REPORT NUMBER 103-GTL-20-001

SAFETY COMPLIANCE TESTING FOR FMVSS NO. 103 WINDSHIELD DEFROSTING AND DEFOGGING SYSTEMS

TOYOTA MOTOR CORPORATION
2020 TOYOTA COROLLA, PASSENGER CAR
NHTSA NO. C20205105

GENERAL TESTING LABORATORIES, INC.
1623 LEEDSTOWN ROAD
COLONIAL BEACH, VIRGINIA 22443

January 6, 2020

FINAL REPORT

PREPARED FOR

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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Technical Report Documentation Page

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7. Author(s) Grant Farrand, Project Engineer Debbie Messick, Project Manager		8. Performing Organ. Rep# GTL-DOT-20-103-001
9. Performing Organization Name and Address General Testing Laboratories, Inc. 1623 Leedstown Road Colonial Beach, Va 22443		10. Work Unit No. (TRAIS) 11. Contract or Grant No. DTNH22-16-D-00031
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Enforcement Office of Vehicle Safety Compliance (NEF-210) 1200 New Jersey Ave., S.E. Washington, DC 20590		13. Type of Report and Period Covered Final Test Date November 21-22, 2019 14. Sponsoring Agency Code NEF-210
15. Supplementary Notes		
16. Abstract Compliance tests were conducted on the subject 2020 Toyota Corolla Passenger Car in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-103-13. Test failures identified were as follows: None		
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SECTION 1

PURPOSE OF COMPLIANCE TEST

1.0 PURPOSE OF COMPLIANCE TEST

A 2020 TOYOTA COROLLA PASSENGER CAR was subjected to Federal Motor Vehicle Safety Standard (FMVSS) No. 103 testing to determine if the vehicle was in compliance with the requirements of the standard. All tests were conducted in accordance with NHTSA, Office of Vehicle Safety Compliance (OVSC) Laboratory Procedure, TP-103-13 dated 26 June 1996 and General Testing Laboratories, Inc. (GTL) Test Procedure, "Windshield Defrosting and Defogging Systems – Passenger Vehicles, Multipurpose Vehicles, Trucks and Buses".

1.1 TEST VEHICLE

The test vehicle was a 2020 TOYOTA COROLLA PASSENGER CAR. Nomenclature applicable to the test vehicle are:

A. Vehicle Identification Number: JTDEPRAE1LJ060304

B. NHTSA No.: C20205105

C. Manufacturer: TOYOTA MOTOR CORPORATION

D. Manufacture Date: 07/19

E. Color: Black Sand Pearl

F. Body Style: LE

1.2 TEST DATE

The test vehicle was subjected to FMVSS No. 103 testing during the time period November 21-22, 2019.

SECTION 2

COMPLIANCE TEST PROCEDURE AND SUMMARY OF RESULTS

2.0 GENERAL

The 2020 TOYOTA COROLLA PASSENGER CAR, NHTSA No. C20205105 was subjected to FMVSS No. 103 tests during the time period November 21-22, 2019. Photographs of the test vehicle are shown in Figures 5.1 through 5.4. The manufacturer's certification and tire information labels are shown in Figures 5.5 and 5.6. The test instrumentation and instrument panel setups are depicted in Figures 5.7 and 5.8. Figures 5.9 through 5.24 depict the windshield pre and post test defrost conditions.

2.1 TEST PROCEDURE

Prior to test the test vehicle was inspected for completeness, systems operability, and appropriate liquid levels, i.e., oil and coolant to include antifreeze protection. The vehicle was then photographically documented as required by the DOT/NHTSA test procedure. The vehicle was installed in the cold chamber and pre-conditioned for a 14-hour minimum, 0° ±5° F temperature soak for the first test run. After the pre-condition, the hood was raised to assure engine coolant and lubricant were stabilized within the test temperature range for a minimum of 2 hours.

