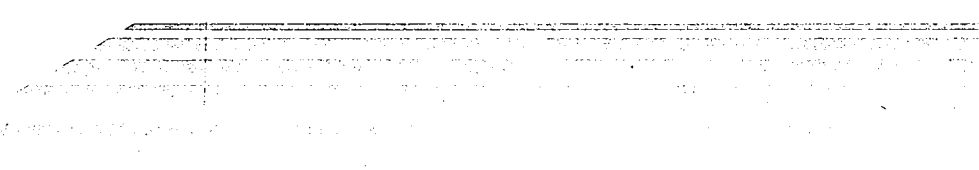


504575



# **Calspan**

*IMPROVED LIGHTWEIGHT SUBCOMPACT  
SIDE STRUCTURE TEST REPORT*

Donald A. Alianello

Calspan Report No. 6225-V-3

TEST: BASELINE CRASH TEST NO. 4  
TYPE OF TEST: CAR-TO-CAR FRONT TO SIDE OBLIQUE  
TEST DATE: 2 FEBRUARY 1978

Prepared For:  
THE BUDD COMPANY  
TECHNICAL CENTER  
FORT WASHINGTON, PA 19034  
PURCHASE ORDER NO. TC-14436

Calspan Corporation  
Buffalo, New York 14221



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## TEST OBJECTIVE

The test objective was to obtain baseline performance data on the following vehicles when involved in a 30 mph car-to-car front to side oblique impact.

- 1976 Volkswagen Rabbit
- 1978 Chevrolet Impala

The 1976 Volkswagen Rabbit was chosen as the program subcompact vehicle after the candidate subcompact vehicles were evaluated during Task 2 of the National Highway Traffic Safety Administration (NHTSA) contract DOT-HS-7-01588. The 1978 Chevrolet Impala was chosen by NHTSA as the bullet vehicle because it was considered to be the more representative of the full size vehicles that would be manufactured in the 1980's.

This test was one of four baseline tests that will be performed in order to obtain the required baseline test data for use in evaluation of the modified vehicle.

## PRESENTATION OF RESULTS

This test report presents all the test results obtained from this car-to-car, front to side impact. Included in this document are still photographs, all vehicle and dummy response data in plotted form, vehicle interior and exterior damage sketches, figures of pre and post test vehicle side intrusion measurements and instrumentation identification. High speed motion pictures and color slides of pre and post test conditions were obtained, and have been submitted to the sponsor.

Included in the vehicle response data, in plotted form, are strain measurements obtained from strain gages mounted to the door beam, sill, and B-post. Dynamic intrusion measurements are also included which were obtained by a Calspan designed linear displacement transducer. A commercial string potentiometer was also used in parallel with Calspan's transducer at one location for comparison.

Calspan Report No. ZP-6144-V-1, Baseline Crash Test No. 1, of the Improved Lightweight Subcompact Side Structure Contract, Appendix A contains information on the crash test facility and supporting equipment at Calspan.

Table 1

**CRASH TEST SUMMARY**

TEST NO. Baseline Crash No. 4 PROJECT Improved Lightweight Subcompact Side Structure

DATE 2/3/78 TIME 12:15 TEMP. 20°F

TEST CONDITION Car-to-Car, 60° Side Oblique

Bullet VEHICLE NO. 1 1978 Chevrolet Impala (4-Door Sedan)

Target VEHICLE NO. 2 1976 Volkswagen Rabbit

(Bullet) **VEH. NO. 1** (Target) **VEH. NO. 2**

| TEST WEIGHT (lbs)       | <u>Curb weight plus 2 Dummies</u> | <u>Curb weight plus 2 Dummies</u> |
|-------------------------|-----------------------------------|-----------------------------------|
| IMPACT ANGLE (deg)*     | <u>60</u>                         | <u>0</u>                          |
| IMPACT VELOCITY (mph)** | <u>29.08</u>                      | <u>0</u>                          |
| MAX. CRUSH (in)         | <u>                    </u>       | <u>21</u>                         |
| MAX. INTRUSION (in)     | <u>0</u>                          | <u>19-3/4</u>                     |

**DUMMIES****VEH. NO. 1****VEH. NO. 2**

TYPE Hybrid II Part 572

LOCATION LF(1), RF(2)

RESTRAINT Production 3-Point System

Hybrid II Part 572

LF(1), RF(2)

Unrestrained Dummies

NUMBER OF DATA CHANNELS 71

NUMBER OF HIGH SPEED CAMERAS 9

\* WITH RESPECT TO TOW TRACK CENTERLINE

\*\* SPEED TRAP MEASUREMENT ( $\pm 0.5\%$  ACCURACY)

1978 Chevrolet Impala

**OBSERVATIONS (VEHICLE NO. 1)**

GLAZING Undamaged

DOORS Undamaged

SEAT ANCHORAGES Intact

RESTRAINTS Intact

1976 Volkswagen Rabbit

**OBSERVATIONS (VEHICLE NO. 2)**

GLAZING Windshield was cracked, Driver's door and rear side windows were broken.

DOORS Passenger door was operable

SEAT ANCHORAGES Driver's seat was crushed

RESTRAINTS ----

**GENERAL COMMENTS**

- All cameras operated
- On Car No. 1: one channel of data was lost due to a bad channel on tape machine (Engine X)
- On Car No. 2: 3 strain gage signals were lost due to cut wires (#2, #8, #10).
- On Car No. 2: lower side intrusion data was lost after 13 inches due to improper scale factor when channel was calibrated.

TABLE 2

## VEHICLE TEST WEIGHTS

BULLET VEHICLE - 1978 CHEVROLET IMPALACar No. 1

|                    |             |        |             |             |                    |
|--------------------|-------------|--------|-------------|-------------|--------------------|
| Left Front         | <u>1060</u> | lbs.   | Left Rear   | <u>880</u>  | lbs.               |
| Right Front        | <u>1080</u> | lbs.   | Right Rear  | <u>850</u>  | lbs.               |
| Total Front        | <u>2140</u> | lbs.   | Total Rear  | <u>1730</u> | lbs.               |
|                    |             |        |             |             |                    |
| Total Weight =     | <u>2140</u> | lbs. + | <u>1730</u> | lbs. =      | <u>3870</u> lbs.   |
| Wheel Base         | <u>116</u>  | in.    |             |             |                    |
| Cg <sub>FW</sub> = | <u>1730</u> | lbs.   | <u>116</u>  | in.         | = <u>51.85</u> in. |
|                    | <u>3870</u> | lbs.   |             |             |                    |

TARGET VEHICLE - 1976 VOLKSWAGEN RABBITCar No. 2

|                    |             |        |             |             |                    |
|--------------------|-------------|--------|-------------|-------------|--------------------|
| Left Front         | <u>650</u>  | lbs.   | Left Rear   | <u>510</u>  | lbs.               |
| Right Front        | <u>670</u>  | lbs.   | Right Rear  | <u>550</u>  | lbs.               |
| Total Front        | <u>1320</u> | lbs.   | Total Rear  | <u>1060</u> | lbs.               |
|                    |             |        |             |             |                    |
| Total Weight =     | <u>1320</u> | lbs. + | <u>1060</u> | lbs. =      | <u>2380</u> lbs.   |
| Wheel Base         | <u>94.5</u> | in.    |             |             |                    |
| Cg <sub>FW</sub> = | <u>1060</u> | lbs.   | <u>94.5</u> | in.         | = <u>42.08</u> in. |
|                    | <u>2380</u> | lbs.   |             |             |                    |

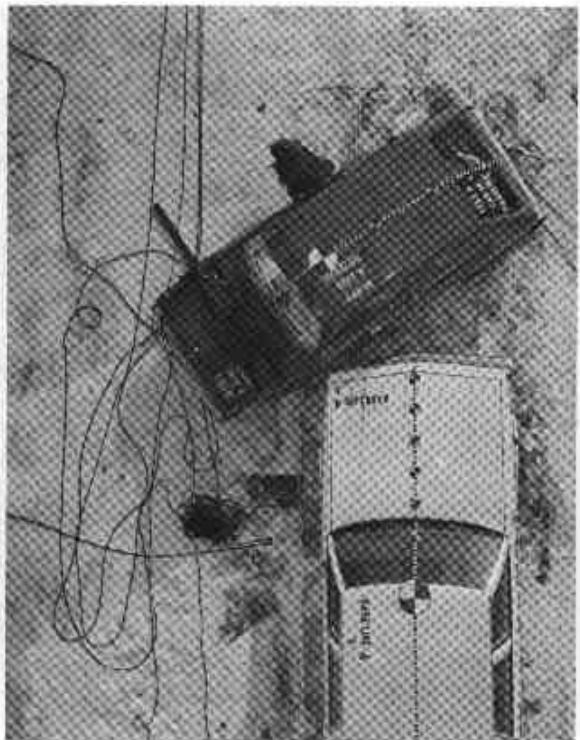
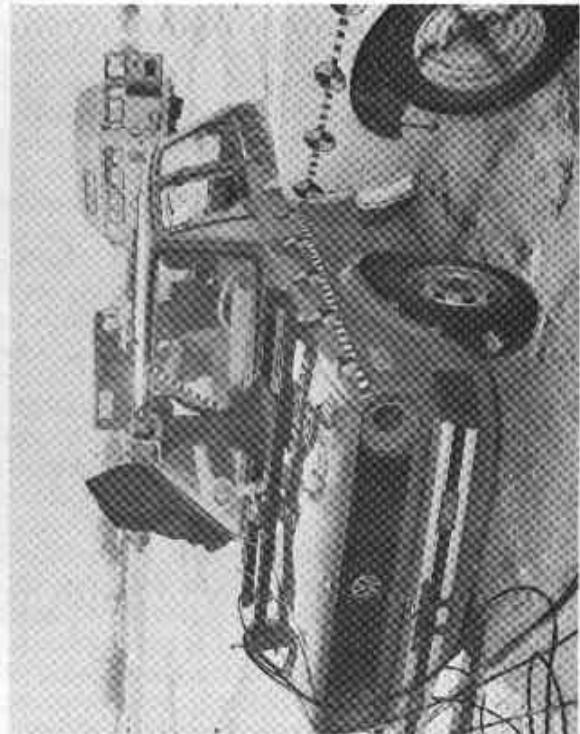
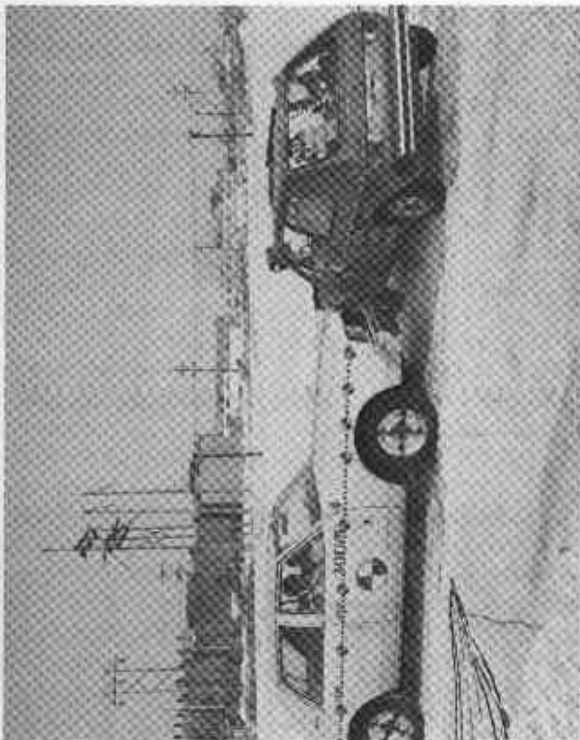


Figure 1 PRE-BASELINE TEST NO. 4 – VEHICLE IMPACT CONFIGURATION

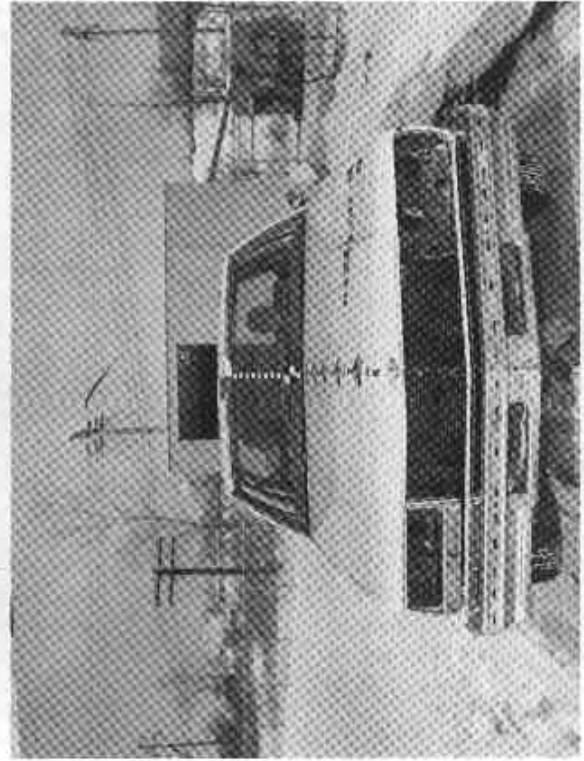
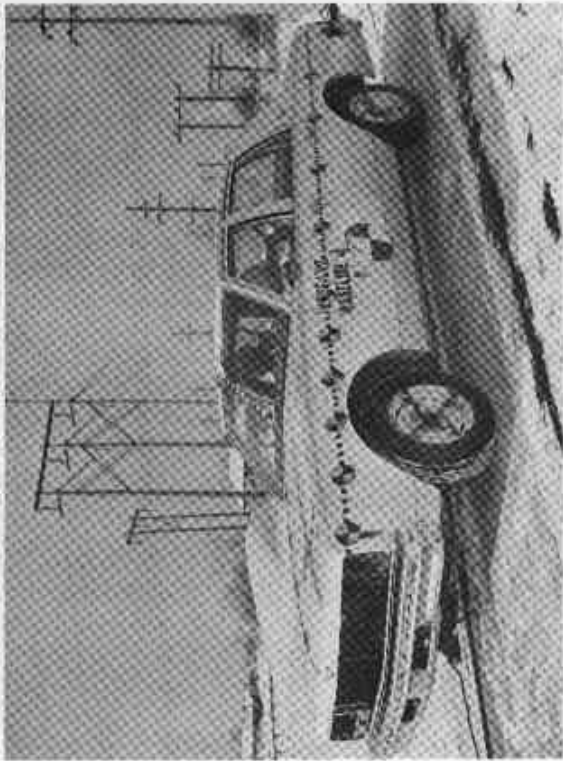
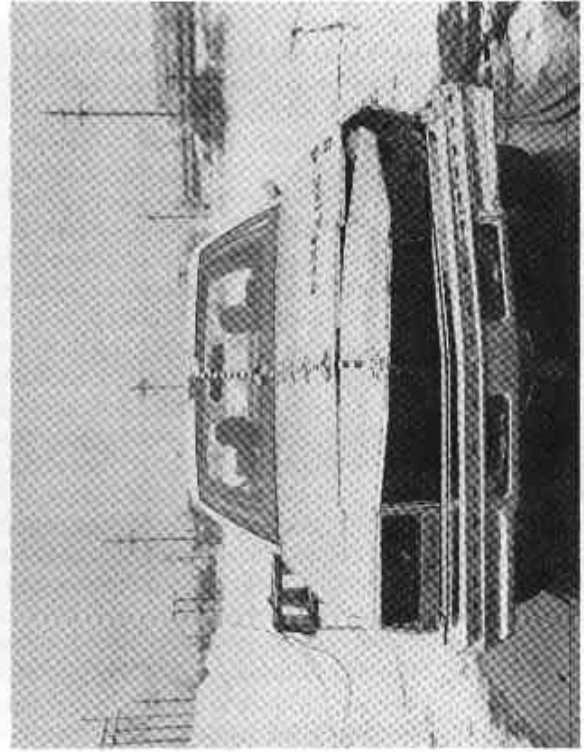
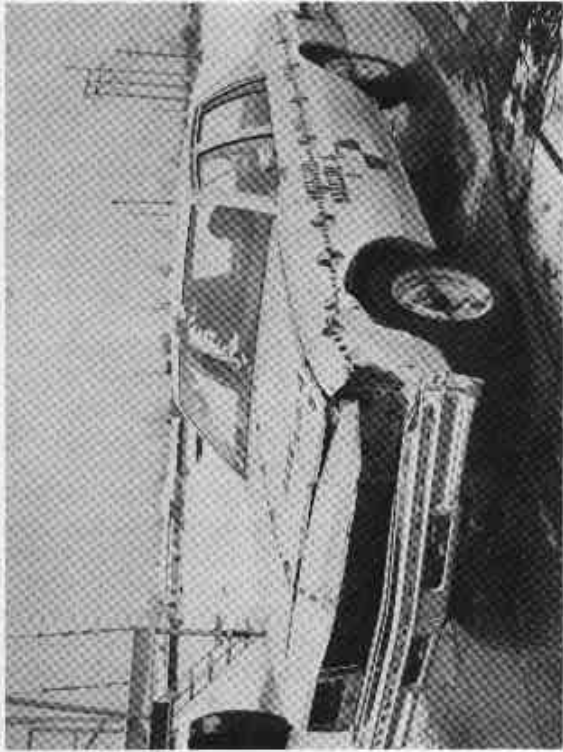


Figure 2 PRE- AND POST-TEST NO. 4 - CAR 1, 1978 CHEVROLET IMPALA

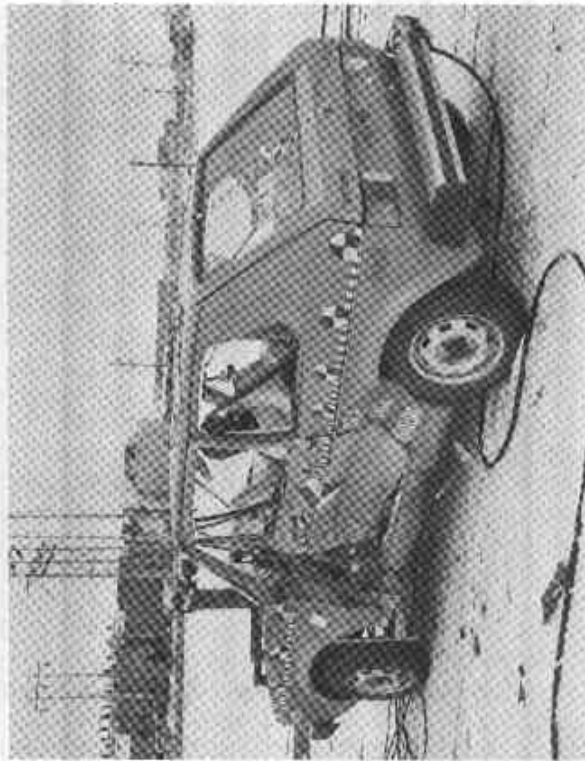
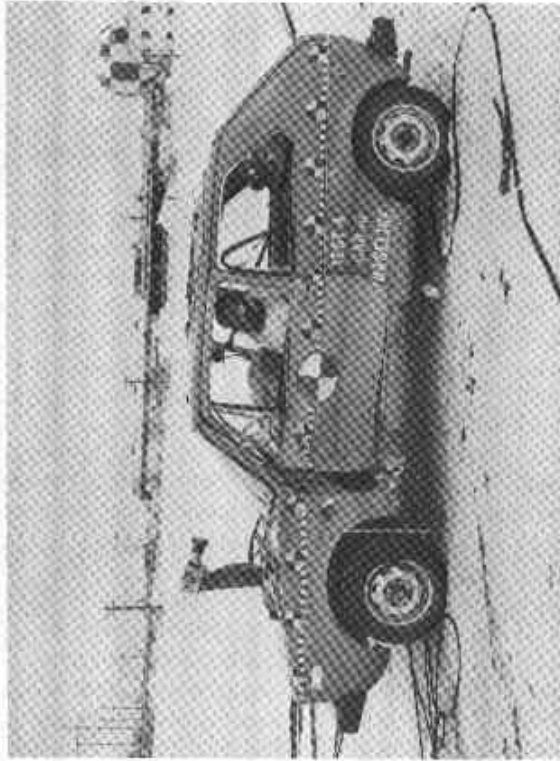
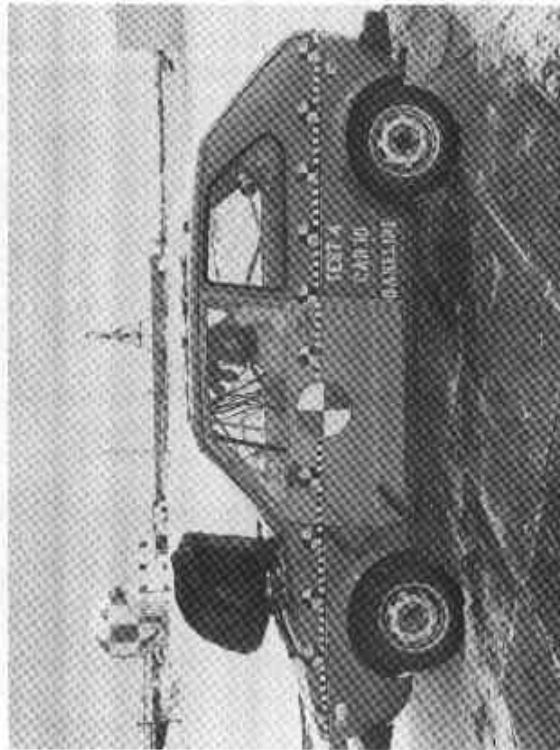


Figure 3 PRE- AND POST-BASELINE TEST NO. 4 - CAR 2, 1976 V.W. RABBIT



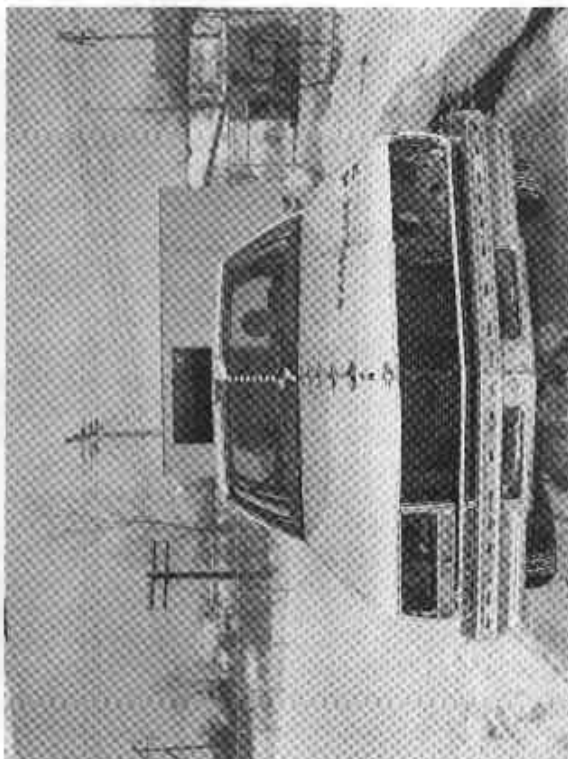
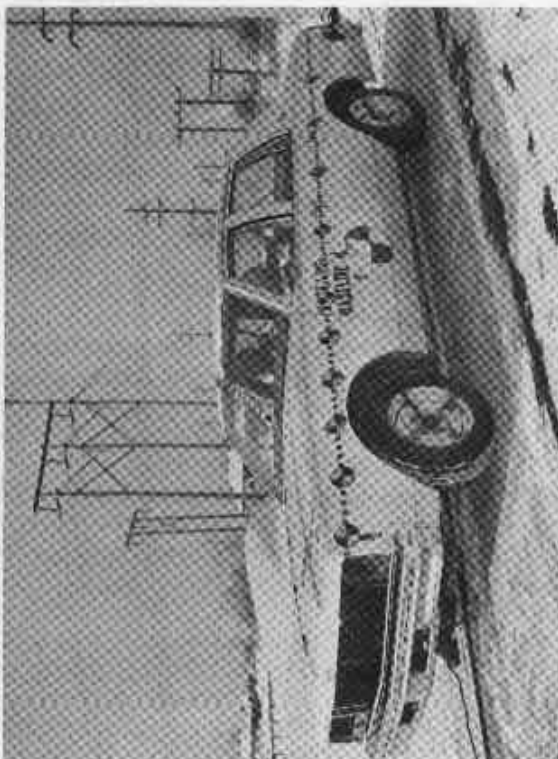
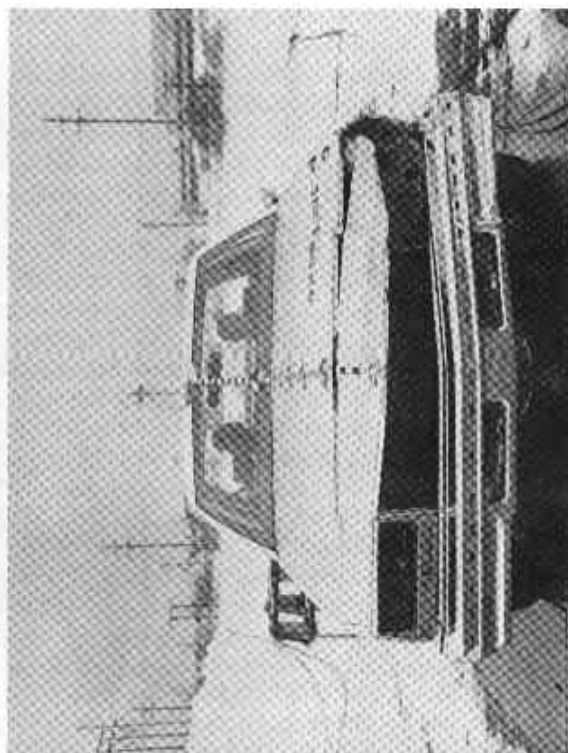
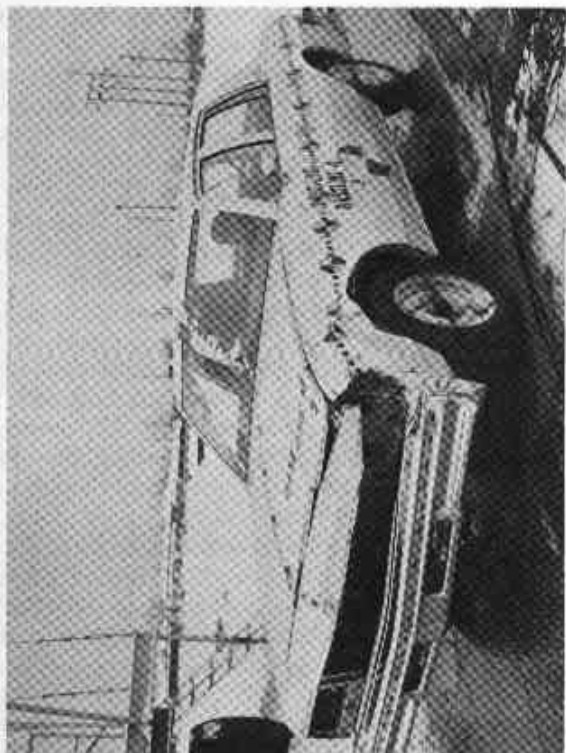


Figure 2 PRE- AND POST-TEST NO. 4 - CAR 1, 1978 CHEVROLET IMPALA

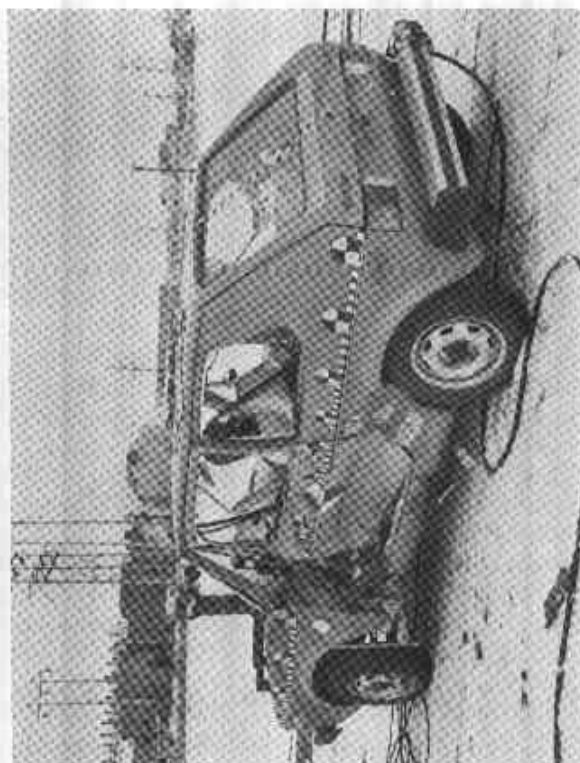
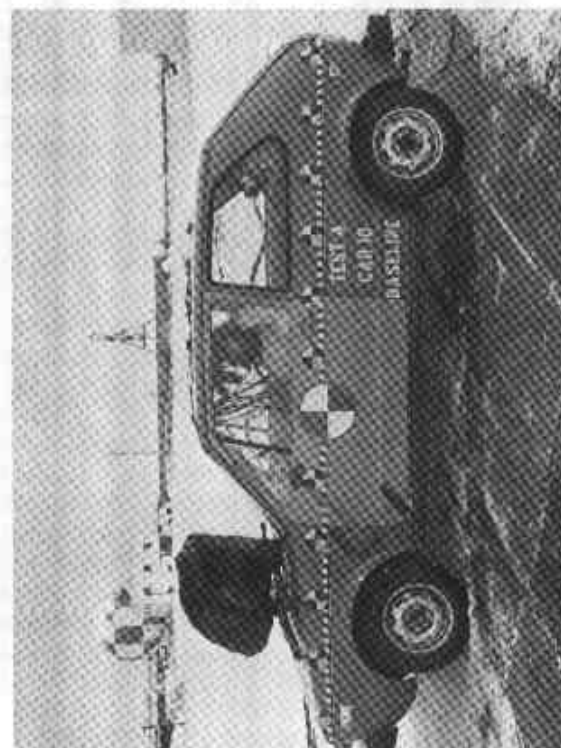
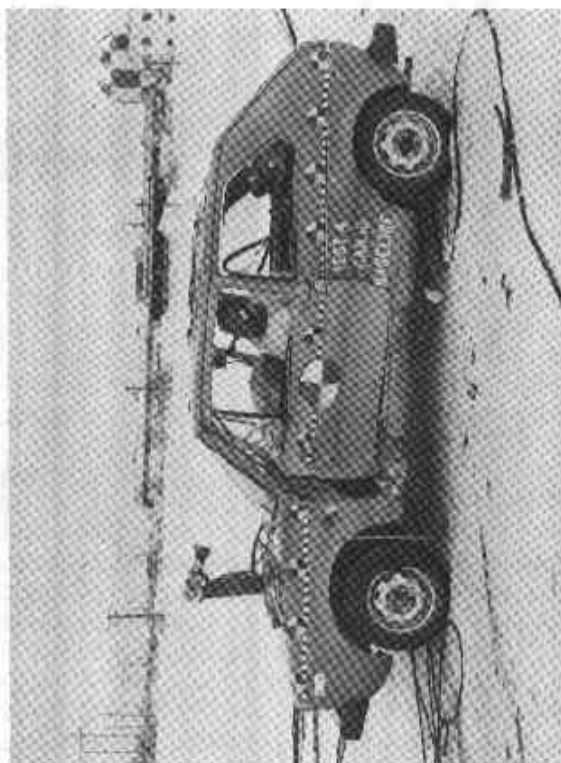


Figure 3 PRE- AND POST-BASELINE TEST NO. 4 - CAR 2, 1976 V.W. RABBIT

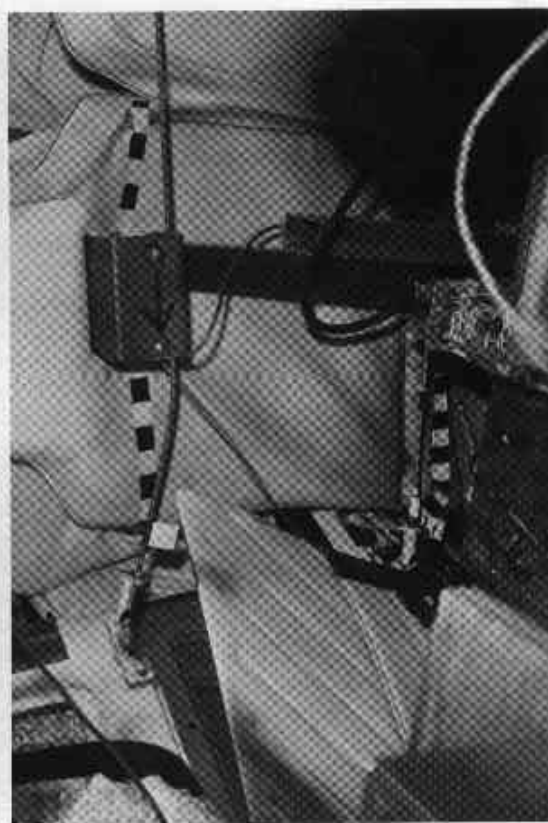
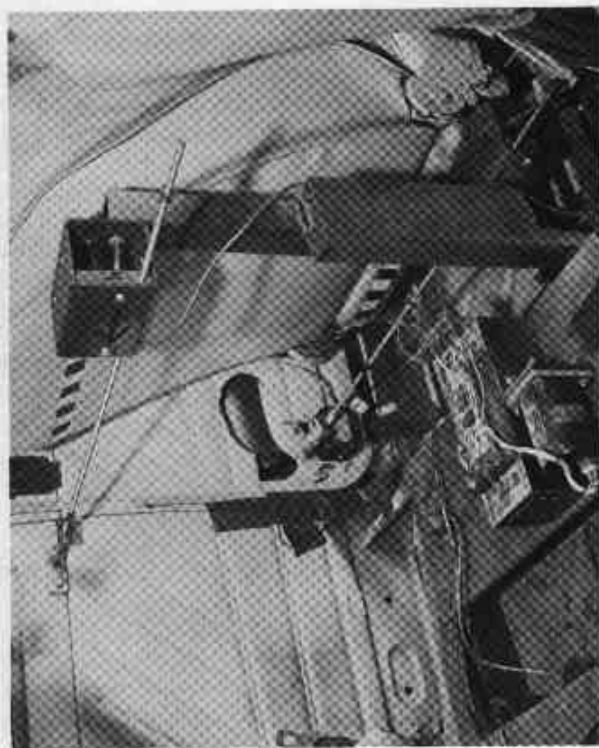
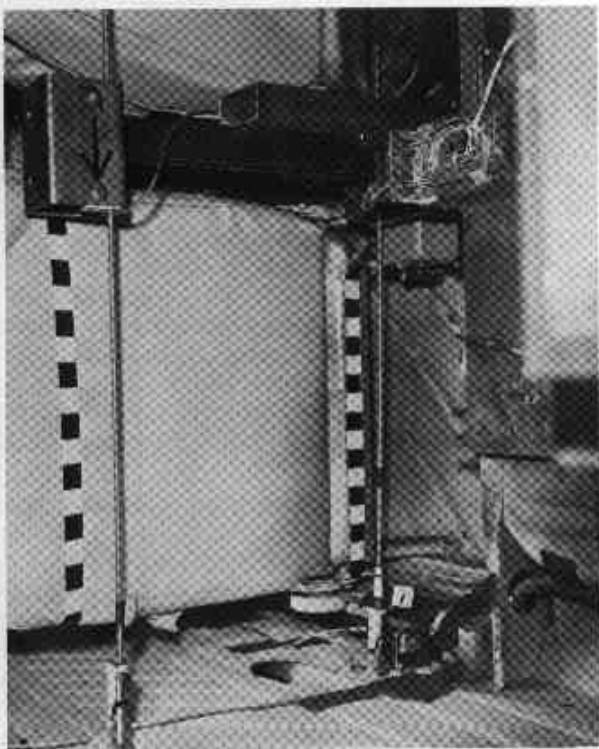


Figure 6 PRE- AND POST-TEST INTRUSION TRANSDUCERS - 1976 V.W. RABBIT

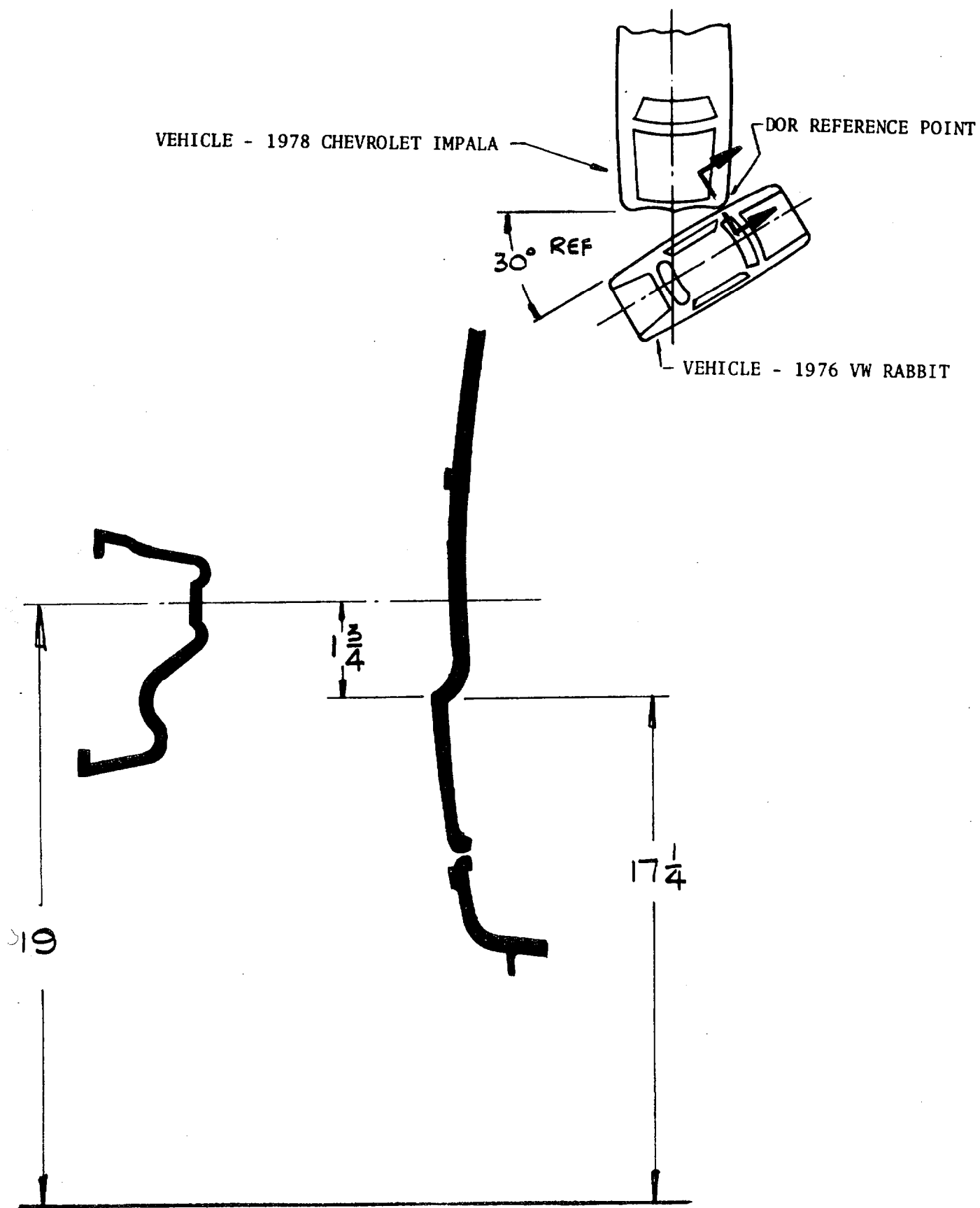
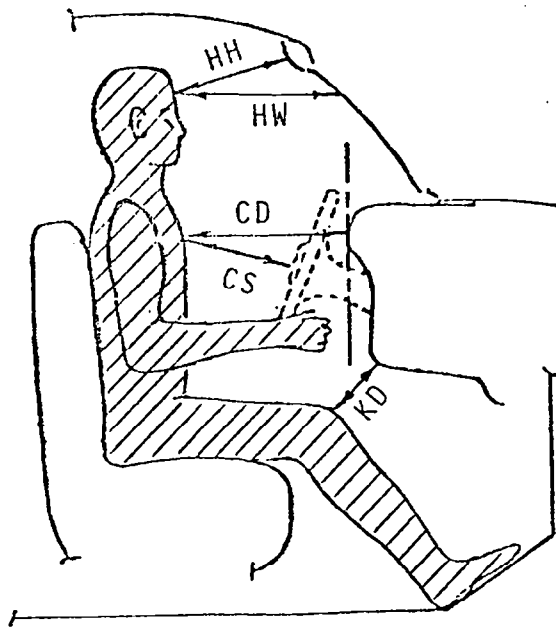
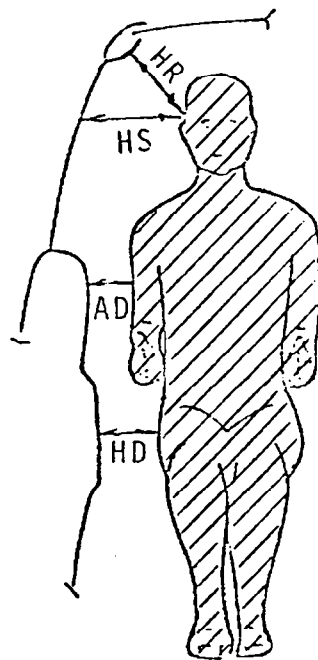


