

APPENDIX H

RANGE CARDS AND SECTOR SKETCHES

The success of a defense depends on the positioning of soldiers and weapons. To position their weapons effectively, platoon leaders must know the characteristics, capabilities, and limitations of their weapons, the effects of terrain, and the enemy. However, the platoon leader is not done after merely positioning his weapons. He must ensure that each weapon can effectively engage the enemy, and the sum of his weapons can effectively mass coordinated direct fires on the enemy. The platoon leader accomplishes this by making his soldiers produce detailed range cards and by making his squad leaders and section leaders produce detailed, coordinated sector sketches. He personally inspects individual soldier positions, reviews subordinate sector sketches, and coordinates with adjacent units to develop a detailed and accurate platoon sector sketch.

Section I. RANGE CARDS

A range card is a sketch of the assigned sector that a direct fire weapon system is intended to cover. A range card aids in planning and controlling fires and aids the crews and squad gunners in acquiring targets during limited visibility. It is also an aid for replacement personnel or platoons or squads to move into the position and orient on their sector. The individual soldier or gunner should make the range card so that he becomes more familiar with the terrain in his sector. He should continually assess the sector and, if necessary, update his range card. To prepare a range card, the gunner must know the following information.

- Sectors of fire.
- Target reference points.
- Dead space.
- Maximum engagement line.
- Weapons or gunners reference point.
- Weapons symbol, left and right limits, and north seeking arrow.

H-1. SECTORS OF FIRE

A sector of fire is a piece of the battlefield for which a gunner is responsible. He may be assigned a primary and a secondary sector. Leaders use sectors of fire to ensure fires are distributed across the platoon's area of responsibility.

a. A sector of fire is assigned to cover possible enemy avenues of approach. Leaders should overlap sectors to provide the best use of overlapping fire and to cover areas that cannot be engaged by a single weapon system.

b. The leader assigns left and right sector limits using prominent terrain features or easily recognizable objects such as large rocks, telephone poles, fences, or stakes.

H-2. REFERENCE POINTS AND TARGET REFERENCE POINTS

Leaders designate natural or man-made features as reference points. A soldier uses these reference points for target acquisition and range determination. Some reference points may also be designated as target reference points. A TRP is an easily recognizable point on the ground (natural or manmade) used to initiate, distribute, and control fires. The company or battalion designates TRPs, and platoon and squad leaders also should designate TRPs. TRPs always should be visible. These also may be useful as indirect-fire targets.

a. The commander or platoon leader designates TRPs used as indirect fire targets so that target numbers can be assigned.

b. TRPs should be visible through all spectrums available to the unit. They must be easily identifiable to the defender during daylight. TRPs must be heated so they can be recognized with thermal sights, and they must have an infrared signature so they can be recognized through night vision devices.

H-3. DEAD SPACE

Dead space is any area that cannot be observed or covered by direct-fire systems within the sector of fire. All dead space within the sector must be identified to allow the platoon leaders and squad leaders to plan indirect fires (mortars, artillery, MK19, or M203) to cover the area. The squad leader must walk the engagement area to identify dead space for his M249s and M240B. When the vehicles are used in the defense, the section leaders must walk the engagement area so gunners can detect dead spaces through their remote weapons sighting system.

H-4. MAXIMUM ENGAGEMENT LINE

The MEL is the depth of the sector and normally is limited to the maximum effective engagement range of the weapons systems. However, it can be less if there are objects that prevent the soldier from engaging targets at maximum effective ranges of his assigned weapon. To assist in determining the distance to each MEL, the soldier should use a map to ensure that the MELs are depicted accurately on the range card. Identifying the MEL will decrease ammunition expenditure during an engagement.

H-5. WEAPONS REFERENCE POINT

The weapons reference point (WRP) is an easily recognizable terrain feature on the map used to assist leaders in plotting the vehicle, squad, or weapon position. The WRP is used to assist leaders in plotting positions and assisting replacement personnel in finding positions.

H-6. Weapons symbol, left and right limits, and north seeking arrow.

- Weapon Symbol. Indicates the type of weapon that the range card was designed for.
- Magnetic North. Take the range card and orient it with the assigned sector of fire. Use a lensatic compass to determine magnetic north. Keep the range card oriented to the sector of fire and draw the magnetic north symbol in the appropriate direction in the *Magnetic North* box.
- Left Limit and Right Limit. Left and right limits are imaginary lines from the gunner's firing position to a designated point on the ground. Use terrain features when possible to designate left and right limits. Other recognizable objects such as a building or other man-made structures can be used. The area between the left and right limits depicts the gunner's sector of fire or area of responsibility.

