
DEFENSE MAPPING AGENCY TECHNICAL MANUAL 8358.1

DATUMS, ELLIPSOIDS, GRIDS, AND GRID REFERENCE SYSTEMS

CHAPTER 8 PORTRAYAL OF GRIDS ON MAPS AT 1:1,000,000 SCALE

8-1 GENERAL.

Grid data and grid format for maps at 1:1,000,000 scale generally appear as described in this section. Except for minor differences, the design is essentially the same for Universal Transverse Mercator grids, Universal Polar Stereographic grids, and nonstandard grids. The maps usually show grid lines and ticks, their values, grid letters, and notes in the margin identifying the grid and the grid zone designation. Variations in the specifications for particular types of products at 1:1,000,000 scale exist. The individual product specifications must be followed. A typical treatment is shown in figure 34.

8-2 THE MAJOR GRID.

8-2.1 The major grid is shown by full lines at 100,000-unit intervals, intersected by ticks at 10,000-unit intervals. Where a grid line coincides with a neatline of the map, the grid line and its intersecting ticks are omitted. However, the neatline is labeled in the margin with the values for the grid line.

8-2.2 Grid values appear outside the neatline on all four sides of the sheet, labeling each grid line. They may also label only the first grid line in each direction from the southwest corner. Except for the values labeling the first grid line in each direction from the southwest corner of the sheet, the last four digits (0000) of the values are omitted. The values are shown in two sizes of type, with the larger size being used for the principal digits.

8-2.2.1 With most grids, one principal digit is used. This represents the 10,000 digit of the grid values.

8-2.2.2 Two principal digits are used with the Madagascar grid and the Lambert grids of northwest Africa, and the Ceylon Belt. These digits represent the 100,000 and 10,000 digits of the grid values.

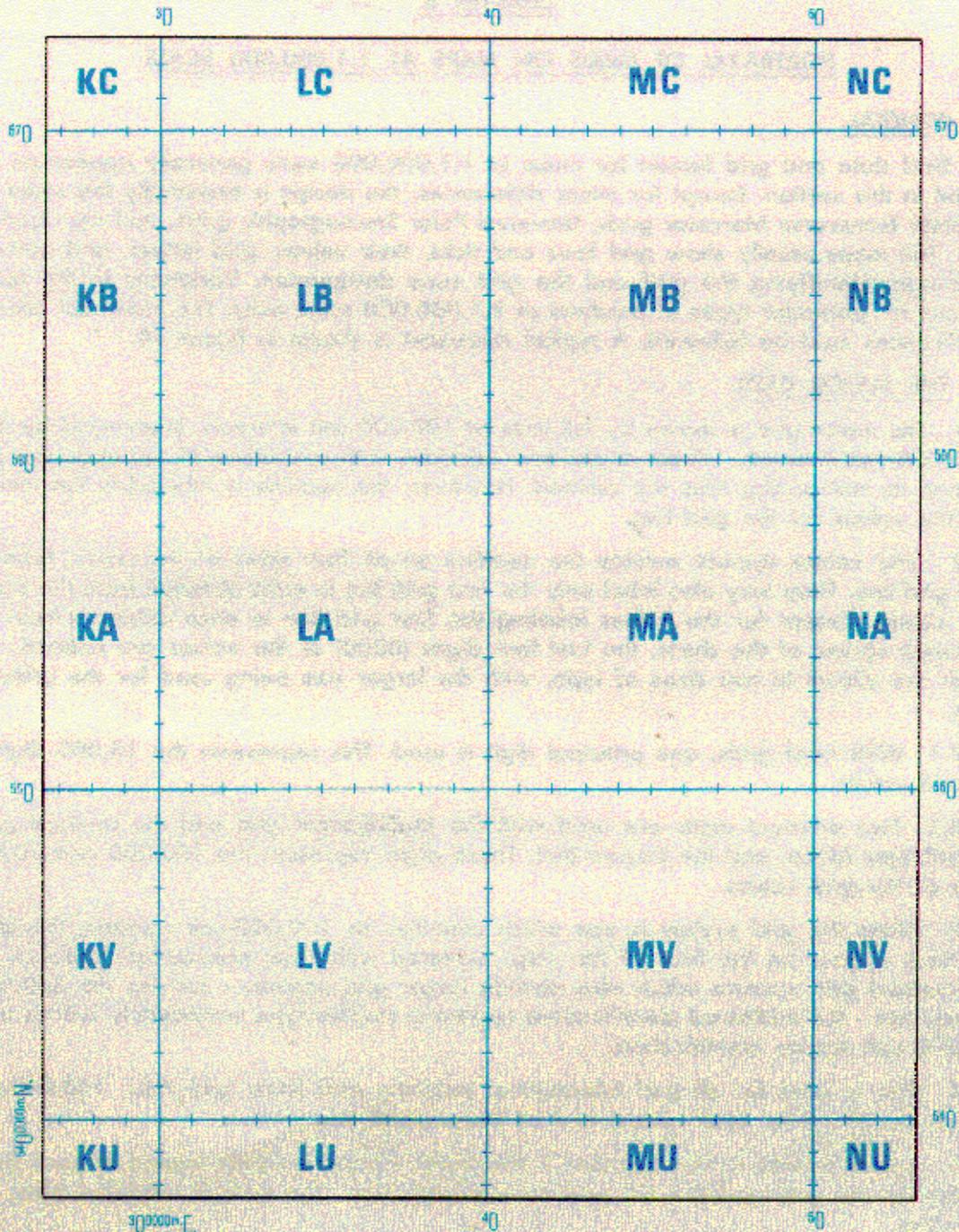
8-2.3 When the grid system is one which identifies its 100,000-unit squares, the identifications appear on the face of the map, centered within the appropriate squares. For nonstandard grid systems which also identify larger grid squares - such as the 500,000-unit squares - the additional identifications appear in smaller type immediately before each 100,000-unit square identification.

8-2.4 Blue is used for all grid information, including grid lines, grid ticks, 100,000-unit square identifications, grid values, and all margin grid information.

8-2.5 A note printed in blue appears in the lower margin or in the legend of each sheet to identify the grid and the full grid zone designation. The note is modeled after the following:

BLUE TICKS AT 100,000 METER INTERVALS AND BLUE
TICKS AT 10,000 METER INTERVALS INDICATE THE
UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE
DESIGNATION 37T, INTERNATIONAL ELLIPSOID

BLUE LINES AT 100,000 METER INTERVALS AND BLUE
TICKS AT 10,000 METER INTERVALS INDICATE THE
MADAGASCAR GRID, INTERNATIONAL ELLIPSOID



BLUE LINES AT 100,000 METER INTERVALS AND BLUE TICKS AT 10,000 METER INTERVALS INDICATE THE UNIVERSAL TRANSVERSE MERCATOR GRID. ZONE DESIGNATION 38U, WORLD GEODETIC SYSTEM ELLIPSOID

Scale 1:1,000,000 (in miniature)

Figure 34. Treatment for the Major Grid in UTM Areas as Shown on Maps at 1:1,000,000 Scale.

8-2.6 On maps having land insets for which the grid or grid zone differs from that of the map proper, the appropriate grid note is shown within the inset.

8-3 MULTIPLE MAJOR GRIDS.

8-3.1 In many instances a sheet contains more than one major grid. This occurs especially in higher latitudes, where sheets may be wide in longitudinal extent, and in areas covered by nonstandard grids, where grid junctions are not necessarily coincident with parallels or meridians.

8-3.2 Grid, datum, ellipsoid, and zone junctions are indicated by accentuated lines, printed in blue. Labels appear on each side of the junction line. The labels may be shown more than once to facilitate identification. Where a grid, datum, ellipsoid, or zone junction line is coincident with a neatline, both the junction line and the identifying labels are omitted.

8-3.2.1 For nonstandard grids, the label is modeled after the following:

BRITISH NATIONAL GRID

MADAGASCAR GRID

8-3.2.2 The label for a UTM grid junction, or a UPS grid junction, includes the identification of the Grid Zone Designation and is written in MGRS terms as:

UTM GRID ZONE DESIGNATION: 22W

UPS GRID ZONE DESIGNATION: A

8-3.3 Each grid is shown by full lines within its own area only, being represented in the normal manner at 100,000-unit intervals, intersected by ticks at 10,000-unit intervals. All grid lines are printed in blue.

8-3.4 Grid values appear on all four sides of the sheet (outside the neatline) labeling each grid line. They may also label only the first grid line in each direction from each corner of the sheet. The composition of the number is similar to that described in paragraph 8-2.2, except that full grid values label the first grid line in each direction from each corner of the sheet.

8-3.5 Where appropriate for the grid, identification of 100,000-unit squares and larger unit squares appear on the face of the map, centered within the appropriate squares, as described in paragraph 8-2.3.

8-3.6 Notes identifying each grid appear in the lower margin of the sheet. The note is modeled after the following:

BLUE LINES AT 100,000 METER INTERVALS AND BLUE
TICKS AT 10,000 METER INTERVALS INDICATE THE
UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE
DESIGNATIONS 22K AND 23K, INTERNATIONAL ELLIPSOID

BLUE LINES AT 100,000 METER INTERVALS AND BLUE
TICKS AT 10,000 METER INTERVALS INDICATE THE
NORD MAROC GRID, CLARKE 1880 ELLIPSOID

8-3.7 In those cases where a sheet includes an ellipsoid junction, the grids for the two ellipsoids are treated in the same manner as that specified in paragraph 8-3.2. The ellipsoids are identified on each side of the junction line. Where an ellipsoid junction line is coincident with a neatline, both the junction line and the identifying labels are omitted. The grid note in the lower margin of the sheet identifies each ellipsoid which appears on that sheet. It is modeled after the following:

BLUE LINES AT 100,000 METER INTERVALS AND BLUE
TICKS AT 10,000 METER INTERVALS INDICATE THE
UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE
DESIGNATIONS 33T, INTERNATIONAL ELLIPSOID, AND
ZONE DESIGNATION 33T, WGS ELLIPSOID

8-3.8 In certain cases, a sheet bearing the UTM grid may straddle a parallel which marks the division between different grid zone designations. A continuous line in black or blue indicates the dividing parallel. The proper grid zone designations, printed in blue appear on each side of the line.

8-3.9 Figures 35 and 36 illustrate principles described for sheets with more than one major grid.

8.4 OVERLAPPING, EXTENDED, AND SECONDARY GRIDS.

Overlapping, extended, or secondary (obsolete) grids are not shown on the 1:1,000,000 scale map.

8-5 GRID AND MAGNETIC DECLINATIONS.

Grid and magnetic declination data are not shown on 1:1,000,000 scale maps.

8-6 THE GRID REFERENCE BOX.

8-6.1 A grid reference box may be shown in the margin of the sheet. The box contains explicit step-by-step instructions for composing a grid reference. See figure 37 for a typical grid reference box.

8-6.2 The grid system(s) in use on the map dictates the referencing instructions contained in the grid reference box.

8-6.3 When more than one major grid appears on a sheet and the method for giving a reference is the same for all the grids, a common reference box is used.

