

Chapter 14

Special Considerations

This chapter discusses special procedures applied to some missions to effectively engage targets.

REGISTRATION AND SHEAF ADJUSTMENT

14-1. Firing the registration is the first mission that will be completed if time and the tactical situation permit.

FIRING COORDINATED AND NONCOORDINATED MISSIONS

14-2. Two types of registration missions are fired on the surveyed chart: coordinated and noncoordinated.

Firing Coordinated Missions

14-3. The FDC and FO coordinate the location of the RP before the FO joins the unit to support it. Once the FO is in position, the FDC sends a message telling the FO to prepare to register RP 1. The FO sends the OT direction to the RP.

Firing Noncoordinated Missions

14-4. The FO, upon joining the unit to support it, checks the area of responsibility and selects a point to be used as the RP. This point must be identifiable both on the ground and on the map to allow a valid eight-digit grid to be determined. The FO then sends the CFF to register the RP.

CONSTRUCTING SURVEYED FIRING CHART

14-5. The surveyed firing chart is the most accurate chart that can be constructed. It can be used to determine all the correcting factors that are needed to fire more first-round FFE missions than the other firing charts. Three items must be known to construct the surveyed chart: a grid intersection to represent the pivot point, a surveyed mortar position, and a surveyed RP. The construction of the surveyed chart is similar to the modified-observed chart.

- (1) To obtain the DOF after constructing the chart, align the mortar position with the RP. Determine the DOF to the nearest mil.
- (2) To determine the mounting azimuth, round off the DOF to the nearest 50 mils.
- (3) To superimpose the deflection scale, the referred deflection is received from the section sergeant. Then, construct the deflection scale in the same manner as for the modified-observed chart.

NOTE: The procedure to obtain the firing data is the same as with all firing charts.

- (4) Determine correction factors after the registration has been completed. Apply these factors to all other targets within the transfer limits of the RP.

OBTAINING FIRING DATA

14-6. Obtaining the firing data is the same as with any mission, except that the FO continues to adjust until a 50-meter bracket is split and the last fired round is within 25 meters of the target (Figure 14-1). Refinement corrections are sent to the FDC and the mission is ended. Table 14-1 provides information to be used in setting up the plotting boards to fire a surveyed registration.

NOTE: See FM 6-30 for more information.

OBSERVER CORRECTION			CHART DATA		SUBSEQUENT COMMANDS							
DEV	RANGE	TIME (HEIGHT)	DEFL	CHARGE (RANGE)	MORTAR FIRE	METHOD FIRE	DEFL	RANGE	CHARGE	TIME (SETTING)	ELEV	
	-100		2791	1700			2833				1326	(2)
R50	+50		2781	1750			2823				1317	(3)
	-25	EOM R/C	2799	1725	MTO: PREPARE TO ADJ THE SHEAF						1322	

Figure 14-1. Splitting of a 50-meter bracket.

Table 14-1. Plotting of a surveyed registration.

MORTAR GRID: 0086 6158	ALT: 0520
RP 1 GRID: 9953 5884	ALT: 0470
GRID INTERSECTION:	01/59
DOF:	3660 MILS
MAZ:	3650 MILS
REF DEF:	2800 MILS
INIT DEF (1ST RD):	2790 MILS

ADJUSTING THE SHEAF

14-7. The purpose of adjusting the sheaf is to align the fires of all of the mortars. Mortars are positioned with gun No. 1 through 4 for 81-mm and 120-mm mortars (when employed as a platoon), or No. 1 through 2 for all other mortar systems (when employed as a section) from right to left as seen from behind the guns. There is normally a 10-second interval between rounds. The FO needs that time to observe the impact of the rounds and to determine corrections. If the corrections are 50 meters or more (deviation left/right only), the mortar must be refired. The corrections can be plotted on the board, or the DCT can be used to determine the number of mils to add or subtract from the base mortar deflection (Figure 14-2).

NOTE: If the target has been mechanically surveyed, enter the DCT at the initial range plot. If the target is a nonsurveyed target (even if it is an eight-digit grid), enter the DCT at the final range plot.

RANGE IN METERS	DEFLECTION IN METERS														
	1	10	20	30	40	50	75	100	125	150	175	200	300	400	500
500	3.0	20	41	61	81	102	152	201	250	297	34	388	550	687	800
600	1.7	17	34	51	68	85	127	168	209	250	289	328	472	599	708
700	1.5	15	29	44	58	73	109	145	180	215	250	284	412	529	632
800	1.3	13	25	33	51	64	95	127	158	189	219	250	365	472	569
900	1.1	11	22	34	45	57	85	113	141	168	195	223	328	426	517
1000	1.0	10	20	31	41	51	76	102	127	152	176	201	297	388	473
1100	.93	9	18	28	37	46	69	92	115	138	161	183	271	355	435
1200	.85	8	17	25	34	42	64	85	106	127	148	168	249	328	402
1300	.79	8	16	23	31	39	59	78	98	117	136	155	231	304	374
1400	.73	7	15	22	29	36	55	73	91	109	127	145	215	283	349
1500	.68	7	14	20	27	34	51	68	85	102	118	135	201	265	328
1600	.63	6	13	19	25	32	48	64	80	95	111	127	189	250	309
1700	.60	6	12	18	24	30	45	60	75	90	104	119	178	235	291
1800	.57	6	11	17	23	28	42	57	71	85	99	113	168	223	276
1900	.54	5	11	16	21	27	40	54	67	80	94	107	160	211	262
2000	.51	5	10	15	20	25	38	51	64	76	89	102	152	201	250
2100	.49	5	10	15	19	24	36	48	61	73	85	97	145	192	238
2200	.46	5	9	14	19	23	35	46	58	69	81	92	138	183	228
2300	.44	4	9	13	18	22	33	44	55	66	77	88	132	175	218
2400	.43	4	8	13	17	21	32	42	53	63	74	85	127	168	209
2500	.41	4	8	12	16	20	31	41	51	61	71	81	122	162	201
2600	.39	4	8	12	16	20	29	39	49	59	68	78	117	155	194
2700	.38	4	8	11	15	19	28	38	47	57	66	75	113	150	187
2800	.37	4	7	11	15	18	27	36	45	55	64	73	109	145	180
2900	.35	4	7	11	14	18	26	35	44	53	61	70	105	140	174
3000	.34	3	7	10	14	17	25	34	42	51	59	68	102	135	168
3100	.33	3	7	10	13	16	25	33	41	49	57	66	98	131	163
3200	.32	3	6	10	13	16	24	32	40	48	56	64	95	127	158
3300	.31	3	6	9	12	15	23	31	39	46	54	62	92	123	153
3400	.30	3	6	9	12	15	22	30	37	45	52	60	90	119	149
3500	.30	3	6	9	12	15	22	29	36	44	51	58	87	116	145
3600	.29	3	6	8	11	14	21	28	35	42	49	57	85	113	141
3700	.28	3	6	8	11	14	21	28	34	41	48	55	82	110	137
3800	.27	3	5	8	11	13	20	27	33	40	47	54	80	107	133
3900	.27	3	5	8	10	13	20	26	33	39	46	52	78	104	130
4000	.26	3	5	8	10	13	19	26	32	38	45	51	76	102	127

Figure 14-2. Deflection conversion table.

EXAMPLE

The sheaf of an 81-mm platoon is being adjusted. No. 2 mortar conducted the registration. The FDC has requested to prepare to adjust the sheaf. The FO requests section right. The entire platoon then fires, in order, starting at the right (No. 1, 3, 4) with 10-second intervals between rounds. The mortar that was used to register (No. 2) will not fire. The sheaf is adjusted perpendicular to the gun-target line. The observer notes where each round lands and sends back deviation corrections in meters; range corrections are ignored if less than 50 meters. If a deviation correction is 50 meters or more, it must be refired. Corrections to be refired should always be transmitted first by the FO.

If angle T is greater than 499 mils, each piece is adjusted onto the RP, and the FDC computes the data for the sheaf. In adjusting the sheaf, all rounds must be adjusted on line at about the same range (within 50 meters) and with the lateral spread between rounds equal to the bursting diameter of the ammunition used.

The spottings from the FO are No. 4, right 20, No. 3, left 60, and No. 1, left 30 (Figure 14-3). The FO then sends these corrections to the FDC; No. 3, right 60 (it is transmitted first because it needs to be refired [since it is greater than 50 meters]), No. 4, left 20. No. 4 is adjusted, and finally No. 1, right 30. No. 1 is adjusted. The No. 3 mortar is now fired, and the round impacts 10 meters right of the desired burst point. The FO would then send: No. 3, left 10, No. 3 is adjusted, sheaf is adjusted, end of mission.

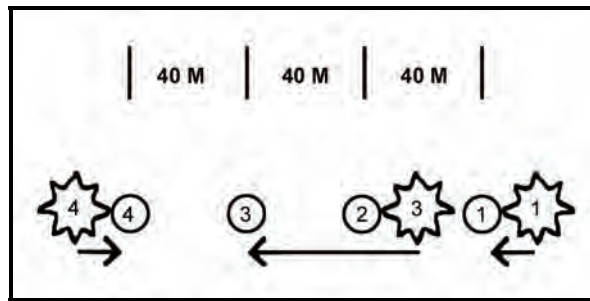


Figure 14-3. No. 1, No. 3, and No. 4 mortars out of sheaf.

OBTAINING CORRECTIONS USING THE DEFLECTION CONVERSION TABLE

14-8. The computer enters the DCT at the initial chart range rounded to the nearest 100 meters: $3,050 = 3,100$. Remember that the RP is at a surveyed grid and it has not moved. Using the deflection-in-meters line at the top of the table, the computer finds the meters needed to correct the sheaf. Where the range line and the correction line meet is the number of mils needed to apply. He applies the mils to the base deflection. When working with deflections, use the LARS rule. Once the FO has given EOM, "Sheaf adjusted," the section is given, "Section, refer deflection two eight zero one (2801), realign aiming posts," (2801 was the base mortar's hit deflection). This procedure allows all mortars to be fired with the same data, and the resulting sheaf will be linear.

DETERMINING FIRING CORRECTIONS

14-9. Once registration is completed, the firing corrections (range correction factor and deflection correction) are applied to all targets within the transfer limits of the RP (Figure 14-4). The computer applies correction factors to correct for nonstandard conditions (weather and equipment wear) affecting the round.

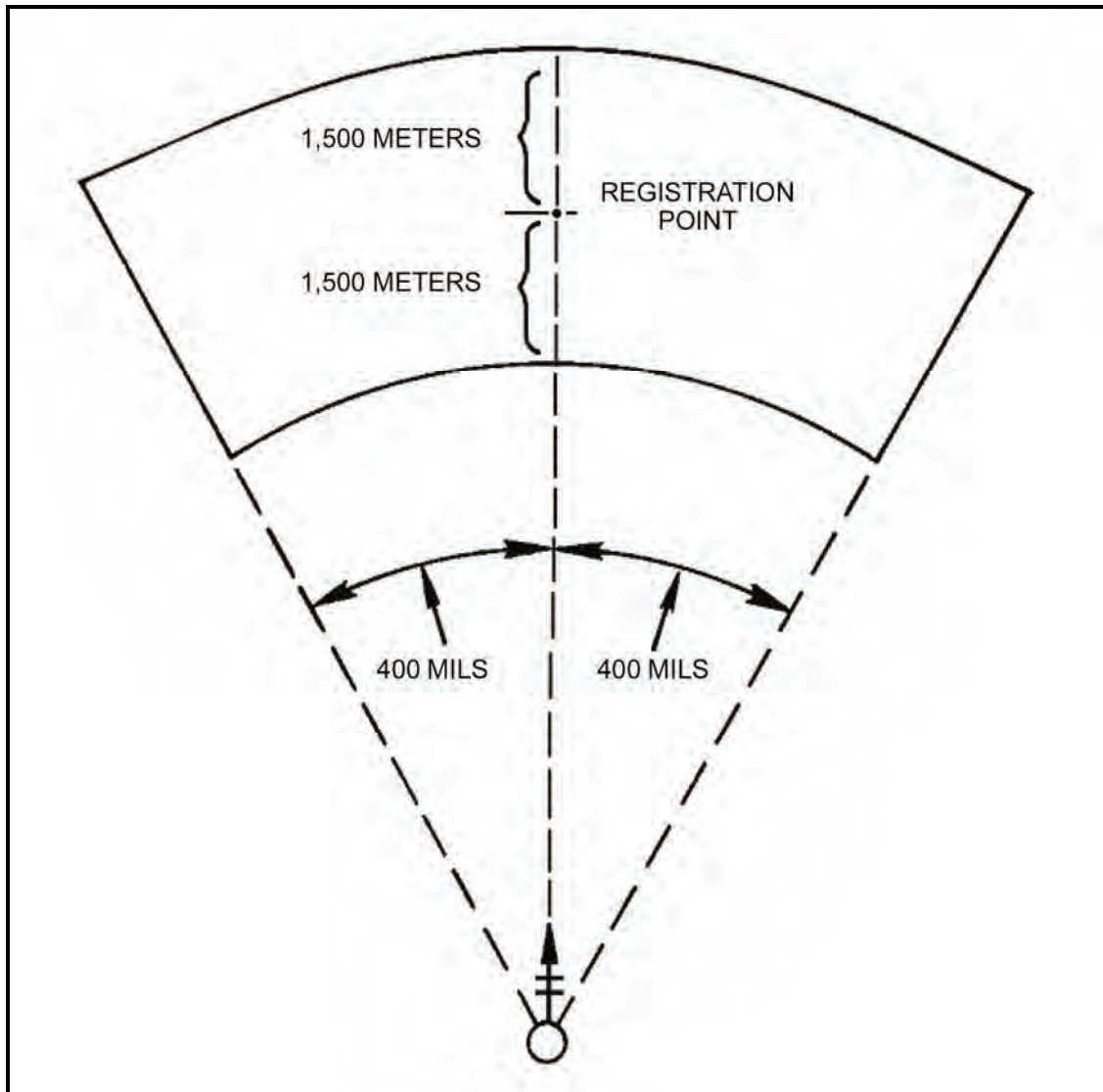


Figure 14-4. Transfer limits for one registration point.

NOTE: If a target is plotted outside of the transfer limits, the range correction factor and deflection correction are no longer applied.

DETERMINING MULTIPLE REGISTRATION POINTS

14-10. The ideal situation would be to have multiple RPs, if the tactical situation permits (Figure 14-5). Keep in mind each RP has its own range correction factor and deflection correction. Range correction is the difference in meters between the initial chart range and the final chart range for the RP. As the registration mission is fired and completed, the rounds on the plotting board may not be plotted at the point where the RP was plotted. Because of wind and weather, the rounds may have to be fired at a greater or lesser range and to the right or left of the target to hit it. As shown in Figure 14-6, the initial chart range to the RP was 3,050 meters; the final adjusted chart range (range used to hit the RP) was 3,200.

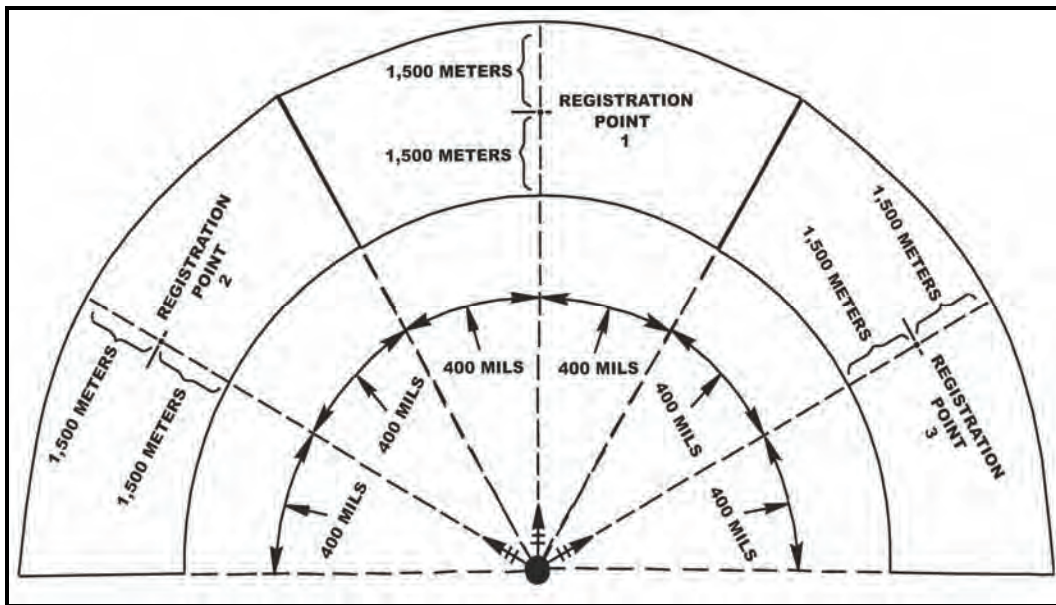


Figure 14-5. Multiple transfer limits.

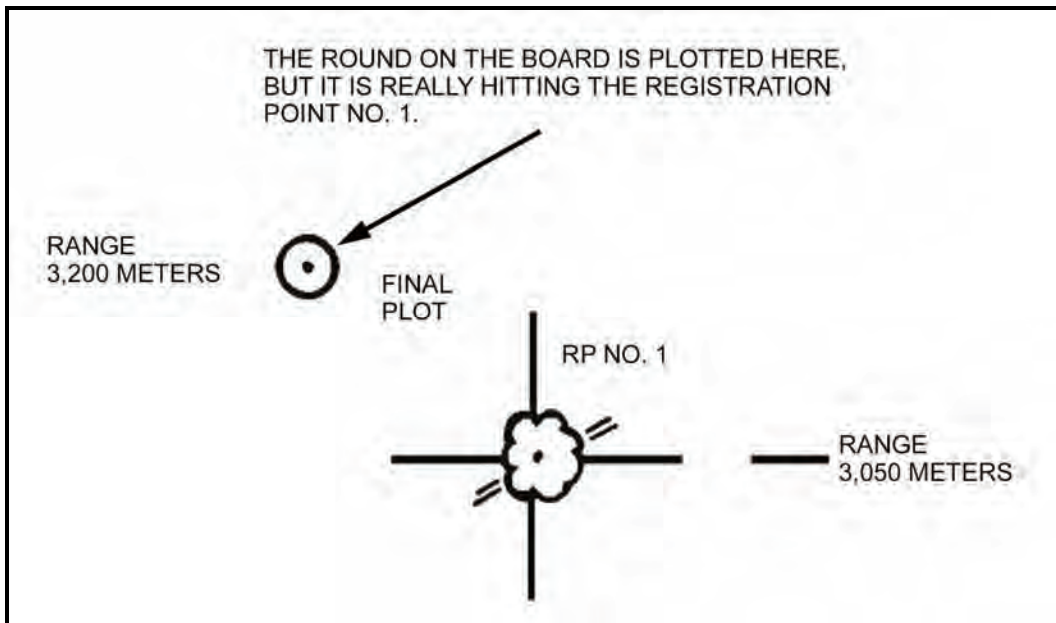


Figure 14-6. Plotting of rounds.

DETERMINING RANGE DIFFERENCE

14-11. The computer compares the initial chart range and the final adjusted chart range and subtracts the smaller from the larger. This gives the range difference. If the initial chart range is larger than the final adjusted chart range, then the range correction is a minus (-). If it is smaller, then the range correction is a plus (+).

EXAMPLE

Initial chart range smaller: 3,050; final adjusted chart range: 3,200

Then, $3,200 - 3,050 = +150$ meters.

Initial chart range larger: 3,200; final adjusted chart range: 3,050

Then $3,200 - 3,050 = -150$ meters.

Range Correction Factor

14-12. The RCF is the number of meters per thousand to be applied to the initial chart range of a target within the transfer limits resulting in a range correction for that mission. Continuing the preceding example, since the ranges to other targets will be different from the 3,050 range to the RP, the RCF (+150) will also differ. Range corrections must be determined for each target. Once the range difference has been determined, round the initial chart range to the nearest 100, and then express that number in thousandths. Determine to the nearest whole meter and use the sign of the range correction.

EXAMPLE

Range difference:	+150
Initial chart range:	3,050
Rounded to nearest 100:	3,100
Expressed in thousandths:	3.1

Divide the range in thousandths into the range difference. To get the range correction factor, round the result to the nearest whole number.

$$+150 \div 3.1 = 48.3 = +48 \text{ RCF}$$

Deflection Correction

14-13. The deflection correction is the number of mils needed to correct the deflection to hit the target since nonstandard conditions again caused the plots on the board to be either left or right of the initial chart deflection (Figure 14-7). Compare the initial chart deflection and the final chart deflection and subtract the smaller from the larger.

RULE: Final chart deflection (hit) larger = LEFT deflection correction; final chart deflection (hit) smaller = RIGHT deflection correction.

EXAMPLE

Hit Larger

Final chart deflection: 2,801
Initial chart deflection: 2,790
(2,801 – 2,790 = L11)

Hit Smaller

Final chart deflection: 2,790
Initial chart deflection: 2,801
(2,790 – 2,801 = R11)

14-14. Range and deflection corrections are applied to all other targets within the transfer limits of the RP.

FIRING OF A TOTAL RANGE CORRECTION MISSION

14-15. The procedure for a TRC mission on the surveyed chart is the same as with the modified-observed chart. However, now the firing corrections are applied to chart data to obtain command data (firing data sent to the mortars). For example, the computer assumes that the board is still set up on the information for the registration mission, and the mission in Figure 14-7 has been received. It is within the transfer limits.

