INTEGRATED NUCLEAR AND CONVENTIONAL THEATER WARFARE SIMULATION (INWARS)
DOCUMENTATION PART IV
USER'S MANUAL COMPONENT
VOLUME II:
COMBAT INTERACTIONS INPUT
**Final-Integrated Nuclear and Conventional Theater Warfare Simulation (INWARS).**

**Final Report: Part IV, Volume II**

Dr. J.R. Aldrich  
J.B. Gilmer

The BDM Corporation  
7915 Jones Branch Drive  
McLean, VA 22101

HQ DA, (DAMO-2D)  
The Pentagon, Room 3A546  
Washington, D.C. 20310

February 8, 1980

70

This manual provides user documentation on the INWARS simulation.
FOREWORD

This is Volume II of the User's Manual Component of the Integrated Nuclear and Conventional Theater Warfare Simulation (INWARS) documentation. It presents the content and format of user inputs to the INWARS treatment of combat interactions.

PART I - INWARS SYNOPSIS

PART II - MODELING DESCRIPTION

PART III - SOFTWARE DESCRIPTION

PART IV - USER'S MANUAL

Accession For

DTIC&#160;DEAD

Unannounced

Justification

Distribution/
Availability Codes
A and/or Special

Dist 11
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOREWORD</td>
<td>iii</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>vii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>ix</td>
</tr>
<tr>
<td>A GENERAL COMMENTS</td>
<td>1</td>
</tr>
<tr>
<td>B Run Control and Diagnostic Features</td>
<td>4</td>
</tr>
<tr>
<td>C Information Degradation Data</td>
<td>7</td>
</tr>
<tr>
<td>D Terrain Effects and Search Data</td>
<td>10</td>
</tr>
<tr>
<td>E Entity Type Descriptor Data</td>
<td>15</td>
</tr>
<tr>
<td>F Weapon/Asset Characteristics Data</td>
<td>19</td>
</tr>
<tr>
<td>G Nuclear/Chemical Readiness Tables</td>
<td>29</td>
</tr>
<tr>
<td>H Operation Reaction System Tables</td>
<td>33</td>
</tr>
<tr>
<td>I Operations Data</td>
<td>43</td>
</tr>
<tr>
<td>J Contingency Data</td>
<td>57</td>
</tr>
<tr>
<td>K Hex Data</td>
<td>58</td>
</tr>
<tr>
<td>L Entity Assignment Data</td>
<td>61</td>
</tr>
<tr>
<td>Figure</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Octal Number Use</td>
</tr>
<tr>
<td>2</td>
<td>Information Degradation Input Deck</td>
</tr>
<tr>
<td>3</td>
<td>Search Data Deck</td>
</tr>
<tr>
<td>4</td>
<td>Entity Type Description Deck</td>
</tr>
<tr>
<td>5</td>
<td>Asset Data</td>
</tr>
<tr>
<td>6</td>
<td>Table Nuclear/Chemical Readiness Input Deck</td>
</tr>
<tr>
<td>7</td>
<td>Operation Reaction System Deck</td>
</tr>
<tr>
<td>8</td>
<td>Operations Data Deck</td>
</tr>
<tr>
<td>9</td>
<td>Hex Input Deck</td>
</tr>
<tr>
<td>10</td>
<td>Entity Input Deck</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Debug Flags</td>
</tr>
<tr>
<td>2</td>
<td>Data Structures Dump Control Flags</td>
</tr>
</tbody>
</table>
INPUT SPECIFICATIONS

A. GENERAL COMMENTS

This volume specifies the inputs to the Combat Interactions portion of the INWARS model. This software may be run either in a stand alone mode, or as part of the integrated INWARS model. In the latter case, the run control cards given in Section A are omitted.

The function of the inputs are to initialize various data structures which define operations weapons, terrain, units, and other aspects of the model. Thus, the inputs are organized by the data structure initialized. The data structure definitions are given in "INWARS CIS DATA STRUCTURES" in sections shown by Table 1, for the respective sections of this volume.

Since the inputs are primarily used to load data structures, the acceptable range for numbers depends on the space, or number of bits, allocated to the particular field in the data structured definition. The minimum value for almost all inputs is zero; blank or negative entries will usually cause catastrophic software failure. Most "factors" in the model are stored in nine bits, with a maximum input value of 7.99 in floating point formats or 799 (%) in integer formatted fields. Larger values will probably cause software errors, except where the data specifications in this volume say otherwise.

One type of data used throughout the CIS data structures is the "flag." This type of information is normally stored in one bit, and is used to enable or indicate a particular feature. Examples are flags which indicate that a weapon is nuclear, or that it is subject to air attack. These flags are put in octal format, with each digit of the octal number representing three flags, as shown in Figure 1.

When floating point format is specified, such as with F5.2, the first number indicates the total number of card columns used, and the second indicates the number of card columns following the decimal point. Thus, for the F5.2 format, the first two columns would be the integer portion of the number, the third column a decimal, followed by the fractional value in the last two columns.
**TABLE 1. DEBUG FLAGS**

<table>
<thead>
<tr>
<th>BIT</th>
<th>DECIMAL</th>
<th>SUBROUTINE</th>
<th>USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>PERCEV</td>
<td>PERCEPTION, ENTRY POINT</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>PERCEV</td>
<td>PERCEPTION, LOOP FOR ALL PERCEPTIONS</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>PERCEV</td>
<td>PERCEPTION, EXIT POINT</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>COMBAT</td>
<td>COMBAT PROCESS; THIS CAUSES A LOT OF OUTPUT</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>CONTING</td>
<td>CONTINGENCY RECOGNITION PROCESS, ORS</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
<td>BGSGO</td>
<td>OPERATION REACTION SYSTEM</td>
</tr>
<tr>
<td>6</td>
<td>64</td>
<td>GETHX</td>
<td>GET HEX UTILITY</td>
</tr>
<tr>
<td>7</td>
<td>128</td>
<td>GETHX2</td>
<td>GET HEX UTILITY, EXIT</td>
</tr>
<tr>
<td>8</td>
<td>256</td>
<td>GETHX2</td>
<td>GET HEX UTILITY, LOOP (LOTS OF OUTPUT)</td>
</tr>
<tr>
<td>9</td>
<td>512</td>
<td></td>
<td>NOT USED</td>
</tr>
<tr>
<td>10</td>
<td>1024</td>
<td></td>
<td>NOT USED</td>
</tr>
<tr>
<td>11</td>
<td>2048</td>
<td>GIMME,</td>
<td>ALLOCATION AND RETURN OF DYNAMICALLY ALLOCATED MEMORY ARRAY SPACE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RELEASE</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>4096</td>
<td>GUBEDR</td>
<td>TRACES ENTRY AND EXIT OF MAJOR SUBRoutines</td>
</tr>
<tr>
<td>13</td>
<td>8192</td>
<td>EVALST</td>
<td>EVALUATE ENTITY STRENGTH</td>
</tr>
<tr>
<td>14</td>
<td>16384</td>
<td>DISPOSE</td>
<td>DISPOSE OF OLD OPERATION ORDER</td>
</tr>
<tr>
<td>15</td>
<td>32768</td>
<td>SITCVT</td>
<td>SITUATION CONVERSION OF CODE (ORS)</td>
</tr>
<tr>
<td>16</td>
<td>65536</td>
<td>GENOBJ</td>
<td>GENERATE OBJECTIVE</td>
</tr>
<tr>
<td>17</td>
<td>131072</td>
<td></td>
<td>NOT USED</td>
</tr>
<tr>
<td>18</td>
<td>262144</td>
<td>DIVPLN</td>
<td>DIVISION PLANNING PROCESS</td>
</tr>
<tr>
<td>19</td>
<td>524288</td>
<td>DORDER</td>
<td>DETAIL TEMPLATE ORDER PROCEDURE</td>
</tr>
<tr>
<td>20</td>
<td>1048576</td>
<td>HORIEN</td>
<td>HEX ORIENTATION UTILITY</td>
</tr>
<tr>
<td>21</td>
<td>2097152</td>
<td>RECOV</td>
<td>RECOVERY FROM SUPPRESSION EFFECTS</td>
</tr>
<tr>
<td>22</td>
<td>4194304</td>
<td>SCORMV</td>
<td>MOVEMENT SECTION, SPEED, AND PROCESS</td>
</tr>
<tr>
<td>23</td>
<td>8388608</td>
<td>DAMAGE</td>
<td>EQUIPMENT DAMAGE</td>
</tr>
<tr>
<td>24</td>
<td>16777216</td>
<td>EVALU8</td>
<td>SITUATION FEATURE AGGREGATION</td>
</tr>
<tr>
<td>25</td>
<td>33554432</td>
<td>RECSGO</td>
<td>RECEPTION OF SUPPLY REQUESTS</td>
</tr>
<tr>
<td>26</td>
<td>67108864</td>
<td>HXMOV</td>
<td>MOVEMENT WITHIN HEX TREE</td>
</tr>
<tr>
<td>27</td>
<td>12248288</td>
<td>ABCOPS</td>
<td>AIR BASE CLUSTER OPERATIONS</td>
</tr>
<tr>
<td>28</td>
<td>24496576</td>
<td>BDEACT</td>
<td>ENTITY OPERATIONS SUPERVISOR</td>
</tr>
<tr>
<td>29</td>
<td>48993152</td>
<td>GSARTY</td>
<td>GENERAL SUPPORT ARTILLERY AND GSARTS</td>
</tr>
<tr>
<td>30</td>
<td>97986304</td>
<td>RECARQ</td>
<td>RECEPTION OF AIR REQUESTS BY ABC</td>
</tr>
<tr>
<td>31</td>
<td>195972608</td>
<td>CREATE</td>
<td>ENTITY CREATION</td>
</tr>
<tr>
<td>32</td>
<td>391945216</td>
<td>PURGEN</td>
<td>ENTITY PURSE</td>
</tr>
<tr>
<td>33</td>
<td>783890432</td>
<td>GETTPU</td>
<td>GET TEMPLATE RELATION UNIT UTILITY</td>
</tr>
<tr>
<td>34</td>
<td>1567780864</td>
<td>TRANSA</td>
<td>TRANSFER ASSETS UTILITY</td>
</tr>
<tr>
<td>35</td>
<td>3135561728</td>
<td>EXTSUP</td>
<td>EXTERNAL SUPPLY ECHO</td>
</tr>
</tbody>
</table>
### OCTAL NUMBER:  EXAMPLE CFLAGS FOR ASSET

<table>
<thead>
<tr>
<th>FLAGS:</th>
<th>8 7 6 5 4 3 2 1 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDENTITY</td>
<td>1 1 1 1 1 1 1 1 1 1</td>
</tr>
<tr>
<td>VALUE ASSIGNED</td>
<td>0 0 0 1 0 1 0 0 1 1</td>
</tr>
<tr>
<td>DIGITS</td>
<td>0 0 0 1 0 1 0 0 1 1</td>
</tr>
<tr>
<td>COMPONENT VALUES</td>
<td>4 2 1 4 2 1 4 2 1 4</td>
</tr>
<tr>
<td>MULTIPLY VALUE</td>
<td>0 0 0 1 0 1 0 0 1 1</td>
</tr>
<tr>
<td>ADD COMPONENTS</td>
<td>0 0 0 4 0 1 0 0 1 1</td>
</tr>
<tr>
<td>FOR EACH DIGIT</td>
<td></td>
</tr>
<tr>
<td>TO GIVE OCTAL</td>
<td></td>
</tr>
<tr>
<td>NUMBER USED ON</td>
<td></td>
</tr>
<tr>
<td>INPUT</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 1. Octal Number Use**
B. RUN CONTROL AND DIAGNOSTIC FEATURES

The cards described here are at the start of each INWARS CIS input deck. They are omitted when the CIS input is used as part of the complete INWARS model input.

