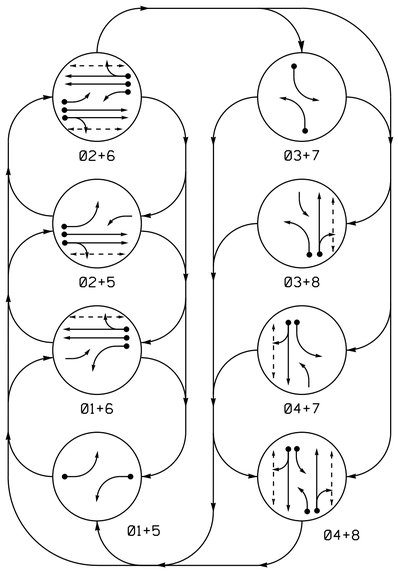
PROJECT REFERENCE NO.	SHEET NO.
W-5601HY	Sig. 1

8 Phase Fully Actuated w/ Emergency Vehicle Preemption (Durham Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV PREEMPT PHASES

*See Note #15

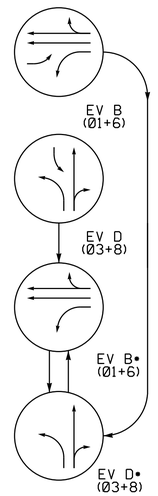


TABLE OF OPERATION

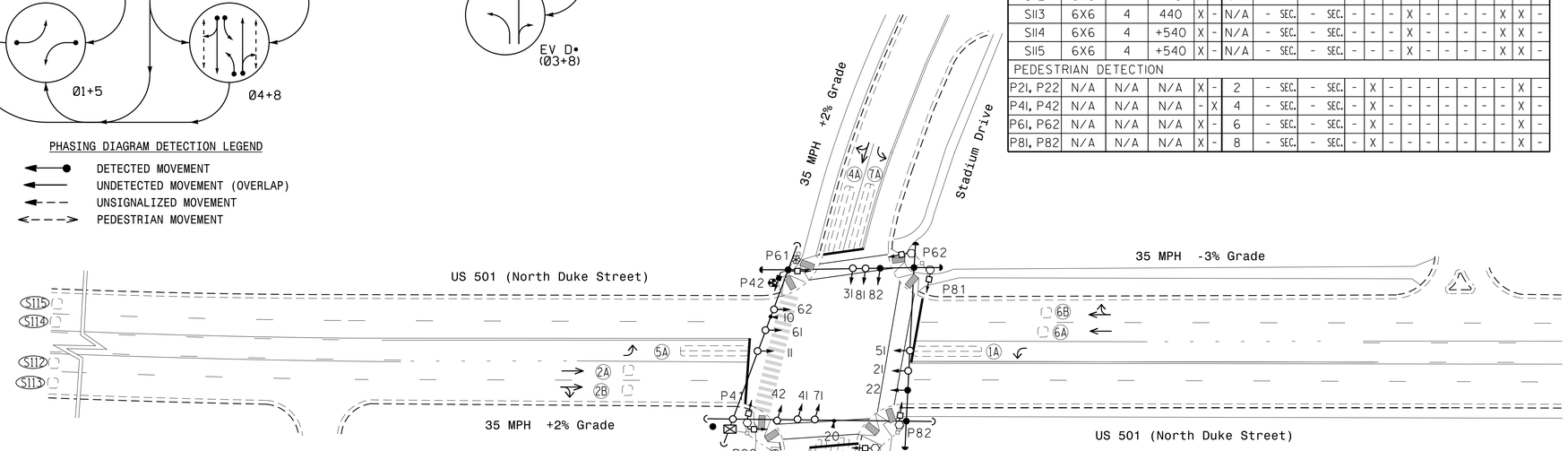
SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	03+7	03+8	04+7	04+8	EV B	EV D	EVB•	EVD•	FLASH
11	←	←	F Y	F Y	~~R~~	~~R~~	~~R~~	~~R~~	←	~~R~~	←	~~R~~	~~Y~~
21, 22	R	R	G	G	R	R	R	R	R	R	R	R	Y
31	~~R~~	~~R~~	~~R~~	~~R~~	←	←	F Y	F Y	~~R~~	←	~~R~~	←	~~R~~
41, 42	R	R	R	R	R	R	G	G	R	R	R	R	R
51	←	F Y	←	F Y	~~R~~	~~R~~	~~R~~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