COMPUTER'S RECORD											
For use of this form, see FM 3-22.91; the proponent agency is TRADOC											
ORGANIZATION <u>B Co 1st IN</u>				DATE		TIME		OBSERVER ID <u>P88</u>		TARGET NUMBER <u>AB 0101</u>	
<input checked="" type="checkbox"/> ADJUST FIRE <input type="checkbox"/> FIRE FOR EFFECT <input type="checkbox"/> IMMEDIATE SUPPRESSION				SHIFT FROM <u>RP #1</u>				POLAR			
GRID _____				DT DIRECTION <u>3550</u>		ALTIITUDE _____		DT DIRECTION _____		ALTIITUDE _____	
OT DIRECTION _____				<input type="checkbox"/> LEFT / <input checked="" type="checkbox"/> RIGHT <u>200</u> <input type="checkbox"/> ADD / <input checked="" type="checkbox"/> DROP <u>100</u>		<input type="checkbox"/> UP / <input type="checkbox"/> DOWN _____		<input type="checkbox"/> UP / <input type="checkbox"/> DOWN _____		DISTANCE _____	
ALTIITUDE _____				<input type="checkbox"/> UP / <input type="checkbox"/> DOWN _____		<input type="checkbox"/> UP / <input type="checkbox"/> DOWN _____		<input type="checkbox"/> +1 / <input type="checkbox"/> _____		VERTICAL ANGLE _____	
TARGET DESCRIPTION <u>P10</u>						METHOD OF CONTROL _____					
METHOD OF ENGAGEMENT _____						MESSAGE TO OBSERVER _____					
FDC ORDER			INITIAL CHART DATA			INITIAL FIRE COMMAND			ROUNDS EXPENDED		
MORTART TO FFE <u>SEC</u>			DEFLECTION <u>2715</u>			MORTART TO FOLLOW <u>SEC</u>			① HE ② PROX		
MORTART TO ADJ <u>#2</u>			DEFLECTION CORRECTION			SHELL AND FUZE <u>HEQ</u>					
METHOD OF ADJ <u>LRd</u>			<input checked="" type="checkbox"/> L <input type="checkbox"/> R			MORTART TO FIRE <u>#2</u>					
BASIS FOR CORRECTION <u>RPI</u>			RANGE <u>2975</u>			METHOD OF FIRE <u>LRd</u>					
SHEAF CORRECTION _____			VIALT CORRECTION <u>50</u>			MORTART TO FIRE <u>3 Rds PROX in FFE</u>					
SHELL AND FUZE <u>HEQ in ADJ</u>			<input type="checkbox"/> + <input checked="" type="checkbox"/> - <u>25</u>			DEFLECTION/AZIMUTH <u>2726</u>					
<u>PROX in FFE</u>			RANGE CORRECTION <u>+144</u>			CHARGE <u>6</u>					
METHOD OF FFE <u>3 Rds</u>			TRC <input checked="" type="checkbox"/> + <input type="checkbox"/> - <u>119</u>			TIME SETTING _____					
RANGE LATERAL SPREAD _____			CHARGE/RANGE <u>6/3100</u>			ELEVATION <u>0991</u>					
TIME OF OPENING FIRE <u>W/R</u>			AZIMUTH <u>3360</u>			_____					
ANGLE T <u>190</u>			_____			_____					
OBSERVER CORRECTION			CHART DATA			SUBSEQUENT COMMANDS					
DEV	RANGE	TIME (HEIGHT)	DEFL	CHARGE (RANGE)	MORTAR FIRE	METHOD FIRE	DEFL AZIMUTH	RANGE	CHARGE	TIME (SETTING)	ELEV
		<u>FFE</u>			<u>SEC</u>	<u>3 Rds PROX</u>					<u>0991</u> ③ <u>PROX</u>
						<u>EOM EST</u>		<u>60%</u>	<u>CAS</u>		
NOTE: $+48 \times 3.0 = +144 - 25 = +119$ TRC											

Figure 14-7. Example of completed DA Form 2399-R (Computer's Record) for firing a total range correction mission on the surveyed chart.

APPLYING FIRING CORRECTIONS

14-16. Once the chart data have been determined, the computer applies the deflection correction by either adding or subtracting the deflection correction to the chart data determined. When working with deflection corrections, the computer uses the LARS rule. The deflection correction must be applied to each chart deflection throughout the mission.

EXAMPLE

$$2,715 + L11 = 2,726$$

Range Correction

14-17. Determine the initial chart range, then round to the nearest hundred and express it in thousandths; for example, 2975 = 3000 = 3.0. Multiply the range in thousandths times the RCF and use the sign of the RCF: $3.0 \times +48 = +144$. This gives the range correction for this target.

Total Range Correction

14-18. The TRC is the total correction that must be applied to get the command range to fire the target. TRC is the range correction (RCF x range in thousandths) plus or minus the altitude correction.

EXAMPLE

$$\text{Range correction} = +144 - 25 \text{ (altitude correction)} = +119 \text{ TRC}$$

14-19. The two factors (RCF and altitude correction) are compared. If one of these factors is a negative, subtract the smaller from the larger. The sign of the larger is used for the TRC. If both factors are negative or positive, then add the two factors to get the TRC. This must be applied to every chart range to obtain command range. To enter the firing tables, the command range is rounded to the nearest 25 meters.

FIRING REREGISTRATION

14-20. The FDC must consider weather changes to ensure the accuracy of the firing data (firing corrections) from the surveyed chart. Two methods can be used to do this: reregistration on the RP or MET message. Of those two methods, reregistration is the better because all the unknown (nonstandard) factors are fired out. However, due to countermortar-radar, determining and applying the MET messages may be safer. The choice is dictated by the tactical situation and the availability of MET messages.

- (1) Fire the reregistration at the established RP using only the mortar that originally fired the registration (Figure 14-8). (The FDC assumes that the sheaf is still parallel; therefore, the sheaf should not need adjusting again.) The chart data are the same as with the initial registration. Apply the firing corrections to obtain the command data (Figure 14-8). A blank reproducible copy of DA Form 2188-R (Figure 14-9) is located at the back of this manual.

DATA SHEET																					
For use of this form, see FM 3-22.91 The proponent agency is TRADOC.																					
SETUP					WEAPON DATA										FO DATA						
TIME OUT:	60				UNIT:	B 1/29				WPN:	1			WPN:				FO	ALT	GRID	
TGT PRFX:	AB				81 mm CAR:	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO				DIR:	5250			DIR:				P88	420	010 422	
TGT NO:	0100-0500				ALARM:	<input type="checkbox"/> ON <input checked="" type="checkbox"/> OFF				DIS:	50			DIS:							
MIN E:	096				BP:	2				WPN:	3			WPN:							
MIN N:	029				E:	0086				DIR:	2050			DIR:							
GD:	<input checked="" type="checkbox"/> E <input type="checkbox"/> W 10				N:	6158				DIS:	50			DIS:							
LAT:	<input checked="" type="checkbox"/> + <input type="checkbox"/> - 34				ALT:	520				WPN:	4			WPN:							
LISTEN:	<input type="checkbox"/> ON <input checked="" type="checkbox"/> OFF				DEF:	2800				DIR:	2050			DIR:							
BIT RATE:	1200				ELE:					DIS:	100			DIS:							
KEY TONE:	1.4				OWNER ID:	A															
BLK:	<input checked="" type="checkbox"/> SNG <input type="checkbox"/> DBL																				
AMMUNITION DATA																					
TEMPERATURE	70°				TYPE:	<input checked="" type="checkbox"/> HE <input checked="" type="checkbox"/> WP <input checked="" type="checkbox"/> ILL <input type="checkbox"/> CS <input type="checkbox"/> TNG															
LOT NUMBER	HE 6008		NP B008		JLA06																
WEIGHT																					
ON HAND	200		100		50																
RECEIVED	100		50		25																
TOTAL	300		150		75																
ROUNDS EXPENDED	24																				
ROUNDS REMAINING	276																				
TARGET DATA																					
TARGET ID		CHART DATA		FIRING CORRECTIONS				FIRING DATA				INTELLIGENCE				ROUNDS					
TGT NO.	GRID	ALT	DEFL	RG CHG	DEFL CORR	RANGE CORR	ALT VI	ALT CORR	DEFL	RG CHG	FUZE TIME SETTING	ELEV	TIME FIRED	TARGET DESCRIPTION	METHOD OF ENGAGEMENT	SURVEILLANCE	EXP	REM			
RP1	9953 5884	470	2790	3050	L11	+150	470 -50	-25	2801	3175		0958		RP #1		R/C S/A	(2) HE 273				
AB 0105		470	275	2975	L11	+144	470 -50	-25	2726	3100		0991		PID	SEC 3RD PROX	EST US/CAS	(4) HE 279				
RP1		470			L11	-25	470 -50	-25	2788	3100		0991		RP #1		R/C	(3) HE 276				
					UP DATING AFTER REREGISTRATION																
RP1			2790	3050	R2	+75	470 -50	-25	2782	3100			0991								
AB 0105			275	2975	R2	+72	470 -50	-25	2713	3025			1019								

DA FORM 2188-R, MAR 1991 REPLACES DA FORM 2188-R, MAR 1977 WHICH IS OBSOLETE. USAPA V1.00

Figure 14-9. Example of completed DA Form 2188-R (Data Sheet).

- (2) The chart deflection plus or minus deflection correction equals command deflection. The chart range plus or minus the range correction plus or minus the altitude correction equals the command range.
- (3) Carry out the mission the same as with the initial registration. Once the EOM, "Registration complete," has been given, determine firing corrections again.
- (4) In the initial registration, the FDC compared the initial chart range and the final chart range difference. Determining the range difference after the reregistration is the same; however, now determine the final adjusted range. During the reregistration, firing corrections were applied for each round. Now apply those same corrections.
- (5) Adjusted range is the final range with the correction for altitude correction deleted.

EXAMPLE

Final command range: 3,100 meters; altitude correction: -25
Final adjusted range: $3,100 + 25 = 3,125$

The altitude correction is added since it was initially subtracted. If the altitude correction had been a plus (+), then it would have been subtracted to obtain the final adjusted range.

- (6) Once the final adjusted range has been determined, compare the initial chart and the final adjusted range. Subtract the smaller from the larger to determine the RCF. The sign (+/-) would be determined as with the initial registration. Again, divide the range (initial chart range rounded to the nearest 100 expressed in thousandths) into the new range correction to determine the new RCF.
- (7) To determine the deflection correction, compare the initial chart deflection and the final command deflection. Subtract the smaller from the larger and determine the sign (L or R) to apply.
- (8) Apply the new firing corrections to all targets that have been and are fired within the transfer limits. For those targets that are already plotted on the board, apply the new firing corrections and update the target data. The chart data does not change. The target does not move; however, the weather conditions do change.

MEAN POINT OF IMPACT REGISTRATION

14-21. The FDC uses MPI registration during darkness and on featureless terrain to determine firing corrections. Two M2 aiming circles or radar must be used to conduct an MPI registration. MPI registration can also be used for reregistration.

CONDUCT OF A MEAN POINT OF IMPACT REGISTRATION

14-22. To fire the MPI registration, the FDC must proceed as follows:

- (1) Set up the M16/M19 plotting board as a surveyed firing chart (eight-digit grids to the mortar position and RP).
- (2) Plot the location and altitudes of the two FO points to be used. Because the FOs will be sending azimuth readings for the impact points of the rounds, they must see the area of the RP using the M2 aiming circle.
- (3) Record all data on DA Form 2188-R. To determine each FO's direction to the RP, rotate the azimuth disk until the FO's position is aligned with the RP. Read the azimuth scale to the nearest mil. To determine each FO's vertical angle (VA), compare the altitudes of each FO's location and the RP, and subtract the smaller from the larger. This remainder is the VI, which is used to determine the vertical angle and carries the sign of the larger. Determine the range from each FO's location. Round the range to the nearest 100 and express it in thousandths. Divide the

range expressed in thousandths into the VI and determine the product to the nearest whole mil. The sign (+/-) of the VA is the same as the VI sign (+/-).

EXAMPLE

Assume that the VI is -80 for FO 1 and +50 for FO 2.
The range for FO 1 is 2,525 meters; for FO 2 is 3,000 meters.

FO 1: $2,525 = 2,500 = -800 \div 25 = -32$ VA: -32 mils

FO 2: $3,000 = 3,000 = +500.0 \div 30 = +16.6$ VA: +17 mils

Send the direction and VA to the FOs so they can set up their M2 aiming circles.

- (4) To determine the firing data, align the mortar position with the RP. Determine the chart data and apply the range correction for altitude between the mortar and target. During the registration, only the range correction for altitude is used. Give the firing command to the base mortar. Three to six rounds will be fired at 10-second to 20-second intervals. The FO uses this interval to give himself time to determine the azimuth readings to each round. If the azimuth for one or more rounds is determined to be 50 or more mils different, then another round may be fired for each erratic round. Six rounds are needed for the most accurate MPI registration, but as few as three rounds give correction data.
- (5) As the rounds are fired, the FO reads the azimuth to each round and records it. When the last round has been fired, he sends the data recorded to the FDC. Once the rounds are fired and the readings are recorded in the FDC, plot the MPI as follows:
 - Determine the total by adding all the readings from each FO.
 - Divide the total by the number of readings to determine the average of the readings to the nearest mil.

EXAMPLE

	FO 1	FO 2
1	6104	0400
2	6110	0402
3	6105	0404
4	6106	0405
5	6107	0401
6	<u>6109</u>	<u>0400</u>
TOTAL	36,641 mils	2,412 mils

$36,641 \div 6 = 6,106.8 = 6,107$ mils (average azimuth)

$2,412 \div 6 = 402 = 402$ mils (average azimuth)

NOTE: FDC may send the average azimuth.

- Once the average azimuth for each FO has been determined, index the average azimuth and draw a line from each FO position toward the top of the board; where the lines intersect is the MPI. Determine and record the eight-digit grid coordinates and altitude of the MPI.

DETERMINATION OF RANGE CORRECTION FACTORS

14-23. With the MPI and RP on the board and the altitude determined, correction factors to be applied to other targets within the transfer limits of the RP must be determined. Again, because of the effects of interior and exterior ballistics on the round, the MPI may not be plotted in the same location on the plotting board as the surveyed point. Therefore, the corrections to hit that surveyed point must be determined. These corrections are noted on DA Form 5472-R (Computer's Record [MPI]) (Figure 14-10). A blank reproducible copy of DA Form 5472-R is located at the back of this manual.

Range Difference

- (1) Compare the command range to the MPI point (minus the altitude correction) and the initial chart range to the RP.

EXAMPLE

Command range MPI = M Alt 500 mils, MPI Alt 450 mils, VI = -50, Alt Corr -25. Adjusted chart range to the MPI = command range 2,650 M + 25 (to delete altitude correction, reverse the sign) = 2,675 adjusted chart range to the MPI.

- (2) The sign of the range difference is determined by how the move from the MPI to the RP must be made. If the RP range is larger, the difference is a plus (+); if smaller, it is a minus (-).

EXAMPLE

Initial chart range to the RP is 2,600 meters; adjusted chart range to the MPI is 2,675 meters.

$2,675 - 2,600 = -75$ range difference

COMPUTER'S RECORD (MPI)						
For use of this form, see FM 3-22.91; the proponent agency is TRADOC.						
UNIT	DATE	TIME				
MESSAGE TO OBSERVERS		OBSERVER'S READINGS				
PREPARE TO OBSERVE MPI REGISTRATION OP# <u>1</u> DIR <u>6105</u> VA <u>32</u> OP# <u>2</u> DIR <u>0400</u> VA <u>17</u> REPORT WHEN READY TO OBSERVE		ROUND NO	OP# 1	OP# 2		
VERTICAL ANGLE COMPUTATIONS RP ALTITUDE <u>450</u> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> OP# <u>1</u> RP ALT <u>450</u> OP ALT <u>370</u> VI <u>80</u> OP RANGE <u>2525</u> W _____ RXM _____ </td> <td style="width: 50%; border: none;"> OP# <u>2</u> RP ALT <u>450</u> OP ALT <u>400</u> VI <u>50</u> OP RANGE <u>3000</u> W _____ RXM _____ </td> </tr> </table> (VI + RN IN THOUSANDS - VA) 100R _____ VI x 100R _____ (NEAREST .1) VA <u>32</u> (NEAREST MIL)		OP# <u>1</u> RP ALT <u>450</u> OP ALT <u>370</u> VI <u>80</u> OP RANGE <u>2525</u> W _____ RXM _____	OP# <u>2</u> RP ALT <u>450</u> OP ALT <u>400</u> VI <u>50</u> OP RANGE <u>3000</u> W _____ RXM _____	1.	<u>6104</u>	<u>0400</u>
		OP# <u>1</u> RP ALT <u>450</u> OP ALT <u>370</u> VI <u>80</u> OP RANGE <u>2525</u> W _____ RXM _____	OP# <u>2</u> RP ALT <u>450</u> OP ALT <u>400</u> VI <u>50</u> OP RANGE <u>3000</u> W _____ RXM _____			
		2.	<u>6110</u>	<u>0402</u>		
		3.	<u>6105</u>	<u>0404</u>		
		4.	<u>6106</u>	<u>0405</u>		
		5.	<u>6107</u>	<u>0401</u>		
		6.	<u>6109</u>	<u>0400</u>		
		7.				
		8.				
		9.				
10.						
		(MUST BE SIX USABLE AZIMUTHS)				
		TOTAL OF AZIMUTHS (ADD EACH COLUMN)	<u>36641</u>	<u>2412</u>		
		AVG OF AZIMUTHS (TOTAL ÷ 6)	<u>6107</u>	<u>0402</u>		
		DIR TO MPI	<u>6107</u>	<u>0402</u>		
DATA SECTION						
81 MM/80-MM		120 mm				
RP GRID	CHA	ELE				
RP ALT <u>450</u>	MPI ALT <u>450</u>	MPI ALT _____	CHA FIRED _____			
MORT ALT <u>500</u>	MORT ALT <u>500</u>	MORT ALT _____	CHA CORR _____			
VI <u>80</u>	VI <u>50</u>	VI _____	VI _____			
ALT CORR <u>25</u>	ALT CORR <u>25</u>	(USE THIS VI TO COMP CHA CORR) (SUBTRACT IF + AND IF -)				
RP CHART DATA	MPI DATA	CHART CHARGE TO MPI _____				
DEF <u>2790</u>	DEF <u>2810</u>	CHART DEFL TO MPI _____				
RN <u>2600</u>	RN <u>2675</u>	(DRAW THE ADJ CHG GAGE LINE FROM THE MPI POINT TO THE CHART CHG OF THE MPI POINT)				
(MINUS ALT CORR)	(MINUS ALT CORR)	CHART RANGE TO MPI _____				
DEF CORR _____	RANGE CORR _____	DEFL FIRED _____	DEFL CORR _____			
RP DEF <u>2790</u>	RP RN <u>2600</u>	DEFL CORR _____	(DETERMINE THE LARS CORR TO GET FROM MPI TO RP DEFL)			
MPI DEF <u>2810</u>	MPI RN <u>2675</u>	DEFL CORR _____				
DIFF <u>20</u>	DIFF <u>75</u>	DEFL CORR _____				
DEF CORR <u>20</u>	RCF <u>27</u>	DEFL CORR _____				
(TO APPLY, REVERSE SIGN)	(TO APPLY, REVERSE SIGN)	GRID OF MPI _____				

Figure 14-10. Example of completed DA Form 5472-R (Computer's Record [MPI]).

Range Correction Factor

14-24. Once the range difference has been determined, divide it by the chart range to the MPI rounded to the nearest 100 expressed in thousandths and round it to the nearest whole meter. The sign is the same as the range difference.

EXAMPLE

Range difference - 75	
Chart range to MPI	2,675 meters
Round to the nearest 100	= 2,700 meters
Express in thousandths	= 2.7
$-75.00 \div 2.7 = -28$ meters RCF	

Deflection Correction

14-25. Compare the chart deflection of the MPI and the chart deflection of the RP to determine the deflection correction (Figure 14-10). The sign of the deflection correction will be determined by how the move from the MPI to the RP must be made.

RULE: RP deflection is greater than the MPI deflection = LEFT deflection correction. RP deflection is less than MPI deflection = RIGHT deflection correction.

EXAMPLE

MPI chart deflection = 2810; RP chart deflection = 2,790
 $2,810 - 2,790 = L20$ (correction to apply R20)

14-26. The application of the correction factors to other targets, within the transfer limit of the RP, is the same as with the other registration corrections except that the sign of the corrections must be reversed.

NOTE: The only time the corrections will be applied with the signs as determined is when the corrections are being applied to move the strike of the round from the MPI to the RP.

VERTICAL INTERVAL CORRECTION FACTORS

14-27. When the mortar position is known to surveyed accuracy and a map is being used, the computer can work with altitude differences and the correction factor for those altitude differences. As noted earlier, the term used for altitude difference is VI.

DETERMINATION OF VERTICAL INTERVAL

14-28. The computer compares the altitude of the mortar position and the altitude of the target being engaged. If the altitude of the target is higher than that of the mortar position, then the VI will be a plus (+); if lower, it will be a minus (-) (Figure 14-11).

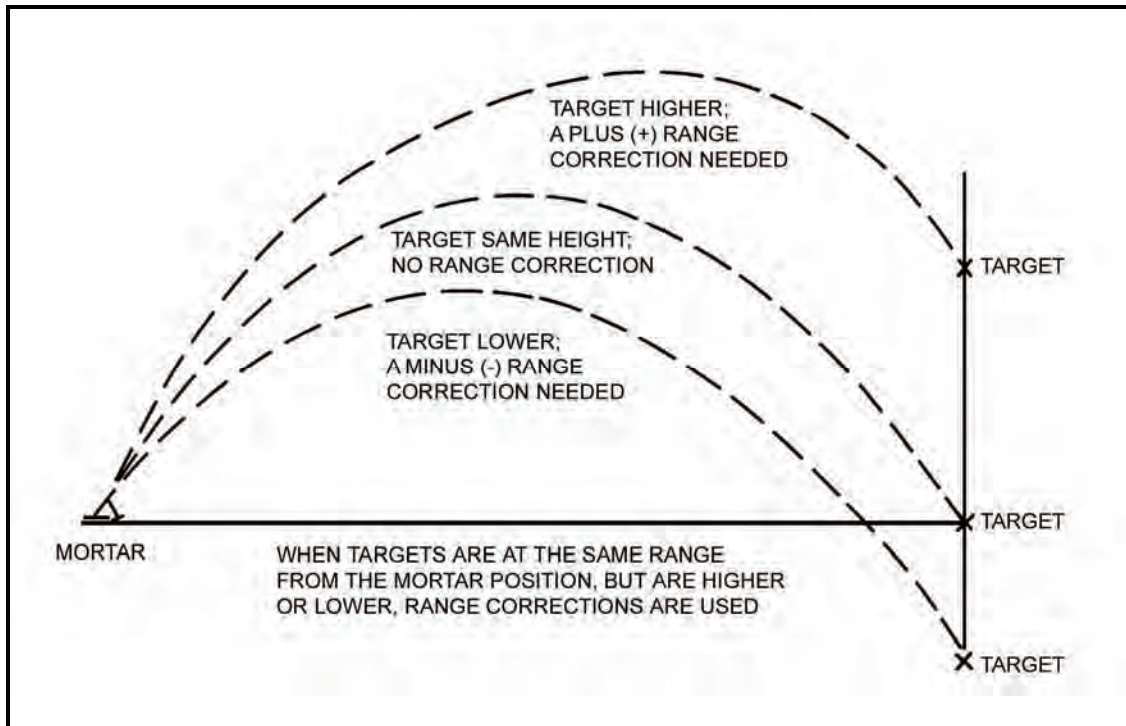


Figure 14-11. Altitude correction.