At the end of the 2-hour minimum stabilization period, the entire windshield was sprayed evenly with 0.010 ounces of water per square inch of glass area. Refer to Section 3, Compliance Test Data, for test specifics such as total amount of water sprayed, spray gun identification, and air pressure regulation. The vehicle soak continued for an additional 30 minutes minimum but no more than 40 minutes after the windshield was sprayed.

At the conclusion of the additional soak time the vehicle's motor/system was started and operated. The defroster blower was turned on to the high-speed setting with the heater selector in the de-ice (defrost) position, and the temperature control in the maximum temperature position. All doors and windows were closed. The heater air intake was fully open, and the vehicle's hood closed. At no time during the test were the windshield wipers used.

At start of testing and during test, at each 5-minute interval after engine start, cold chamber, engine coolant, heater coolant in and defroster air left/defroster air right temperatures were recorded. Likewise, at each 5-minute interval the boundary of the defrosted area was marked on the inside surface of the windshield. The test was run for a maximum of 40 minutes from engine start, or until such time as 100 percent windshield clearance was achieved. Photographs were made of the windshield at the pre-test frosted state and 5-minute, 10-minute and 15-minute intervals. Post test actions included placing a vellum pattern on the windshield and tracing the windshield's 5-minute interval defrosted area boundary lines onto the vellum pattern.

After the traces were obtained, the windshield was again thoroughly cleaned and the vehicle engine coolant and lubricant stabilization period at 0° ± 5° F temperature commenced for a repeat of the procedure discussed. The windshield patterns for both tests were used subsequently to determine the cleared area percentages.

2.2 SUMMARY OF RESULTS

Based on the test performed, the test vehicle appears to be in compliance with the requirements of FMVSS 103.

SECTION 3

COMPLIANCE TEST DATA

3.0 TEST RESULTS

The following data sheets document the results of testing on the 2020 TOYOTA COROLLA PASSENGER CAR.

SUMMARY DATA SHEET
FMVSS 103, WINDSHIELD DEFROSTING AND DEFOGGING SYSTEMS

VEH. MOD YR/MAKE/MODEL/BODY: 2020 TOYOTA COROLLA LE PASSENGER CAR
VEH. NHTSA NO: C20205105; VIN: JTDEPRAE1LJ060304
VEH. BUILD DATE: 07/19 TEST DATE: NOVEMBER 21-22, 2019
CONTRACT NO./DELIVERY ORDER NO.:DTNH2216D00031/693JJ919F000169
TEST LABORATORY:GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

WINDSHIELD AREA: 1841 in^2 AREA C = 338.5 in^2 AREA D = 338.5 in^2 AREA A= 1153.3 in^2

MANUFACTURER'S WINDSHIELD PATTERN USED: Yes X No

ENGINE THERMOSTAT NOMINAL REGULATING TEMPERATURE: 172-180 °F

HEATER-DEFROSTER SYSTEM INCLUDES AIR CONDITIONER: YES NO X

DESCRIBE UNUSUAL FEATURES OF DEFROSTING SYSTEM:

DESCRIBE UNUSUAL FEATURES OF TEST CAR:

DESIGNATION	AREA PERCENT DEFROSTED					
	TEST 1	TEST 2	AVG	REQ'D	PASS	FAIL
CRITICAL AREA C AT 20 MINUTES	100%	99.1%	99.6%	80% MINIMUM	X	
PASSENGER AREA D AT 25 MINUTES	100%	100%	100%	80% MINIMUM	X	
TOTAL AREA A AT 40 MINUTES	100%	100%	100%	95% MINIMUM	X	

REMARKS:

RECORDED BY: G. FARRAND DATE: 11/22/19

APPROVED BY: D. MESSICK

FMVSS 103 TEST DATA RECORD – TEST RUN NO. 1

VEH. MOD YR/MAKE/MODEL/BODY: 2020 TOYOTA COROLLA LE PASSENGER CAR
VEH. NHTSA NO: C20205105; VIN: JTDEPRAE1LJ060304
VEH. BUILD DATE: 07/19 TEST DATE: NOVEMBER 21, 2019
CONTRACT NO./DELIVERY ORDER NO.:DTNH2216D00031/693JJ919F000169
TEST LABORATORY:GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

If 1st Test Run, chamber conditioned 24 hours @ 0° ±5° F (14 hrs. min.)