Card 1: Run Control

Inputs: ICON (A4) Input Control:
(colums 10-13) NEWb If new data input
OLDb If old data from ISPACE

Note: Use NEW for input processor, OLD for model

RCON (A4) Run Control:
(colums 14-17) RUNb If run division planning, then combat model
BDEb To run only the combat model, no division planning
(Blank) Input only

Note: Use RUN or BDE only for model, not input processor.

CYCLES (15) Specifies the number of combat cycles
(columns 19-23) for the model

EFLG (A4) Save Flag:
(columns 25-29) SAVE: At end of run, ISPACE is saved on device 9

Card 2: Echo Control

Format: 7X, 2A4

Inputs: ECH (A4) Echo Enable
(columns 8-11) YESb If input echo required
bNOb If no input echo desired

OPT (A4) Option Specification
(columns 12-15) ALLb For echo of all inputs
SRCH Search tables
NCRD Nuclear/chemical readiness data
ORST  ORS tables
OPDT  Operations data
TABS  Includes Search, N/C readiness, ORS, Operations, and Asset Data
HEXS  Hex data
ENTY  Entity data

Notes:
1. This card is omitted if "OLD" is specified for ICON on Card 1.
2. The option specification allows restriction of echo to only part of the input data.

Card 3: Dump Control
Format: 7X, A4
Input: DCON (A4) Input Diagnostic Control
(columns 6-19) YESb Activates diagnostic writes in GUBEDR, GETHX, GETHX2, GIMME subroutines
bNOb No diagnostics on input

Card 5: Model Run Diagnostic Control
Format: 3X, 012 (columns 4-15)
This octal number is a series of 36 flags which selectively enable various debug writes in the CIS software. Table 1 identifies the bits.

Card 6: Diagnostic Data Structure Dump Control
Format: 3X, 012 (columns 4-15)
This octal number is a series of 36 flags which govern the operation of the DSDUMP subroutine. This routine dumps selected data structure at the completion of the run. Table 2 identifies the bit.

Note: In the input descriptions, the smaller letter b indicates a blank in the A4 format.
<table>
<thead>
<tr>
<th>BIT</th>
<th>DECIMAL</th>
<th>USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>ENTITIES</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>OPERATION ORDERS (BIT 0 MUST ALSO BE ON)</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>HEXES AND OCCUPANCY BLOCKS</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>ASSET DESCRIPTORS</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>OPERATION DESCRIPTORS</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
<td>CONTINGENCY TABLE</td>
</tr>
<tr>
<td>6</td>
<td>64</td>
<td>SEARCH TABLES</td>
</tr>
<tr>
<td>7</td>
<td>128</td>
<td>TARGET LIST</td>
</tr>
<tr>
<td>8</td>
<td>256</td>
<td>OPERATION EFFECTS TABLE (BIT 4 MUST ALSO BE ON)</td>
</tr>
<tr>
<td>9</td>
<td>512</td>
<td>COMBAT EFFECTS TABLE</td>
</tr>
<tr>
<td>10</td>
<td>1024</td>
<td>ISPACE DUMP (USES SUBROUTINE FSDUMP)</td>
</tr>
<tr>
<td>11</td>
<td>2048</td>
<td>ORS TABLES (DOES NOT WORK)</td>
</tr>
<tr>
<td>12</td>
<td>4096</td>
<td>TYPE DESCRIPTOR BLOCKS</td>
</tr>
<tr>
<td>13</td>
<td>8192</td>
<td>NUCLEAR/CHEMICAL READINESS TABLES</td>
</tr>
<tr>
<td></td>
<td>16384</td>
<td>SUPPLY STRUCTURES (BIT 0 MUST ALSO BE ON)</td>
</tr>
</tbody>
</table>
NOTE - Failure to include the echo control card will cause the program to abort due to a fatal loader error.

C. INFORMATION DEGRADATION DATA

This data defines the extent to which information collected about enemy force elements is degraded by loss of qualitative information element or quantitative precision. Its role is described in the Modeling Description Volume IV, Chapter II. Information degradation is organized by side (NATO vs Warsaw Pact) and, within side, by 20 meter "range bands" around the collecting force element (10 such range bands are permitted). The Information Degradation Input Deck thus consists of 20 Degradation Data Sets, one for each side and range band. The organization of the deck is suggested in Figure 2.

This data is read only in the complete INWARS model version, and precedes all other inputs described in this volume. It is not read in the case of the test version of the combat interactive software. Thus, either the cards described in Section B or these cards are included depending on application.

Each Information Degradation Data Set consists of: (1) a set of flags indicating whether or not associated information element can be collected; and, (2) a set of measurement unit expressing the precision with which associated information elements can be collected. Each such data set is specified on a single card as will now be described.

Format Specification: 8I1, I2, 3I3, I6, 2I3.

Input Variables

DGNATF (II) = Flag indicating whether or not Nationality (Column 1) information is degraded (1 = degraded)
DGSVCF (II) = Flag indicating whether or not source information (i.e., air versus ground) is degraded (1 = degraded)
Figure 2. Information Degradation Input Deck
DGTYPE (II) = Flag indicating whether or not type information (e.g., combat versus combat support) is degraded (1 = degraded)

DGFCNF (II) = Flag indicating whether or not Function information is degraded (1 = degraded; not used at present).

DGNRYF (II) = Flag indicating whether or not nuclear readiness information is degraded (1 = degraded)

DGCRYF (II) = Flag indicating whether or not Chemical Readiness information is degraded (1 = degraded).

DGMSNF (II) = Flag indicating whether or not mission information is degraded (1 = degraded).

DGOPNF (II) = Flag indicating whether or not Operation information is degraded (1 = degraded).

LOCDEG (I2) = Hex level to which Location information can be known (0-6)

AXDEG (I3) = Nearest number of degrees to which axis of operation information can be known (0-360 degrees)

SECDEG (I3) = Nearest number of kilometers to which Sector information can be known (0-51 kilometers)

SPDDEG (I3) = Nearest number of kilometers/hour to which Speed information can be known (0-128 km/hour)

STRDEG (I6) = Nearest number of standard strength unit (e.g., tank equivalents, etc.) to which Strength information can be known (0-262K strength units)

CAPDEG (I3) = Nearest number of suppression index units to which Capability/Suppression information can be known (0-512 suppression index units)

ACQDEG (I3) = Fraction of a large scale unit which may be "acquired" for targeting purposes (0-100 percentage points)
D. TERRAIN EFFECTS AND SEARCH DATA

1. Terrain Effects Data

Immediately preceding the search pattern data are three cards which allow the user to specify terrain effects on speed, cover, and obscuration respectively. The first eight values on each card is for terrain types zero to seven. The remaining five are for the two types of artificial barrier hexes, rivers, and the two types of barrier hex sides. These last five values are omitted on the last card (obscuration).

a. Card 1: Terrain speed effects

FORMAT: 1315
TERSPD (I)  
I=1, 13  
(columns 1-5, 6-10, a maximum value of 64 is used to give complete degradation.)

b. Card 2: Terrain cover effects

FORMAT: 1315
TERTAB (I)  
I=1, 13  
(columns 1-5, 6-10, get acquisition (LOS) to some target for the average weapon, for each type of terrain. The value for the basic terrain type in a given hex. This factor is intended to give the ability of targets to take advantage of micro terrain cover in the hex.)

c. Card 3: Terrain Obscuration

FORMAT: 1315
MVALU (I)  
I=1, 13  
(columns 1-5, 6-10, and forest. The effect depends on the disposition of the unit. The value for...
a terrain type is the minimum exponent to which the disposition is raised to give the proportion of effective weapons. This is applied to direct five weapons. The maximum exponent is a reflection of the range capability of the weapon. Use zero for artillery and other indirect fire weapons.

2. **Search Patterns:**

The data which described the search patterns is organized by search class and sector width. The initial card gives the number of search classes. Each class is headed by a card giving the number of search patterns in that class. The actual cards which define the search pattern follow, headed by a card specifying the number of search vectors in the pattern and the sector width. The Search Data Deck is illustrated in Figure 3.

3. **Search Deck Header Card**

Format Specification: 10X, I5

Input Variable: NSRCHS(I5) = Number of search classes

(COLUMNS 11-15)

4. **Search Class Header Card**

Format Specification: I5

Input Variable: NSRCS(I5) = Number of search patterns in class

(COLUMNS 1-5)

5. **Search Pattern Header Card**

Format Specification: 3I5

Input Variables:

NHEXES(I5) = Number of hex vectors in search

(COLUMNS 1-5)

SECTOR(I5) = Sector width for which this search pattern is

(COLUMNS 6-10) defined
Figure 3. Search Data Deck
TGTLM(I5) = Number of target units which can be simultaneously acquired or engaged by a unit using this search pattern. If zero, there is no limit.

6. Search Data Cards
Format Specification: 2X, 03, 3I5, 4F5.2, 2(4X, 01), 2X, 03

Input Variables:

HSVECT(03) = Search vector (in hex, value ≥ 0)
(Column 3-5)

HXLEV(I5) = Level of search above base level
(Column 6-10)

RANGE(I5) = Range of search from searching unit (zero for hexes occupied by the unit).
(Column 11-15)

FLNDX(I5) = Flank index indicating side
(Column 16-20)

1 = left flank
2 = right flank
0 = no flank effects.

COEF1(F5.2) = Threat coefficient for enemy force in hex.
(Column 21-25)

Normal value is one for vector 7.

COEF2(F5.2) = Flank threat coefficient for enemy force in hex. Normal value is one for vectors 2 or 4.
(Column 26-30)

COEF3(F5.2) = Allocation factor against enemy units in the hex. Normal value is one for vector 7.
(Column 31-35)

COEF4(F5.2) = Force distribution fraction. All COEF4 factors in the search pattern should sum to one; COEF4 should be zero if RANGE > 0.
(Column 36-40)

DIR1 (01) = Direction for which threat evaluation is doubled.
(Column 45)

DIR2 (01) = Direction for which flank evaluation is doubled.
(Column 50)

ENGFGS(O3) = Engagement mode flags: A binary bit is set
Figure 4. Entity Type Descriptor Deck
(Columns 53-55) in this octal field to indicate which engagement modes the searching unit may use to engage targets in the hex. These flags are:

<table>
<thead>
<tr>
<th>Bit (lsb)</th>
<th>Engagement Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Counter-Command/Control</td>
</tr>
<tr>
<td>1</td>
<td>Indirect Fire</td>
</tr>
<tr>
<td>2</td>
<td>Direct Fire</td>
</tr>
<tr>
<td>3</td>
<td>Anti-Air Defense</td>
</tr>
<tr>
<td>4</td>
<td>Anti-Air</td>
</tr>
<tr>
<td>5</td>
<td>Counter Fire</td>
</tr>
<tr>
<td>6</td>
<td>Counter Logistics</td>
</tr>
<tr>
<td>7-8</td>
<td>Unassigned</td>
</tr>
</tbody>
</table>

7. **Notes on Input Data Limits, Effects, and Anomalies**
   All input data elements having a floating point format must have values between 0 and 7.99. Negative numbers or blank entries for any of the variables will cause errors or model failure during execution. A zero value should not be used for HSVECT; a value of 7 is used for the "own hex" search. A value of zero for DIR1 or DIR2 will nullify the direction of movement considerations. A zero for FLNDX causes flank considerations to be nulled. FLNDX should be less than 3.