FIGURE 7 VEHICLE CRASH ATTITUDE

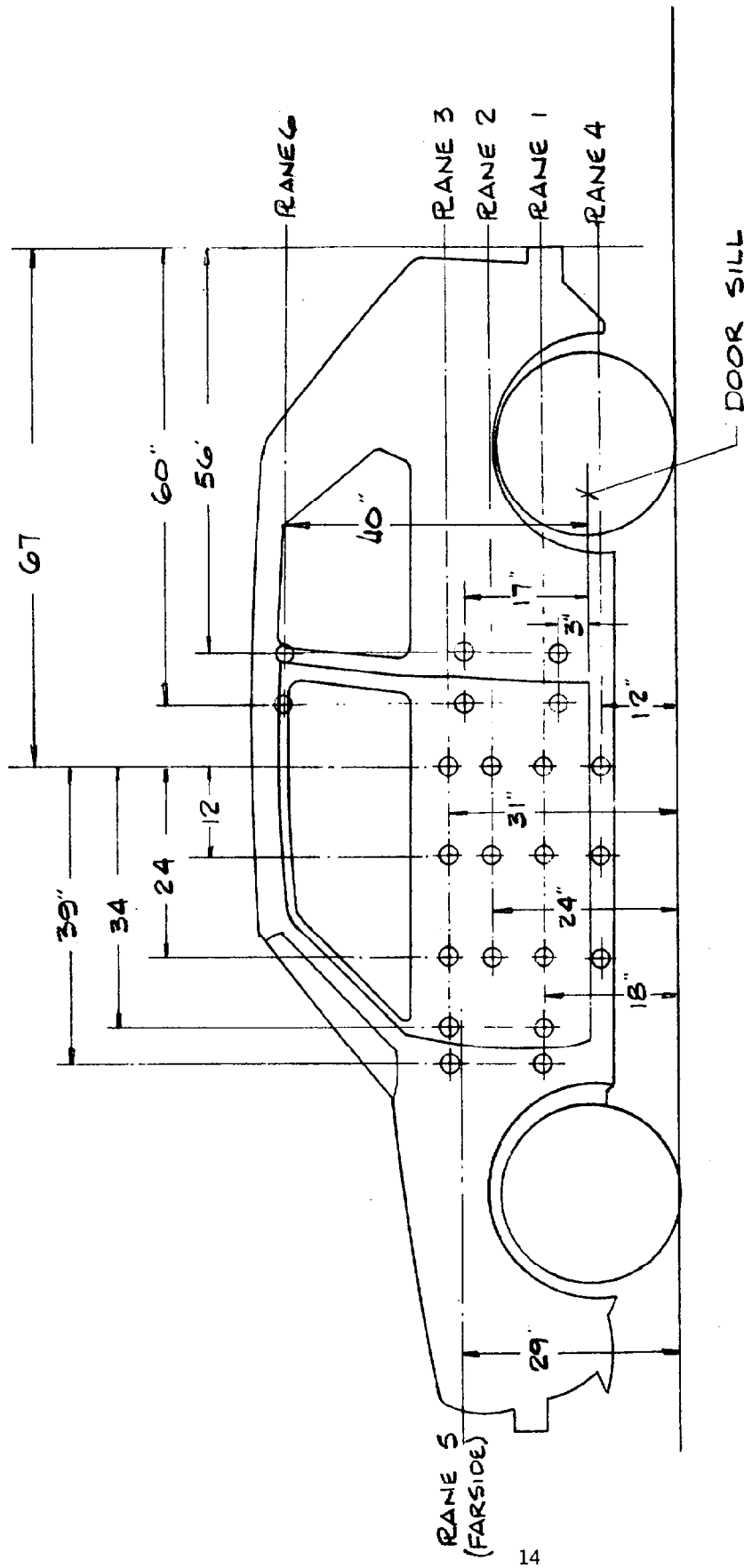


|    |         |
|----|---------|
| HH | 18-1/2" |
| HW | 22-1/2" |
| CD | 23-1/4" |
| CS | 15-1/4" |
| KD | 8-3/4"  |



|    |        |
|----|--------|
| HR | 6-1/4" |
| HS | 7-1/2" |
| AD | 4"     |
| HD | 7"     |

Figure 8 OCCUPANT CLEARANCE DIMENSIONS



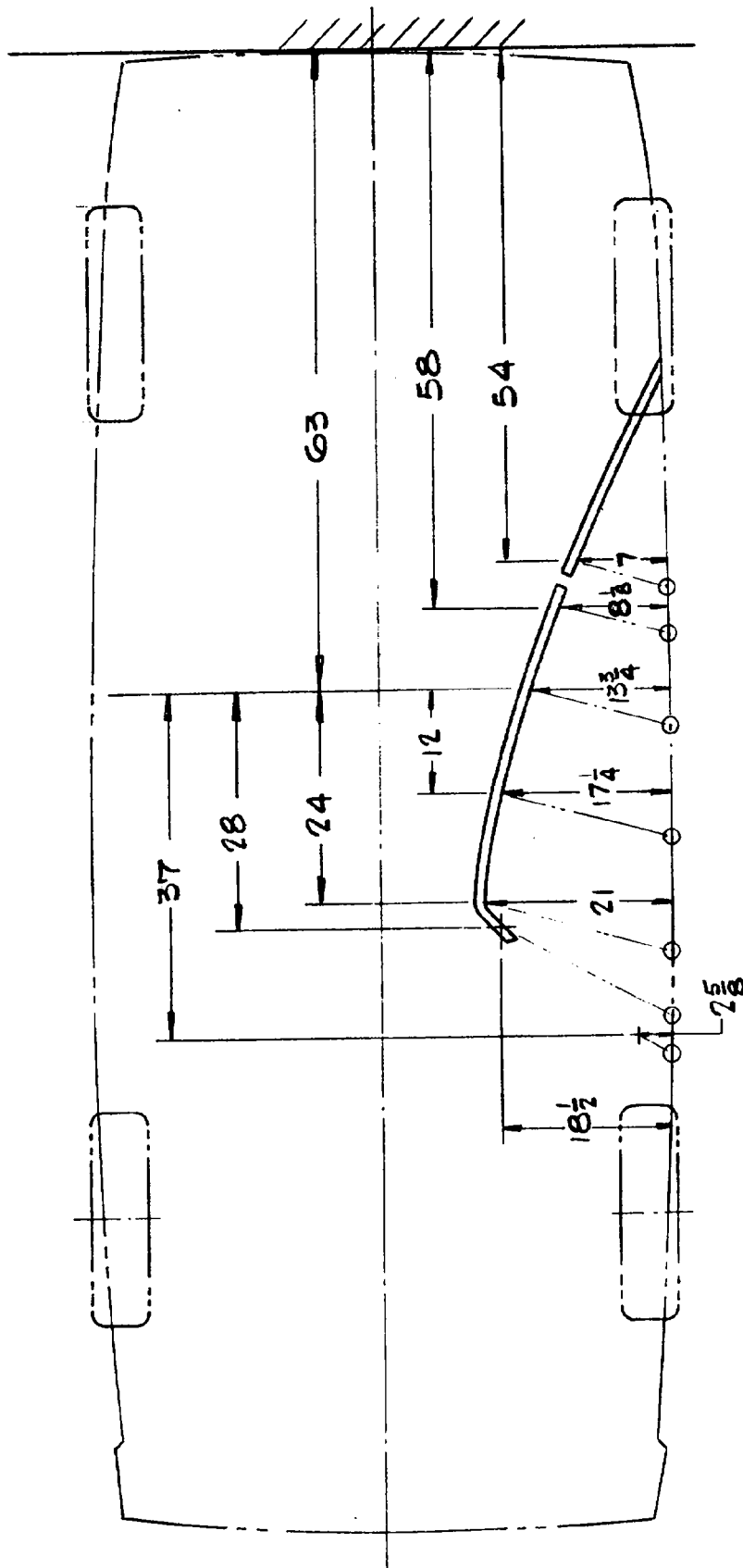
14

1976 V.W. RABBIT

PRE-TEST LOCATION MEASUREMENTS

FIGURE 9-1 SIDE INTRUSION MEASUREMENTS

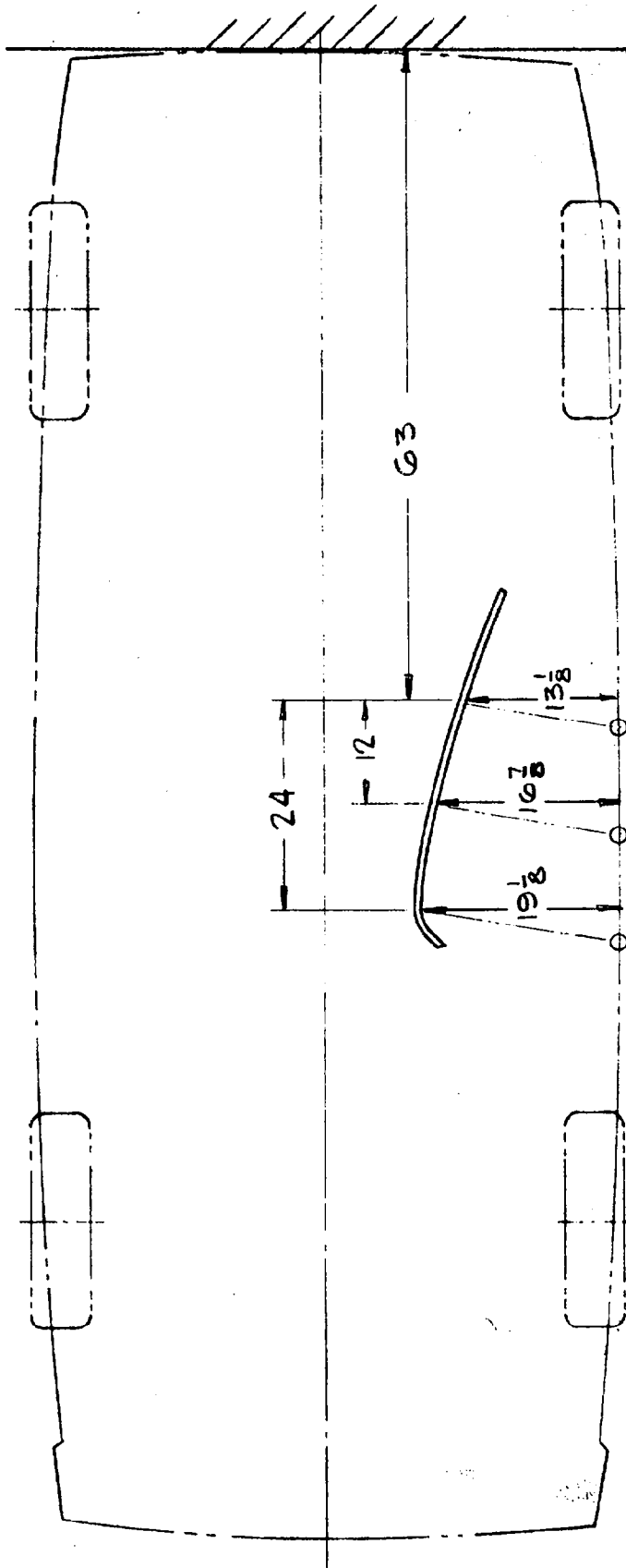
6225-V-3



1976 V.W. RABBIT  
SCALE .06" = 1"

PLANE 1  
POST - TEST

FIGURE 9-2 SIDE INTRUSION MEASUREMENTS

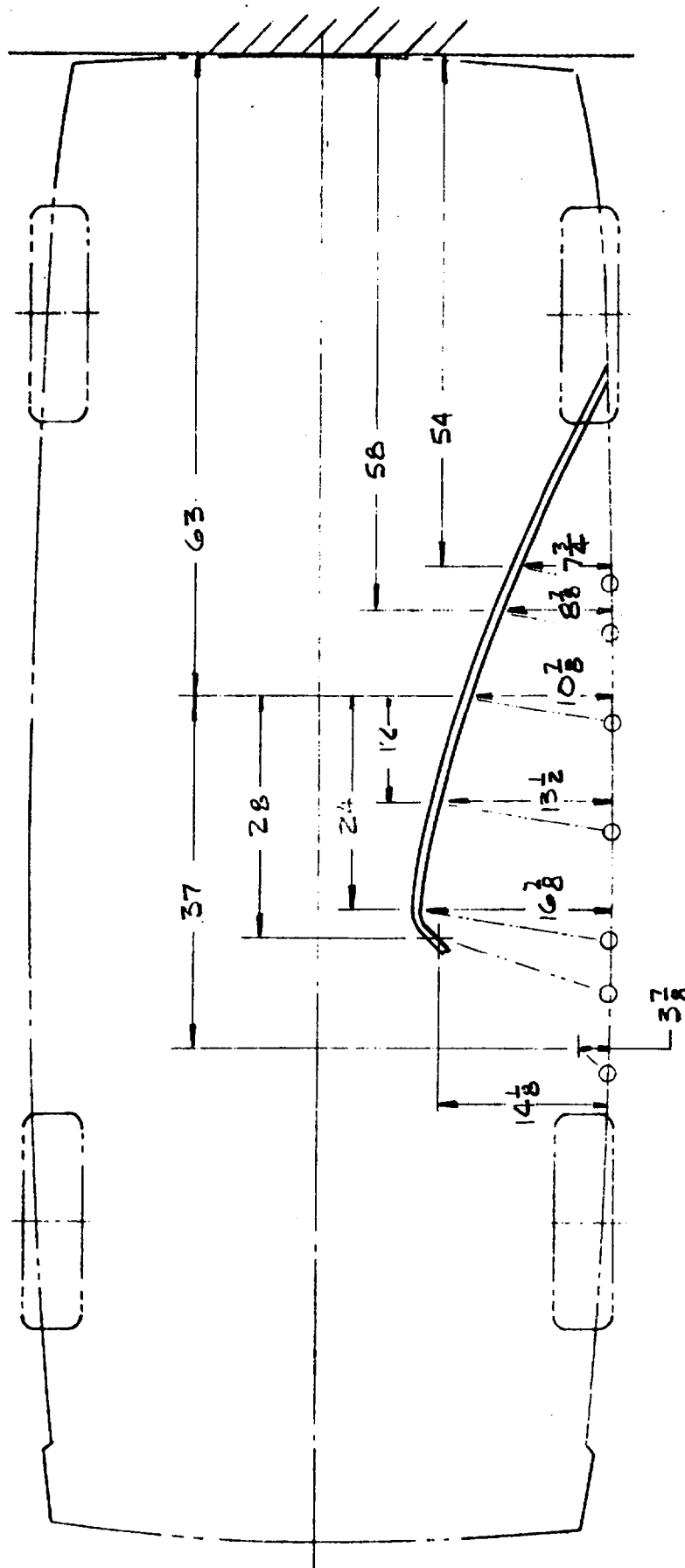


PLANE ~2  
POST-TEST

FIGURE 9-3 SIDE INTRUSION MEASUREMENTS

1976 V.W. RABBIT  
SCALE .06" = 1"

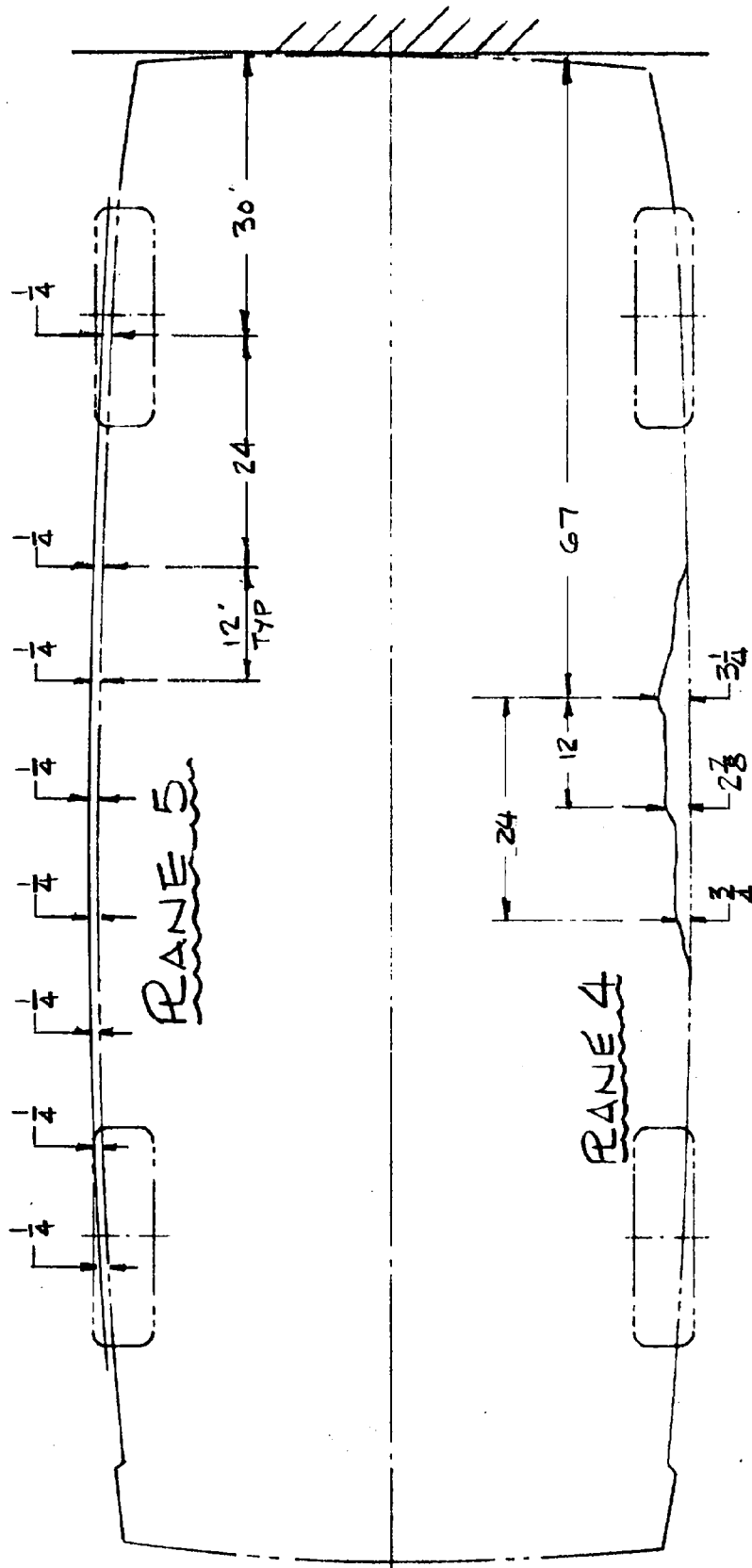




PLANE -3  
POST-TEST

FIGURE 9-4 SIDE INTRUSION MEASUREMENTS

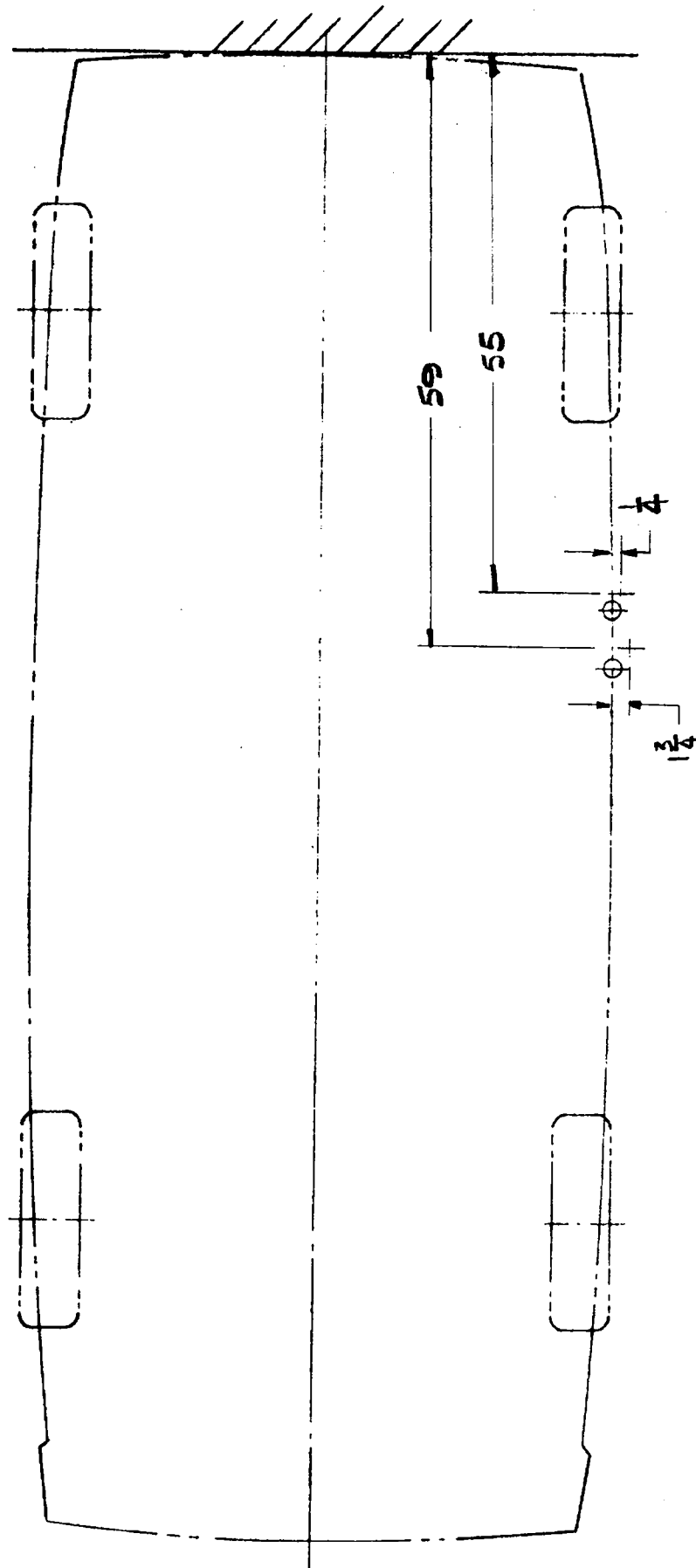
1976 V.W. RABBIT  
SCALE .06"=1"



PLANE 5 4 & 5  
POST-TEST

FIGURE 9-5 SIDE INTRUSION MEASUREMENTS

1976 V.W. RABBIT  
SCALE .06" = 1"



1976 V.W. RABBIT  
SCALE .06" = 1"

PLANE C  
POST-TEST

FIGURE 9-6 SIDE INTRUSION MEASUREMENTS

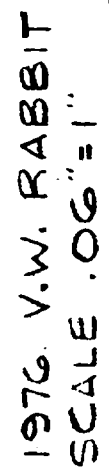


FIGURE NO. 10-1 PRE-TEST DOOR BEAM INTRUSION MEASUREMENT

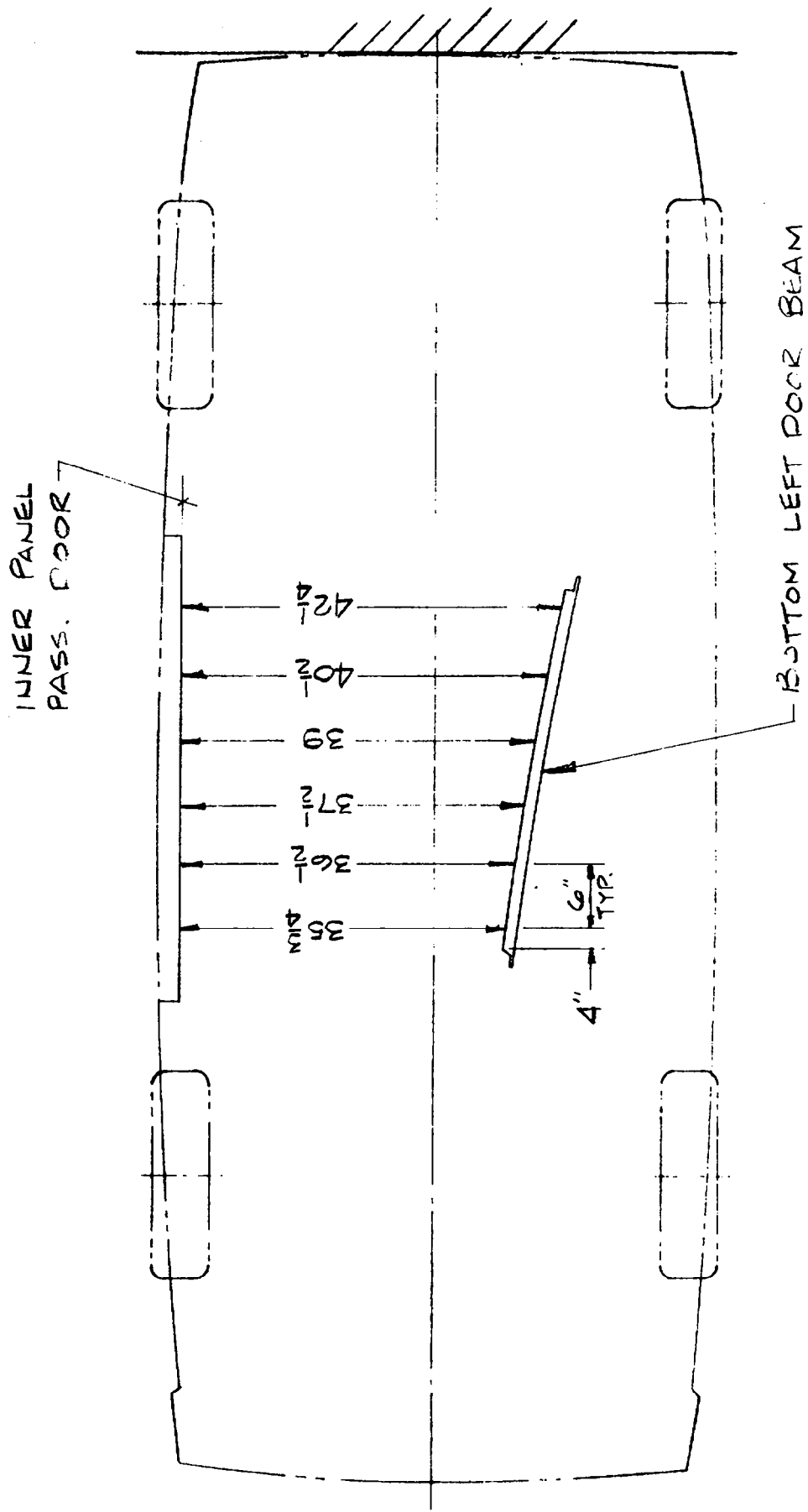


FIGURE 10-2 POST-TEST DOOR BEAM INTRUSION MEASUREMENT

1976 V.W. RABBIT  
SCALE .06" = 1"

Table 3

## ELECTRONIC INSTRUMENTATION TEST Baseline No. 4

Car 1 - Bullet Vehicle - 1978 Chevrolet Impala

| TRANSDUCER<br>DESCRIPTION OR<br>ACCELEROMETER LOCATION * | DIRECTION OF<br>PARAMETER<br>BEING MEASURED | LOCATION<br>ON<br>VEHICLE     | DESCRIPTION LISTED<br>ON DATA PLOTS |
|----------------------------------------------------------|---------------------------------------------|-------------------------------|-------------------------------------|
| <u>VEHICLE ACCELEROMETER</u>                             |                                             |                               |                                     |
| 1                                                        | X                                           | Left Sill next to Rear Seat   | Right Compartment                   |
| 2                                                        | X                                           | Right Sill next to Rear Seat  | Right Compartment                   |
| 3                                                        | X,Y,Z                                       | Deck over Rear Axel           | Rear Deck                           |
| 4                                                        | X,Y,Z                                       | Firewall                      | Firewall                            |
| 5                                                        | X                                           | Rear Compartment              | Left Rear Compartment-Angular X     |
| 6                                                        | X,Y,Z                                       | Top of Engine, Carburetor     | Engine                              |
| 7                                                        | X                                           | Front Crossmember             | Front Crossmember                   |
| 9                                                        | X                                           | Rear Compartment              | Right Rear Compartment-Angular X    |
| <u>D U M M Y</u>                                         |                                             |                               |                                     |
| LF Head (Dummy (1) )                                     | X,Y,Z                                       | Left Front Seat               | Dummy (LF) Head                     |
| LF Chest "                                               | X,Y,Z                                       | Left Front Seat               | Dummy (LF) Chest                    |
| LF Femurs "                                              | R,L**                                       | Left Front Seat               | Dummy (LF) Femurs                   |
| LF Belts "                                               | U,R,L***                                    | Left Front Seat               | Self-explanatory                    |
| <u>MISCELLANEOUS</u>                                     |                                             |                               |                                     |
| 10                                                       | Yaw Rate                                    | Centerline behind Front Seats | Tunnel Yaw Rate                     |
| 12                                                       | X-Accel.                                    | Bumper (rear face)            | Bumper                              |

\*See Accelerometer Layout Diagram Figure 11    \*\*Right &amp; Left Forces    \*\*\*Upper, Lower Belt Forces

Table 4

**ELECTRONIC INSTRUMENTATION TEST** Baseline No. 4  
 Car 2 - Target Vehicle - 1976 Volkswagen Rabbit

| TRANSDUCER<br>DESCRIPTION OR<br>ACCELEROMETER LOCATION * | DIRECTION OF<br>PARAMETER<br>BEING MEASURED | LOCATION<br>ON<br>VEHICLE      | DESCRIPTION LISTED<br>ON DATA PLOTS |
|----------------------------------------------------------|---------------------------------------------|--------------------------------|-------------------------------------|
| <u>VEHICLE ACCELEROMETER</u>                             |                                             |                                |                                     |
| 1                                                        | X,Y,Z                                       | Right Sill next to Front Seat  | Right Front Compartment             |
| 2                                                        | X,Y,Z                                       | Right Sill next to Rear Seat   | Right Rear Compartment              |
| 3                                                        | X,Y,Z                                       | Deck over Rear Axle            | Rear Deck                           |
| 4                                                        | Y                                           | Mid-position Left Front Door   | Upper Door                          |
| 5                                                        | Y                                           | Lower Left Front Door          | Lower Door                          |
| 6                                                        | X                                           | Rear Compartment               | Left Compartment-AngularX           |
| 7                                                        | X                                           | Rear Compartment               | Right Compartment-AngularX          |
| 23                                                       | Y                                           | Lower Rear of Left Front Door  | Lower Center, Door                  |
| <u>D U M M Y</u>                                         |                                             |                                |                                     |
| LF Head (Dummy (1) )                                     | X,Y,Z                                       | Left Front Seat                | Dummy (LF) Head                     |
| LF Chest "                                               | X,Y,Z                                       | Left Front Seat                | Dummy (LF) Chest                    |
| LF Pelvis "                                              | X,Y                                         | Left Front Seat                | Dummy (LF) Pelvis                   |
| RF Head (Dummy (2) )                                     | X,Y,Z                                       | Right Front Seat               | Dummy (RF) Head                     |
| RF Chest "                                               | X,Y,Z                                       | Right Front Seat               | Dummy (RF) Chest                    |
| RF Pelvis "                                              | X,Y                                         | Right Front Seat               | Dummy (RF) Pelvis                   |
| <u>MISCELLANEOUS</u>                                     |                                             |                                |                                     |
| 8                                                        | Yaw Rate                                    | Centerline behind Front Seats  | Tunnel Yaw Rate                     |
| 9 - 15                                                   | 7 Gages                                     | Door Beam (Drivers Door)       | Door Beam                           |
| 16 & 17                                                  | 2 Gages                                     | Sill (Drivers Side)            | Sill                                |
| 18                                                       | 1 Gage                                      | B-Pillar (Drivers Side)        | B-Pillar                            |
| 19 - 22                                                  | Side Intrusion                              | Side Intrusion (Driver Side)   | Side Intrusion                      |
| 24                                                       | Side Intrusion                              | Side Rear of Left(Driver Side) | String Pot                          |

\*See Accelerometer Layout Diagram Figure 12

Car 1 - Bullet Vehicle - 1978 Chevrolet Impala

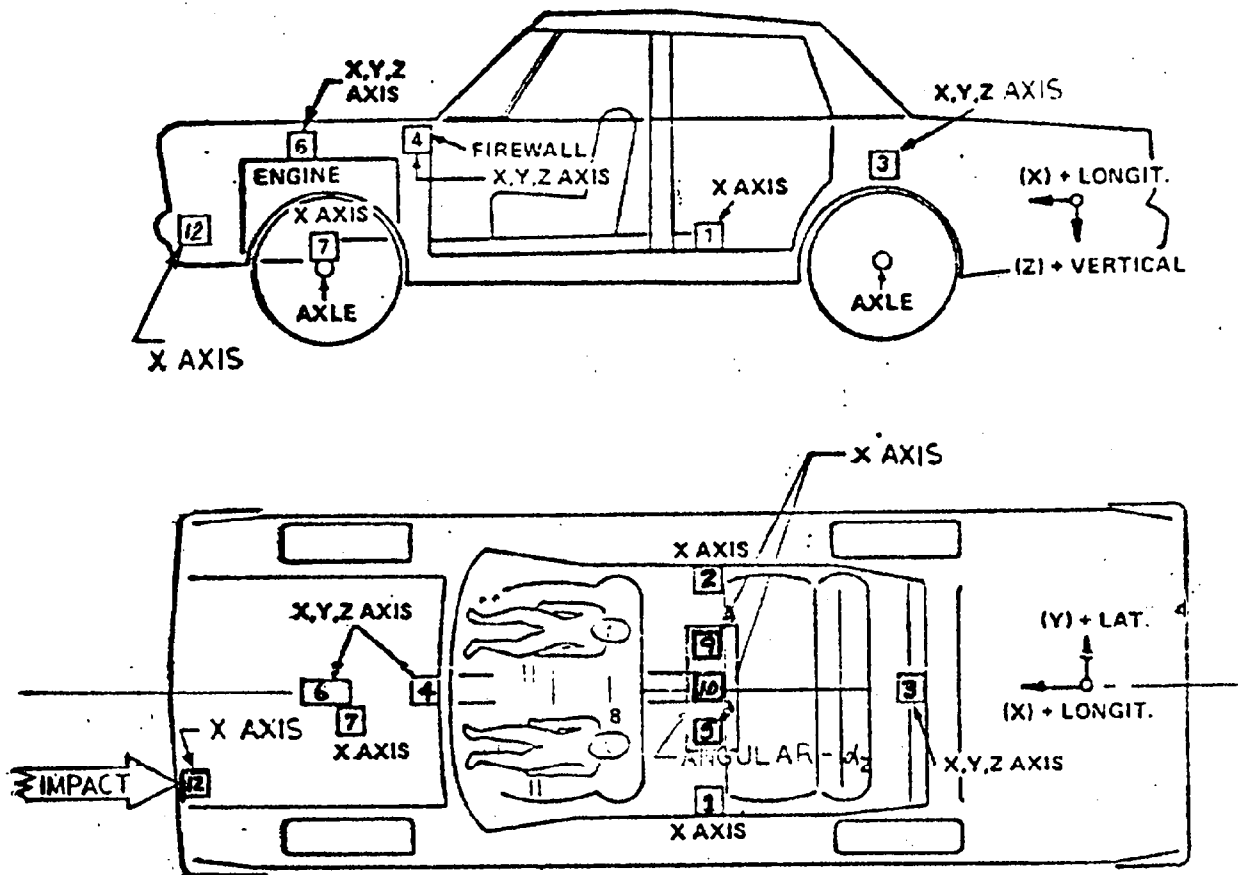


FIGURE 11 - VEHICLE ACCELEROMETER LOCATIONS



Car 2 - Target Vehicle - 1976 Volkswagen Rabbit

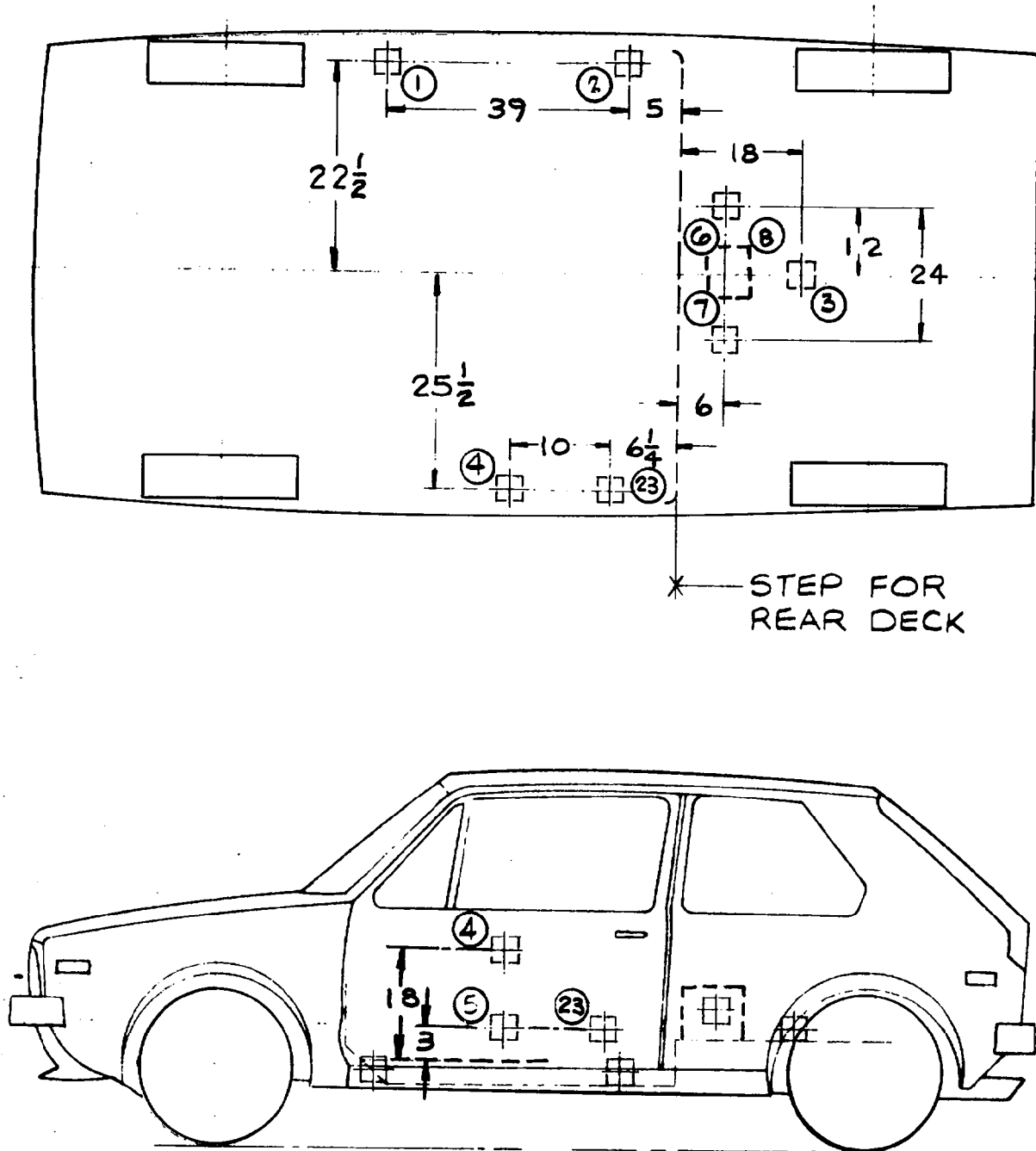


FIGURE 12 - VEHICLE ACCELEROMETER LOCATIONS

Car 2 - Target Vehicle - 1976 Volkswagen Rabbit

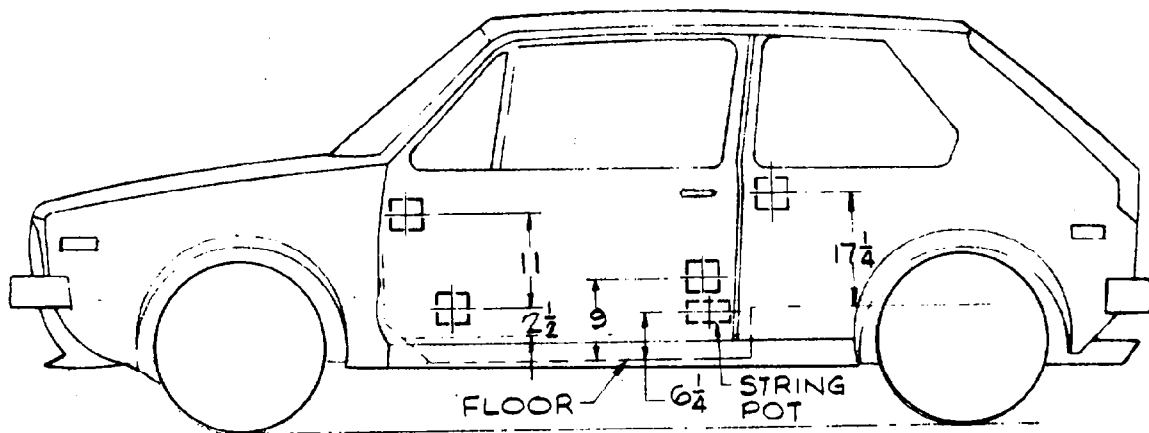
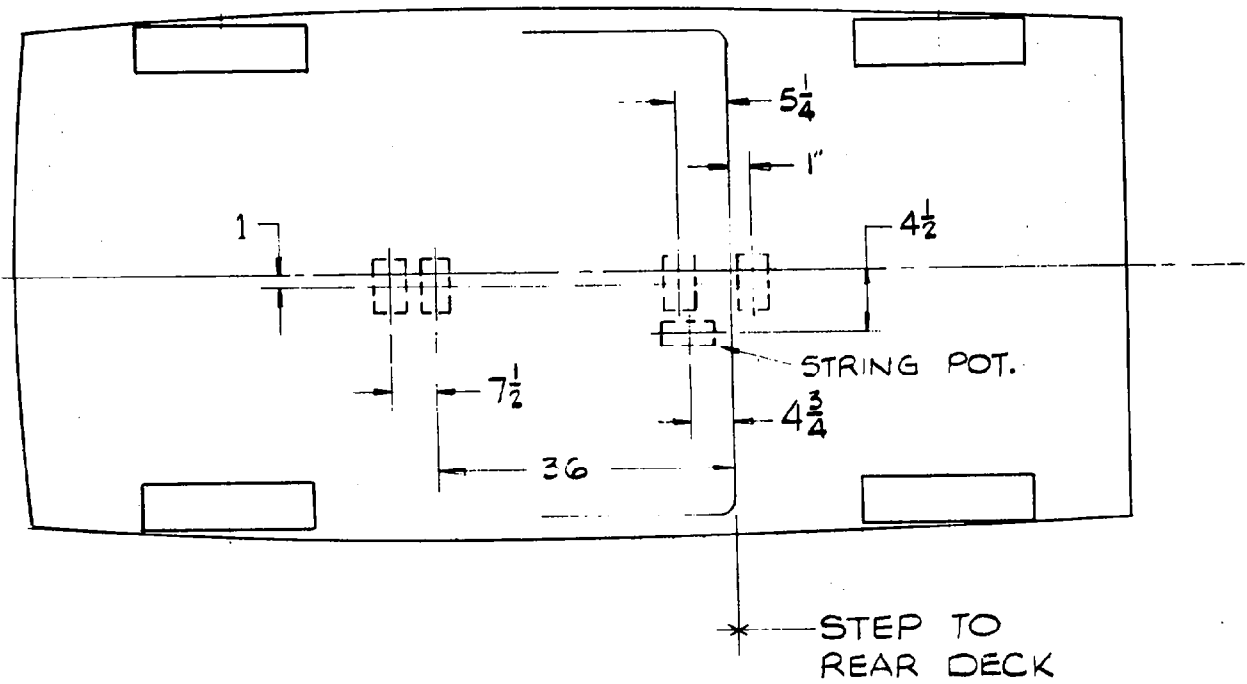
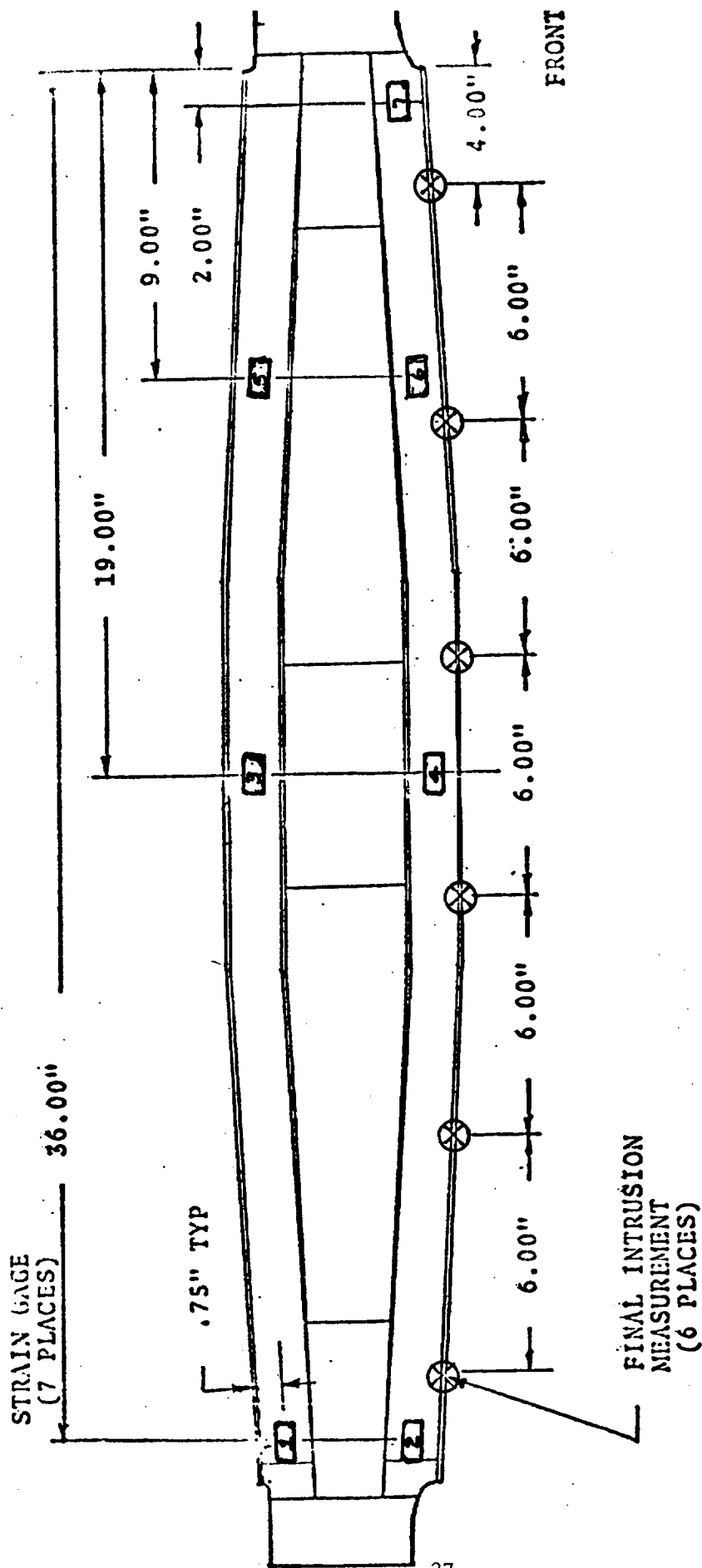


FIGURE 13 - VEHICLE POTENTIOMETER LOCATIONS

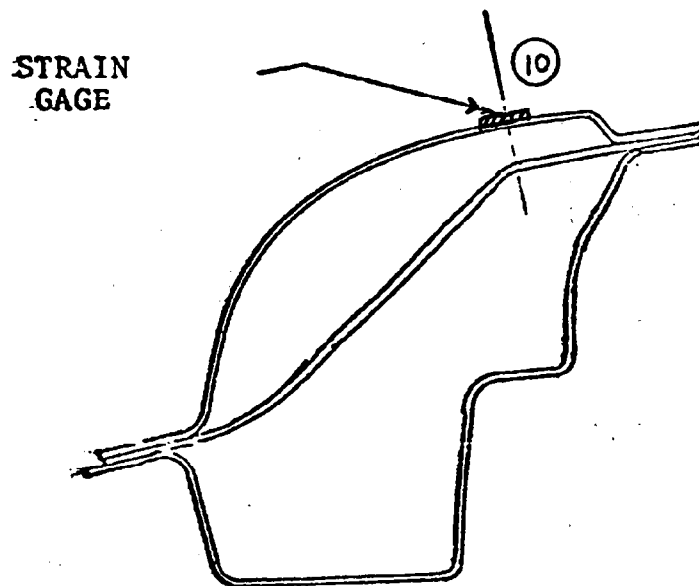
Car 2 - Target Vehicle - 1976 Volkswagen Rabbit



(LEFT DOOR BEAM)

FIGURE 14 - DOOR BEAM STRAIN GAGE LOCATIONS

Car 2 - Target Vehicle - 1976 Volkswagen Rabbit

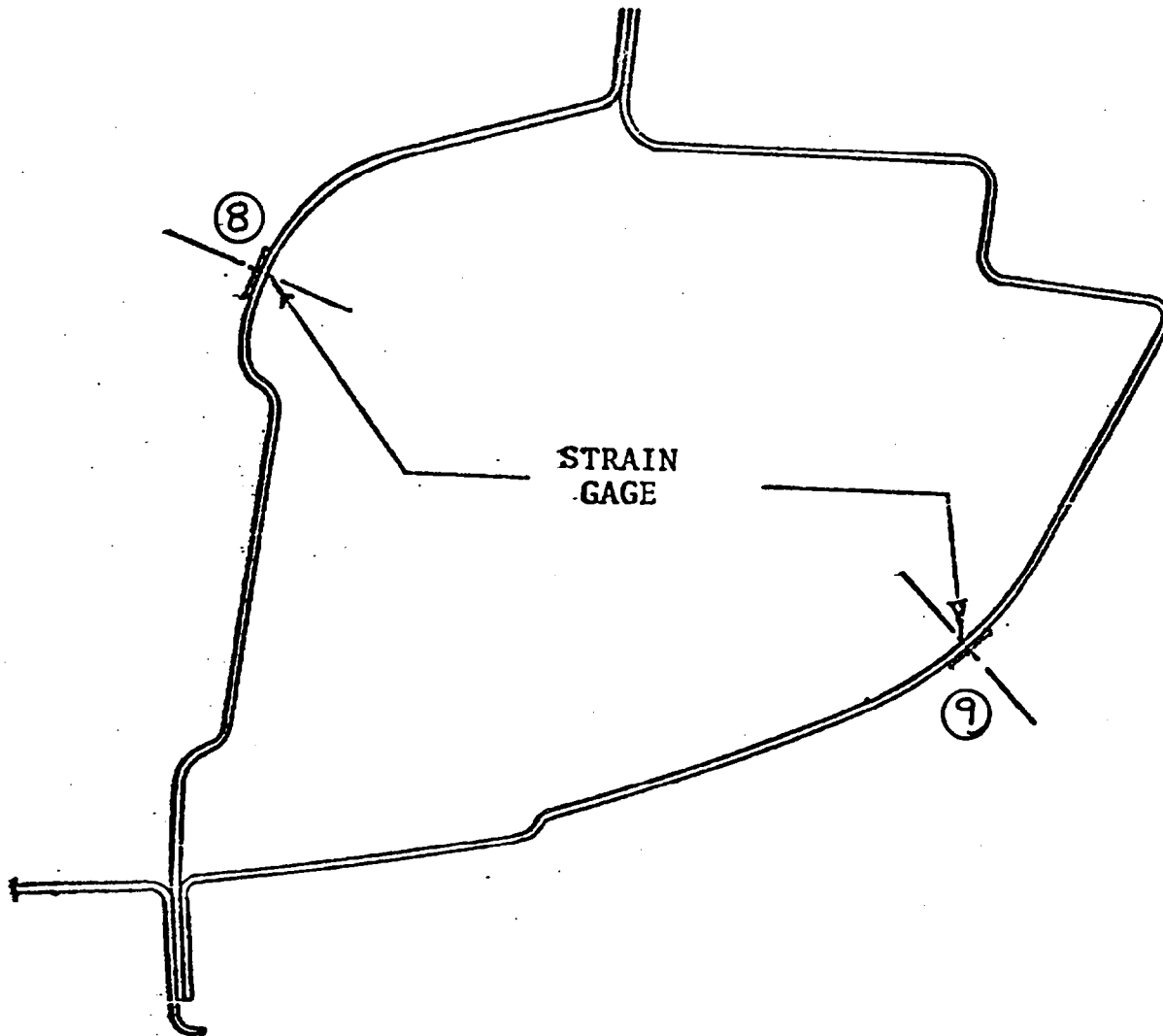


### B-PILLAR CROSS SECTION

GAGE IS LOCATED 4 INCHES BELOW THE CENTER OF THE SEAT BELT GUIDE MOUNTING HOLE AND LOCATED PARALLEL TO THE "B" PILLAR LOCAL AXIS.

FIGURE 15 - "B" PILLAR STRAIN GAGE LOCATION

Car 2 - Target Vehicle - 1976 Volkswagen Rabbit



### SILL CROSS SECTION

GAGES ARE LOCATED 33 INCHES AFT OF THE  
DOOR HINGE PIVOT POINT AND ORIENTED  
PARALLEL TO THE SILL AXIS.

FIGURE 16 - SILL STRAIN GAGE LOCATION

Table 5

HIGH SPEED CAMERA INFORMATION (TEST Baseline No. 4 )

| CAMERA NO.          | LOCATION                     | TYPE        | LENS (mm) | SPEED (fps) |
|---------------------|------------------------------|-------------|-----------|-------------|
| 1)South<br>Wide     | A= 23 Ft.<br>B= 2 Ft. 10 in. | Photosonics | 13        | 800         |
| 2)South<br>Close    | C= 24 Ft. 10 in.<br>D= 5 Ft. | Photosonics | 25        | 810         |
| 3)North<br>Wide     | E= 26 Ft.<br>F= 14 Ft.       | Photosonics | 13        | 660         |
| 4)North<br>Close    | G= 26 Ft. 8 in.<br>H= 19 Ft. | Photosonics | 25        | 710         |
| 5)Tower<br>45°      | J= 21 Ft. 7 in.<br>K= 11 Ft. | Photosonics | 13        | 820         |
| 6)Tower *           | 31 Ft. 6 in.                 | Photosonics | 13        | 620         |
| 7)Hood              | On-board                     | Stalex      | 8         | 1130        |
| 8)Passenger<br>Door | On-board                     | Stalex      | 8         | 1290        |
| 9)Rear              | On-board                     | Stalex      | 8         | 1020        |

NOTE: CAMERAS ARE NUMBERED ACCORDING TO SPLICING SEQUENCE OF FILM.

(24 fps) REAL TIME MOVIE FILM COVERAGE OF PRE-CRASH, POST-CRASH  
AND CRASH EVENT SPLICED AT START AND END OF FILM.