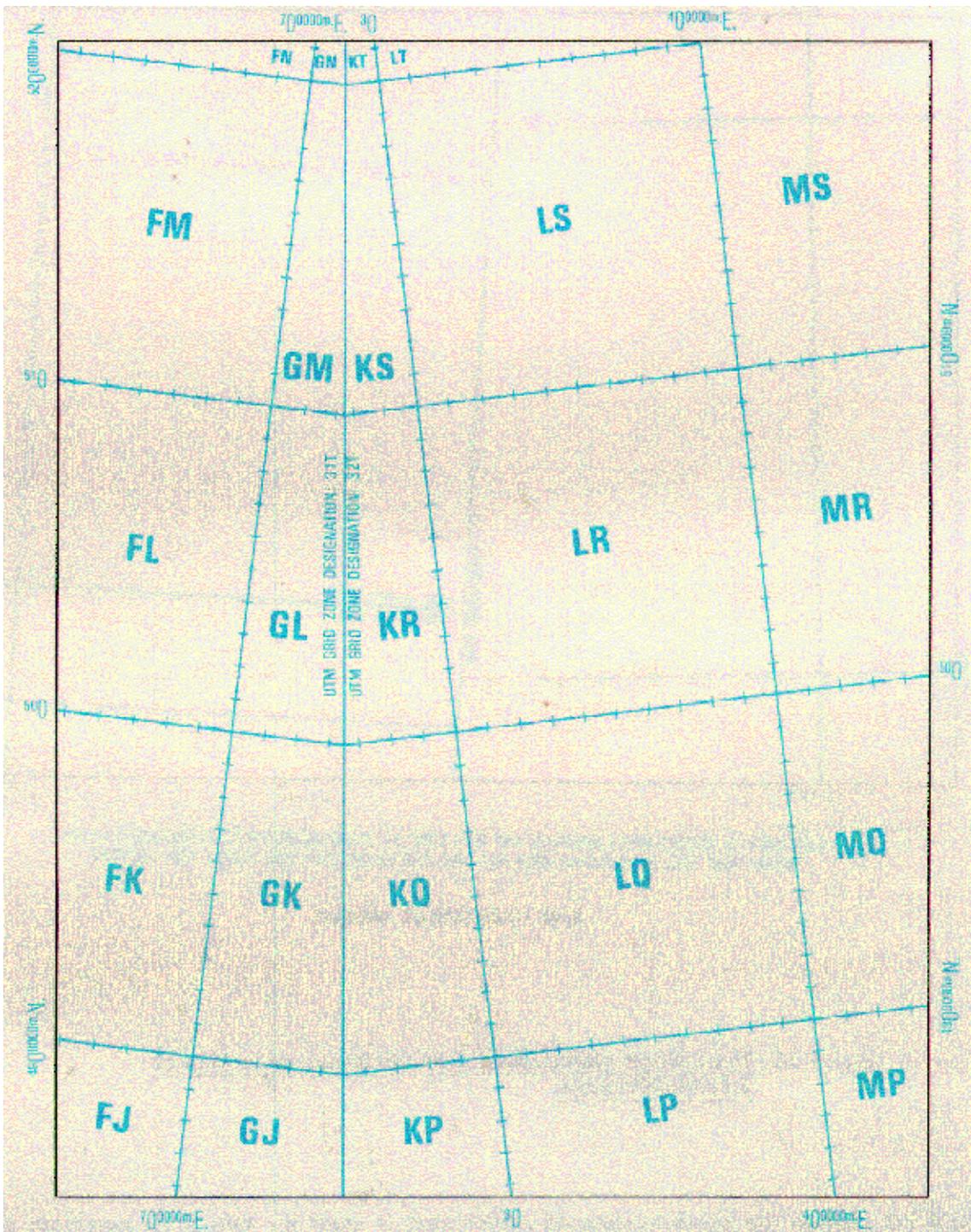
8-6.4 When more than one, major grid appears on a sheet and the method for giving a reference varies with the grids, the treatment of the grid reference boxes is as follows:

8-6.4.1 A grid reference box is shown in the margin for each grid, except those falling completely in open water area. Over each box appears a note limiting the use of the box to the grid or grids concerned.

8-6.4.1.1 When each box describes the method of referencing for one grid only, the note is modeled after the following:

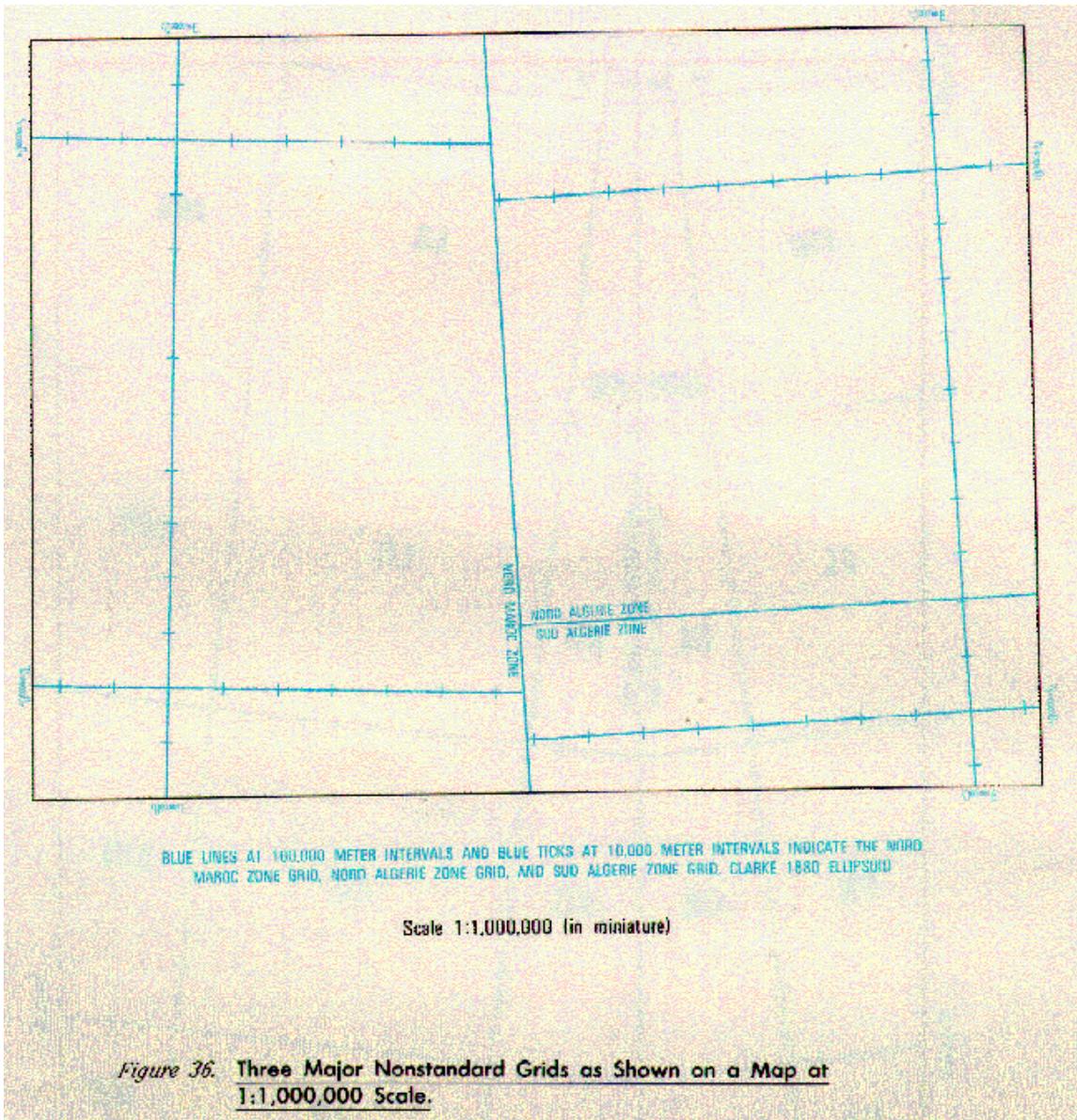
USE THIS BOX FOR GIVING REFERENCES ON THE
UNIVERSAL TRANSVERSE MERCATOR GRID

USE THIS BOX FOR GIVING REFERENCES ON THE
MADAGASCAR GRID



BLUE LINES AT 100,000 METER INTERVALS AND BLUE TICKS AT 10,000 METER INTERVALS INDICATE THE UNIVERSAL TRANSVERSE MERCATOR GRID. ZONE DESIGNATIONS 31T AND 32T INTERNATIONAL ELLIPSOID.
 Scale 1:1,000,000 (in miniature)

Figure 35. Two Major Grids (in this case, Zones of the UTM) Separated by a Grid Junction, as Shown on a Map at 1:1,000,000 Scale.



8-6-4.1.2 When the same system of referencing is used for two grids occurring on the same sheet with a third grid using a different reference system, the note for the common reference box is modeled after the following:

USE THIS BOX FOR GIVING REFERENCES ON THE
SUD ALGERIE AND SUD TUNISIE GRIDS

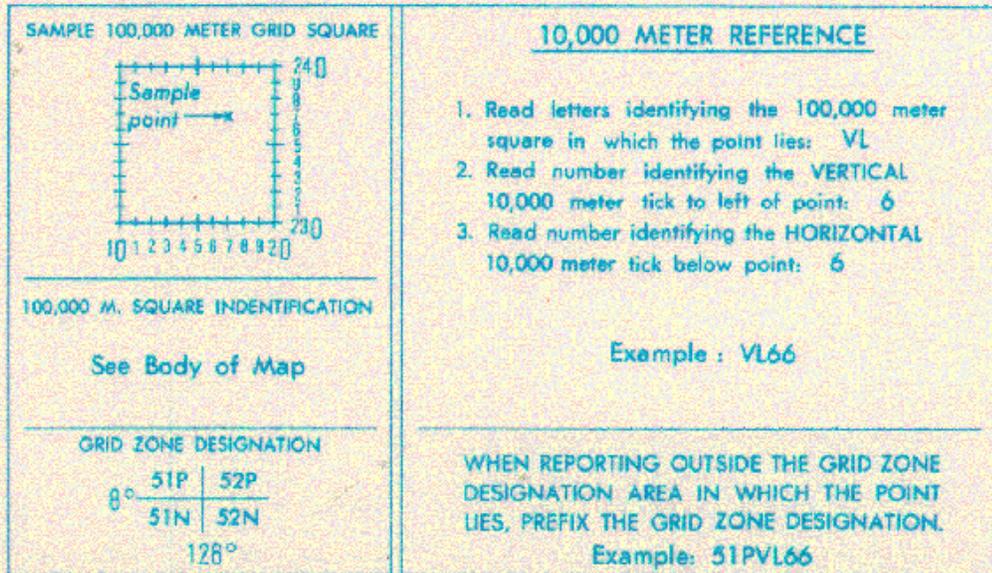


Figure 37. Grid Reference Box for 1:1,000,000 Scale Map.

8-6.4.2 When all reference boxes cannot be accommodated in the margin, the excess is shown in expanses of open water on the face of the map. When this is not practicable, a note which refers the user to an adjacent sheet is added to a reference box in the margin. This note is positioned below the note described in paragraph 8-6.4.1.2 above. The notes are modeled after the following:

USE THIS BOX FOR GIVING REFERENCES ON THE UNIVERSAL TRANSVERSE MERCATOR GRID

SEE SHEET 1 FOR GIVING REFERENCES ON THE NORD MAROC GRID

USE THIS BOX FOR GIVING REFERENCES ON THE UNIVERSAL TRANSVERSE MERCATOR GRID

SEE SHEET 2 FOR GIVING REFERENCES ON THE SUD ALGERIE AND SUD TUNISIE GRIDS

CHAPTER 9 GRIDS ON NAUTICAL CHARTS AT 1:75,000 SCALE AND LARGER

9-1 GENERAL.