CORRECTION FOR VERTICAL INTERVAL

14-29. Because of the VI, a range correction must be applied to the chart range to obtain the range to be fired (command). The range correction to apply is half of the VI; it is determined to the nearest whole meter.

EXAMPLE

VI = 75 meters
 $1/2 = 38$ meters (altitude [range] correction)

14-30. The altitude (range) correction must be 25 meters or more to be applied. The range correction is then added to or subtracted from the chart range. If the target is higher than the mortar, the computer adds the range correction; if lower, the computer subtracts to get the altitude to be fired (command). The altitude correction is applied to every chart range throughout the mission.

NOTE: A VI of less than 50 meters is not used when working with the modified-observed chart.

DETERMINATION OF VERTICAL INTERVAL FOR DIFFERENT MISSIONS

14-31. When there is a difference in altitude between the mortar position and the target, a range correction is made. Since the mortar round has a steep angle of fall, corrections are made only when differences of 50 meters or more in altitude exist. The chart range is corrected by one-half the difference in altitude expressed in meters. The correction is added when the target is above the mortar, and subtracted

when the target is below the mortar. Difference in altitude can be determined from contour maps, by estimating, or by measuring the angle of sight, and by using the mil-relation formula.

Grid Missions

14-32. The target is plotted on the map and the altitude determined. If the altitude of the target cannot be determined, then the computer assumes that it is the same as that of the mortars.

Shift From a Known Point Missions

14-33. The target is assumed to be the same altitude as the point being shifted from unless, in the CFF, the FO sends a vertical shift (up or down). Therefore, that shift is applied to the point being shifted from, and that is the altitude of the new target.

Polar Plot Missions

14-34. The altitude of the target is assumed to be the same as that of the FO's position if no vertical shift is given. If one is given, then the computer applies the shift to the FO's altitude, and that is the altitude of the new target. Once the computer has determined the altitude of the target, then it is possible to determine the VI for the mission and, finally, the altitude correction to apply. Remember, VI is the difference in altitude between the mortars and the target.

RADAR REGISTRATION

14-35. Radar registration is another method used by the FDC to obtain firing corrections to apply to the firing data to obtain better accuracy.

14-36. Two types of radar units can be used: AN/PPS-5, which gives direction and distance to impact; and AN/PPS-4, which gives grid of impact. The one used will determine which method the FDC will use during the registration. At the unit level, the AN/PPS-5 will probably be used for the 60-mm and 81-mm mortars; the AN/PPS-4 for the 120-mm mortars.

NOTE: Registration of the AN/PPS-5 is explained here for the 60-mm and 81-mm mortars.

14-37. The M16/M19 plotting board must be set up as a surveyed firing chart. That is, the mortar position, RP, and radar site must be plotted to surveyed accuracy. The procedure for obtaining firing data is the same as with a regular registration mission. The altitude correction is the only firing correction used. Because this is a polar-type mission, the VI is now obtained as with a polar plot mission. The firing corrections are obtained in the same manner as with the regular registration mission.

14-38. After the board is set up and the direction and distance from the radar to the target have been determined, the FDC informs the radar operator of this information. The radar operator then orients the radar set using the information and calls the FDC when the set is ready. Once the radar is ready, the FDC then gives the initial data to the mortar section. The base mortar will adjust and then the sheaf will be established.

- (1) When the first round impacts, the radar operator sends the FDC the direction and distance to that round.
- (2) The FDC then indexes that direction and plots the round at the distance sent (the plot is made from the radar position plot, using the distance sent).
- (3) The FDC indexes the mortar RP azimuth and determines the spotting by comparing the round's impact plot with the RP plot. The FDC, acting as the FO, determines all spottings (Figure 14-12).

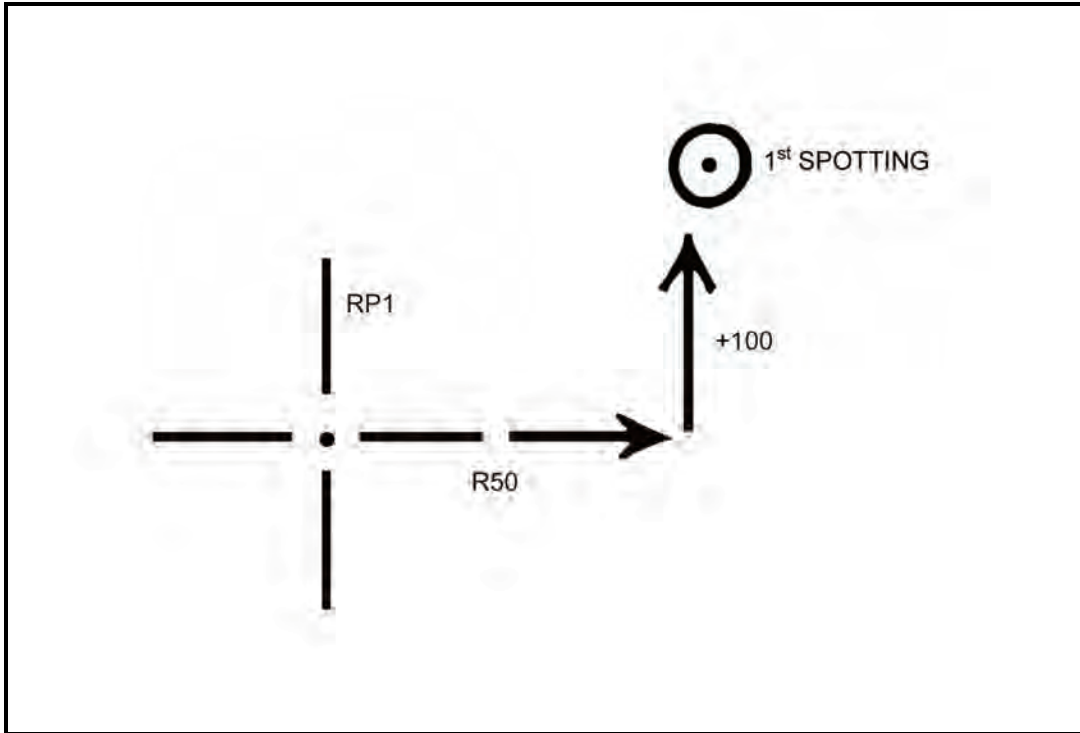


Figure 14-12. Determination of a spotting.

- (4) Once the spotting has been determined, the FDC converts the spotting into a correction to fire the second round. He does this by reversing the signs of the spotting. He then applies that to the RP on the azimuth of the radar position (Figure 14-13).

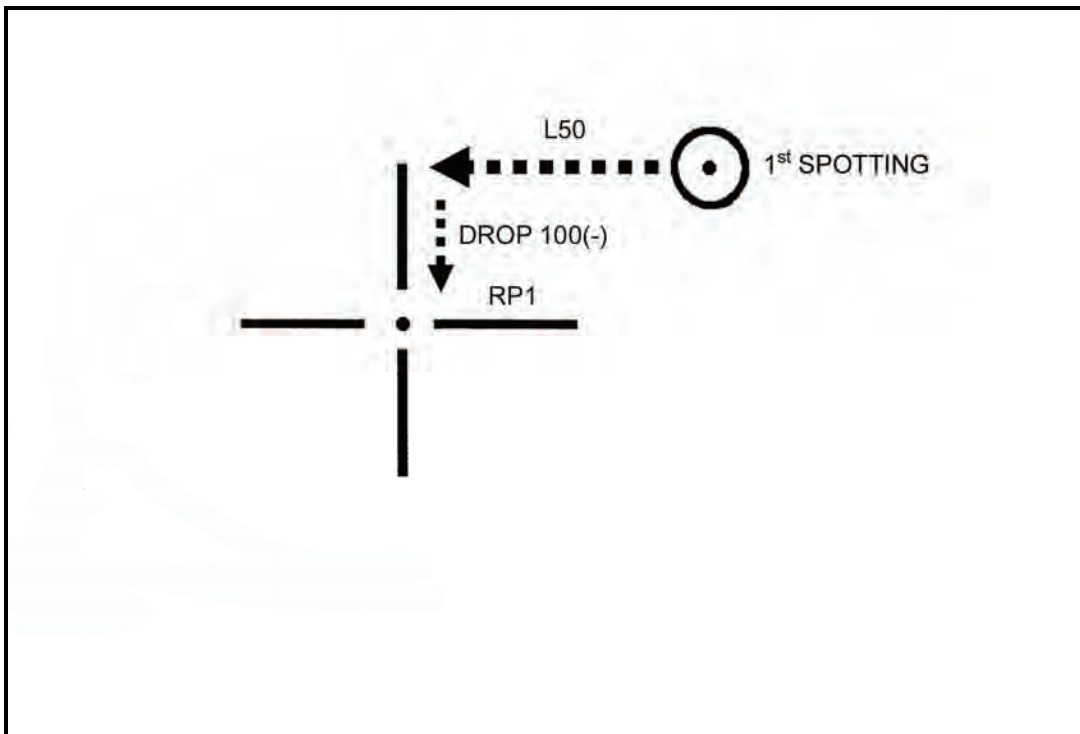


Figure 14-13. Application of correction to fire the second round.

- (5) The firing data are then obtained by aligning the new plot with the mortar position. (6)
The spottings for additional rounds are spotted from the initial RP, but the corrections (spotting reversed) are applied to the last fired plot. This procedure is repeated for all adjustment rounds until a range correction of 50 meters is split.

FINAL PROTECTIVE FIRES

14-39. The highest priority mission for the mortar section is FPF. The FPF is a barrier of steel designed to stop the enemy. It is integrated with the other weapons of the unit being supported to cover dead space or likely avenues of approach. The FPF is a last-ditch effort to stop the enemy force from overrunning the unit. Normally, it is placed not more than 200 meters in front of friendly forces; however, the exact position of the FPF is based on the tactical situation.

14-40. The M16/M19 plotting board can be set up as any one of the three firing charts for FPF. With regard to the area of an FPF, the 60-mm and 81-mm mortar platoons can fire up to three FPF (one for each mortar).

14-41. The target location given in the CFF is not the location of the FPF. A 200- to 400-meter safety factor is added to the location of the FPF by the FO. This is the location given in the CFF.

NOTE: The computer *never* adds a safety factor.

14-42. An FPF adjustment can be fired in three ways:

- Adjust each mortar onto the FPF (most desirable method).
- Adjust only the danger close mortar, using the attitude of the target and mortar position to compute data for the other mortars.
- Using the attitude of both the mortar section and the FPF, compute only the data for the FPF, with no rounds being fired (least desirable method).

14-43. Obtaining the firing data is still performed by aligning the mortar location with the plot being engaged and using the azimuth disk and vernier scale.

NOTE: If the FPF is within 200 meters of friendly troops, the FO should call for HE delay in adjustment (preferred method) and use the creeping method of adjustment.

14-44. When adjusting each mortar, the FO may (in the CFF) give a section left (SL) or section right (SR) to determine the danger close mortar. The danger close mortar is the one impacting closest to friendly troops.

- (1) Once the danger mortar is known, it is adjusted onto the FPF line (Figure 14-14).
- (2) Once the danger mortar has been adjusted, the next mortar (No. 2) is given the danger mortar data and fired. The firing of the same data should put the impact of the next mortar 40 meters left or right of the adjusted mortar.

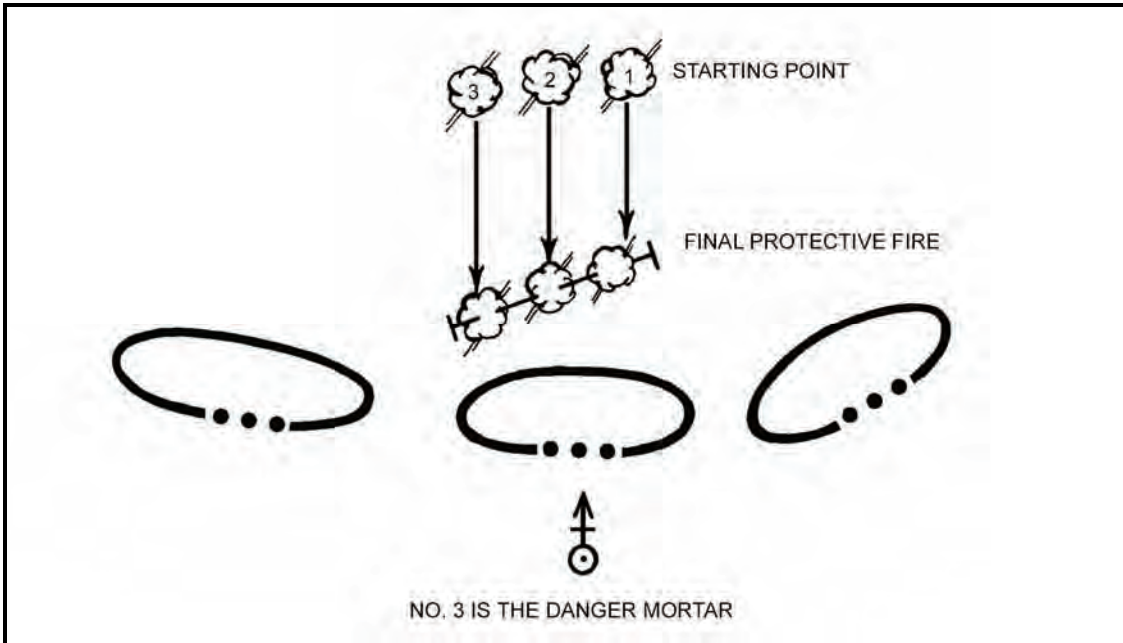


Figure 14-14. Determination of danger mortar.

- (3) This procedure is used for the remaining mortars until each is on the FPF line. As each mortar is adjusted to the FPF line, the data are then given to each mortar and placed on the mortar after each mission. Also, the predetermined number (unit SOP) of rounds is set aside ready to fire (Figure 14-15).

COMPUTER'S RECORD											
For use of this form, see FM 3-22.91; the proponent agency is TRADOC											
ORGANIZATION B Co 1/29 IN				DATE		TIME		OBSERVER ID P 88		TARGET NUMBER FPF	
<input checked="" type="checkbox"/> ADJUST FIRE <input type="checkbox"/> FIRE FOR EFFECT		<input type="checkbox"/> IMMEDIATE SUPPRESSION		SHIFT FROM _____				POLAR			
(ENCODED) GRID 009 644		DT DIRECTION 3020		ALTITUDE _____		<input type="checkbox"/> LEFT / <input type="checkbox"/> RIGHT		<input type="checkbox"/> UP / <input type="checkbox"/> DOWN		DISTANCE _____	
TARGET DESCRIPTION FPF ATT 3740		METHOD OF ENGAGEMENT DANGER CLOSE		MORTAR TO FFE SEC		DEFLECTION 2800		MORTAR TO FOLLOW SEC		ROUNDS EXPENDED	
METHOD OF CONTROL SECTION LEFT		MESSAGE TO OBSERVER		MORTAR TO ADJ _____		DEFLECTION CORRECTION		SHELL AND FUZE HED		④	
FOC ORDER		INITIAL CHART DATA		INITIAL FIRE COMMAND		MORTAR TO FIRE 1 Rd S/L		MORTAR TO FOLLOW _____			
MORTAR TO ADJ _____		DEFLECTION CORRECTION		SHELL AND FUZE _____		MORTAR TO FIRE _____		MORTAR TO FOLLOW _____			
METHOD OF ADJ 1 Rd S/L		<input type="checkbox"/> L <input type="checkbox"/> R		MORTAR TO FIRE _____		MORTAR TO FOLLOW _____		MORTAR TO FOLLOW _____			
BASIS FOR CORRECTION _____		RANGE 2775		MORTAR TO FIRE _____		MORTAR TO FOLLOW _____		MORTAR TO FOLLOW _____			
SHEAF CORRECTION SPECIAL		VIALT CORRECTION		MORTAR TO FIRE _____		MORTAR TO FOLLOW _____		MORTAR TO FOLLOW _____			
SHELL AND FUZE HEQ IN ADJ		<input checked="" type="checkbox"/> + <input type="checkbox"/> - 70		MORTAR TO FIRE _____		MORTAR TO FOLLOW _____		MORTAR TO FOLLOW _____			
HEQ IN FFE		RANGE CORRECTION		MORTAR TO FIRE _____		MORTAR TO FOLLOW _____		MORTAR TO FOLLOW _____			
METHOD OF FFE 20 Rds		<input checked="" type="checkbox"/> + <input type="checkbox"/> - 35		MORTAR TO FIRE _____		MORTAR TO FOLLOW _____		MORTAR TO FOLLOW _____			
RANGE LATERAL SPREAD _____		CHARGE/RANGE 5		MORTAR TO FIRE _____		MORTAR TO FOLLOW _____		MORTAR TO FOLLOW _____			
TIME OF OPENING FIRE AMC		AZIMUTH 2630		MORTAR TO FIRE _____		MORTAR TO FOLLOW _____		MORTAR TO FOLLOW _____			
ANGLE T 390		ELEVATION 0984		MORTAR TO FIRE _____		MORTAR TO FOLLOW _____		MORTAR TO FOLLOW _____			
OBSERVER CORRECTION			CHART DATA			SUBSEQUENT COMMANDS					
DEV	RANGE	TIME (HEIGHT)	DEFL	CHARGE (RANGE)	MORTAR FIRE	METHOD FIRE	DEFL AZIMUTH	RANGE	CHARGE	TIME (SETTING)	ELEV
#1 L100	-100		2820	2825	#1		2820	2850/5			0899 ⑤
	-50		2814	2800	#1		2814	2825/5			0918 ⑥
#1 ADJ	REPEAT #2				#2		2814	2825/5			0918 ⑤
R50	-50		2825	2750	#2		2825	2775/5			0949 ⑧
#2 ADJ	REPEAT #3				#3		2825	2775/5			0949 ⑨
L20	-25	EM FPF ADJ	2830		#3	DNF	2830	2750/5			0963

Figure 14-15. Example of completed DA Form 2399-R (Computer's Record) for computing final protective fire missions.

14-45. When adjusting only the danger close mortar, the computer is given the attitude of the target in the CFF.

- (1) The FDC can determine the danger close mortar by indexing the target attitude and drawing a line from the initial FPF plot (given in the CFF) 50 meters above and below (Figure 14-16).

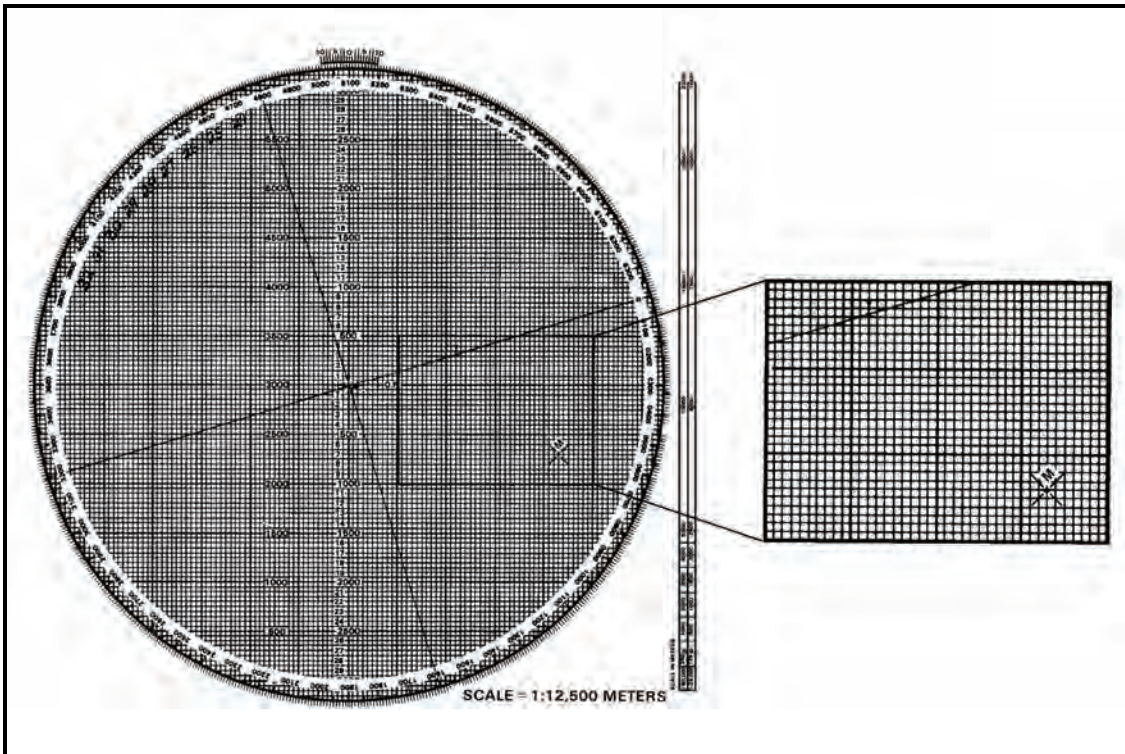


Figure 14-16. Drawing final protective fire symbol with attitude indexed.

- (2) After drawing the FPF line, the computer rotates the azimuth disk and aligns the mortar plot with the FPF plot to see which side of the line is closest to the friendly troops (Figure 14-17).
 - To use this method, the frontline trace of the supported unit must be plotted on the board.
 - Once the danger mortar has been determined, that danger mortar is fired and adjusted to the FPF line.
- (3) After the danger mortar is adjusted to the FPF line, the computer then indexes the FPF attitude and erases all but the last plot.