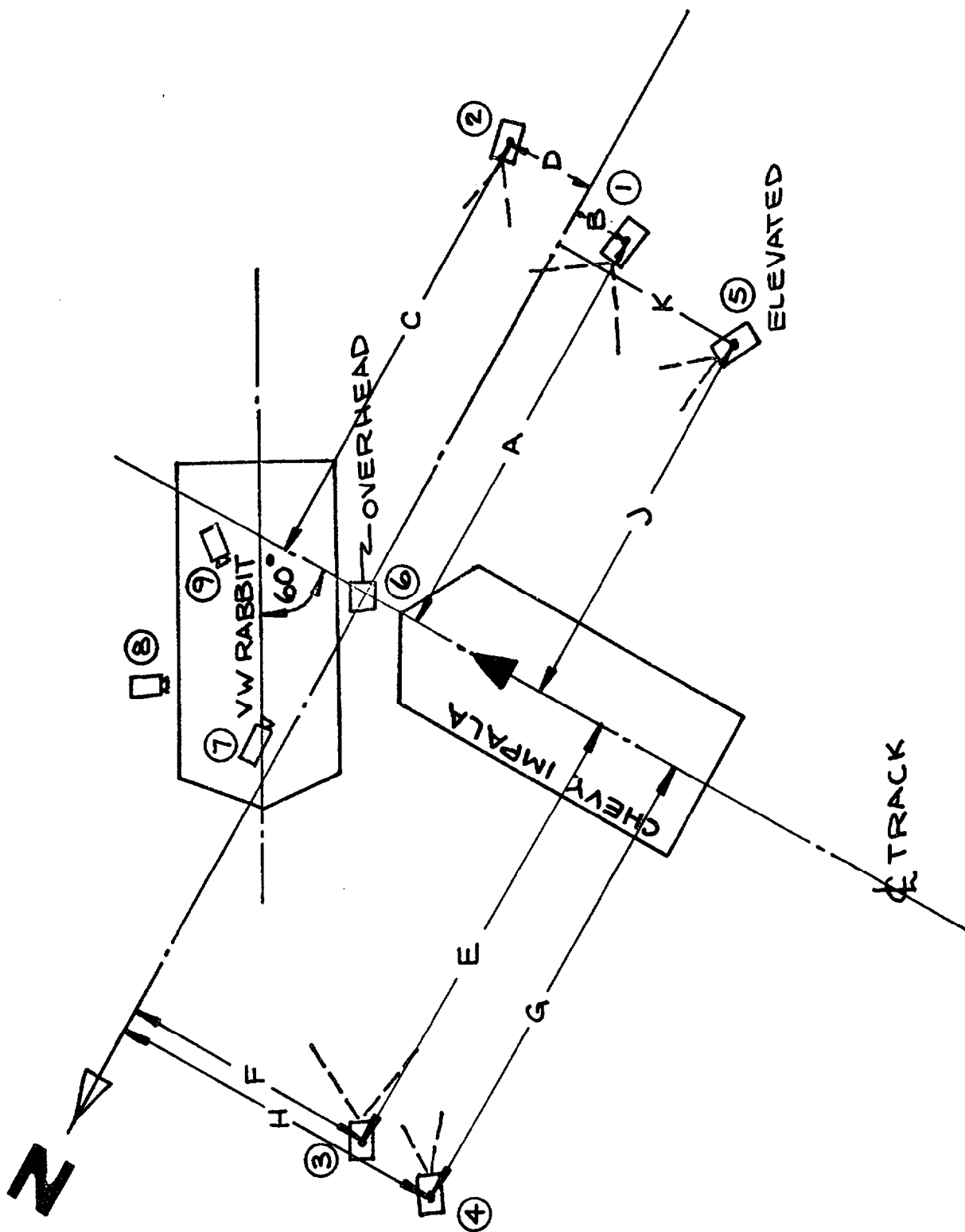


FIGURE 17 - HIGH SPEED CAMERA LOCATIONS

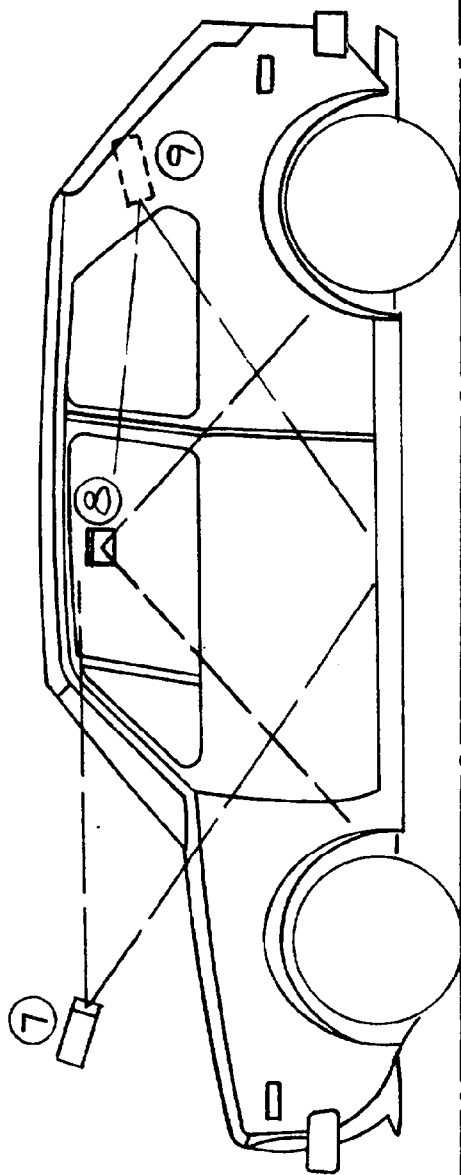


FIGURE 18 - ON-BOARD HIGH SPEED CAMERA LOCATIONS



Table 6  
**DUMMY INJURY CRITERIA VALUES**  
**CAR 1 - STRIKING VEHICLE**  
 (Bullet)

|           | MAXIMUM ACCELERATION ("G")* |    |   |    |       |      |      |    |        |   |   |   |
|-----------|-----------------------------|----|---|----|-------|------|------|----|--------|---|---|---|
|           | HEAD                        |    |   |    | CHEST |      |      |    | PELVIS |   |   |   |
|           | X                           | Y  | Z | R  | X     | Y    | Z    | R  | X      | Y | Z | R |
| DUMMY (1) | 14                          | -2 | 6 | 14 | -13   | -2.1 | -2.2 | 13 |        |   |   |   |
| DUMMY (2) |                             |    |   |    |       |      |      |    |        |   |   |   |
| DUMMY (3) |                             |    |   |    |       |      |      |    |        |   |   |   |
| DUMMY (4) |                             |    |   |    |       |      |      |    |        |   |   |   |

|           | MAXIMUM FORCE-FEMUR LOAD (LBS) |            |
|-----------|--------------------------------|------------|
|           | RIGHT FEMUR                    | LEFT FEMUR |
| DUMMY (1) | 90                             | 90         |
| DUMMY (2) |                                |            |
| DUMMY (3) |                                |            |
| DUMMY (4) |                                |            |

|           | MAXIMUM FORCE-SEAT BELTS LOADS (LBS) |                              |                             |
|-----------|--------------------------------------|------------------------------|-----------------------------|
|           | SHOULDER STRAP<br>UPPER BELT LOAD    | LAP STRAP<br>RIGHT BELT LOAD | LAP STRAP<br>LEFT BELT LOAD |
| DUMMY (1) | 720                                  | 720                          | 160                         |
| DUMMY (2) |                                      |                              |                             |
| DUMMY (3) |                                      |                              |                             |
| DUMMY (4) |                                      |                              |                             |

|           | HEAD INJURY CRITERIA** |                      |                      |                                                   | SEVERITY INDEX |       |
|-----------|------------------------|----------------------|----------------------|---------------------------------------------------|----------------|-------|
|           | HIC                    | t <sub>1</sub> (SEC) | t <sub>2</sub> (SEC) | AVE. ACC. (g)<br>t <sub>1</sub> TO t <sub>2</sub> | HEAD           | CHEST |
| DUMMY (1) | 33.2                   | .0986                | .1655                | 11.98                                             | 38             | 18    |
| DUMMY (2) |                        |                      |                      |                                                   |                |       |
| DUMMY (3) |                        |                      |                      |                                                   |                |       |
| DUMMY (4) |                        |                      |                      |                                                   |                |       |

\*DEFINED AS EXCEEDING 0.003 SEC. DURATION

\*\*AS DEFINED IN FMVSS NO. 208

Table 7

**DUMMY INJURY CRITERIA VALUES****CAR 2 - STRUCK VEHICLE  
(Target)**

|           | MAXIMUM ACCELERATION ("G") * |    |    |    |       |    |     |    |        |    |   |   |
|-----------|------------------------------|----|----|----|-------|----|-----|----|--------|----|---|---|
|           | HEAD                         |    |    |    | CHEST |    |     |    | PELVIS |    |   |   |
|           | X                            | Y  | Z  | R  | X     | Y  | Z   | R  | X      | Y  | Z | R |
| DUMMY (1) | -12                          | 19 | 35 | 39 | 16    | 58 | -20 | 58 | -20    | 95 |   |   |
| DUMMY (2) | -7                           | 24 | 25 | 36 | 11    | 56 | -14 | 56 | -10    | 48 |   |   |
| DUMMY (3) |                              |    |    |    |       |    |     |    |        |    |   |   |
| DUMMY (4) |                              |    |    |    |       |    |     |    |        |    |   |   |

|           | MAXIMUM FORCE-FEMUR LOAD (LBS) |            |
|-----------|--------------------------------|------------|
|           | RIGHT FEMUR                    | LEFT FEMUR |
| DUMMY (1) | -                              | -          |
| DUMMY (2) |                                |            |
| DUMMY (3) |                                |            |
| DUMMY (4) |                                |            |

|           | MAXIMUM FORCE-SEAT BELTS LOADS (LBS) |                              |                             |
|-----------|--------------------------------------|------------------------------|-----------------------------|
|           | SHOULDER STRAP<br>UPPER BELT LOAD    | LAP STRAP<br>RIGHT BELT LOAD | LAP STRAP<br>LEFT BELT LOAD |
| DUMMY (1) | -                                    | -                            | -                           |
| DUMMY (2) | -                                    | -                            | -                           |
| DUMMY (3) |                                      |                              |                             |
| DUMMY (4) |                                      |                              |                             |

|           | HEAD INJURY CRITERIA** |                      |                      |                                                   | SEVERITY INDEX |       |
|-----------|------------------------|----------------------|----------------------|---------------------------------------------------|----------------|-------|
|           | HIC                    | t <sub>1</sub> (SEC) | t <sub>2</sub> (SEC) | AVE. ACC. (g)<br>t <sub>1</sub> TO t <sub>2</sub> | HEAD           | CHEST |
| DUMMY (1) | 110.95                 | .0591                | .1389                | 18.08                                             | 160            | 310   |
| DUMMY (2) | 67.05                  | .0848                | .1398                | 17.16                                             | 105            | 265   |
| DUMMY (3) |                        |                      |                      |                                                   |                |       |
| DUMMY (4) |                        |                      |                      |                                                   |                |       |

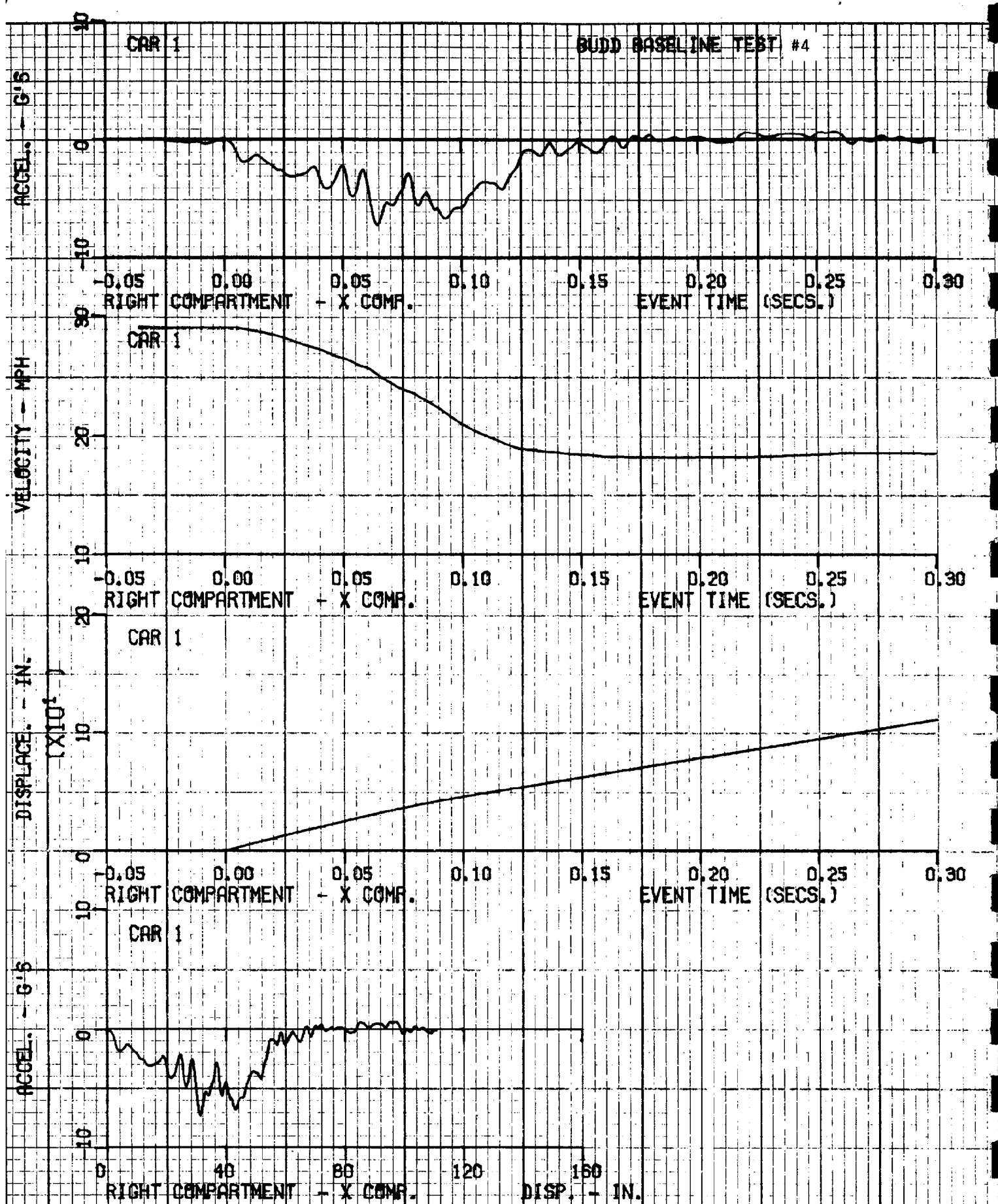
\*DEFINED AS EXCEEDING 0.003 SEC. DURATION

\*\*AS DEFINED IN FMVSS NO. 208

BASELINE TEST NO. 4

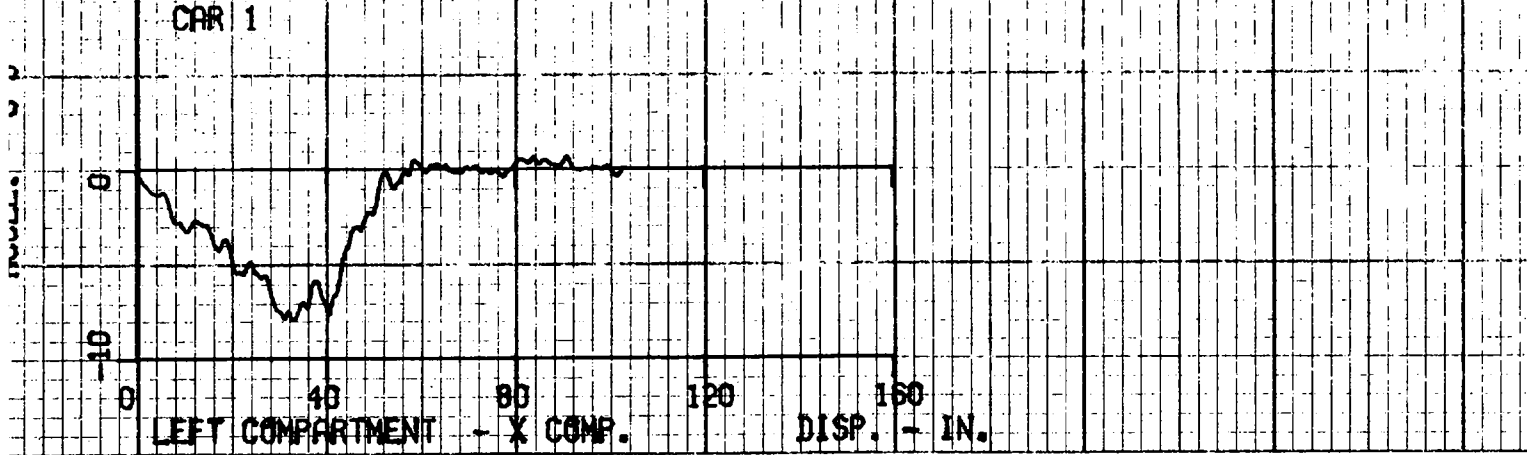
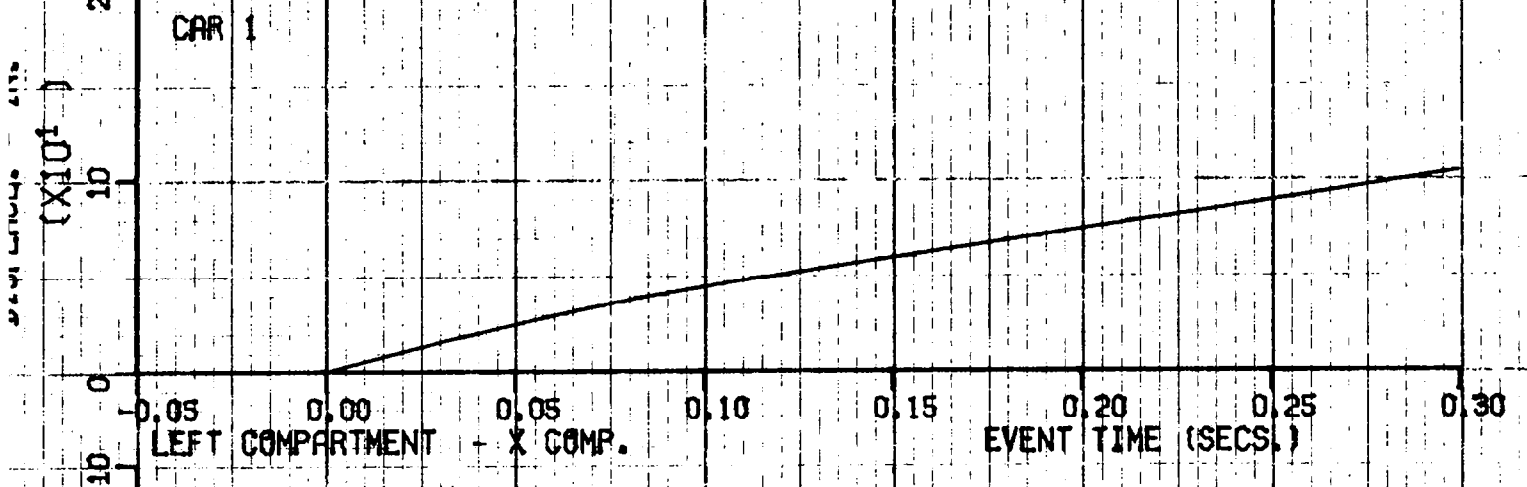
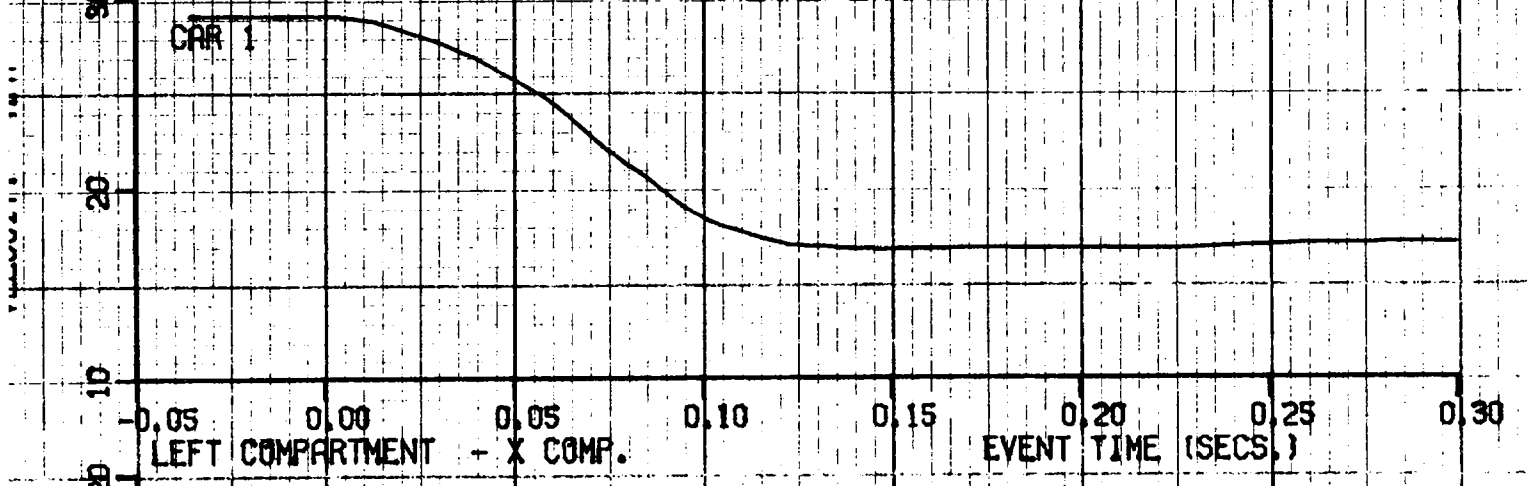
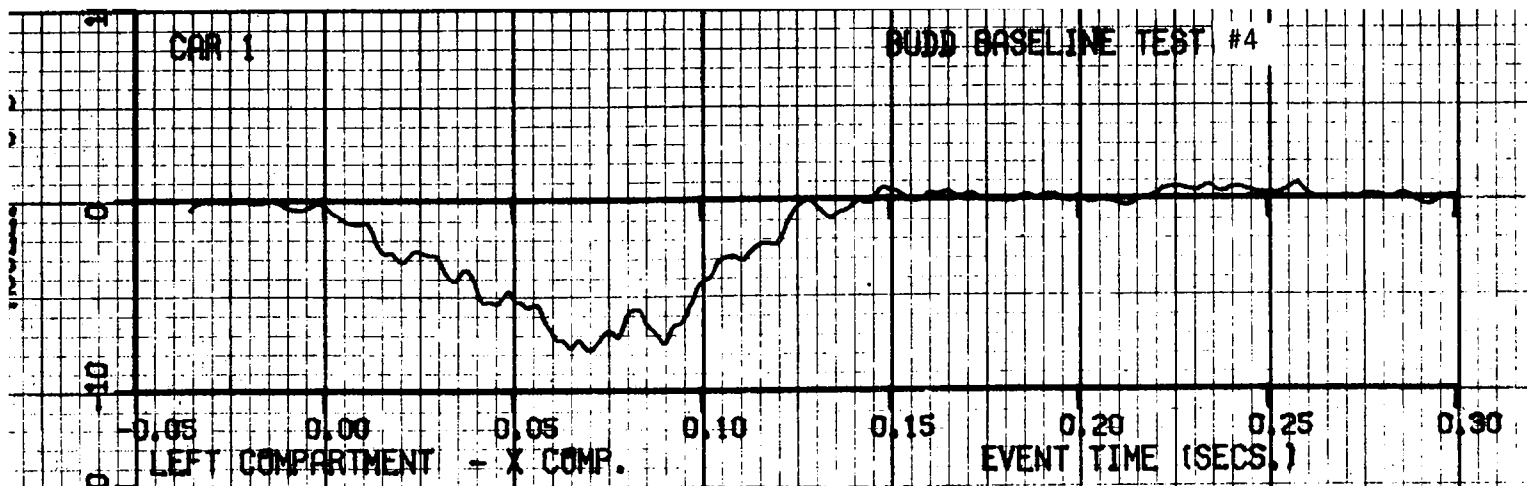
CAR 1 - 1978 CHEVROLET IMPALA

VEHICLE DATA, 60 HZ FILTER

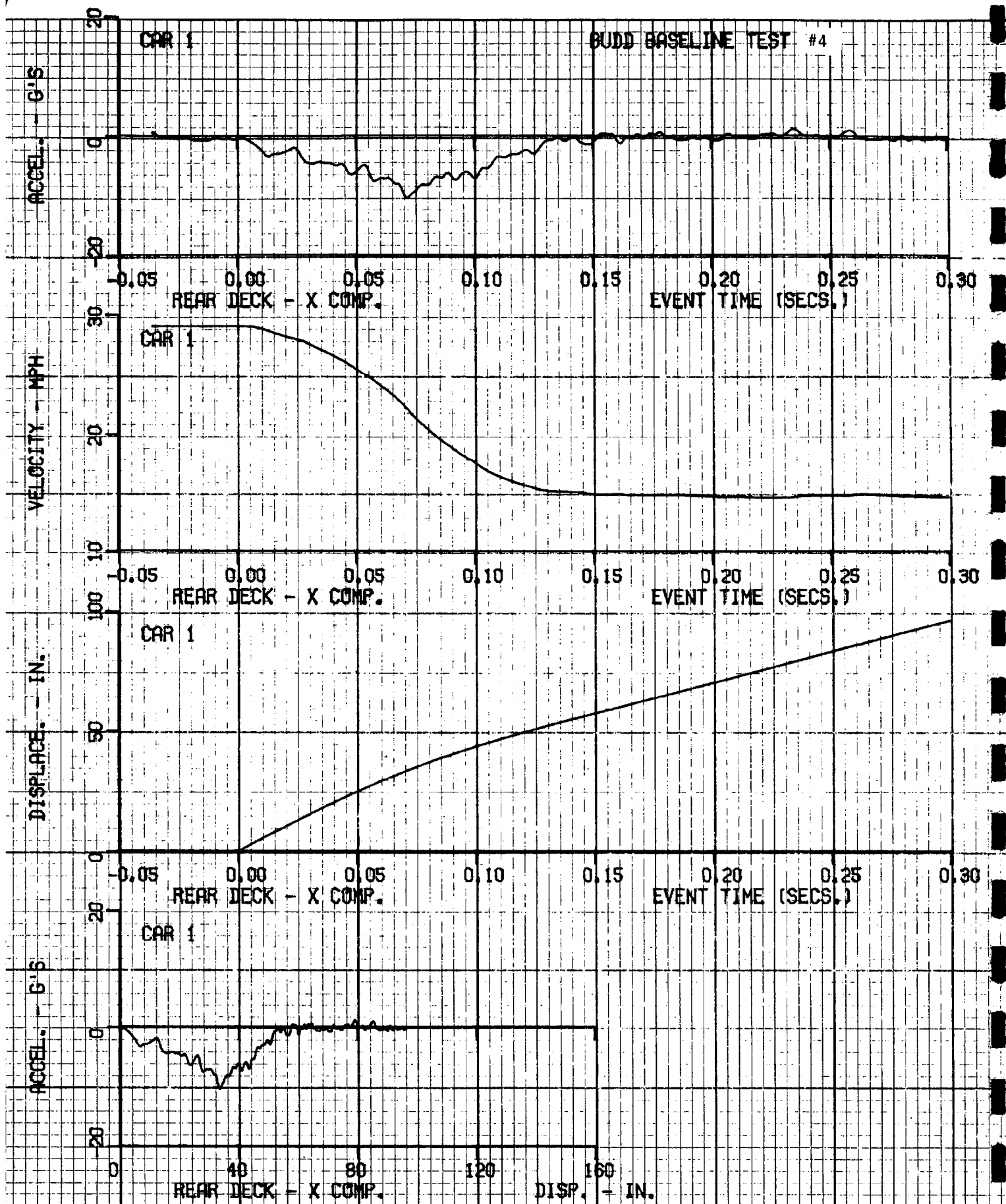


CAR 1

BUDD BASELINE TEST #4

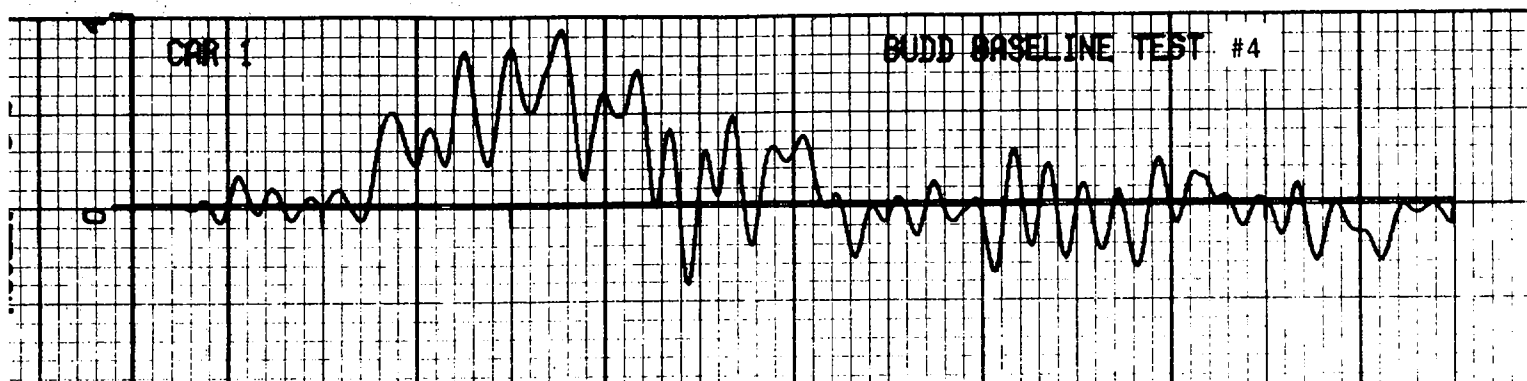


LEFT COMPARTMENT - X COMP. DISP. - IN.



CAR 1

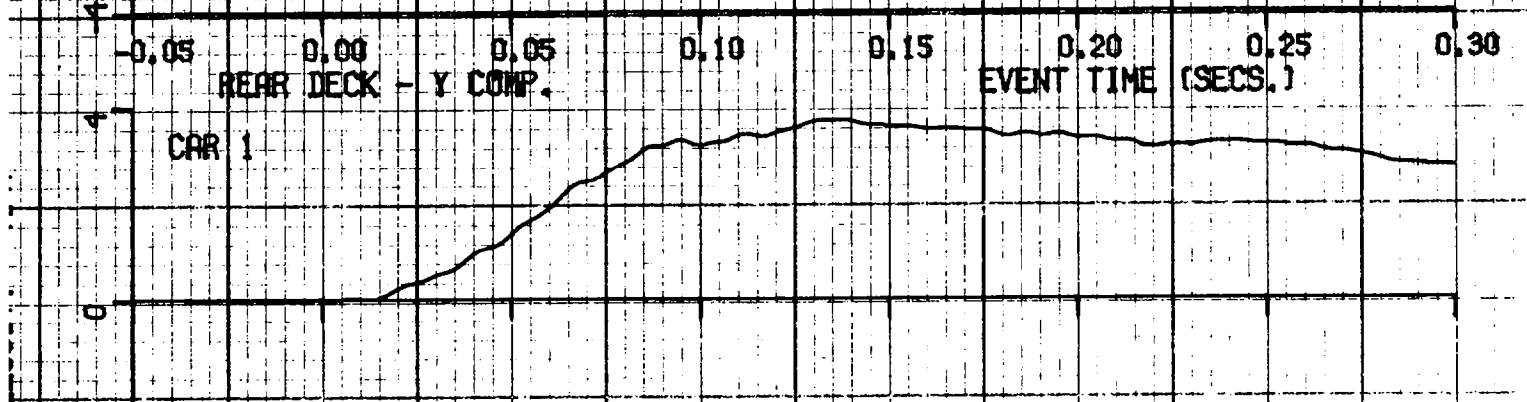
BUDD BASELINE TEST #4



REAR DECK - Y COMP.

EVENT TIME (SECS.)

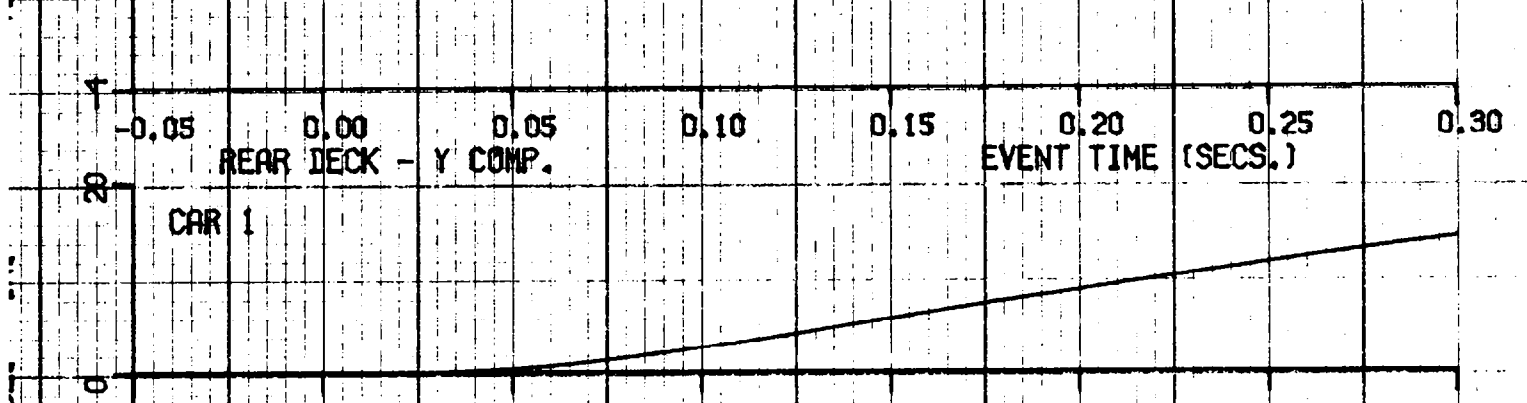
CAR 1



REAR DECK - Y COMP.

EVENT TIME (SECS.)

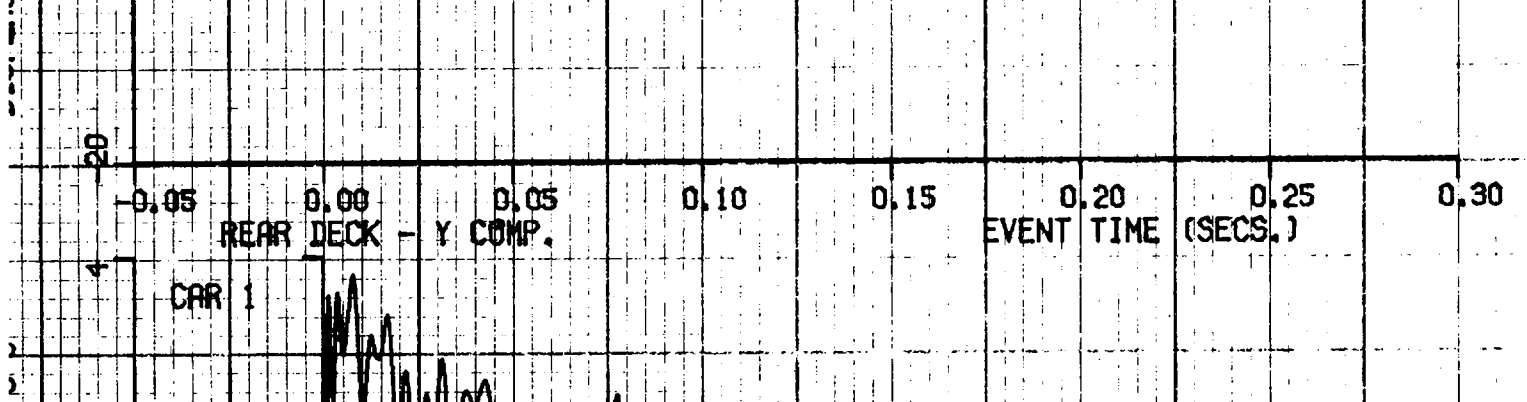
CAR 1



REAR DECK - Y COMP.

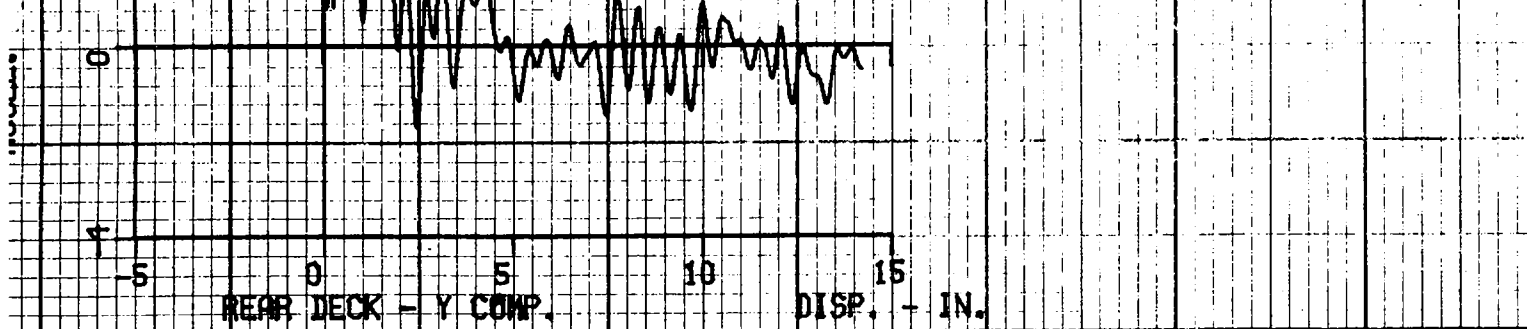
EVENT TIME (SECS.)

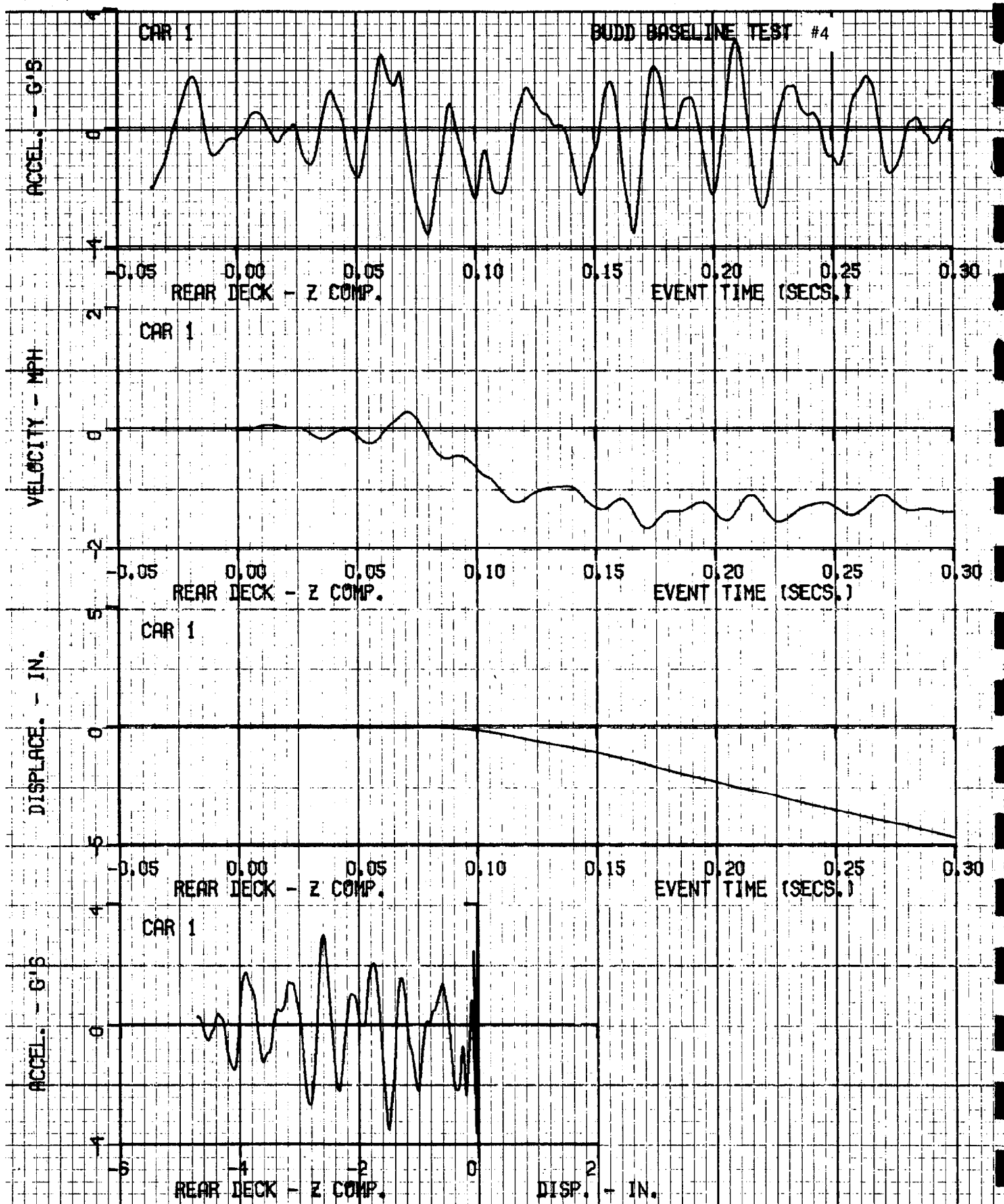
CAR 1



REAR DECK - Y COMP.

DISP. - IN.