Cold Soak Period: 15 hours @ 0° ±5° F (10 hrs. min. unless Alt. Method used)

Time engine coolant and lubricant remained stabilized at 0° F: 10 hrs. 0 minutes

Water Spray Gun and Nozzle Type: BINKS #66 S

Spray Gun Pressure: 50 psi (50 psi ± 3 psi)

Water used: 18.4 fluid oz. (0.010 ounces per square inch of windshield area)

Soak Period Between Ice Application and Test Start: 35 minutes (30 to 40 minutes)

Engine Speed: 2500 for first five minutes then 1500 rpm (1500 to 1600 rpm) or
Electric Vehicle:

Wind at specified location in front of windshield: 1 mph (0 to 2 mph)

Number of Vehicle Occupants: 2 (2 maximum)

Describe window openings, if any: NONE

TIME FROM START (minutes)	BATTERY VOLTAGE (volts)	TEMPERATURE, °F					CHAMBER TEMP °F	DEFROSTED AREA, %		
		RADIATOR COOLANT	HEATER COOLANT OUT	HEATER COOLANT IN	DEFROSTER AIR			A	C	D
					DRVR.	PSGR.				
0	14.2	-1.6°F	-1.2°F	-1.0°F	-0.5°F	0.0°F	-1.4°F	0%	0%	0%
5	14.1	14.7°F	71.2°F	63.5°F	66.1°F	67.0°F	0.9°F	6.0%	0%	0%
10	14.1	52.9°F	103.6°F	93.0°F	90.1°F	89.6°F	0.3°F	46.0%	43.0%	55.8%
15	14.1	79.8°F	118.9°F	107.1°F	101.1°F	99.9°F	1.3°F	86.8%	96.9%	96.1%
20	14.1	96.3°F	126.1°F	112.7°F	107.0°F	105.4°F	2.4°F	99.0%	100%	100%
25	14.0	106.7°F	133.3°F	120.2°F	114.2°F	112.4°F	3.5°F	99.9%	100%	100%
30	14.0	114.2°F	140.4°F	127.1°F	120.7°F	118.7°F	4.5°F	100%	100%	100%

REMARKS:

RECORDED BY: G. FARRAND DATE: 11/21/19
APPROVED BY: D. MESSICK

FMVSS 103 TEST DATA RECORD – TEST RUN NO. 2

VEH. MOD YR/MAKE/MODEL/BODY: 2020 TOYOTA COROLLA LE PASSENGER CAR
VEH. NHTSA NO: C20205105; VIN: JTDEPRAE1LJ060304
VEH. BUILD DATE: 07/19 TEST DATE: NOVEMBER 22, 2019
CONTRACT NO./DELIVERY ORDER NO.:DTNH2216D00031/693JJ919F000169
TEST LABORATORY:GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

If 1st Test Run, chamber conditioned ____ hours @ 0° ± 5° F (14 hrs. min.)

Cold Soak Period: 15 hours @ 0° ±5° F (10 hrs. min. unless Alt. Method used)

Time engine coolant and lubricant remained stabilized at 0° F: 12 hrs. 0 minutes

Water Spray Gun and Nozzle Type: BINKS 66S

Spray Gun Pressure: 50 psi (50 psi ± 3 psi)

Water used: 18.4 fluid oz. (0.010 ounces per square inch of windshield area)

Soak Period Between Ice Application and Test Start: 40 minutes (30 to 40 minutes)

Engine Speed: 2500 for first five minutes then 1500 rpm (1500 to 1600 rpm) or
Electric Vehicle: _____

Wind at specified location in front of windshield: 1 mph (0 to 2 mph)

Number of Vehicle Occupants: 2 (2 maximum)

