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| INCH-POUND |
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MIL-D-70789A (AR)  
AMENDMENT 2  
09 November 1994  
SUPERSEDING  
AMENDMENT 1  
14 April 1993

## MILITARY SPECIFICATION

### DYNAMIC REFERENCE UNIT (DRU)

This amendment forms a part of MIL-D-70789A (AR), dated 15 June 1992, and is approved for use by the US Army Armament, Munitions, and Chemical Command, and is available for use by all Departments and Agencies of the Department of Defense.

PAGE 11

#### 3.5.3.1.1a:

Line 1: Add "S1/6," after "S1/5,"

Line 6: Add "S1/6," after "S1/5,"

#### 3.5.3.1.1h: Delete in its entirety and substitute the following:

"h. Reset STATUS bit S1/7 and set STATUS bit S1/6 when the DRU is ready to proceed to Align."

PAGE 20

#### 3.5.3.2.2.1: Add the following new paragraph to end of section

"Orientation Transition in Process STATUS (S3/7) shall be set while switching between orientations 1 and 2. S3/7 shall be set within one second of detection of the event causing orientation transition. Orientation Transition in Process STATUS (S3/7) shall be reset when orientation transition is completed and position, velocity attitude, azimuth, and rate data are valid-for the new Orientation (1 or 2). The time to switch orientations and provide valid data in the new orientation (1 or 2) shall not exceed 3 seconds. DRU in Orientation 2 STATUS (S4/7) shall be set while the DRU is in Orientation 2 and reset while in Orientation 1. S4/7 shall transition when the orientation transition is complete and valid data are available in the new orientation."

MIL-D-70789A (AR)  
AMENDMENT 2

PAGES 24 and 25

\* Table II, under FUNCTION column:

For pins 3, 25, 34, 43, 47, 51, 56, 62, and 66: Delete "Spare" and substitute "Wired Spare".

For pins 11 and 44: Delete "Spare" and substitute "Signal Ground".

For pins 48, 55, and 61: Delete "Spare" and substitute "Reserved Spare".

PAGE 40

3.5.6, line 5: Add "." after "S2" and delete the remainder of the paragraph.

PAGE 45

3.5.8.8e: Delete in its entirety and substitute the following:

"e. Shot detect. When set, the DRU shall activate Shot Detect STATUS (S2/3) as specified in 3.5.6. When reset, Shot Detect STATUS (S2/3) shall always be reset."

PAGE 49

3.5.8.9.2: Add the following at the end of the paragraph:

"When an ACCEPT CONFIGURATION DATA command is received while the DRU is in motion, the update shall be rejected and the Motion During Update Request Alert (D3/5) shall be set. When an ACCEPT CONFIGURATION DATA command is accepted:

a. The Position Update Request STATUS (S1/1) shall be set.

b. If the Pointing Device Boresight Angles configuration definition flag (D29/7) is set, the Pointing Device Boresight Angles Not Present Alert (D5/4) shall be set.

If the vehicle Boresight Angles configuration definition flag (D29/6) is set, the Vehicle Boresight Angles Not Present Alert (D2/7) shall be set."

MIL-D-70789A (AR)  
AMENDMENT 2

PAGE 50

3.5.8.15, line 4: Delete "Travel lock references shall be corrected for vehicle rotations which occur during gun firing at the end of the Shot Detect Interval."

3.5.9.1.1, line 14: Add the following sentence:

"When an ACCEPT VEHICLE BORESIGHT command is received while the DRU is in motion, the update shall be rejected and the Motion During Update Request Alert (D3/5) shall be set."

PAGE 51

3.5.9.2.1, line 15: Add the following sentence:

"When an ACCEPT POINTING DEVICE BORESIGHT command is received while the DRU is in motion, the update shall be rejected and the Motion During Update Request Alert (D3/5) shall be set."

PAGE 53

3.6.1.1, Paragraph 3, line 5: Delete "0.42262 secant latitude.: and substitute "0.283 secant latitude Probable Error."