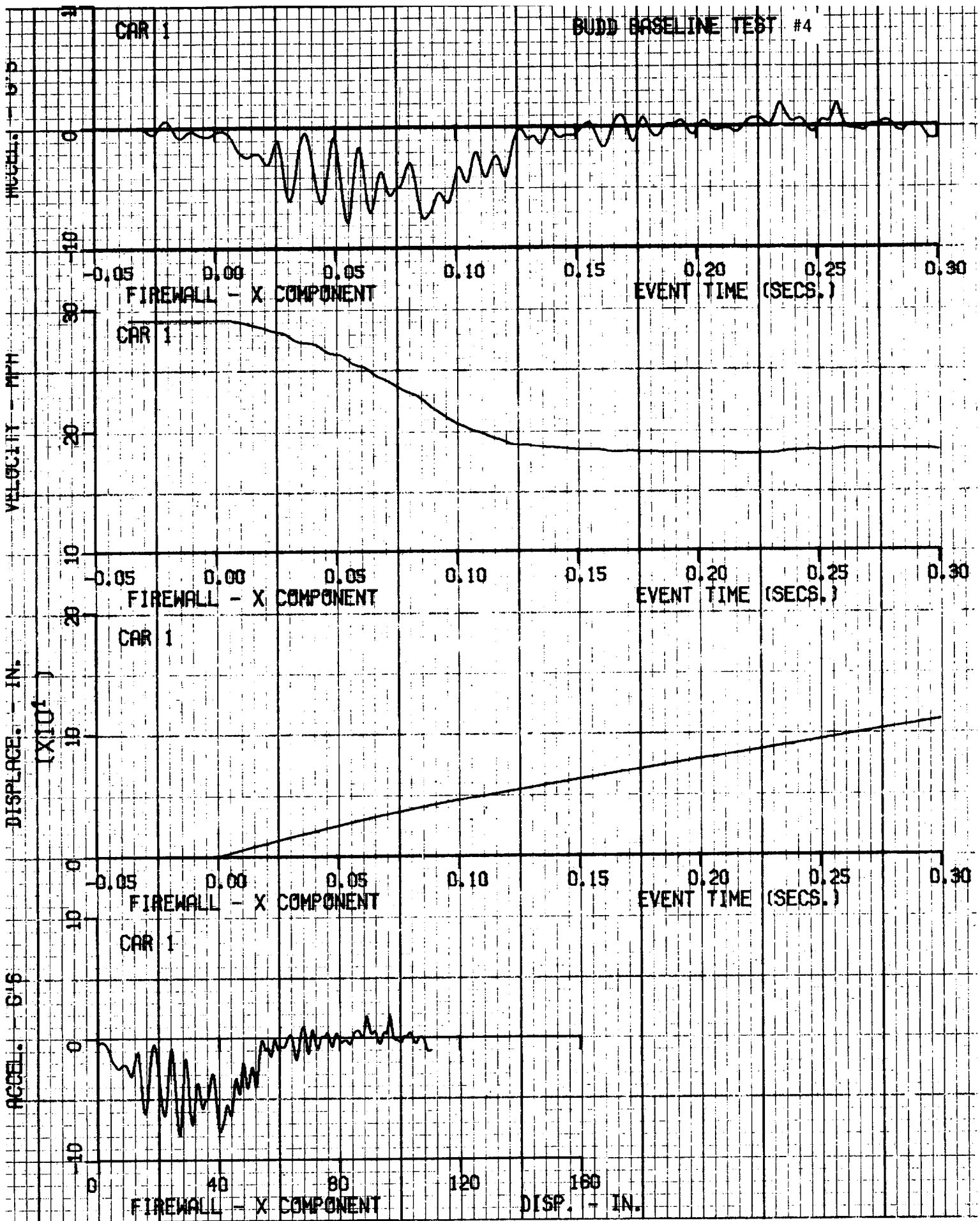


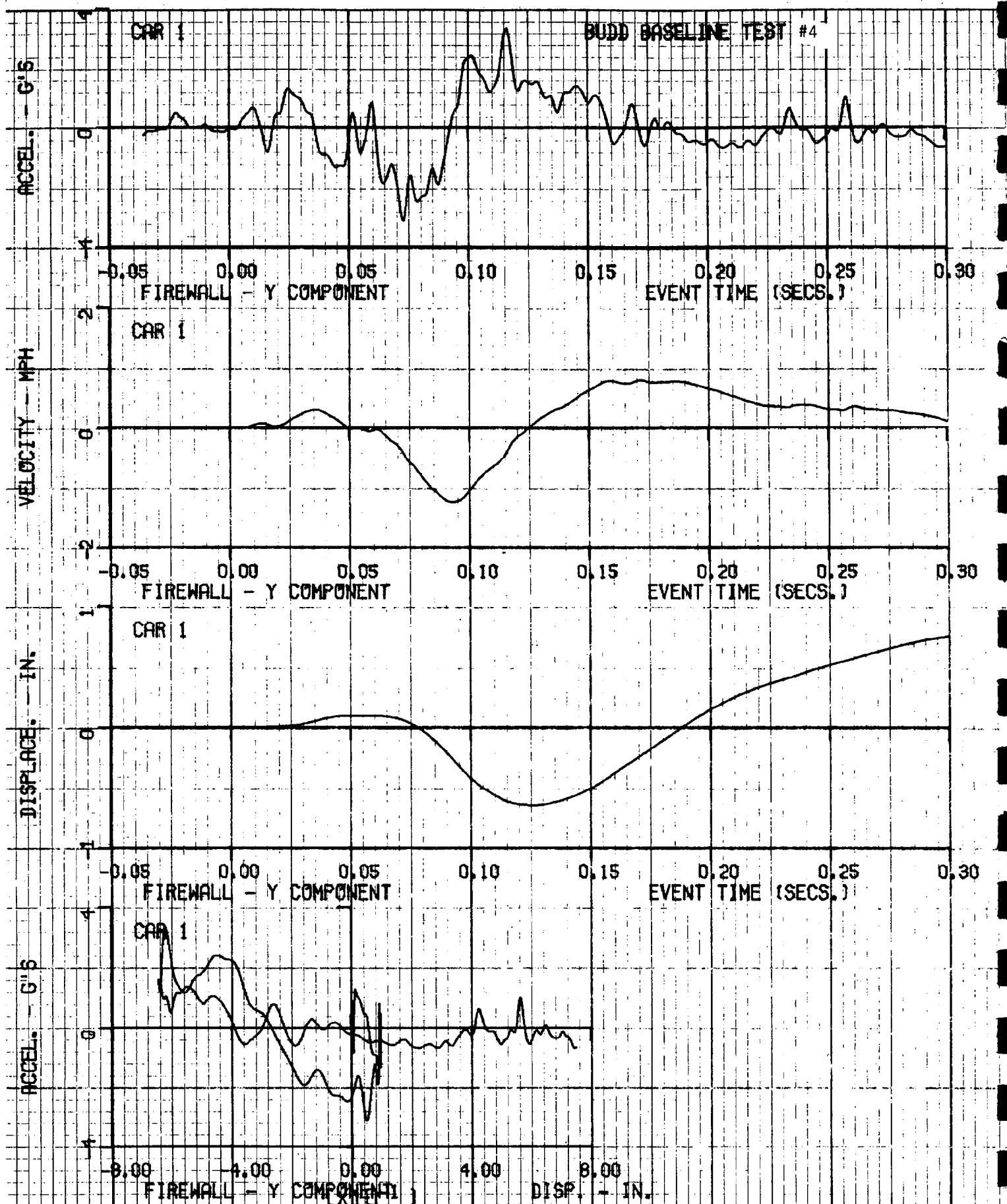




CAR 1

BUDD BASELINE TEST #4

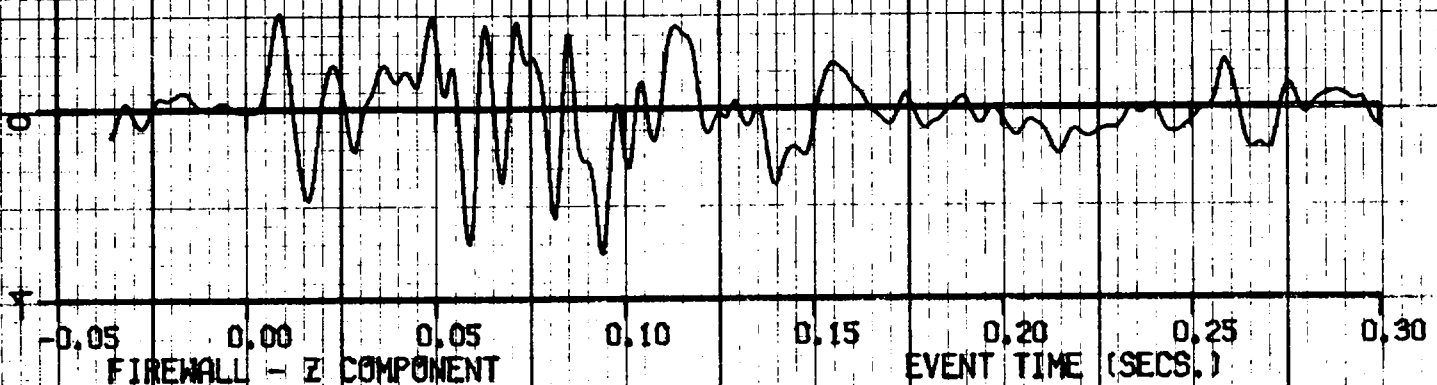




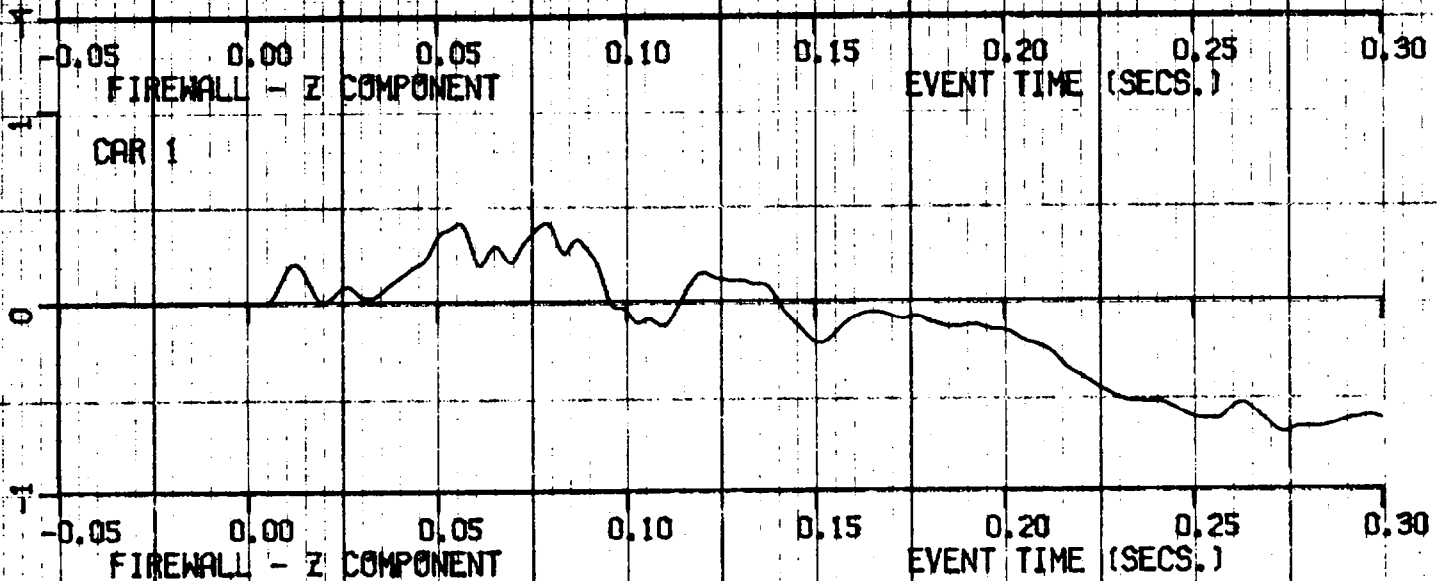
CAR 1

BUDD BASELINE TEST #4

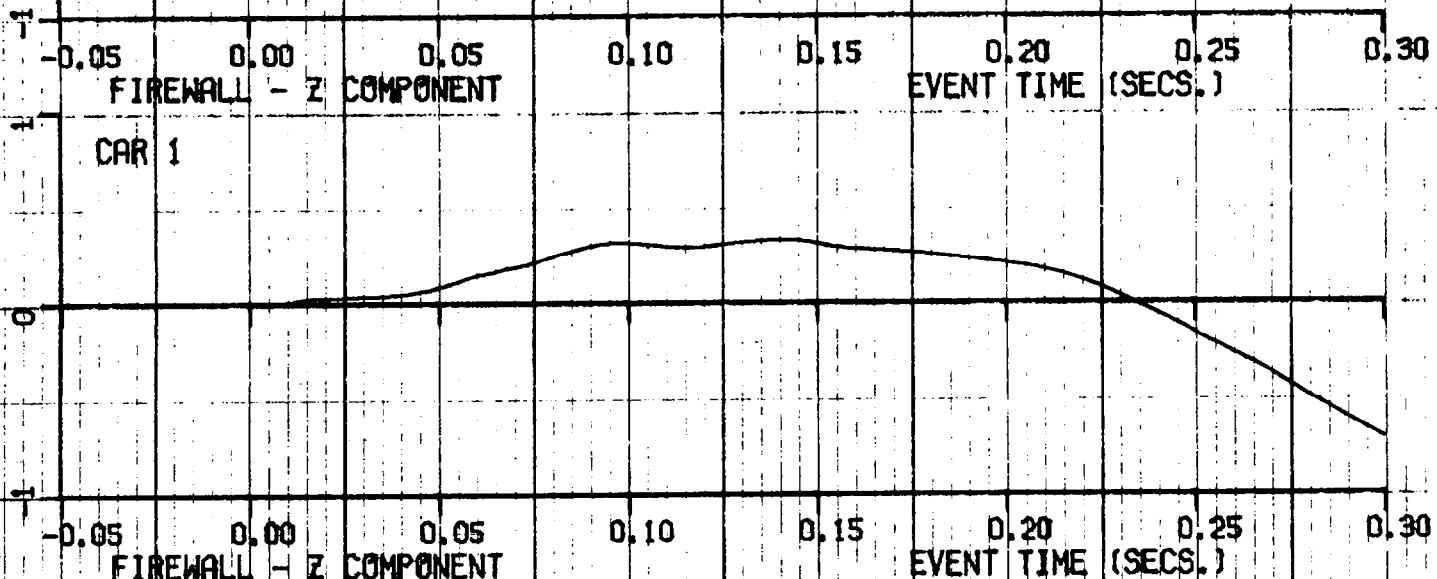
ACCEL. - G'S



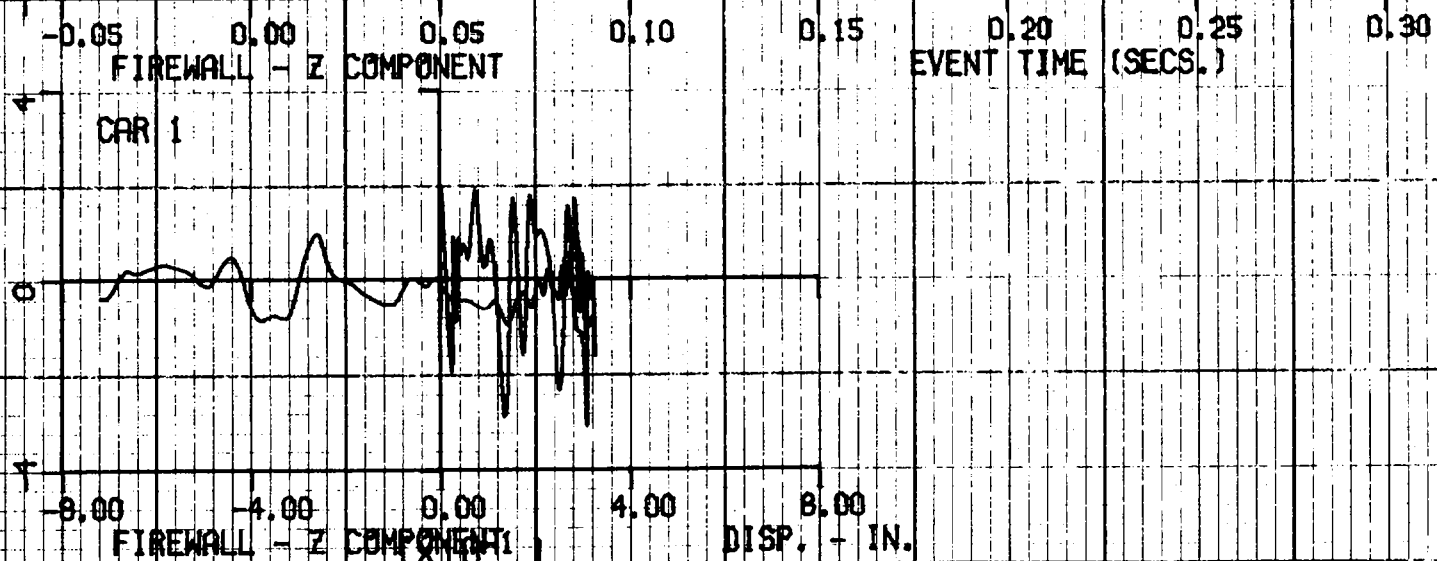
VELOCITY - MPH

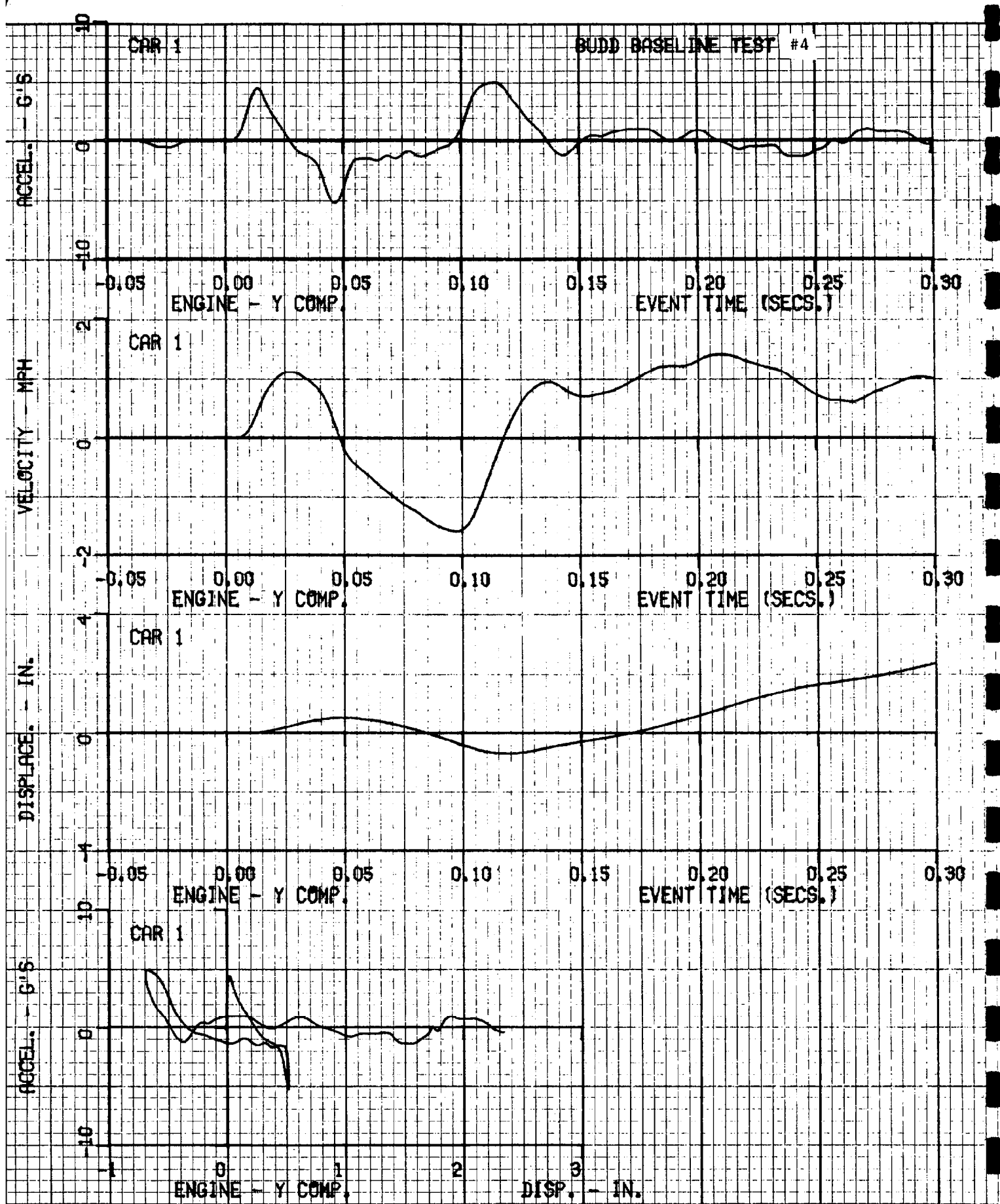


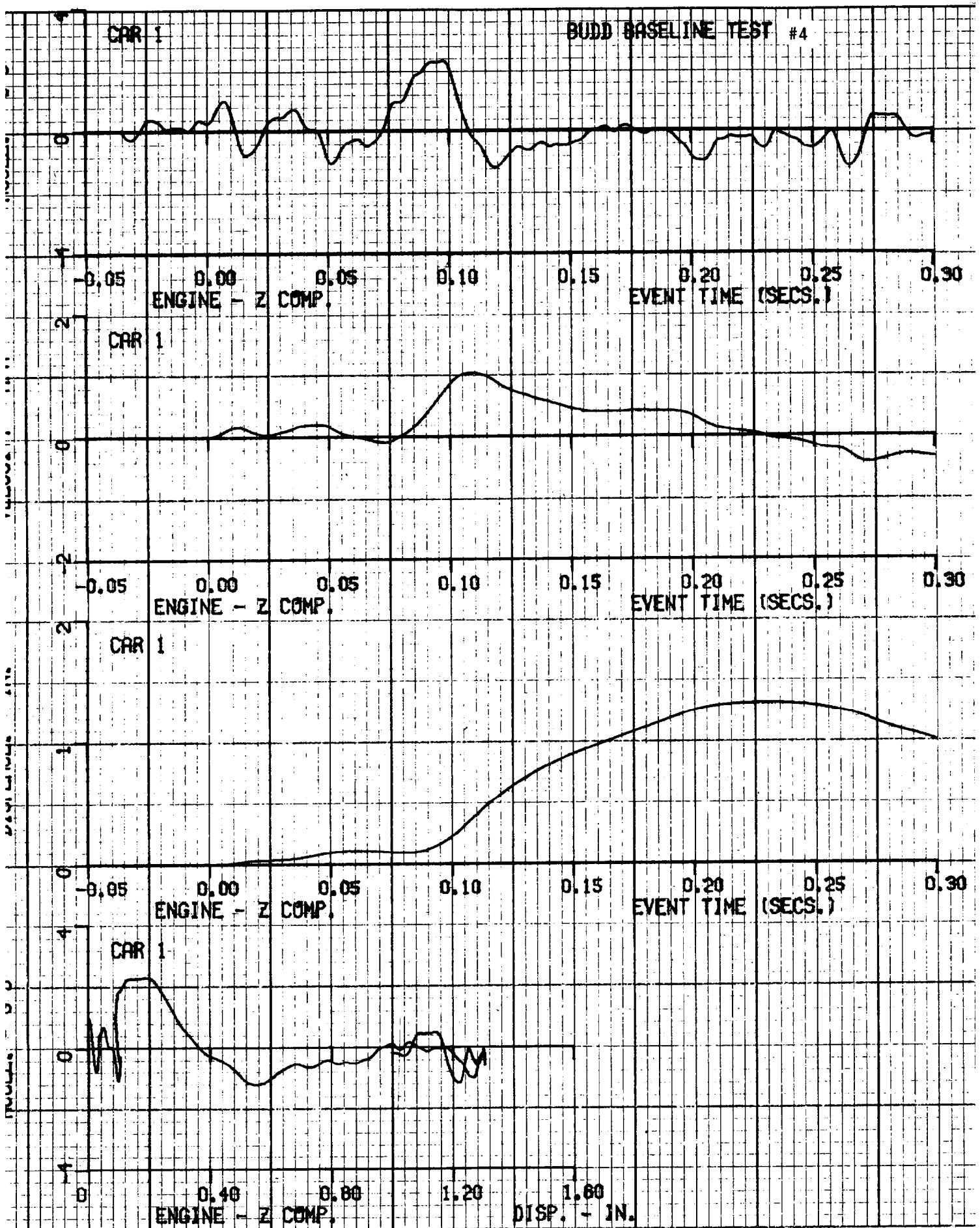
DISPLAC. - IN.

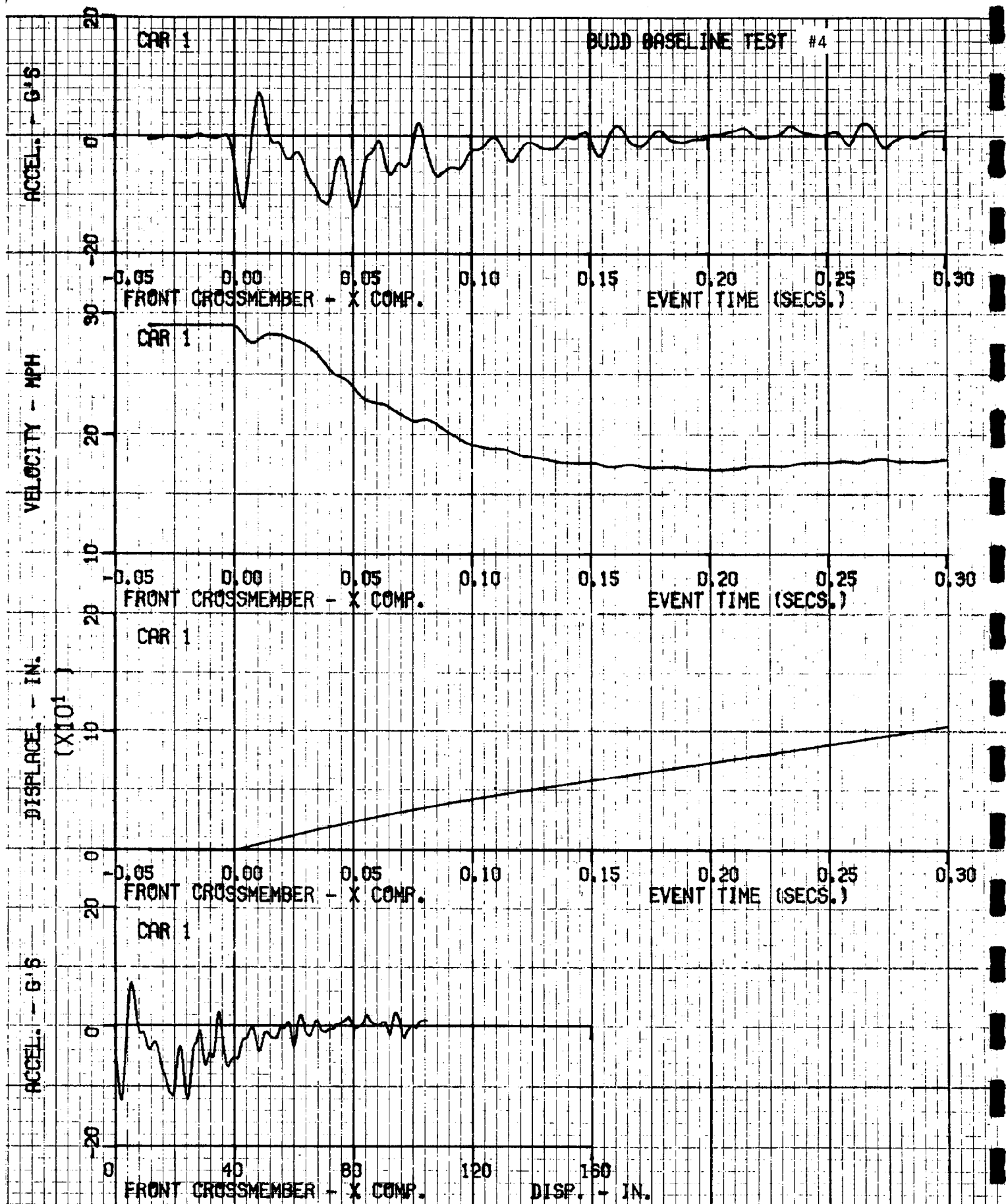


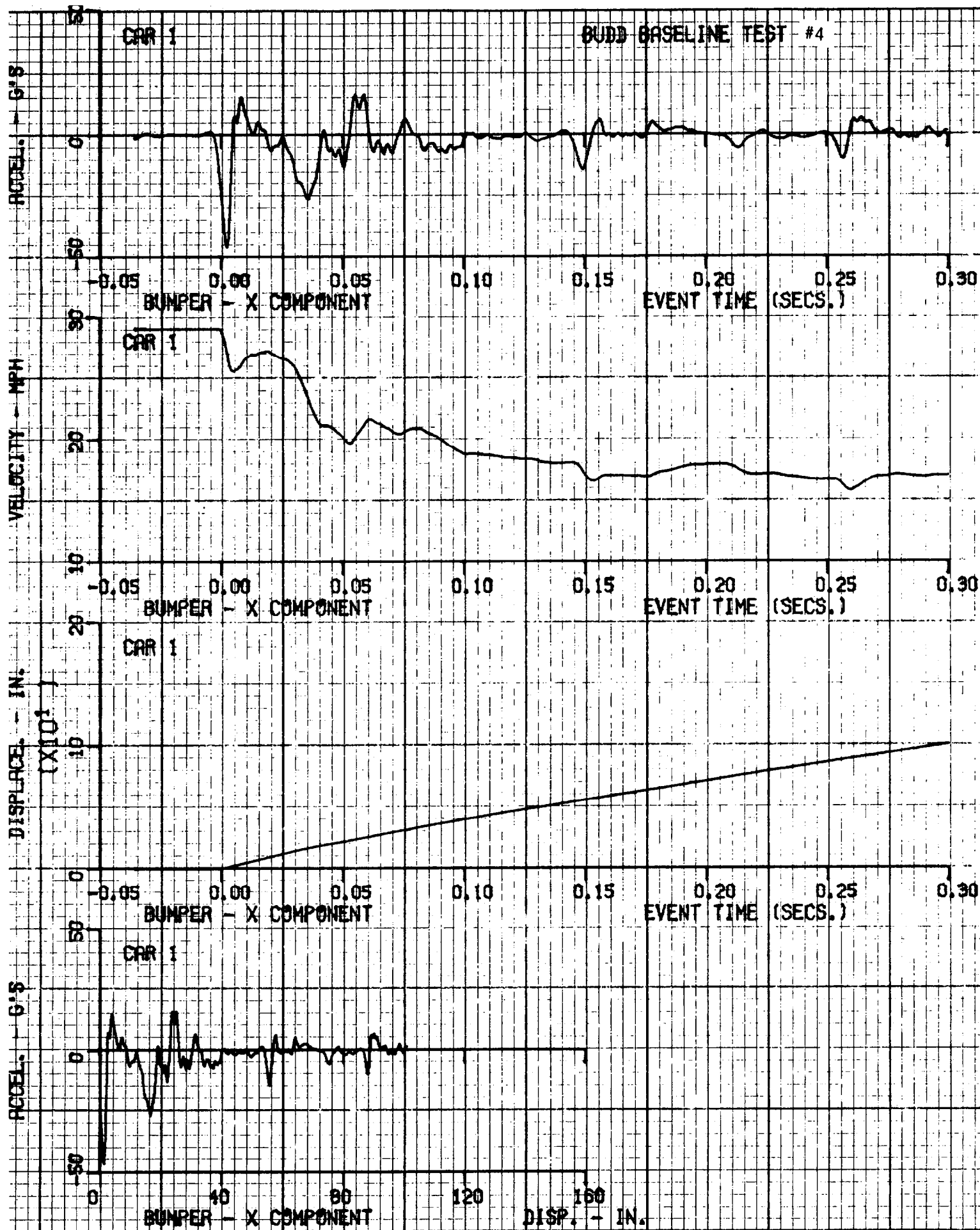
ACCEL. - G'S

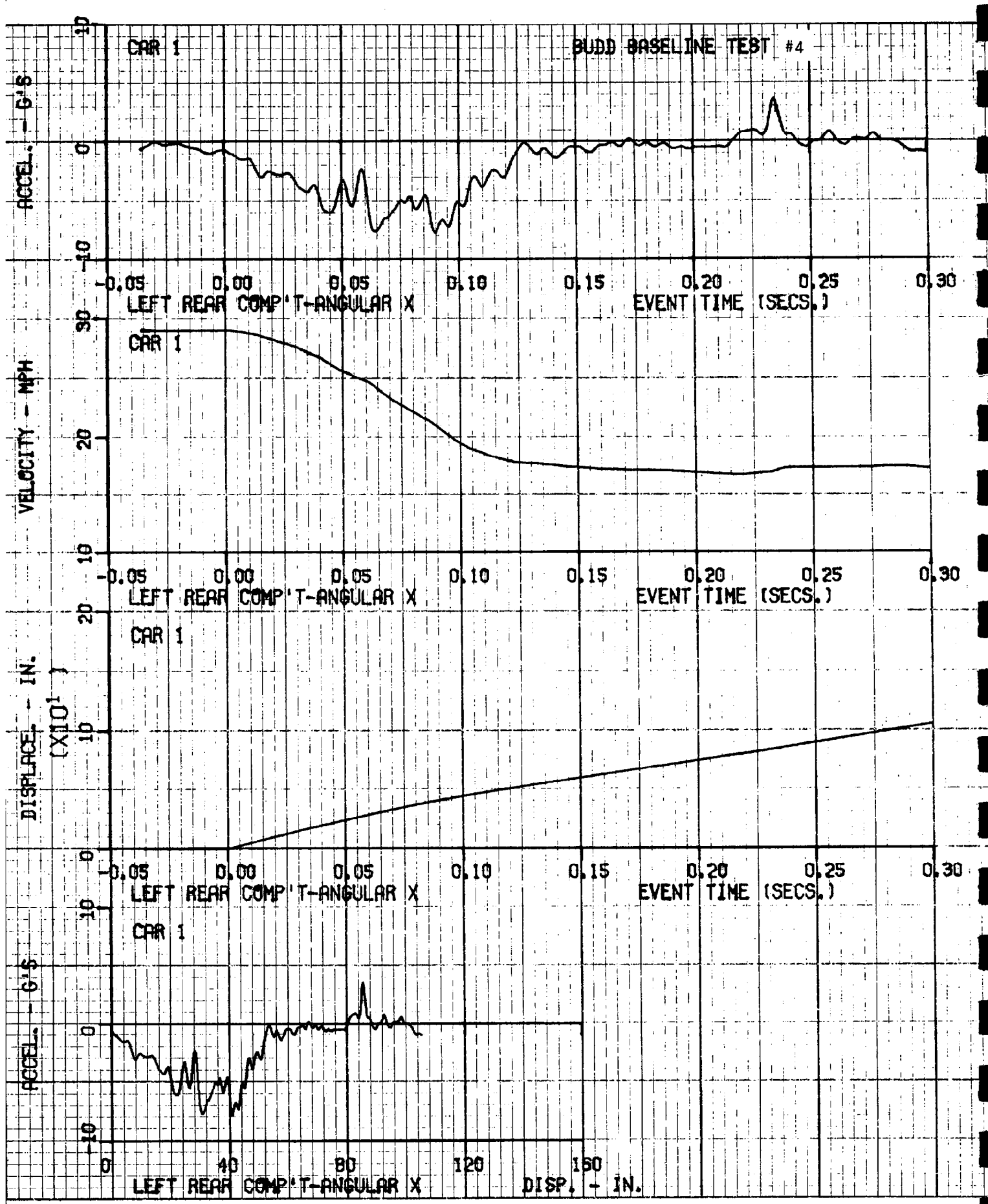




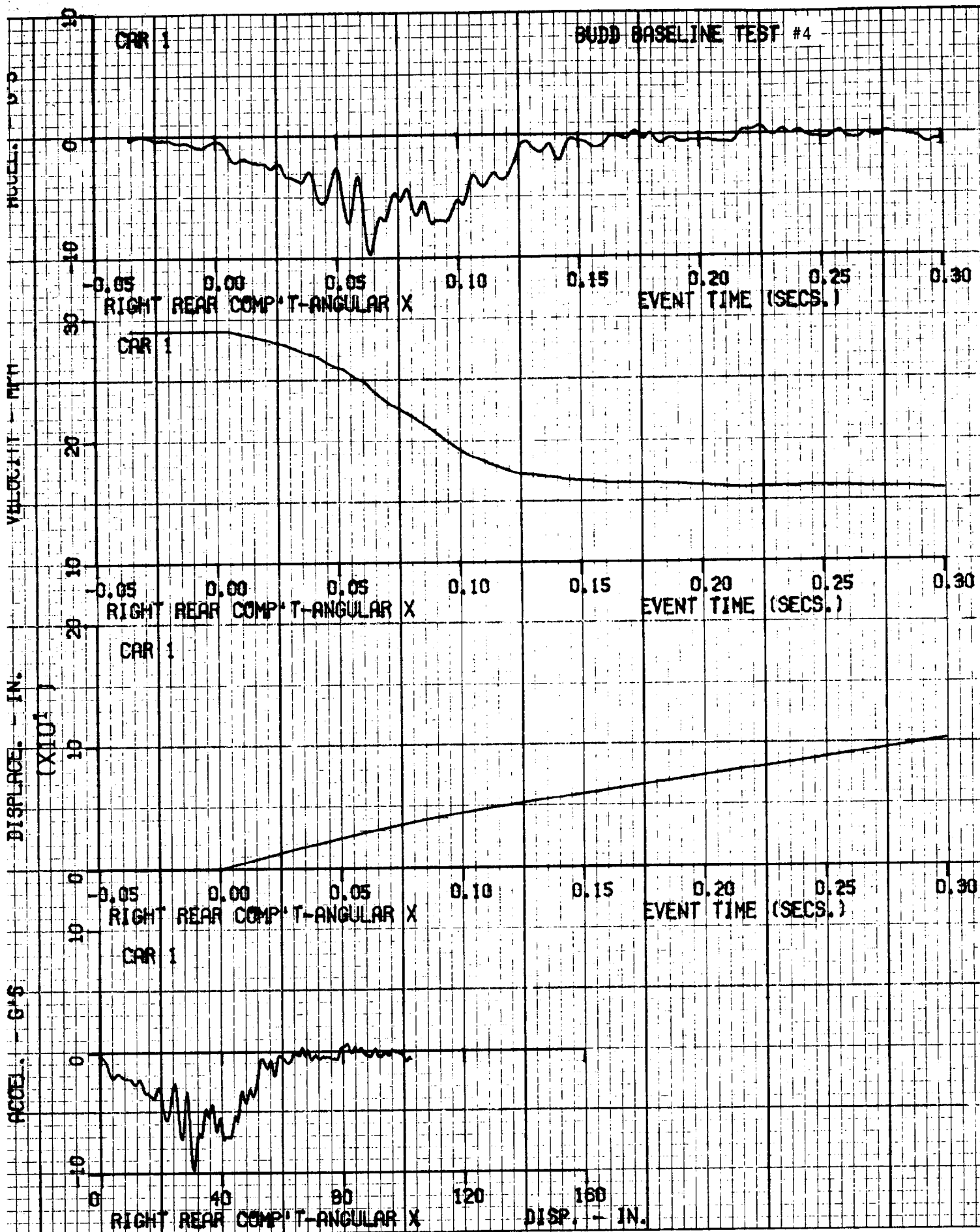


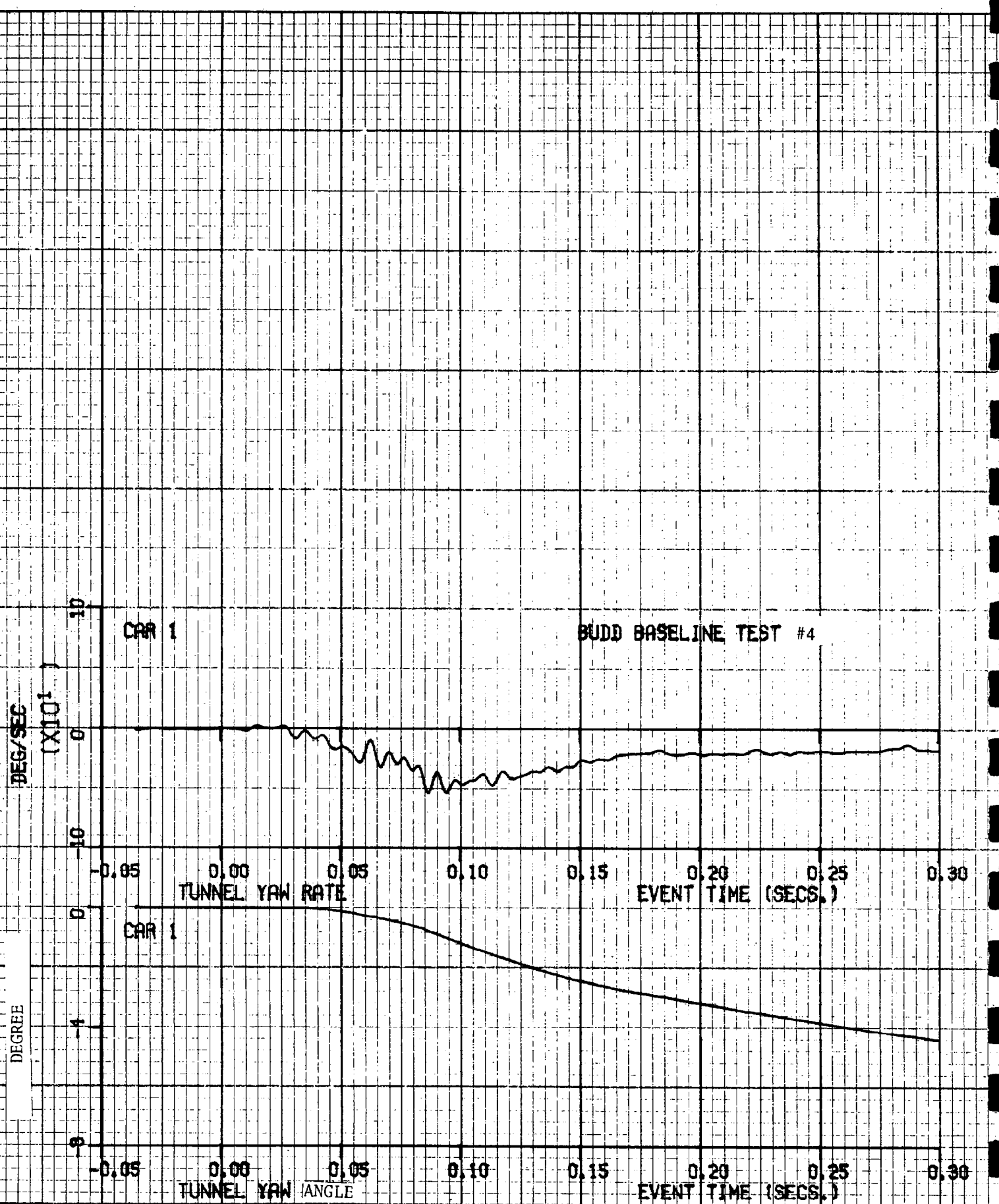








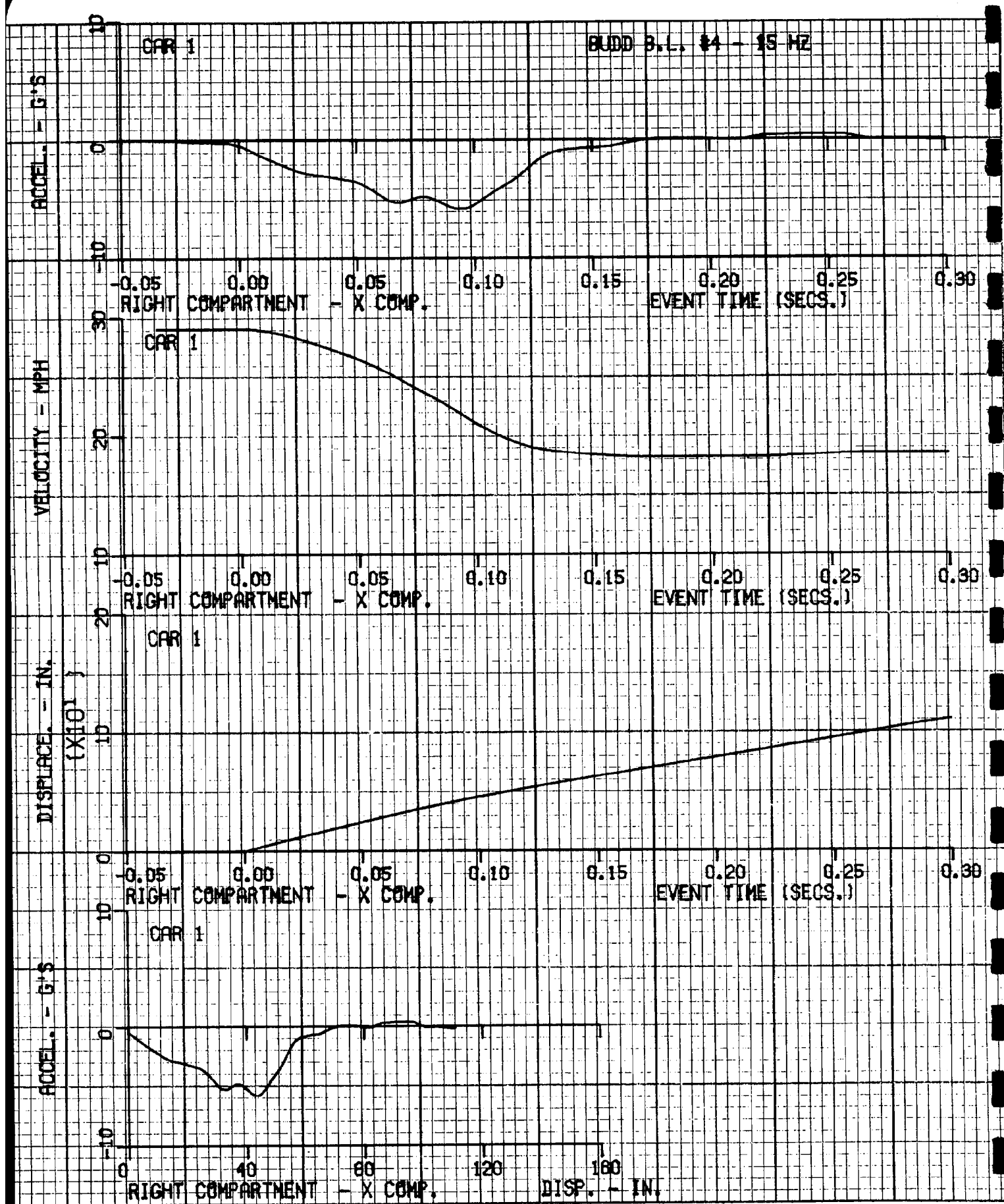


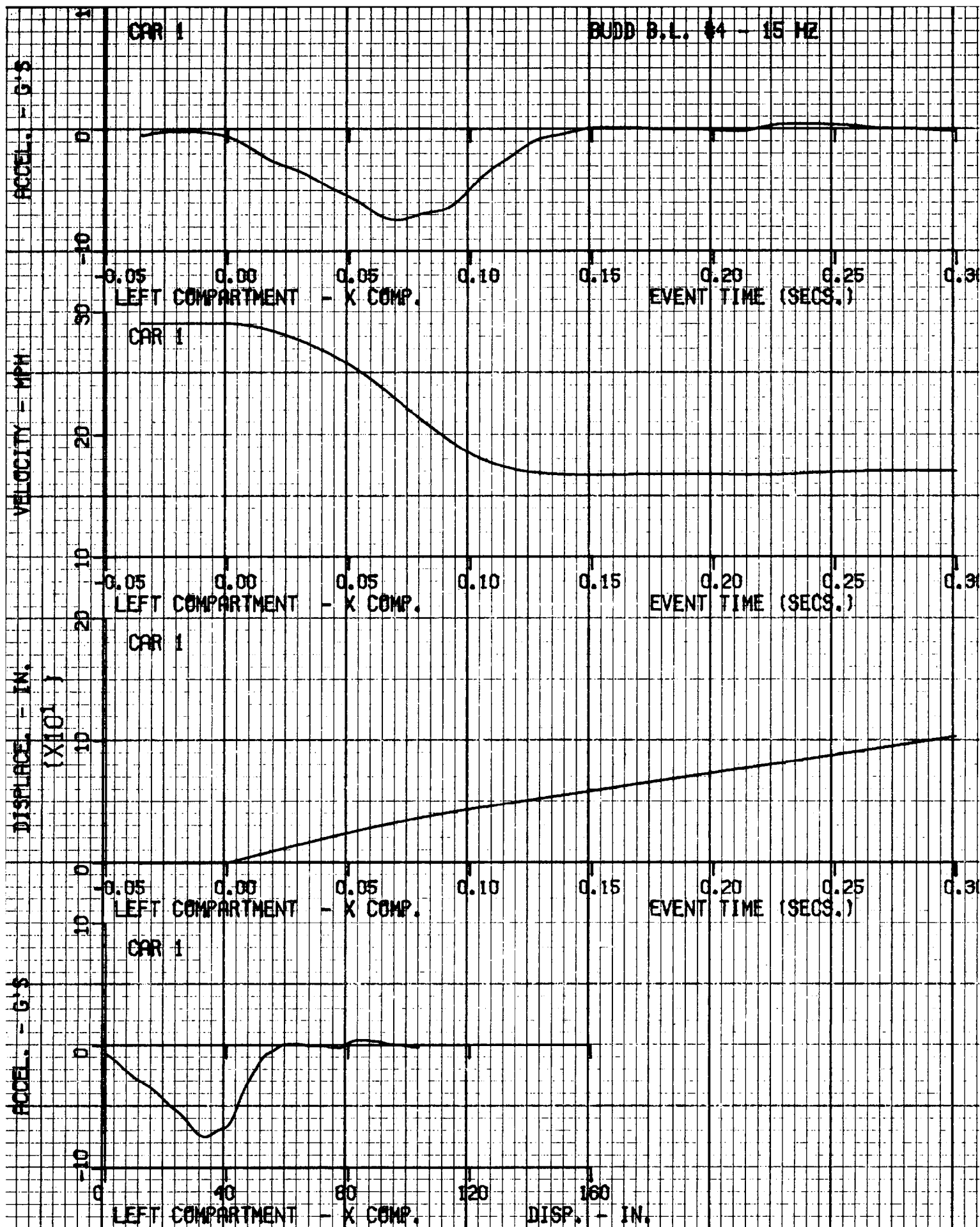


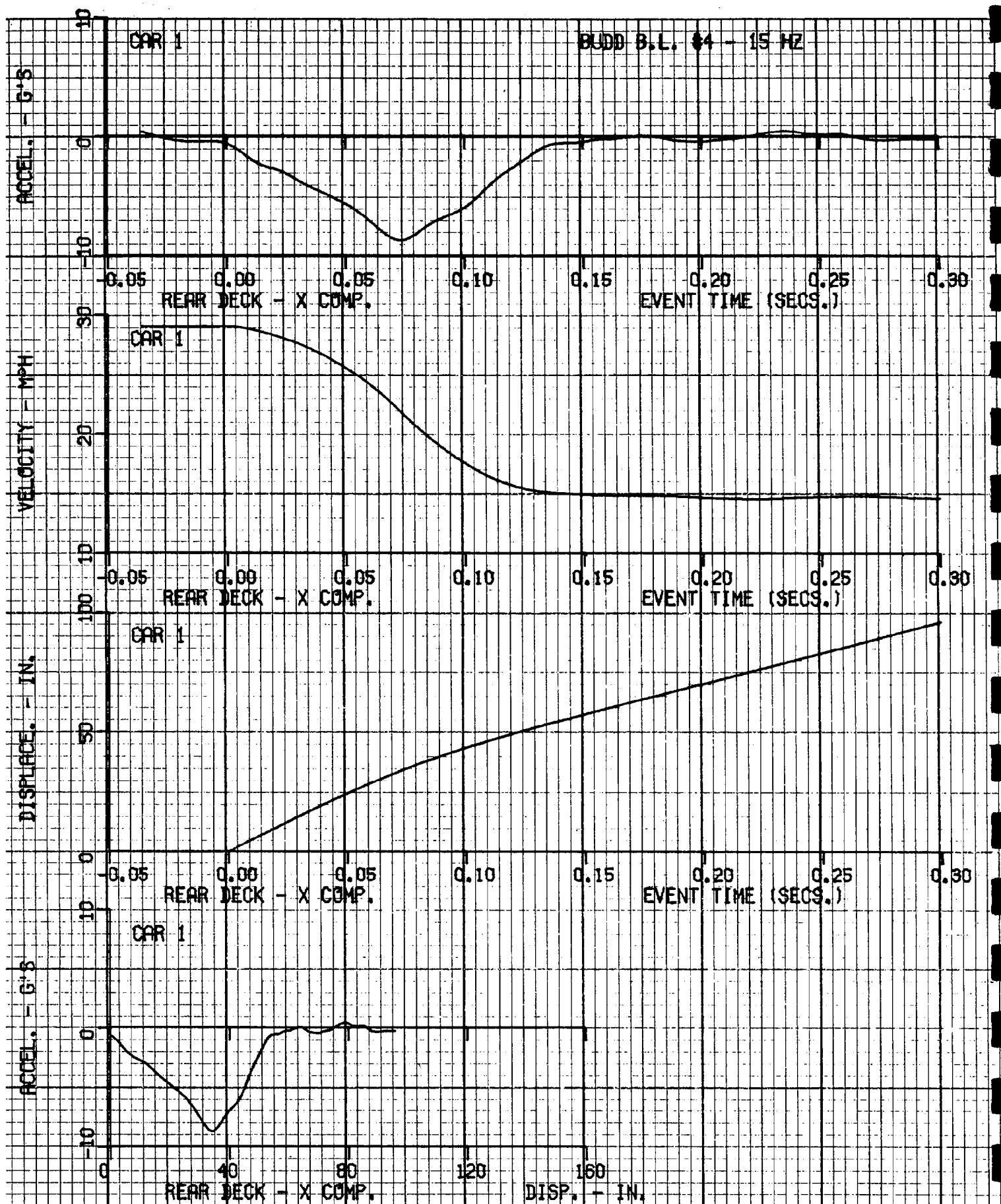
BASELINE TEST NO. 4

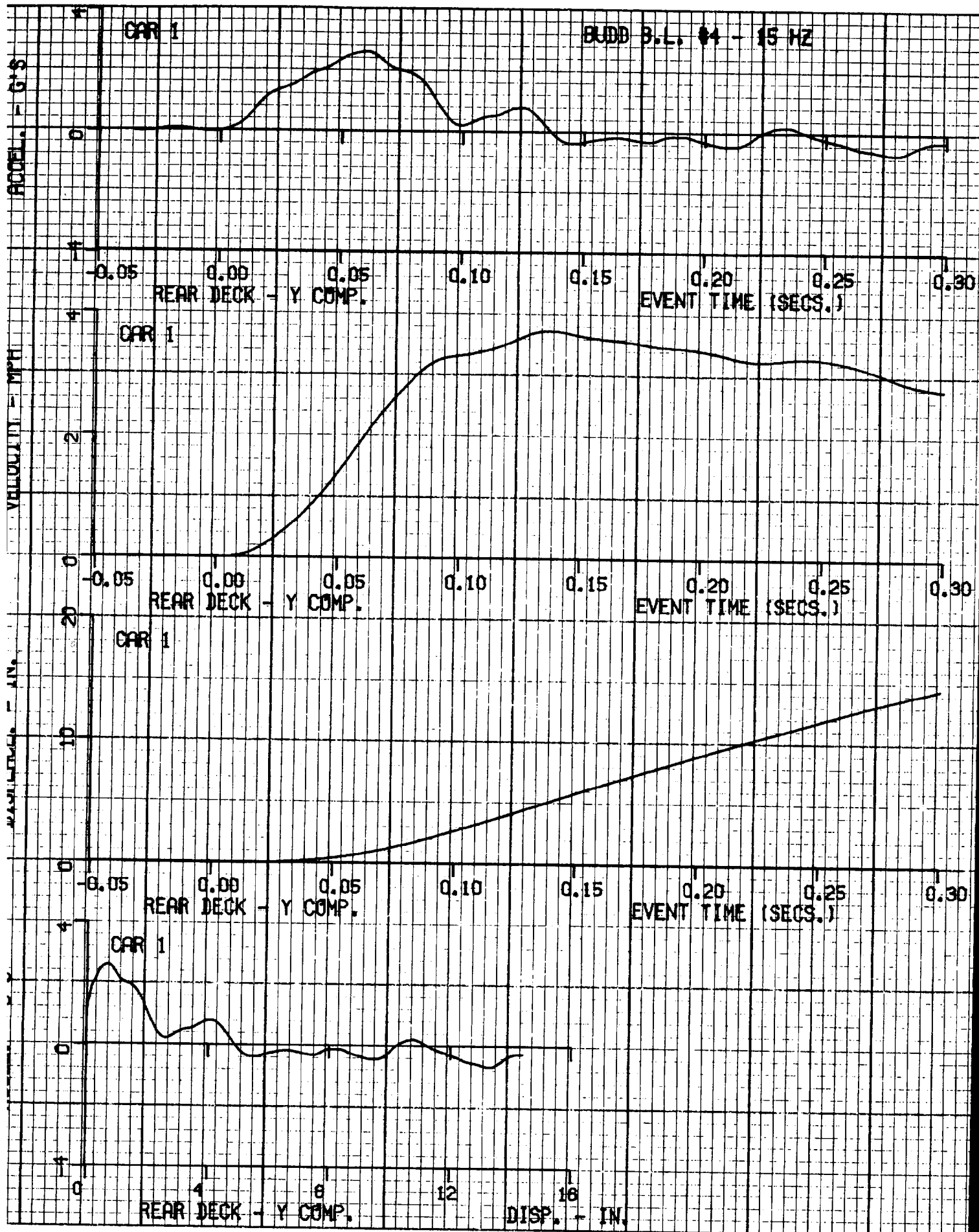
CAR 1 - 1978 CHEVROLET IMPALA

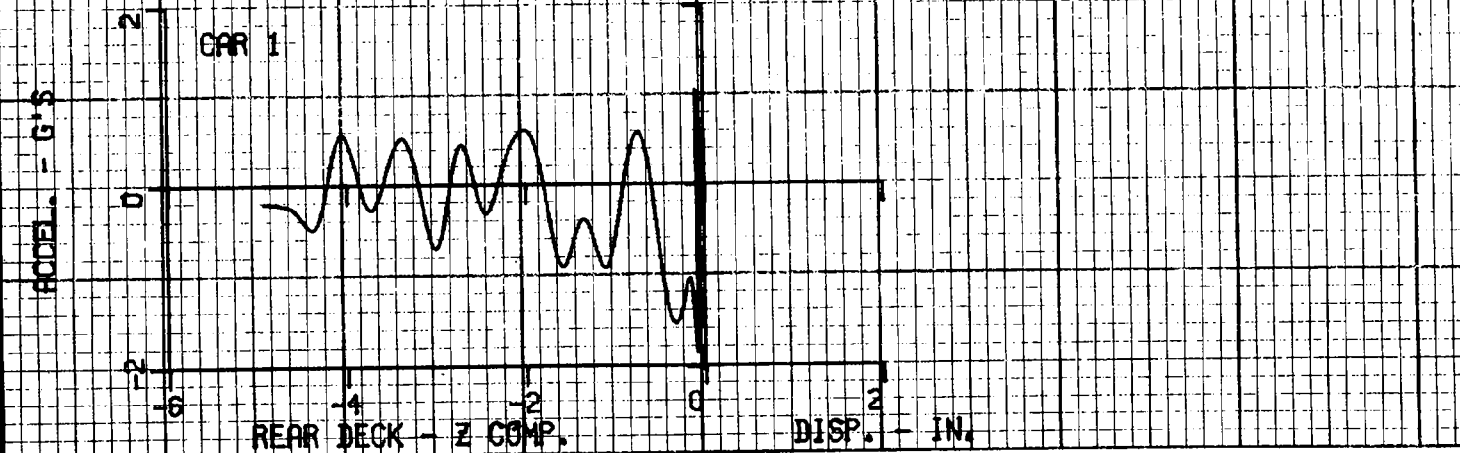
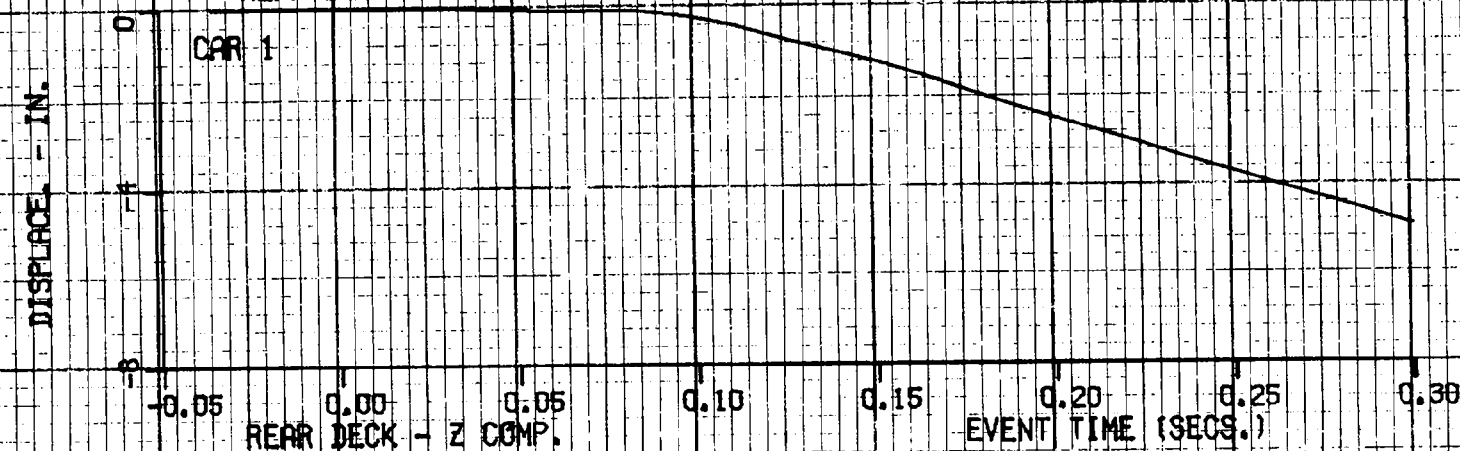
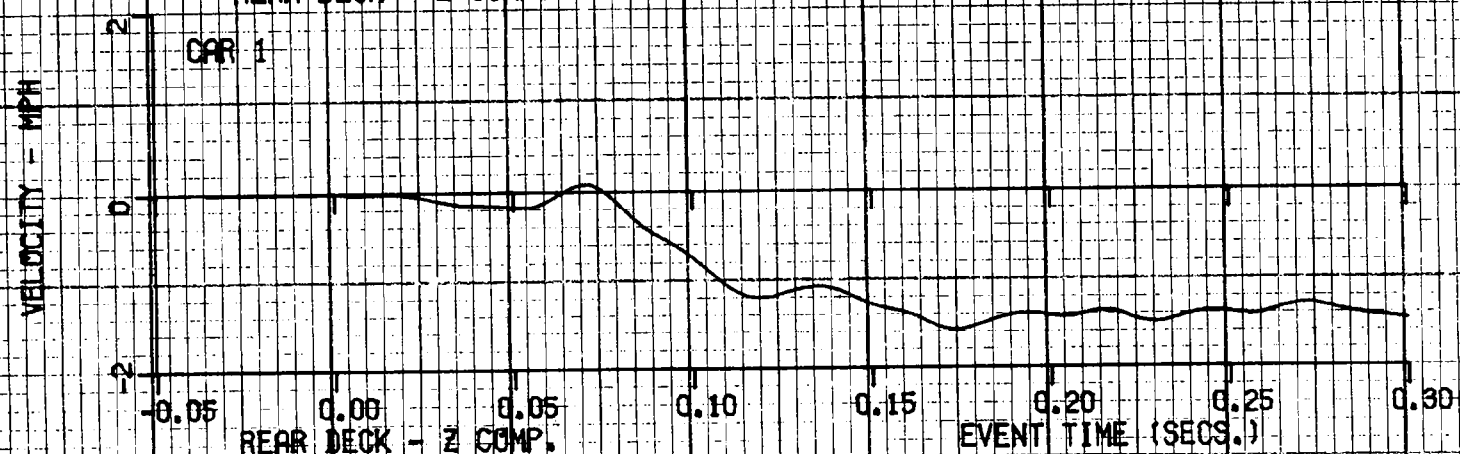
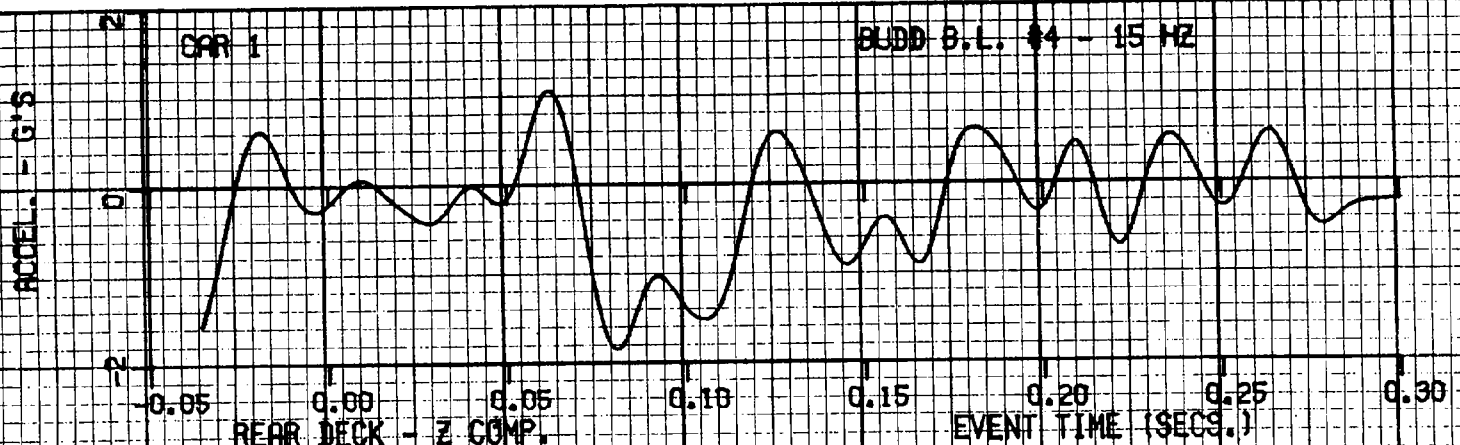
VEHICLE DATA, 15 HZ FILTER