H-7. PREPARATION PROCEDURES

The individual soldier or gunner prepares two copies of the range card. If alternate and supplementary firing positions are assigned, two copies are required for these as well. One copy is kept with the gunner and the other is given to the section or squad leader for his sketch.

a. Draw the weapon symbol in the center of the small circle. Draw two lines from the position of the weapons system extending left and right to show the limits of the sector ([Figure H-1](#)). The area between the left and right limits depicts the gunner's sector of fire or area of responsibility. Number the left limit as No. 1, number the right limit No. 2, and place a circle around each number. **Record the azimuth and distance of each limit in the data section.**

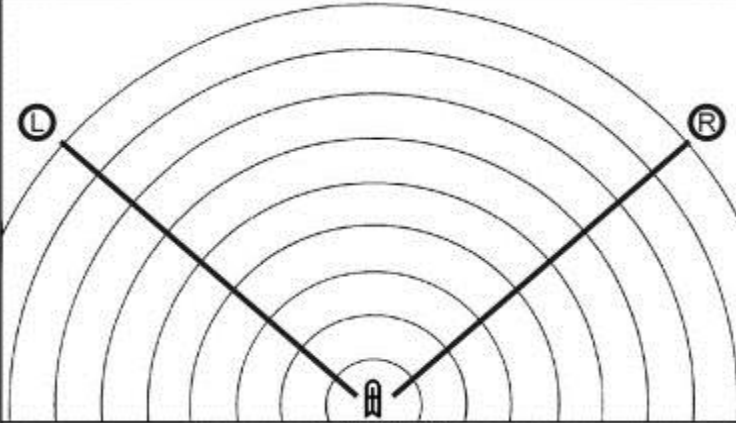
STANDARD RANGE CARD					
For use of this form see FM 7-7J. The proponent agency is TRADOC.					
SQD _____ PLT _____ CO _____	May be used for all types of direct fire weapons.				MAGNETIC NORTH
					
DATA SECTION					
POSITION IDENTIFICATION				DATE	
WEAPON				EACH CIRCLE EQUALS METERS	
NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
REMARKS:					
DA FORM 5517-R, FEB 1986					

Figure H-1. Placement of weapon symbol and left and right limits.

b. Determine the value of each circle by finding a terrain feature farthest from the position and within the weapon system's capability. Determine the distance to the terrain feature. Round off the distance to the next even hundredth, if necessary. Determine the maximum number of circles that will divide evenly into the distance. The result is the value of each circle. Draw the terrain feature on the appropriate circle on the range card. Clearly mark the increment for each circle across the area where DATA SECTION is written. For example, in [Figure H-2](#) a hilltop at 2,345 meters is used. The distance is rounded to 2,400 meters, divided by 8, and equals 300. Thus, each circle has a value of 300 meters.

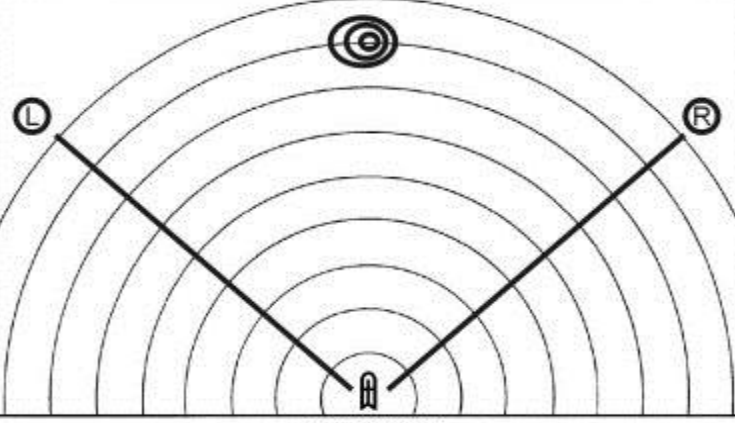
STANDARD RANGE CARD <small>For use of this form see FM 7-7J. The proponent agency is TRADOC.</small>					
SQD: _____ PLT: _____ CO: _____	May be used for all types of direct fire weapons.				MAGNETIC NORTH
					
DATA SECTION					
POSITION IDENTIFICATION				DATE	
WEAPON				EACH CIRCLE EQUALS METERS <u>300</u>	
NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
REMARKS:					
<small>DA FORM 5517-R, FEB 1986</small> <small>USARPA V1-80</small>					

Figure H-2. Circle value.