PAGE 67

Figure 11, Temperature Cycling: Delete in its entirety and substitute as included page 67.

PAGE 93

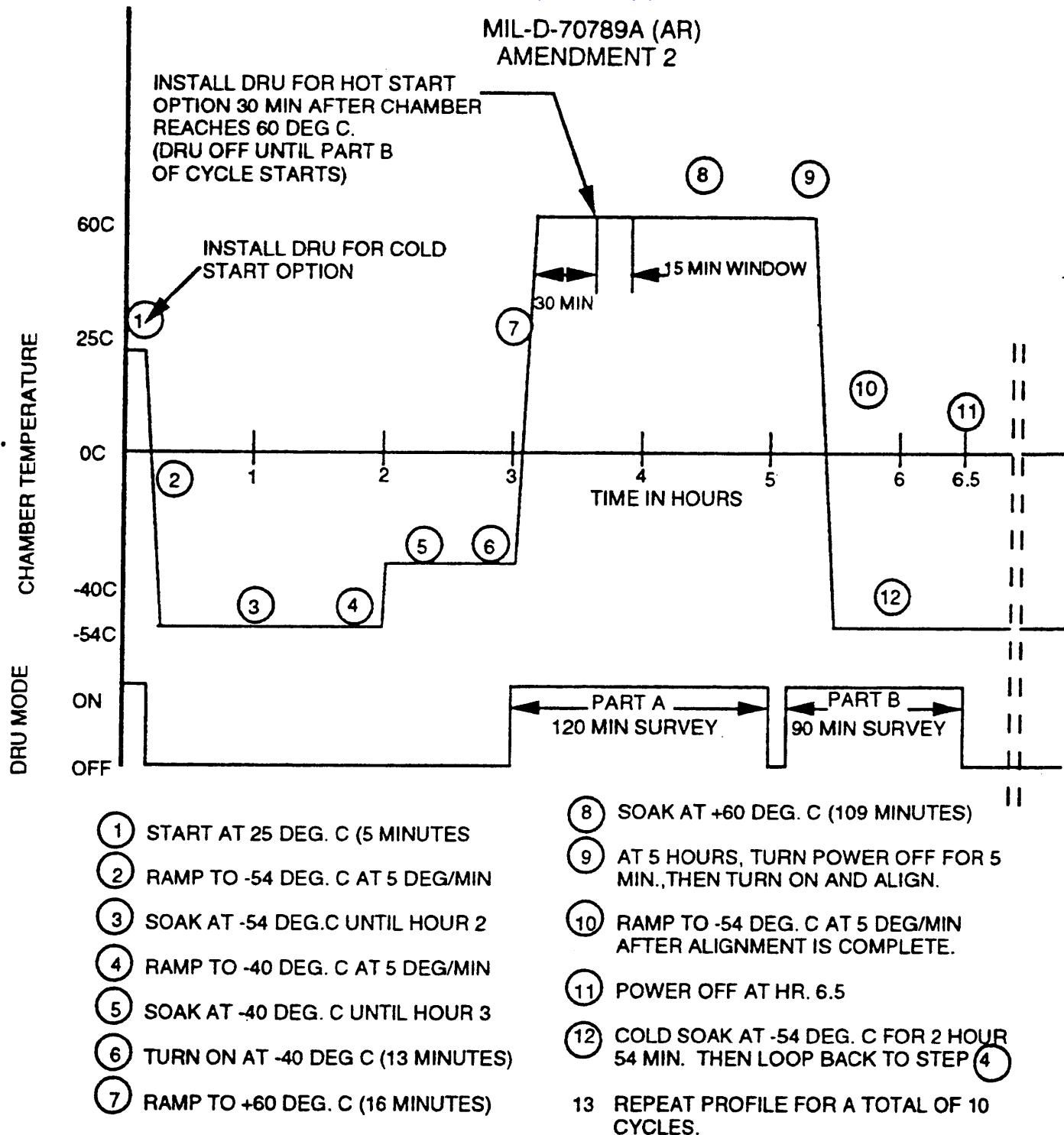
Table V, Data Bus Requirements for BCU Parameter Change Alert D4/5: Delete "Sets alert on both data buses." and substitute "Sets Alert only on the data bus which sent the ACCEPT POSITITON or ACCEPT GEODETIC DATA command."