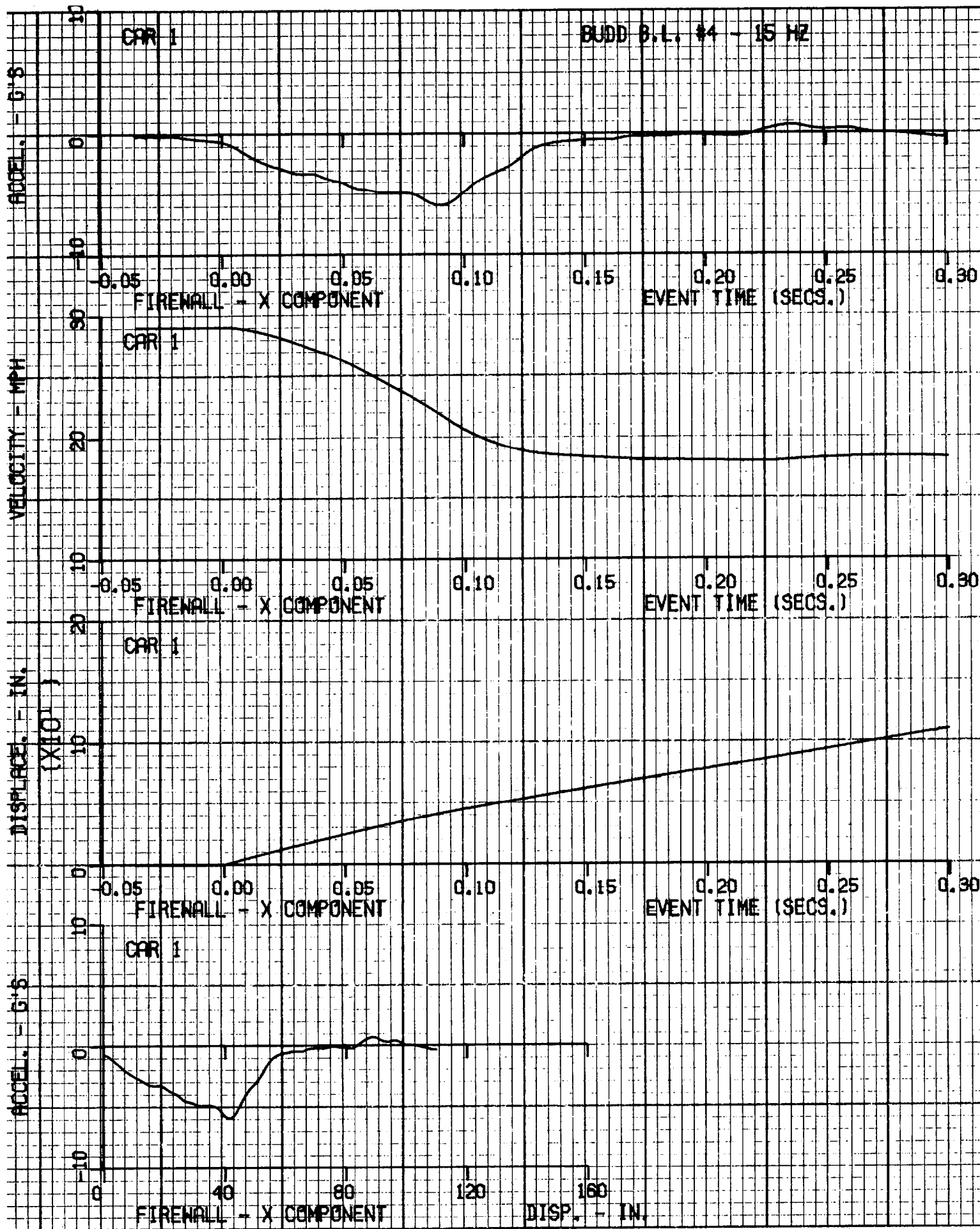


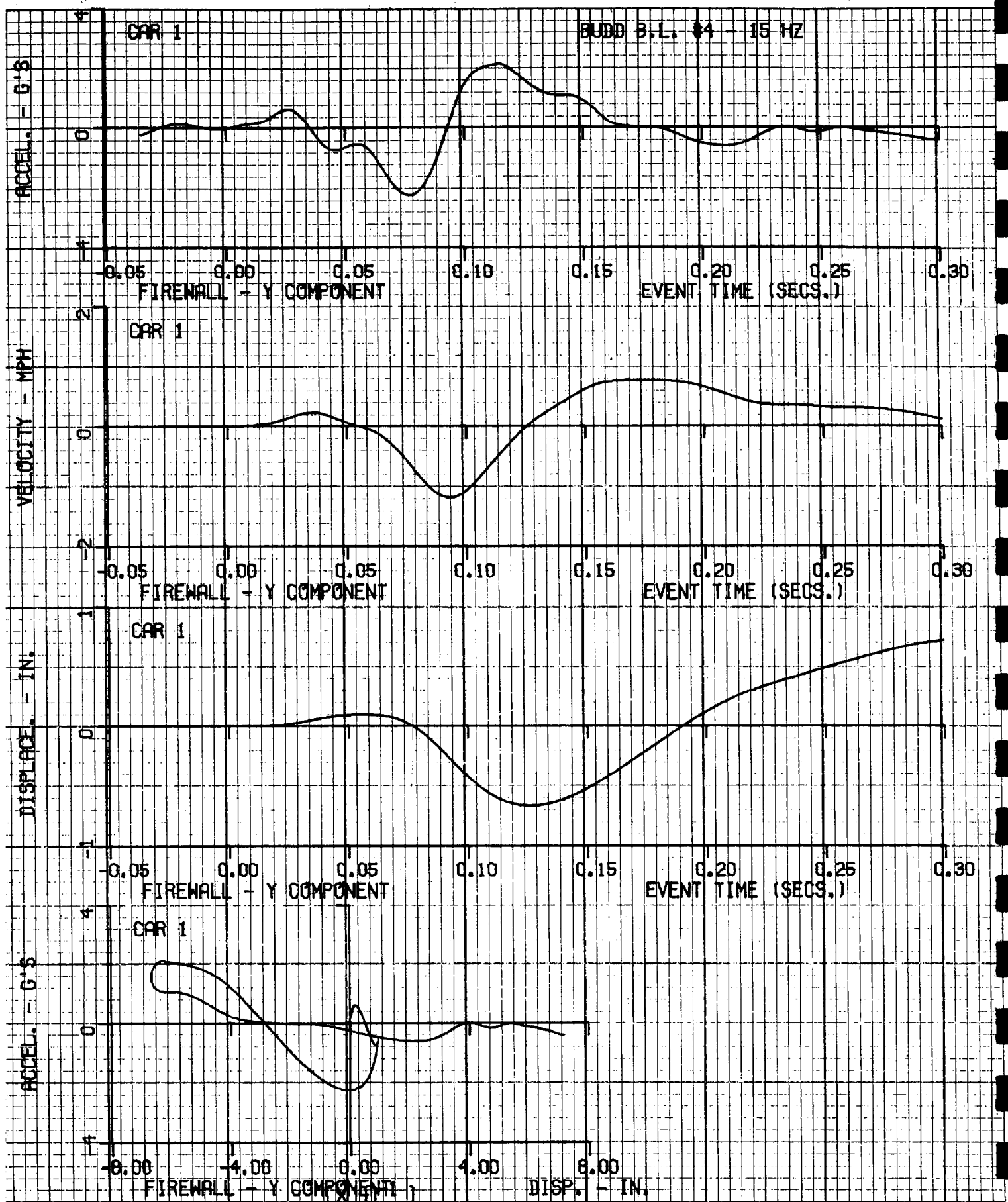


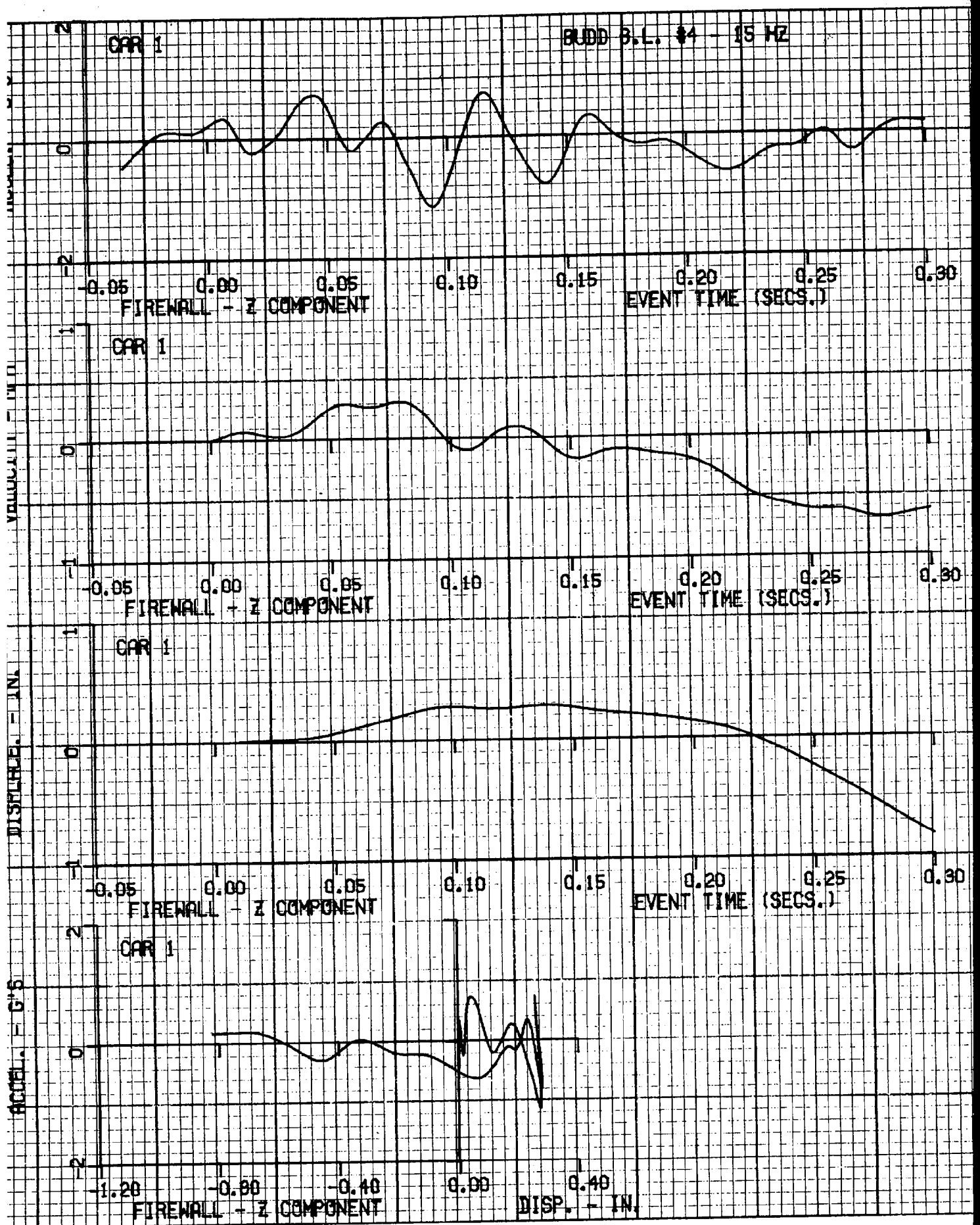




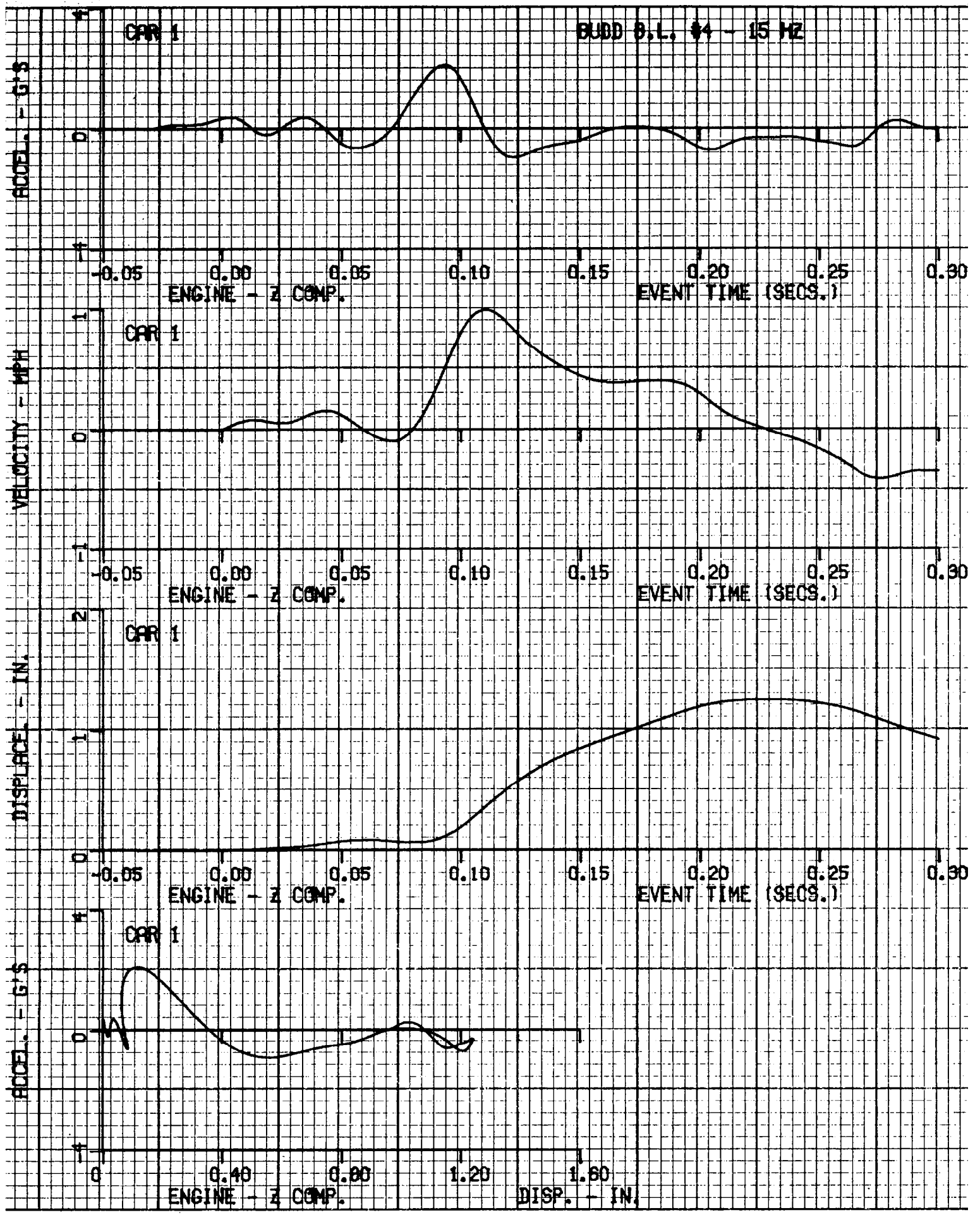


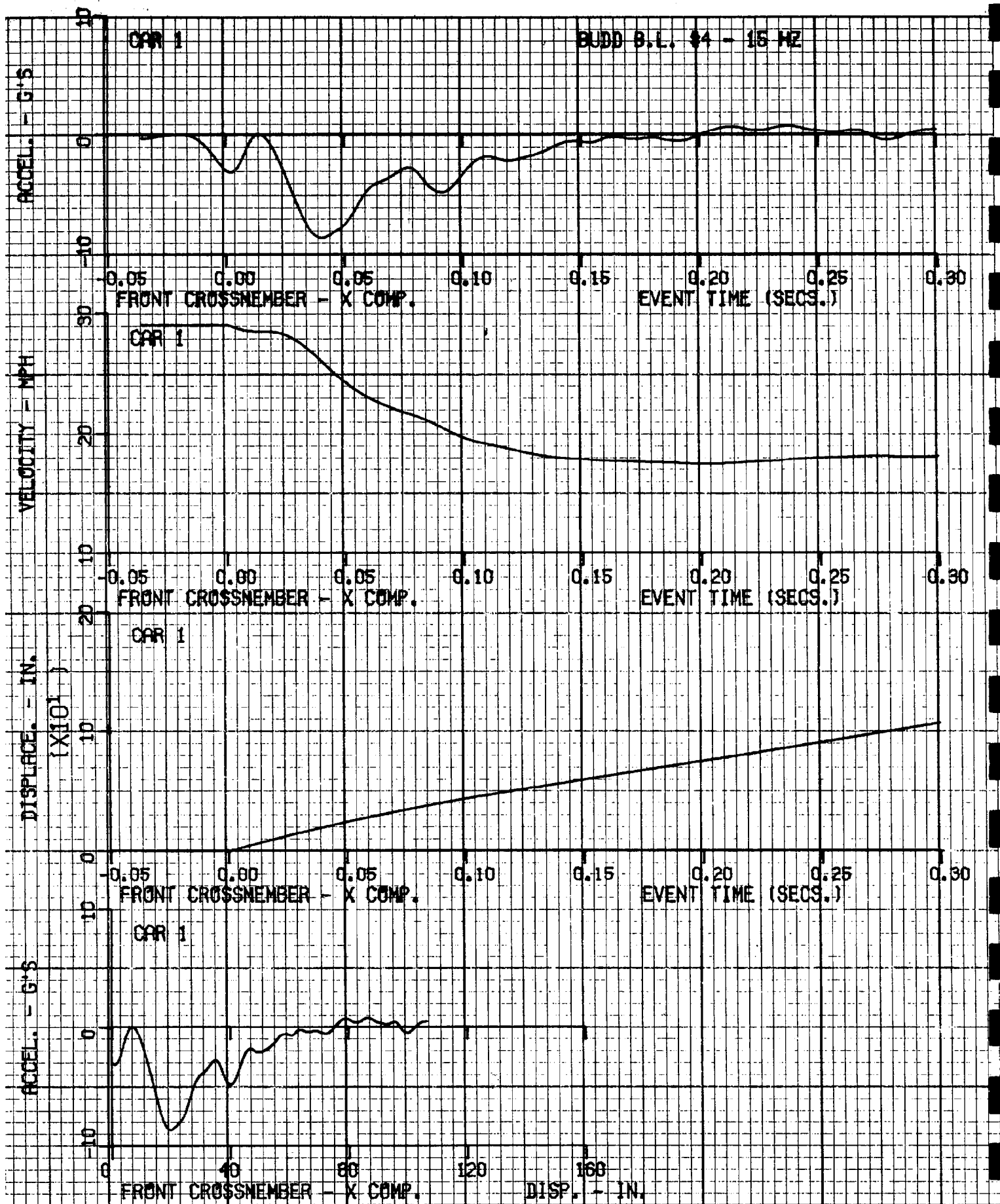


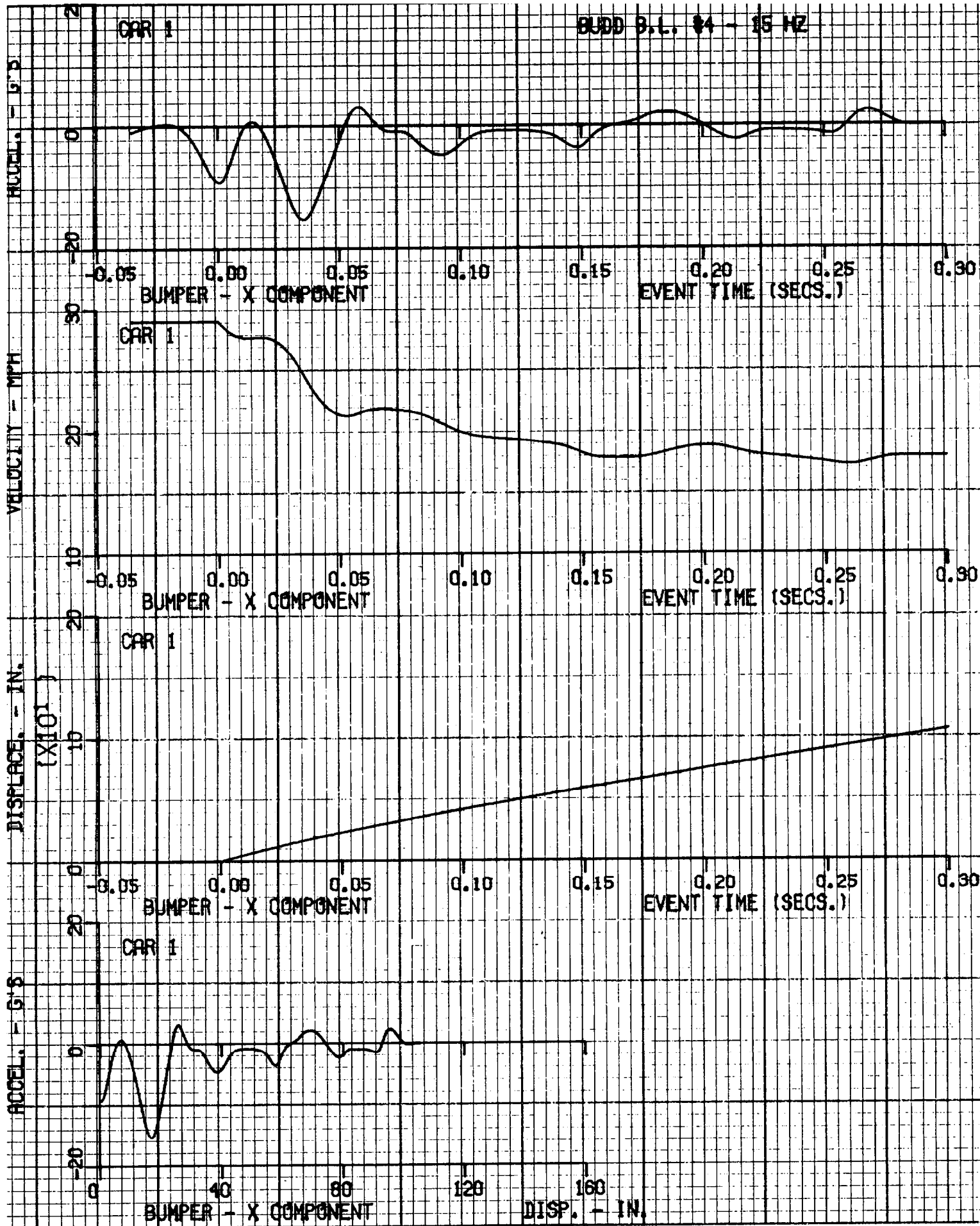


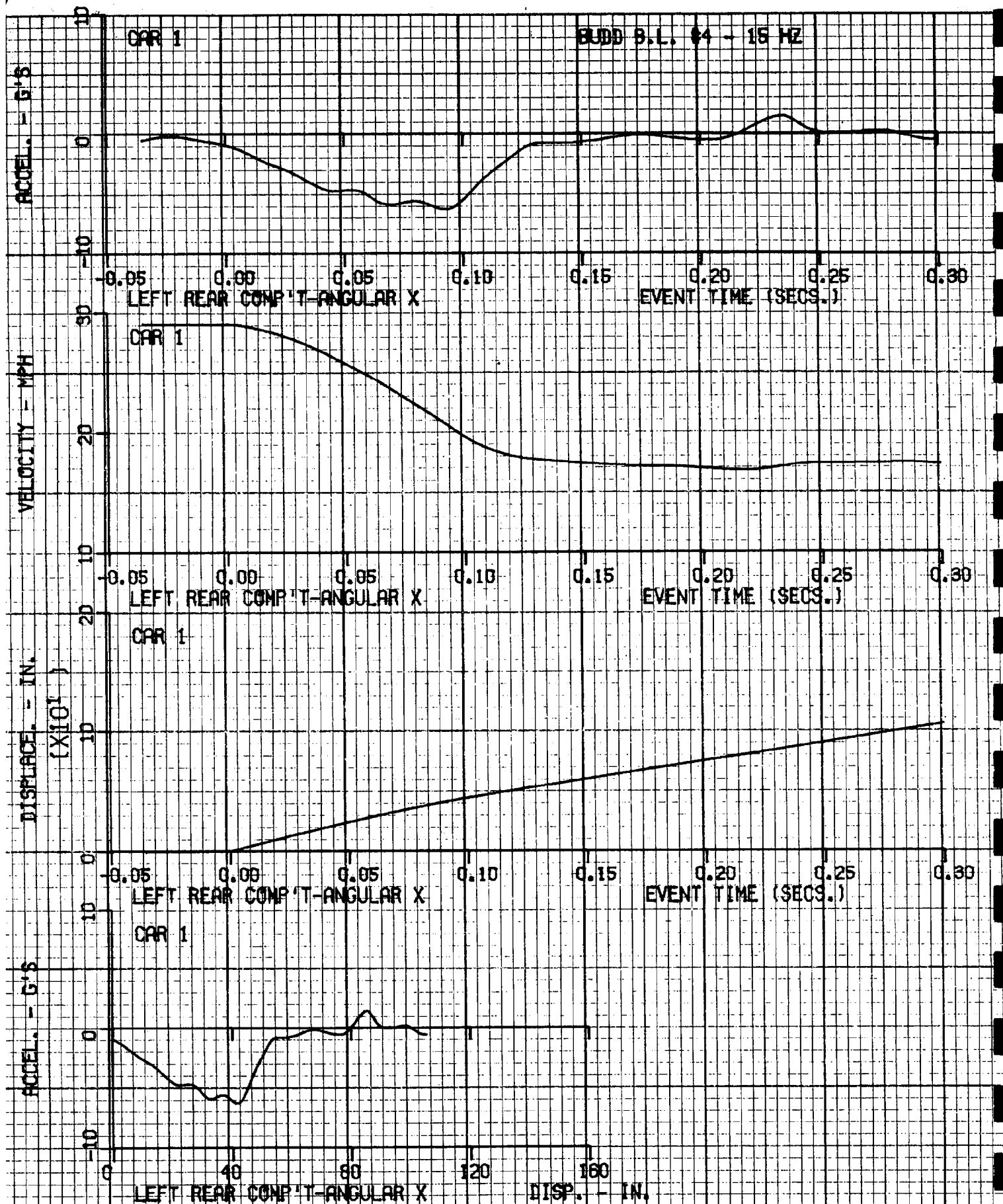




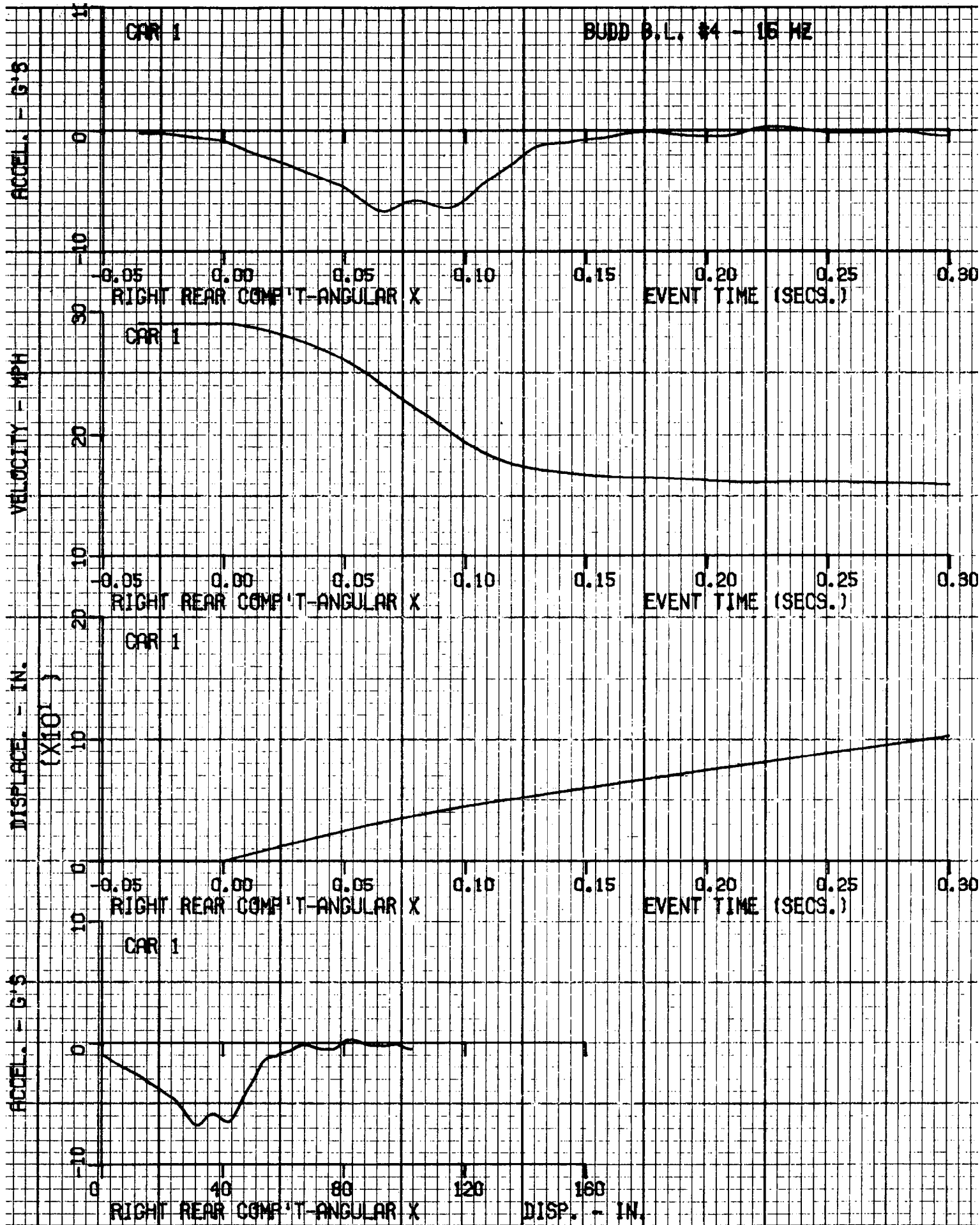


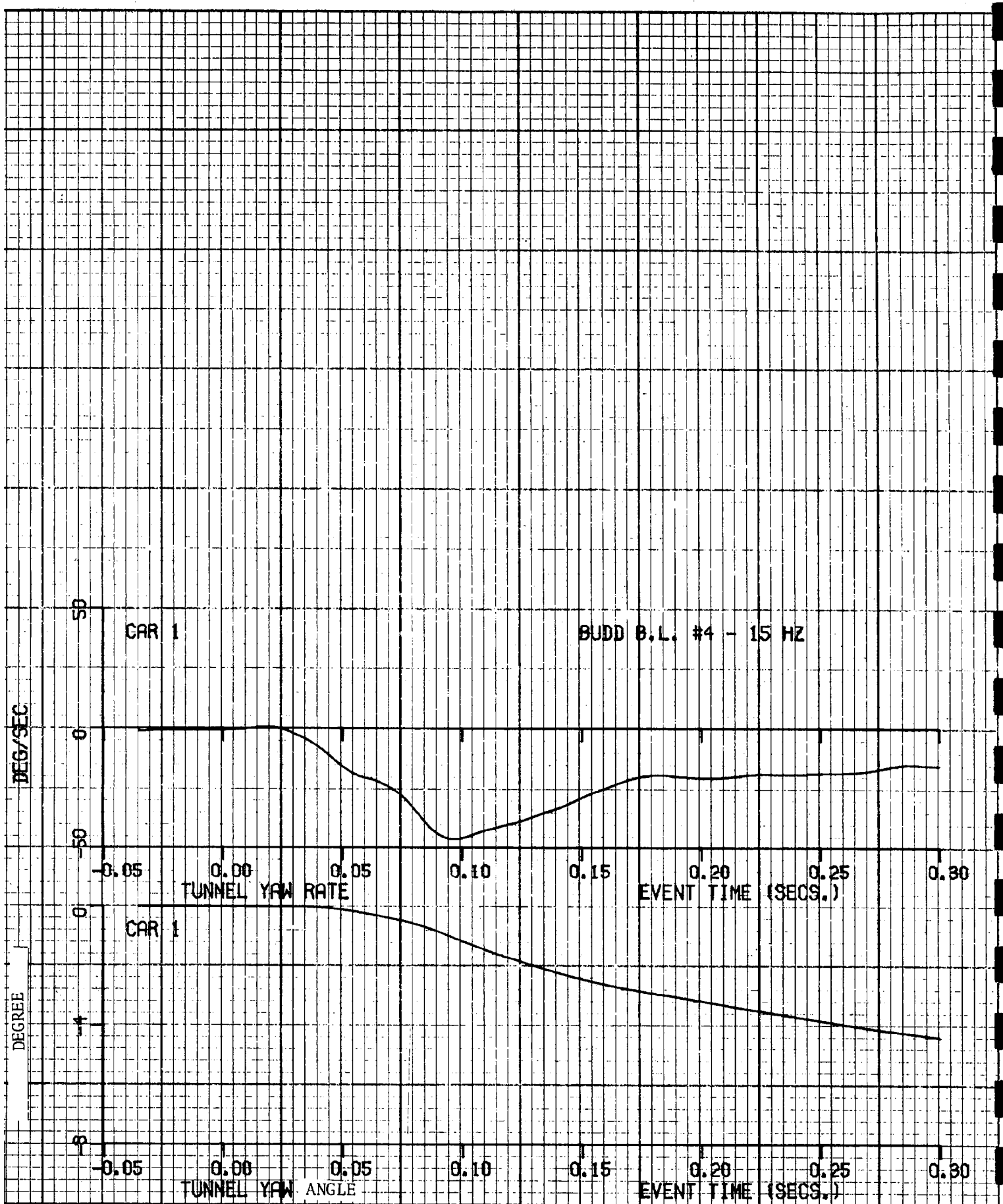












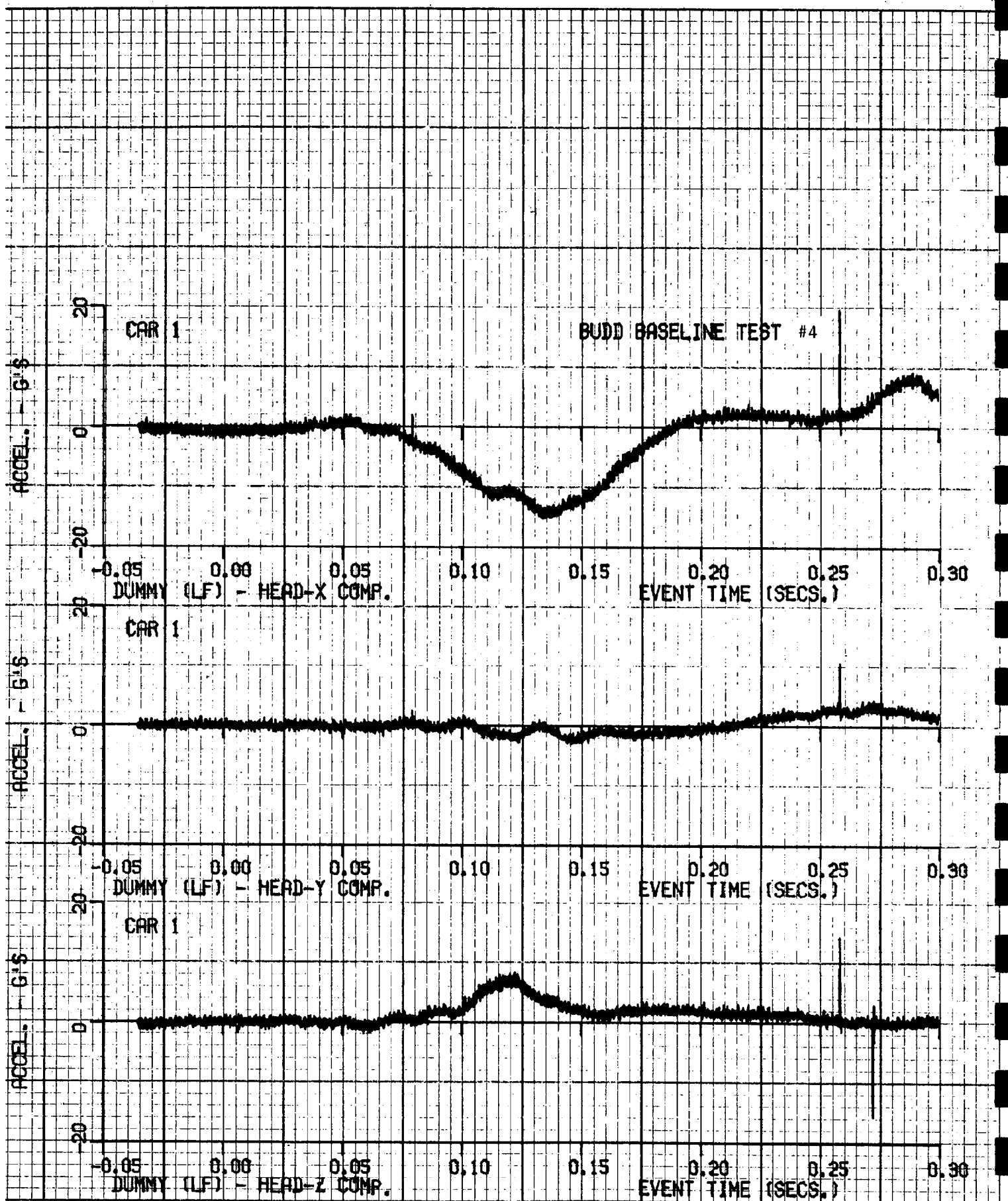
BASELINE TEST NO. 4

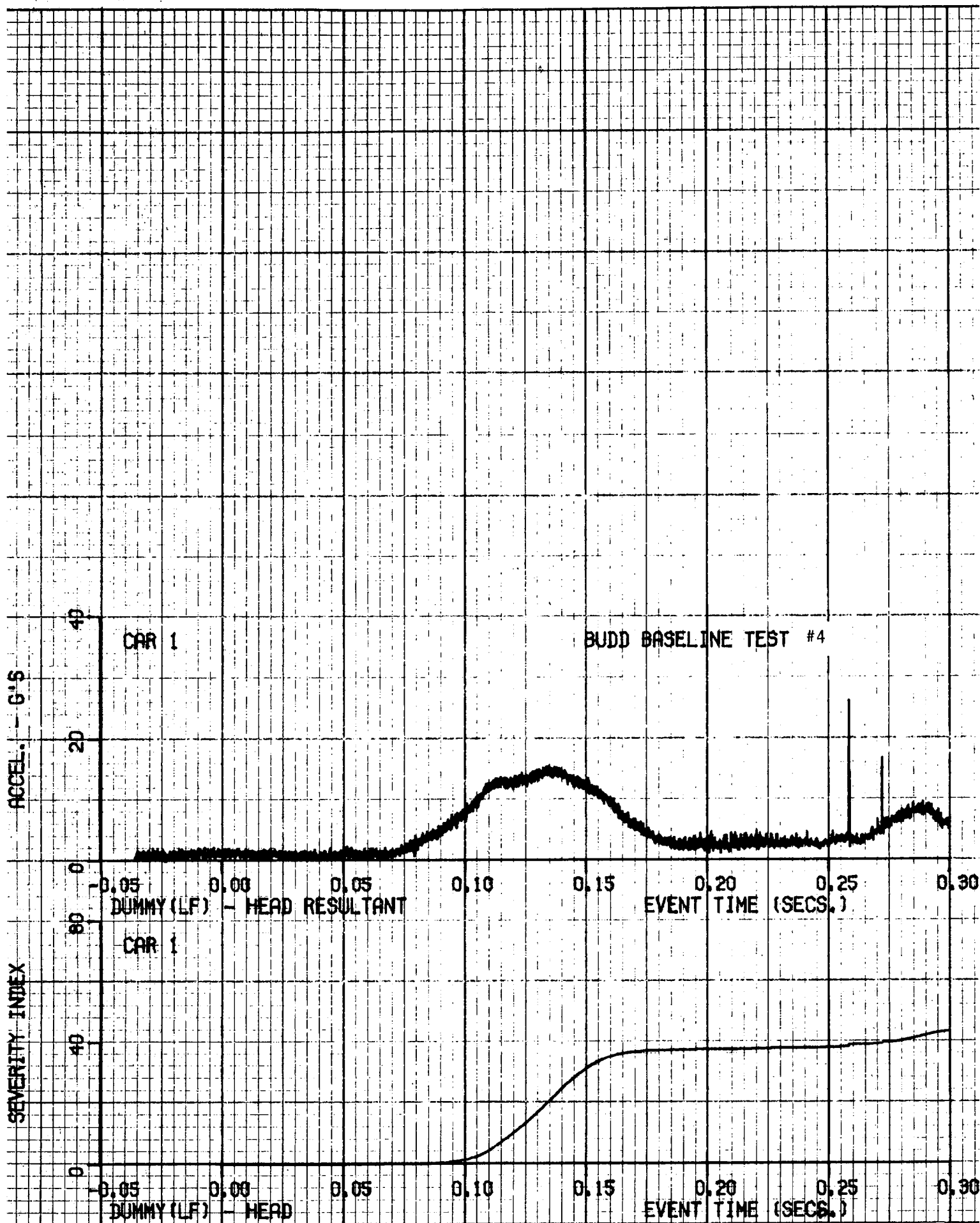
CAR 1 - 1978 CHEVROLET IMPALA

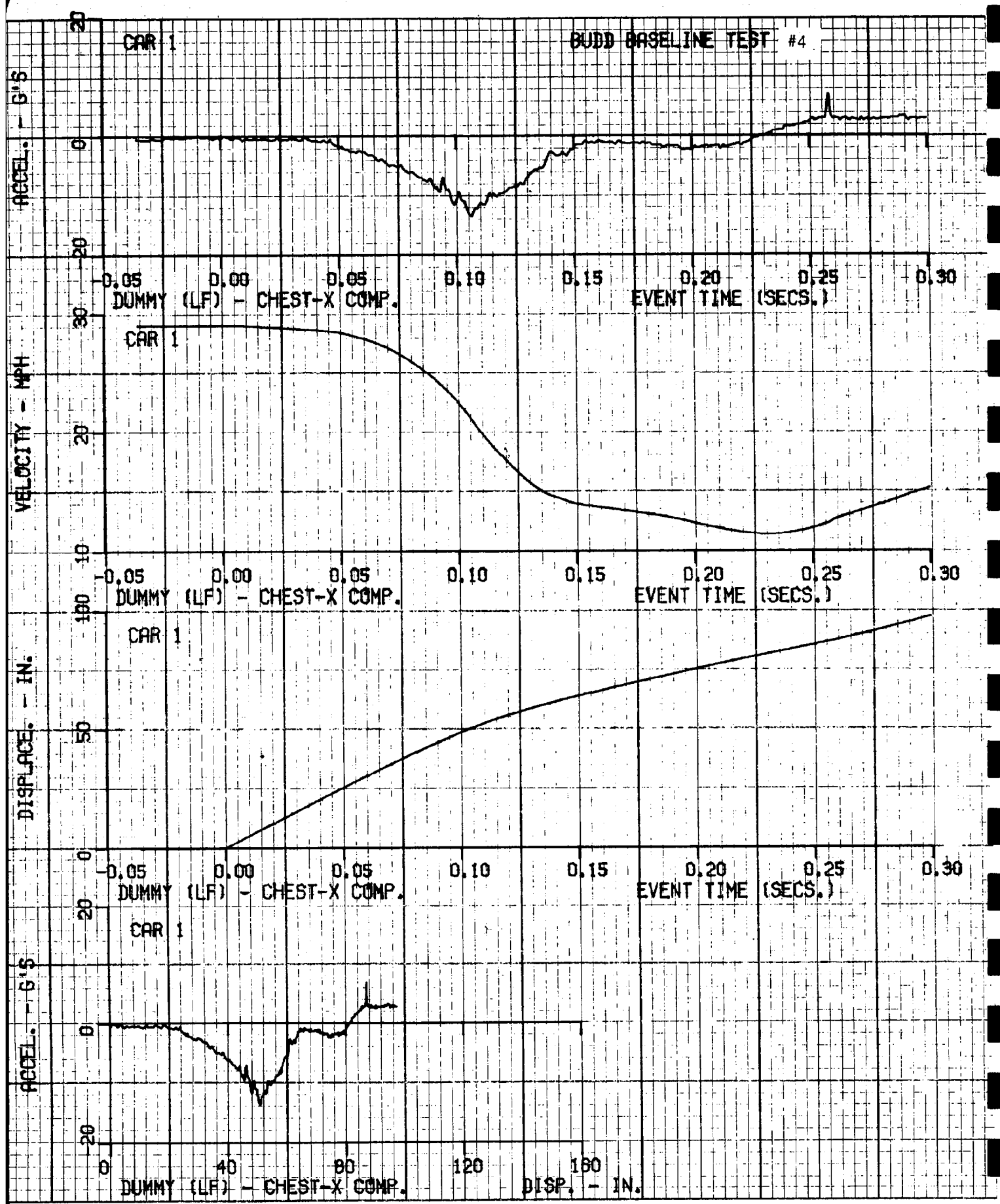
DUMMY DATA

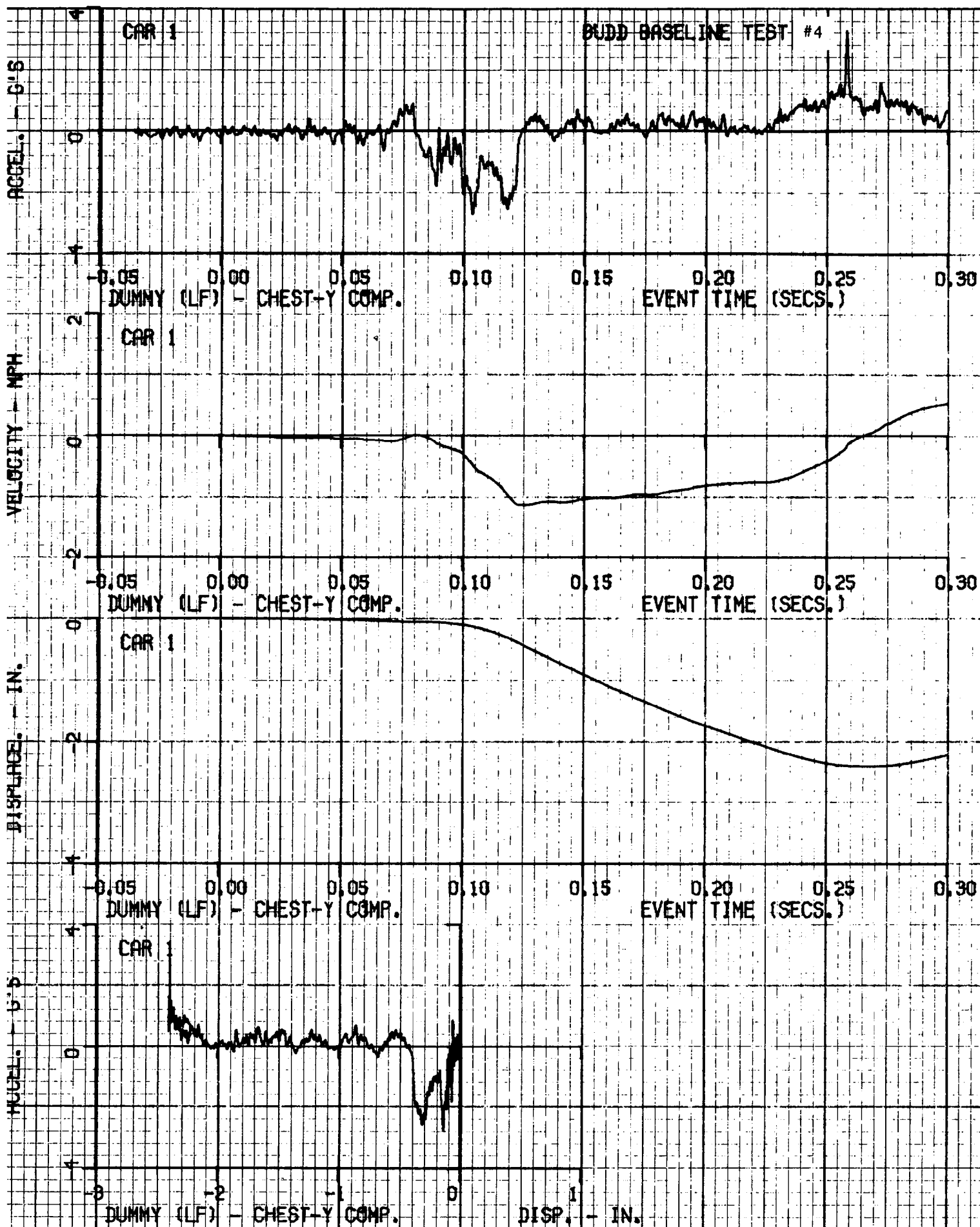
FILTER CHANNEL CLASS

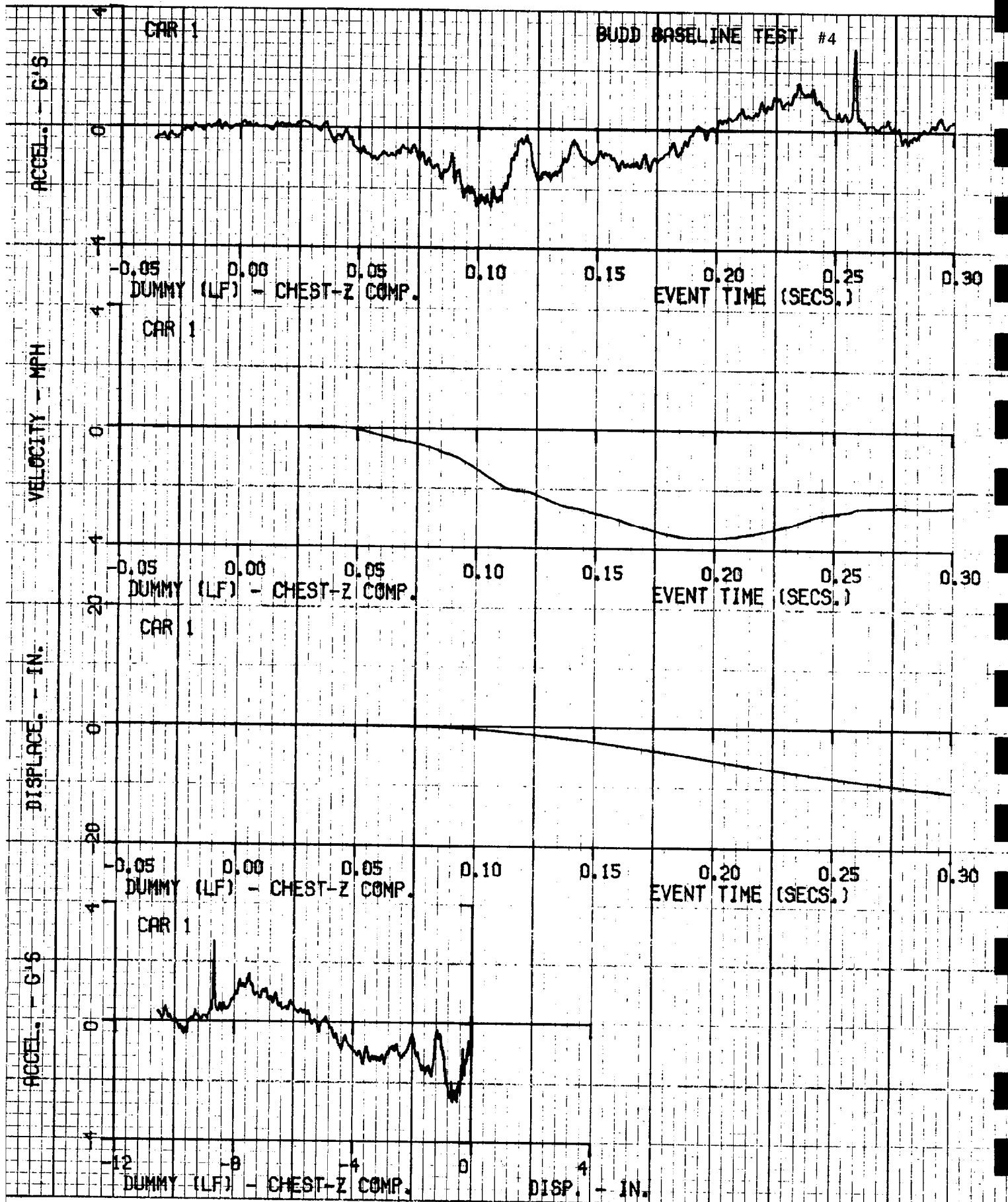
|                    |      |
|--------------------|------|
| HEAD ACCELERATION  | 1000 |
| CHEST ACCELERATION | 180  |
| FEMUR FORCES       | 600  |