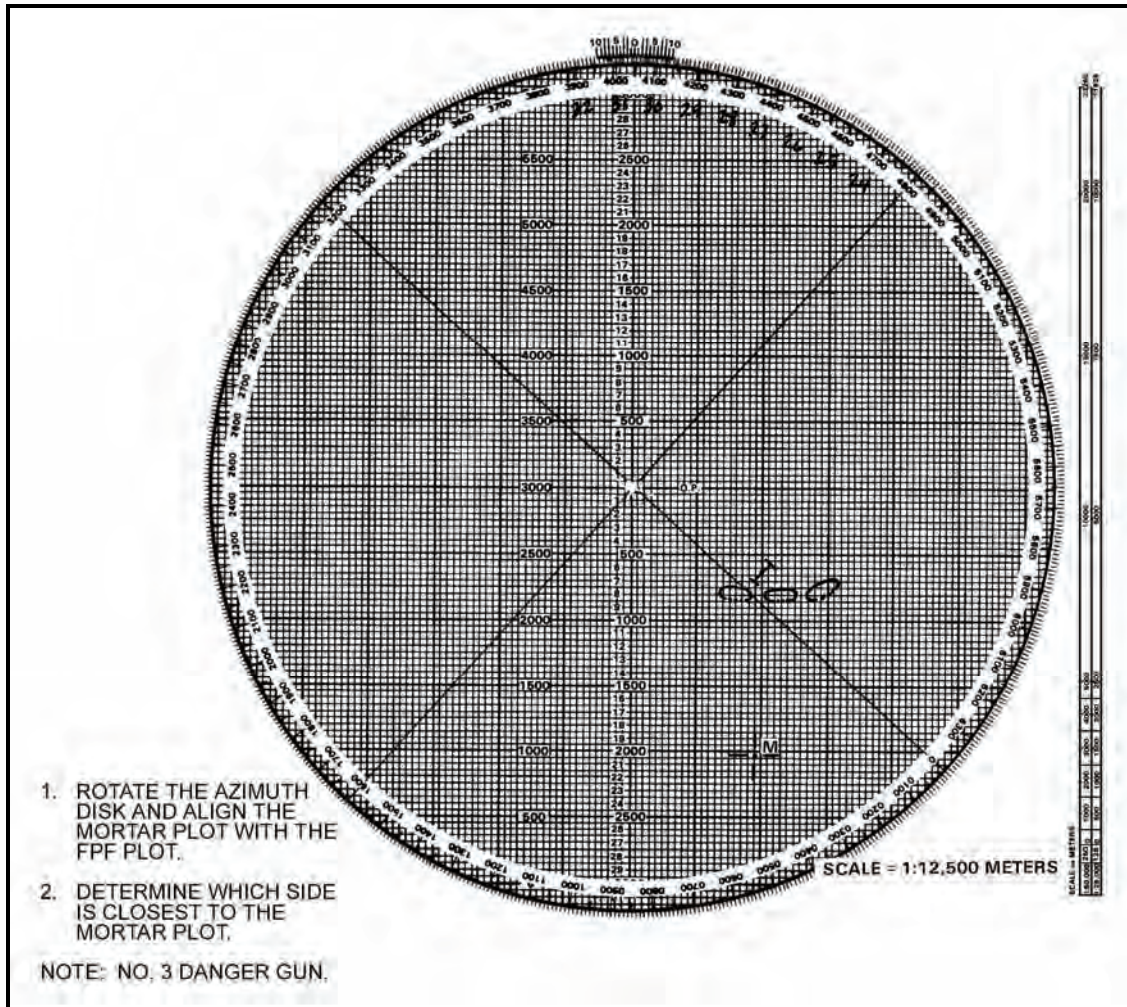


Figure 14-17. Determination of danger mortar.

- (4) Using the last plot, the computer draws the FPF symbol by extending a line 90 meters long toward the top of the board and 10 meters long from the plot towards the bottom of the board. This shows the full 100-meter width of the FPF.
- (5) The remaining plots for the No. 1, No. 2, and No. 3 mortars are then plotted 40 meters apart (Figure 14-18).

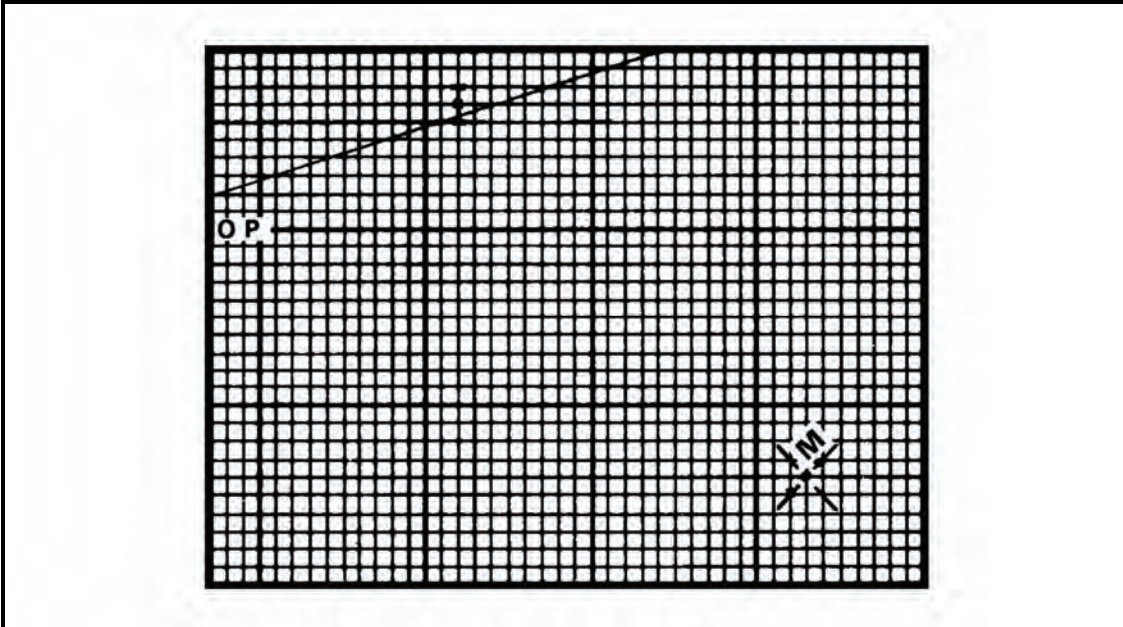


Figure 14-18. Plotting of No. 1, No. 2, and No. 3 mortars.

- (6) Once the plots are on the plotting board, the computer determines the firing data for each mortar by aligning each mortar plot with its intended impact plot (Figure 14-19).

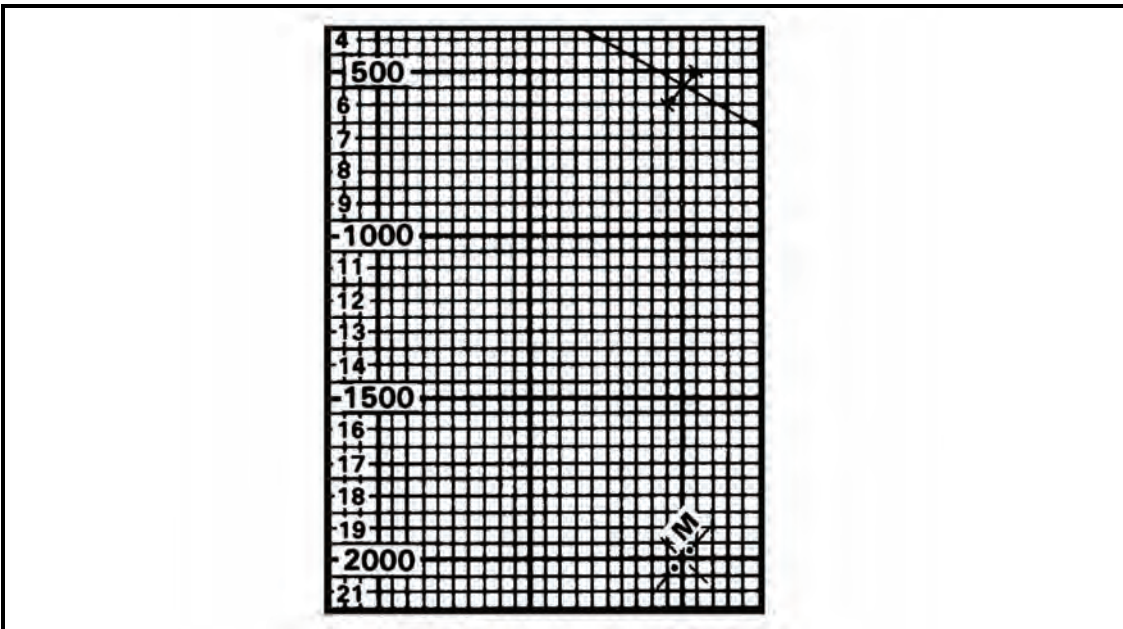


Figure 14-19. Alignment of each mortar with its impact point.

- (7) Again, these data are placed on the mortar after each mission, and the rounds are readied to fire.

14-46. To compute data for FPF without adjustment, the computer indexes the attitude of the FPF line and makes a plot 40 meters above and below the FPF starting plot.

- (1) The computer then indexes the attitude of the mortar section and plots the No. 1, No. 3, and No. 4 mortars 40 meters above and below the No. 2 mortar plot.
- (2) Once the FPF and mortars have been plotted, each mortar is aligned with its impact plot, and the data determined.
- (3) These data are given to the mortars and, again, are set on the mortars between missions.
- (4) This method is used when ammunition is low and time or the tactical situation does not permit the adjustment of the FPF.

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Part Five

Mortar Fire Control System

Chapter 15

Introduction

The Mortar Fire Control System (MFCS) provides a complete, fully-integrated, digital, onboard fire control system for the carrier-mounted 120-mm mortar. It provides a “shoot and scoot” capability to the carrier-mounted M121 mortar. With the MFCS, the mortar FDC computes fire commands to execute fire missions and controls its gun tracks. The carrier-mounted MFCS components work together to compute targeting solutions, direct the movement of vehicles into firing positions, allow real-time orientation, and present gun orders to the gunner.

SECTION I. INITIALIZATION AND CONFIGURATION

This section discusses the introduction, initialization, and configuration of the MFCS.

DESCRIPTION

15-1. The MFCS is an automated fire control system designed to improve the command and control of mortar fires and the speed of employment, accuracy, and survivability of mortars. The commander's interface (CI) microprocessor, controlled by a software operating system, manages computer activities, performs computations, and controls the interface with peripheral and external devices. The CI operator enters data at the keypad and composes messages using the liquid crystal display (LCD). Completed messages are then transmitted digitally or by radio. Should the FDC become disabled, each mortar crew can compute its own fire missions if the FDC is configured as a gun/FDC. System accuracy is increased through the use of a Global Positioning System (GPS), an onboard azimuth reference for the gun, and digital MET updates. The MFCS (Figure 15-1) enables self-surveying mortars, digital call for fire exchange, and automated ballistic solutions.

NOTE: For more information about the MFCS, see TM 9-1220-248-10 and FM 3-22.90.

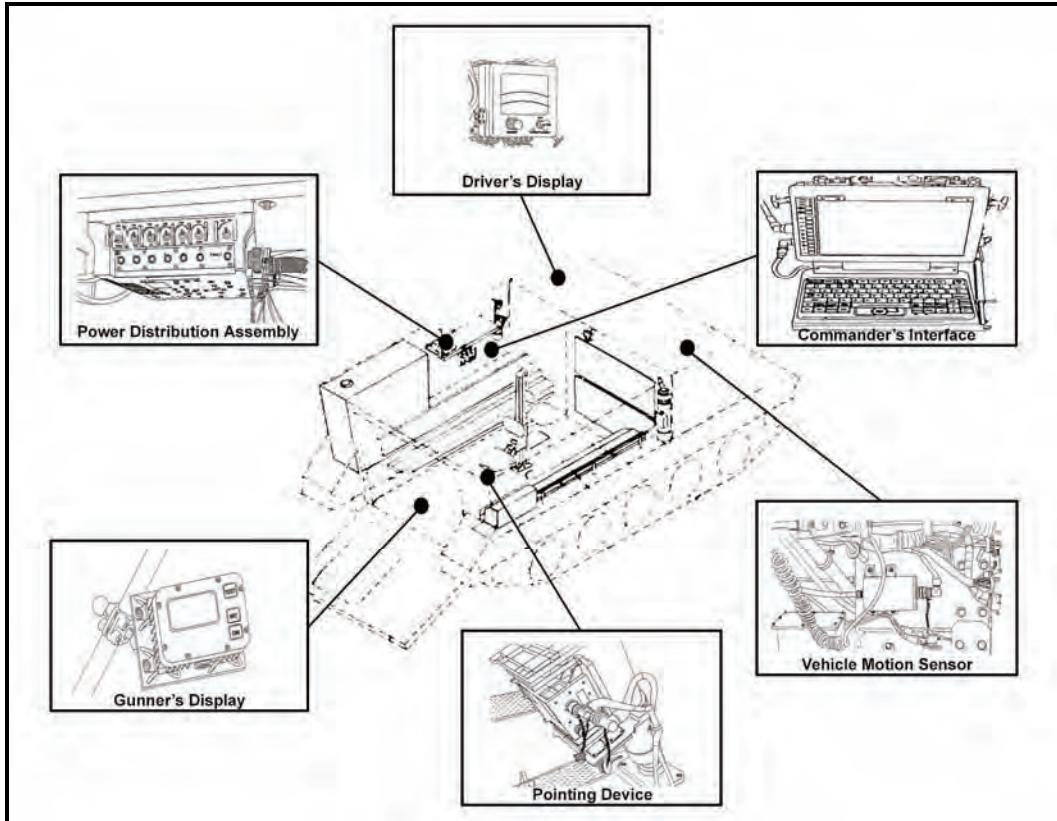


Figure 15-1. Mortar Fire Control System.

COMMANDER'S INTERFACE

15-2. The CI (Figure 15-2) is a computer terminal that provides high-speed data processing, an LCD, and a QWERTY-style keyboard similar to that of a common personal computer. It has a built-in modem, allowing a wide variety of data exchange requirements. The operator works with the CI's graphic user interface (GUI) to operate the system using the built-in mouse or the keyboard to point and click buttons and tabs. Data are presented on screens designed for specific missions and operations. The CI's keys and their functions are as follows.

Function Keys

15-3. Although the primary method of operating the CI is the built-in mouse, the operator can use the F1 through F10 function keys (1, Figure 15-2) to make selections in the software (F11 and F12 are not used). Table 15-1 identifies the assignment of keys.

Table 15-1. Function keys.

FUNCTION KEY	ASSIGNMENT
F1	This Menu
F2	Use All
F3	Undo Changes
F4	FSCMs
F5	Hipshoot
F6	Final Protective Fire (FPF)
F7	Boresight
F8	Safety Fan
F9	Checkfire
F10	To Be Determined
F11	Not Used
F12	Not Used

Keyboard Backlighting Control

15-4. This control (2, Figure 15-2) adjusts the intensity of the light (with off, low, and high settings).

Number Lock Key and Indicator

15-5. With blue numerals and arithmetic functions, these keys can be used as a number pad. Inadvertent use of the Number Lock (NUM LK) key (3, Figure 15-2) may result in the inability to perform other desired functions. When activated, the indicator light is illuminated.

Mouse

15-6. The mouse (4, Figure 15-2) allows the operator to move the cursor on the screen and make selections.

Windows Key

15-7. The Windows key (5, Figure 15-2) is not used by the operator.

Alpha, Numeric, and Special Character Keys

15-8. The alpha, numeric, and special character keys (6, Figure 15-2) function as a standard keyboard to compose messages and enable operators to enter data into the system.

Blackout Key

15-9. The Blackout key (7, Figure 15-2) blacks out the screen to guard against enemy detection in a tactical environment.

Right, Left, Down, and Up Direction Arrow Keys

15-10. The right, left, down, and up direction arrow keys (11 through 14, Figure 15-2) enable operators to make selections in the software. Mouse or keyboard use is recommended.

Enter Key

15-11. The Enter (ENT) key (15, Figure 15-2) brings up a menu of function keys.

Control, Alternate, and Escape Keys

15-12. The Control (CTL), Alternate (ALT), and Escape (ESC) keys (16 through 18, Figure 15-2) are not used in this application.

Screen Brightness Intensity Buttons

15-13. The screen brightness intensity buttons (19 and 20, Figure 15-2) decrease and increase the brightness of the LCD screen.

Battery 1 and Battery 2 Indicators

15-14. The Battery 1 (BTRY1, shown in 22, Figure 15-2) and Battery 2 (BTRY2, shown in 21, Figure 15-2) indicators illuminate with green light when the capacity of the respective battery is 50 to 100 percent of power, with amber light when capacity is 25 to 50 percent, and with no illumination when the capacity drops below 25 percent.

Power Indicator

15-15. The Power indicator (23, Figure 15-2) illuminates with green light when the computer is being powered with external power (PDA, AC/DC adapter) and with amber light when battery power only is used.

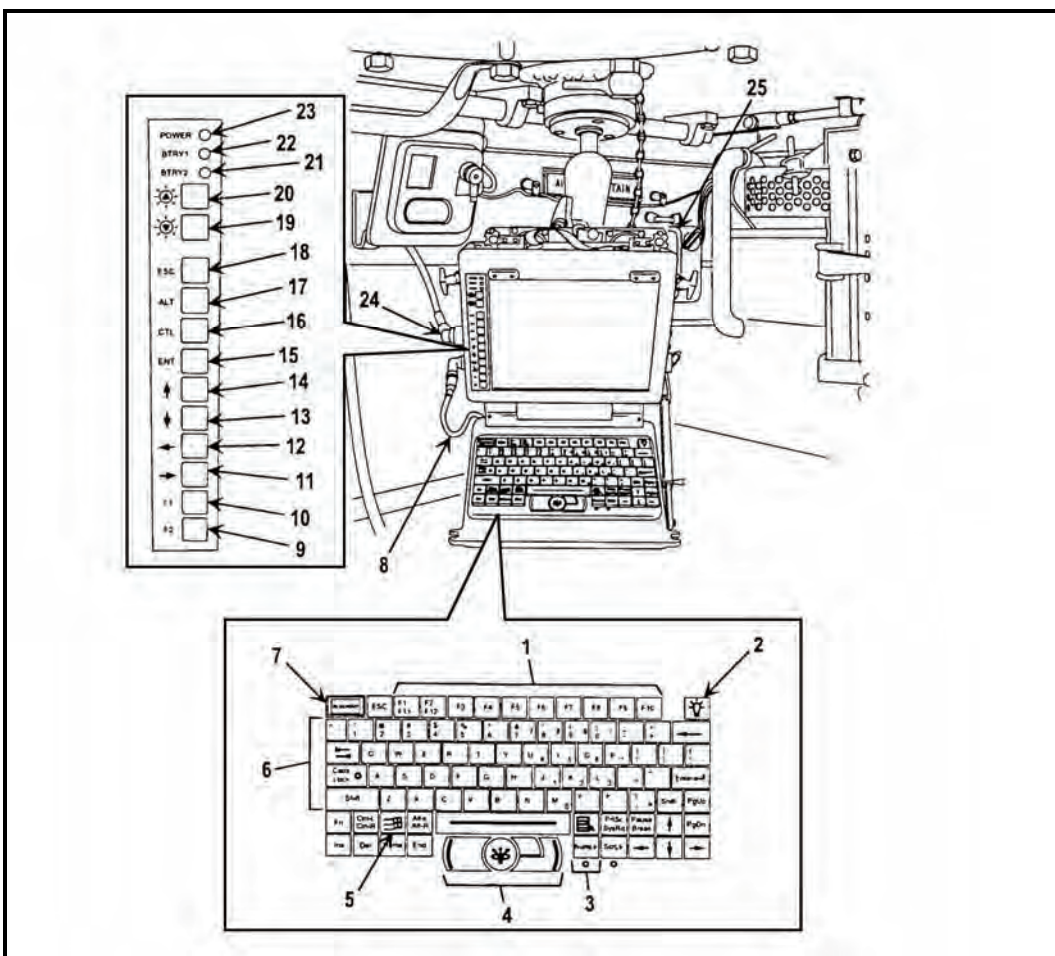


Figure 15-2. Commander's interface.

POWER DISTRIBUTION ASSEMBLY

15-16. The power distribution assembly (PDA, shown in Figure 15-3) accepts direct current (DC) and alternating current (AC) to power the MFCS components. It filters vehicle power through a DC-to-DC power system that isolates the MFCS components from fluctuations in vehicle power, including starting the vehicle. It also protects the MFCS components against reverse polarity and power surges.

To support classroom training and nonfield usage, the PDA also provides a 115-220v AC interface for connection to available line power, which preserves the battery charge level.

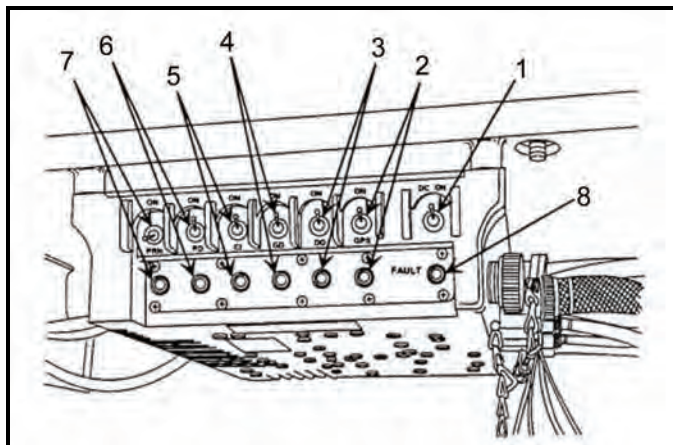


Figure 15-3. Power distribution assembly.

Power On Switch

15-17. The Power On switch (1, Figure 15-3) turns the PDA on and off for DC power only.

Switch and Light-Emitting Diode Indicator for the Global Positioning System

15-18. This switch (2, Figure 15-3) distributes power to the precision lightweight Global Positioning System receiver (PLGR) on the M1064 only. The LED turns green when the switch is on.

Switch and Light-Emitting Diode Indicator for the Driver's Display

15-19. This switch (3, Figure 15-3) distributes power to the driver's display (DD) on the M1064 only. The LED turns green when the switch is on.

Switch and Light-Emitting Diode Indicator for the Gunner's Display

15-20. This switch (4, Figure 15-3) distributes power to the gunner's display (GD) on the M1064 only. The LED turns green when the switch is on.

Switch and Light-Emitting Diode Indicator for the Commander's Interface

15-21. This switch (5, Figure 15-3) distributes power to the CI. The LED turns green when the switch is on.

Switch and Light-Emitting Diode Indicator for the Pointing Device

15-22. This switch (6, Figure 15-3) distributes power to the pointing device (PD) on the M1064 only. The LED turns green when the switch is on.

Switch and Light-Emitting Diode Indicator for the Printer

15-23. This switch (7, Figure 15-3) distributes power to the printer, or in an emergency, the printer port can be used to power the PD. The LED turns green when the switch is on. This switch is not used in this application except in an emergency situation.

Fault Light-Emitting Diode Indicator

15-24. This indicator (8, Figure 15-3) illuminates with amber light and may flicker if the PDA malfunctions.