PAGE 137

6.7.9, line 8: Delete "In the case where the pointing device is a weapon, the reference is corrected for any vehicle chassis in motion resulting from weapon firing."

PAGE 138

6.7.10, line 6: Delete "In the case where the pointing device is a weapon, the reference is corrected for any vehicle chassis motion resulting from weapon firing."



NOTES: 1. TIMES ARE APPROXIMATE AND ANY ONE FUNCTION MAY DEVIATE BY UP TO 5 PER CENT. THE OVERALL CYCLE (AFTER THE FIRST CYCLE) SHALL BE 6 HOURS 30 MINUTES - 5, +15 PERCENT.

2. PROVISIONS ARE MADE TO START THE TEST AT ROOM TEMPERATURE OR AT HIGH TEMPERATURE IN ORDER TO FACILITATE PRODUCTION TEST WITH MULTIPLE DRUS IN THE SAME CHAMBER. THE OVERALL ESS TEST TIME IS THE SAME FOR A HOT OR COLD START.

3. CHAMBER RAMP RATES ARE SPECIFIED AS MINIMUM RATES.

Figure 11  
ESS Temperature Cycle

MIL-D-70789A (AR)  
AMENDMENT 2

PAGE 155

30.1.5 (Appendix A): Delete in its entirety and substitute the following:

"30.1.5 Command: ACCEPT GEODETIC DATA

From: Prime System

To: DRU

Function: This user update command requests the DRU to accept position data from the prime system in geodetic coordinate form. The DRU accepts update data when the DRU is stationary.

DRU Response: STATUS DATA Message

COMMAND STRUCTURE

| <u>FLAG ( F )</u> | <u>ECHO<br/>SEO#(N)</u> | <u>COMMAND<br/>CODE (C)</u> | <u>DATA<br/>CHARACTERS(D)</u> | <u>ERROR DET. CODE<br/>CHARACTERS(E)</u> | <u>FLAG (F)</u> |
|-------------------|-------------------------|-----------------------------|-------------------------------|--|-----------------|
| 01111110          | XXX                     | 10100                       | D1-D19                        | 16 bits                                  | 01111110        |

Numbers of Data Characters: 19

Data Format: Binary 2's Complement

|  |   |
|--|---|
| D1, Character (8 bits)<br>Value: 14  | Command Subcode<br>(unsigned binary)  |
| D2, D3 Characters (16 bits)<br>Range: 0-15   | Prime System Spheroid<br>(unsigned binary)  |
| D4, D5 Characters (16 bits)<br><br>Range: $\pm 90$ degrees<br>Resolution: 1 degree                           | Latitude Degrees<br>(signed binary *)<br>+ Northern Hemisphere<br>- southern Hemisphere |
| D6, D7, D8, D9 Characters (32 bits)<br>Range: 0 to 59.99999 arc minutes<br>Resolution: $1/2^{24}$ arc minute | Latitude Minutes<br>(unsigned binary)   |
| D10, D11 Characters (16 bits)<br><br>Range: $\pm 180$ degrees<br>Resolution: 1 degree                        | Longitude Degrees<br>(signed binary *)<br>+ East of Greenwich<br>- West of Greenwich    |

MIL-D-70789A (AR)  
AMENDMENT 2

PAGE 155 (continued)

30.1.5 (Appendix A): (continued)