9-1.1 Requirements for grid data and grid formats on nautical charts prepared for the DoD at 1:75,000 scale and larger are essentially the same for Universal Transverse Mercator grids, Universal Polar Stereographic grids and nonstandard grids.

9-1.2 The grid data for DoD charts usually include the major grid, a grid reference box, and notes identifying the grid. Combat Charts and Amphibious Assault Charts also include a declination note.

9-1.3 The adjacent grid is provided as an overlapping grid when a chart lies within approximately 40 kilometers of a grid junction line or a datum junction boundary. A separate declination note, and notes identifying the overlapping grid, appear in the margin for grid junctions, and may or may not appear for datum junctions, depending on grid alignments.

9-1.4 A chart may show a secondary grid which occurs in the area. The secondary grid is identified by margin notes.

9-1.5 No single chart in this scale category ever shows more than three grids. When a chart covers an area which includes more than three (either major, overlapping, or secondary), those omitted are the ones which are considered of least military importance. Major grids are never omitted. When choice lies between two overlapping grids, the one retained usually is the one which best covers the land area of interest.

9-1.6 Specific dimensions, size and style of type, and placement of margin data relating to grids and grid formats at 1:75,000 scale and larger are contained in Defense Mapping Agency (DMA) product specifications.

9-2 THE MAJOR GRID ON COMBAT CHARTS AND AMPHIBIOUS ASSAULT CHARTS.

9-2.1 The major grid on Combat Charts and Amphibious Assault Charts is indicated by full lines at 1,000-unit intervals. The unit is meters. Every 10,000-unit grid line at scales of 1:45,001 and smaller, or 5,000-unit grid line at scales of 1:45,000 and larger, accentuated in weight (index line).

9-2.2 Grid numbers appear outside the neatline on all four sides of the chart. Each 1,000-unit line is labeled with the principal digits and the higher order digits, i.e. (Sup7)81 or (Sup67)45. Each 10,000-unit line has a full numerical label, i.e. (Sup6)90(Sup000) or (Sup47)50(Sup000).

9-2.3 Full grid labels, including unit and direction, will be shown on the first full grid line in each direction from each corner, i.e. (Sup3)92(Sup000m)E or (Sup23)11(Sup000m)N.

9-2.3.1 Where a grid line coincides with a neatline, the grid line is overprinted and labeled in the margin with its value.

9-2.3.2 On charts showing the major and overlapping grids, the first grid line and grid tick in each direction from each corner are given the full coordinate values for both grids.

9-2.3.3 On the Madagascar grid and the Lambert grids of northwest Africa, use three principal digits to represent the 100,000-, 10,000-, and 1,000-meter values of the grid lines.

9-2.3.4 Only the index grid lines are labeled in the margin of skewed charts. These labels include the appropriate Northing or Easting abbreviation and the unit of measurement.

9-2.4 The grid lines in the chart interior contain a pattern of grid value labels (principal digits) designed to assist in position referencing on a folded chart. The 1,000 meter northing grid lines are labeled to the right of each 10,000 meter easting grid line and the 1,000 meter easting grid lines are labeled above each 10,000 meter northing grid line.

9-2.5 The color of the grid lines and values is purple for the primary major grid, blue for the second major or overlapping grid, and red-brown for the secondary grid.

9-2.6 A note identifying the grid and ellipsoid appears in the margin of a chart. The note is modeled after the following:

PURPLE LINES INDICATE THE 11,000 METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 59N, INTERNATIONAL ELLIPSOID

9-2.7 Figures 38 and 39 illustrate the treatment for the major grid on Combat Charts and Amphibious Assault Charts.

9-3 THE MAJOR GRID ON MINE WARFARE CHARTS.

9-3.1 The major grid is indicated by interior ticks at 10,000-unit intersections and by ticks along the neatlines at 1,000-unit intervals. The 10,000-unit ticks along the border are accentuated in weight. The major grid ticks are printed in purple.

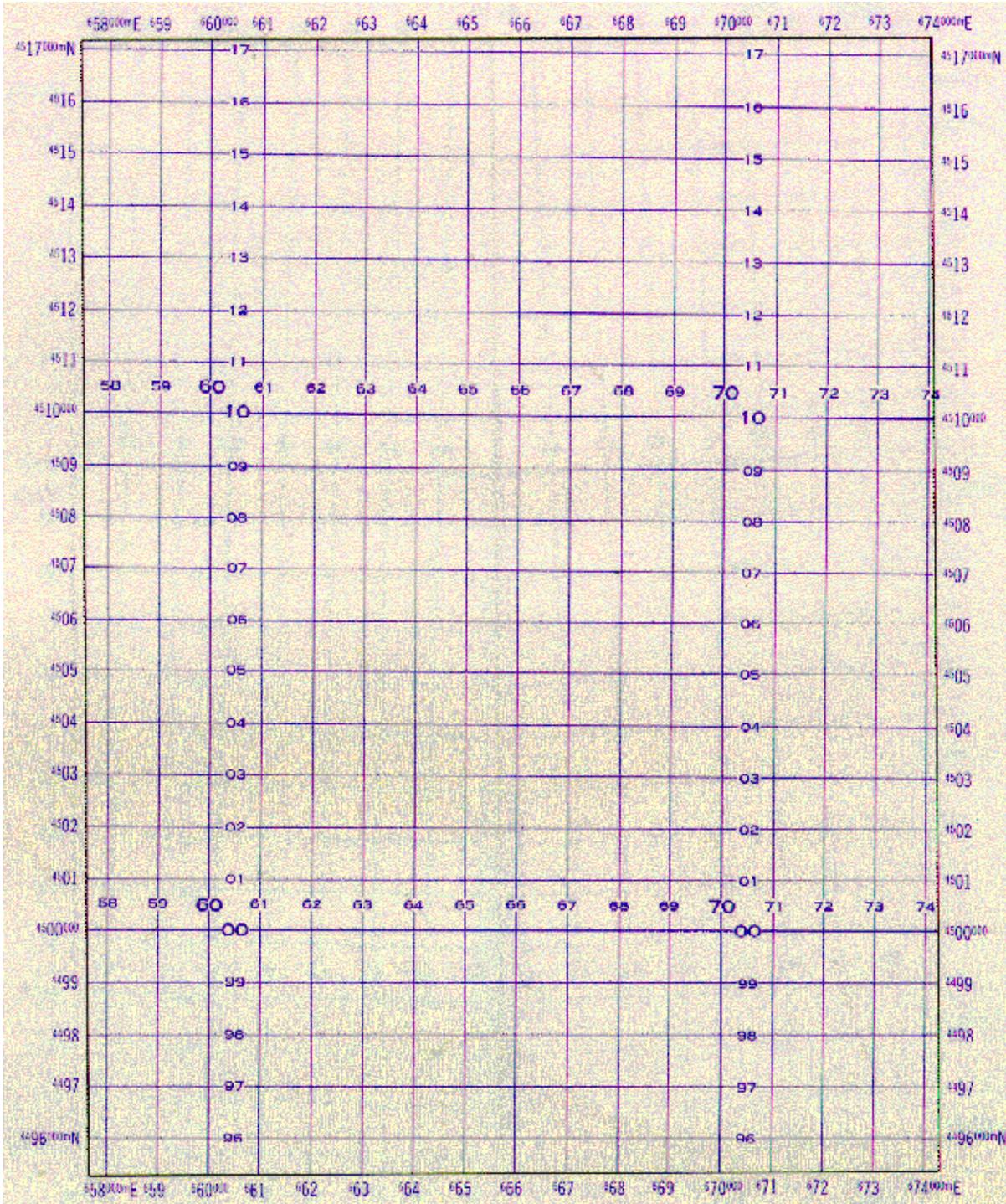
9-3.2 Grid numbers appear outside the neatlines on all four sides of the chart, labeling every 5,000-unit grid tick. Every 10,000-unit grid tick is labeled with the full coordinate value. The intermediate 5,000-unit grid tick is labeled by the principle digits preceded by the 100,000-unit and 1,000,000-unit digits. The first 10,000-unit tick from each corner includes the E for Easting and the N for Northing. All grids values are printed in the same color as the ticks. See figure 40.

9-3.3 A note identifying the grid and ellipsoid appears in the margin of a chart. The note is modeled after the following:

UNIVERSAL TRANSVERSE MERCATOR (UTM) GRID, ZONE 10T,
NORTH AMERICAN 1927 DATUM, CLARKE 1866 ELLIPSOID
FOR MILITARY GRID REFERENCE

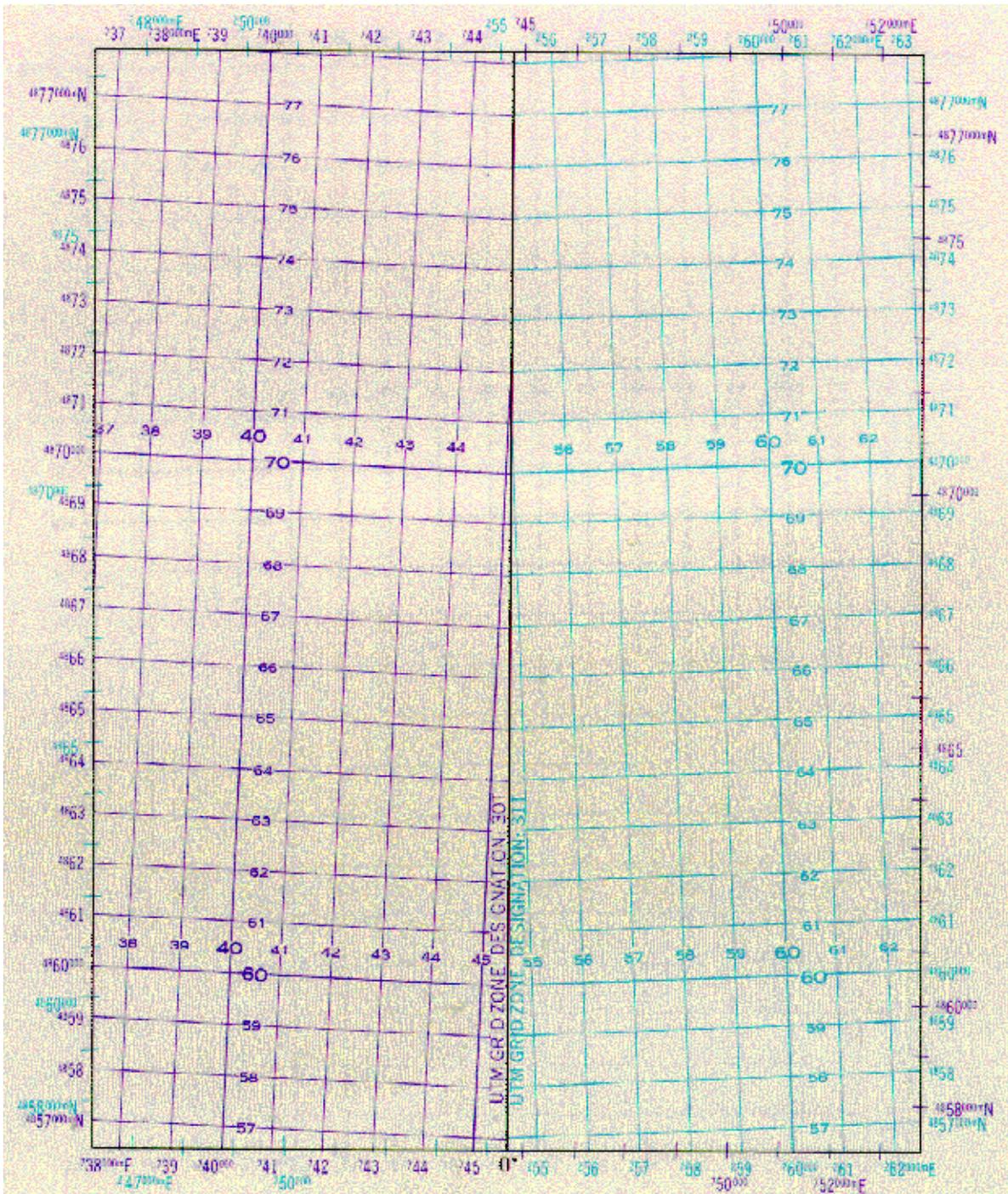
9-4 THE MAJOR GRID ON HARBOR, APPROACH, AND COASTAL CHARTS.