Describe window openings, if any: NONE

TIME FROM START (minutes)	BATTERY VOLTAGE (volts)	TEMPERATURE, °F					CHAMBER TEMP °F	DEFROSTED AREA, %		
		RADIATOR COOLANT	HEATER COOLANT OUT	HEATER COOLANT IN	DEFROSTER AIR			A	C	D
					DRVR.	PSGR.				
0	14.1	-1.5°F	-1.1°F	-0.9°F	0.0°F	-0.8°F	0.9°F	0%	0%	0%
5	14.1	1.7°F	46.3°F	39.3°F	48.0°F	50.4°F	-0.1°F	0%	0%	0%
10	14.1	33.6°F	78.8°F	67.7°F	65.6°F	65.5°F	-0.7°F	19.9%	11.9%	18.1%
15	14.1	59.4°F	99.8°F	88.6°F	84.1°F	83.5°F	0.2°F	59.2%	62.7%	72.3%
20	14.1	80.3°F	116.0°F	104.1°F	99.4°F	98.4°F	0.7°F	91.3%	99.1%	99.2%
25	14.1	96.3°F	127.4°F	115.0°F	110.2°F	109.2°F	1.7°F	99.8%	100%	100%
30	14.1	107.9°F	132.5°F	117.9°F	111.1°F	109.1°F	3.0°F	100%	100%	100%

REMARKS:

RECORDED BY: G. FARRAND DATE: 11/22/19
APPROVED BY: D. MESSICK

SECTION 4
INSTRUMENTATION AND EQUIPMENT LIST

TABLE 1 - INSTRUMENTATION & EQUIPMENT LIST

EQUIPMENT	DESCRIPTION	MODEL/ SERIAL NO.	CAL. DATE	NEXT CAL. DATE
TIMER	ACCU-SPLIT	ACT1	03/19	03/20
TEMPERATURE RECORDER	FLUKE	8210007	04/19	04/20
SPRAY GUN	BINKS	66S	BEFORE USE	BEFORE USE
TACHOMETER	MONARCH	ACT 3 1444664	11/19	11/20
ANEMOMETER	OMEGA	HHF-616	08/19	08/20
AIR PRESSURE GAGE	BINKS	0-160	03/19	03/20
SCALE	METTLER	H315/ 445951	11/19	11/20
GRADUATED BEAKER	PHOTAX	N/A	N/A	N/A
EVENT RECORDER	COMPUTER	GEO1	BEFORE USE	BEFORE USE

SECTION 5

PHOTOGRAPHS

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.1
LEFT SIDE VIEW OF VEHICLE

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.2
RIGHT SIDE VIEW OF VEHICLE

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.3
¾ FRONTAL VIEW FROM LEFT SIDE OF VEHICLE

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.4
¾ REAR VIEW FROM RIGHT SIDE OF VEHICLE

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.5
VEHICLE CERTIFICATION LABEL

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.6
VEHICLE TIRE INFORMATION LABEL

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.7
CLOSE-UP VIEW OF DEFROSTER CONTROL SETTING
ON DASH

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.8
INSTRUMENTATION SET-UP

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.9
WINDSHIELD, PRE-TEST FROSTED STATE TEST #1

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.10
DEFROSTED AREA AT 5 MINUTES TEST #1

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.11
DEFROSTED AREA AT 10 MINUTES TEST #1

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.12
DEFROSTED AREA AT 15 MINUTES TEST #1