COMMAND STRUCTURE

| FLAG (F) | ECHO<br>SEO#(N)        | COMMAND<br>CODE (C)  | DATA<br>CHARACTERS(D) | ERROR DET. CODE<br>CHARACTERS(E) | FLAG (F) |
|----------|------------------------|----------------------|-----------------------|----------------------------------|----------|
|          | D12,D13,D14,D15        | Characters (32 bits) | Longitude Minutes     |                                  |          |
|          | Range: 0 to 59.99999   | arc minutes          | (unsigned binary)     |                                  |          |
|          | Resolution: $1/2^{24}$ | arc minute           |                       |                                  |          |
|          | D16,D17,D18,D19        | Characters (32 bits) | Altitude              |                                  |          |
|          | Range:                 |                      |                       |                                  |          |
|          | Resolution: 0.01       | meters               |                       |                                  |          |

\* MSB = 0 for + and 1 for -. Remainder of field is unsigned binary."

PAGE 197

30.4.16 (Appendix D): Delete in its entirety and substitute the following:

"30.4.16 Message: GEODETIC DATA

From: DRU To: Prime System

Number of Data Characters: 29

Data Format: Binary 2's Complement

MESSAGE STRUCTURE

| FLAG (F)    | ECHO<br>SEO#(N)      | IDENTIFIER(I) | STATUS<br>S1, S2 DATA(D) | ERROR DET. CODE (E) | FLAG (F) |
|-------------|----------------------|---------------|--------------------------|---------------------|----------|
| 01111110    | XXX                  | 10001         | 16 Bits D1-D29           | 16 bits             | 01111110 |
| D1,D2       | Characters (16 bits) |               | Latitude Degrees         |                     |          |
| Range:      | $\pm 90$             | degrees       | (signed binary *)        |                     |          |
| Resolution: | 1                    | degree        |                          |                     |          |

MIL-D-70789A (AR)  
AMENDMENT 2

PAGE 197 (continued)

30.4.16 (Appendix D): (continued)

MESSAGE STRUCTURE

| ECHO               |                           | STATUS        |                | ERROR DET.        |          |
|--------------------|---------------------------|---------------|----------------|-------------------|----------|
| FLAG (F)           | SEQ#(N)                   | IDENTIFIER(I) | S1, S2 DATA(D) | CODE (E)          | FLAG (F) |
| D3, D4, D5, D6     | Characters (32 bits)      |               |                | Latitude Minutes  |          |
| Range:             | 0 to 59.99999 arc minutes |               |                | (unsigned binary) |          |
| Resolution:        | $1/2^{24}$ arc minute     |               |                |                   |          |
| D7, D8             | Characters (16 bits)      |               |                | Longitude Degrees |          |
| Range              | $\pm 180$ degrees         |               |                | (signed binary *) |          |
| Resolution:        | 1 degree                  |               |                |                   |          |
| D9, D10, D11, D12  | Characters (32 bits)      |               |                | Longitude Minutes |          |
| Range:             | 0 to 59.99999 arc minutes |               |                | (unsigned binary) |          |
| Resolution:        | $1/2^{24}$ arc minute     |               |                |                   |          |
| D13, D14, D15, D16 | Characters (32 bits)      |               |                | Altitude          |          |
| Range:             | -32,768 to +32,767 meters |               |                |                   |          |
| Resolution:        | 0.01 meters               |               |                |                   |          |
| D17, D18, D19, D20 | Characters (32 bits)      |               |                | Velocity North    |          |
| Range:             | $\pm 32,767$ meters/see   |               |                |                   |          |
| Resolution:        | $1/2^{16}$ meters/see     |               |                |                   |          |
| D21, D22, D23, D24 | Characters (32 bits)      |               |                | Velocity East     |          |
| Range:             | $\pm 32,767$ meters/see   |               |                |                   |          |
| Resolution:        | $1/2^{16}$ meters/see     |               |                |                   |          |
| D25, D26, D27, D28 | Characters (32 bits)      |               |                | Velocity Up       |          |
| Range:             | $\pm 32,767$ meters/see   |               |                |                   |          |
| Resolution:        | $1/2^{16}$ meters/see     |               |                |                   |          |
| D29                | Character (8 bits)        |               |                | DRU Spheroid      |          |
| Range:             | 0 to 14                   |               |                | (unsigned binary) |          |
| Resolution:        | 1                         |               |                |                   |          |

\* MSB = for + and 1 for -. Remainder of field is unsigned binary."