E. **ENTITY TYPE DESCRIPTOR DATA**

The type descriptor data is commonly used by all entities of a given type. The types of entities thus distinguished can be given different operations classes, nuclear readiness posture effects, and different Operation Reaction System tables. Figure 4 illustrates the makeup of this input deck.

1. **Entity Type Deck Header**
   Format Specification: 10X, I5
   Input Variable: NTYPES(I5) = Number of entity types
   (Columns 11-15)
2. **Type Descriptor Data Cards**

Format Specification: I5, 4X, A6, 3X, O2, 1X, O4, 2(2X, O3), 4X, O1, I5

Input Variables:

- **TYPE(I5)** = Type index (1 to 31) (Columns 1-5)
- **NAME(A6)** = Alpha description of specified type (Columns 10-15)
- **UNICAT(02)** = Unit category used in C2I processing. (Columns 19-20) (Not used by supply).
- **TFLAGS(04)** = Type flags as follows: (Columns 22-25)

<table>
<thead>
<tr>
<th>Bit</th>
<th>Identity</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1sb) 0-4</td>
<td>- Undefined</td>
</tr>
<tr>
<td>5</td>
<td>FLGMVC Move consideration:</td>
</tr>
<tr>
<td></td>
<td>0 = normal method</td>
</tr>
<tr>
<td></td>
<td>1 = direction to objective only</td>
</tr>
<tr>
<td>6</td>
<td>FLGTER Terrain effects. If zero, unit gets no terrain cover benefit during combat processes.</td>
</tr>
<tr>
<td>7</td>
<td>FLGSL Shoots last on interim combat during multi-hex movement</td>
</tr>
<tr>
<td>8</td>
<td>FLGSF Shoots first on interim combat during multi-hex movement</td>
</tr>
<tr>
<td>9</td>
<td>- Undefined</td>
</tr>
<tr>
<td>10</td>
<td>FLGMCB Indicates combat during movement on hex moves</td>
</tr>
<tr>
<td>(msb) 11</td>
<td>FLGMCR Indicate unit receives fire during multiple hex moves</td>
</tr>
</tbody>
</table>

**UNENGR(03)** Unit engagement rule flags: A flag is set for each engagement made which the entity may employ:
<table>
<thead>
<tr>
<th>Bit</th>
<th>Engagement Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1sb)</td>
<td>0 Counter-Command/Control</td>
</tr>
<tr>
<td></td>
<td>1 Indirect Fire</td>
</tr>
<tr>
<td></td>
<td>2 Direct Fire</td>
</tr>
<tr>
<td></td>
<td>3 Anti-Air Defense</td>
</tr>
<tr>
<td></td>
<td>4 Anti-Air</td>
</tr>
<tr>
<td></td>
<td>5 Counter Fire</td>
</tr>
<tr>
<td></td>
<td>6 Counter-logistics</td>
</tr>
<tr>
<td>7-8</td>
<td>Unassigned</td>
</tr>
</tbody>
</table>

**UNVULR(03)**

Unit vulnerability rule flags: These flags indicate the engagement modes by which an entity of this type may be engaged. The bit definitions correspond to those listed for UNENGR above.

**FLNTEL(01)**

Flags available for the control of intelligence acquisition process. (Unused).

**TGTCAT(I5)**

Target Category and Unit Category for C²I purposes. Assigned from list below. These are inserted into the data structure elements which are also defined as STKLOC and STKTR.

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>TGCAT</th>
<th>UNICAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EAD HQ</td>
<td>2</td>
<td>23</td>
</tr>
<tr>
<td>2</td>
<td>DIV HQ</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>LOG</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>5</td>
<td>N/C DELIV</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>ABC</td>
<td>4</td>
<td>41</td>
</tr>
<tr>
<td>7</td>
<td>AMP</td>
<td>0</td>
<td>33</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
STKSUP, STKOPS  Stock levels for intelligence acquisition by an
entity of this type. (Value = 0 to 511)
(Columns 61-65, 66-70)
Not used.
SRCTYP(I5)  Identifies the type of search/perception pattern
(Columns 71-75)
used by the unit. If it is zero, the search/
perception pattern is a function of operation.
NTELEV(I5)  Indicates the proportion of the perception of
(Columns 76-80)
the situation that depends on subordinate
unit reports (for division HQ only).

3. Unit Type Limits
These six cards are used to define the type numbers associated
with units which undergo special processing. On each card is a maximum and
minimum type number which will result in recognition as a unit at that
type.

1) Card 1: Echelon Above Division Types:
FORMAT: 215
EADTYP, EADTYH  EAD unit types. Both values must be 1.
(columns 1-5, 6-10,
2) Card 2: Division Headquarters types:
FORMAT: 215
TDIVHQ, TDIVHH  Division headquarters types. Both
(columns 1-5, 6-10) values must be 2.
3) Card 3: Maneuver Unit types
FORMAT: 215
GNDMV, GNDMVH  Ground maneuver unit types. Both values
(columns 1-5, 6-10) normally 3.
4) Card 4: Logistics Unit Types
FORMAT: 215
TLOG, TLOGH  Logistics unit types. Both values
(columns 1-5, 6-10) normally 4
5) Card 5: Airbase Cluster Types
FORMAT: 215
THE BDM CORPORATION

TABC, TABCH    ABC unit types. Both values normally 6 (columns 1-5, 6-10)

6) Card 6: Nuclear/Chemical Delivery Entities
FORMAT: 215
TNCDE, TNCDEH  N/C Delivery Entity types. Both (columns 1-5, 6-10) normally 5

F. WEAPON/ASSET CHARACTERISTICS DATA - (INTABS)

This data defines the characteristics of all the various assets which may be attached to entities in the model. This information is stored in the Asset Descriptor Blocks and associated combat effects tables. Section 3 of "INWARS Combat Interactions Data Structures" provides additional information.

The Input Deck includes a header card which specifies the number of different assets which will be defined, the number of target types, and the resolution to be used for each target type. This is followed by a series of card sets describing each asset. Figure 5 illustrates.

1. Asset Data Header Card
Format Specification: 10X, 215, 10F6.2/20X, 10F6.2
Input Variables:

NASSET(I5)   Number of assets described
(Columns 11-15)
NTGTYP(I5)   Number of target types
(Columns 16-20)
TGTRAD(I)(F6.2) Array which gives the resolution used for each target type. For example, .25 indicates that each 4 integer steps is one individual. Note that there is a limit on the maximum integer value which can be put in the asset list. Thus, if the maximum integer value is 511 (as it is for 2 or 3 assets per asset item structure),
Figure 5. Asset Data
and if a unit may have up to, but no more than, 127 tanks, then tanks must have a target class with a value TGTRAD of .25 or greater.

Note that for NTGTYP \( \geq 10 \), two cards are used. Provision is made for 20 target types.

2. **Asset Descriptor Basic Data**

This data is on a series of cards which will be listed separately.

a. **Card 1**

Format Specification: \( I5, 4X, A6, 2I5, 2X, 03, I5, 2(2X, 03), 5I5 \)

Variable Inputs:

- **TYPE(I5)** Asset type identifier (1 to ASTYPM). The maximum value allowed depends on the form of the asset list and is put in as the variable ASTYPM during compilation. Normally it will be 511 for INWARS.

Reserved types:

- 60 = Supply capacity
- 61 = Repair capacity
- 59 = Supplies
- 63 = Air base capacity

- **NAME(A6)** Alpha description of asset.

This gives the category of which the asset type is a member. Typical categories might be for tanks, APC’s, suppliers, etc. This value must be less than 63. The classes may be assigned as equal to target type (defined later) as the simplest alternative.

- **NXOPS(I5)** This operations index specified the class of operations for which this asset can act as a weapon. A zero indicates it may
act as a weapon regardless of the operation class of the unit to which it is attached. NXOPS must be 7 or less, but may be no greater than the number of classes for which data is provided.

CFLAGS(03) These flags define certain asset characteristics as follows:

<table>
<thead>
<tr>
<th>Bit</th>
<th>Identity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (lsb)</td>
<td>FLGTER</td>
<td>Terrain Flag: If 1, indicates that the weapon is affected by terrain.</td>
</tr>
<tr>
<td>1</td>
<td>FLGMVR</td>
<td>Indicates that combat results are reduced if a target unit is moving faster than 1 hex per interval, reducing engagement time.</td>
</tr>
<tr>
<td>2</td>
<td>FLGSCN</td>
<td>Indicates target list scan direction. 0 for all except counter-air weapons.</td>
</tr>
<tr>
<td>3</td>
<td>FLGNUK</td>
<td>Nuclear weapon</td>
</tr>
<tr>
<td>4</td>
<td>FLGCHM</td>
<td>Chemical weapon</td>
</tr>
<tr>
<td>5</td>
<td>FLGWPN</td>
<td>Indicates the asset is a weapon.</td>
</tr>
<tr>
<td>6</td>
<td>FLGAES</td>
<td>Indicates supply consumption depends on suppression as well as attrition.</td>
</tr>
<tr>
<td>7, 8</td>
<td>Undefined</td>
<td></td>
</tr>
</tbody>
</table>

NTGTS(15) This indicates the number of target types for which combat parameters are defined. Values are given for types one to NTGTS, even though a weapon may be unable to engage one of those types. NTGTS must be no greater than the number of target classes.

WPENGR(03) Weapon engagement mode flags. These indicate the manner in which a weapon may be used. For a weapon to be used, there must be a corresponding bit set in its
unit, the operation engagement mode flags, and the vulnerability flags of the target unit and asset.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Engagement Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Counter-command/Control</td>
</tr>
<tr>
<td>1</td>
<td>Indirect Fire</td>
</tr>
<tr>
<td>2</td>
<td>Direct Fire</td>
</tr>
<tr>
<td>3</td>
<td>Anti-Air Defense</td>
</tr>
<tr>
<td>4</td>
<td>Anti-Aircraft</td>
</tr>
<tr>
<td>5</td>
<td>Counterfire</td>
</tr>
<tr>
<td>6</td>
<td>Anti-Logistics</td>
</tr>
<tr>
<td>7, 8</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

WPVULR(03) Asset vulnerability flags. These indicate the engagement modes by which the asset may be engaged. The flags correspond to those for WPENGR above.

RANGE(I5) Range of the asset in hexes. (Zero for direct fire weapons in INWARS.)

TGTTYP(I5) Target type - Identifies the target class to which this asset belongs.

The target types currently in use are:

1. Hard targets (tanks)
2. Medium armor (APCs)
3. Unarmored or light armor
4. Artillery
5. Air defense
6. Helicopters
7. Aircraft
8. Supply and Logistics
9. Nuclear and Chemical weapons

RNGFAC(I5) This value gives a percentage effectiveness modification which is applied to any engagements at range other than zero. It is
percent with a value of 100 causing no modification. The maximum value allowed is 799.