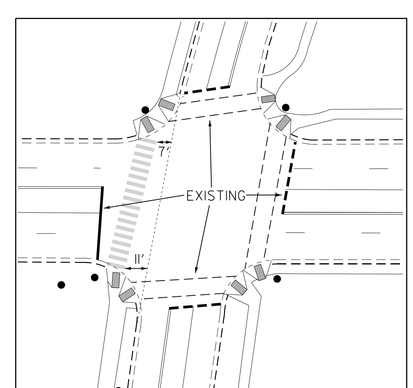
2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
1A	6X40	2-4-2	0	X	-	1	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2A	6X6	4	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2B	6X6	4	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
3A	6X40	2-4-2	+5	X	-	3	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4A	6X40	2-4-2	0	X	-	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
5A	6X40	2-4-2	0	X	-	5	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6X6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6B	6X6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
7A	6X40	2-4-2	0	X	-	7	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
						4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8A	6X40	2-4-2	+5	X	-	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
SI12	6X6	4	440	X	-	N/A	- SEC.	- SEC.	-	-	-	X	-	-	-	-	X	X	-
SI13	6X6	4	440	X	-	N/A	- SEC.	- SEC.	-	-	-	X	-	-	-	-	X	X	-
SI14	6X6	4	+540	X	-	N/A	- SEC.	- SEC.	-	-	-	X	-	-	-	-	X	X	-
SI15	6X6	4	+540	X	-	N/A	- SEC.	- SEC.	-	-	-	X	-	-	-	-	X	X	-
PEDESTRIAN DETECTION																			
P21, P22	N/A	N/A	N/A	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P41, P42	N/A	N/A	N/A	-	X	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P61, P62	N/A	N/A	N/A	X	-	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P81, P82	N/A	N/A	N/A	X	-	8	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Phase 3 and/or phase 7 may be lagged.
7. Reposition existing signal heads numbered 22 and 82.
8. Set all detector units to presence mode.
9. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
10. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
11. Set phase bank 3 maximum limit to 250 seconds for phases used.
12. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
13. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
14. Pedestrian pedestals are conceptual and shown for reference only. See sheets P1-P3 for pushbutton location details.
15. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
16. If preempt phasing resides in the barrier being serviced then the opposing 4-section FYA will flash continuously. If the preempt phase requires crossing the barrier then the opposing 4-section FYA will display a red arrow.
17. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation based on vehicle demand.
18. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

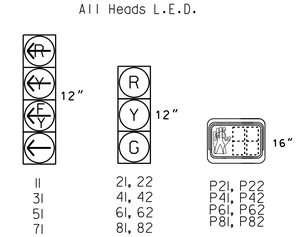




Proposed Crosswalk and Stopbar Locations

SIGNAL FACE I.D.

All Heads L.E.D.



LEGEND

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

TIMING CHART

2033 SOFTWARE w/ 2070 CONTROLLER

PHASE	01	02	03	04	05	06	07	08
MINIMUM INITIAL *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.	7 SEC.
VEHICLE EXTENSION *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.1 SEC.	3.0 SEC.	4.1 SEC.	3.0 SEC.	4.1 SEC.	3.0 SEC.	4.1 SEC.
RED CLEARANCE	2.8 SEC.	2.1 SEC.	2.4 SEC.	2.1 SEC.	2.8 SEC.	2.1 SEC.	2.4 SEC.	2.1 SEC.
MAXIMUM LIMIT *	15 SEC.	60 SEC.	25 SEC.	30 SEC.	15 SEC.	60 SEC.	15 SEC.	30 SEC.
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	NONE	VEH. RECALL	NONE	NONE
VEHICLE CALL MEMORY	NONLOCK	YELLOW LOCK	NONLOCK	NONLOCK	NONLOCK	YELLOW LOCK	NONLOCK	NONLOCK
DOUBLE ENTRY	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON
WALK *	– SEC.	7 SEC.	– SEC.	7 SEC.	– SEC.	7 SEC.	– SEC.	7 SEC.
FLASHING DON'T WALK	– SEC.	13 SEC.	– SEC.	18 SEC.	– SEC.	11 SEC.	– SEC.	18 SEC.
Min Ped Clear*	– SEC.	7 SEC.	– SEC.	9 SEC.	– SEC.	6 SEC.	– SEC.	9 SEC.
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAXIMUM GAP*	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.

* 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.

2033 EMERGENCY PREEMPTION TIMING CHART

FUNCTION	EV B (1+6) SECONDS	EV D (3+8) SECONDS
DELAY BEFORE PREEMPT	0	0
PED. CLEAR BEFORE PREEMPT	*	*
MIN. GREEN BEFORE PREEMPT	1.0	1.0
CLEARANCE TIME	2.0	2.0
PREEMPT EXTEND**	2.0	2.0

* See Timing Chart
** Program Timing on Optical Detector Unit

Signal Upgrade

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SCALE 0 40 1"=40'

US 501 (North Duke Street) at Stadium Drive

Division 5 Durham County Durham

PLAN DATE: December 2016	REVIEWED BY:
PREPARED BY: C.E. Carter	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 2/2/2017
430320F4A2654C3 DATE

SIG. INVENTORY NO. 05-0462

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