9-4.1 The major grid is indicated by interior and neatline ticks at 10,000-unit intervals for scales of 1:45,001 to 1:75,000. For charts at scales of 1:45,000 and larger, a 5,000-unit interval is used. The grid ticks are printed in purple. Sometimes the size and scale of charts may require the interval to be modified to show at least two ticks in each direction.



PURPLE LINES INDICATE THE 1,000 METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 49T, WORLD GEODETIC SYSTEM 1984 ELLIPSOID

Figure 38. The Major Grid as Shown on Combat, Amphibious Assault Charts.



PURPLE LINES AND TICKS INDICATE THE 1,000 METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 30T, INTERNATIONAL ELLIPSOID

BLUE LINES AND TICKS INDICATE THE 1,000 METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 31T, INTERNATIONAL ELLIPSOID

Figure 39. Two Major Grids (in this case, Zones of the UTM) Separated by a Grid Junction as Shown on Combat, Amphibious Assault Charts.

9-4.2 Grid numbers appear outside the neatline on all four sides of the chart, labeling every grid tick. The first tick from each corner includes the E for Easting and the N for Northing, m for meters or yds for yards. All grid values are printed in the same color as the ticks. See figure 41.

9-4.3 A note identifying the grid and ellipsoid appears in the margin of a chart. The note is modeled after the following:

UNIVERSAL TRANSVERSE MERCATOR (UTM) GRID, ZONE 10T,
NORTH AMERICAN 1927 DATUM, CLARKE 1866 ELLIPSOID
FOR MILITARY GRID REFERENCE

9-5 MULTIPLE MAJOR GRIDS ON COMBAT CHARTS AND AMPHIBIOUS ASSAULT CHARTS.

9-5.1 In certain instances a chart contains more than one major grid.

9-5.1.1 With the UTM and UPS grids this may occur:

9-5.1.1.1 Where original chart limits are retained as established by a mapping agency of a foreign country.

9-5.1.1.2 Where a chart is shifted from the normal position to avoid making additional charts.

9-5.1.2 With nonstandard grids, this condition occurs more frequently since, in addition to the above cases, grid junctions are sometimes loxodromes or are grid lines.

9-5.2 Grid, datum, ellipsoid, and zone junctions are indicated by accentuated lines, tinted in black. Labels identifying the junction appear parallel to and on each side of the Junction line. The labels may be shown more than once to facilitate identification. Each label is printed in the color designated for the particular grid system. When a grid, datum, ellipsoid, or zone junction line is coincident with a neatline, both the junction line and the identifying labels are omitted. If the junction line falls within 2.5 mm (0.10 inch) of the neatline, the junction line is not shown; it is considered as being coincident with the neatline.

9-5.2.1 For nonstandard grids, the label is modeled after the following:

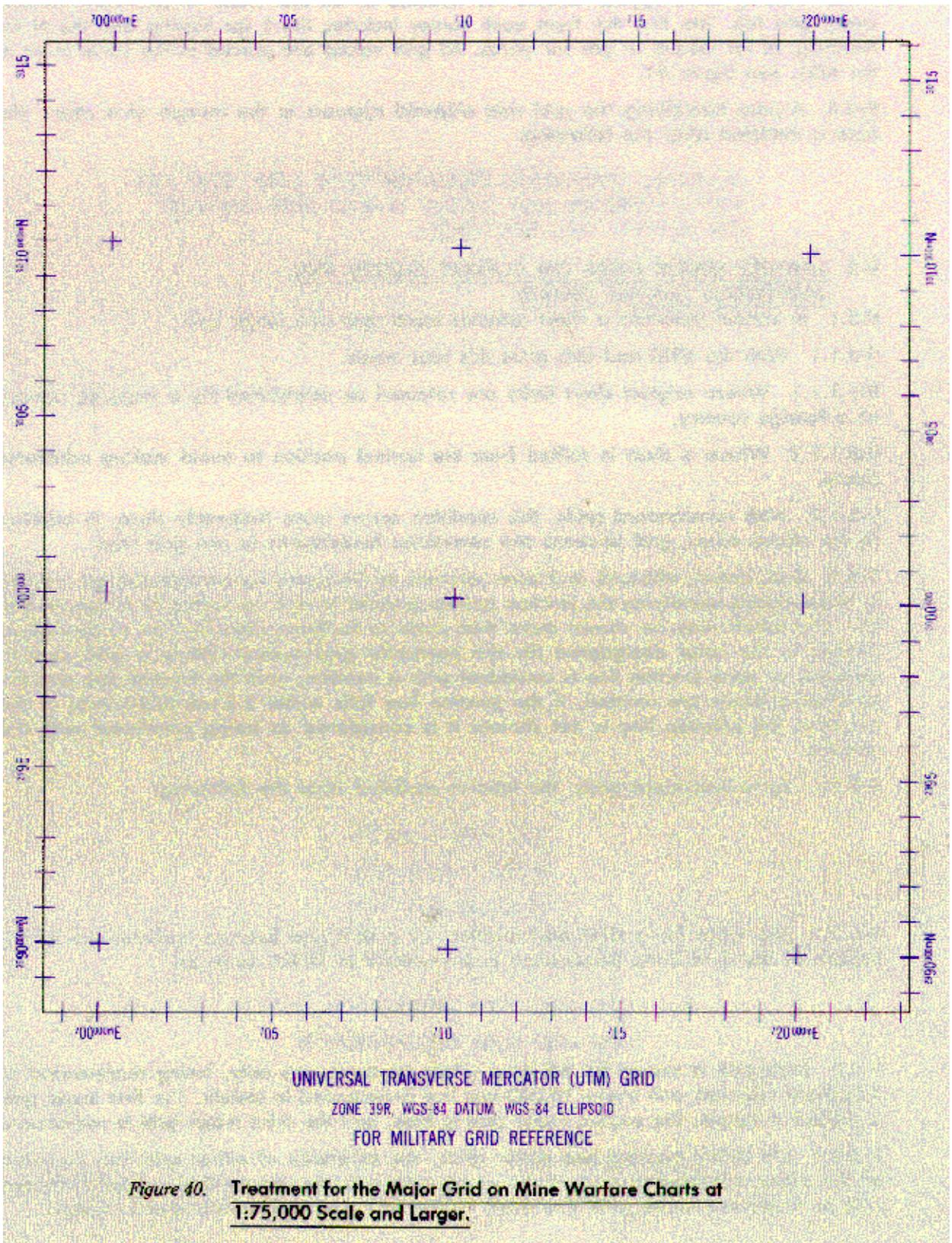
SUD MAROC GRID
NORD TUNISIE GRID
MADAGASCAR GRID

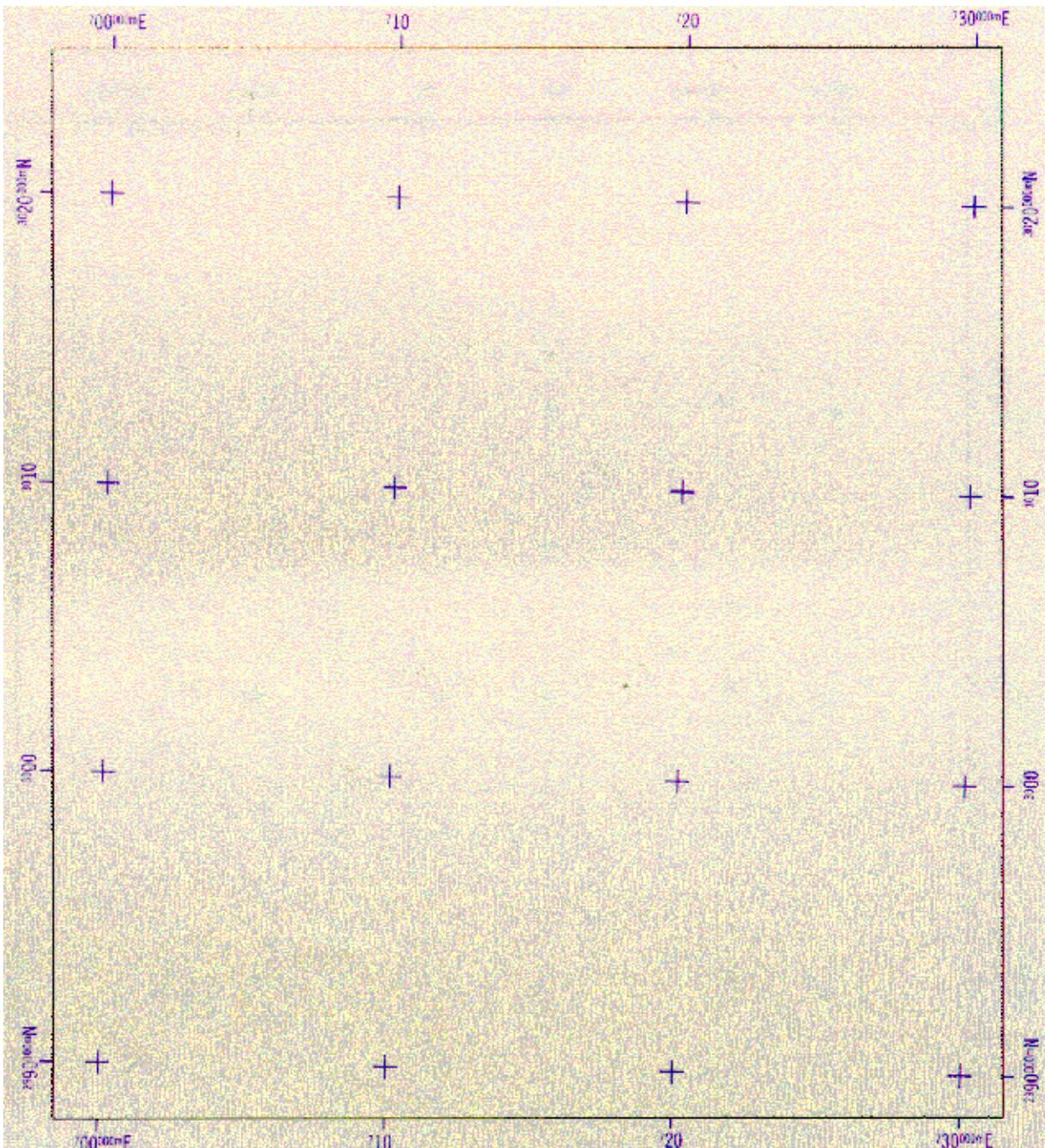
9-5.2.2 The label for a UTM grid junction, or a UPS grid junction, includes the identification of the Grid Zone Designation and is written in MGRS terms as:

UTM GRID ZONE DESIGNATION: 54T
UPS GRID ZONE DESIGNATION: B

9-5.3 Each grid is shown by full lines within its own area only, being represented at 1,000-unit intervals with every 10,000-unit line accentuated in weight. The first major grid is printed in purple, the second major grid in blue, and the third major grid in red-brown.