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

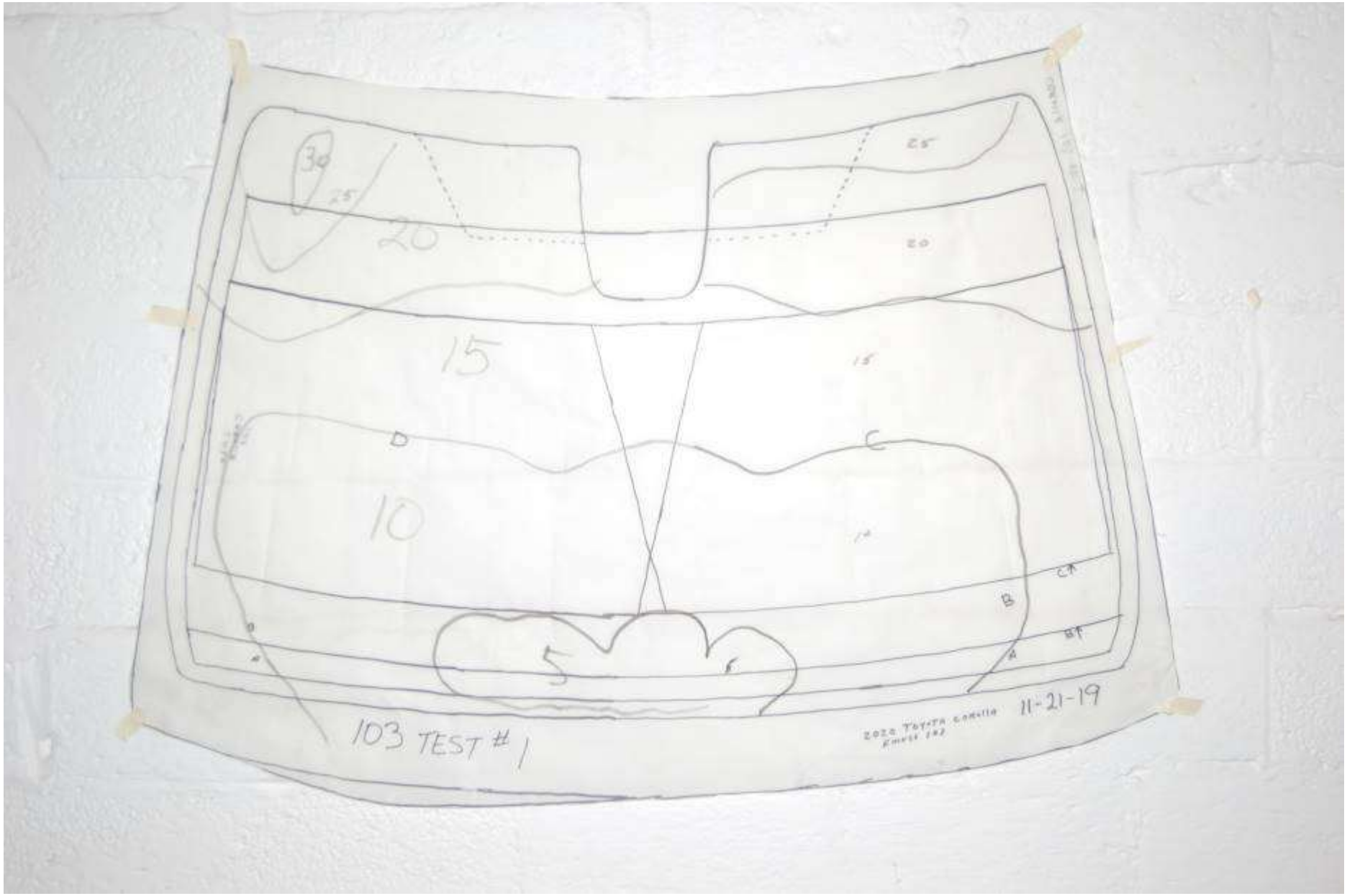
FIGURE 5.13
DEFROSTED AREA AT 20 MINUTES TEST #1

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.14
DEFROSTED AREA AT 25 MINUTES TEST #1

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.15
DEFROSTED AREA AT 30 MINUTES TEST #1



2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.16
WINDSHIELD VELLUM PATTERN, POST TEST #1

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.17
WINDSHIELD PRE-TEST FROSTED STATE TEST #2

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.18
DEFROSTED AREA AT 5 MINUTES TEST #2

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.19
DEFROSTED AREA AT 10 MINUTES TEST #2