**EFFNDX(I5)**
(Column 61-65)

This effectiveness index gives the relative contribution of this asset to unit strength and effectiveness. It must be chosen so that the total strength of a unit is no more than the integer value 511. This is the weighting factor $W_i$ in the strength evaluation formula:

$$NASSET = \sum W_i N_i$$

where $STR = \text{unit strength (} \leq 511 \text{ limit)}$

$N = \text{integer number of assets of type } i \text{ in unit (actual number of assets divided by the value in TGTRAD for its target type)}$

**NTABS(I5)**
(Column 66-70)

Number of tables. This value, 0 to 3, specifies the number of tables associated with the asset. If zero, then there are no combat effects tables. If NTABS is 1, the weapon inflicts attrition only, in accordance with an attrition table. If NTABS is 2, a suppression effects table is also used. If NTABS is 3, then attrition, suppression, and allocation tables are used.

**Card 2**
Format Specification: 8I5

Variable Inputs:

**MVULN (I-5)**
Marginal vulnerability of the asset to
attrition, compared to others of the same target class. In percent, with a value of 100 normal.

SVULN (I5) Marginal suppression vulnerability (similar to MVULN).

NVULN (I5) Marginal vulnerability to nuclear weapons effects.

CVULN (I5) Marginal vulnerability to chemical weapons effects.

NUCEFF (I5) Nuclear readiness effect, indicates the extent to which the nuclear readiness posture modifies the effects of enemy nuclear attack on the asset.

CHMEFF (I5) As NUCEFF, but for chemical attack.

NCEFF (I5) Nuclear/Chemical readiness degradation effect; indicates the extent to which the weapon's capabilities are degraded by the readiness state.

SRECOV (I5) Suppression recovery rate; specifies the amount or percentage of suppression on the asset which decays away each interval.

Note: All of the above are in units of % with a value of 100 "normal" (except for SRECOV, 100 implies complete recovery). All variables must be less than 799.

c. Card 3
Format Specification: 6I5, 3X, 012
Variable Inputs:
TEREFF(I5) Terrain effects index. Indicates the extent to which the asset can take advantage of terrain for cover. Normally 100 (in percent). Maximum value is 799.

TEREFS(I5) Target terrain utilization modifier.
(Columns 6-10) This percentage value modifies the target asset's value of TEREFF. Use 100 for null modification, zero if the target gets no terrain benefit. Maximum value is 799.

WPEXP(I5) Weapon exponent. The combat effects a weapon inflicts is proportional to the number of weapons raised to this power. It is in 100ths, so that a value of 100 is the normal "one" exponent. This would be less than one for certain cases only (such as nuclear and chemical weapons) where effects are very nonlinear.

WPDISF(I5) This disposition factor is the extent to which the disposition of the unit affects the number of weapons actually able to fire. The unit disposition is raised to the WPDISF power to obtain a combat modification factor. Maximum value is 63.

APROP(I5) This specifies the proportion of allocation of fire which is based on attrition rather than suppression. It should be between 0 and 100.

SPEED(I5) Maximum speed of the asset in idealized (or best normal) conditions. In units of km/hr.

SITUAT(O12) This data element is a set of situation flags which are OR'ed into the situation description word of a unit being attacked. It is primarily used to indicate immediate victim of a chemical, nuclear, or air attack for which it is set to 4000, 10000, or 1000000 octal respectively.
d. **Card 4**

Format Specification: 8I5

**Input Variables:**

**SUPTYP(I5)**

Supply type. This is the asset type of an ammunition asset which is expended during combat. It if is zero or the unit has no asset item labeled with this type, supply effects are neglected.

**SUPRAT(I5)**

Supply expenditure rate. This is the amount of supplies expended per suppression or attrition unit inflicted. The value is in units of 1/100ths and must take into account the integer values of the targets.

**SUPLEV(I5)**

This is the supply asset level at which the asset becomes degraded in units of integer values of the supply asset.

**SUPDEG(I5)**

Supply degradation factor. When the supply level is below that specified by the quantity SUPLEV, the unit degradation is proportional to the percentage shortfall multiplied by this factor. If it is 100, degradation is proportional to the shortage. Maximum value is 799. If zero, there is no degradation.

**DEPTPI(I5)**

Dependent target type 1. This value, if nonzero, specifies another type of asset which is to suffer combat results in association with the primary (direct) target asset. This would normally be used for supplies, personnel, or nuclear devices.

**DEPRTI(I5)**

Dependent target rate for DEPTPI. This
value is a scaling factor for combat results. The attrition and suppression inflicted on the dependent type are computed from the combat results on the primary target asset by multiplying by this factor. It is given in percent so that a value of 100 causes equal results. Maximum value is 799.

DETP2(I5) Similar to DEPTYP1. Allows a second dependent target type to be specified.

DEPRT2(I5) Dependent target rate for DETP2.

Format Specification: 8I5

Input Variables:

NCTLEV(I5) Nuclear/chemical contamination level. If the weapon is nuclear or chemical, this gives the level of contamination to be inserted into the terrain.

COLLAT(I5) This value is a multiplier used in computing collateral damage. It is multiplied by the population density figure for the hex attacked.

RADIAT(I5) The application of these variables has not yet been defined.

CHEMIK(I5)

EXTRA1(I5) Tons per unit

EXTRA2(I5) Type of damaged equipment (zero if no damage)

EXTRA3(I5) Type of repaired equipment (zero if no repair)
EXTRA4(I5) Proportion damaged during attrition or repairable per cycle (depending on which of EXTRA2 or EXTRA3 is non zero).

3. Allocation Data Cards (Target Tables) (Weapon Effects Tables)

Format Specification: 9F7.2

Input Variables:
VALUE(J)(F7.2) Fire allocation factor for target J up (Columns 1-7, to a maximum of J = 9.
8-14, 15-21,
22-28, etc.)

Note: The weapons effects data follows the basic asset descriptor data. It includes up to three tables: attrition, suppression, and allocation. The number of tables read is given by NTABS, and the number of values in each table by NTGTS, both specified on card 1. All tables use a format as follows: 9F7.2. (If there are more than 9 target types, multiple cards are read for each table as necessary.)

a. Attrition
   The attrition table gives theoretical kill rates against each of the respective target classes from 1 to NTGTS. This is the number of kills per time interval. Adjustments for target representation are made after input by the input processor.

b. Suppression
   This table is similar to that of the attrition table, except the result is suppression of the target asset and its unit.

c. Allocation
   This table gives allocation factors for the various classes of targets if used.

G. NUCLEAR/CHEMICAL READINESS TABLES

This data defines the impact of Nuclear/Chemical readiness states on the various model processes. This information is stored in the NCREL data structure and is accessed through the TYPELEM and TYPBLK data structures.
Section G of "INWARS Combat Interactions Data Structures" provides additional information.

The input deck includes a header card which specifies the number of readiness tables to be input. Each table is specified by an input data set consisting of three (3) card types. Figure 6 illustrates a two (2) table nuclear/chemical readiness input deck.

1. **Nuclear/Chemical Header Card**
   Format Specification: 10X, I5
   Input Variable:
   \[
   \text{NNCSTS}(I5) \quad \text{Number of sets of nuclear/chemical readiness tables. (Columns 11-15)}
   \]

2. **Applicable Unit Types Card**
   Format Specification: 8I5
   Input Variables:
   \[
   \text{NTYP}(1)(I5) \quad \text{First unit type to which nuclear/chemical readiness tables apply. (Columns 1-5)}
   \]
   \[
   \text{NTYP}(2)(I5) \quad \text{Second unit type to which nuclear/chemical readiness tables apply.}
   \]
   \[
   \text{NTYP}(8)(I5) \quad \text{Last unit type to which nuclear/chemical readiness tables apply. (Columns 36-40)}
   \]
   Note: Up to eight (8) unit types may be specified for each set of nuclear/chemical readiness tables. However, as few as one (1) unit type is sufficient to drive the program without loader errors.

3. **Nuclear/Chemical States Card**
   Format Specification: 2I5
   Input Variables:
   \[
   \text{NNUCST}(I5) \quad \text{Number of nuclear readiness states. (Columns 1-5)}
   \]
   \[
   \text{NCHMST}(I5) \quad \text{Number of chemical readiness states. (Columns 6-10)}
   \]

4. **Nuclear/Chemical Effects Card**
   Format Specification: 6F7.3, 3X, 012
Section G of "INWARS Combat Interactions Data Structures" provides additional information.

The input deck includes a header card which specifies the number of readiness tables to be input. Each table is specified by an input data set consisting of three (3) card types. Figure 6 illustrates a two (2) table nuclear/chemical readiness input deck.

1. **Nuclear/Chemical Header Card**
   Format Specification: 10X, I5
   Input Variable:
   
   NNCSTS(I5) Number of sets of nuclear/chemical readiness tables.
   (Columns 11-15)

2. **Applicable Unit Types Card**
   Format Specification: 8I5
   Input Variables:
   
   NTYP(1)(I5) First unit type to which nuclear/chemical readiness tables apply.
   (Columns 1-5)
   NTYP(2)(I5) Second unit type to which nuclear/chemical readiness tables apply.
   .
   NTYP(8)(I5) Last unit type to which nuclear/chemical readiness tables apply.
   (Columns 36-40)

   Note: Up to eight (8) unit types may be specified for each set of nuclear/chemical readiness tables. However, as few as one (1) unit type is sufficient to drive the program without loader errors.

3. **Nuclear/Chemical States Card**
   Format Specification: 2I5
   Input Variables:
   
   NNUCST(I5) Number of nuclear readiness states.
   (Columns 1-5)
   NCHMST(I5) Number of chemical readiness states.
   (Columns 6-10)

4. **Nuclear/Chemical Effects Card**
   Format Specification: 6F7.3, 3X, 012
Figure 6. Table Nuclear/Chemical Readiness Input Deck
Input Variables:

**DISPOS(F7.3)** (Columns 1-7)

Change in disposition of the unit due to the nuclear/chemical readiness posture.

1.0 = no effect on disposition. This value is multiplied by the operation's determined disposition to find the actual disposition.

**DEGRAD(F7.3)** (Columns 8-14)

Degradation in effectiveness of the unit. Affects movement as well as the attrition and suppression mechanism.

1.0 = no effect.

**NVULN(F7.3)** (Columns 15-21)

Nuclear vulnerability factor applied to attrition and suppression inflicted on a unit by nuclear weapons.

1.0 = no effect.

**CVULN(F7.3)** (Columns 22-28)

Same as NVULN but for chemical weapons.

**DECONT(F7.3)** (Columns 29-35)

Decontamination rate factor. (Not implemented.)

**COMMS(F7.3)** (Columns 36-42)

Communications effect factor. (Not implemented) 1.0 = no effect.

**ORFLGS(012)** (Columns 46-58)

ORS - Operation Reaction System flags. Indicates to decision making process the nuclear/chemical status. (Also referred to as BGFLGS.)

Note: The number of nuc/chem effects cards will be equal to the number of nuclear readiness states times the number of chemical readiness states (NNVCST * NCHMST)

H. OPERATION REACTION SYSTEM TABLES

This series of input tables defines the operation reaction tables for specified unit types. These tables are loaded into the basic descriptor block data structure BGSELM which identifies the unit of operational
behavior. This structure is accessed through the array BGSARY which is indexed by the BGSID field found in the ORDELM data descriptor blocks. Additional information is provided in Section 8 of "INWARS Combat Interactions Data Structures.