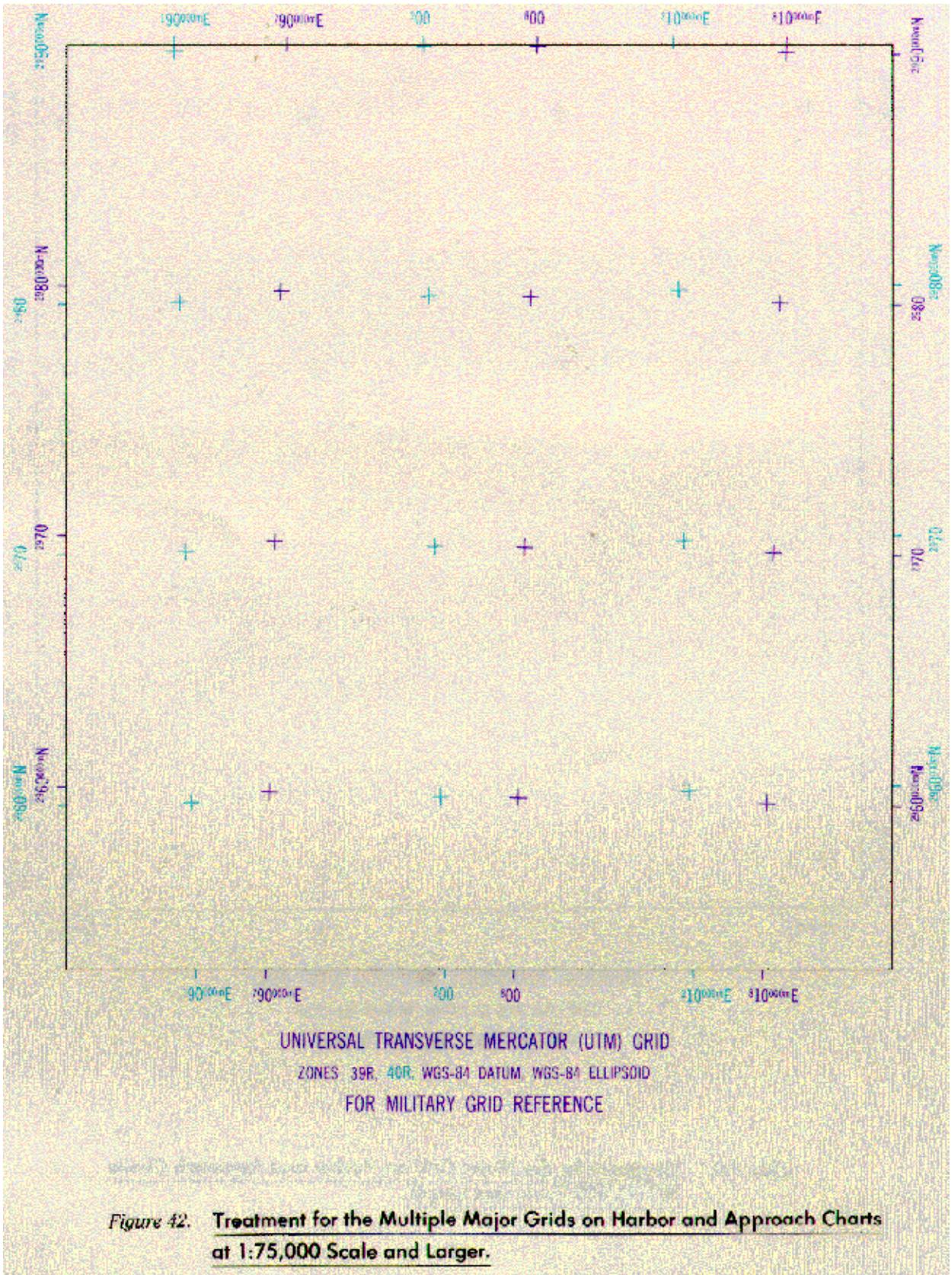
9-5.3.1 On charts bearing two major grids, the extension of either grid into the area of the other (overlapping grid) is shown by ticks crossing the neatline correctly aligned with its respective major grid. The even 10,000-unit ticks are accentuated in weight.





UNIVERSAL TRANSVERSE MERCATOR (UTM) GRID
 ZONE 39R WGS-84 DATUM, WGS-84 ELLIPSOID
 FOR MILITARY GRID REFERENCE

Figure 41. Treatment for the Major Grid on Harbor and Approach Charts at 1:75,000 Scale and Larger.



9-5.3.2 On charts bearing three major grids, a similar practice is followed.

9-5.4 Grid values appear on all four sides of the chart labeling each grid line and those grid ticks whose values are multiples of 5,000. Full values appear at each corner, labeling the first grid line in each direction from the corner.

9-5.5 Grid values, expressed in principal digits only, appear on the face of the chart labeling each grid line.

9-5.6 Notes identifying each grid appear in the margin of the chart. The notes are modeled after the following:

PURPLE LINES AND TICKS INDICATE THE 1,000 METER UNIVERSAL TRANSVERSE
MERCATOR GRID, ZONE 59N, INTERNATIONAL ELLIPSOID

BLUE LINES AND TICKS INDICATE THE 1,000 METER UNIVERSAL TRANSVERSE MERCATOR
GRID, ZONE 60N, INTERNATIONAL ELLIPSOID

9-6 MULTIPLE MAJOR GRIDS ON HARBOR, APPROACH, AND COASTAL CHARTS.

9-6.1 In certain instances a chart contains more than one major grid. See paragraph 9-5.1.

9-6.2 Grid, datum, Ellipsoid, and zone junctions are not indicated in the interior of the chart. They are marked only in the grid reference box.

9-6.3 Each grid is depicted across the full area of the chart. The first major is represented in purple. The second major grid is represented in blue, and a third major grid is shown in red-brown. Figure 42 illustrates the treatment of multiple major grids.

9-6.4 Examples of notes identifying each grid appear in figure 43. These notes may be placed within the chart neatlines or outside the border as space permits.

9-7 OVERLAPPING GRIDS ON COMBAT CHARTS, AMPHIBIOUS ASSAULT CHARTS, AND MINE WARFARE CHARTS.

9-7.1 An overlapping grid is generally required within approximately 40 kilometers of a grid, zone, or ellipsoid junction. The overlapping grid may be omitted if there are no land bodies within the 40 kilometer overlap area.

9-7.2 The overlapping grid is shown by ticks, printed in blue if there is one major grid and red-brown if there are two major grids, crossing the neatline correctly aligned with its respective grid and spaced at 1,000-unit intervals. The even 10,000-unit ticks are accentuated in weight.

9-7.3 Values, similar in composition to those labeling the major grid lines or ticks, appear on all four sides of the chart. The first grid tick in each direction from each corner of the chart whose values are multiples of 5,000 are labeled. These values are printed in the same color as that of the grid.

9-7.4 Notes identifying overlapping grids appear in the margin of each chart. The notes are patterned after those used to identify multiple major grids. Figures 38 and 39 illustrate the treatments described for charts containing major and overlapping grids.

9-8 OVERLAPPING GRIDS ON HARBOR, APPROACH, AND COASTAL CHARTS.

9-8.1 An overlapping grid may be required within approximately 40 kilometers of a grid, zone, or ellipsoid junction. The overlapping grid may be omitted if there are no land bodies within the 40 kilometer overlap area.

9-8.2 The overlapping grid is shown in the same manner as a major grid with interior and neatline ticks at 10,000 meter intervals, printed in blue if there is one major grid and red-brown if there are two major grids.

9-8.3 Values, similar in composition to those labeling the major grid ticks, appear on all four sides of the chart. The first grid tick in each direction from each corner of the chart are labeled with the full grid value. These values are printed in the same color as that of the grid.

9-8.4 Notes identifying overlapping grids appear within the chart or outside the heavy border of each chart. The notes are patterned after those used to identify multiple major grids. Figure 43 illustrates the treatments described for charts containing major and overlapping grids.

9-9 SECONDARY GRIDS.

9-9.1 As a general rule, secondary grids are not required on nautical charts.

9-9.2 When required, the secondary grid is shown in the same manner as overlapping grids except that they are printed in the next color of the hierarchy, blue then red-brown. They are labeled in the same manner as overlapping grids.

9-9.3 A grid note, identifying the secondary grid, appears in the margin or on the face of the chart depending on available space.

9-9.4 When a secondary grid differs uniformly from the major grid, a datum shift note may be used in lieu of showing the secondary grid. The note should be printed in the next color of the hierarchy: blue, then red-brown, and patterned after the following:

TO REFER THIS CHART TO EUROPEAN DATUM:
SUBTRACT 0.1 SECONDS FROM THE LATITUDE VALUE AND
ADD 1.1 SECONDS TO THE LONGITUDE VALUE;
SUBTRACT 9 METERS FROM THE UTM GRID NORTHING VALUE AND
ADD 30 METERS TO THE UTM GRID EASTING VALUE.

9-10 THE DECLINATION NOTE.

9-10.1 A grid declination note appears in the margin of each Combat Chart or Amphibious Assault Chart. The note identifies the grid declination from true north for the approximate mid-latitude of the east and west chart edges.

9-10.2 The note for the first major grid is shown in purple. The note for the second major or overlapping grid is shown in blue. If an overlapping grid occurs in combination with two major grids, the grid declination note for the overlapping grid is shown in red-brown.

The grid declination note for a secondary grid is shown in red-brown.

9-10.3 The grid declination note is modeled after the following:

CAUTION

GRID LINES ARE NOT TRUE NORTH AND SOUTH

At West edge of chart Grid N. is 0° 40'E. of True N.

At East edge of chart Grid N. is 1° 15'E. of True N.

9-10.4 Magnetic information will be derived from the magnetic compass rose.

9-11 THE GRID REFERENCE BOX.

9-11.1 A grid reference box on a Combat or Amphibious Assault Chart is printed in purple and appears in the margin of each chart. The box contains instructions and attendant data to enable the user to compose standard grid references.

9-11.1.1 The grid system(s) in use on the chart dictates the referencing instructions contained in the grid reference box. The grid reference boxes most commonly used on charts, 1:175,000 scale and larger, are illustrated in figure 43. The boxes are subject to modifications.

