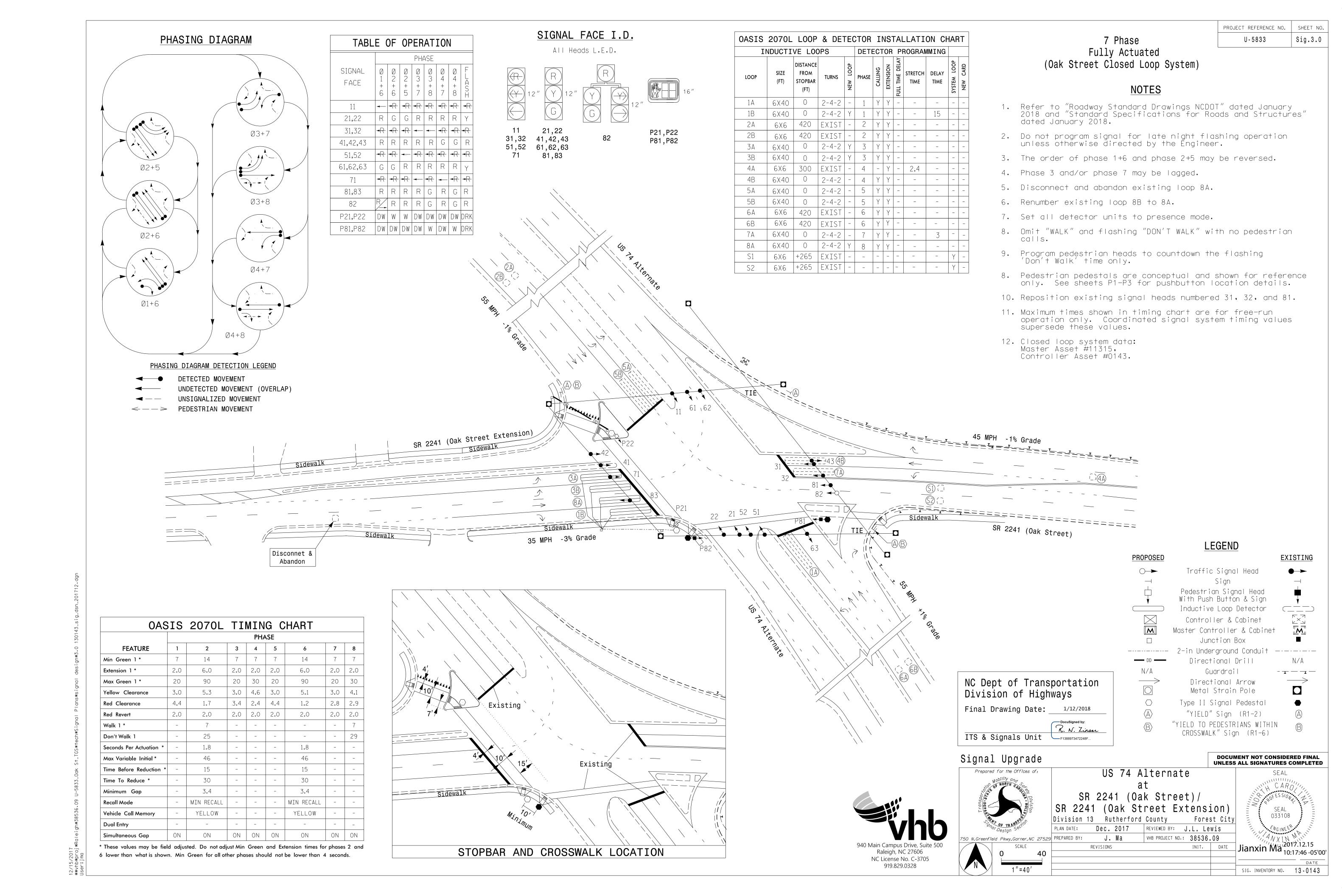
SR 2159 (Piney Ridge Road) SR 2241 (Oak Street Extension) Rutherford County