POINTING DEVICE

15-25. The PD (Figure 15-4) is mounted in the M1064 mortar carrier and aligns the M121 mortar. It can maintain alignment and accuracy within 3 mils of the azimuth and 1 mil of the elevation in all conditions. It provides pointing and positional performance at an operational range of 80 degrees south to 84 degrees north latitude. An inertial measurement unit (IMU) provides the weapon with absolute knowledge of vehicle position and mortar barrel azimuth and elevation. The IMU can determine the orientation of the mortar barrel without survey control points, aiming circles, or aiming posts—allowing the mortar platoon to emplace anywhere, anytime. To maintain a high degree of accuracy, the IMU incorporates information from the GPS and a vehicle motion sensor (VMS). The PD's design allows for loss of the GPS, the VMS, or both devices without substantial degradation of overall performance.

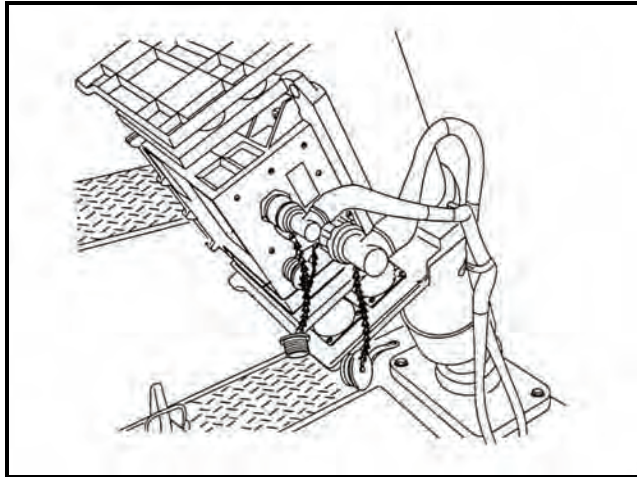


Figure 15-4. Pointing device.

GUNNER'S DISPLAY

15-26. The GD (Figure 15-5) provides the gunner with the necessary information (deflection, elevation, check fire, and CFF commands) to aim and fire the mortar. It is mounted to the left center bipod leg. Function keys are used to start various displays that cover the gunner's functional needs for information, status, and reporting.

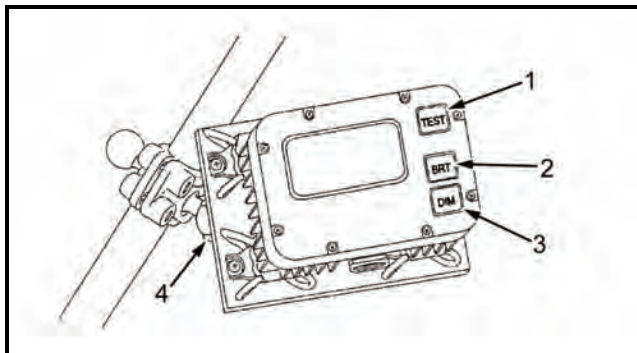


Figure 15-5. Gunner's display.

Test Key

15-27. The Test key (1, Figure 15-5) initiates the internal built-in test (BIT) display.

Bright and Dim Keys

15-28. The Bright (BRT) and Dim (DIM) keys (2 and 3, Figure 15-5) increase and decrease the brightness of the LCD.

Locking Clamp

15-29. The locking clamp (4, Figure 15-5) is used to allow movement of the GD from the mounting wall.

DRIVER'S DISPLAY

15-30. Located within the driver's vision, the DD (Figure 15-6) displays the steering directions and compass orientation to move the vehicle to the next firing location or waypoint. It also provides information to correctly orient the vehicle at the next emplacement. Information is graphically displayed for steering directions and compass orientation, and numerically for distance and heading.

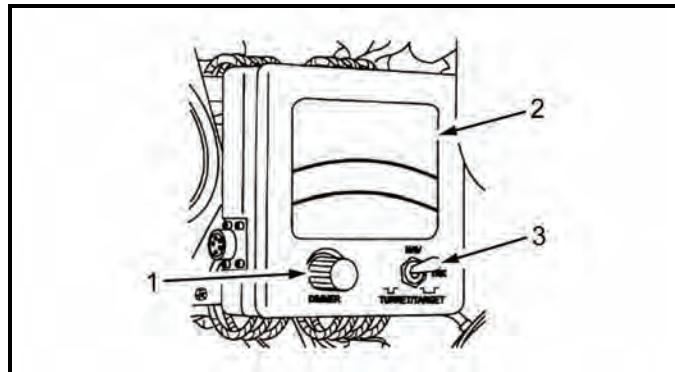


Figure 15-6. Driver's display.

Dimmer Knob

15-31. The dimmer knob (1, Figure 15-6) controls the brightness of the LCD.

Liquid Crystal Display

15-32. The LCD (2, Figure 15-6) displays directions to the next position. The LCD blinks when a call for fire is received.

Toggle Switch

15-33. With the toggle switch (3, Figure 15-6) turned to NAV, the LCD displays directional instructions. The TRK and TURRET/TARGET toggle positions are not used.

VEHICLE MOTION SENSOR

15-34. The VMS (Figure 15-7) provides the PD with vehicle velocity data to reduce the vertical position error and improve location accuracy. Rotation of the drive wheels, and, thus, motion of the vehicle, creates a pulse, which represents forward or backward motion of the vehicle. The VMS is mounted inside the engine compartment in front of the driver's cab on the M1064 carrier.

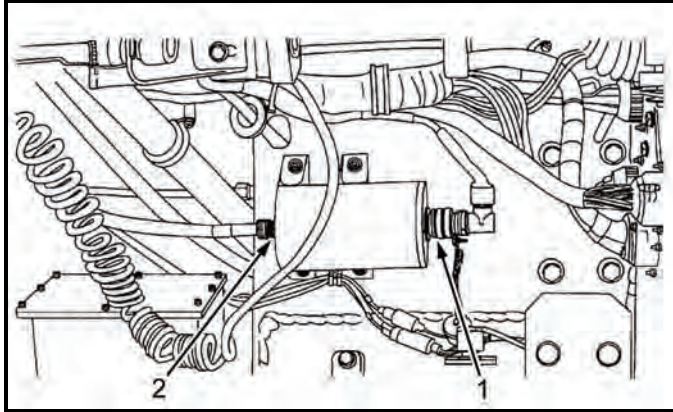


Figure 15-7. Vehicle motion sensor.

CAPABILITIES

15-35. The computer design permits the system to be upgraded to match expanding demands on field terminal equipment. Currently, the MFCS is capable of storing—

- 18 gun positions.
- 3 gun sections.
- 50 known points.
- 50 known targets.
- 16 RPs.
- 3 FPFs.
- 12 FO locations.

COMMANDER'S INTERFACE PROCESSING CAPABILITIES

15-36. The CI can simultaneously process up to six active fire missions, consisting of one to six guns per mission, as long as no mission consists of guns from different sections and no gun is assigned to more than one mission concurrently. It can also—

- Accept up to 100 digital messages.
- Handle a full range of mortar ammunition per type.
- Conduct registration missions and apply all registration corrections automatically.
- Receive, compute, and automatically apply all MET corrections.
- Store a maximum of 10 safety fans.
- Provide a 13-digit grid to impact for all rounds.
- Provide azimuth and range from the gun to the impact for each round.
- Connect to radio or wire for digital communications.

15-37. The CI can be powered with dual nickel metal hydride (NiMh) rechargeable lithium batteries. Power can also be supplied through power adapter options of 12- to 32-volt DC or 110- or 220-volt AC power. The CI also contains power-saving circuitry.

15-38. The CI accepts digital messages from the Forward Observer System (FOS), the Advanced Field Artillery Tactical Data System (AFATDS), and the interim fire support artillery software (IFSAS) to support FSCMs and digital messaging devices (DMDs). It has an integral speaker and software to control its output and provides the following safety geometry:

- No-fire areas (NFA).
- Coordinated fire lines (CFL).
- Restricted fire areas (RFA).
- Restricted fire lines (RFL).
- Lateral boundaries (LB).
- Airspace coordination areas (ACA).
- Forward line of own troops (FLOT).

COMMANDER'S INTERFACE BATTERY SPECIFICATIONS

15-39. The CI holds two rechargeable NiMh batteries, which are for backup power purposes only. The CI can operate without batteries. It also includes the following features:

- Single batteries can be replaced while the system is in operation.
- Batteries cannot be installed incorrectly.
- Battery power will last for approximately four hours at ambient conditions.

WARNINGS

- 1. The battery indicator is no longer reliable. The conditioning process recalibrates the battery indicator, and without recalibration, that indicator becomes inaccurate. Remaining battery life can be determined by applying external power to the CI and observing the BTRY1 and BTRY2 indicators. See MAM 06-019 for more information.**
- 2. CI batteries DO NOT REQUIRE CONDITIONING OR DEEP CYCLING. The CI should never be used to condition batteries.**
- 3. Charging two batteries simultaneously can create internal noise and grounding loops in the CI. Ensure that only one battery is installed in the CI at all times.**

SOLDIER GRAPHIC USER INTERFACE

15-40. A Soldier GUI (Figure 15-8) is a display that allows the operator to use menus, windows, and icons rather than type complicated commands.

SCREEN AREA

15-41. The screen area is located on the screen of the laptop computer. The screen will display an image with buttons, tabs, fields, and menus. It displays the classification of the information on the current screen in the upper center of the screen.

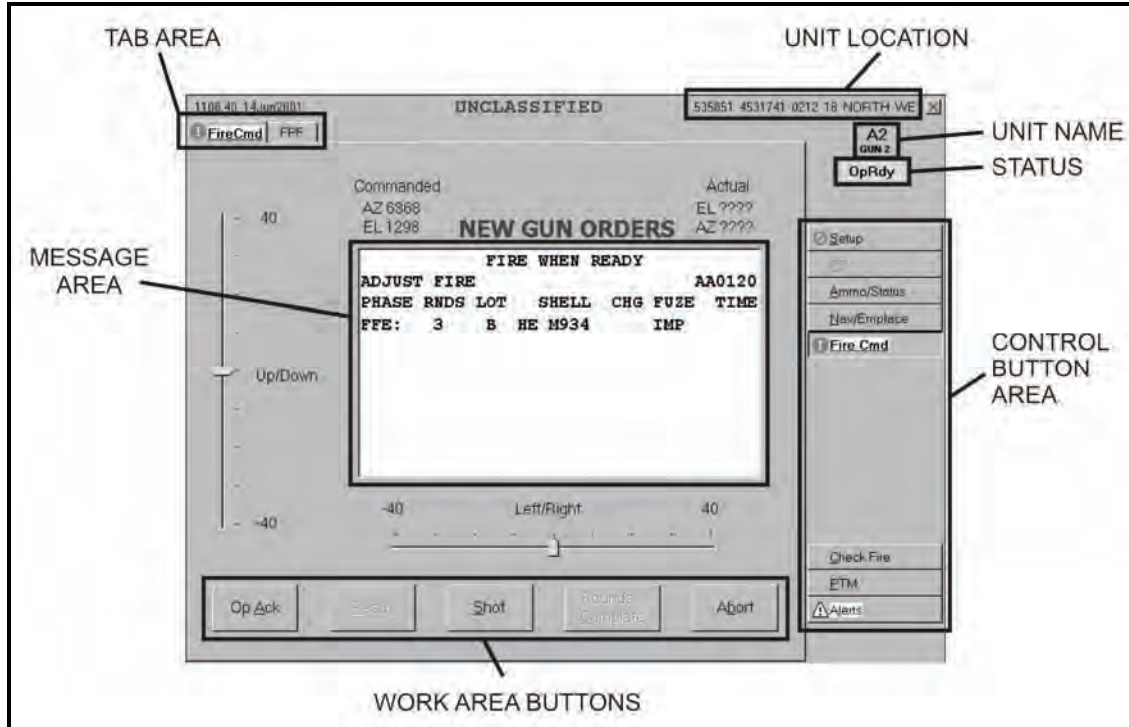


Figure 15-8. Graphic user interface.

Control Button Area

15-42. The control button area displays the buttons used to access all available MFCS functions for the gun and is located on the right side of the GUI. The buttons include—

- Setup.
- Pointing Device (PD).
- Ammunition/Status (Ammo/Status).
- Navigation/Emplacement (Nav/Emplace).
- Fire Command (Fire Cmd).
- Check Fire.
- Plain Text Messages (PTM).
- Alerts.

NOTE: The control button area displays only those buttons available for the function currently being used. For example, the setup display above does not include the fire mission functions of PPF, FSCMs, MET, and so on.

Tabs

15-43. Tabs are similar to buttons and are displayed at the top of the screen after a control button has been selected. When a tab is selected, the appropriate screen appears, and the operator can review and enter information and execute actions.

Work Area

15-44. The work area is located in the center of the screen. This is where information can be viewed, selected, or modified.

Work Area Buttons

15-45. Work area buttons are located in the center and at the bottom of the screen. They are used to accept, process, or refuse data presented in the work area.

Position Location

15-46. Position location is in the upper right corner of the screen. It can be the actual position, a series of question marks (if the position is not established), or a note such as "Position Not Available."

Unit Name and Long Name

15-47. These are located just below the position location.

COMMON ACTIONS

15-48. When using the MFCS, the operator repeatedly uses the same commands. These are usually done by clicking buttons in the working button area of the screen or responding to a query in a message box. These commands include—

- Operationally acknowledge (OpAck).
- Record data.
- Message to the observer (MTO) accept or deny.
- Process or delete.
- Select the guns to fire the mission.
- Confirm gun orders.
- Accept or modify data.

Operationally Acknowledge

15-49. Clicking the operationally acknowledge (OpAck) button acknowledges receipt of a message and, if turned on, deactivates the audio alarm. The phrase "click the OpAck button" is used throughout the chapter to indicate this action.

Record Data

15-50. Data is recorded throughout the process to maintain a record and to preserve data should the MFCS fail. Data is transcribed onto DA Form 2399-R or DA Form 2188-R. The phrase "record data" is used throughout the chapter to indicate this action.

Message to the Observer Accept or Deny

15-51. The phrases "click MTO Accept to accept the mission" or "click MTO Deny to refuse the mission" are used throughout the chapter to indicate these actions. If the operator selects MTO Deny, the Delete button becomes visible and, when clicked, deletes the mission. If an error is beyond FDC control, the only choice is MTO Deny.

Process or Delete

15-52. The MFCS usually presents a choice to process or delete the fire mission. The operator can click Process to continue with the mission or Delete to end the mission. The terms "process" and "delete" are used throughout the chapter to indicate these actions.

Select the Guns to Fire the Mission

15-53. Guns for the mission are preselected by the software and are checked in the Sel box in Gun Select. The operator can modify these selections by clicking in the Sel box to select or deselect any operationally ready (OpRdy) gun. The operator can also select all or none of the guns listed by clicking All or None. The phrase "select guns" is used throughout the chapter to indicate this action.

15-54.

Confirm Gun Orders

15-55. When a solution is displayed and the operator is satisfied with the data, the operator will select “Send Gun Orders.” A message box will be displayed to confirm the order. The operator clicks “Yes” to confirm the action.

Accept or Modify Data

15-56. If required, the operator makes adjustments to the mission data. To undo any changes, he clicks Undo Changes, and the data fields display the original data. To accept all changes made, click Use All. If no changes are made, click Use All. The phrase “modify data if necessary” is used throughout the chapter to indicate this action.

STARTUP

15-57. Starting the MFCS on the M1064 must be done in sequence to ensure that the system performs properly. Follow these steps to start the MFCS and its ancillary equipment.

- (1) Ensure that the radios are in the stand-by mode, and turn on the vehicular or AC power. Ensure that sufficient vehicular or auxiliary power is available by checking the power gauge meter on the driver’s instrument panel.
- (2) Turn on the power distribution assembly (PDA). The PDA distributes power to the MFCS components and the PLGR. Use the toggle switch to turn on power for each.
- (3) Turn on the PLGR. The PLGR self-test is successfully performed when the PLGR screen states, “No faults found.” For all MFCS operations, the PLGR must have current COMSEC codes installed.
- (4) Turn on the PD. The PLGR screen states, “Remote control only zeroized key activated.”
- (5) Turn on the CI. Check to see if the batteries are installed in the battery compartment and the power cable is connected to the computer. Turn on the CI switch on the PDA. If the Power indicator illuminates with amber light, the CI is not receiving external power. If the Power indicator illuminates with green light, the CI has external power.
- (6) Establish continuous mode for the PLGR. The upper left portion of the PLGR screen should display “Cont.”
- (7) Turn on the radios
- (8) Turn on the DD.
- (9) Turn on the GD.

NOTE: See TM 9-1220-248-10 for more detailed information.

LOG-IN PROCEDURES

15-58. The log-in screen (Figure 15-9) is displayed after system startup is complete. The log-in screen ensures that only authorized personnel have access to the system. The operator enters his name and password, and then clicks the Enter button.

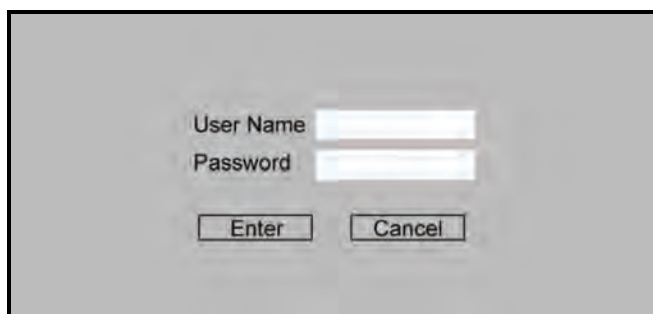


Figure 15-9. Log-in screen.

DATA INITIALIZATION AND SYSTEM CONFIGURATION

15-59. CI initialization and configuration is performed after the startup is completed. The operator inputs or selects information for fields to provide the system with the necessary information. The operator configures the system to the platform using the mouse or keyboard.

15-60. Various symbols or icons may appear on the screen while using the CI. These symbols assist the operator by highlighting actions that must be completed, such as status of operations and changes to data.

NOTE: See TM 9-1220-248-10 for a list of these icons.

15-61. To initialize and configure the MFCS—

NOTE: Until the system is configured, only the Setup and Alert buttons appear. The Setup button is located at the top of the control button area.

- (1) Click the Setup button.
- (2) The Unit List screen appears.

NOTE: The Unit List and Configuration tabs are the only tabs shown.

- (3) Enter the required information for the Unit List and Configuration screens.

NOTE: All other setup tabs display.

- (4) Enter, modify, or confirm the information on each of these screens:
 - Data.
 - Geographical Reference.
 - Position.
 - Channel A and Channel B.

UNIT LIST SCREEN

15-62. The Unit List screen is the default screen; it appears after the operator clicks the Setup button. The Unit List screen (Figure 15-10) lists all of the units assigned or used by the FDC. This screen allows the operator to view, enter, edit, or delete a—

- Unit name.
- URN.
- Long name.
- Device.
- Observer number.

NOTES: 1. If previously configured, the system defaults to the data already entered.

2. There is a limit of 100 unit entries.
-

15-63. Once complete, the operator accepts the existing or modified data. A red question mark displays until the system is configured with Use All on the Config tab. When the system is configured, additional tab choices will display, and the remaining control buttons will be enabled.

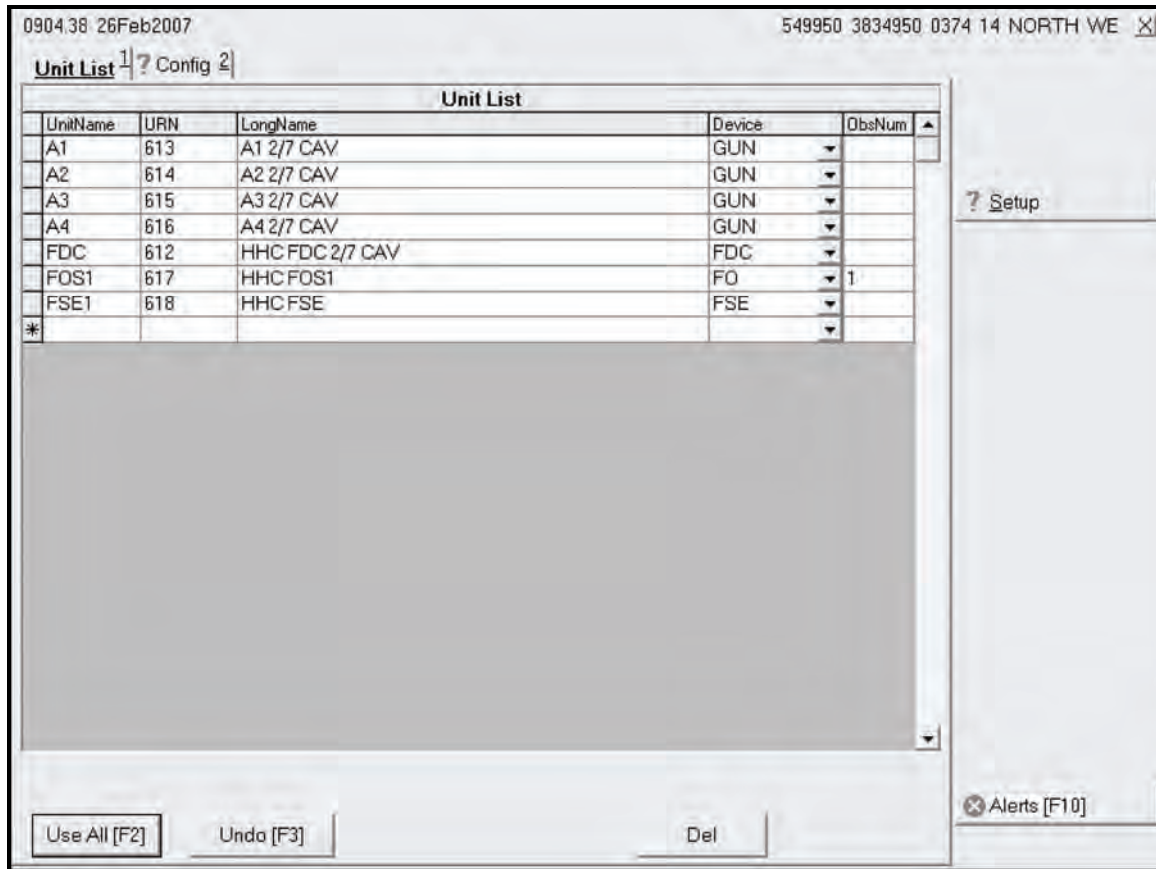


Figure 15-10. Unit List screen.

Unit Name

15-64. A lock icon displays in the index box at the beginning of a row when that platform has already been assigned a unit name. The unit name must be two to four characters long, and the first character must be a letter.

Unit Reference Number

15-65. The unit reference number (URN) must be unique to the unit.