The input deck includes a header card which specifies the number of operation reaction systems used in the simulation. Input for each ORS must include a situation code card, situation cards, an action card, action code cards, an ORS parameter card, action table cards, output table cards, and mission transition table cards. This deck structure is illustrated in Figure 7.

1. **ORS Header Card**
   Format Specification: 10X, I5
   Input Variable:
   \[ \text{NBGST(I5)} \quad \text{Number of the Operation Reaction Systems} \]
   \[ \text{(Columns 11-15)} \quad \text{to be input. Each of these systems} \]
   \[ \text{Max} = 8 \quad \text{requires all of the following cards.} \]

2. **Situation Parameter Cards**
   Format Specification: I3, 1X, A6, I2, I3, I5, 2I2, 3X, 012, I3, I2, 012/2(3X, 012)
   Input Variables:
   \[ \text{NXBGS(I3)} \quad \text{Number of the Operation Reaction System} \]
   \[ \text{(Columns 1-3)} \quad \text{data set which follows. This value should} \]
   \[ \text{be numbered consecutively beginning with} \]
   \[ \text{the first ORS data set entered as 1.} \]
   \[ \text{NAME(A6)} \quad \text{Name of the Operation Reaction System} \]
   \[ \text{(Columns 5-1C)} \quad \text{which follows. This name should be des-} \]
   \[ \text{criptive of the actual function of the} \]
   \[ \text{ORS. For example, an ORS for ground com} \]
   \[ \text{bat units might be named GROUND.} \]
   \[ \text{NXOPS(I2)} \quad \text{An index which identifies the set of} \]
   \[ \text{(Columns 11,12)} \quad \text{operation descriptor blocks used in con-} \]
   \[ \text{junction with this ORS.} \]
Figure 7. Operation Reaction System Deck
The number of situations which are used in the ORS. (Columns 13-15)

Determines size of situation table. Total number of entries = $2^n$ where $n$ is the number of situation components. Used in conjunction with NTRYPW. (512 or 64) (Columns 16-20)

Specifies the number of the situation table entries per word in the situation table. Max = 20. (Columns 21,22)

Number of words per line during entry of the situation code tables. Normally the same as NTRYPW. (Columns 23,24)

Word containing flags which indicate the situation components used by the ORS. The number of bits set to one must correspond to the value in NENTRI. (Columns 29-40)

Number of cards in following situation tables (EQ # situation cards). (Columns 41-43)

Flag indicates if the order element corresponding to this ORS should be at the top of the list. (Necessary for the combat specification.) (Columns 44,45)

Indicates situation flags which are cleared each cycle. Other flags are cleared less often. A bit is set for each flag which is not cleared. (Columns 49-60)

Situation message up. This field specified those flags which are used to send information to the unit's commander. If any flag is set both in this field and in the unit's current situation word, the flag will also be set in the unit's commander's situation word. (Columns 4-15)
Situation message down. This field, similar in function to SMSGUP, is used to relay situation information to subordinate units. Flags are set in all subordinates if there is a corresponding flag set both in this field and in the unit's situation word.

The flags which are identified in the fields SITPAT, FLGCLR, SMSGUP, and SMSGDN are as follows:

<table>
<thead>
<tr>
<th>Bit</th>
<th>Identity</th>
<th>Indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (lsb)</td>
<td>FLGFR1</td>
<td>Dangerous force ratio</td>
</tr>
<tr>
<td>1</td>
<td>FLGFR</td>
<td>Normal force ratio</td>
</tr>
<tr>
<td>2</td>
<td>FLGFR</td>
<td>Normal force ratio</td>
</tr>
<tr>
<td>3</td>
<td>FLGPN</td>
<td>Enemy penetration</td>
</tr>
<tr>
<td>4</td>
<td>FLGFR</td>
<td>Normal force ratio</td>
</tr>
<tr>
<td>5</td>
<td>FLGADJ</td>
<td>Enemy unit within search pattern</td>
</tr>
<tr>
<td>6</td>
<td>FLGHEX</td>
<td>Enemy unit in same hex</td>
</tr>
<tr>
<td>7</td>
<td>FLGFLK</td>
<td>Flank threat</td>
</tr>
<tr>
<td>8</td>
<td>FLGMGTG</td>
<td>Meeting engagement condition</td>
</tr>
<tr>
<td>9</td>
<td>FLGOBJ</td>
<td>At objective</td>
</tr>
<tr>
<td>10</td>
<td>FLGSU1</td>
<td>Supply replenishment required</td>
</tr>
<tr>
<td>11</td>
<td>FLGSUP</td>
<td>Supplies degrading capabilities</td>
</tr>
</tbody>
</table>
| 12 | NXEFF1 | μνψεχνενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενενε

37
Definition of these flags depends on the construction of roles and operations and will vary with echelon and operation.

3. **C²I Operation Equivalence Card**
   The Command Control and Intelligence processes send down orders which have broad mission codes which do not generally correspond directly to these in the unit receiving the order. This card gives a mapping from the C²I mission codes into those of the particular ORS.
   
   
   Input Variables:
   - **NMCDSD(I5)** (Columns 1-5) Number of Codes: This gives the number of C²I mission codes, and hence the number of additional entries on this card.
   - **VALUE(I3)** (Columns 6-8, 9-11, 12-14, etc) For each of the C²I mission codes, the input VALUE; gives the translation of that mission for this particular ORS.

3. **Situation Code Cards**
   Format Specification: 2X, 03, 2013
   
   Input Variables:
   - **WRDNDX(03)** (Columns 3-5) Word index. Indicates word position from top of situation table. Allows words with "don't care" entries to be omitted.
   - **VALUE(J)(I3)** (Columns 6-8, 9-11, 12-14, etc) Situation codes used to convert the field of situation bits into a single code which identifies a class of situations which cause a similar response. Maximum value of J is given by NTR YPW on a previous card.

5. **Action Parameter Card**
   Format Specification: 10X, I5
Input Variables:
NACTNI(I5) Number of action code cards which follow.

(Columns 11-15)

6. **Action Code Cards**

Format Specification: 2I3, 1X, 02, 1X, 02, 2X, 01, 2X, 03, 2X, 03, 1X, 01, 3I3, 2X, 012, 3X, 012, 3X, 012

Input Variables:
SITCOD(I3) Situation code which is put into the contingency pointer to the old order if a push occurs.

(COLUMNS 1-3)

CONID(I3) Contingency code which is put in the contingency pointer of the new order during a "push."

(COLUMNS 4-6)

NEWOBJ(02) Hex number which specifies (if nonzero) a new objective for the unit. The current objective is replaced by the hex vector given by NEWOBJ added to the unit's current hex location given in the unit scoreboard as HEXLOC.

(COLUMNS 8,9)

LEVFLG(02) This field, if nonzero, will cause redefinition of the hex levels at which the unit is represented in the hex tree. It is composed of six bits each representing a hex level.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Level</th>
<th>Diameter (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1sb</td>
<td>9.5</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>66</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>175</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>463</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>1225</td>
</tr>
</tbody>
</table>

HEXLEV(01) Hex level. This field indicates a change
(Column 15) to a different hex level if other than 7, with the value giving the level as listed above.

FLAGS(03) This field is composed of a series of flags as follows:

<table>
<thead>
<tr>
<th>Bit</th>
<th>Identity</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>FLGMOV</td>
<td>Causes move reconsideration.</td>
</tr>
<tr>
<td>1</td>
<td>FLGROB</td>
<td>Causes the operation order objective to be saved in relative form when a stack push is executed.</td>
</tr>
<tr>
<td>2</td>
<td>FLGPSH</td>
<td>Causes a stack push.</td>
</tr>
<tr>
<td>3</td>
<td>FLGPLN</td>
<td>Causes a headquarters unit to plan.</td>
</tr>
<tr>
<td>4</td>
<td>FLGXUN</td>
<td>Causes unit elimination. Unit is purged from model.</td>
</tr>
<tr>
<td>5</td>
<td>FLGOBJ</td>
<td>Indicates which type of objective is to be used.</td>
</tr>
<tr>
<td></td>
<td>0 = hex objective</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 = unit relative objective</td>
<td></td>
</tr>
</tbody>
</table>

(See Section G7)

REQSTS(03) This field is used to indicate requests.

| (Columns 23-25) Each digit gives the request priority level for GS artillery, air support, and logistics respectively. The request levels are: |
| Ø - no request |
| 1 - target of opportunity |
| 2 - normal support |
| 3 - high priority requirement |

ASTCOD(01) Assist code. Not yet implemented.

(Column 27)
REASGN(I3) (Columns 28-30) Reassignment to a different role - not implemented.

TEMPLU(I3) (Columns 31-33) If nonzero, this initiates creation of a new unit, subordinate to the unit for which the ORS is operating. This field gives the template number of the new unit. If this is the case, the objective fields and flags are used to specify the new unit's op order, rather than their normal purpose.

UNITNX(I3) (Columns 34-36) If FLGOBJ is set to 1, a unit oriented objective is specified. This field gives the relationship of the unit.
0 = parent unit
4 = sibling, air base cluster
5 = sibling, service support others TBD

SITUAT(012) (Columns 39-50) This is a field of situation flags which is OR'ed into the unit's situation word. See Section 2F2 for flag identity.

SMSGUP(012) (Columns 54-65) Situation message up. This field has a function similar to SITUAT, but the flags are set in the parent unit.

SMSGDN(012) (Columns 69-80) Situation message down. This field has a function similar to SITUAT, but the flags are set in all subordinate units.

7. ORS Tables Parameter Card
Format Specification: 10X, 2I5
Input Variables:
NMISNI(I5) (Columns 11-15) Number of cards in each of the following three input tables (e.g., the action table cards, output table cards, and mission transition table cards) may be thought of as the number of rows in each table.
NENTRI(I5) (Columns 16-20) Number of codes on each card of the following three input tables. May be thought of as the number of columns in each table. If NENTRI is greater than 20, the values are on 2 or more cards with format 2013 as necessary to input the specified number of values, for each of the 'cards' in Sections 8, 9, and 10 below.

8. Action Table Cards
Format Specification: 2013
Input Variables:
VALUE(J)(I3) (Columns 1-3, 4-6, etc.) Codes input to ACTCOD action code field of the BGSWRD data structure. A zero indicates no actions. Note that for J greater than 20, an additional card(s) are used for each mission code, up to the limit given by NENTRI previously.

9. Output Table Cards
Format Specification: 2013
Input Variables:
VALUE(J)(I3) (Columns 1-3, 4-6, etc.) Codes input to OPCODE operation code field of the BGSWRD data structure. A zero indicates that the operation code is unchanged. Note the use of multiple cards for J 20 as in 8. above.

10. Mission Transition Table Cards
Format Specification: 2013
Input Variables:
VALUE(J)(I3) (Columns 1-3, 4-6, etc.) Codes input to MISCOD new mission code field of the BGSWRD data structure. If zero, the mission code is unchanged. Note the use of multiple cards for J>20 as in 8. above.
I. OPERATIONS DATA

This data defines the mode of operation for all combat units. Operations data is stored in a group of related data structures referred to collectively as the operation structure. These structures include: CONELM, OPDSBK, CONBLK, POPBKE, SHWORD, OPCFEL, TYPELM, BGSELM, ROLE, PHASE, OPORD, and OPORDP. The operation structure is a set of operation order templates organized into roles and phases which constitute the way in which the operation is to be carried out by lower echelon units. Sections 7, 9, and 10 of "INWARS Combat Interactions Data Structures" provides additional information.