PLAN DATE: Dec. 2017 REVIEWED BY: J.L. Lewis VHB PROJECT NO.: 38536.09 REVISIONS

033108 Jianxin Ma 2017.12.15 SIGNATURE DATE SIG. INVENTORY NO. 13-1241

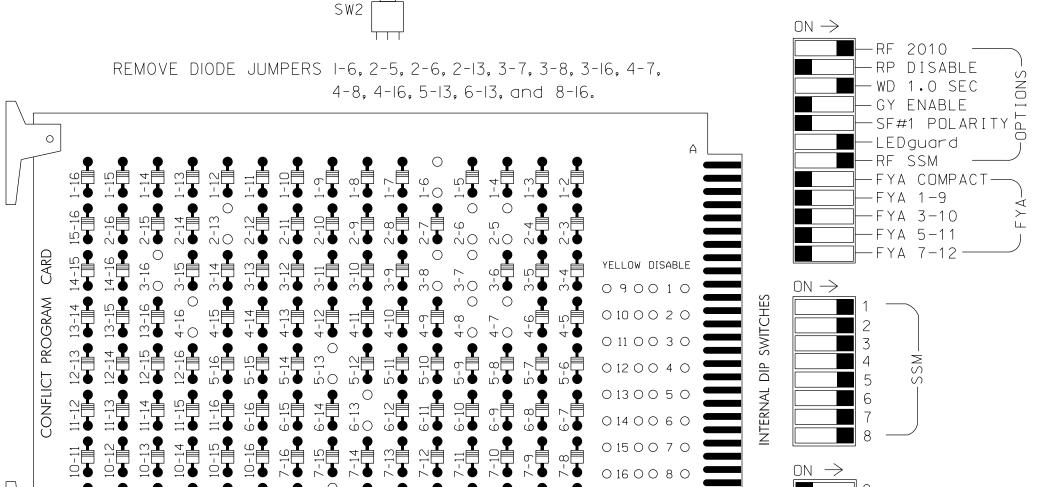
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(remove jumpers and set switches as shown)

ON OFF WD ENABLE 🔨 SW2



REMOVE JUMPERS AS SHOWN

NOTES:

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

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.

COMPONENT SIDE

2. Make sure jumpers SEL2-SEL5 are present on the monitor board.

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 Plans
- 2. Ensure that Red Enable is active at all times during normal operation To prevent Red Failures on used monitor channels, tie unused red monitor inputs 9,10, 11,12,13,14,15 & 16 to load switch AC+ per the cabinet manucturer's instructions.
- 3. Enable Simultaneous Gap-Out for all phases.
- 4. Program phases 2 and 6 for Variable Initial and Gap Reduction.
- 5. Program phases 2 and 6 for Start Up In Green.
- 6. Program phases 2 and 8 for 'STARTUP PED CALL'.
- 7. Program phases 2 and 6 for Yellow Flash.
- 8. The cabinet and controller are part of the Oak Street Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER...........2070

SOFTWARE......ECONOLITE OASIS CABINET MOUNT.....BASE

OUTPUT FILE POSITIONS...12

LOAD SWITCHES USED.....S1,S2,S2P,S3,S4,S5,S6,S7,S8,S8P

OVERLAPS.....NONE

U-5833 Sig 3 1

	S	IGN	AL	HEA	AD H	100	K-U	P C	HAF	RT			
LOAD SWITCH NO.	S	51	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
CMU CHANNEL NO.		1	2	13	3	4	14	5	6	15	7	8	16
PHASE		1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	11	82	21,22	P21, P22	31,32	41,42 43	NU	51,52	61,62 63	NU	71	81,82 83	P81, P82
RED			128			1Ø1			134			107	
YELLOW			129			102			135			1Ø8	
GREEN			130			103			136			109	
RED ARROW	125				116			131			122		
YELLOW ARROW	126	126			117			132			123		
GREEN ARROW	127	127			118			133			124		
₩				113									110
Ķ				115									112