Long Name

15-66. The long name must be less than 30 characters long.

Device

15-67. The operator accesses the drop-down menu in the Device field to select FDC, GUN, FO, FSE, or OTHER.

Observer Number

15-68. In the last field, ObsNum, the operator assigns a number to each observer or any unit that may act as an observer.

CONFIGURATION SCREEN

15-69. The operator selects the Use All working area button on the Unit List screen to display the Configuration screen (Figure 15-11). This screen allows the operator to enter or reconfigure information by selecting one of the options on the drop-down menus for—

- Platform.
- Role.
- Unit.
- Communication (Commo, see note).
- Security Classification.
- Mode.
- Controlling FSE.

15-70. A red question mark displays on the Config tab until the operator clicks Use All.

-
- NOTES:**
1. If previously configured, the system defaults to the data already entered.
 2. MFCS Versions 3.0 and later include a Commo field. This field is used to select Variable Message Format (VMF) PKG11 or VMF R5. If using FOS Version 7.1 or AFATDS Version 6.4 or later, select VMF R5. Otherwise, select VMF PKG11.
-

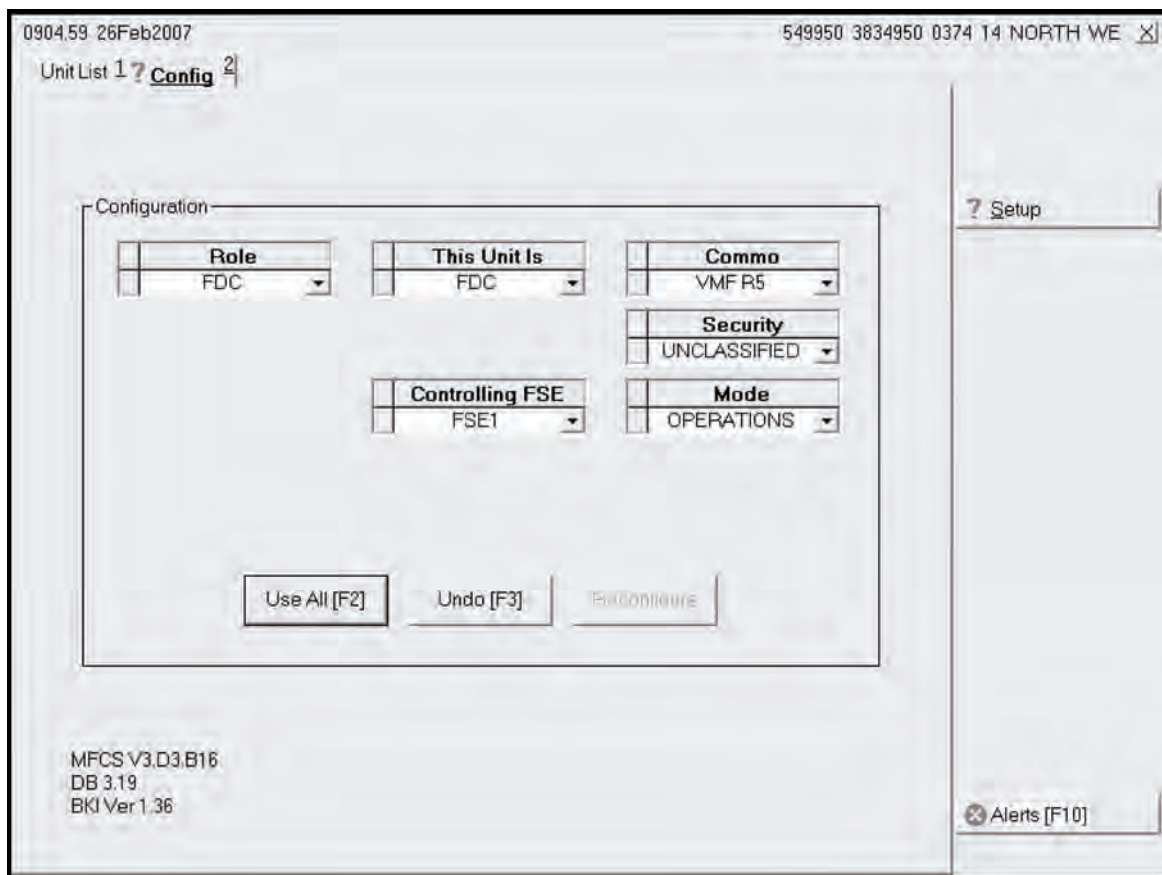


Figure 15-11. Unit Configuration screen.

DATA SCREEN

15-71. The operator selects the Data tab to display the Data screen (Figure 15-12). This screen allows the operator to verify, view, or set the—

- System date/time.
- Audio alarm.
- Target number.
- Splash offset.

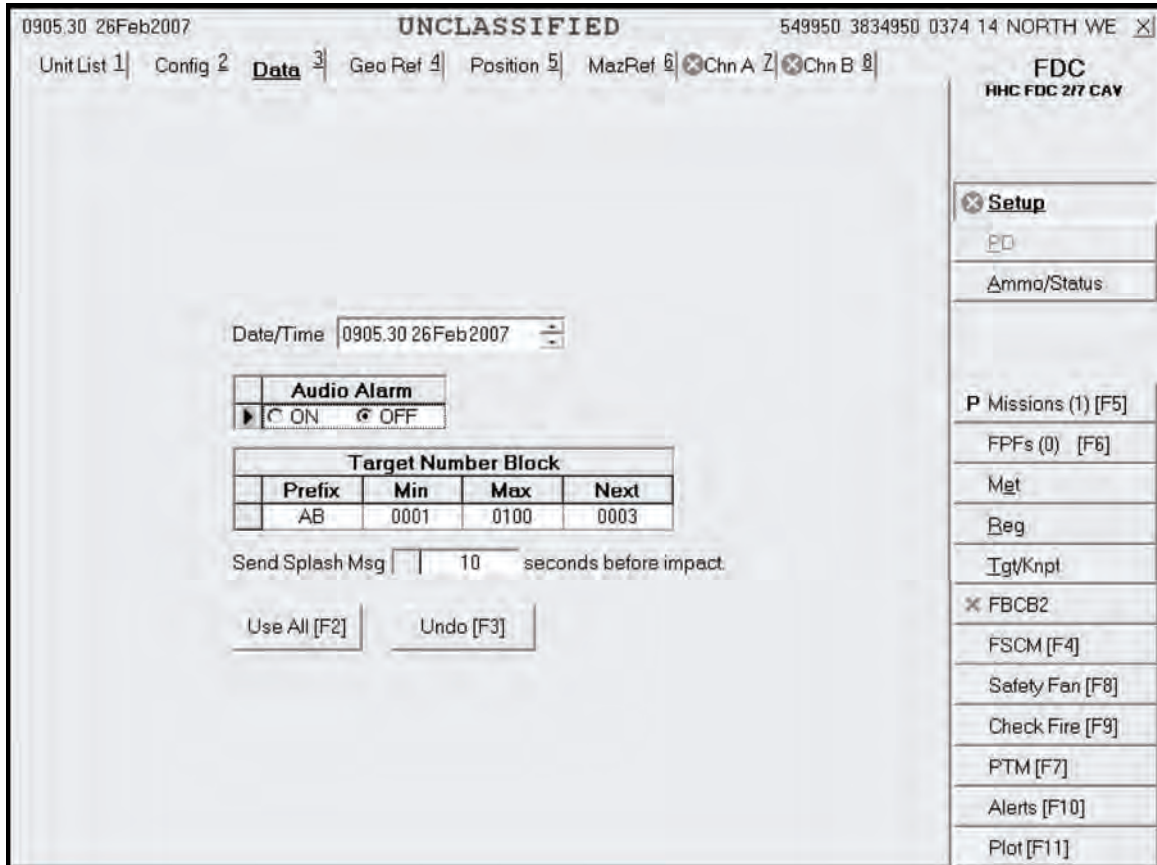


Figure 15-12. Data screen.

GEOGRAPHIC REFERENCE SCREEN

15-72. This screen (Figure 15-13) allows the operator to set the geographic positioning system by filling the following fields:

- Ellipsoid.
- Datum.
- Map Mod.

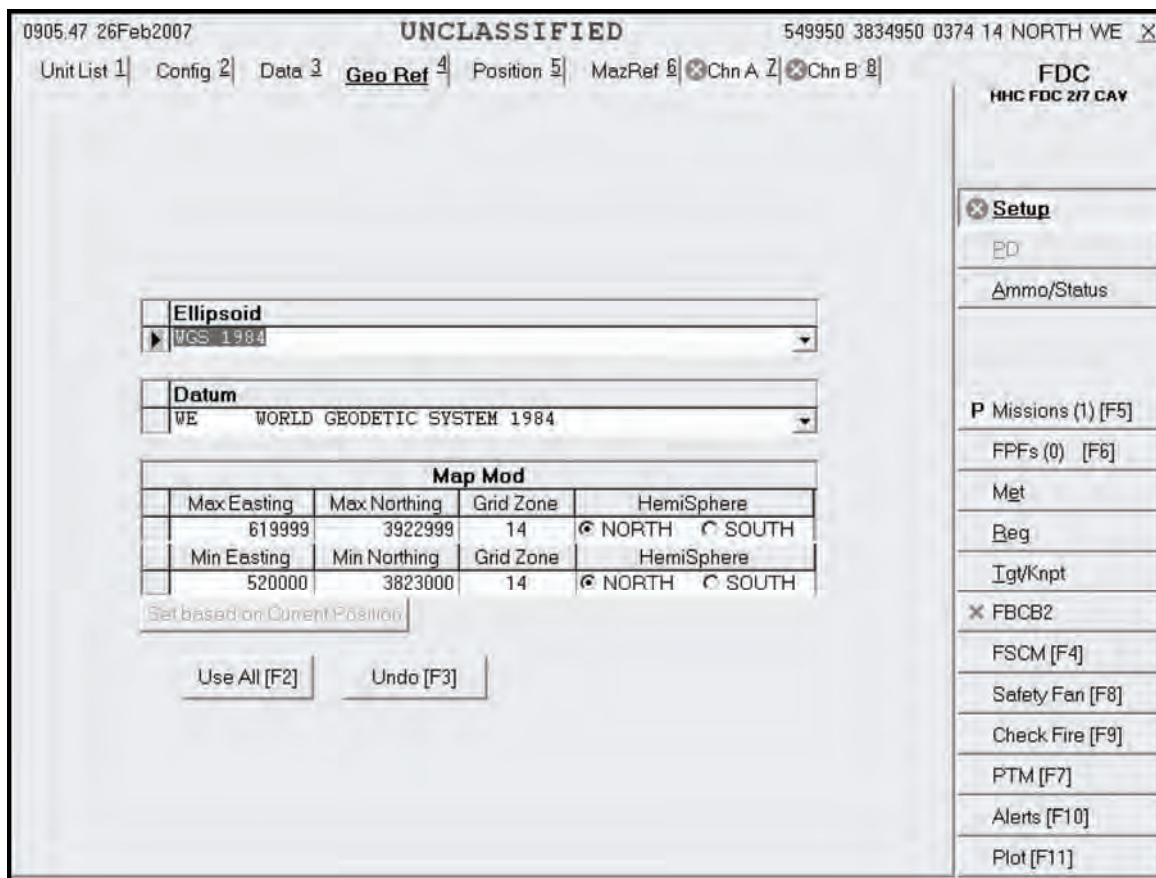


Figure 15-13. Geographic Reference screen.

Ellipsoid and Datum Fields

15-73. To fill the Ellipsoid and Datum fields—

- (1) Click the down arrow in the Ellipsoid field, and select the appropriate choice.
- (2) The corresponding default datum for the ellipsoid automatically displays in the Datum field.
- (3) Change the Datum field by choosing another option.
- (4) The screen value is updated, and a pencil icon displays in the index box at the beginning of each row.

15-74. To undo the changes, click Undo Changes; any unsaved changes (indicated by a pencil icon) are refreshed with the original data.

Map Mod Field

15-75. The Map Mod field is comprised of eight sub-fields:

- Maximum Easting (Max Easting).
- Maximum Northing (Max Northing).
- Grid Zone (maximum field row).
- Hemisphere (HemiSphere, maximum field row).
- Minimum Easting (Min Easting).
- Minimum Northing (Min Northing).
- Grid Zone (minimum field row).
- Hemisphere (HemiSphere, minimum field row).

Maximum Easting and Northing Fields

15-76. The Max Easting and Max Northing fields are read-only and are automatically filled when the operator enters the fields.

Grid Zone and Hemisphere Fields (Maximum Field Row)

15-77. The Grid Zone and Hemisphere fields in the Maximum field row are also read-only and are automatically filled and updated when the operator enters the Minimum values.

Minimum Easting and Northing Fields

15-78. The Min Easting and Min Northing fields are disabled if there are any active missions. The MFCS uses the 13-digit Military Grid Reference System (MGRS) to calculate the map modification. The minimum easting must be six digits long; the minimum northing must be seven digits long.

Grid Zone and Hemisphere Fields (Minimum Field Row)

15-79. The grid zone and hemisphere can be determined using the map sheet. The Grid Zone Designation is located in the Grid Reference box at the bottom center of the map sheet. It consists of two numbers and a letter. The letter is not entered into the MFCS. The Hemisphere field is set to north if operating north of the equator, or south if operating south of the equator.

POSITION SCREEN

15-80. The operator selects the Position tab to display the Position screen (Figure 15-14). This screen allows the operator to view or update his and other units' current positions. The operator must update the position if a red circle with an X through it displays on the Position tab.

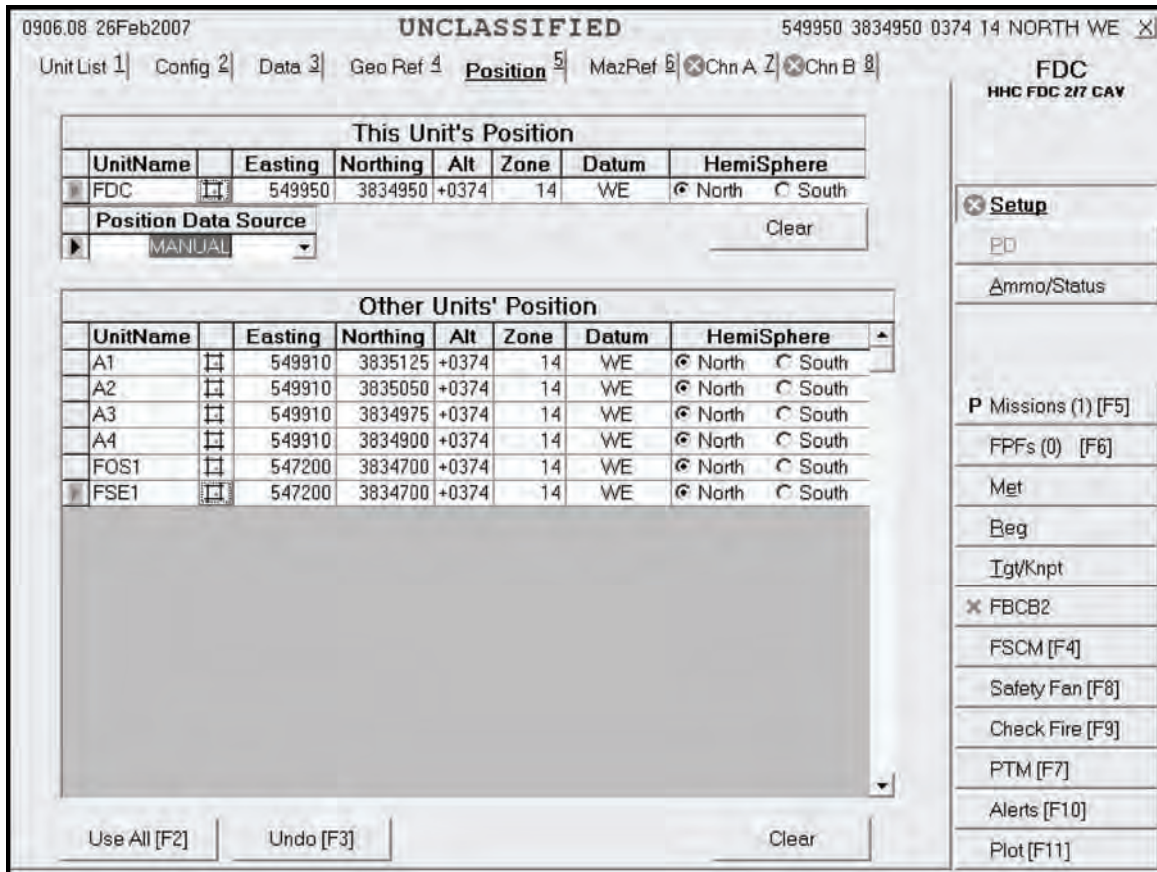


Figure 15-14. Position screen.

This Unit's Position

15-81. This portion of the screen contains eight fields:

- Unit Name (UnitName).
- Easting.
- Northing.
- Altitude (Alt).
- Zone.
- Datum.
- Hemisphere (HemiSphere).
- Position Data Source.

15-82. As necessary, the operator may click—

- Use All.
- Undo.
- Cancel.

Unit Name Field

15-83. The UnitName field is read-only and is automatically filled with the unit names selected in the Configuration screen.

Zone, Datum, and Hemisphere Fields

15-84. The Zone, Datum, and HemiSphere fields are also read-only and are automatically filled when the operator enters the Map Mod field.

Position Data Source, Easting, Northing, and Altitude Fields

15-85. With the Position Data Source field set to Manual, the operator can also manually update or modify the fields as follows:

- The Easting field with six digits.
- The Northing field with seven digits.
- The Alt field with a range of values from -400 to 9999 meters.

NOTE: If the PD is available and operational, the operator must ensure that the position data source is set to PD, GPS, or FBCB2. These fields are read-only.

Other Units' Position Fields

15-86. This portion of the screen contains seven fields:

- Unit Name (UnitName).
- Easting.
- Northing.
- Altitude (Alt).
- Zone.
- Datum.
- Hemisphere (HemiSphere).

15-87. As necessary, the operator clicks Use All, Undo, or Cancel.

Unit Name Field

15-88. The UnitName field is read-only and is automatically filled with the unit names selected in the Configuration screen.

Zone, Datum, and Hemisphere Fields

15-89. The Zone, Datum, and HemiSphere fields are also read-only and are automatically filled when the operator enters the Map Mod field.

Easting, Northing, and Altitude Fields

15-90. Although the values for Easting, Northing, and Alt are transmitted from the gun, the operator has the option to update them manually, as follows:

- The Easting field with six digits.
- The Northing field with seven digits.
- The Alt field with a range of values from -400 to 9999 meters.


15-91. If the operator enters a value which is not within the map modification, a message box will appear indicating the incorrect range.

NOTE: The operator's position is now displayed in the upper right corner of the screen.

Alternate Methods of Entering Position

15-92. Using pop-up screens, the operator may also enter positions using universal transverse mercator (UTM), polar coordinates, Military Grid Reference System (MGRS), or latitude and longitude. These methods may be used in a voice CFF.

15-93. To use these methods—

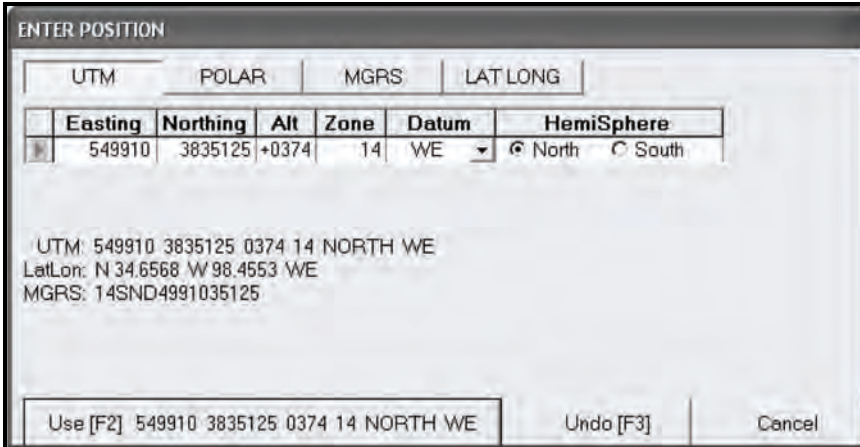
- (1) Click the  icon on the appropriate unit's row.
- (2) The Enter Position screen appears.
- (3) Click the desired alternate method to enter the unit's location.

Universal Transverse Mercator

15-94. To enter the unit's location using UTM (Figure 15-15), enter the following for the selected unit—

- Easting.
- Northing.
- Altitude (Alt).
- Zone.
- Datum.
- Hemisphere (HemiSphere).

15-95. If the coordinates entered are for a valid location, they will appear on the Use button.



The screenshot shows a window titled "ENTER POSITION" with four tabs: UTM, POLAR, MGRS, and LATLONG. The UTM tab is selected. Below the tabs is a table with columns: Easting, Northing, Alt, Zone, Datum, and HemiSphere. The values entered are: Easting: 549910, Northing: 3835125, Alt: +0374, Zone: 14, Datum: WE, and HemiSphere: North (selected). Below the table, the calculated coordinates are displayed: UTM: 549910 3835125 0374 14 NORTH WE, LatLon: N 34.6568 W 98.4553 WE, and MGRS: 14SND4991035125. At the bottom, there are three buttons: "Use [F2]" (containing the UTM coordinates), "Undo [F3]", and "Cancel".

Easting	Northing	Alt	Zone	Datum	HemiSphere
549910	3835125	+0374	14	WE	<input checked="" type="radio"/> North <input type="radio"/> South

UTM: 549910 3835125 0374 14 NORTH WE
 LatLon: N 34.6568 W 98.4553 WE
 MGRS: 14SND4991035125

Use [F2] 549910 3835125 0374 14 NORTH WE Undo [F3] Cancel

Figure 15-15. Universal Transverse Mercator Alternate Methods screen.

Polar Coordinates

15-96. To enter the unit's location using polar coordinates (Figure 15-16), enter the following for the selected unit—

- Direction (Dir).
- Horizontal distance (Dist).
- Vertical interval (VI), indicating the direction + (for up [default]) or – (for down).

15-97. If the location is valid, UTM coordinates will be displayed on the Use button. Easting, Northing, Alt, Zone, Datum, and HemiSphere will auto-fill.