A typical input deck is illustrated in Figure 8. The user is cautioned to read the remainder of this section carefully as the structure of this deck may vary considerably based on specified input parameters.

1. Operations Header Card
   Format Specification: 10X, I5
   Input Variable:
   
   NOSETS(I5) Number of sets of operations to be undertaken. (Columns 11-15)

2. ORS Type Card (INOPD)
   Format Specification: 16I5
   Input Variables:
   
   II(I5) ORS type for which the operation is intended. (Columns 1-5)
   NOPSII(I5) Number of Operations in the set. (Columns 6-10)
   TABLS(I5) Number of table entry types in each operation. (Columns 11-15)
   NTYP(I)(I5) Unit type pointer index. ORS types which will use this class of operations. (Columns 16-20, 21-25, 26-30, etc.) (Max = 8)
Figure 8. Operations Data Deck
3. **Operation Parameters Cards (INOPD)**

Eight cards for each operation.

a. **Card Type 1**


   Input Variables:

   - **OPNO(I3)**: Operation number—indexes pointer. (Columns 1-3)
   - **OPNAME(A6)**: Six character name for the operation. (Columns 5-10)
   - **FSPFEE(F10.2)**: Basic speed for "normal" conditions for this operation prior to modifications. (Columns 11-20)
   - **SRCHNO(I3)**: Identifies type of perception/search/disposition pattern used if no search defined on a basis of unit type. (Columns 21-23)
   - **ALTENO(I3)**: Operation code of an alternate operation to be implemented if the assigned operation is not suitable. (For units which plan only.) (Columns 24-26)
   - **NROLES(I3)**: Number of roles in the operation structure. (Zero if unit doesn't plan under this ORS.) (Columns 27-29)
   - **NPHASE(I3)**: Number of phases in the operation structure. (Zero if unit doesn't plan under this ORS.) (Columns 30-32)
   - **UNREQ(I3)**: Number of units required to implement the operation. (Planned operations only.) (Columns 33-35)
   - **STREQ(I5)**: Strength requested. (Not used.) (Columns 36-40)
   - **FRCERQ(I5)**: Force requirements in units of strength. (Used in planning only.) (Columns 41-45)
   - **EFFREQ(I5)**: Effectiveness requirement for the force as a whole. Force effectiveness is a weighted average for all elements of the force. (Columns 46-50)
THE BDM CORPORATION

TIMERQ(I5)  Time required for execution of the operation under 'normal' circumstances. (Planned operations only.)

Note: A zero should be inserted if a field is not used.

b. Card Type 2
Format Specification: 4I5, 2X, 03

Input Variables:
OBJTYP(I5) Identifies criteria for setting the "AT OBJECTIVE" flag FLGOBJ.

OBJTYP Description
0  Must occupy objective hex
1  Criteria satisfied if within number of hexes specified in OBJDST

OBJDST(I5) Distance to objective to satisfy objective criteria.

OBJTYP Description
2  Unit need only be beyond objective with respect to axis and within distance given by OBJDST. (Not yet implemented.)

SECTOR(I5) Sector width in hexes

MASS(I5) Massing valve. # units/hex max.

ENGMOD(03) Engagement mode. This set of flags specifies the engagement modes for which this operation may be used. See section 2C2, field UNENGR, for engagement mode flag identification.
c. **Card Type 3**

Format Specification: 10I5

Input Variables:

- **SUPTYP(I5)** (Columns 1-5): Asset type which is expended at a constant rate per interval.
- **SUPRAT(I5)** (Columns 6-10): Quantity of the asset SUPTYP expended per unit time.
- **SUPLEV(I5)** (Columns 11-15): Quantity of asset SUPTYP needed for unimpaired operation. At lower levels the speed of the unit is multiplied by proportion remaining times the factor MOVSUP.
- **SUPLV1(I5)** (Columns 16-20): Quantity of asset SUPTYP which is a threshold for setting the supply flag.
- **POLTYP(I5)** (Columns 21-25): Identifies an asset type which is expended in conjunction with unit movement.
- **POLRAT(I5)** (Columns 26-30): Amount of the asset POLTYP expended per hex moved.
- **POLLEV(I5)** (Columns 31-35): Quantity of the asset POLTYP necessary for unimpaired operations. At lower levels the speed of the unit is multiplied by the proportion remaining times the factor MOUPOL.
- **POLLV1(I5)** (Columns 36-40): Threshold for FLGPOL.
- **OTHER1(I5)** (Columns 41-45): Extra (not used).
- **OTHER2(I5)** (Columns 46-50): Extra (not used).

d. **Card Type 4 (5 Cards)**

Format Specification: 8F7.3

Input Variables:

- **VALUE(J)** (Columns 1-7): This parameter affects various processes in the model. They are listed below in...
8-14, etc.) order of entry. The maximum allowed value is 7.99.

1) Combat Computation Effects

The following parameters are applied during the computation of attrition and suppression effects. They are listed in the order of input of the corresponding value (J) as described above.

(1) **ATRFT** - Terrain utilization, the extent to which the unit utilizes terrain for protection.

(2) **ATRFR** - The extent to which rivers, if present, affect combat results suffered.

(3) **ATRFBH** - The extent to which occupying a barrier hex affects combat results suffered.

(4) **ARTFBS** - The extent to which a barrier hex side between firing and target units affects combat results suffered.

(5) **ATRFN** - The effect of terrain on nuclear weapon combat effects.

(6) **ATRFC** - The effect of terrain on chemical weapon combat effects.

(7) **ATRFNV** - Nuclear vulnerability, factor.

(8) **ATRFCV** - Chemical vulnerability factor.

2) Movement Direction Weighting Effects

The following factors are coefficients in the scoring equation used to choose the next hex during movement.

(1) **MDWSPD** - Weighting factor for speed expected to candidate direction.

(2) **MDWTHR** - Weighting factor for enemy threat, where threat is the negative enemy to friendly force ratio.

(3) **MDWOBJ** - Weighting factor for direction to objective, where the direction component is 90 minus the angle between the candidate direction and a straight line to the objective.

(4) **MDWMAS** - Weighting factor for massing of friendly forces, where the massing effect is the negative of the difference between friendly strength in the hex and desired massing, MASS, divided by 100.
(5) **MDWCOH** - Weighting factor for cohesiveness; influenced by the proximity of friendly sibling units on flanks.

(6) **MDWFDR** - Weighting factor for flank danger. Not implemented.

(7) **MDWNCT** - Weighting factor for nuclear and chemical contamination effects of terrain.

3) **Movement Speed Effects**

(1) **MOVFT** - Extent of terrain effects on movement speed.

(2) **MOVFR** - Extent of the effect of a river hex side on movement speed.

(3) **MOVFBH** - Extent of the effect of a barrier hex on movement speed.

(4) **MOVFS** - Extent of the effect of a barrier hex side on movement speed.

(5) **MOVFNC** - Factor modifying speed for nuclear contamination/effects in the hex.

(6) **MOVFCC** - Factor modifying speed for chemical contamination/effects in the hex.

(7) **MOVNCR** - The extent of the impact of the degradation factor resulting from the nuclear/chemical readiness posture on unit speed.

(8) **MOVEFF** - The impact of decreased effectiveness index on unit speed. This factor is multiplied by speed for NXEFF=1, es squared and multiplied by speed for NXEFF=2.

(9) **MOVPOL** - The effect of inadequate petroleum/oil/lubricant type supplies on movement speed.

(10) **MOVSUP** - The effect of inadequate non POL type supplies on movement speed.

(11) **MOVFFR** - Movement speed factor for "normal" force ratio condition as indicated by FLGFR in the unit scoreboard situation word.

(12) **MOVFRI** - Movement speed factor for "dangerous" force ratio condition.

4) **Various Other Data**

(1) **DISPOS** - Disposition of unit, gives the average proportion engaged at each echelon of the organization for this operation. Max = 100, minimum about 20.
(2) **EEVALF** - Enemy evaluation factor: During the summation of Threat and flank threat indicies, friendly forces are weighted -1. This factor determines the weighting for enemy units.

(3) **SRECOV** - Suppression recovery rate for unit.

(4) **ERECOV** - Effectiveness recovery rate for reconstitution, applied only when unit is not in contact with enemy units.

5) **Perception Effects**

(1) **EFF1** - Breakpoint for marginal effectiveness, in fraction of base strength.

(2) **EFF2** - Breakpoint for negligible effectiveness, in fraction of base strength.

(3) **EFF3** - Breakpoint for unit dissolution **EFF4** breakpoint (undesignated)

(4) **EFF4** - Breakpoint (undesignated).

(5) **FLDANG** - Value of the respective flank threat indices which will result in the flags FLGFLL or FLGFLR being set.

(6) **FRNORM** - Force ratio (enemy/friendly) which, if exceeded, results in the flag FLGFR in the unit situation word being turned on to indicate a "normal" force ratio.

(7) **FRDANG** - Force ratio (enemy/friendly) which, if exceeded, results in the flag FLGFR1 in the unit situation word being turned on to indicate a "danger" situation.

(8) **OTHER3** - Unused at this time.

4. **Role Parameter Cards (1 per Role) (INPOST)**

Format Specification: I3, 1X, A6, 4I3, 2X, 02, I3, I7, 2I3, 2X, 07, I5, 3X, 02, 4X, 01, I5

Input Variables:

- **ROLEID(I3)**: Role identification number. Also points to an element **ROLEM** in the array **ROLARY** which governs the aggregation and processing of situation information.

- **NAME(A6)**: Name of the role.

(COLUMNS 1-3)

(COLUMNS 5-10)
ELEMENTS(I3) Number of force elements (units) which (Columns 11-13) may be allocated to this role.
TYPE(I3) Type of unit required for this role. (Columns 14-16)
CLASRQ(I3) Classification identity requested. This (Columns 17-19) is the classification of unit preferred in the role. Ground unit types as follows:
1. Armor/tank
2. Mechanized
3. Infantry
5. Artillery
6. Air Defense
7. Support
CRITEL(I3) Number of force elements (units which are (Columns 20-22) critical to the performance of this role.
FLGS(02) Field of one bit flags. (Columns 24-25)

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>OBJTYP</td>
<td>Objective type.</td>
</tr>
<tr>
<td>1</td>
<td>FLGDEF</td>
<td>Default role for units not able to assume other roles.</td>
</tr>
<tr>
<td>2</td>
<td>FLGTMP</td>
<td>Order should be put at end of order element list.</td>
</tr>
<tr>
<td>3</td>
<td>FLGLST</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>FLGCRT</td>
<td>Indicates role critical to operation (must be filled).</td>
</tr>
<tr>
<td>5</td>
<td>FLGCLA</td>
<td>Classification flag. Indicates, if on, that the correct classification of unit in the role is essential.</td>
</tr>
</tbody>
</table>

BGSID(I3) Applicable ORS identification for the (Columns 26-28) subordinate unit.
THE BDM CORPORATION

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>Undefined</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>FLGCBT</td>
<td>Identifies an order element to be used for combat calculations.</td>
</tr>
<tr>
<td>4</td>
<td>FLGPER</td>
<td>Perception function only.</td>
</tr>
<tr>
<td>5</td>
<td>FLGLST</td>
<td>Identifies last element.</td>
</tr>
</tbody>
</table>

DISROL(01) Disposition role. This identifies the type of role according to its disposition:
1: Left flank
2: Right flank front
0: Center
3: Rear/reserve/Hq, etc.