9-11.1.2 The grid reference box also contains diagrams identifying applicable grid zone designations and grid square identifications.

9-11.1.3 For the UTM and UPS grids, the diagrams show the grid zone designation in black, the 100,000-meter grid lines and their values (in abbreviated form) in the appropriate grid color, and the 100,000-meter square identification(s) in the appropriate grid color. Figure 43 illustrates the composition of the diagrams under various conditions.

9-11.1.4 For nonstandard grids, the diagram shows the 100,000-unit square identifications and the values of the 100,000-unit grid lines in abbreviated form. These data are printed in the same color as the grid values

to which they pertain. If the grid system identifies larger squares, their identifications are shown in smaller type just preceding the 100,000-unit identifications. The 100,000-unit grid lines are printed in purple. Grid junction lines are printed in black. If a junction is a grid line, its value is shown in abbreviated form and printed in the same color as the grid values to which it pertains. Loxodromes are not labeled.

9-11.1.5 For charts that have an inset whose 100,000-unit square identification letters differ from those of the chart proper, the identification letters are shown in the interior of the inset, rather than in the grid reference box.

9-11.2 A grid reference diagram for a Mine Warfare, Harbor or Approach Chart is printed in purple and may be located within the chart or in the margin (where space permits).

9-11.2.1 The grid reference diagram identifies the applicable grid zone designation(s) and grid square identification(s).

9-11.2.2 For the UTM and UPS grids, the diagrams show the grid zone designation(s) in the same color to which they apply.

9-11.2.3 The 100,000-unit line(s), square identification(s) and value(s) in abbreviated form are always printed in the same color as the grid values to which they pertain.

9-11.2.4 Grid junction lines are printed in black. Charts that consist of panels, the line depicting the panel limits is printed in black.

9-11.3 For charts that have an inset/plan whose 100,000-unit square identification letters differ from those of the main chart, the identification letters are shown below the inset/ plan title rather than the grid reference diagram.

9-11.4 When more than one major grid appears on a chart and the method for giving a reference is the same for all the grids, a common reference box is used.

9-11.5 When more than one major grid appears on a chart and the method for giving a reference varies with the grids, circumstances control the treatment of the grid reference boxes.

9-11.6 Standard nautical charts do NOT show full grid lines and therefore will carry a note below the grid reference diagram for constructing a full line grid, for example:

TO FORM 10,000 METER SQUARES, JOIN THE TICKS ON
NEATLINES WITH STRAIGHT LINE SEGMENTS THROUGH THE
INTERIOR TICKS.

9-12 WORLD GEODETIC SYSTEM (WGS) DATUM NOTE.

9-12.1 All nautical charts, Other than Combat Charts, Amphibious Assault Charts, and certain modified facsimiles, are constructed on WGS wherever possible. When the chart is not on the latest World Geodetic System datum, a note is shown in black indicating the correction needed to convert a coordinate to that datum.

Example for Combat Chart:

COORDINATE CONVERSIONS

EUROPEAN DATUM TO WORLD GEODETIC SYSTEM

Grid: Subtract 65m E; Subtract 296m N

Geographic: Subtract 3.5" Long; Subtract 3.0" Lat

9-12.2 When there is insufficient data available or inconsistent deviations result from the available geodetic control, one of the following notes, as appropriate, is shown in place of the WGS correction note:

WORLD GEODETIC SYSTEM DATA ADJUSTMENT

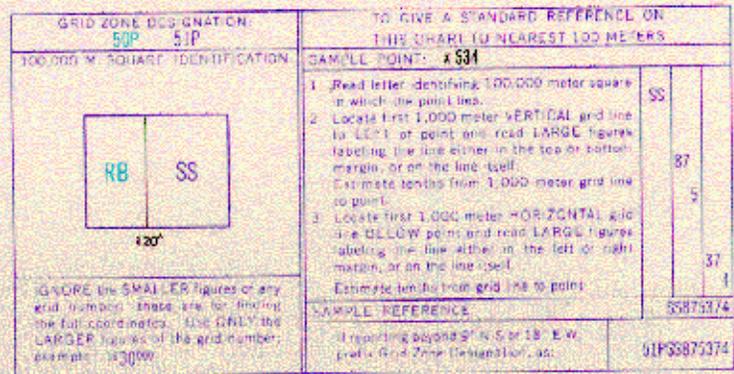
Due to unavailability of geodetic data, this chart cannot be placed on the World Geodetic System (WGS) Datum.

The available geodetic control does not indicate a uniform deviation; therefore, this chart cannot be placed on the World Geodetic System (WGS) Datum.

9-12.3 When a Mine Warfare or Harbor, Approach, and Coastal Chart is on WGS, a datum note is shown as follows:

DATUM NOTE

Positions obtained from satellite navigation systems referred to the World Geodetic System (WGS) can be plotted directly on this chart.



← **Combat, Amphibious Assault Chart example.**

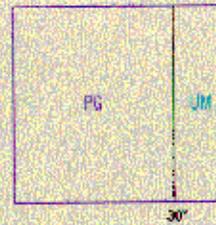
CAUTION

GRID LINES ARE NOT TRUE NORTH AND SOUTH

- At Zone Junction Grid N is 0°48'W of True N
- At East edge of Zone Grid N is 0°44'W of True N
- At West edge of zone Grid N is 0°48' E of True N
- At Zone Junction Grid N is 0°48' E of True N

UNIVERSAL TRANSVERSE MERCATOR (UTM) GRID
 ZONE 18, 35V, 36V WGS-84 DATUM, WGS-84 ELLIPSOID
 FOR MILITARY GRID REFERENCE

100,000 METER SQUARES PG JM



Mine Warfare, Harbor, Approach & Coastal Chart example. →

TO GIVE 10,000 METER SQUARES, JOIN THE Ticks ON NEAT LINES WITH 5-RIGHT LINE SEGMENTS THROUGH THE INTERIOR Ticks.

THE UTM GRID Ticks AND THE CHART ARE BASED ON THE WORLD GEODETIC SYSTEM 1984. TO REPORT WORLD GEODETIC DATUM GRID COORDINATES OF A POINT, GIVE THE LETTERS OF THE 100,000 METER SQUARE DESIGNATION FOLLOWED FIRST BY THE NUMBERS OF THE EAST READING AND THEN BY THE NORTH READING. e.g. TOLBUKH LIGHT PG417580.

CAUTION

Grid lines constructed by connecting border ticks are NOT true North and South. The resulting UTM Grid is NOT to be used for navigation. It is designed to facilitate the reporting of positions according to the Military Grid Reference System prescribed for this area.

Figure 43. Grid Reference Boxes commonly used on Nautical Charts at scales of 1:75,000 and Larger.

CHAPTER 10 GRIDS ON NAUTICAL CHARTS AT SCALES SMALLER THAN 1:75,000

10-1 GENERAL.

10-1.1 Grids are required on nautical charts at scales from 1:75,001 to 1:300,000. For charts at scales smaller than 1:300,000, reference should be made to individual project instructions to determine grid requirements.

10-1.3 The grid data for DoD charts usually include the major grid, a grid reference box, and notes identifying the grid.

10-1.4 A chart may show a secondary grid which occurs in the area. The secondary grid is identified by margin notes.

10-1.5 No single chart in this scale category ever shows more than three grids. When a chart covers an area which includes more than three (either major or secondary), those omitted are the ones which are considered of least military importance.

10-1.6 Specific dimensions, size and style of type, and placement of margin data relating to grids and grid formats at scales smaller than 1:75,000 are contained in Defense Mapping Agency (DMA) product specifications.

10-2 THE MAJOR GRID.

10-2.1 The grid is indicated by ticks at interior intersections and along the neatline. The spacing of the ticks, depends upon the scale and size of the chart and upon the need to keep the grid information within acceptable limits of accuracy. Nautical charts at scales smaller than 1:75,000 are typically constructed on Mercator projections. Grid lines which appear straight on Transverse Mercator projections will therefore appear curved when plotted on a Mercator. Since nautical charts do not normally show full grid lines, ticks are used to represent the grid allowing the user to construct a grid by drawing straight line segments between the ticks. The ticks must be positioned close enough together to allow the chart user to approximate the curve of the true grid line by drawing straight line segments. On charts at scales from 1:75,001 to 1:200,000 the maximum acceptable deviation between the true grid line and the one which the user would construct by joining the ticks is 0.5 mm (0.02in.). As a general rule, charts at this scale should indicate grids by ticks at 20,000-unit intervals. For charts at extreme latitudes, care should be taken to make sure that the maximum acceptable deviation is not exceeded. Similarly, for charts at scales from 1:200,001 to 1:300,000, the maximum acceptable deviation is 1.0 mm (0.04in.) which generally would require ticks at 50,000-unit intervals. Again, care should be taken on charts in the extreme latitudes to see that the maximum acceptable deviation is not exceeded. This paragraph is summarized in table 10.

SCALE	TICK SPACING	MAXIMUM ACCEPTABLE DEVIATION
1:95,001-1:200,000	20,000	0.5mm (0.02in.)
1:200,001-1:300,000	50,000	1.0mm (0.04in.)

Table 10 Maximum acceptable deviation of the constructed grid from the true grid.

10-2.2 Grid numbers appear outside the neatline on all four sides of the chart, labeling every grid tick. Every 100,000-unit grid tick is labeled with the full coordinate value. The intermediate grid tick(s) is (are) labeled by the principal digits preceded by the 100,000- unit digits. The first tick from each corner includes the E for Easting and the N for Northing. All grid values are printed in the same color as the ticks.

10-2.3 A note identifying the grid and ellipsoid appears in the margin or on the face of a chart depending on the available space. The note is modeled after the following:

UNIVERSAL TRANSVERSE MERCATOR (UTM) GRID, ZONE 19,
NORTH AMERICAN 1927 DATUM, CLARKE 1866 ELLIPSOID
FOR MILITARY GRID REFERENCE

10-2.4 Figure 44 illustrates the treatment for the major grid.

10-3 MULTIPLE GRIDS.

10-3.1 In many instances a chart contains more than one major grid. There may be multiple major grids or there may be a special requirement for a secondary grid in addition to the required major grid.

10-3.2 Grid, datum, and zone junctions are indicated in the grid reference box and are not shown on the face of the chart.

10-3.3 Each grid is depicted within its own area by the use of internal and neatline ticks as described in section 10-2. The grid is extended one tick beyond any grid junction line. The first major grid ticks and values are represented in purple. The second major grid ticks and values are represented in blue, and a third major grid is shown in red-brown. Figure 45 illustrates the treatment of multiple major grids.

10-3.4 Notes identifying each grid appear on the chart. The notes are modeled after the following:

UNIVERSAL TRANSVERSE MERCATOR (UTM) GRID, ZONE 19,
NORTH AMERICAN 1927 DATUM, CLARKE 1866 ELLIPSOID,
FOR MILITARY REFERENCE

UNIVERSAL TRANSVERSE MERCATOR (UTM) GRID, ZONE 19,
NORTH AMERICAN 1983 DATUM, GRS 80 ELLIPSOID,
FOR MILITARY GRID REFERENCE

10-4 SECONDARY GRIDS.