(1) [Figure H-3](#), shows a farmhouse at 1,500 meters on the left limit. The wood line at 2,000 meters annotates the right limit. Determine the distance to these features by using a map or laser range finder. Note how the circle markings can assist in positioning the features on the range card.

STANDARD RANGE CARD <small>For use of this form see FM 7-7.1. The proponent agency is TRADOC.</small>					
SQD: _____ PLT: _____ CO: _____	May be used for all types of direct fire weapons.				MAGNETIC NORTH
DATA SECTION					
POSITION IDENTIFICATION				DATE	
WEAPON				EACH CIRCLE EQUALS METERS <u>300</u>	
NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
REMARKS:					
<small>DA FORM 5517-R, FEB 1986</small> <small>USARPA V-1-80</small>					

Figure H-4. Reference points and target reference points.

(3) Dead space ([Figure H-5](#)) is shown as an irregular circle with diagonal lines drawn inside. Any object that prohibits observation or coverage with direct fire will have the circle and diagonal lines extend out to the farthest maximum engagement line. If the area beyond the dead space can be engaged, the circle is closed.

STANDARD RANGE CARD <small>For use of this form see FM 7-7J. The proponent agency is TMADOC.</small>					
SQD _____ PLT _____ CO _____	May be used for all types of direct fire weapons.				MAGNETIC NORTH
DATA SECTION					
POSITION IDENTIFICATION				DATE	
WEAPON				EACH CIRCLE EQUALS METERS 300	
NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
REMARKS:					
<small>DA FORM 5517-R, FEB 1986</small> <small>USDAK V1-80</small>					

Figure H-5. Dead space.

(4) MELs are shown as in [Figure H-6](#). They are drawn at the maximum effective engagement range per weapon if there is no dead space to limit their range capabilities. MELs are not drawn through dead space.

STANDARD RANGE CARD <small>For use of this form see FM 7-7.1. This proponent agency is TRADOC.</small>					
SQD: _____ PLT: _____ CO: _____	May be used for all types of direct fire weapons.				MAGNETIC NORTH
DATA SECTION					
POSITION IDENTIFICATION				DATE	
WEAPON				EACH CIRCLE EQUALS METERS 300	
NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
REMARKS:					

DA FORM 5517-R, FEB 1986
USGPA V1-80

Figure H-6. Maximum engagement lines.

(5) The WRP ([Figure H-7](#)) is represented as a line with a series of arrows extending from a known terrain feature and pointing in the direction of the weapon system symbol. This feature is numbered last. The WRP location is given a six-digit grid. When there is no terrain feature to be designated as the WRP, the weapon system's location is shown as an eight-digit grid coordinate in the remarks block of the range card. (In [Figure H-7](#) the WRP is number 4.)

(6) **Direction/Deflection.** The direction is listed in degrees. The deflection is listed in mils.

(7) **Elevation.** The elevation is listed in mils.

(8) **Range.** This is the distance, in meters, from weapon system position to L and R limits and TRPs and RPs.

(9) **Ammunition.** List types of ammunition used.

(10) **Description.** List the name of the object (for example, farmhouse, wood line, or hilltop).

(11) **Remarks.** Enter the WRP data. As a minimum, WRP data includes a description of what the WRP is, its six-digit or eight digit grid coordinate, the magnetic azimuth, and the distance from the WRP to the position.

d. Complete the marginal information at the top of the card ([Figure H-8](#)).

(1) **Unit Description.** Enter unit description such as squad, platoon, or company. Never indicate a unit higher than company.

(2) **Magnetic North.** Orient the range card with the terrain and draw the direction of the magnetic north arrow.