NEVAL(15) Number of evaluation elements to follow. If zero, no evaluation elements are inputted.
5. **Evaluation Element Cards (INPOST) (1 Set Per ROLE)**

The evaluation element specifies the information aggregation process by which situation features can be combined to detect the presence of other situation features. The different evaluation elements are applied to different echelons. The first element causes information aggregation into the unit's own situation word, the second into his commanding unit's situation word. In INWARS only two evaluation elements will be used at the brigade level. See "INWARS CIS Data Structures" section B14 for details and "INWARS CIS Software Modules" section C6.

a. **Card 1**

*Format Specification: 3I5*

*Input Variables:*

- **NANDFL** Number of flags modified in unit using a logical "and" criteria. (Columns 1-5)
- **NORFL** Number of flags modified in unit using a logical "or" criteria. (Columns 6-10)
- **NADDFL** Number of flags modified in unit using a summation criteria. (Columns 11-15)

b. **Following Cards**

*Format Specification: 3X, 012*

The following cards define the evaluation process. They are divided into three sections for the AND, OR and SUMMATION oriented processes. The total number of cards is equal to:

\[
\text{NANDFL + NORFL + 2 * NADDFL + (number of nonzero fields in Card 1)}
\]

*Cards:*

- **AND Flag Specification:** Flags corresponding to flags to be modified in unit. This card is put in for any NANDFL ≠ 0. The number of bits set in this field must equal NANDFL.
- **AND Flag criteria Cards (number - NANDFL):** For each bit set in the AND specification, from right to left, there is a card which specifies which flags must be set in the unit situation word.
- **OR Flag Specification Card:** Similar to AND specification, one card if NORFL ≠ 0.
OR Flag Criteria Cards (number = NORFL).

ADD Flag Specification: Similar to AND specification, one card if NADDFL ≠ 0.

ADD Flag Sum Component Cards (number = $2^n$ NADDFL): For each ADD flag, from right to left, there are two cards. A bit set in the first indicates a 1, and in the second indicates a 2, which are summed if the respective flag is on.

6. Phase Card (1 for Each Phase)
   Format Specification: I3, 1X, A6, I3
   Input Variables:
   PHASID(I3)  Phase identification number.
   NAME(A6)  Name of phase.
   TIME(I3)  Amount of time, in combat cycles, that normally would be needed for a given phase of the operation.

7. Role Card (1 per Role)
   Format Specification: 2I5
   Input Variables:
   PRIRTY(I5)  The priority of the role during the phase.
   RESOUR(I5)  The relative priority of the role with respect to the allocation of resources.

8. Order Card (INPORD)
   Format Specification: I5, 3X, 07, 8I5
   Input Variables:
   MISCOD(I5)  Mission code for the type of mission to be carried out by the unit.
   HEXOBJ(07)  Hex address of the objective defined for the unit in this operation order. Relative to the hex given in the role definition.
AXIS(I5)  Axis of operation. Azimuth angle expressed as an integer number of degrees clockwise from north, which orients the unit's operation.

SECTOR(I5)  Sector width of the unit in hexes.

TIME(I5)  Timer which can be used to specify an interval over which the operation is effective.

NCONTS(I5)  Number of contingency pointers.

ROLEID(I5)  Identification number which specifies the role filled by the unit in a multi-unit coordinated operation being conducted at the next higher echelon. It affects the manner of info aggregation.

FLGTMP(I5)  Flag which specifies that the operation order pointed to is in template form. (see FLGCTM below)

NTEMP(I5)  Number of template order if it is to be referenced.

FLGOBJ(I5)  (Always zero)

9.  Contingency Card (INPORD)  (If NCONTS ≠ 0 in Previous OPORDER)
Format Specification:  515
Input Variables:

CONID(I5)  Contingency identification which causes the associated contingency operation order to be implemented. Defines contingency in terms of the situation.

SITCOD(I5)  Situation code which causes the contingency order to be implemented. The contingency order will be used if either the
contingency is recognized or the situation code matches that computed from the current situation.

<table>
<thead>
<tr>
<th>CONDC(I5)</th>
<th>ConDC</th>
<th>Disposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Do not dispose of contingency order.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Dispose of contingency order.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Attach contingency to the new current order when a &quot;push&quot; is executed.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Attach contingency to the new current order when a &quot;pop&quot; or contingency is executed.</td>
<td></td>
</tr>
</tbody>
</table>

FLGCTM(15) This flag, if nonzero, specifies that the operation order pointed to is in template form. This means it has not been oriented or detailed for the unit. The use of template orders allows one copy to exist which may be referred to by the order structures of many units, thus saving space. When a template order contingency is implemented, a copy of the template order is made, and the hex objective, axis, and node ID are changed to those appropriate to the unit's actual orientation and location. FLGCTM is also used to indicate linkage to the following phase if a 2 is put in. A 3 indicates that the contingency is the template given by NTEMP.

NTEMP(I5) Number of template order.
for each contingency with a value FLGCTM equal to zero or one, an operation order card (see section 9 above) follows. Thus the operation orders form the nodes of a tree structure, and the contingencies form the branches (although the branches may not have nodes put in at the same time; if a value of FLGCTM = 2 or 3, the node (OPORDER) is a template put in a later phase or as an earlier template.

10. **Equivalent Operations Card (INOPD)**

Format Specification: 16I5

Input Variables:

FVALUE(J)(15) Equivalent operations for a unit in this
K = NOSETS operation if engaged by or engaging an
(Number of enemy unit under a different operation
sets of opera-
tions (Columns class (e.g., air units attacking ground
1-5, 6-10, 11-15
16-20, etc.)

11. **Operations Tables Cards (1 for Each Table Entry Type**

Format Specification: 16F5.2

Note that if there are more than 16 operations in the set, then there are more than one card read for each table. Thus, for three tables and 20 operations, 6 cards would be read using 16F5.2, 4F5.2, 16F5.2, 4F5.2, 16F5.2, and 4F5.2 respectively.

Input Variables:

VALUE(J)(F5.2) Operations table entries. First table is
(Columns 1-5, 6-10, for attrition, second for suppression,
11-15, 16-20 etc.) third for allocation.

**J. CONTINGENCY DATA**

The contingency data cards are used to specify the conditions under which a contingency code is recognized. It is stored in the contingency array and accessed when required to check whether a contingency order should be executed. See "INWARS CIS Data Structures" section B13 and "INWARS CIS Software Modules" section Clf for details on this data.
1. **Contingency Parameter Card**
   Format Specification: 10X, I5
   Input Variable:
   NCONT(I5) Number of contingencies.
   (Columns 11-15)

2. **Contingency Data Cards (1 for Each Contingency)**
   Format Specification: 2I5, 3X, 012, 3X, 012, 3X, 012, I5
   Input Variables:
   PCONT(I5) Pointer to contingency descriptor.
   (Columns 1-5)
   CONSIT(I5) Situation code which will result in recognition of the contingency.
   (Columns 6-10)
   CAFLGS(012) Set of flags corresponding to those in the unit situation work which must be on for the contingency to be recognized.
   (Columns 14-25)
   COFLGS(012) The on flags in this word must be off in the unit situation word to allow contingency recognition.
   (Columns 29-40)
   PCONEL(I5) Pointer to another contingency which also will result in the recognition of the given contingency.
   (Columns 41-45)

K. **HEX DATA**

Hex data describes the characteristics of the geographic area in which combat occurs. Information on terrain and trafficability is stored in a tree data structure based on hex blocks (HEXBLK). Various levels in the tree structure correspond to particular size hexes. For the purposes of data input it is important to note that this tree structure eliminates the need for specification of a great deal of lower level hex data. A hex data card need be present only if it or one of its daughters has terrain characteristics which are different from its parent. For a more detailed explanation of the hex data structure see Section 4 of "INWARS Combat Interactions Data Structures."
The hex input deck structure is illustrated in Figure 9.

1. Hex Data Cards (1 for Each Specified Hex)


   Input Variables:

   EFLAG(I1)  Input flag which indicates hex input status.
               (Column 2)  0 = more hex cards follow
                             1 = last hex card

   HEXLOC(07) Hex location. A seven digit code which
               (Columns 4-10) specifies the unique location and level
                                 of the hex.

   TERTYP(I5) Identifies the basic type of terrain in
               (Columns 11-15) the hex.

       Value  Type
       0    Not used
       1    Clear
       2    Marginal for vehicles
       3    Difficult
       4    Urban
       5    Impassable (Sea)
       6, 7 Undefined

   RIV1(I1)  Flags indicating whether rivers exist on
             (Column 18) hex sides which are in the 3, 2 or 1
               directions, respectively.

   RIV2(I1)  (Column 19)

   RIV3(I1)  (Column 20)

   BAR1(I1)  Flags indicating whether barriers exist
             (Column 23) on hex sides which are in the 3, 2, or 1
               directions, respectively.

   BAR2(I1)  (Column 24)

   BAR3(I1)  (Column 25)
Figure 9. Hex Input Deck
THE BDM CORPORATION

BHEX(I5) (Columns 26-30) Indicates whether the hex as a whole constitutes a barrier.
BTYP(I5) (Columns 31-35) Barrier type. Distinguishes between two types of barriers.
POPULA(I5) (Columns 36-40) Defines population density. The following values are currently in use:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>less than 250/km²</td>
</tr>
<tr>
<td>3</td>
<td>250 to 1000/km²</td>
</tr>
<tr>
<td>5</td>
<td>over 1000/km²</td>
</tr>
</tbody>
</table>
SIDE(I2) (Columns 41,42) Gives nationality side (0 = neutral, 1 = NATO, 2 = PACT, 3 = none)
NATION(I3) (Columns 43-45) Nationality for given side:

<table>
<thead>
<tr>
<th>SIDE</th>
<th>NATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>AU</td>
</tr>
<tr>
<td>1</td>
<td>US</td>
</tr>
<tr>
<td>2</td>
<td>SU</td>
</tr>
<tr>
<td>3</td>
<td>SZ</td>
</tr>
<tr>
<td>4</td>
<td>WG</td>
</tr>
<tr>
<td>5</td>
<td>EG</td>
</tr>
<tr>
<td>6</td>
<td>BR</td>
</tr>
<tr>
<td>7</td>
<td>PO</td>
</tr>
<tr>
<td>8</td>
<td>FR</td>
</tr>
<tr>
<td>9</td>
<td>CZ</td>
</tr>
<tr>
<td>10</td>
<td>BE</td>
</tr>
<tr>
<td>11</td>
<td>HU</td>
</tr>
<tr>
<td>12</td>
<td>NE</td>
</tr>
<tr>
<td>13</td>
<td>IT</td>
</tr>
<tr>
<td>14</td>
<td>DN</td>
</tr>
</tbody>
</table>

L. ENTITY ASSIGNMENT DATA

This data defines combat entities, including physical data such as location and asset types possessed by the unit. It also includes operation data and initial assignment of ORS types and appropriate operation codes. More detailed information is contained in Sections 1, 2, 3, 5, 8, 9, and 10 of "INWARS Combat Interactions Data Structures."
A typical input deck structure is illustrated in Figure 10.