MIL-D-70789A (AR)  
AMENDMENT 2

PAGE 199

30.5 (Appendix E), S1 Character table, BIT POSITION 6 MODE OR CONDITION:

Delete "Spare" and substitute "Startup Complete".

PAGE 200

30.5 (Appendix E):

S3 Character table, BIT POSITION 7 MODE OR CONDITION:  
Delete "Spare" and substitute "Orientation Transition in Process".

S4 Character table, BIT POSITION 7 MODE OR CONDITION: Delete  
"Spare" and substitute "DRU in Orientation Two".

PAGE 201

Table 30.5 (Appendix E):

CHAR/BIT S1/7, RESET CONDITION, line 3: Add "or Stored Heading" after "Normal".

CHAR/BIT S1/6, SET CONDITION: Delete "Spare" and substitute  
"DRU operations are sufficient for proceeding with Normal or Stored Heading Align".

CHAR/BIT S1/6, RESET CONDITION: Delete "Spare" and substitute  
"Turn-on or RESTART".

PAGE 203

Table 30.5 (Appendix E):

CHAR/BIT S3/7, SET CONDITION: Delete "Spare" and substitute  
"DFU transitioning between Orientations 1 and 2 \*\*\*".

CHAR/BIT S3/7, RESET CONDITION: Delete and "Spare" and substitute  
"DRU in Orientation 1 or 2".

Below first note: Add "\*\*\* After the DRU has switched to the new orientation, S3/7 shall remain set until position and orientation data are valid for the new orientation.".

MIL-D-70789A (AR)  
AMENDMENT 2

PAGE 204

Table 30.5 (Appendix E):

CHAR/BIT S4/7, SET CONITION: Delete "Spare" and substitute "DRU in orientation 2 \*".

CHAR/BIT S4/7, RESET CONDITION: Delete "Spare" and substitute "DRU in Orientation 1 \*".

Below table box: Add "\* The indication provided by S4/7 may not be valid while Orientation Transition in Process STATUS (S3/7) is set.".

PAGE 206

Appendix F, POINTING DEVICE BORESIGHT ANGLES:

Orientation 1, after "B::": Delete "88.9" and substitute "0.0".

Orientation 2, after "B::": Delete "88.9" and substitute "0.0".

Appendix F, ZRP OFFSET DISTANCES, Orientation 1 (vehicle)

After "  $\Delta X$  ::": Delete "3.1" and substitute "0.0".

After "  $\Delta Y$  ::": Delete "-2.1" and substitute "0.0".

After "  $\Delta Z$  ::": Delete "-2.2" and substitute "0.0".

PAGE 207

Appendix F:

D28/3, after "EXTENDED ALERT DATA": Delete "0" and substitute "1".

D28/2, after "BCU PARAMETERS": Delete "1" and substitute "on,"

D29/7, after "POINTING DEVICE BORESIGHT ANGLES": Delete "0" and substitute "1".

MIL-D-70789A (AR)  
AMENDMENT 2

PAGE 207 (continued)

D29/6, after "VEHICLE BORESIGHT ANGLES": Delete "0" and substitute "1".

D29/4, after "TRAVEL LOCK COMMANDS": Delete "0" and substitute "1".

D29/3, after "TRAVEL LOCK DISCRETE": Delete "1" and substitute "0".

The margins of this amendment are marked with an asterisk or vertical lines to indicate where changes (additions, modifications, corrections, deletions) from the previous amendment were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous amendment.

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