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.20
DEFROSTED AREA AT 15 MINUTES TEST #2

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

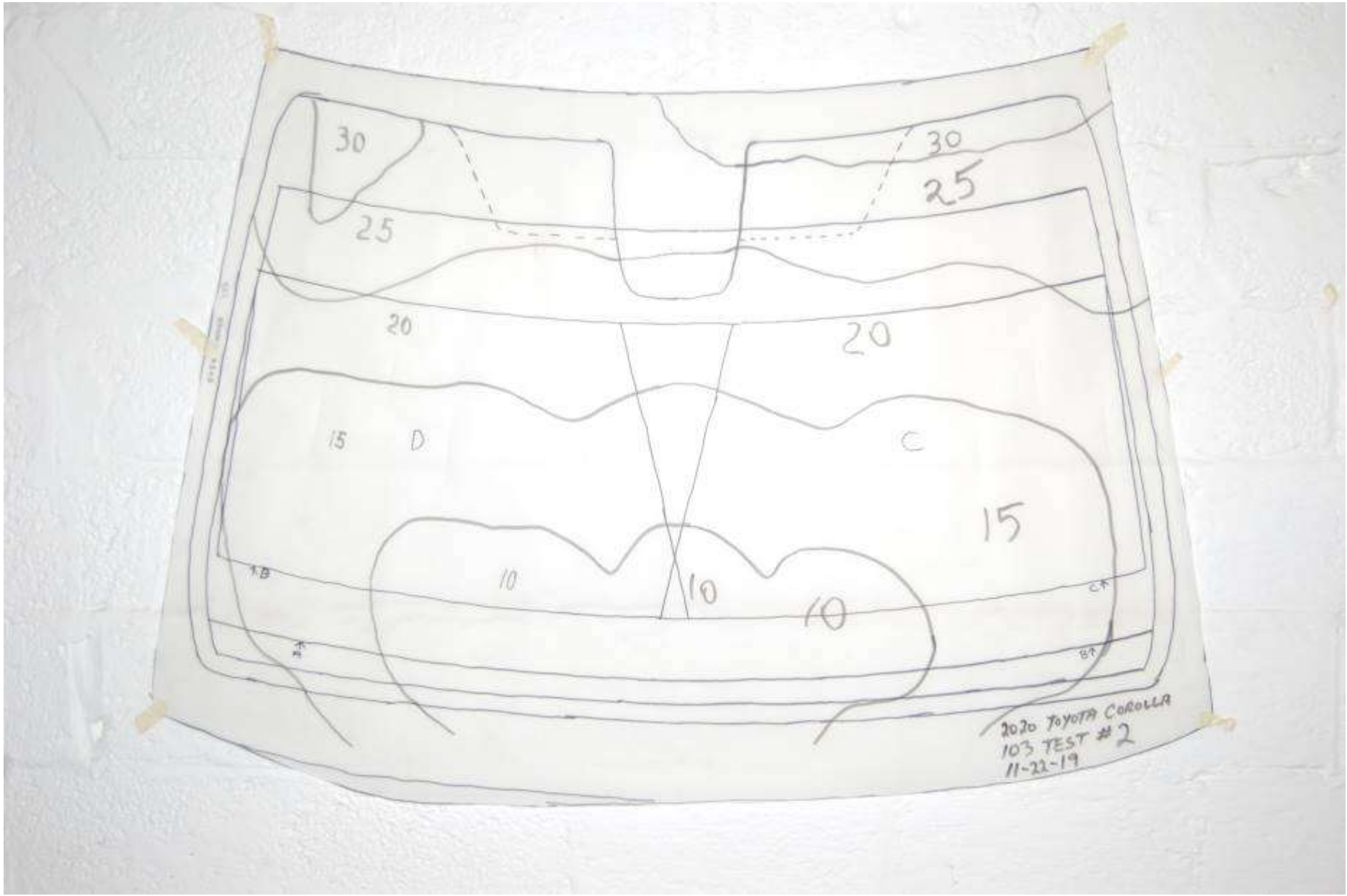
FIGURE 5.21
DEFROSTED AREA AT 20 MINUTES TEST #2