1. Flag Card (ENTYIN)
   Format Specification: 10X, I5
   Input Variables:
   FLG(I5) Indication of new or additional units.
   (Columns 11-15) 0 = Reinitialize unit numbers
                    1 = Do not reinitialize

2. Unit Scoreboard Data Card
   Format Specification: 2X, (4II, I2), 2X, (4II, I2), 4I2, 1X, 07,
                        1X, 01, 1X, 6II, 312, 2X, (4II, I2), 13,
                        I5
   Input Variables:
   UNITID(4II, I2) A multi-field unit identifier consisting
                    of the following fields:
   (Columns 3-8) (1) SIDE(I1) 1 for NATO, 2 for WPACT.
               (2) ARMYGP(I1) Front or army group identification, from 1 to 9.
               (3) CORPS(I1) Army or corps identification, from 1 to 9.
               (4) DIVISN(I1) Division identification from 1 to 9.
               (5) BRIGAD(I2) Brigade or regiment identification, from 1 to 14.
   CMRID(4II, I2) Commander's identification. Used to construct \( C^2 \) tree. Unit identified must have been previously input. Zero if no commander unit (such as for a template).
   (Columns 11-16)
   TYPE(I2) Unit type identification. While the type categories can be assigned by the user during initial data input, the following type identifications are now being used.
   (Columns 17,18)
Figure 10. Entity Input Deck
### Value and Type

<table>
<thead>
<tr>
<th>Value</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Echelon above division</td>
</tr>
<tr>
<td>2</td>
<td>Division headquarters</td>
</tr>
<tr>
<td>3</td>
<td>Ground maneuver or air defense unit</td>
</tr>
<tr>
<td>4</td>
<td>Logistics</td>
</tr>
<tr>
<td>5</td>
<td>N/C supply point</td>
</tr>
<tr>
<td>6</td>
<td>Air base cluster</td>
</tr>
<tr>
<td>7</td>
<td>Air mission package</td>
</tr>
<tr>
<td>8</td>
<td>Weapon delivery package</td>
</tr>
<tr>
<td>15</td>
<td>Nuc/chem effects entity</td>
</tr>
</tbody>
</table>

**CLASIF(I2)**

Further identifies type of unit. It is used by the model to identify appropriate units for roles during mission planning and to define units symbols for graphics output. While these types can be redefined by the user, the following are now in use.

<table>
<thead>
<tr>
<th>Value</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Armor/tank</td>
</tr>
<tr>
<td>2</td>
<td>Mechanized</td>
</tr>
<tr>
<td>3</td>
<td>Infantry</td>
</tr>
<tr>
<td>4</td>
<td>Mech. cavalry</td>
</tr>
<tr>
<td>5</td>
<td>Artillery</td>
</tr>
<tr>
<td>6</td>
<td>Air Defense</td>
</tr>
<tr>
<td>7</td>
<td>Support</td>
</tr>
</tbody>
</table>

**ECHLON(I2)**

Identifies the echelon of the unit within the command structure.

<table>
<thead>
<tr>
<th>Echelon</th>
<th>Side=NATO</th>
<th>Pact</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Theater</td>
<td>Theater</td>
</tr>
<tr>
<td>5</td>
<td>Army Gp</td>
<td>Front</td>
</tr>
<tr>
<td>4</td>
<td>Corps</td>
<td>Army</td>
</tr>
<tr>
<td>3</td>
<td>Division</td>
<td>Division</td>
</tr>
<tr>
<td>2</td>
<td>Brigade</td>
<td>Regiment</td>
</tr>
<tr>
<td>1</td>
<td>Detachment</td>
<td>-</td>
</tr>
<tr>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>64</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
NATION(I2) Identifies nationality.
(Column 23, 24)

<table>
<thead>
<tr>
<th>Nation</th>
<th>Side=NATO</th>
<th>Pact</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>US</td>
<td>SU</td>
</tr>
<tr>
<td>1</td>
<td>WG</td>
<td>EG</td>
</tr>
<tr>
<td>2</td>
<td>BR</td>
<td>PO</td>
</tr>
<tr>
<td>3</td>
<td>FR</td>
<td>CZ</td>
</tr>
<tr>
<td>4</td>
<td>BE</td>
<td>HU</td>
</tr>
<tr>
<td>5</td>
<td>NE</td>
<td>--</td>
</tr>
<tr>
<td>6</td>
<td>IT</td>
<td>--</td>
</tr>
<tr>
<td>7</td>
<td>DN</td>
<td>--</td>
</tr>
</tbody>
</table>

HEXLOC(07) Defines hex location of the unit in the hexagonal array. The hexagonal coordinate system is described in the INWARS Level III Specifications; Volume I.
(Column 26-32)

FACING(01) Octal digit indicating an orientation of the unit, which is not necessarily the same as the movement direction. It orients the search (perception) pattern of the unit.
(Column 34)

L1(I1) Identify hex levels in which unit is initially located.
(Column 36)

L2(I1) (Column 37)
L3(I1) (Column 38)
L4(I4) (Column 39)
L5(I1) (Column 40)
L6(I1) (Column 41)
NORDPT(I2) Number of ORS's of a unit and number of concurrent operation orders.
(Column 42,43)
THE BDM CORPORATION

NASSET(I2) Number of assets in the asset list.
(Column 44,45)
FASSET(I2) Asset flag. If zero, assets follow. If
(Column 46,47) 1, copy assets of unit identified in
ASSREF.
ASSREF(41,12) Reference unit for asset list if FASSET = 1.
(Column 50-55)
FLGCCI(I3) Indicates unit has special capabilities.
(Column 56-58) One for EAD Hq units, air base cluster,
logistics, and weapons delivery entities,
zero for others.
FLGTMP(I5) If nonzero, indicates a template unit.
The value is the template number of the
(Column 59-63) unit.
The template numbers currently defined are:

<table>
<thead>
<tr>
<th>Template Number</th>
<th>Unit Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NATO Close Air Support Air Mission Package</td>
</tr>
<tr>
<td>2</td>
<td>PACT Close Air Support Air Mission Package</td>
</tr>
<tr>
<td>3</td>
<td>NATO Interdiction Air Mission Package</td>
</tr>
<tr>
<td>4</td>
<td>PACT Interdiction Air Mission Package</td>
</tr>
<tr>
<td>5</td>
<td>NATO Nuclear Munitions Package</td>
</tr>
<tr>
<td>6</td>
<td>PACT Nuclear Munitions Package</td>
</tr>
<tr>
<td>7</td>
<td>NATO Chemical Munitions Package</td>
</tr>
<tr>
<td>8</td>
<td>PACT Chemical Munitions Package</td>
</tr>
</tbody>
</table>

All eight of these template units must be defined in the entity input deck. It is

66
normal practice to put them together at either the start or end of the deck. All template units should have a uni ID starting with ooo. These templates specify the types of entities which are created for air, nuclear, and chemical packages.

3. Asset Data Cards (1 for Each Asset. A Unit has NASSET.)
Format Specification: I5, F10.2
Input Variables:
ASTYP(I5) Asset type. Index which refers to appropriate asset description.
(COLUMNS 1-5)
FNUMBR(F10.2) Number of assets of a given type which a unit has.
(COLUMNS 6-15)

4. Basic Cata Cards (1 for Each Order)
Format Specification: 2I5, 3X, 02
Input Variables:
ORSID(I5) ORS which governs unit's operations.
(COLUMNS 1-5)
OPCODE(I5) Operation code which identifies a particular operation posture for the unit. The codes are user specified. See Section VI, User's Manual. (Initial OPCODE only.)
(COLUMNS 6-10)
FLAGS(02) This field includes the following bit flags.
(COLUMNS 14,15)

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>--</td>
<td>Undefined</td>
</tr>
<tr>
<td>3</td>
<td>FLGCBT</td>
<td>Identifies an order element to be used for combat computations.</td>
</tr>
<tr>
<td>4</td>
<td>FLGPER</td>
<td>Perception function only</td>
</tr>
<tr>
<td>5</td>
<td>FLGST</td>
<td>Identifies last element</td>
</tr>
</tbody>
</table>

5. Order Card
Format Specification: I5, 2X, B11, B15
Input Variables:

MISCOD(I5) (Columns 1-5) Mission code for the type of mission to be carried on by the unit.

HEXOBJ(7I1) (Columns 9-15) Hex address of the objective defined for unit in this operation order. If the order is a template, this is a relative objective and thus should have leading zeros (rather than leading sevens as normal). If FLGOBJ = 1, the objective is unit-centered and not a template. The input is equivalent to 4I1, I2, where the first 6 digits are the unit ID of the objective. The referenced unit must have been put in previously.

AXIS(I5) (Columns 16-20) Axis of operation. Azimuth angle expressed as an integer number of degrees clockwise from north, which orients the unit's operation.

SECTOR(I5) (Columns 21-25) Sector width of the unit in hexes.

TIME(I5) (Columns 26-30) Timer which can be used to specify an interval over which the operation order is effective.

NCONTS(I5) (Columns 31-35) Number of contingency pointers.

ROLEID(I5) (Columns 36-40) Identification number which specifies the role filled by the unit in a multi-unit coordinated operation being conducted at the next higher echelon. It affects the manner of info aggregation.

FLGTMP(I5) (Columns 41-45) Flag which specifies that the operation order pointed to is in template form. (See FLGCTM.)
NTEMP(I5) Template number, if FLGTMPE = 1, may be nonzero.

FLGOBJ(I5) Objective type. 0 for hex objective, 1 for unit objective.

6. Contingency Card (If Contingency)

Format Specification: 515

Input Variables:

CONID(I5) Contingency identification which causes the associated contingency operation order to be implemented. Defines contingency interims of the situation.

SITCOD(I5) Situation code which causes the contingency order to be implemented. The contingency order will be used if either the contingency is recognized or the situation code matches that computed from the current situation.

CONDC(I5) Contingency Disposal Code.

<table>
<thead>
<tr>
<th>Code</th>
<th>Disposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Do not dispose of contingency order.</td>
</tr>
<tr>
<td>1</td>
<td>Dispose of contingency order normally (release to ISPACE).</td>
</tr>
<tr>
<td>2</td>
<td>Attach contingency to the new current order when a &quot;push&quot; is executed.</td>
</tr>
<tr>
<td>3</td>
<td>Attach contingency to the new current order when a &quot;pop&quot; or contingency is executed.</td>
</tr>
</tbody>
</table>

FLGCTM(I5) This flag specifies that the operation order pointed to is in template form. This means it has not been oriented or detailed for the unit. The use of template orders allows one copy to exist...
which may be referred to by the order structure of many units, thus saving space. When a template order contingency is implemented, a new copy of the template order is made and the hex objective, axis, and role ID are changed to those appropriate to the unit's actual orientation and location. If FLGCTM = 13, order is template; if 0, not template. Do not use 2.

NTEMP(I5)
(Column 21-25)
Number of template order.

Note: If FLGCTM = 0 or 1, this contingency must be followed by an OPORDER card as in section 5, above.

7. End Card
Format Specification: I2
Input Variable:
FLAG(I2)
(Column 1,2)
Option to indicate end of the CIS data stream: 1 = END. This distinguishes it from another Entity Input, for which this entry would be blank (negative zero).