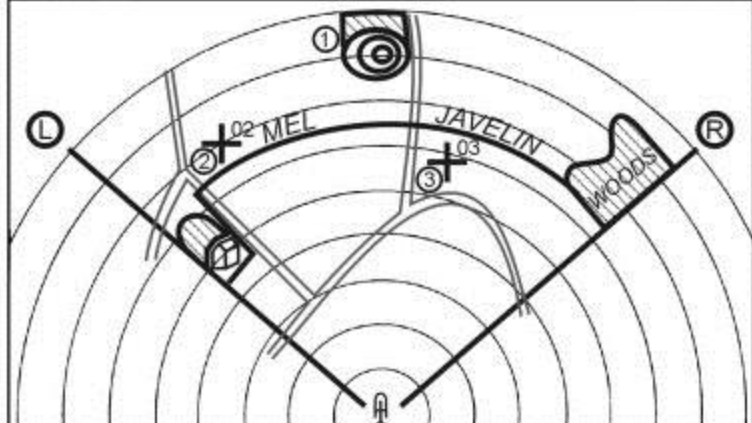
STANDARD RANGE CARD <small>For use of this form see FM 7-7J. This proponent agency is TRADOC.</small>					
SQD <u>A</u> PLT <u>2</u> CO <u>C</u>	May be used for all types of direct fire weapons.				 MAGNETIC NORTH
					
DATA SECTION					
POSITION IDENTIFICATION <u>PRIMARY</u>			DATE <u>11 FEB / 1135 HRS</u>		
WEAPON <u>JAVELIN</u>			EACH CIRCLE EQUALS <u>300</u> METERS		
NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
L	350 °	N/A	1500m	JAV	FARM HOUSE
R	105 °	N/A	1900m	JAV	RIGHT SIDE
1	050 °	N/A	2200m	JAV	RP-HILLTOP
2	360 °	N/A	2100m	JAV	TRP-AB002RJ
3	075 °	N/A	1800m	JAV	TRP-AB003RT
REMARKS:					
<small>DA FORM 5517-R, FEB 1986</small> <small>USARV V1.00</small>					

Figure H-8. Example of a completed range card.

Section II. SECTOR SKETCHES

Individual soldiers, crew-served weapon crews in the squads, and ICV gunners prepare range cards. Squad leaders prepare squad sector sketches, and section leaders prepare section sector sketches. The platoon leader reviews his squads' and sections' sector sketches and ensures the sketches meet his intent. If he finds any gaps or other flaws, the platoon leader adjusts weapons locations or sectors. Once the platoon leader approves the squad and section sector sketches, he prepares a consolidated report for the company commander and incorporates this into a consolidated platoon sector sketch. The platoon leader or platoon sergeant physically prepares the platoon sector sketch. The sector sketch can be on acetate taped to a map or it can be a hand drawn sketch. Accurate and detailed sketches aid in direct fire planning and in direct fire control and distribution.

H-8. SQUAD AND SECTION SECTOR SKETCH

The squad leaders and section leaders make two copies of their sector sketches; one copy goes to the platoon leader, the other remains at the position. The squad leaders and section leaders draw sector sketches ([Figure H-9](#)) as close to scale as possible, showing:

- Main terrain features in the sector and the range to each.
- Each primary position.
- Engagement area or primary and secondary sectors of fire covering each position.
- M240B machine gun FPL or PDF (if applicable)
- M249 squad automatic weapon FPLs or PDFs.
- M2 and MK 19 FPLs or PDFs.
- Type of weapon in each position.
- Reference points and TRPs in the sector.
- Observation post locations.
- Dead space.
- Obstacles.
- MELs for all weapon systems.
- MELs for Javelin (if applicable) and AT4s.
- Indirect fire targets.