| BELT LOADS         | 60   |



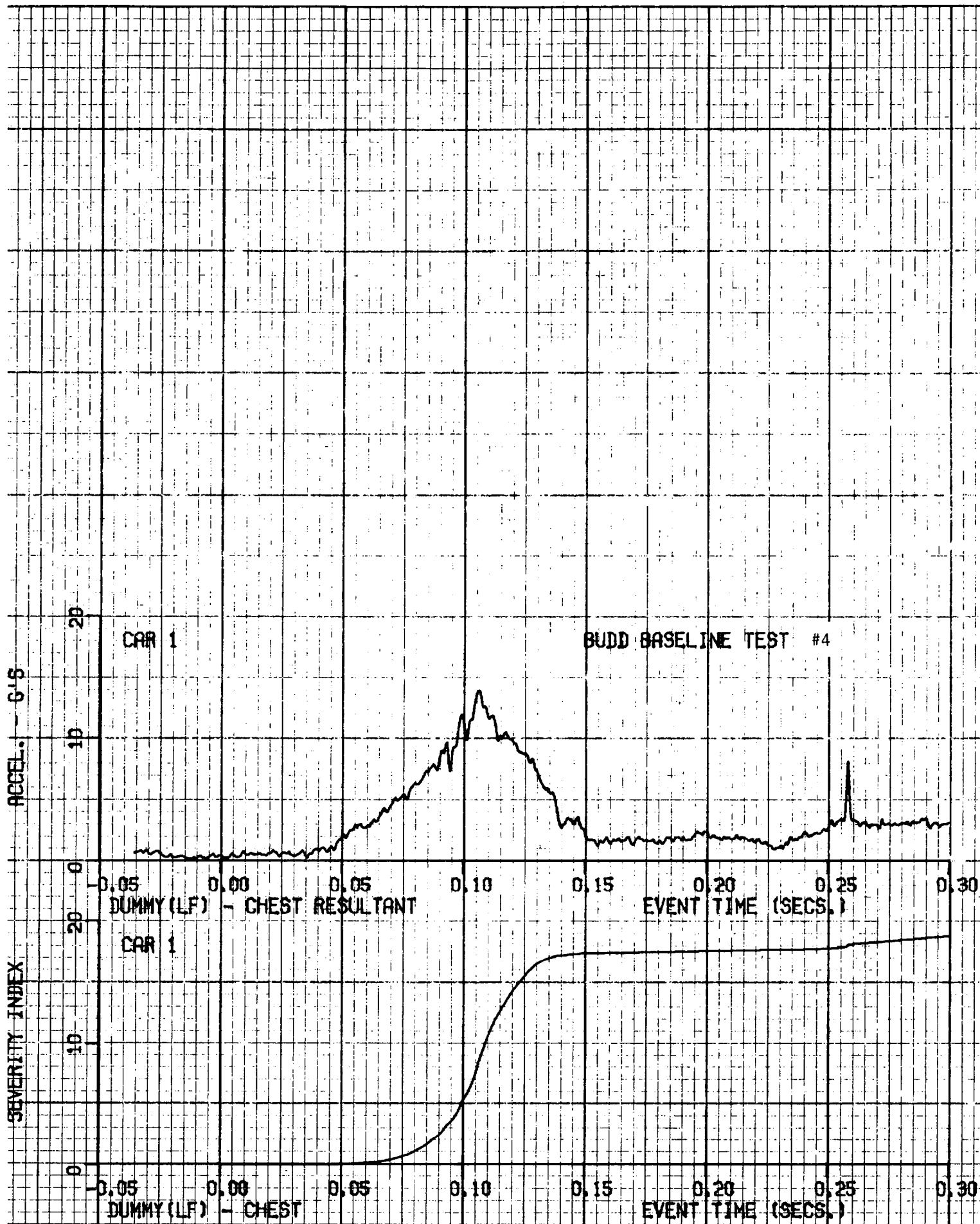


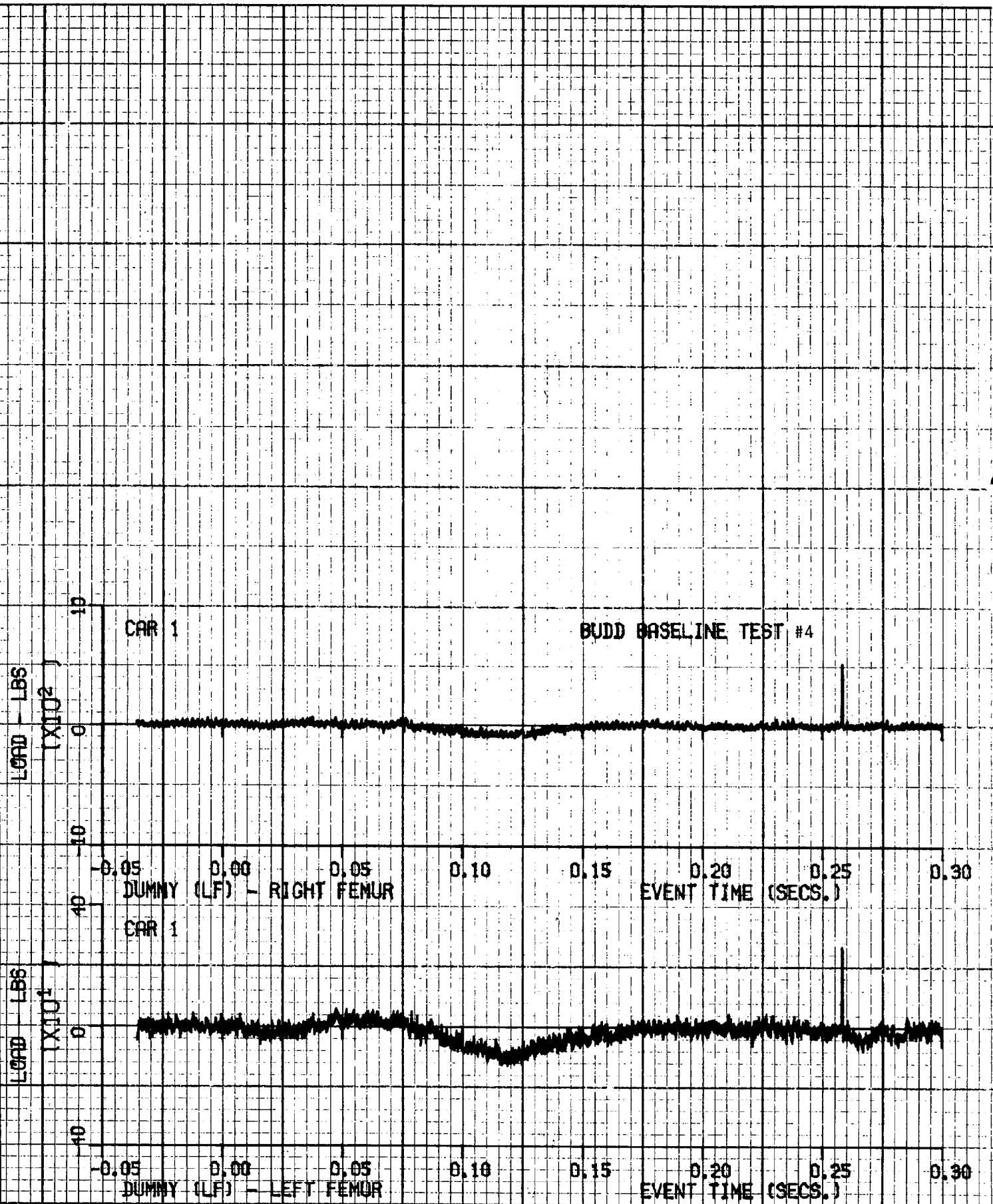


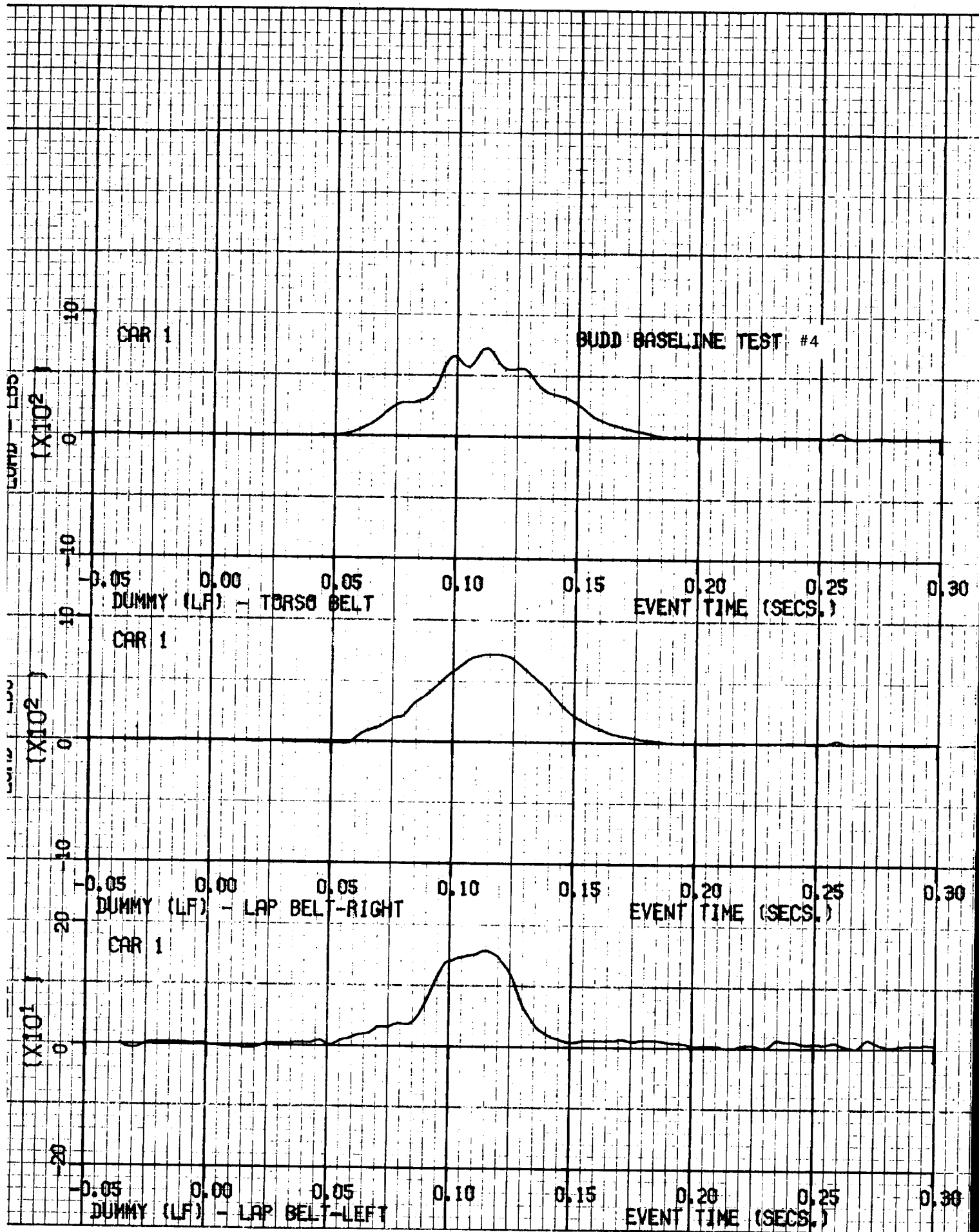












BASELINE TEST NO. 4

CAR 2 - 1976 VOLKSWAGEN RABBIT

|                     |                |
|---------------------|----------------|
| VEHICLE DATA        | 60 HZ FILTER   |
| STRAIN GAGE DATA    | 60 HZ FILTER   |
| SIDE INTRUSION DATA | 1000 HZ FILTER |

CAR 2

BUDD BASELINE TEST #4

RIGHT FRONT COMPARTMENT X

EVENT TIME (SECS.)

CAR 2

RIGHT FRONT COMPARTMENT X

EVENT TIME (SECS.)

CAR 2

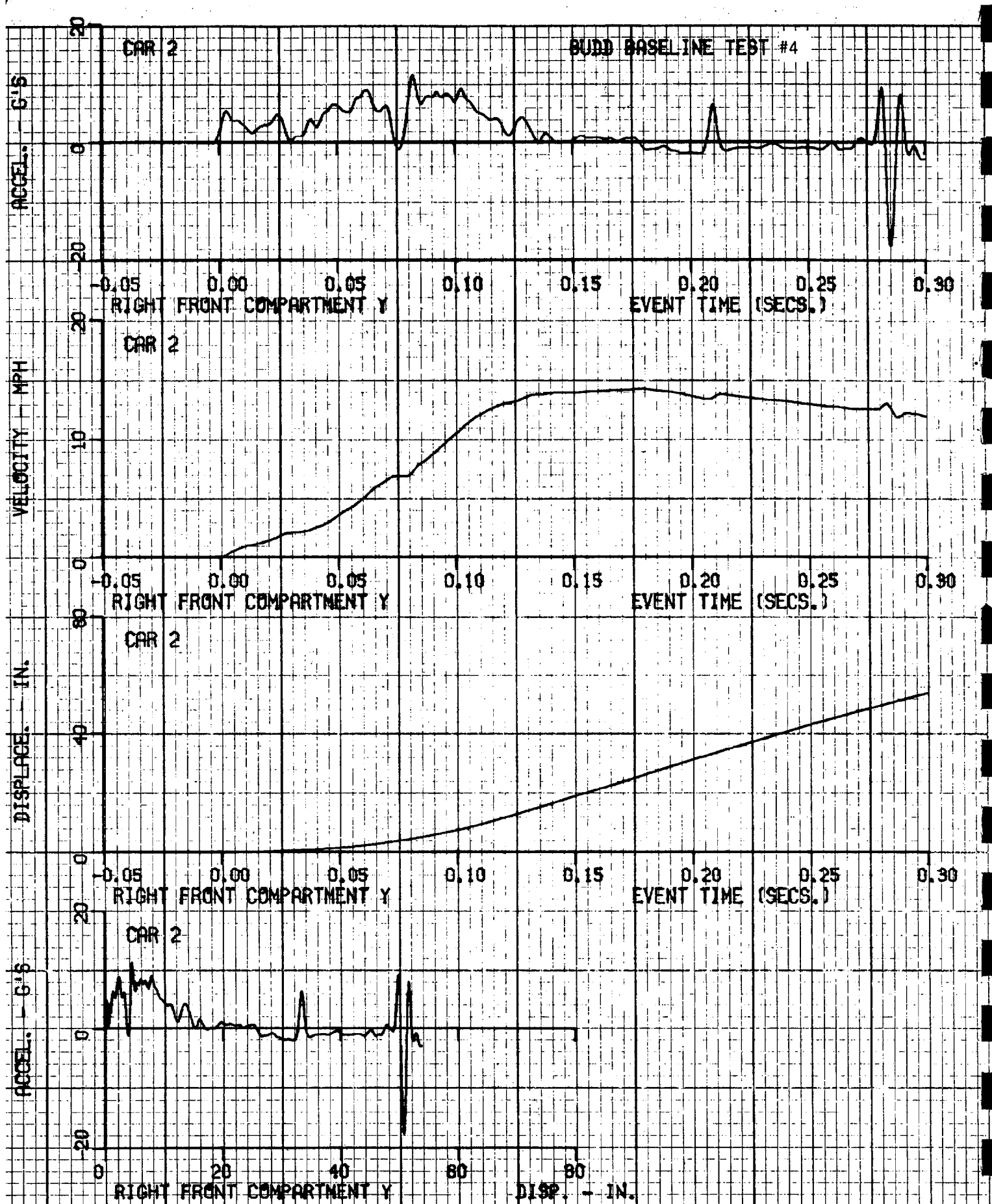
RIGHT FRONT COMPARTMENT X

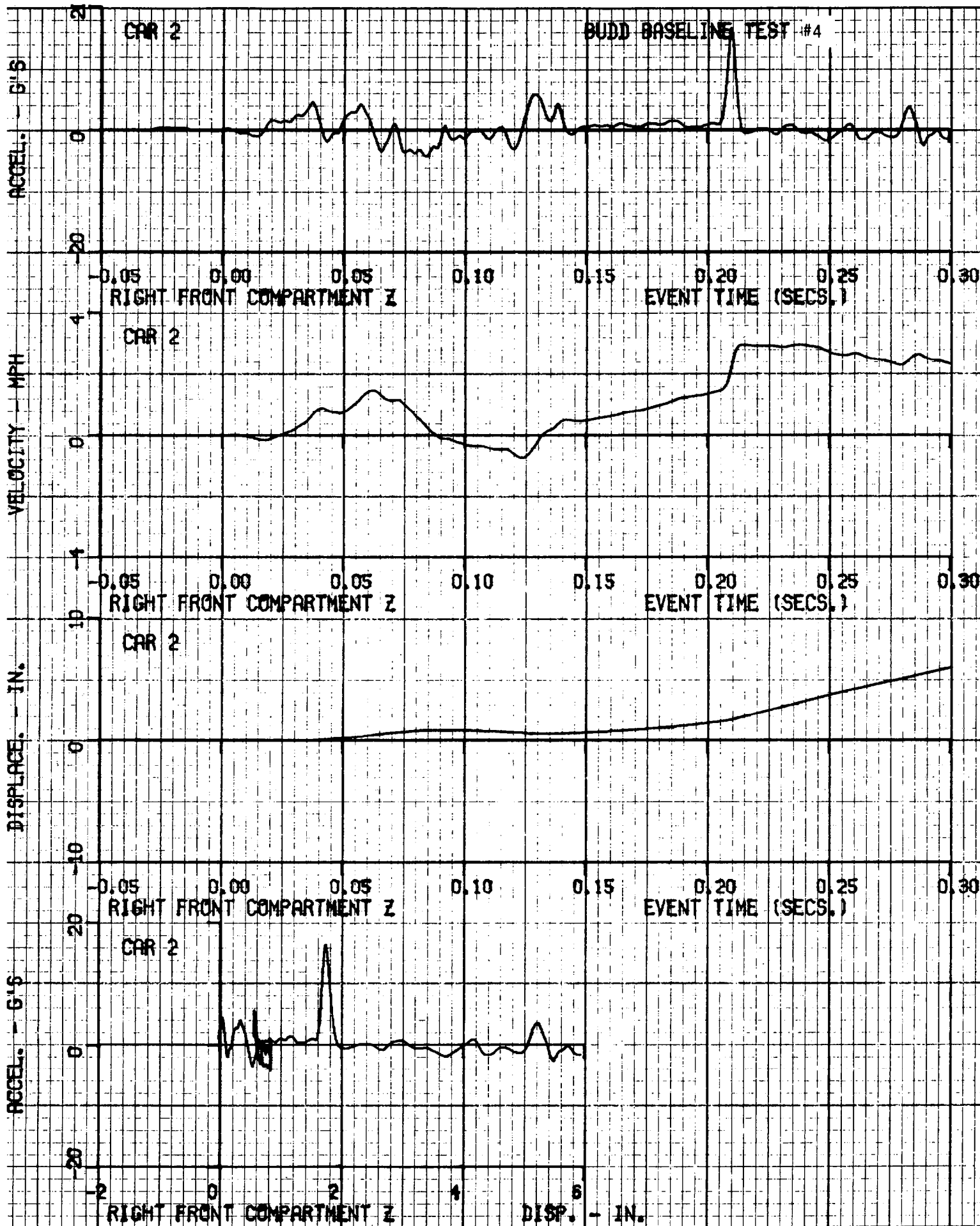
EVENT TIME (SECS.)

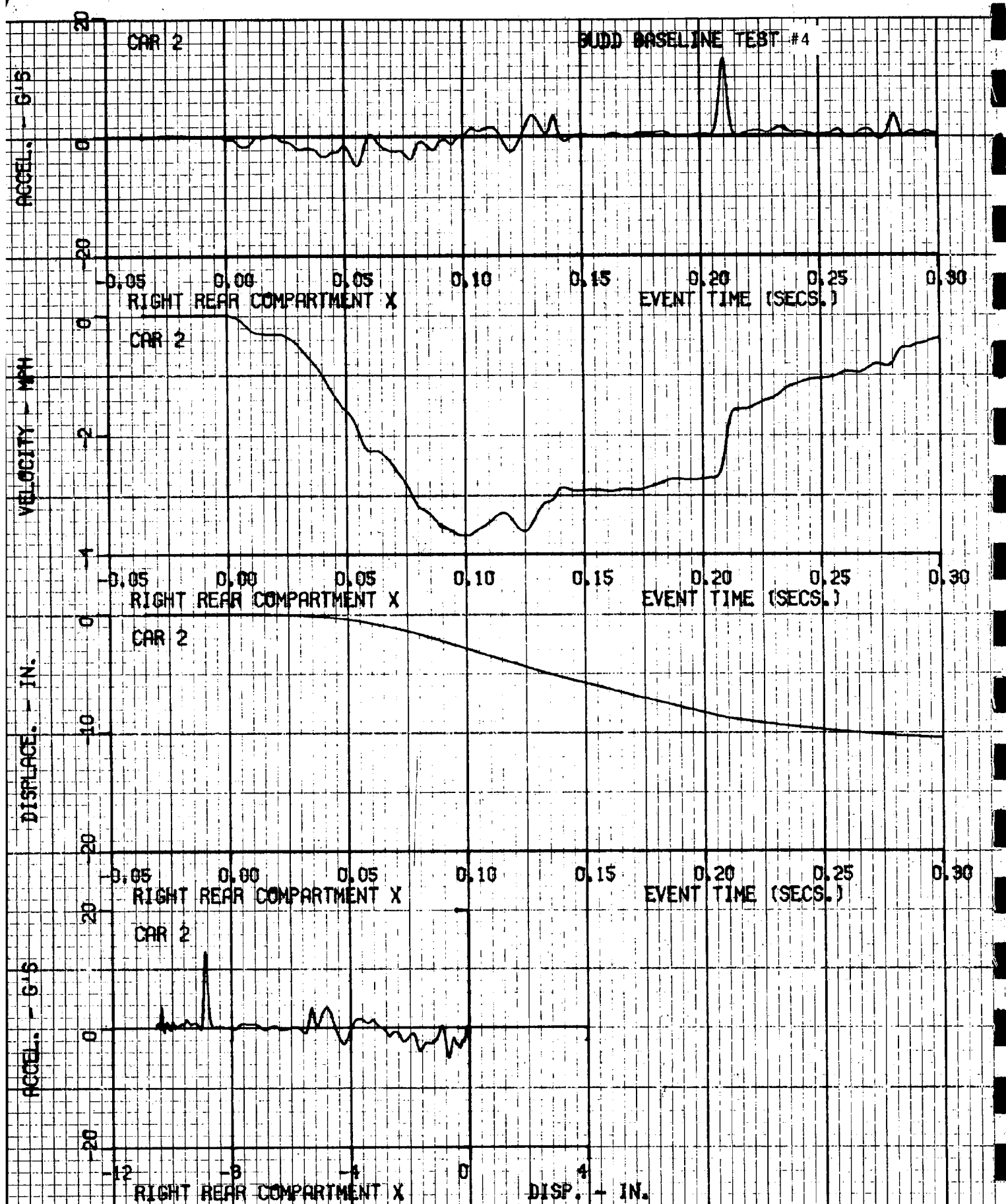
CAR 2

RIGHT FRONT COMPARTMENT X

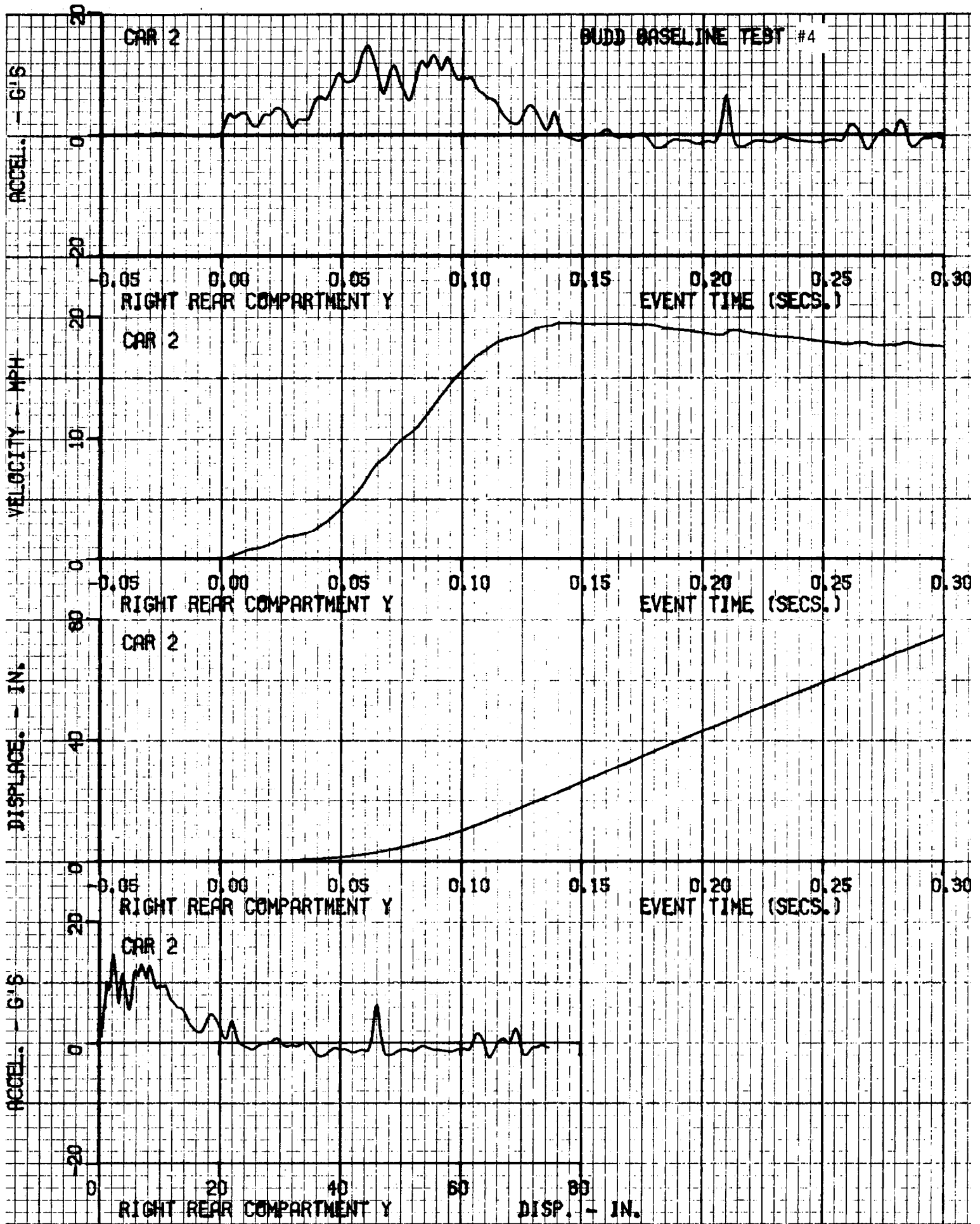
DISP. - IN.