ENTER POSITION							
UTM		POLAR		MGRS		LAT LONG	
Unit	Easting	Northing	Alt	Zone	Datum	HemiSphere	
FSE1	547200	3834700	+0374	14	WE	<input checked="" type="radio"/> North	<input type="radio"/> South
Dir	Dist	VI					
2000	3200	+50					
UTM: 550156 3833475 0424 14 NORTH WE							
LatLon: N 34.6420 W 98.4527 WE							
MGRS: 14SND5015633475							
Use [F2] 550156 3833475 0424 14 NORTH WE				Undo [F3]		Cancel	

Figure 15-16. Polar Alternate Methods screen.

Military Grid Reference System

15-98. To enter the unit's location using the MGRS (Figure 15-17), enter the following for the selected unit—

- Zone.
- Square (100,000 square meter identifier).
- Coordinates.

ENTER POSITION							
UTM		POLAR		MGRS		LAT LONG	
Zone	Square	Coordinates					
14S	ND	5015933480					
UTM: 550159 3833480 N/G 14 NORTH WE							
LatLon: N 34.6420 W 98.4527 WE							
MGRS: 14SND5015933480							
Use [F2] 550159 3833480 N/G 14 NORTH WE				Undo [F3]		Cancel	

Figure 15-17. Military Grid Reference System Alternate Methods screen.

Latitude and Longitude

15-99. To enter the unit's location using the latitude and longitude (Figure 15-18), enter the latitude and longitude. If the location is valid, UTM coordinates will be displayed on the Use button.

ENTER POSITION

UTM POLAR MGRS **LAT LONG**

Latitude	Longitude
34.642	-98.4527

UTM: 550159 3833480 N/G 14 NORTH WE
 LatLon: N 34.6420 W 98.4527 WE
 MGRS: 14SND5015933480

Use [F2] 550159 3833480 N/G 14 NORTH WE Undo [F3] Cancel

Figure 15-18. Latitude/ Longitude Alternate Methods screen.

Undo, Cancel, and Use Buttons

15-100. For all of the alternative methods, the operator can click Undo to undo the entries, Cancel to exit without using the information, or Use to accept the entries. The unit's coordinates are now displayed on the Position screen. The coordinates are saved by clicking Use All on the Position screen.

MOUNTING AZIMUTH AND REFERENCE SCREEN

15-101. When necessary, the MFCS can be operated in conventional mode by mounting an M67 sight and placing aiming stakes as described in FM 3-22.90. To display deflections, a mounting azimuth and referred deflection must be entered on the MazRef screen (Figure 15-19).

15-102. To manually enter the MazRef, complete the following fields, and then click Use All.

- Unit Name (UnitName).
- Mounting Azimuth (Mnt Az).
- Use Reference (Use Ref).

15-103. When a gun's PD is not operational or available, the gun operator must provide MazRef data for the MFCS to compute deflection solutions. The FDC operator does not need the MazRef data if deflection information is not required. If the situation permits, the gun operator completes the MazRef data to provide backup capability should the PD malfunction during a mission.

NOTE: If a gun is operating using a manual position data source, the FDC operator must enter and save the MazRef data for that gun before checking the Manual (Man) box in the Status, by Gun section of the Status Fire Unit screen. Then, the MFCS can compute gun orders in deflection.

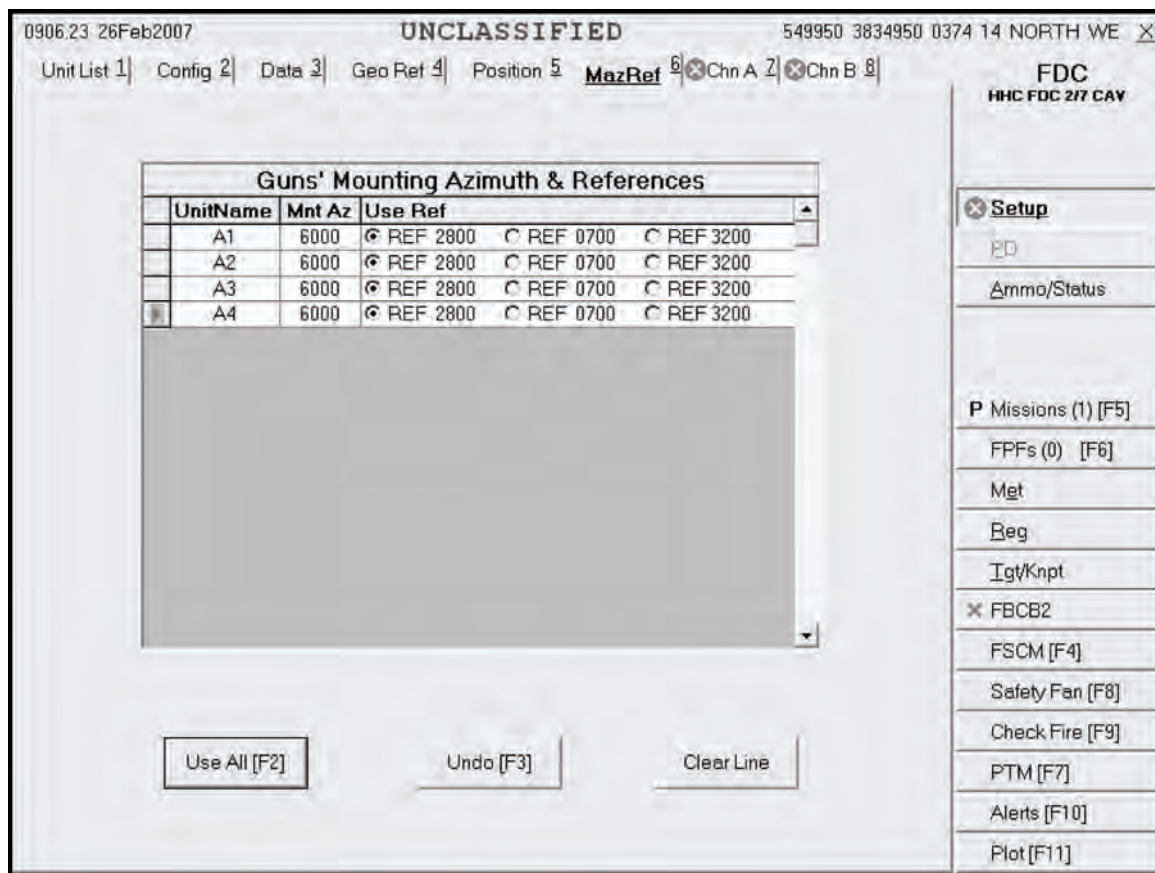


Figure 15-19. Mounting Azimuth and References screen.

Unit Name Field

15-104. This field is read-only from the guns listed in the Unit List screen.

Mounting Azimuth Field

15-105. In this field, the operator enters the mounting azimuth for the appropriate gun. The last digit must be a zero.

Use Reference Field

15-106. In this field, the operator may choose REF 2800, REF 0700, or REF 3200 by clicking in the appropriate circle.

Undo Button

15-107. The operator can press this button to undo entries before saving.

Clear Line Button

15-108. The operator can press this button to erase a line of information.

Use All Button

15-109. The operator can press this button to save all of the information on the screen.

CHANNEL A AND CHANNEL B SCREENS

15-110. These screens (Figure 15-20) allow the operator to enter, view, or update net parameters for Channel A or B subscribers. Both channels share the same setup procedures and can be set up for

SINGGARS, but only Channel A can be set up for wire. Using Channel A for SINGGARS and digital communication between the FDC and the gun tracks is recommended. If a red circle with an X through it displays on the Chn A or Chn B tab, the parameters and subscribers must be set up.

NOTE: If a channel is not being used, click the Disable button for that channel.

0906.39 26Feb2007 UNCLASSIFIED 549950 3834950 0374 14 NORTH WE X

Unit List 1 | Config 2 | Data 3 | Geo Ref 4 | Position 5 | MazRef 6 | **Chn A** 7 | Chn B 8

Chn A Net Parameters

TCIM Status	FAILED
Chn A Status	INACTIVE
SINGGARS Status	NOT IN USE
Protocol	C220
DeviceType	SINGGARS
Modulation	NRZ
DataRate	N4800
ComsecMode	CT
FhMode	FH
EdcMode	NONE
NadMethod	DAPNAD
NetUsage	DATA ONLY
NumberOfStations	7
Rank	3

Chn A This Unit

UnitName	En	IP Address	Adr
FDC	<input checked="" type="checkbox"/>	130.139.112.031	31

Chn A Subscribers

UnitName	En	IP Address	Adr
A1	<input checked="" type="checkbox"/>	130.139.112.041	41
A2	<input checked="" type="checkbox"/>	130.139.112.042	42
A3	<input checked="" type="checkbox"/>	130.139.112.043	43
A4	<input checked="" type="checkbox"/>	130.139.112.044	44
FOS1	<input checked="" type="checkbox"/>	130.139.112.040	40
FSE1	<input checked="" type="checkbox"/>	130.139.112.050	50

Configuration

8-SINGGARS_4800N_CT_FH

Use All [F2] Undo [F3] Disable

FDC
HHC FDC 2/7 CAV

Setup

PD

Ammo/Status

P Missions (1) [F5]

FPFs (0) [F6]

Mgt

Reg

Tgt/Knpt

X FBCB2

FSCM [F4]

Safety Fan [F8]

Check Fire [F9]

PTM [F7]

Alerts [F10]

Plot [F11]

Figure 15-20. Channel A screen.

Channel A and Channel B Net Parameters Fields

15-111. The operator sets the radio or wire defaults or manually selects the parameters to set the net parameters. To determine the parameters, he coordinates with the communications officer.

15-112. Channel A and Channel B Net Parameters fields include the following sub-fields:

- Tactical Communication Interface Modem (TCIM) Status.
- Channel A/Channel B Status (Chn A/Chn B Status).
- SINGGARS Status.
- Protocol.
- Device Type.
- Modulation.
- Data Rate (DataRate).
- Communication Security Mode (ComsecMode).
- Frequency Hop Mode (FhMode).
- Error Detection and Correction Mode (EdcMode).
- Network Access Delay Method (NadMethod).
- Network Usage (NetUsage).

- Number of Stations (NumberOfStations).
- Rank.

NOTE: Only white fields are editable. All yellow fields are auto-filled and cannot be changed.

Tactical Communication Interface Modem Status, Channel A Status, Channel B Status, and Protocol Fields

15-113. Tactical Communication Interface Modem (TCIM) Status, Chn A Status, Chn B Status, and Protocol are read-only and are automatically filled. TCIM Status and Chn A/Chn B Status reflect the current status.

Device Type, Modulation, Data Rate, Communication Security Mode, Frequency Hop Mode, Error Detection and Correction Mode, Network Access Delay Method, and Network Usage Fields

15-114. The operator clicks the Configuration working area button to select the radio defaults for Device Type, Modulation, DataRate (Baud), ComsecMode, FhMode, EdcMode, NadMethod, and NetUsage.

NOTE: When using SINCGARS FSK188-C, ensure that SINCGARS is the Device Type and FSK188-C is the Modulation.

Number Of Stations and Rank Fields

15-115. The operator enters the number of stations and rank, as supplied by the communications officer.

Channel A and Channel B This Unit Fields

15-116. Channel A and Channel B This Unit fields include the following sub-fields:

- Unit Name (UnitName).
- Internet Protocol (IP) Address.
- Abbreviated Address (Adr).

Unit Name Field

15-117. The UnitName field is read-only and is automatically filled with the unit name listed in the Unit List screen.

Internet Protocol Address Field

15-118. To update or enter the IP address, the operator types the correct address. Each IP address has four sets of numbers, three digits in each set. The first set must range from 128 to 254. The second and third sets must range from 001 to 254. The fourth set must range from 004 to 095.

Abbreviated Address Field

15-119. The fourth set of numbers in the IP address is the abbreviated address of the unit.

Channel A and Channel B Subscriber Fields

15-120. Channel A and Channel B This Unit fields include the following sub-fields:

- Unit Name (UnitName).
- Enabled (En)
- Internet Protocol (IP) Address.
- Abbreviated Address (Adr).

Unit Name Field

15-121. The UnitName field is read-only and is automatically filled with the unit names listed in the Unit List screen.

Internet Protocol Address Field

15-122. In the IP Address field, the operator enters the last two digits of the IP address for each unit name.

Abbreviated Address Field

15-123. This field is automatically filled when the operator enters the last two digits of the IP address for each unit name and moves to another field.

Enabled Box

15-124. The operator clicks the En box for each unit name to enable communication with that subscriber. A green checkmark is displayed in the box when communication has been established.

Undo Changes Button

15-125. To undo any changes, the operator clicks Undo Changes; any unsaved changes (indicated by a pencil icon at the beginning of the row) are refreshed with the original data.

Use All Button

15-126. The operator clicks the Use All working area button to save all screen information and activate the channel status, which will cause Chn A Status to go from inactive to loading to active, and TCIM Status to go from operating to downloading to operating.

NOTE: Allow some time for the channel activation. Do not keep clicking the Use All button.

Disable Button

15-127. If disabling communication becomes necessary, the operator clicks Disable.

SECTION II. ADDITIONAL FUNCTIONS

Additional functions and procedures of the MFCS include—

- Determining ammunition status.
- Transmitting check fires.
- Sending and receiving plain text messages (PTMs).
- Using the Alerts function.
- Using the Plot function.

This section displays the sequences used to review, modify, and use data during FDC operations. As previously discussed, the MFCS operator uses the GUI or keystrokes to navigate and use the system.

AMMUNITION/STATUS FUNCTION

15-128. Ammunition information about the unit, shell, lot number, and quantity is transmitted digitally from the gun tracks. This function allows the operator to enter, modify, delete, and sort these data. This button also includes procedures for checking, entering, or changing ammunition status. When the operator presses the Ammo/Status button, three tabs display:

- Ammo Fire Unit.
- Ammo Roll Up.
- Status Fire Unit.

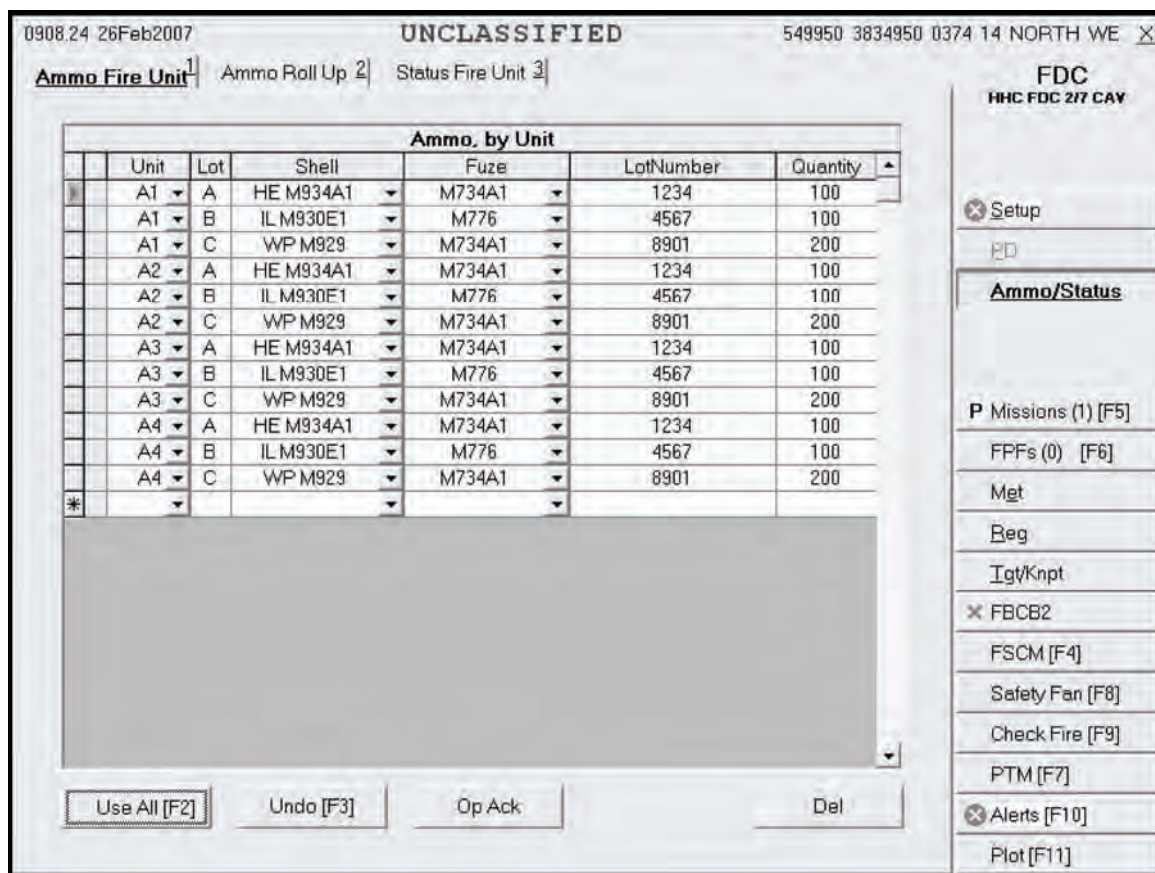


Figure 15-21. Ammo By Unit screen.

AMMO FIRE UNIT SCREEN

15-129. The operator clicks the Ammo/Status button in the control button area, and then clicks the Ammo Fire Unit tab to display the Ammo Fire Unit screen (Figure 15-22).

15-130. This screen include the following fields:

- Unit.
- Lot.
- Shell.
- Fuze.
- Lot Number (LotNumber).
- Quantity.

15-131. The Ammo Fire Unit Screen uses symbols and colors to provide information. A green sunburst icon on the Ammo/Status button indicates that the ammunition has been changed. When an ammunition report is digitally received from the guns, an exclamation point (!) is displayed in the index at the beginning of each row for which ammunition is received. A field with a red background indicates a discrepancy between the data residing in the MFCS and the data received from the gun track.

15-132. Ammunition information about the unit, lot, shell, fuze, lot number, and quantity is received digitally from the gun, but the FDC can manually update ammunition. When the Use All tab is clicked, the ammunition data is automatically transmitted to the guns.

15-133. The system automatically arranges ammunition alphabetically by lot, but the operator can click another column heading to sort data by another field.

15-134. The operator can click—

- Use All to save information.
- Del to delete information.
- Undo to undo any changes.
- OpAck to acknowledge receipt of ammunition status and turn off the alarm.

The screenshot displays the 'Ammo Fire Unit' screen. At the top, it shows the date '0908.24 26Feb2007', the classification 'UNCLASSIFIED', and a long alphanumeric string '549950 3834950 0374 14 NORTH WE'. Below this are three tabs: 'Ammo Fire Unit' (selected), 'Ammo Roll Up', and 'Status Fire Unit'. The main area contains a table titled 'Ammo. by Unit' with columns for Unit, Lot, Shell, Fuze, LotNumber, and Quantity. The table lists 16 rows of data, each with a small icon in the first column. At the bottom of the table is a greyed-out area with an asterisk. Below the table are four buttons: 'Use All [F2]', 'Undo [F3]', 'Op Ack', and 'Del'. On the right side, there is a vertical panel for the 'FDC HHC FDC 217 CAV'. It includes a 'Setup' button, a 'PD' button, and a section titled 'Ammo/Status' with a green sunburst icon. Below this are several status indicators: 'P Missions (1) [F5]', 'FPFs (0) [F6]', 'Met', 'Reg', 'Igt/Knpt', 'FBCB2', 'FSCM [F4]', 'Safety Fan [F8]', 'Check Fire [F9]', 'PTM [F7]', 'Alerts [F10]', and 'Plot [F11]'.

	Unit	Lot	Shell	Fuze	LotNumber	Quantity
	A1	A	HE M934A1	M734A1	1234	100
	A1	B	IL M930E1	M776	4567	100
	A1	C	WP M929	M734A1	8901	200
	A2	A	HE M934A1	M734A1	1234	100
	A2	B	IL M930E1	M776	4567	100
	A2	C	WP M929	M734A1	8901	200
	A3	A	HE M934A1	M734A1	1234	100
	A3	B	IL M930E1	M776	4567	100
	A3	C	WP M929	M734A1	8901	200
	A4	A	HE M934A1	M734A1	1234	100
	A4	B	IL M930E1	M776	4567	100
	A4	C	WP M929	M734A1	8901	200
*						

Figure 15-22. Ammo Fire Unit screen.

AMMO ROLL UP SCREEN

15-135. This screen (Figure 15-23) displays all of the ammunition carried by the gun carrier. Ammunition information is read-only, is automatically filled, and includes the following information:

- Lot.
- Shell.
- Lot number.
- Total number of rounds.

15-136. To send the FU ammunition status to the FC, the operator clicks the Send Ammo to FSE button.

NOTE: The message “Not Sent” (Figure 15-23) will be displayed after the Ammo Roll-Up heading if the ammunition has not been sent from the guns. If the ammunition has been sent, the date and time group of when it was sent will be displayed.

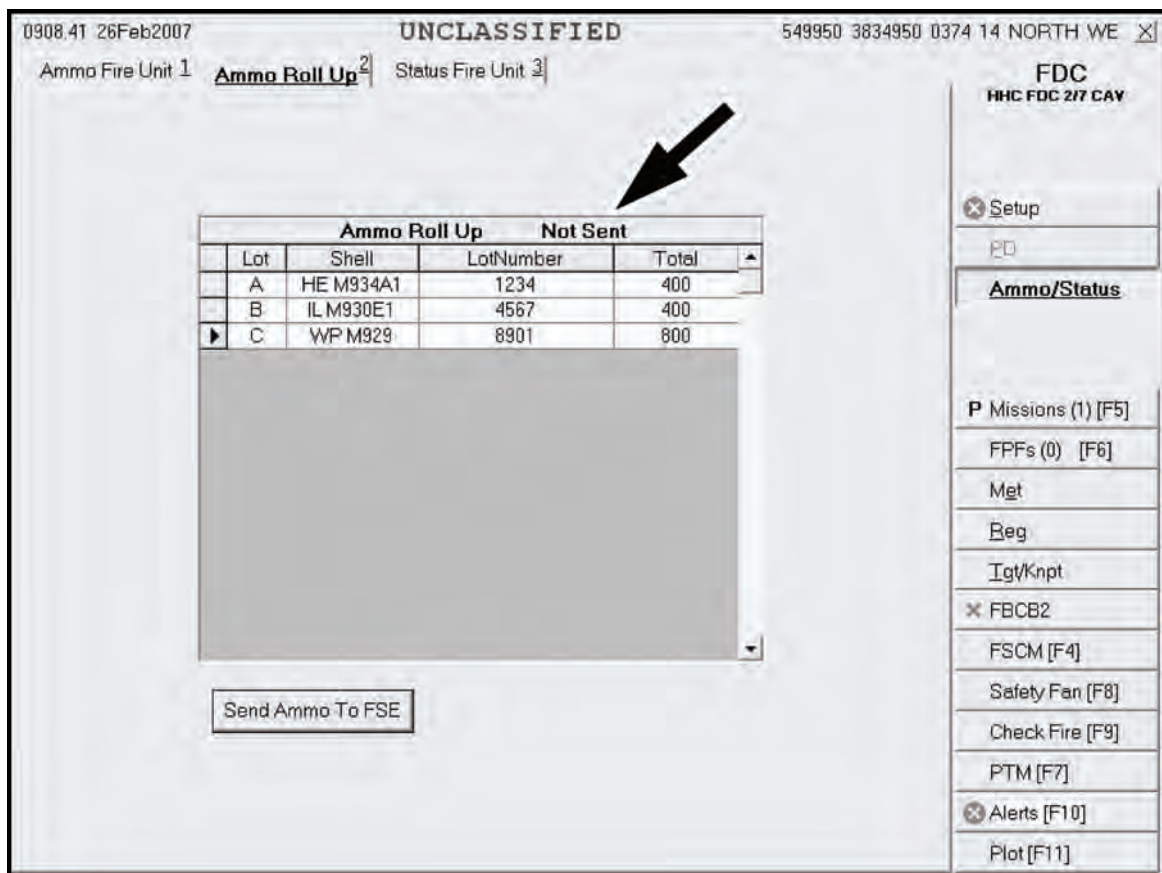


Figure 15-23. Ammo Roll Up screen.