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.22
DEFROSTED AREA AT 25 MINUTES TEST #2

2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.23
DEFROSTED AREA AT 30 MINUTES TEST #2



2020 TOYOTA COROLLA LE
NHTSA NO. C20205105
FMVSS NO. 103

FIGURE 5.24
WINDSHIELD VELLUM PATTERN, POST TEST #2

SECTION 6

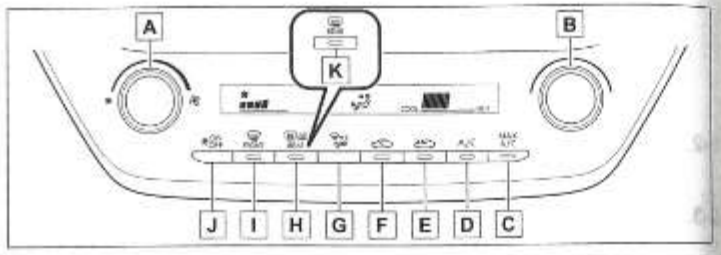
OWNER'S MANUAL DEFROSTER INSTRUCTIONS

Manual air conditioning system*

*: If equipped

Air conditioning controls

The display and button positions will differ depending on the type of the system.



A Fan speed control switch
B Temperature control switch
C "MAX A/C" switch
D "A/C" switch
E Outside air mode switch
F Recirculated air mode switch
G Airflow mode control switch
H Rear window defogger and outside rear view mirror defoggers switch*
I Windshield defogger switch
J On/off switch
K Rear window defogger switch*

*: If equipped

■ Adjusting the temperature setting

To adjust the temperature setting, turn the temperature control switch clockwise (warm) or counterclockwise (cool).

If "A/C" switch is not pressed, the system will blow ambient temperature air or heated air.

For quick cooling, press the "MAX A/C" switch. The air conditioning will automatically turn on and, if an air outlet position or is selected, the system will be set to recirculated air mode. While "MAX A/C" is selected, it is not possible to turn off the air conditioning.

■ Fan speed setting

To adjust the fan speed, turn the fan speed control switch clockwise (increase) or counterclockwise (decrease).

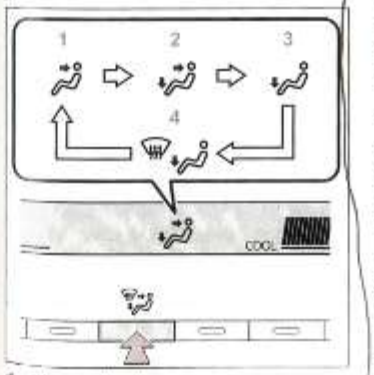
Pressing the on/off switch to turns off the fan.

When the fan is off, pressing the on/off switch or turning the fan speed control switch clockwise will turn on the fan.

■ Change the airflow mode

Press the airflow mode control switch.

The airflow mode changes as follows each time the switch is pressed.



1 Upper body
2 Upper body and feet
3 Feet
4 Feet and the windshield

■ Switching between outside air and recirculated air modes

- To change to recirculated air mode, press the recirculated air mode switch.

The indicator illuminates on the recirculated air mode switch.

- To change to outside air mode, press the outside air mode switch.

The indicator illuminates on the outside air mode switch.

■ Set cooling and dehumidification function

Press the "A/C" switch.

When the function is on, the indicator illuminates on the "A/C" switch.

■ Defogging the windshield

Defoggers are used to defog the windshield and front side windows.

Press the windshield defogger switch.

Set the outside/recirculated air mode switch to outside air mode if the recirculated air mode is used.

To defog the windshield and the side windows quickly, turn the air flow and temperature up.

To return to the previous mode, press the windshield defogger switch again when the windshield is defogged.

When the windshield defogger switch is on, the indicator illuminates on the windshield defogger