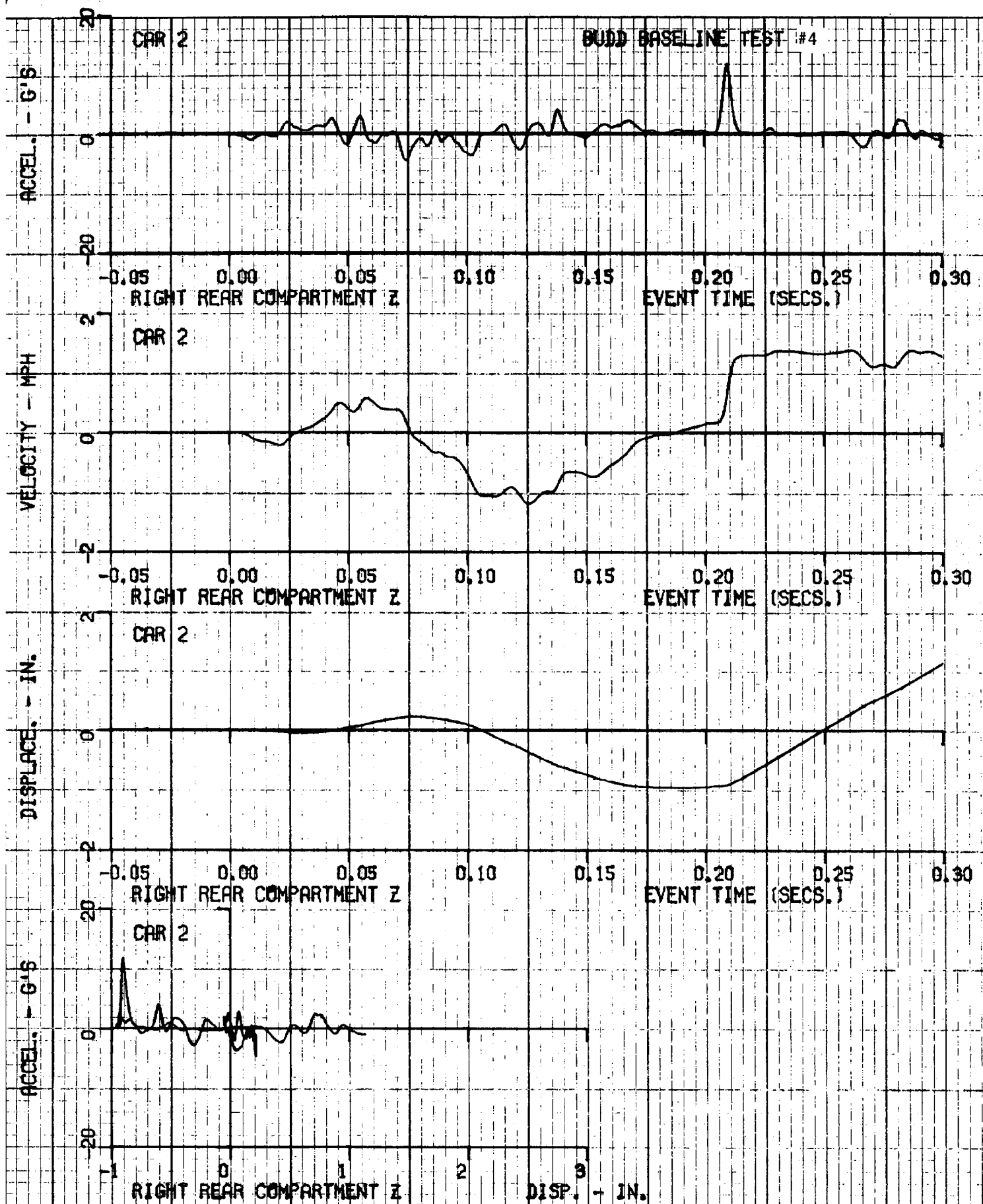




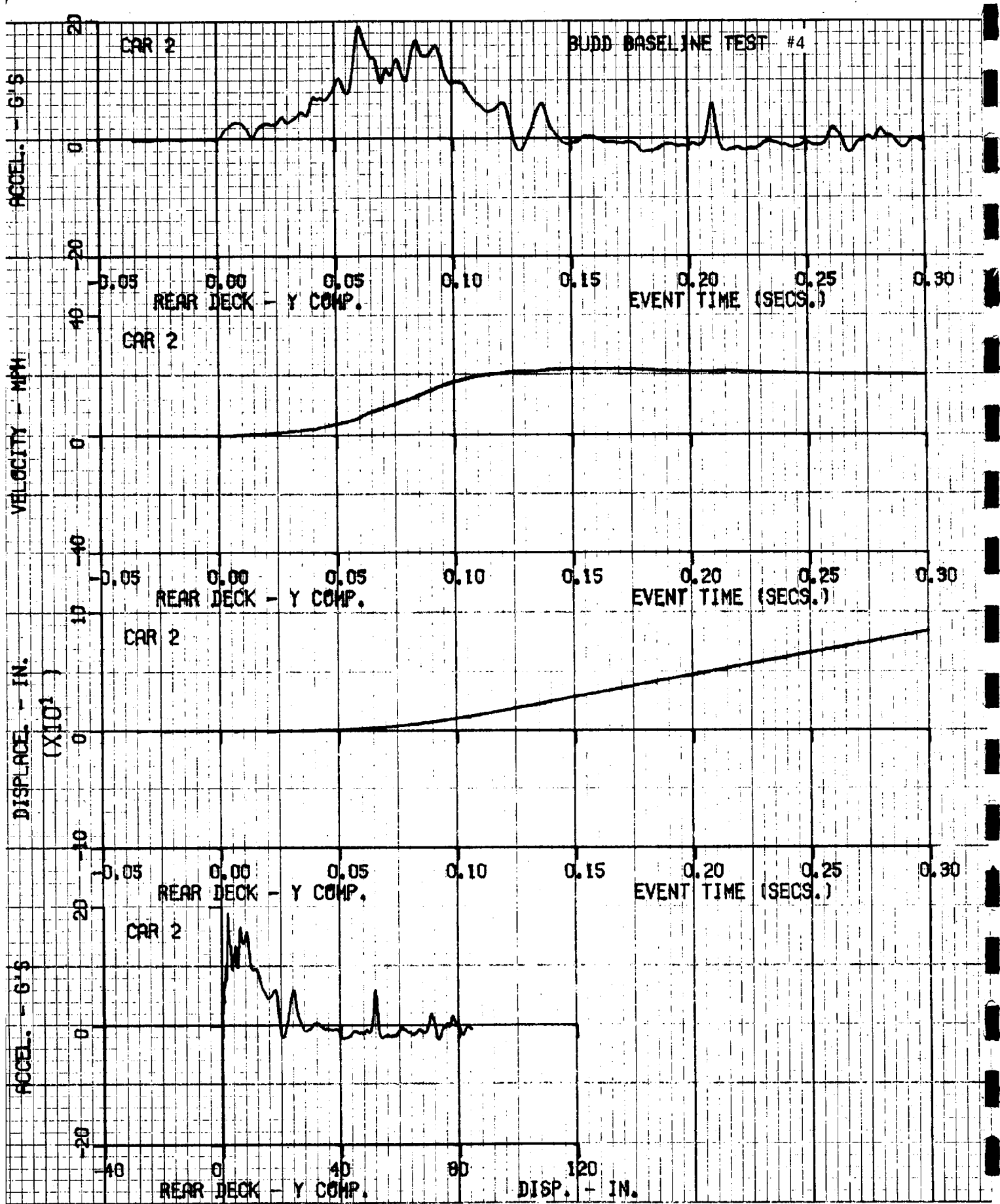




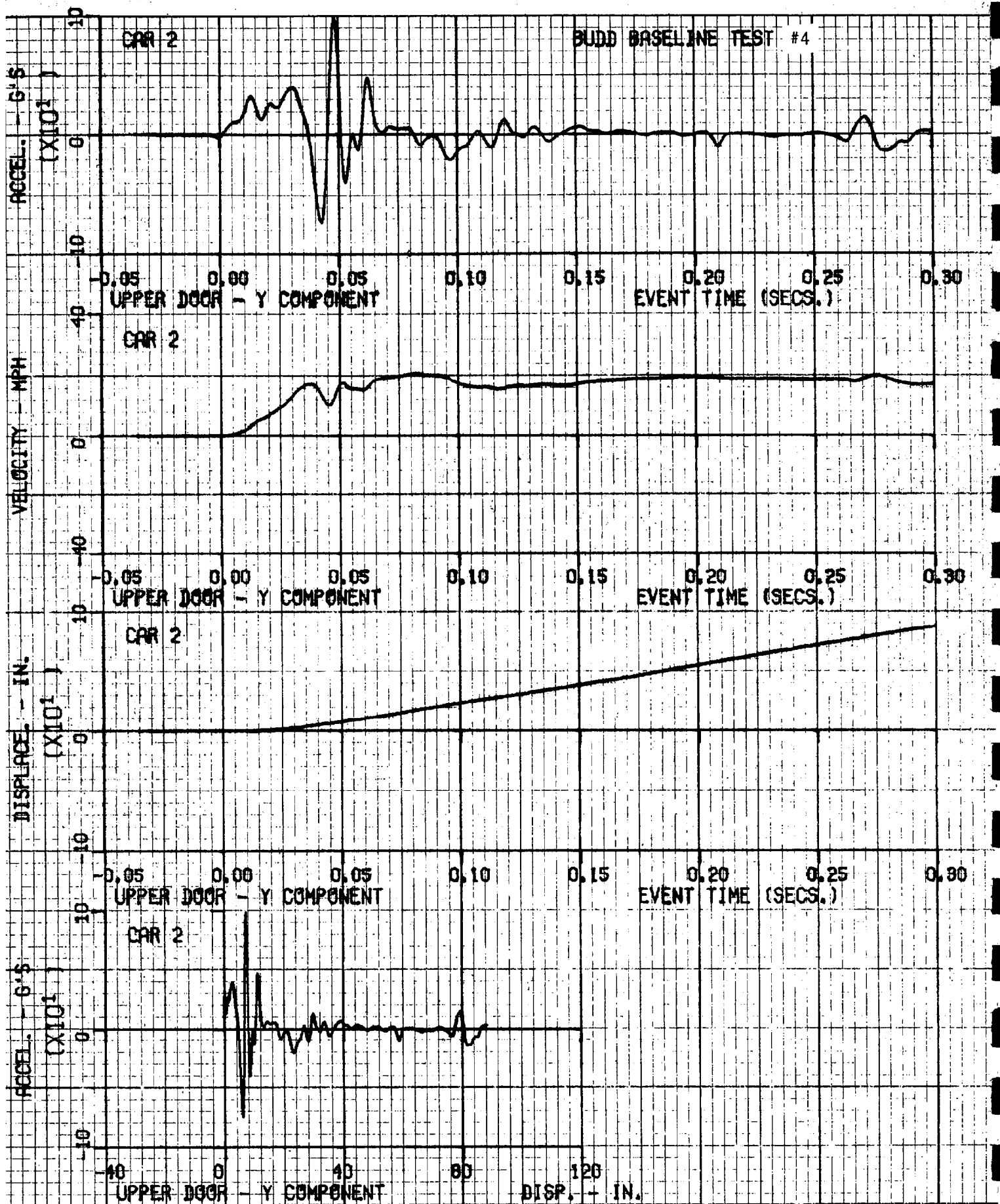


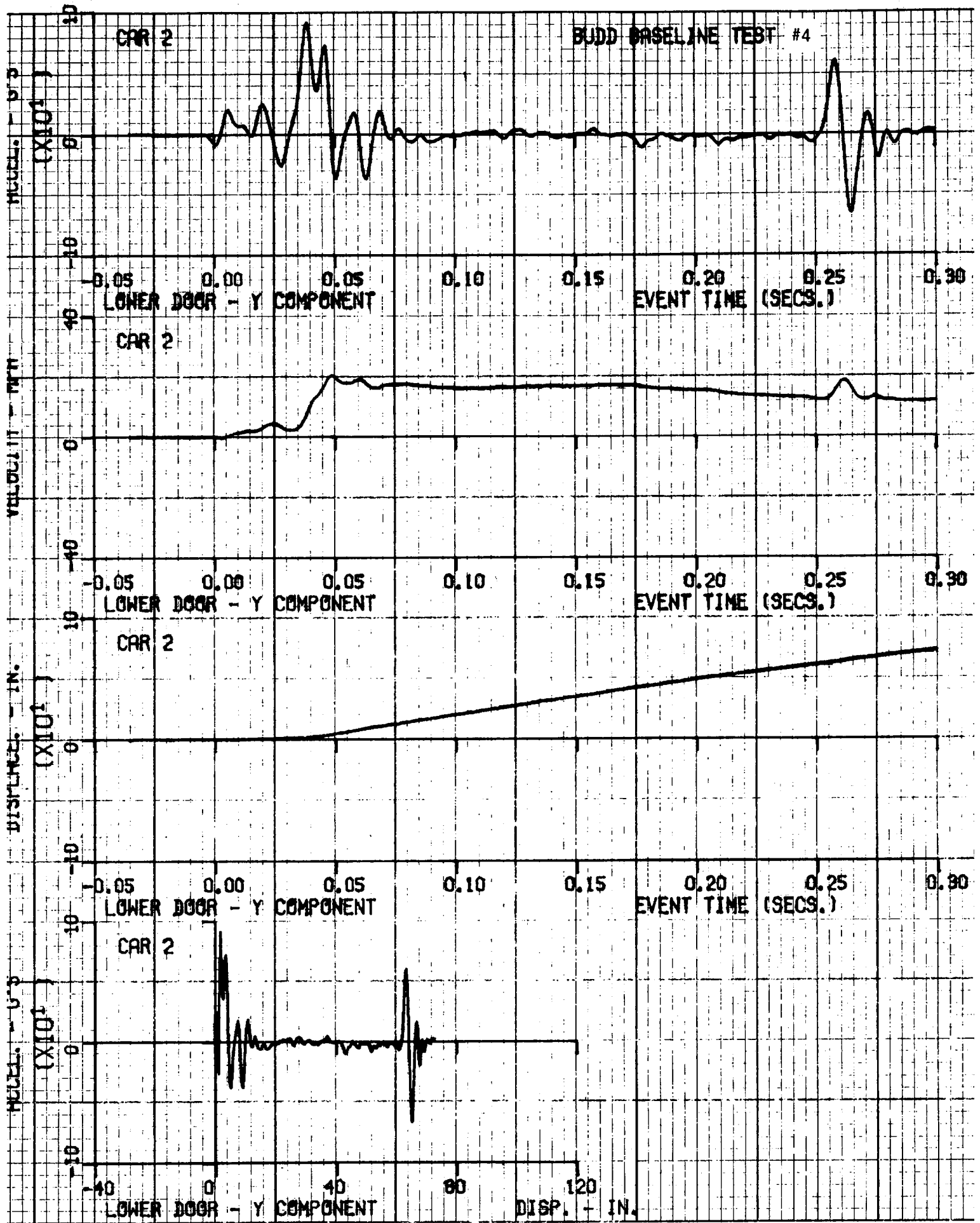


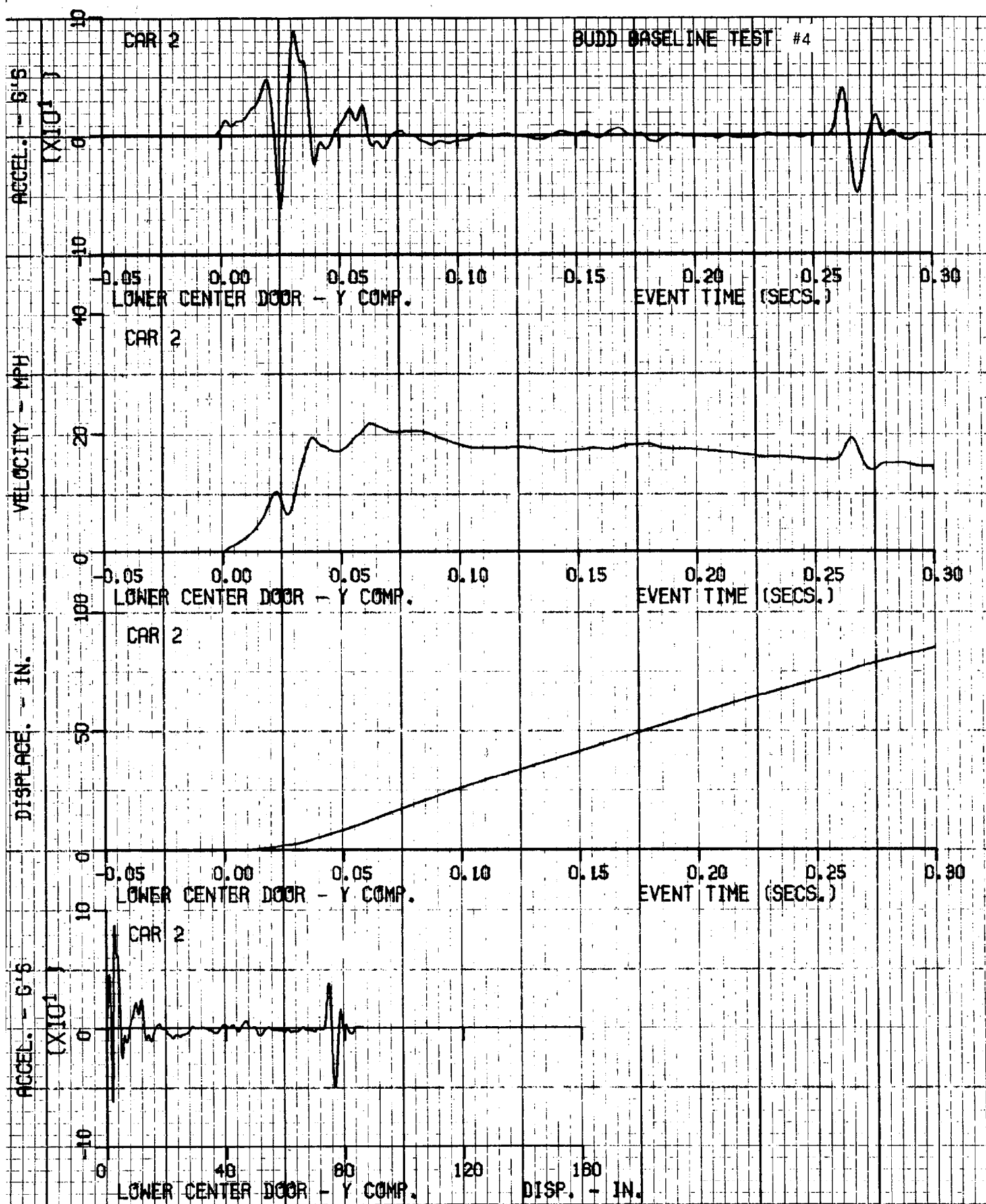




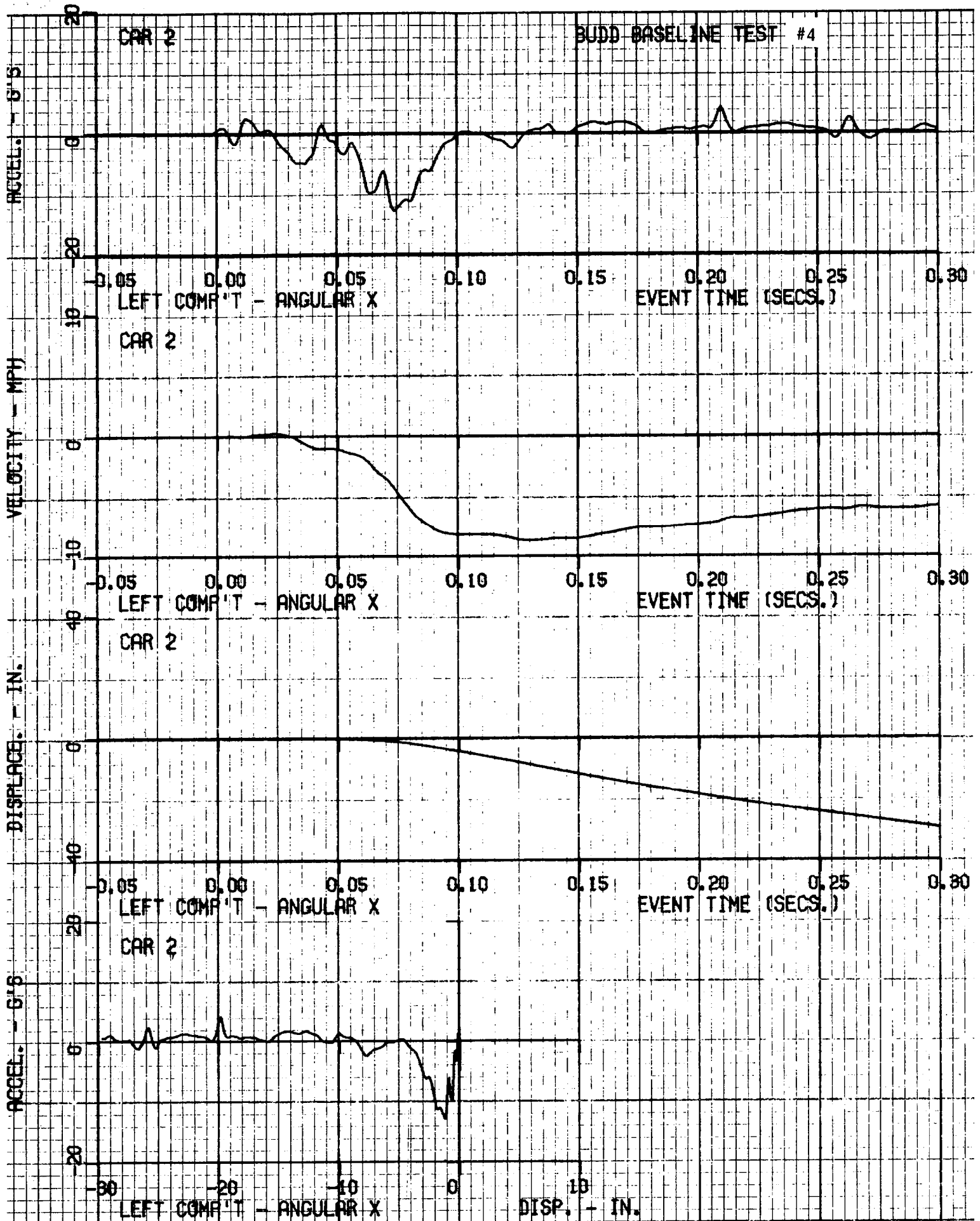


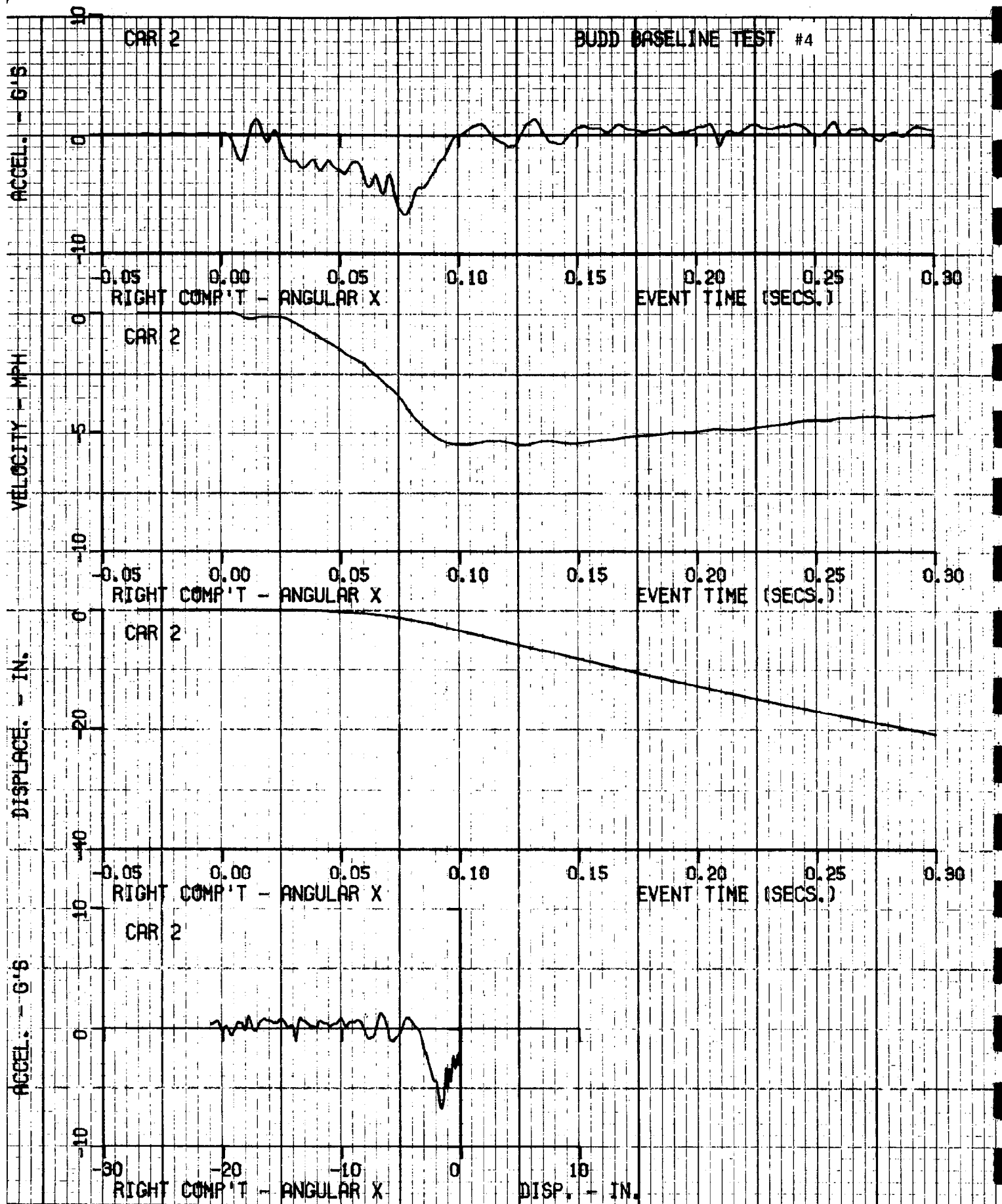


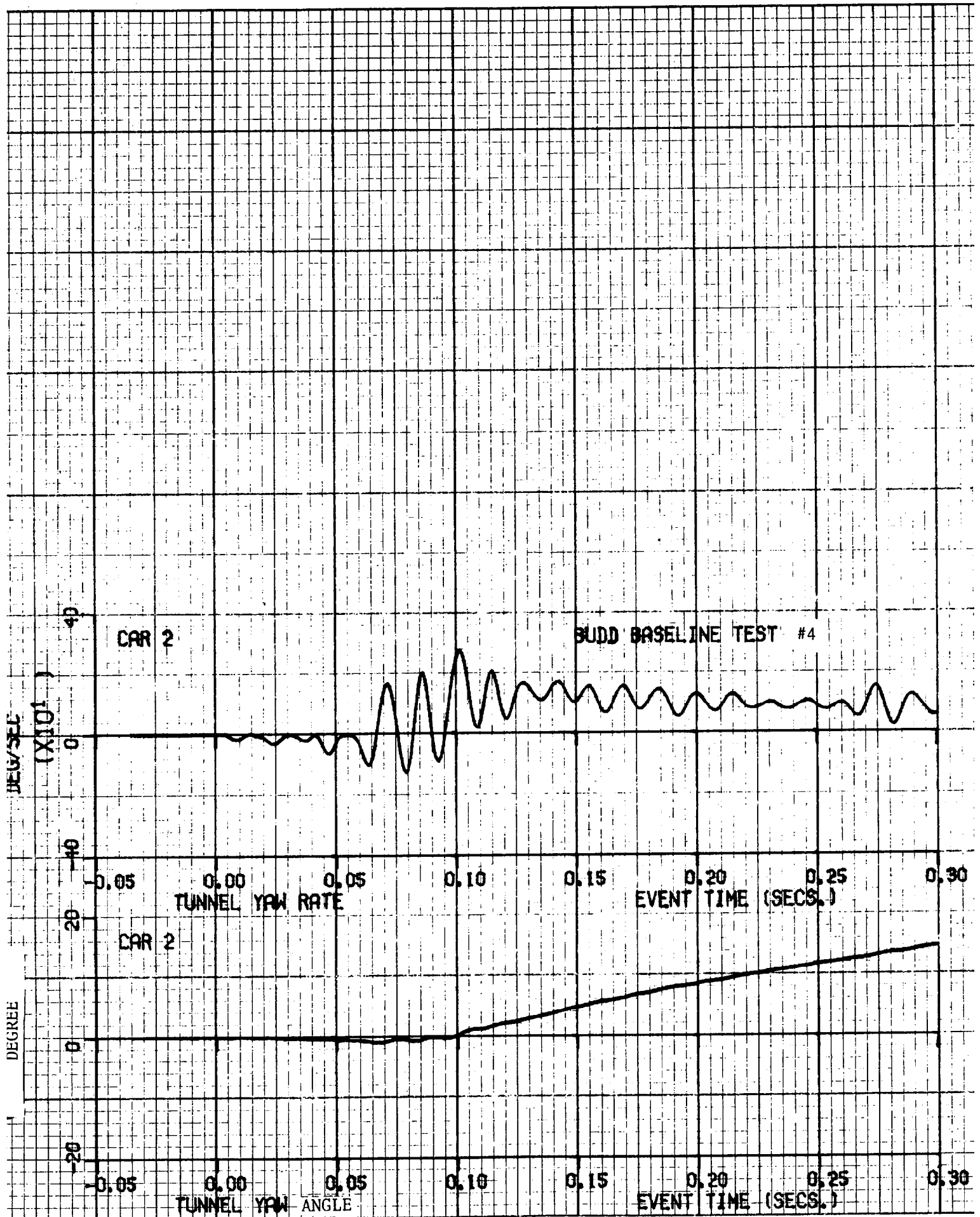


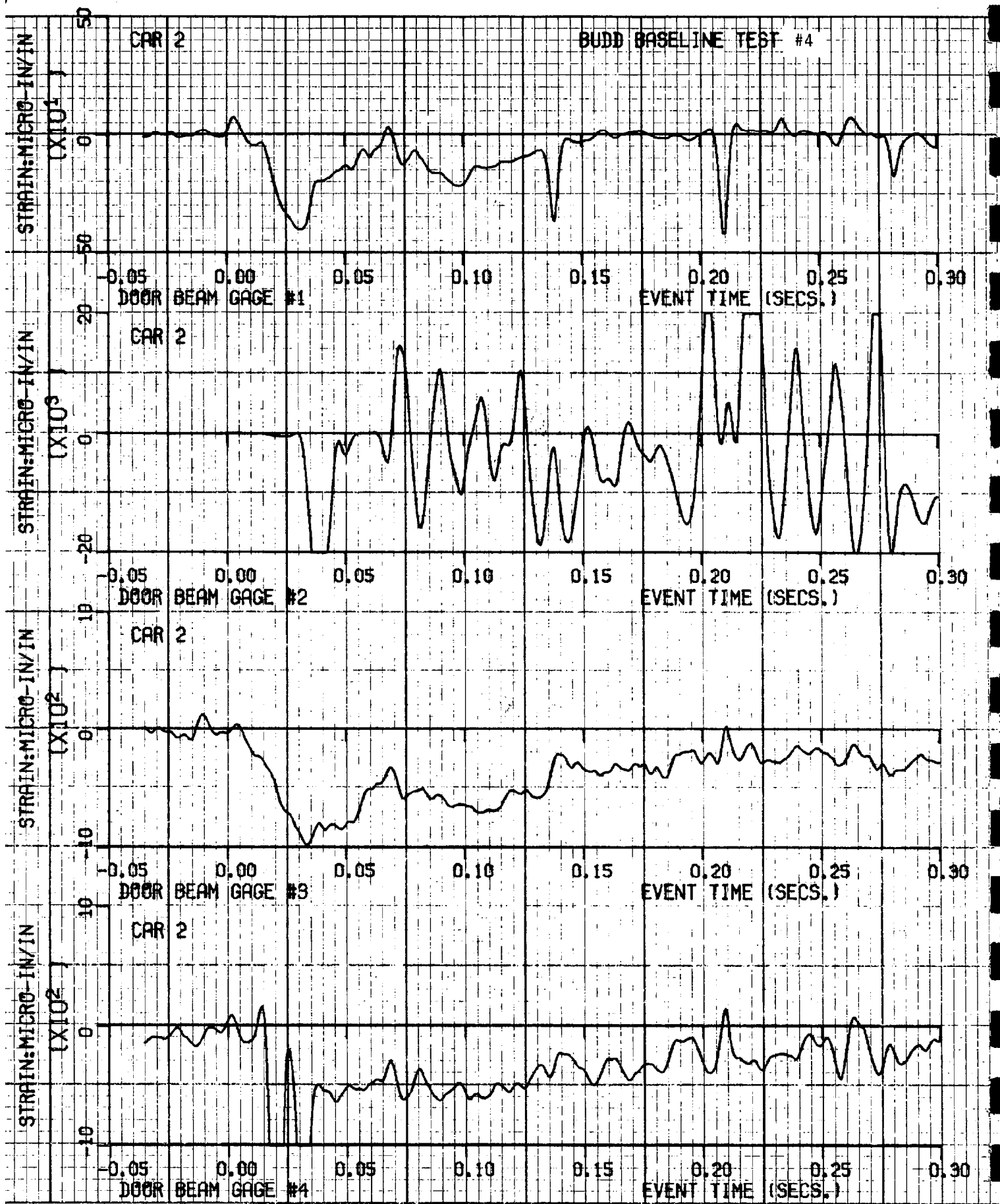


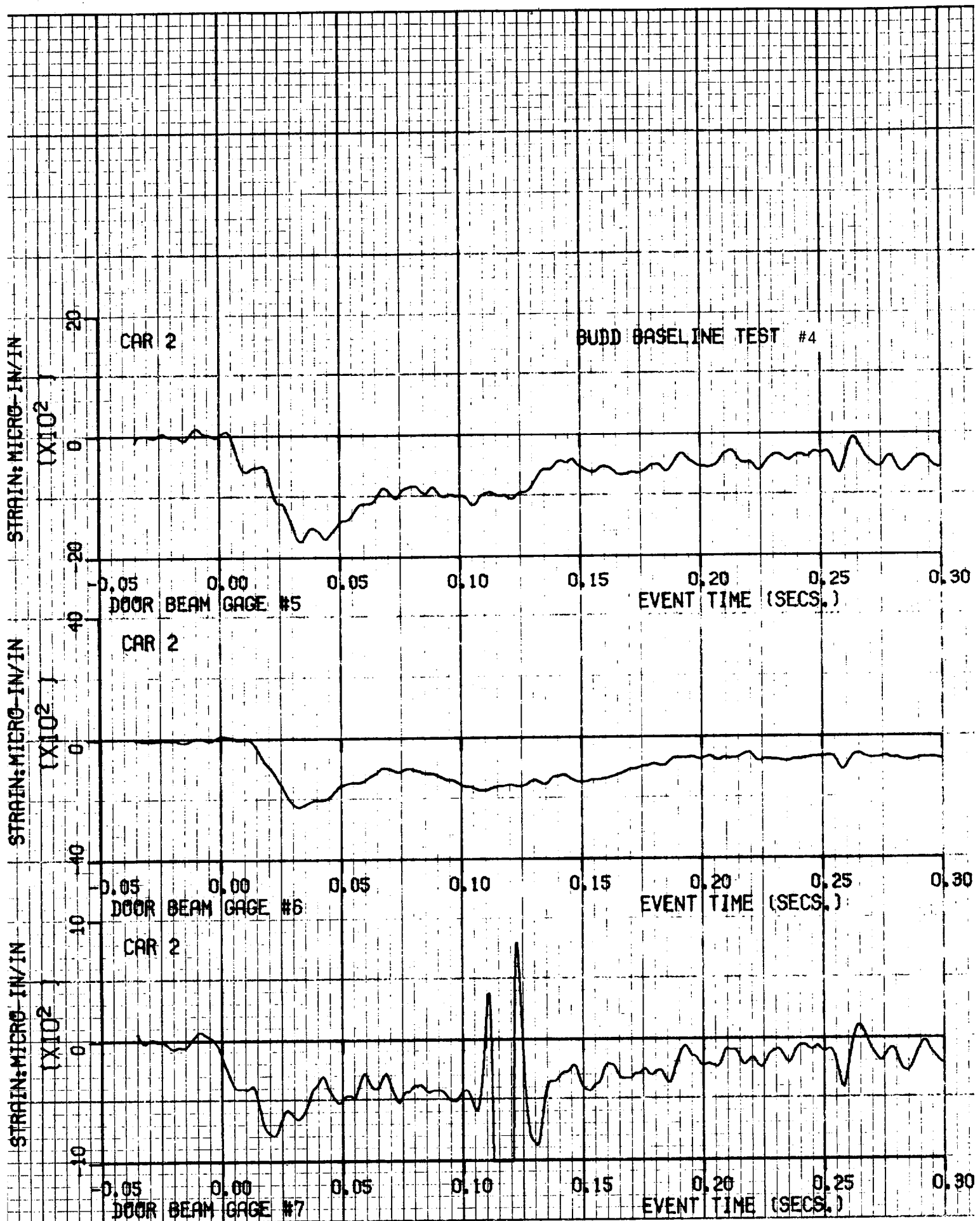




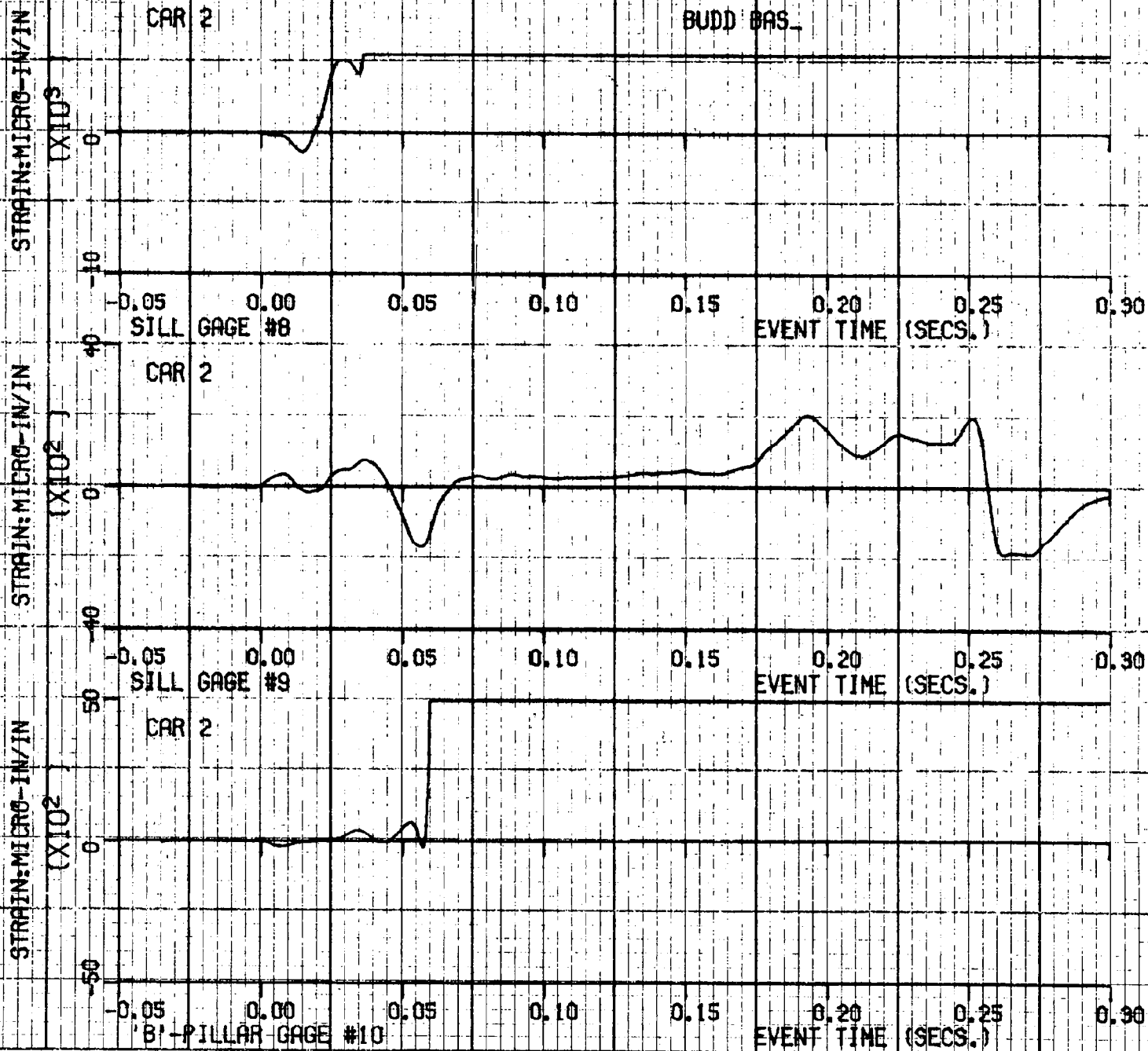


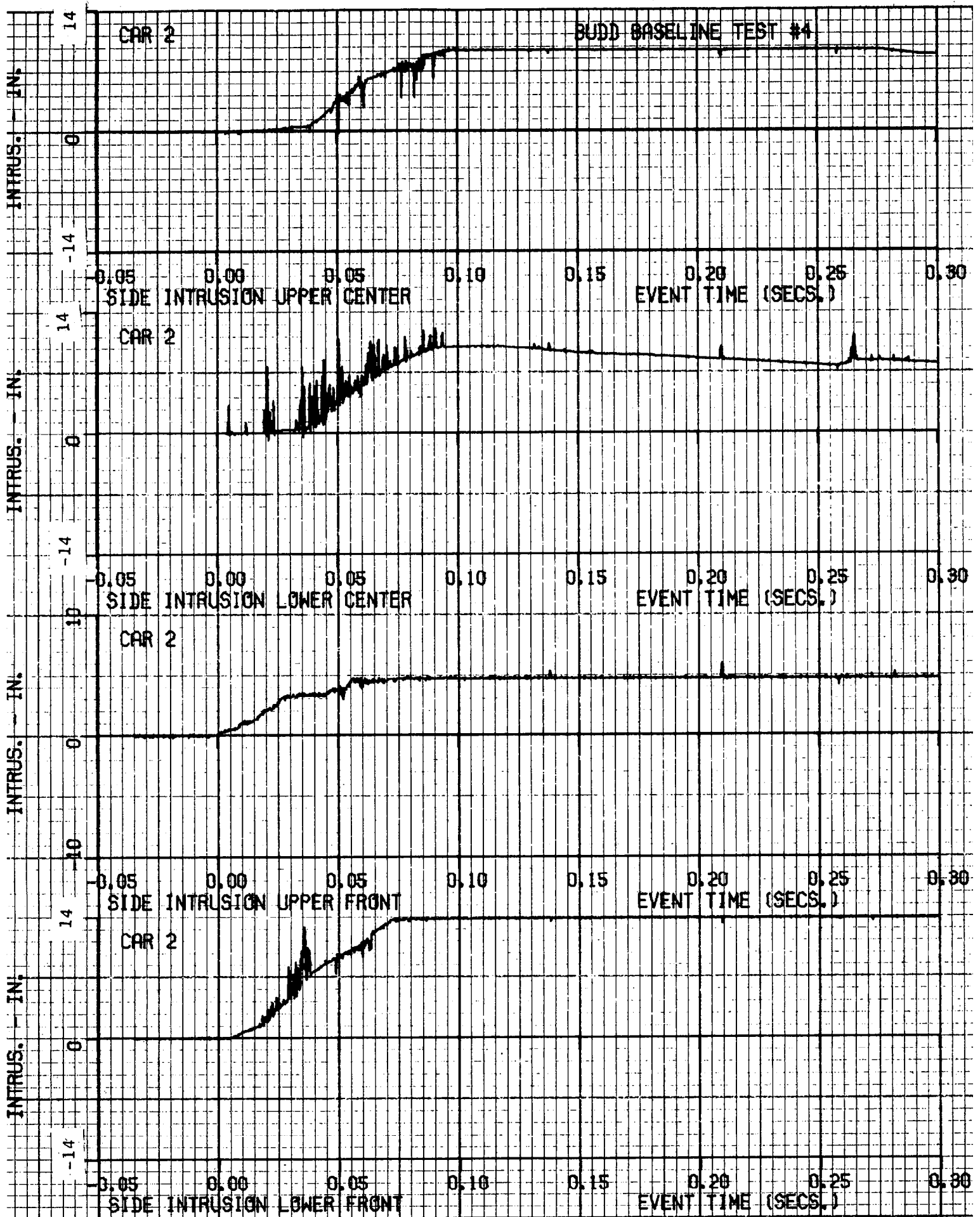


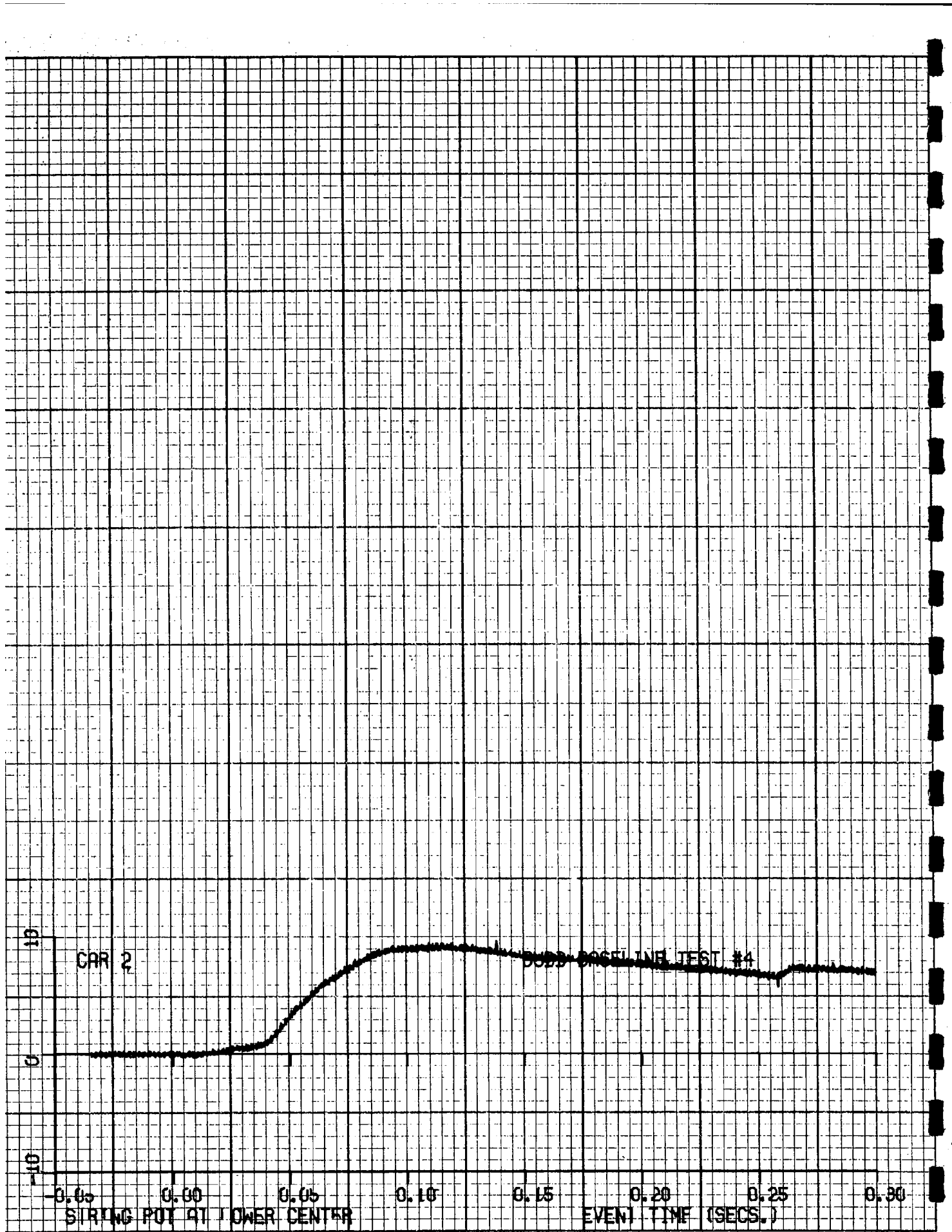




# BUDD BASELINE TEST #4







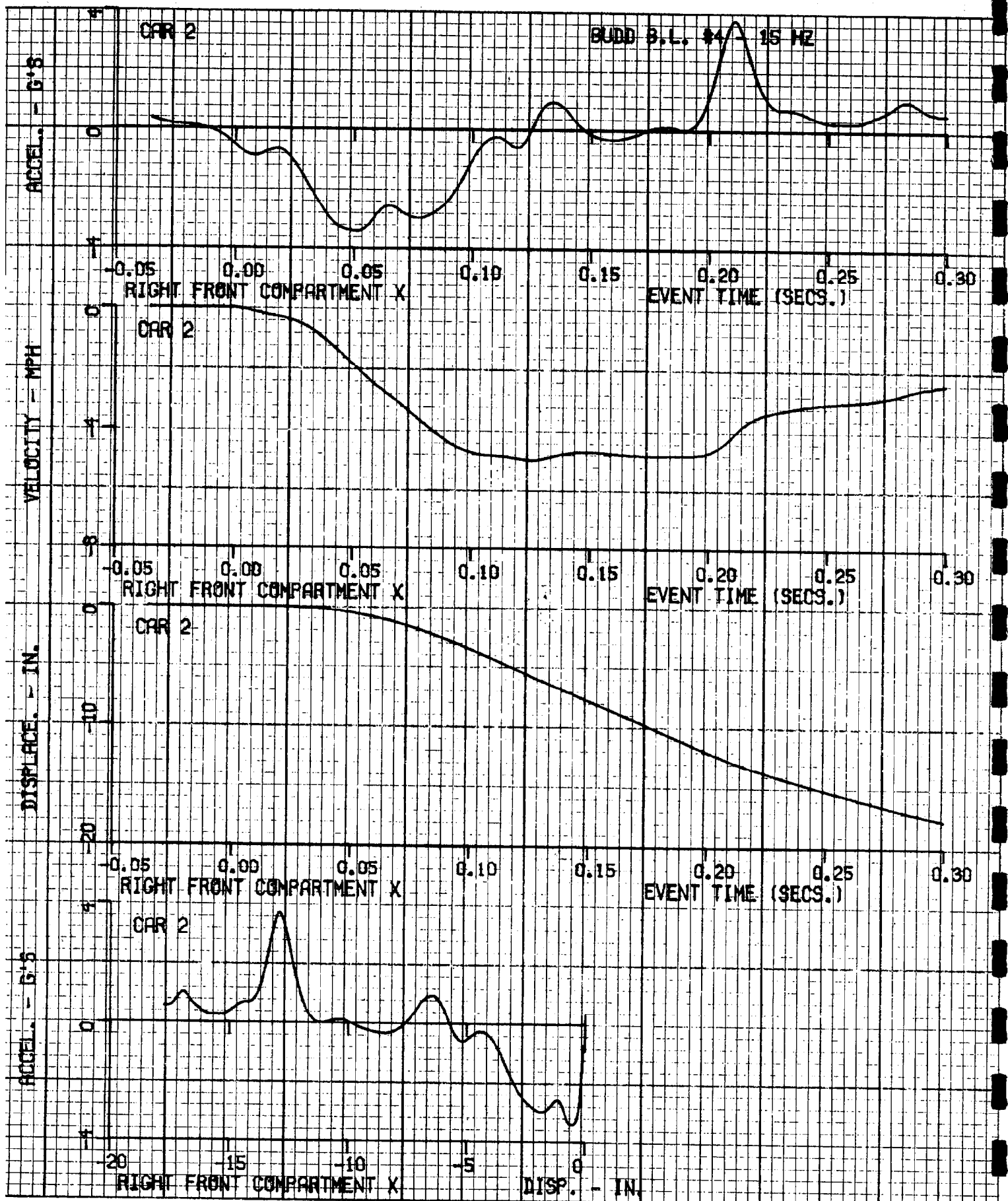


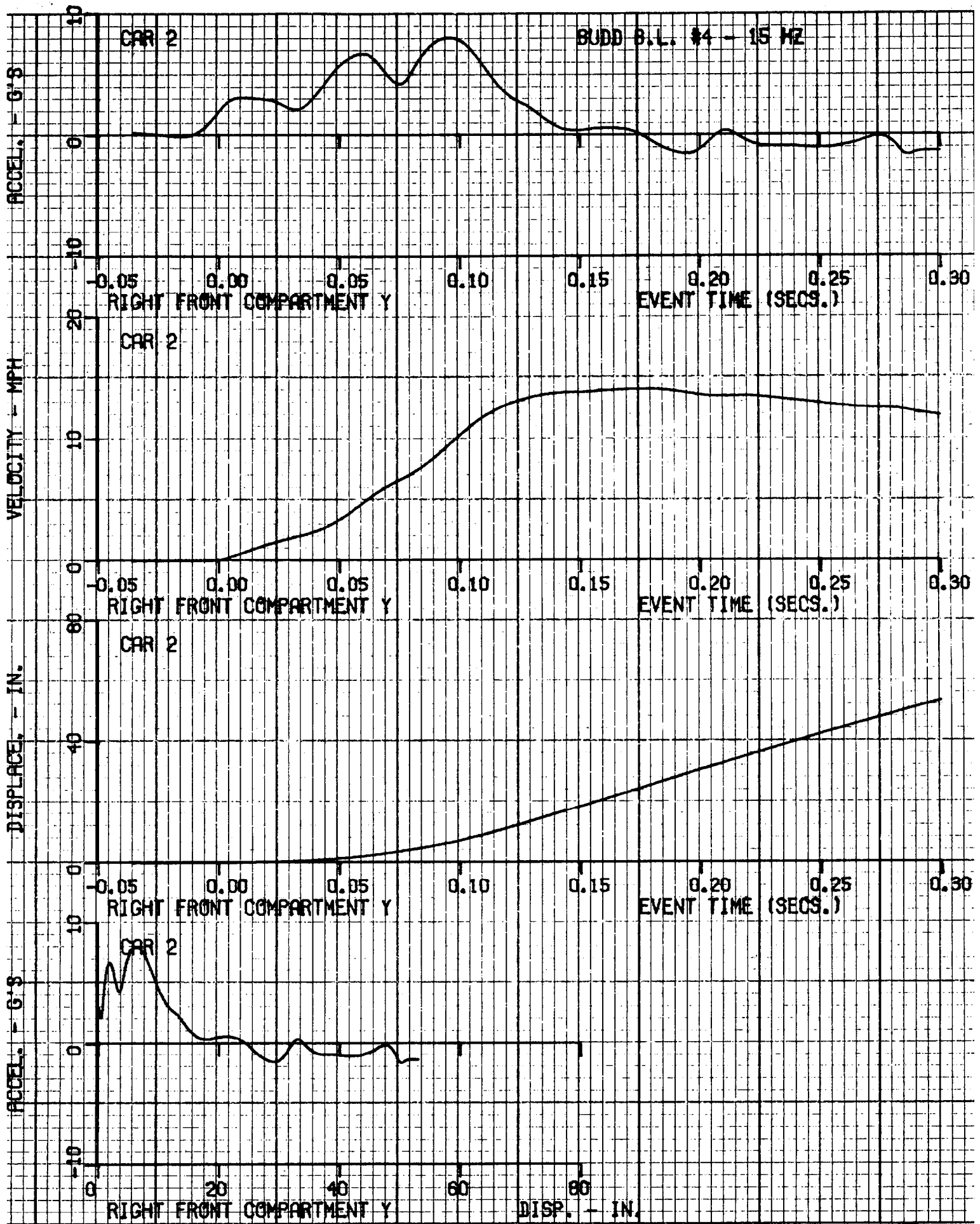
BASELINE TEST NO. 4

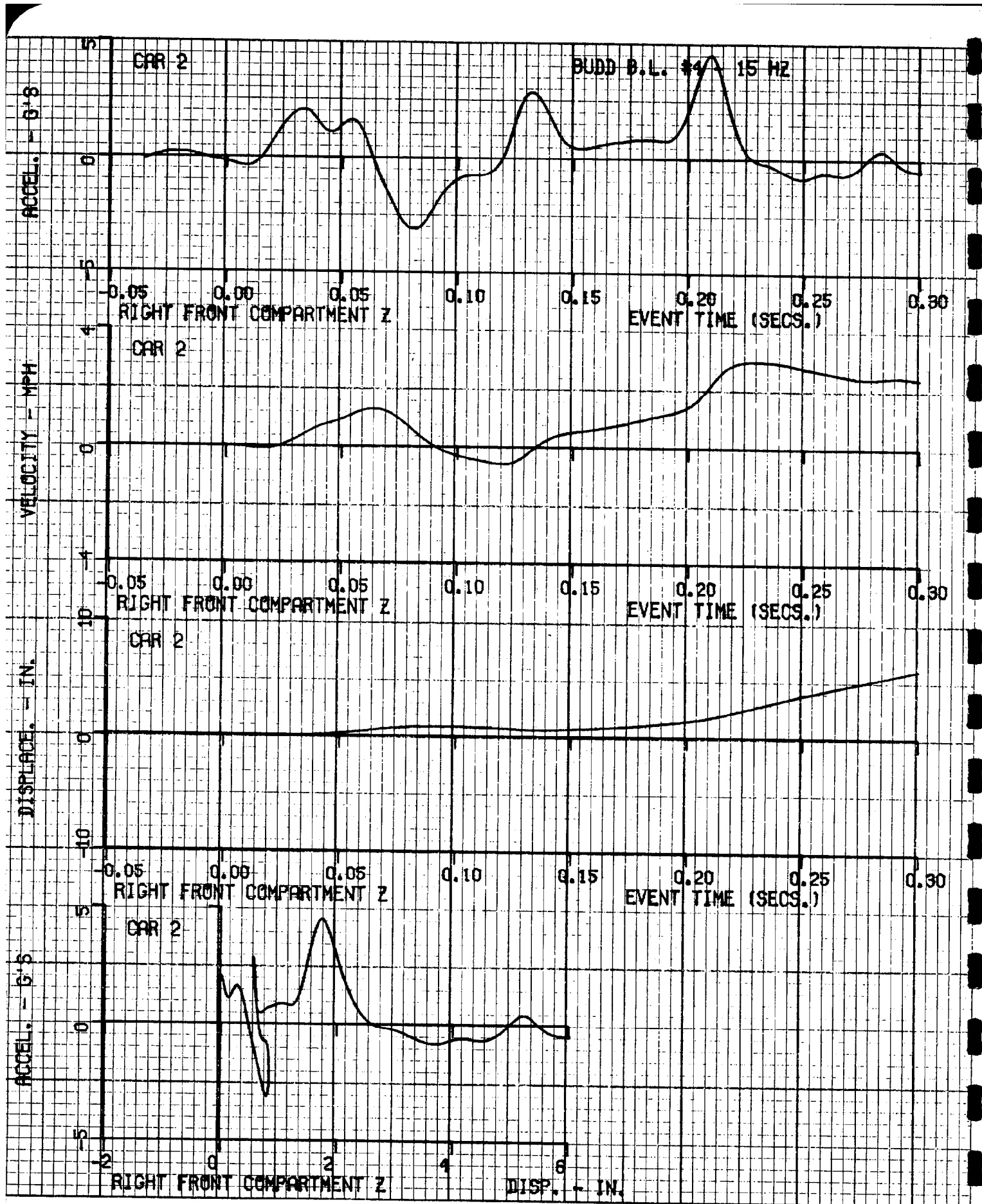
CAR 2 - 1976 VOLKSWAGEN RABBIT

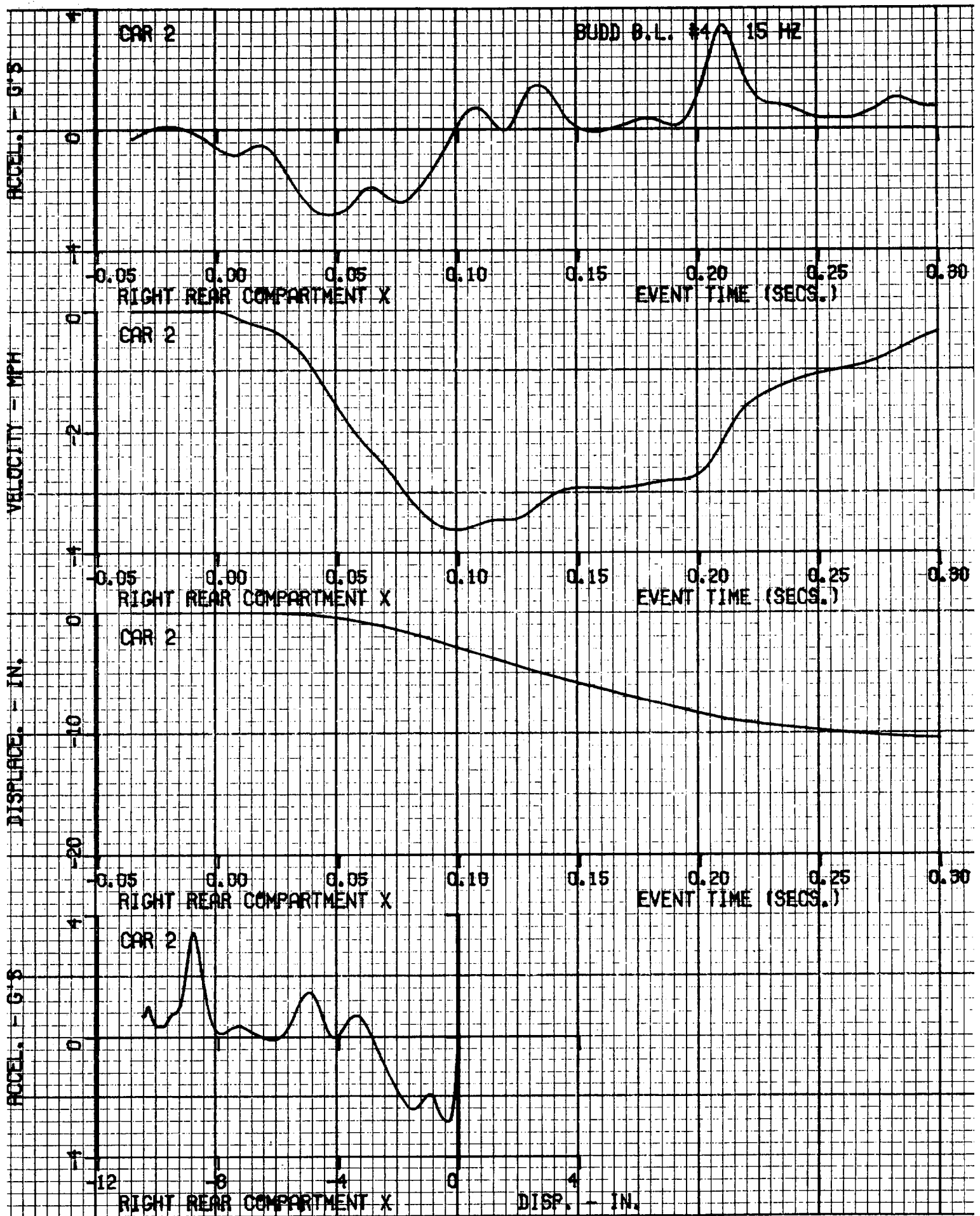
|              |              |
|--------------|--------------|
| VEHICLE DATA | 15 HZ FILTER |
|--------------|--------------|