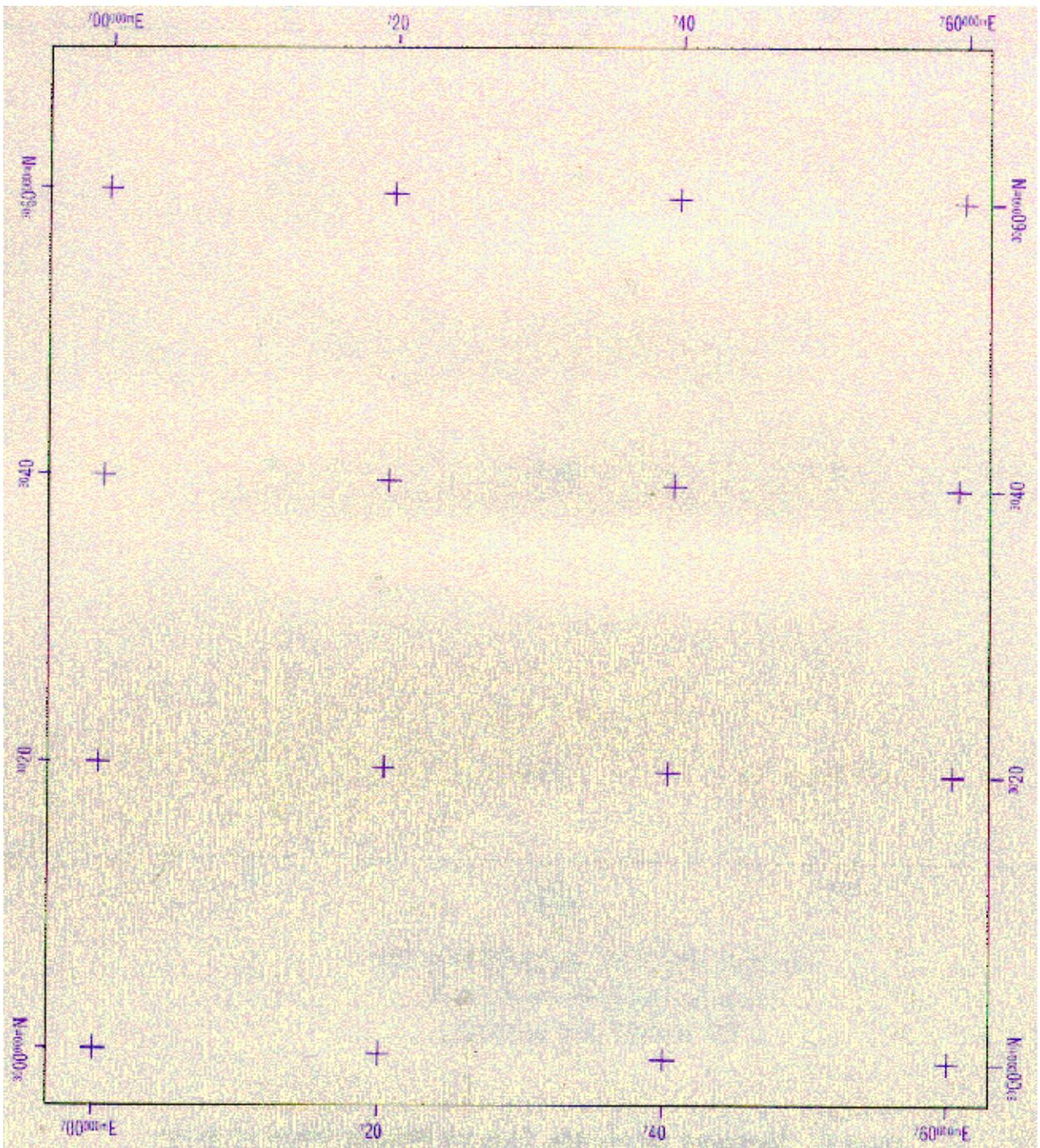
10-4.1 As a general rule, secondary grids are not required on nautical charts.

10-4.2 When required, the secondary grid is depicted within its own area by the use of internal and neatline ticks as described in section 10-2. Secondary grid ticks are printed in the next color in the hierarchy, blue then red-brown.

10-4.3 Values, similar in composition to those labeling the major grid lines, appear on all four sides of the chart. The first grid tick in each direction from each corner of the chart is labeled with full values.

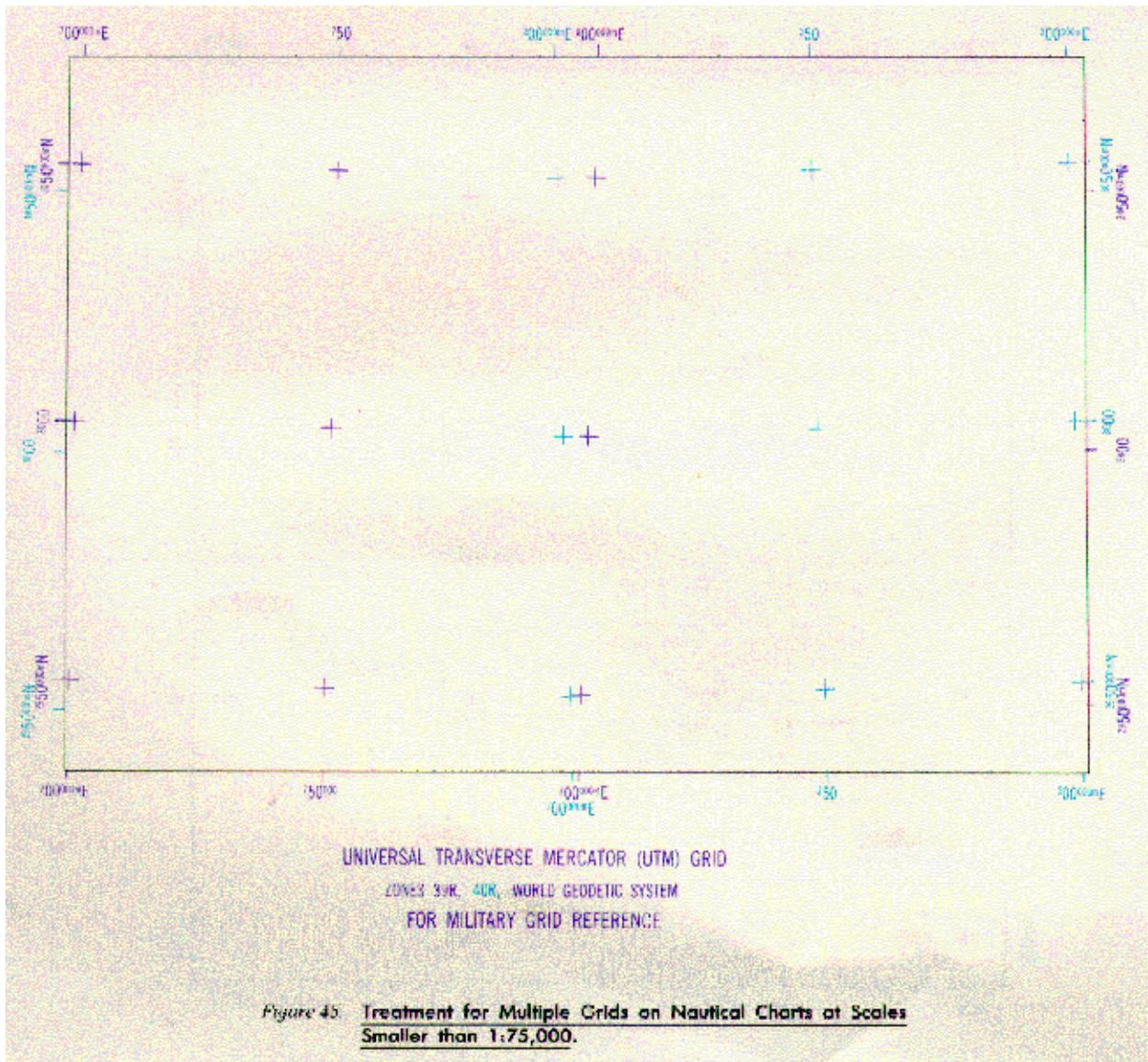
Secondary grid values are printed in the same color as the grid ticks.

10-4.4 A grid note, identifying the secondary grid, appears in the margin or on the face of the chart depending on the available space.



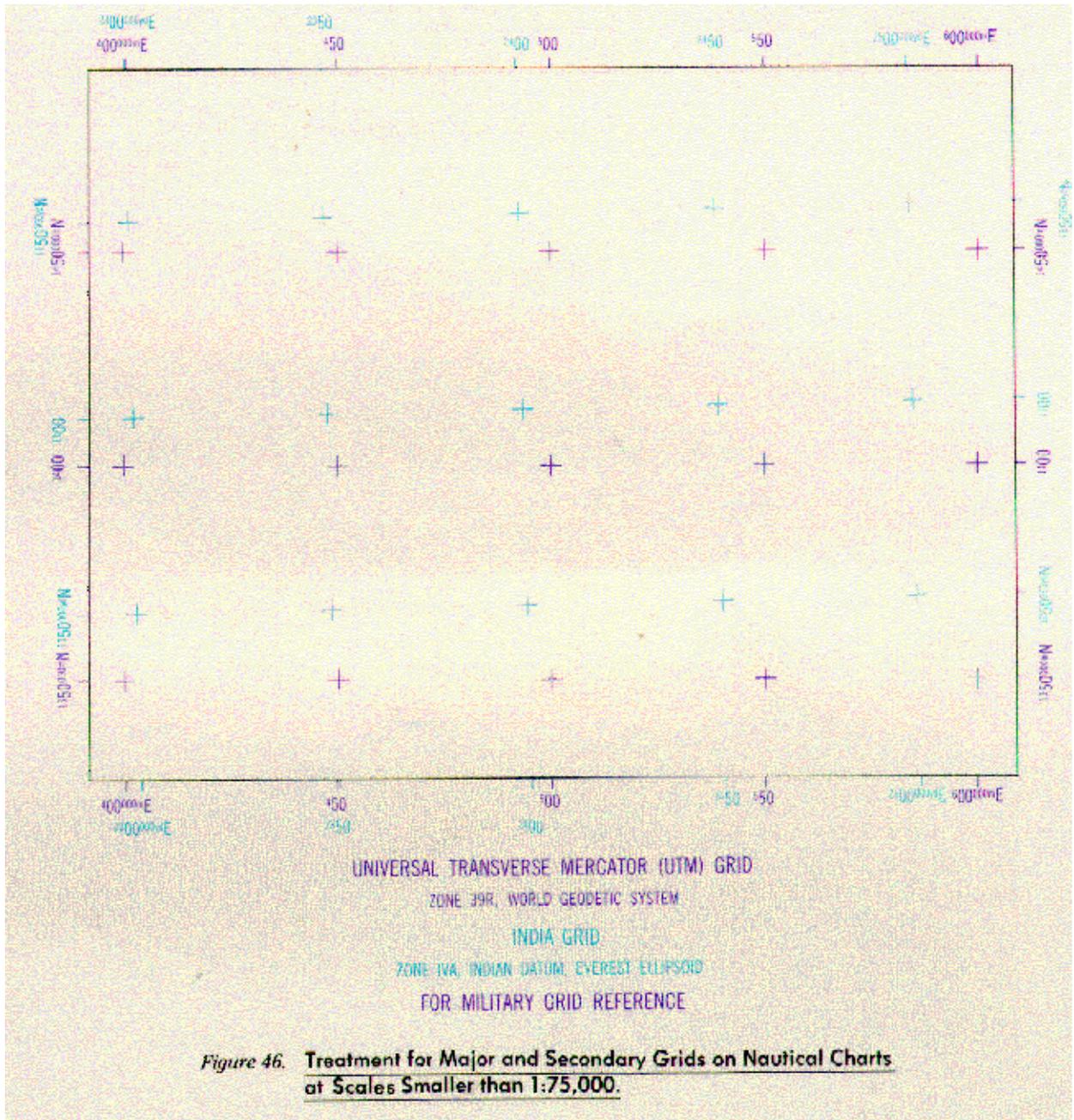
UNIVERSAL TRANSVERSE MERCATOR (UTM) GRID
 ZONE 39R, WORLD GEODETIC SYSTEM
 FOR MILITARY GRID REFERENCE

Figure 44. Treatment for the Major Grid on Nautical Charts at Scales Smaller than 1:75,000.