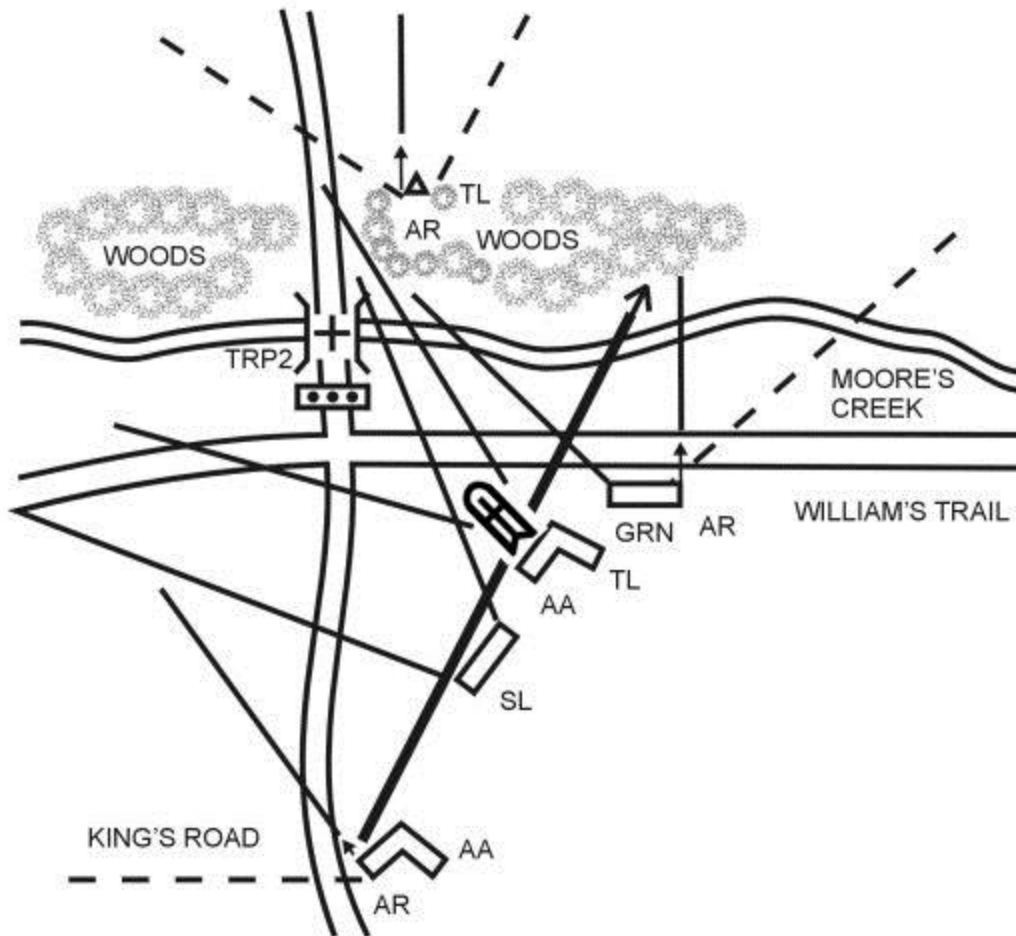


Figure H-9. Squad sector sketch.

H-9. PLATOON SECTOR SKETCH

Squad leaders and section leaders prepare their sketches and submit them to the platoon leader. The platoon leader combines all sector sketches (and possibly separate range cards) to prepare a platoon sector sketch. A platoon sector sketch ([Figure H-10](#)) is drawn as close to scale as possible and includes a target list for direct and indirect fires. One copy is submitted to the company commander, one copy is given to the platoon sergeant (controlling the mounted element), and one copy is given to the leader of the dismounted element (usually the platoon leader). As a minimum, the platoon sector sketch should show:

- Primary and secondary sectors of fire or engagement areas.
- Primary, alternate, and supplementary vehicle and squad positions.
- Remount points.
- Javelin, M240B, and M249 positions with primary directions of fire.
- M2 and MK19 positions with primary direction of fire.
- M240B and M249 FPLs or PDFs.
- MELs for all weapon systems.
- Observations posts.
- Target reference points.

- NOTE:** FBCB2-equipped units provide leaders a more accurate means for recording and sharing sector sketch and range card data. If the platoon leader finds any gaps or other flaws, the platoon leader adjusts weapons locations or sectors. Once the platoon leader approves the squad sector sketches and vehicle range cards, he prepares a consolidated report and incorporates this into a consolidated platoon sector sketch. These locations are forwarded to company (then to battalion) using FBCB2 to plot the requisite no-fire areas and graphic fire control measures.



Platoon leaders coordinate with adjacent platoons, and squad leaders coordinate with adjacent squads, so that all positions and all platoons and squads are mutually supporting. The platoon leader must ensure that this coordination takes place. Coordination usually is initiated from left to

right. As a minimum, gaps between positions are covered by fire. Contact points are established to ensure friendly forces meet at some specific point on the ground to tie in their flanks. In many cases, the exchange of sector sketches will accomplish most of the coordination necessary for tying in the flank positions. Typical information that is exchanged includes:

- Locations of primary, alternate, and supplementary positions.
- Sectors of fire for ICVs, M240Bs, and Javelins.
- Location of dead space between platoons and how it is to be covered.
- Location of observation posts.
- Location and types of obstacles and how to cover them.
- Patrols (size, type, time of departure and return, and routes).