NU = Not Used

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

INPUT FILE POSITION LAYOUT

(front view)

r	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.1	Ø 1	Ø 2	SLO	SLO	SLO	Ø 3	Ø 4	SLO	SYS. DET.	SL	SLO	Ø2PED	NUI	FS
FILE U	1A	2A	T	ŌŢ	ÖT	3A	4A	ÖT	S1	Ö T	Ö T	DC ISOLATOR	USED	DC ISOLATOR
"] "	NOT	Ø 2	E M p	E M P	E M P	Ø 3	Ø 4	E M P	SYS. DET.	E M P	E M P	I NO I	Ø8 PED	ST
	USED	2B	T Y	T Y	T Y	3B	4B	T Y	S2	T Y	T Y	USED	DC ISOLATOR	DC ISOLATOR
	Ø 5	Ø 5	Ø 6	S	Ø 7	Ø 8	S	S	S	S	S	S	S	S
FILE U	,	/	'	L O T	7A	,	LOT	L O T	L Q	L O T	L O T	L P	L Q	
II T II	5A	5B	6B	F	/ H	8A	' F	F '	E	F	F	E	F	'
	NOT	Ø 6	NOT	E M P	NOT	$\not \supset 1$	E M P	E M P	M P	E M P	E M P	M P	E M P	E M P
	USED	6A	USED	T Y	USED	1B	T Y	T Y	T Y	T Y	T Y	T Y	T Y	T Y

FS = FLASH SENSE ST = STOP TIME

= DENOTES POSITION

OF SWITCH

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A	TB2-1,2	I1U	56	18	1	1	Υ	Υ			
1B	TB5-11,12	J6L	46	8	18	1	Υ	Υ			15
2A	TB2-5,6	I2U	39	1	2	2	Υ	Υ			
2B	TB2-7,8	I2L	43	5	12	2	Υ	Υ			
3A	TB4-9,10	I6U	41	3	4	3	Υ	Υ			
3B	TB4-11,12	I6L	45	7	14	3	Υ	Υ			
4A	TB6-1,2	I7U	65	27	34	4		Υ		2.4	
4B	TB6-3,4	I7L	78	40	44	4	Υ	Υ			
5A	TB3-1,2	J1U	55	17	5	5	Υ	Υ			
5B	TB3-5,6	J2U	40	2	6	5	Υ	Υ			
6A	TB3-7,8	J2L	44	6	16	6	Υ	Υ			
6B	TB3-9,10	J3U	64	26	36	6	Υ	Υ			
7A	TB5-5,6	J5U	57	19	7	7	Υ	Υ			3
8A	TB5-9,10	J6U	42	4	8	8	Υ	Υ			
* S1	TB6-9,10	I9U	6Ø	22	11	SYS					
* S2	TB6-11,12	I9L	62	24	13	SYS					
PED PUSH BUTTONS							NOTE: INSTALL DC ISOLATOR				
P21,P22	TB8-4,6	I12U	67	29	PED 2	2 PED		IN I	NPUT F	FILE SLO	OTS
P81,P82	TB8-8,9	I13L	7Ø	32	PED 8	8 PED		I12 AND I13.			

* System detector only. Remove the vehicle phase assigned to this detector in the default programming.

LOWER-

INPUT FILE POSITION LEGEND: J2L FILE J-SLOT 2-



PHASE SEQUENCE PROGRAMMING DETAIL

(program controller as shown below)

FROM OASIS LOCAL CONTROLLER MAIN MENU SELECT: 4 PHASE SEQUENCE

РН	ASE SI	EQUENCE	: PAGE	1 N	EXT: PAC	SES)		
RNO	G¦LEA[d Bar	RIER 1	X-L	AG¦LEAD	ВА	RRIER 2	X-LAG
1	1	2	0	0	¦ 3	4	0	0
2	10	6	0	5	¦ 7	8	0	0
3	10	0	0	0	¦ O	0	0	0
4	10	0	0	0	¦ O	0	0	0

NC Dept of Transportation Division of Highways

Final Drawing Date:

R. N. Zinser ITS & Signals Unit

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-0143 DESIGNED: Dec. 2017 SEALED: 12/15/2017 REVISED: N/A

Electrical Detail ELECTRICAL AND PROGRAMMING

US 74 Alternate

Prepared for the Offices of: 750 N.Greenfield Pkwy,Garner,NC 27529

SR 2241 (Oak Street)/ SR 2241 (Oak Street Extension) Rutherford County

Dec. 2017 REVIEWED BY: J.L. Lewis PLAN DATE: VHB PROJECT NO.: 38536.09 PREPARED BY: J. Ma REVISIONS

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SIGNATURE DATE SIG. INVENTORY NO. 13-0143