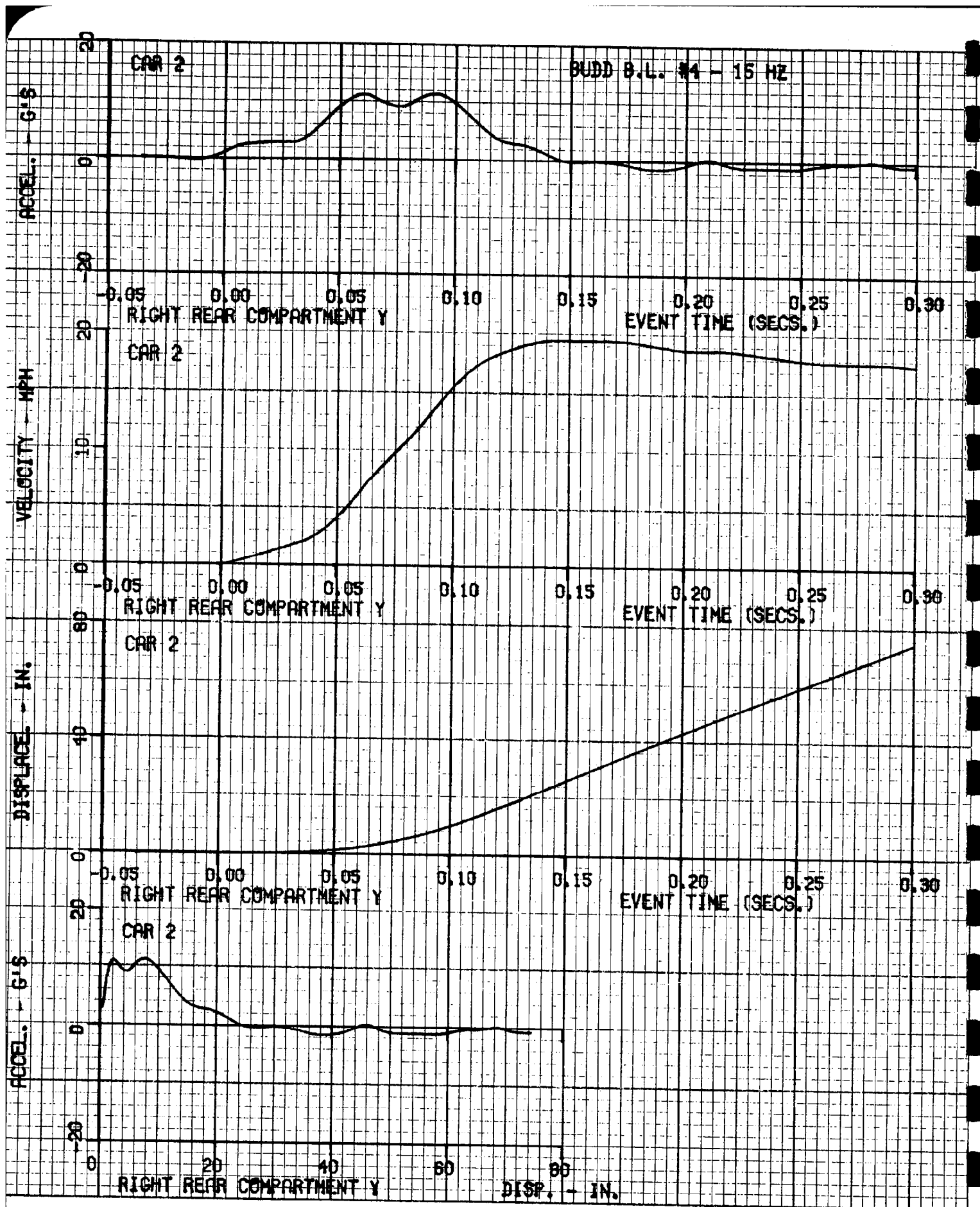
|                  |              |
|------------------|--------------|
| STRAIN GAGE DATA | 15 HZ FILTER |
|------------------|--------------|

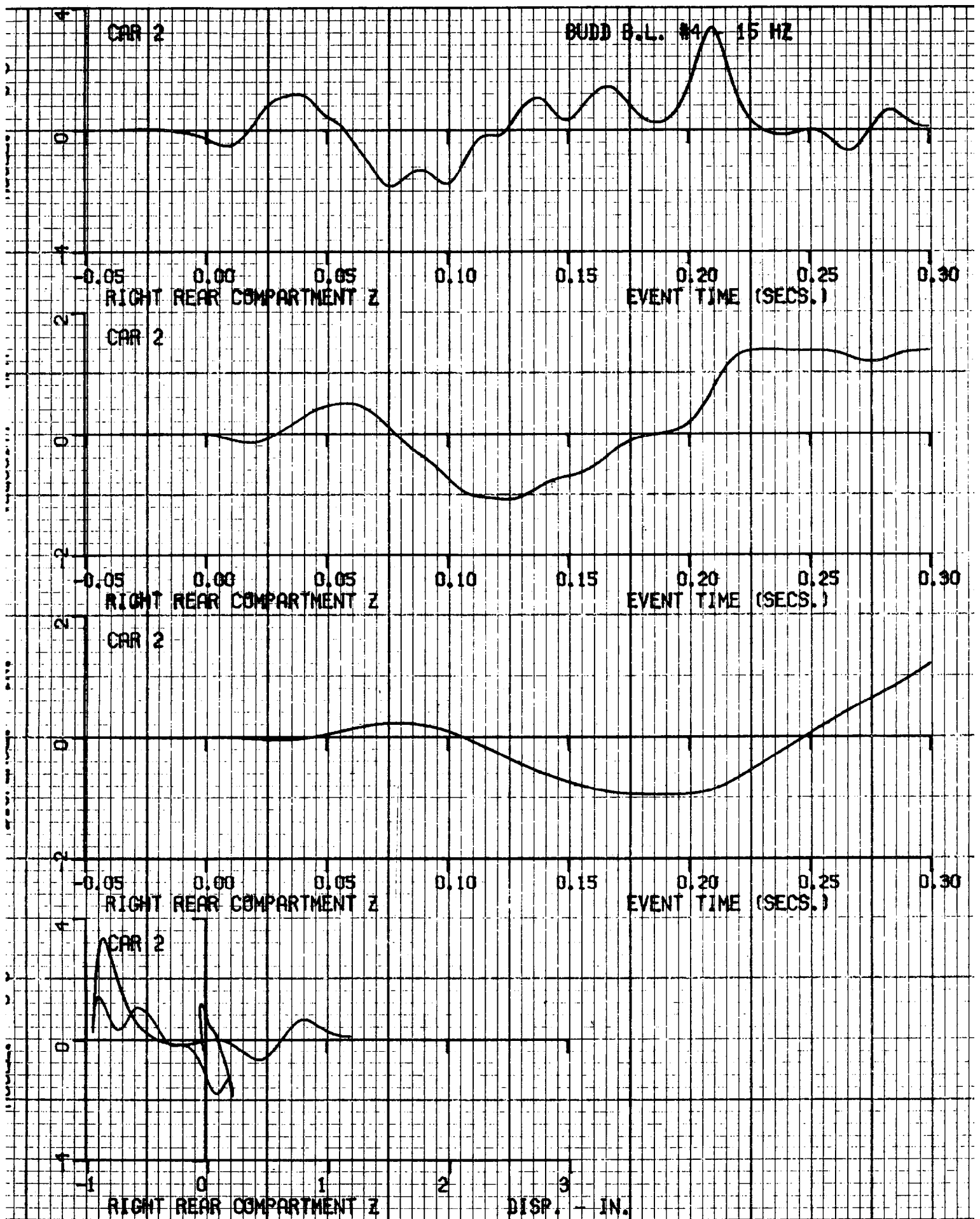


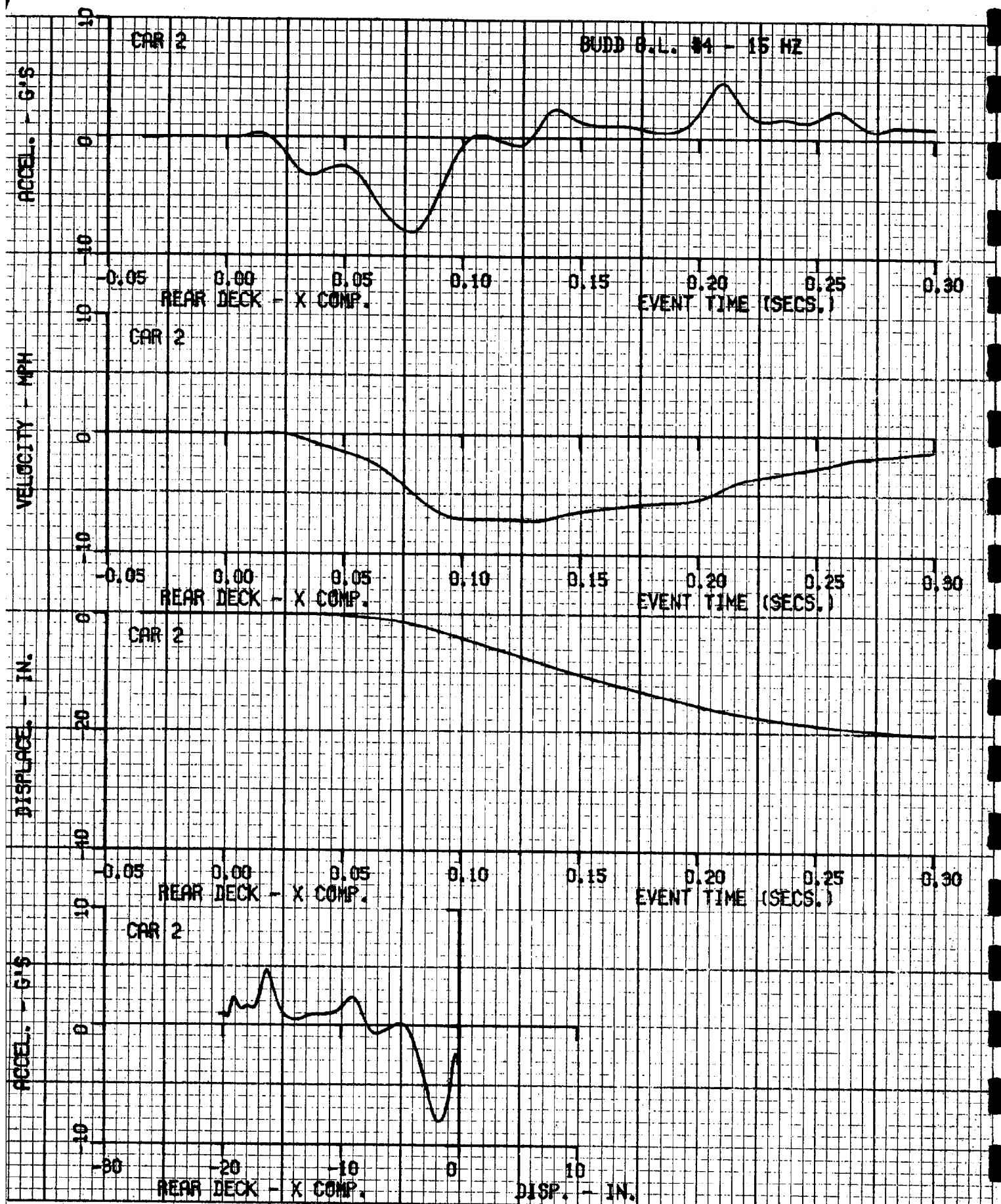




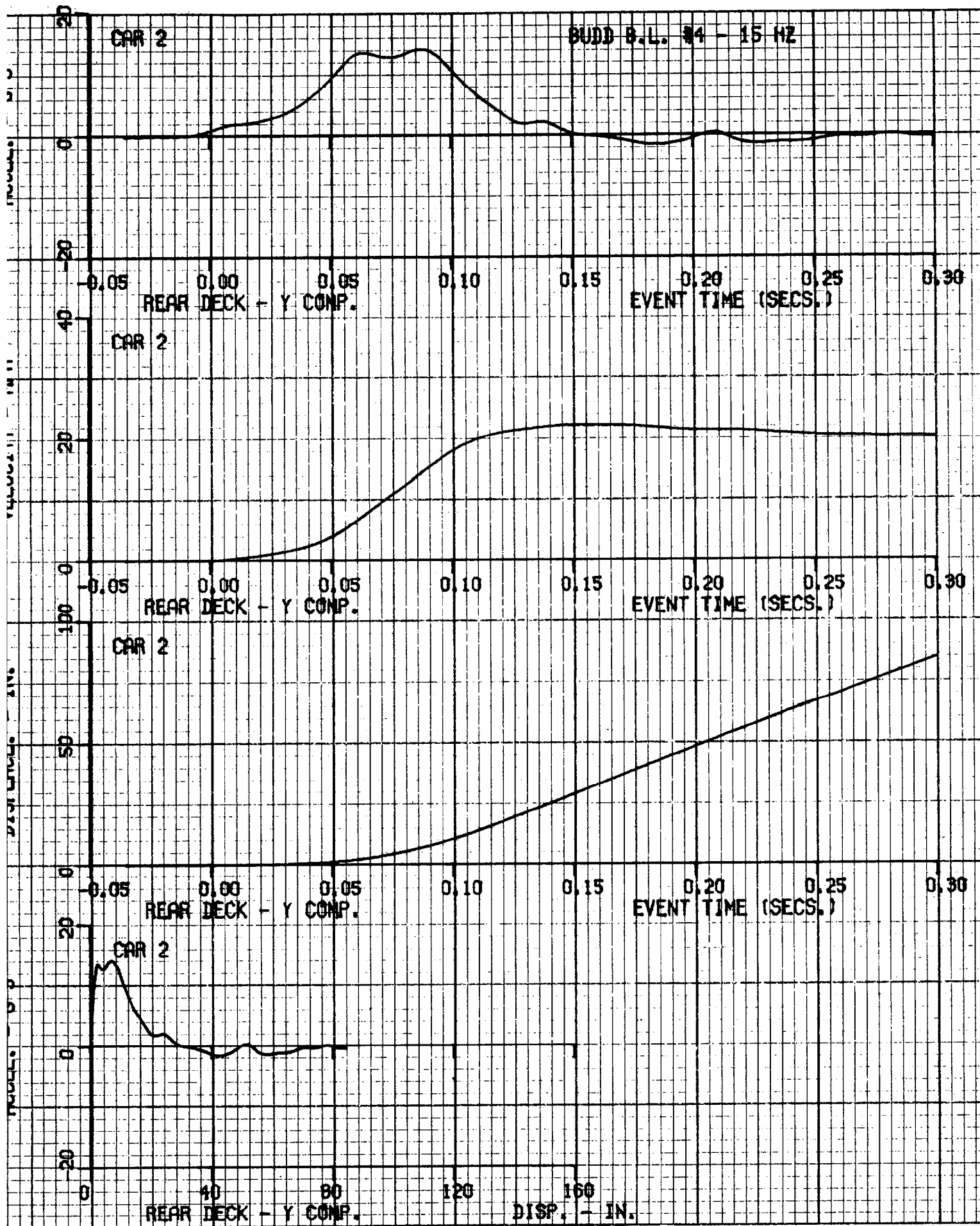


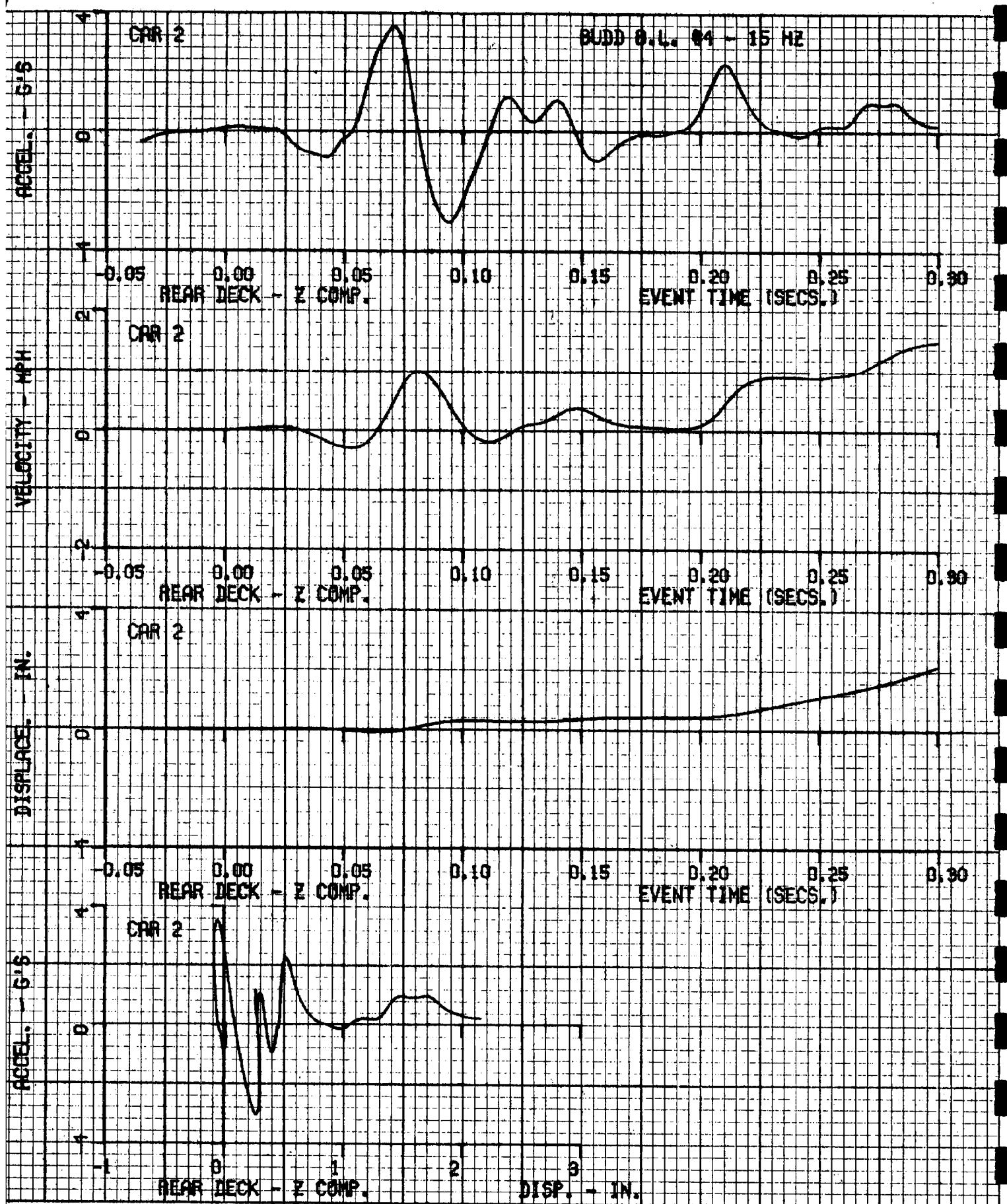


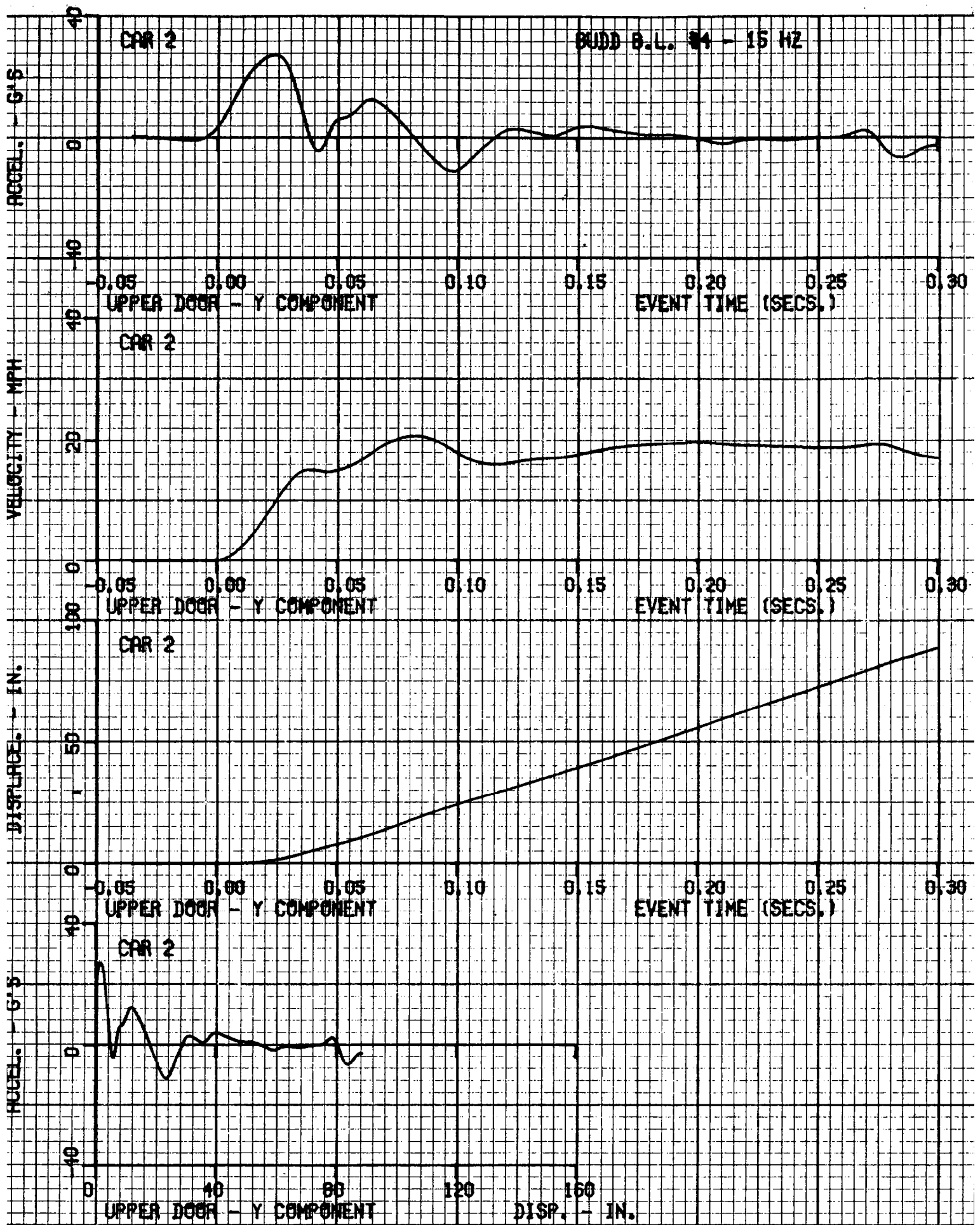


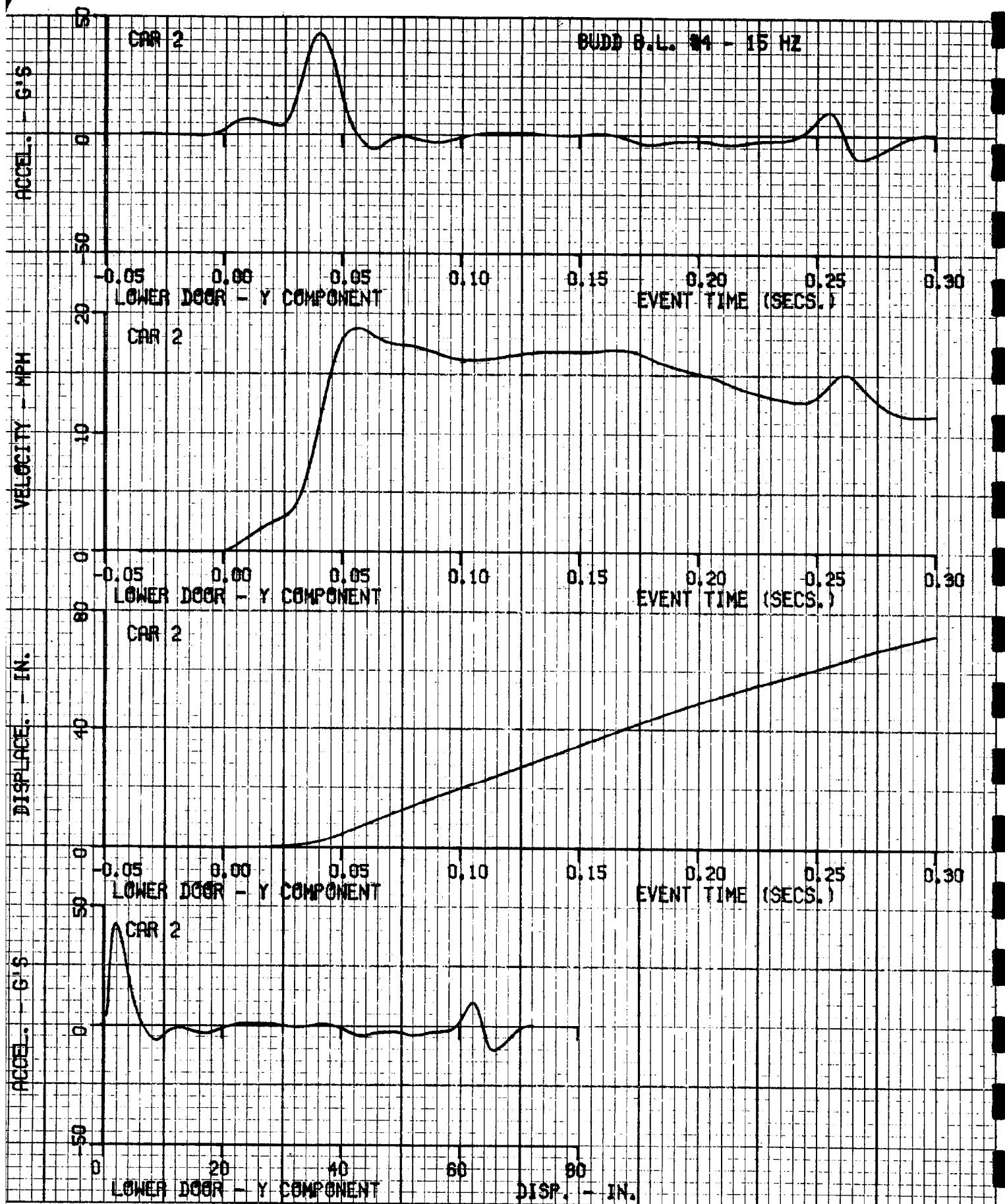


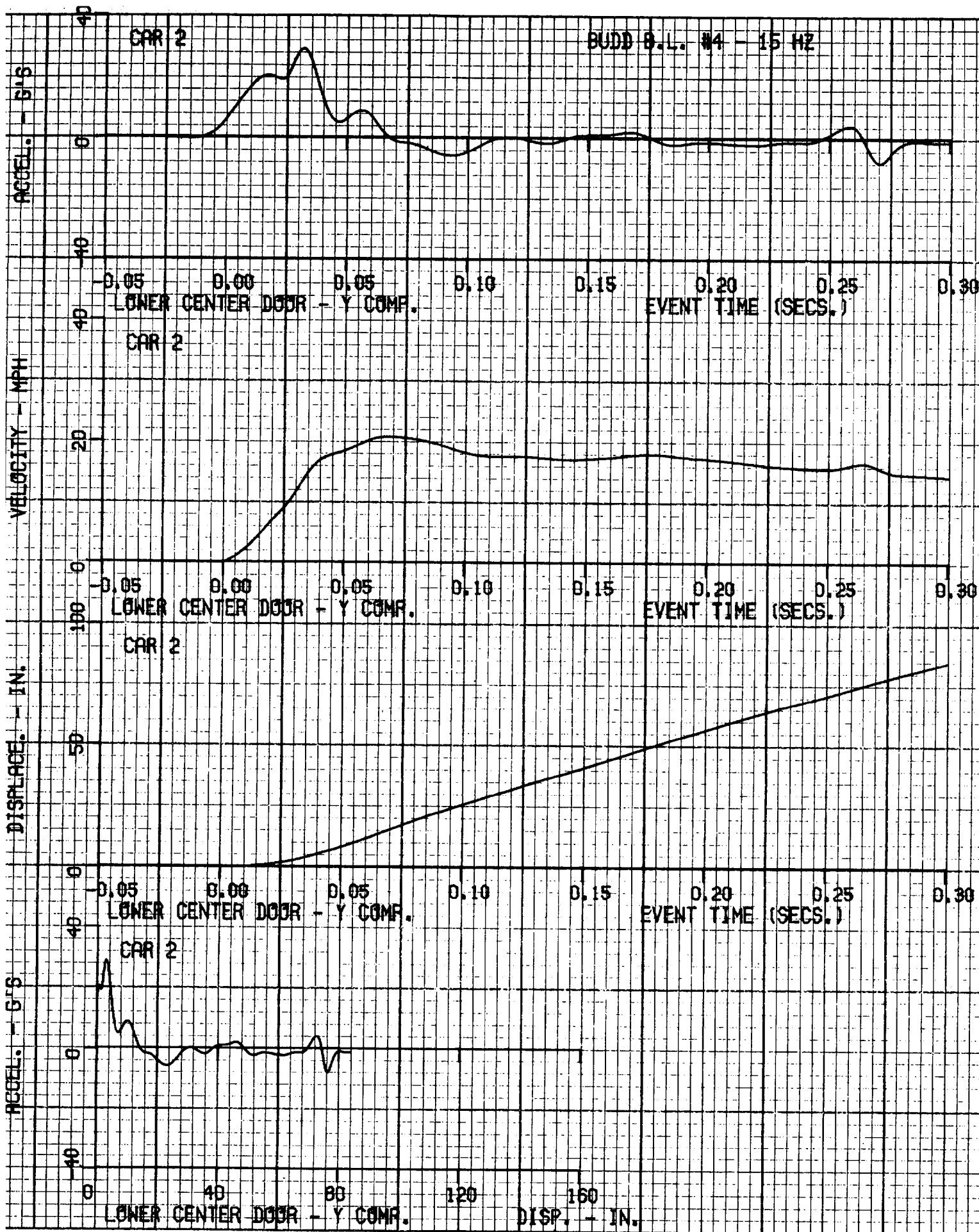


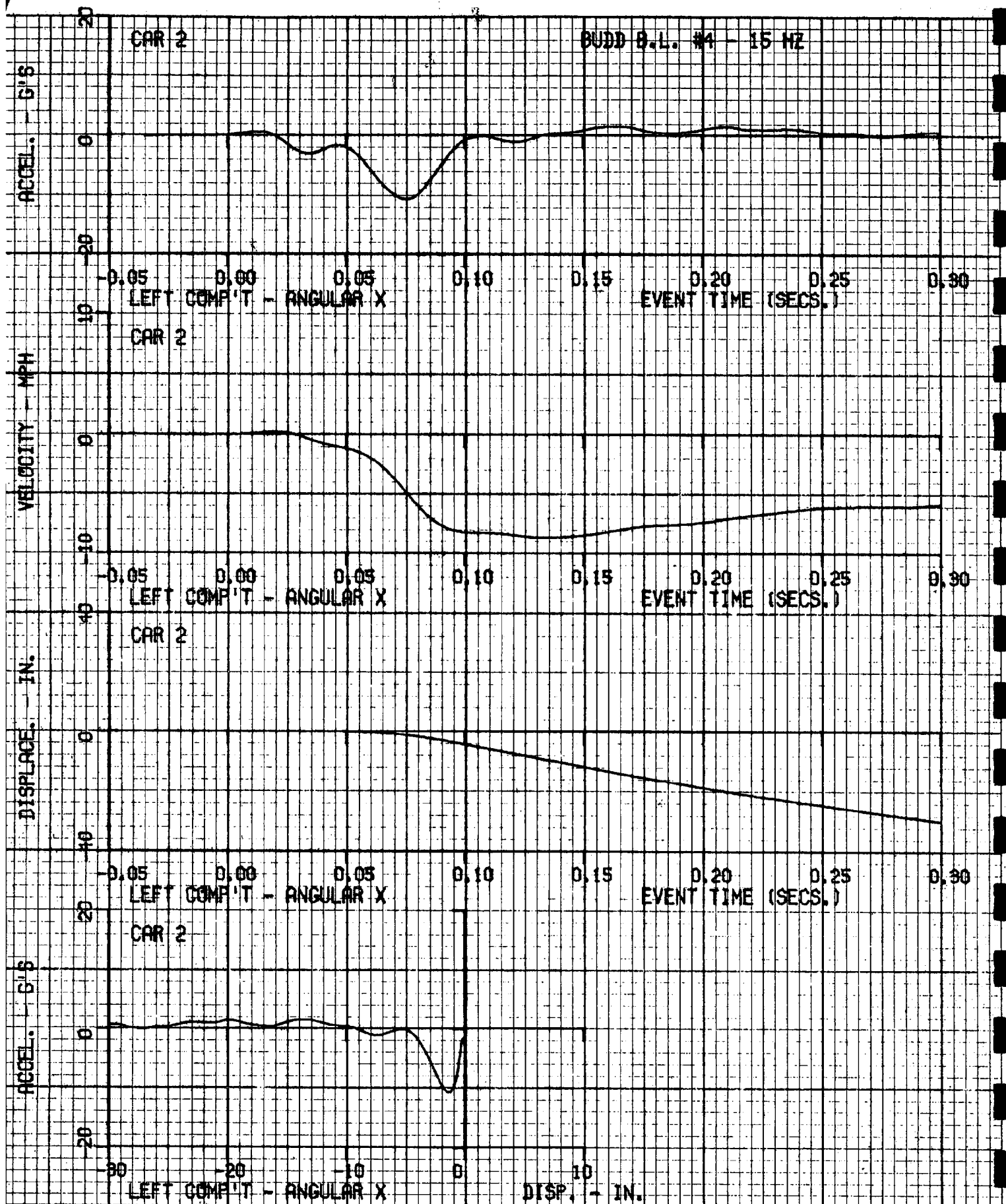


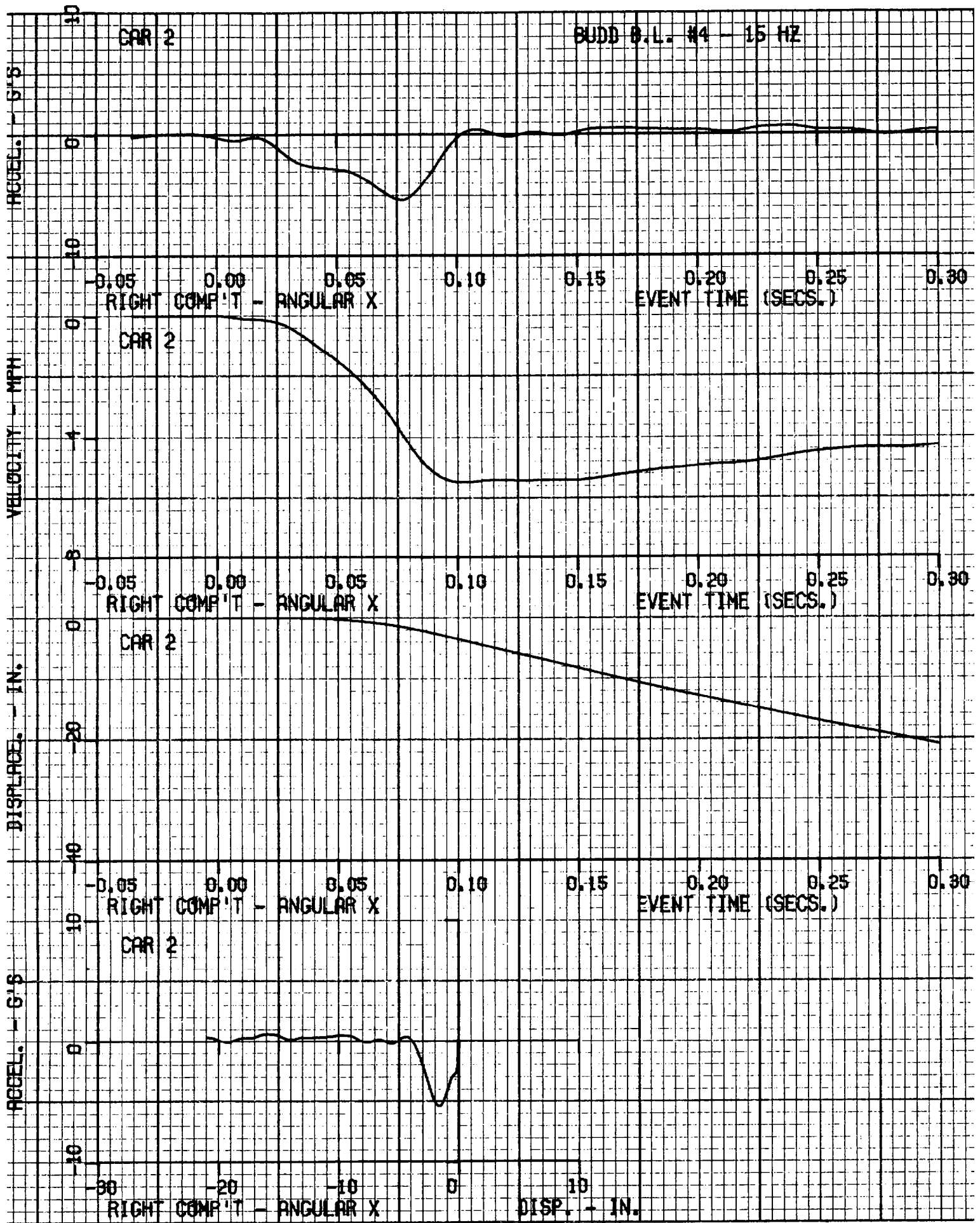




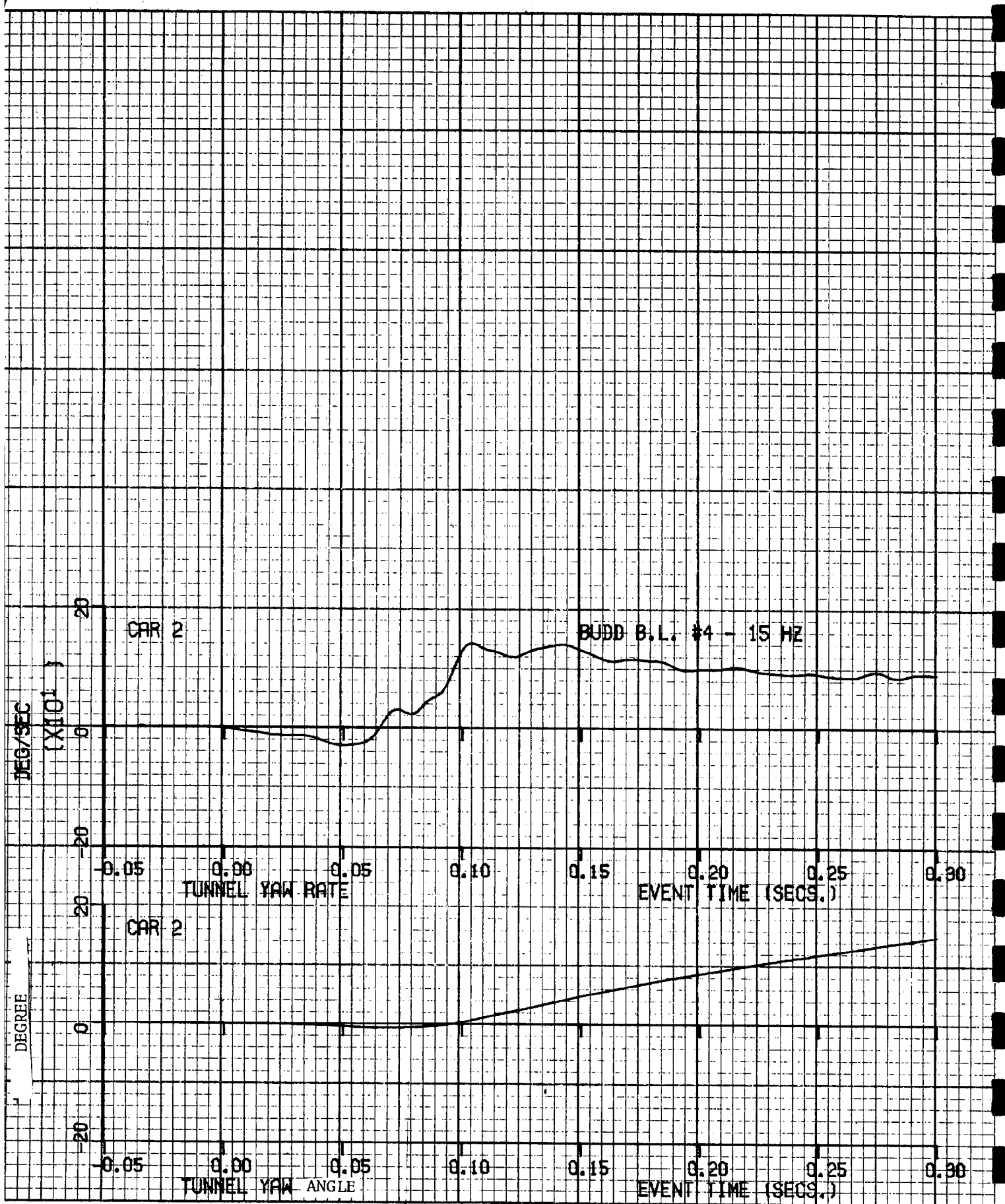






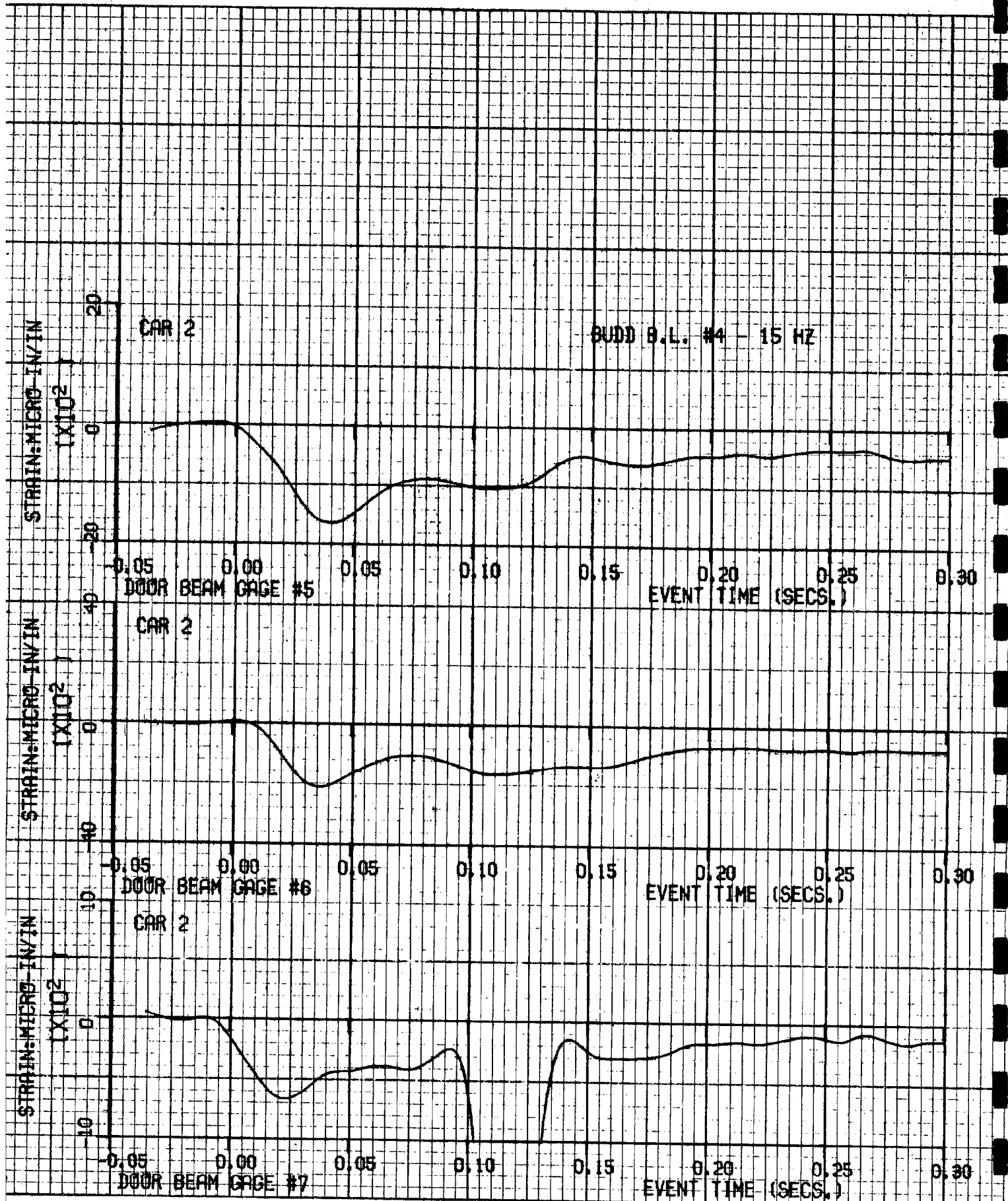


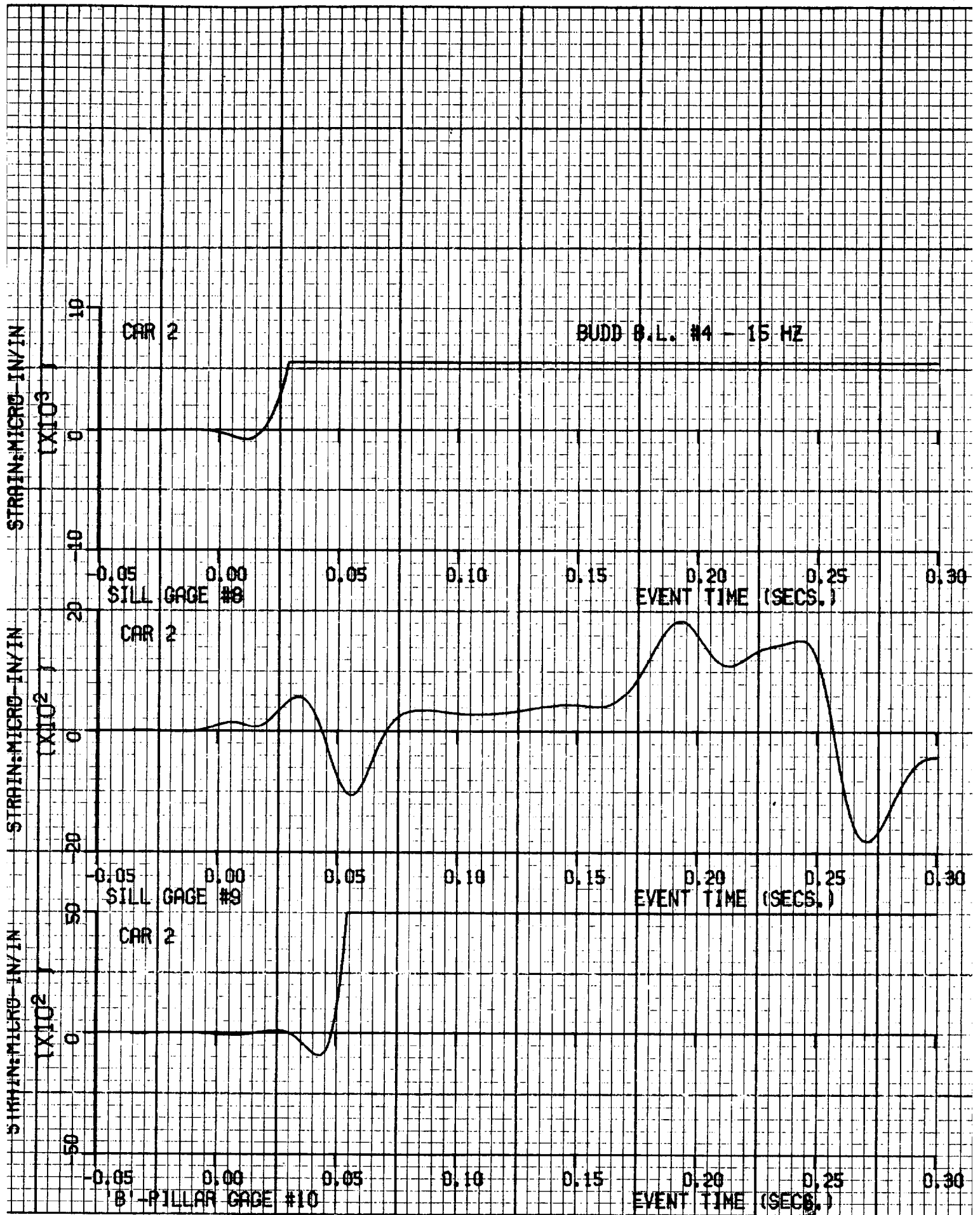












BASELINE TEST NO. 4

CAR 2 - 1976 VOLKSWAGEN RABBIT

DUMMY DATA

|                    | <u>FILTER CHANNEL CLASS</u> |
|--------------------|-----------------------------|
| HEAD ACCELERATION  | 1000                        |
| CHEST ACCELERATION | 180                         |