10-4.5 When a secondary grid differs uniformly from the major grid, a coordinate shift note may be used in lieu of showing the secondary grid. The note should be printed in red-brown and patterned after the following:

TO REFER THIS CHART TO EUROPEAN DATUM:
 SUBTRACT 0.1 SECONDS FROM THE LATITUDE VALUE;
 AND ADD 1.1 SECONDS TO THE LONGITUDE VALUE;
 SUBTRACT 9 METERS FROM THE UTM GRID NORTHING VALUE AND
 ADD 30 METERS TO THE UTM GRID EASTING VALUE.



10-4.6 Figure 46 illustrates the treatment described for charts containing major and secondary grids.

10-5 THE GRID REFERENCE BOX (OR NOTES).

A grid reference box, printed in purple appears in the margin or on the face of each chart depending on available space. The box contains instructions and attendant data to enable the user to compose standard grid references. For information relating to the grid reference box, see Chapter 9 paragraph 9-11.

10-6 WORLD GEODETIC SYSTEM (WGS) DATUM NOTE.

For information relating to the appropriate WGS Datum Note, see Chapter 9 paragraph 9-12.

CHAPTER 11 GRIDS ON AERONAUTICAL CHARTS AT 1:500,000 SCALE AND LARGER

11-1 GENERAL.

11-1.1 The treatment of the grid and isogonic data for the 1:250,000 scale Joint Operations Graphic Air (JOG-A) series is contained in Chapter 7.

11-1.2 Grid data and grid format for the aeronautical chart at 1:500,000 scale are essentially the same for Universal Transverse Mercator grids, Universal Polar Stereographic grids, and nonstandard grids. Sheet lines of charts at these scales are planned to provide a uniform sheet size. Details of the chart format and size are contained in the appropriate product specification.

11-1.3 The grid data consist of grid lines and values, grid reference boxes, notes identifying the grids, and information concerning the magnetic declination over the sheet. Secondary, overlapping and extended grids are not shown.

11-2 THE MAJOR GRID.

11-2.1 The major grid is shown by full lines printed in blue, at 100,000-unit intervals. Ticks are shown at 10,000-unit intervals along the grid lines and neatlines. (For sheets covering the United States, full lines will be shown at 50,000-meter intervals, with intensified lines at 100,000-meter intervals.) The unit of measure is predominately meters; yards are used for some nonstandard grids.

11-2.2 Grid lines are labeled along the margins as follows:

11-2.2.1 Full grid line values shall be shown at the first grid line in each direction from each corner. They are also shown if there is a change of the measuring unit. (Show four pair of full grid line values per unit of measurement only.) Except for the values labeling the first grid line from each corner, the last four digits (0000) of the values are omitted. The values are shown in two sizes of type, with the larger size being reserved for the principal digits.

11-2.2.2 Full grid tick values shall include the abbreviated designation of the measuring unit "m." for meters or "yds." for yards and the abbreviated geographic designation of the tick, "N." for Northings and "E." for Eastings.

11-2.2.3 Intermediate grid line and tick values are shown in the margins and include only the principal digits and digits prefixing the principal digits. The end of each grid line within the neatline are labeled in this manner. With most grids, one principal digit is used. This represents the 10,000-unit digit of the grid values. Two principal digits are used with the Madagascar grid and the Lambert grids of northwest Africa. These represent the 100,000- and 10,000-unit digits of the grid values.

11-2.3 The grid square identification (100,000-unit squares) is shown near each 100,000-unit grid line intersection. When the intersection is coincident with the west or south neatline, only the identification letters falling inside the neatline are shown. When the intersection is coincident with the east or north neatline, identification letters are shown on both sides of the neatline.

11-2.4 On aeronautical charts at 1:500,000 scale, all grid information is printed in blue.

11-2.5 A grid note appears in the lower margin of each sheet to identify the grid. The note is part of the grid reference box and is modeled after the following:

BLUE NUMBERED LINES INDICATE 100,000 METERS,
TICKS 10,000 METERS, UNIVERSAL TRANSVERSE MERCATOR
GRID, ZONE 53S, BESSEL ELLIPSOID

BLUE NUMBERED LINES INDICATE 100,000 METERS,
TICKS 10,000 METERS, LAMBERT SUD MAROC GRID

11-2.6 When the entire grid falls within one ellipsoid, the ellipsoid is not identified within the grid reference box but beneath it as follows:

Entire UTM Grid falls within International Ellipsoid.

11-2.7 In most instances a sheet contains more than one major grid. Grid, ellipsoid, and zone junctions are indicated by solid blue lines. Labels are shown on each side of the junction line. The labels may be shown more than once to facilitate identification. Where a grid, ellipsoid, or zone junction is coincident with the south or west neatline, only the identifying names within the chart area will be shown.

11-2.8 Junction line labels are modeled after the following:

**BESSEL ELLIPSOID
WORLD GEODETIC SYSTEM 1972 ELLIPSOID
SUD ALGERIE GRID
UTM GRID ZONE DESIGNATION: 31R
UTM GRID ZONE DESIGNATION: 15C
UPS GRID ZONE DESIGNATION: A**

11-2.8.1 When the grids are different zones of the UTM grid, the note is modeled after the following:

BLUE NUMBERED LINES INDICATE 100,000 METERS,
TICKS 10,000 METERS, UNIVERSAL TRANSVERSE MERCATOR
GRID, ZONES 50 AND 51, CLARKE 1866 ELLIPSOID

11-2.8.2 When more than one grid is involved, the notes are modeled after the following:

IN AREAS COVERED BY UTM GRID: BLUE NUMBERED LINES
INDICATE THE 100,000 METERS, TICKS 10,000 METERS,
UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 37X,
INTERNATIONAL ELLIPSOID

IN AREAS COVERED BY UPS GRID: BLUE NUMBERED LINES
INDICATE THE 100,000 METERS, TICKS 10,000 METERS
UNIVERSAL POLAR STEREOGRAPHIC GRID, ZONE Z,
INTERNATIONAL ELLIPSOID

11-2.8.3 A separate marginal note is not shown for the grid in the north or east overlap of a chart. Such a grid is identified on the face of the chart only.

11-2.9 When an ellipsoid junction occurs on a chart, the UTM grid treatment is the same as that followed when a sheet straddles a grid junction. The ellipsoids are identified on each side of the junction line. See figure 30. A note, printed in the same color as the grid values, appears in the lower margin of the sheet identifying the grid(s), zone(s), and ellipsoids.

BLUE NUMBERED LINES INDICATE 100,000 METERS,
TICKS 10,000 METERS UNIVERSAL TRANSVERSE MERCATOR
GRID, ZONE 52T, WGS ELLIPSOID AND ZONE 52T,
BESSEL ELLIPSOID

11-2.10 In certain cases, a sheet bearing the UTM grid may straddle a parallel which marks the division between different grid zone designations. The grid and corresponding labeling appear as previously described. A continuous line in black indicates the dividing parallel. The proper grid zone designations appear on each side of the line. The dividing parallel is omitted when it falls within 2.5 mm (0.10 inch) of the north or south neatlines. Figure 31 illustrates these principles.

11-3 GRID DECLINATION.

Grid declination from true north is not shown on 1:500,000 scale aeronautical charts.

11-4 MAGNETIC DECLINATION.

11-4.1 Isogonic lines are shown on the face of the sheet. In addition to the isogonic lines, a note modeled after the following is shown in the margin:

LINES OF EQUAL MAGNETIC VARIATION FOR 1990
(Annual rate of change, no change)

11-4.2 When the magnetic variation is approximately the same over the entire chart, no isogonic lines are shown, and the magnetic variation is indicated by a note modeled after the following:

MAGNETIC VARIATION FOR 1990 IS APPROXIMATELY
1° W OVER THE ENTIRE AREA
(Annual rate of change 7' decrease)

11-5 THE GRID REFERENCE BOX.

11-5.1 A grid reference box appears in the margin of each sheet. The box contains step- by-step instructions for composing a grid reference. For examples, see figure 47. The applicable grid zone designation is also identified in the box.

11-5.2 The grid system(s) in use on the map dictates the referencing instructions contained in the grid reference box.

11-5.3 When more than one major grid appears on a sheet and the method for giving a reference is the same for all the grids, a common reference box is used.

11-5.4 When more than one major grid appears on a sheet and the method for giving a reference varies with the grids, circumstances control the treatment of the grid reference boxes. A grid reference box is shown in the margin for each grid, except those falling completely in open water area. At the top of each box appears a note limiting the use of the box to the grid or grids concerned.

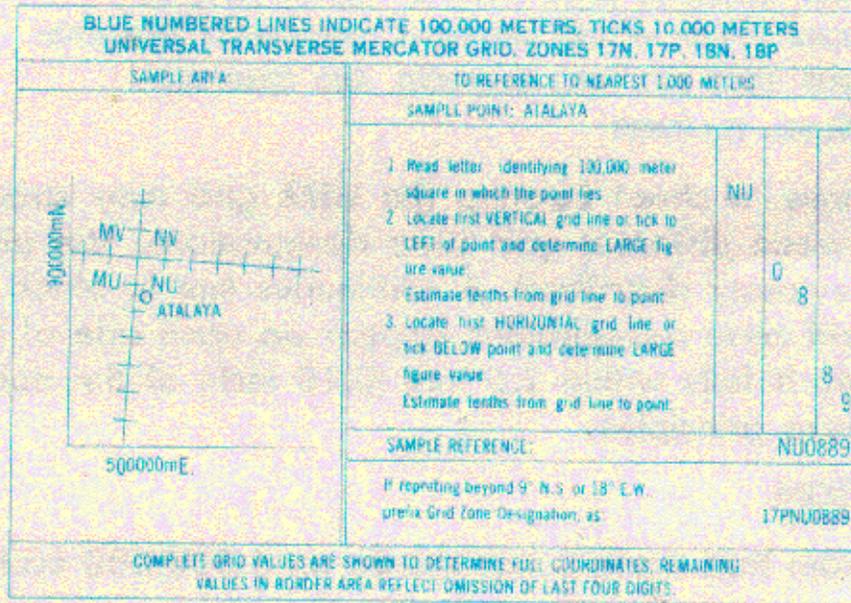


Figure 47. Grid Reference Box Commonly Used on Aeronautical Charts at 1:500,000 Scale and Larger.