STATUS FIRE UNIT SCREEN

15-137. This screen (Figure 15-24) contains two parts:

- Status, by Gun.
- Status Fire Unit.

0907.40 26Feb2007 UNCLASSIFIED 549950 3834950 0374 14 NORTH WE X

Ammo Fire Unit 1 Ammo Roll Up 2 **Status Fire Unit**³

FDC
HHC FDC 2/7 CAV

Status, by Gun									
Gun	OpStatus	Wpn	Mnt	Man	In Msn	In FPF	Tmp	Location	
A1	OpRdy	M121	CR	<input checked="" type="checkbox"/>			+070	549910	3835125 0374 14 N WE
A2	OpRdy	M121	CR	<input checked="" type="checkbox"/>			+070	549910	3835050 0374 14 N WE
A3	OpRdy	M121	CR	<input checked="" type="checkbox"/>			+070	549910	3834975 0374 14 N WE
A4	OpRdy	M121	CR	<input checked="" type="checkbox"/>			+070	549910	3834900 0374 14 N WE

Use All [F2] Op Ack

Status Fire Unit Last Sent 0907.38 26Feb2007									
# Guns	OpStatus	AOF	Easting	Northing	Alt	Zone	HemiSphere	Datum	
4	OpRdy	1200	549910	3835012	+0374	14	NORTH	WE	

Get # Guns Get FU Center Undo [F3]

Set Fire Unit Status to

OpOut OpMov OpSta **OpRdy** Resend

Setup
PD
Ammo/Status
P Missions (1) [F5]
FPFs (0) [F6]
Met
Reg
Tgt/Knpt
FBCB2
FSCM [F4]
Safety Fan [F8]
Check Fire [F9]
PTM [F7]
Alerts [F10]
Plot [F11]

Figure 15-24. Status Fire Unit screen.

Status, By Gun

15-138. Status is received digitally from the guns, and the information is automatically filled. Meteorological data (MET) is automatically sent to the FDC Alerts messages when a gun reports "OpRdy."

15-139. This section contains the following fields:

- Gun.
- Operational Status (OpStatus).
- Weapon (Wpn).
- Mount (Mnt).
- Manual (Man).
- In Mission (In Msn).
- In FPF.
- Temperature (Tmp).
- Location.

Gun, In Mission, In Final Protective Fire, and Location Fields

15-140. These fields are read-only.

Operational Status Field

15-141. The operator may change the OpStatus field using the drop-down menu. The options for this menu include—

- Operationally Moving (OpMov).
- Operationally Stationary (OpSta).
- Operationally Ready (OpRdy).
- Operationally Out (OpOut).
- Operationally Detached (OpDet).

NOTE: OpDet is used in split section operations. When more than one FDC is active in the platoon, the gun reports his normal status to the controlling FDC and OpDet to a noncontrolling FDC.

Weapon Field

15-142. The operator may change the Wpn field using the drop-down menu. A warning alerts the operator that entering a weapon type that differs from the gun will cause a solution mismatch and asks if the operator still wants to change it. If the operator chooses Yes, he must select a weapon type from the pull-down list.

Mount Field

15-143. The operator may change the mount status using the drop-down menu. A warning alerts the operator that entering a mount type that differs from the gun will cause a solution mismatch and asks if the operator still wants to change it. If the operator chooses Yes, he must select a type of mount from the list that is displayed.

Manual Box

15-144. The operator must check the Man box if a gun is operating using a manual position data source. However, the FDC operator must have the mounting azimuth and reference data entered and saved for that gun before checking the Man box.

Temperature Field

15-145. The operator may enter or change the temperature by clicking in the Tmp field, but he must override a warning.

Status Fire Unit

15-146. This section provides the overall status of all of the firing units assigned to the FDC. It contains the following fields:

- Number of Guns (# Guns).
- Operational Status (OpStatus).
- Azimuth of Fire (AOF).
- Easting.
- Northing.
- Altitude (Alt).
- Zone.
- Hemisphere (HemiSphere).
- Datum.

15-147. It also includes the following buttons:

- Get Number of Guns (Get # Guns).
- Get the Fire Unit Center (Get FU Center).
- Undo.
- Set Fire Unit Status to:
 - OpOut.
 - OpMov.
 - OpSta.
 - OpRdy.
 - Resend.

Number of Guns Field

15-148. To enter or change the number of guns, the operator clicks the field and enters the correct number within a range of 0 through 18. Then, he selects the Get # Guns button, and the field automatically updates according to the number of guns enabled.

Operational Status and Ammunition Fields

15-149. The OpStatus and Ammo fields are read-only.

Azimuth Of Fire Field

15-150. The operator enters data into the AOF field.

Easting, Northing, and Altitude Fields, and Get Fire Unit Center Button

15-151. To get the geographical center of the firing unit, the operator clicks Get FU Center, which displays the easting, northing, and altitude to the center point of all available guns. To manually enter or change the FU center location, the operator enters data in the Easting (6 digits), Northing (7 digits), and Alt fields (-400 through 9999 meters).

Zone, Hemisphere, and Datum Fields

15-152. Zone, HemiSphere and Datum fields are read-only.

Set Fire Unit Status Buttons

15-153. If the FC is not on the Unit List, the Set Fire Unit Status buttons are not available. A line at the bottom of the screen states "FSE UNKNOWN." The buttons for OpOut, OpMov, OpSta, and OpRdy are also shaded.

15-154. If the FC is on the Unit List, the operator clicks OpOut, OpMov, OpSta, or OpRdy, as appropriate, to send the status to the FC. To resend, he clicks the Resend button.

METEOROLOGICAL DATA SCREEN

15-155. The MET data provides the same information as DA Form 3675-R and DA Form 3677-R. MET data provides the corrections needed to compensate for air temperature and density, and the wind speed and direction. New MET data may be received digitally or entered manually. Upon digital receipt of new MET data, the operator receives a message and an option to apply the new MET data. To apply, click Process, and the new MET is displayed (Figure 15-25).

15-156. The MET Data screen contains three tabs:

- Msgs.
- New.
- Current.

METEOROLOGICAL DATA—NEW TAB

15-157. This tab contains the following fields:

- Station Name.
- Octant.
- Station Height (10's M).
- MDP Pressure (MB).
- Latitude (LaLaLa).
- Longitude (LoLoLo).
- Line.
- Altitude.
- Direction.
- Speed.
- Temperature.
- Pressure.

NOTE: If the MFCS is configured using VMF R5 (Figure 15-25), Station Name and Octant are not used and will not be displayed. If the MFCS is configured using VMF PKG11 (Figure 15-26), Station Name and Octant are displayed.

15-158. It also contains the following buttons:

- Save.
- Undo.
- Clear Line.
- Clear All.
- Apply New Met.

15-159. If the MET data is acceptable, the operator clicks Save and Apply New Met. To manually enter or edit the new MET, the operator enters information as appropriate. To clear a line, the operator places the triangular pointer icon in the index box of the line to be cleared and clicks the Clear Line working area button. To clear all entries for direction, speed, temperature, and pressure, he clicks Clear All. To undo any changes before saving, he clicks Undo Changes. Once the operator verifies that the changes are correct, he clicks Save. Then, he clicks Apply New Met.

15-160. The new MET becomes the current MET, and the view changes to the Current tab. The current MET (the newly active MET) is automatically transmitted to the guns. The operator then receives an alert from the guns indicating whether the new MET has been successfully processed.

NOTE: The new MET cannot be processed while a fire mission or FPF is active and will cause an alert message.

0855.32 01Mar2007 UNCLASSIFIED 549950 3834950 0374 14 NORTH WE X

Msgs 1 **New** 2 Current 3

New Met

Station Height (10's M)	MDP Pressure (MB)	Latitude (LaLaLa)	Longitude (LoLoLo)
37	977	347	983

Orange cells indicate that trend limits have been exceeded

Line	Altitude	Direction	Speed	Temperature	Pressure
0	0	160	0007	2900	0977
1	200	187	0011	2887	0965
2	500	220	0015	2878	0937
3	1000	248	0017	2868	0893
4	1500	278	0013	2852	0842
5	2000	320	0011	2830	0793
6	2500	362	0013	2796	0746
7	3000	378	0016	2766	0701
8	3500	384	0017	2737	0659
9	4000				
10	4500				
11	5000				
12	6000				
13	7000				
14	8000				
15	9000				
16	10000				
17	11000				
18	12000				

FDC
HHC FDC 217 CAV

Setup

PD

Ammo/Status

Missions (1) [F5]

PPFs (0) [F6]

Met

Reg

Tgt/Knpt

FBCB2

FSCM [F4]

Safety Fan [F8]

Check Fire [F9]

PTM [F7]

Alerts [F10]

Plot [F11]

Figure 15-25. New Meteorological Data screen using VMF R5.

0930.30 05Mar2007 UNCLASSIFIED 549950 3834950 0374 14 NORTH WE X

Msgs 1 **New** 2 Current 3

New Met

Station Name	Octant (O)	Station Height (10's M)	MDP Pressure (MB)	Latitude (LaLaLa)	Longitude (LoLoLo)
		37	977	347	983

Orange cells indicate that trend limits have been exceeded

Line	Altitude	Direction	Speed	Temperature	Pressure
0	0	160	0007	2900	0977
1	200	187	0011	2887	0965
2	500	220	0015	2878	0937
3	1000	248	0017	2868	0893
4	1500	278	0013	2852	0842
5	2000	320	0011	2830	0793
6	2500	362	0013	2796	0746
7	3000	378	0016	2766	0701
8	3500	384	0017	2737	0659
9	4000				
10	4500				
11	5000				
12	6000				
13	7000				
14	8000				
15	9000				
16	10000				
17	11000				
18	12000				

FDC
HHC FDC 217 CAV

Setup

PD

Ammo/Status

Missions (0) [F5]

PPFs (0) [F6]

Met

Reg

Tgt/Knpt

FBCB2

FSCM [F4]

Safety Fan [F8]

Check Fire [F9]

PTM [F7]

Alerts [F10]

Plot [F11]

Figure 15-26. New Meteorological Data screen using VMF PKG 11.

METEOROLOGICAL DATA—CURRENT TAB

15-161. When the Current tab is selected, the screen in Figure 15-27 is displayed. This screen contains the same fields as the New screen, but the entries on this screen are read-only; the fields can be accessed by clicking on the Current tab or Apply New Met via the New tab.

15-162. This screen also contains two buttons:

- Use Standard.
- Resend Met.

15-163. When a gun reports OpRdy, the current MET is automatically sent to the gun as an alert.

Resend Meteorological Data Button

15-164. To send the MET message to the guns again, the operator clicks Resend Met.

Use Standard Button

15-165. To use the standard MET, the operator clicks Use Standard.

0857.37 01Mar2007 UNCLASSIFIED 549950 3834950 0374 14 NORTH WE X

RMsgs 1 | New 2 | **Current** 3

Current Met

Station Height (10's M)	MDP Pressure (MB)	Latitude (LaLaLa)	Longitude (LoLoLo)	
37	977	347	983	

Line	Altitude	Direction	Speed	Temperature	Pressure
0	0	160	7	2900	977
1	200	187	11	2887	965
2	500	220	15	2878	937
3	1000	248	17	2868	893
4	1500	278	13	2852	842
5	2000	320	11	2830	793
6	2500	362	13	2796	746
7	3000	378	16	2766	701
8	3500	384	17	2737	659
9	4000				
10	4500				
11	5000				
12	6000				
13	7000				
14	8000				
15	9000				
16	10000				
17	11000				
18	12000				

Use Standard Resend Met

FDC
HHC FDC 217 CAV

- Setup
- PD
- Ammo/Status
- P Missions (1) [F5]
- PPFs (0) [F6]
- R Met**
- Reg
- Tgt/Knpt
- FBCB2
- FSCM [F4]
- Safety Fan [F8]
- Check Fire [F9]
- PTM [F7]
- Alerts [F10]
- Plot [F11]

Figure 15-27. Current screen.

Meteorological Data Trend Limits

15-166. The MFCS also has MET trend limits to check the MET data for possible incorrect data. When these limits are exceeded, a visual indicator appears on the Current MET screen—the cell will be orange. The trend limits compare the current data entries with data from the previous message. The following is a list of parameter thresholds which, when exceeded, result in an indicator appearing in the cell:

- Direction--If the difference is more than 100 (10s of mils).
- Speed--If the difference is more than 15 knots.
- Temperature--If the difference is more than 20 degrees Kelvin.
- Pressure--If the air pressure increases on a higher line number (pressure should decrease as altitude increases).

TARGET/KNOWN POINT SCREEN

15-167. Targets and known points are locations that can be entered into the MFCS and used as targets or target references. They can also be a known point selected by an observer, a planned target designated by the unit commander, or the location of a completed mission. Target and known points can be entered or edited manually by the operator or designated at the end of a previous mission.

15-168. When the Tgt/KnPt button is selected, the screen in Figure 15-28 is displayed.

TARGETS SCREEN

15-169. This screen contains the following fields:

- Target Number (TgtNum).
- Easting.
- Northing.
- Altitude (Alt).
- Zone.
- Datum.
- Hemisphere (HemiSphere).

15-170. It also contains three buttons:

- Use All.
- Undo.
- Delete (Del).

15-171. Targets are received digitally at the EOM or can be entered and edited manually by the operator.

Target Number Field

15-172. To manually enter or edit the target number, the operator enters the two-letter target number prefix (AA to ZZ), followed by a four-digit target number (0000 to 9999).

Easting, Northing, Altitude, Zone, Datum, and Hemisphere Fields

15-173. The operator enters easting, northing, altitude, zone, and choice of datum or hemisphere data into the fields.

Use All Button

15-174. To save information, the operator clicks Use All.

Undo Button

15-175. To undo changes, the operator clicks the Undo button.

Delete Button

15-176. To delete an entry, the operator highlights the index box in front of the entry that he wants to delete and clicks Del.

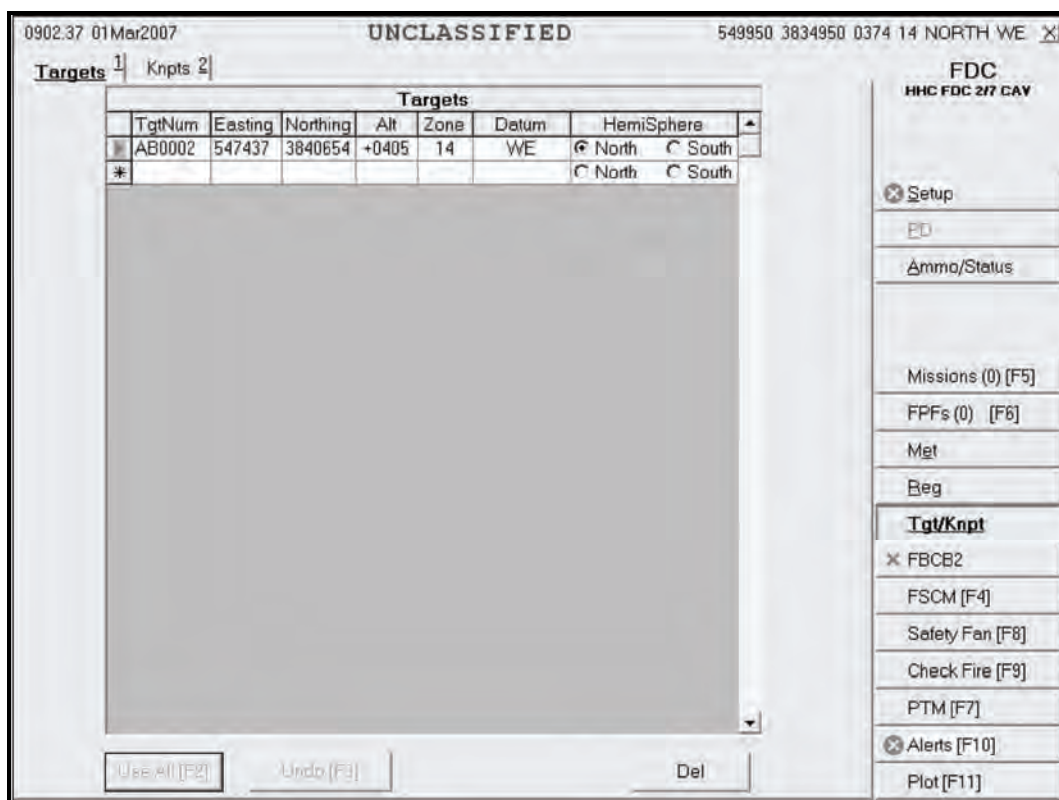


Figure 15-28. Targets screen.

KNOWN POINTS SCREEN

15-177. Known points are received digitally at the EOM or can be entered manually by the operator. A known point must be associated with an observer.

15-178. When the KnPts tab is selected, the screen in Figure 15-29 is displayed. This screen contains the following fields:

- Known Point (KnPt).
- Observer (Obs).
- Target Number (TgtNum).
- Easting.
- Northing.
- Altitude (Alt).
- Zone.
- Datum.
- Hemisphere (HemiSphere).

15-179. It also contains four buttons:

- Use All.
- Undo.
- Clear Target Number (Clear Tgt Num).
- Delete (Del).

Known Point Field

15-180. To manually enter or edit a known point, the operator enters a two-digit number from 00 to 99. A duplicate known point will only be accepted if it is associated with a different observer.

Observer Field

15-181. To manually enter or edit information in this field, the operator chooses the observer from the list.

Easting, Northing, Altitude, Zone, Datum, and Hemisphere Fields

15-182. The operator enters easting, northing, altitude, zone, and choice of datum or hemisphere data into the fields.

Use All Button

15-183. To save information, the operator clicks Use All.

Undo Button

15-184. To undo changes, the operator clicks the Undo button.

Delete Button

15-185. To delete an entry, the operator highlights the index box in front of the entry that he wants to delete and clicks Del.

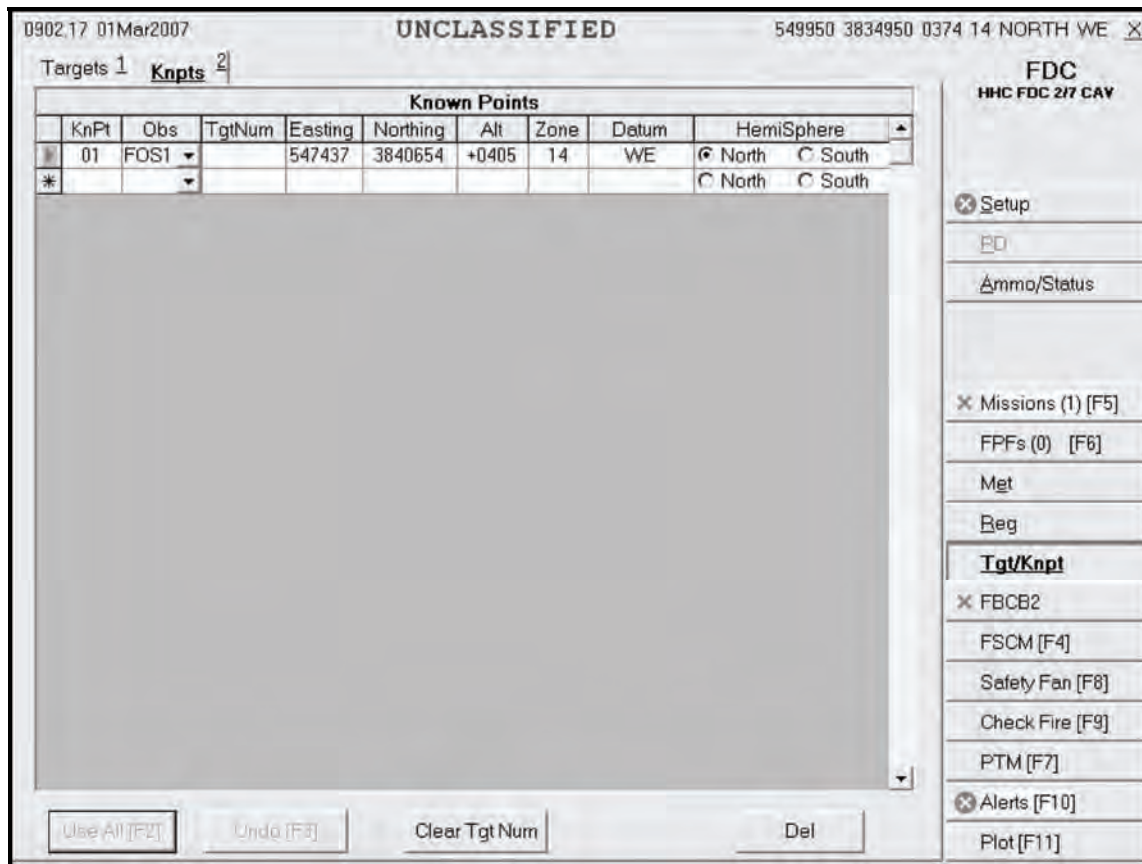


Figure 15-29. Known Points screen.

SAFETY FAN SCREEN


15-186. The safety fan operation enables the FDC to enter and modify data originating at the FDC and to review safety fans generated from other sources. The MFCS then alerts the FDC if the fire mission violates the boundaries of a safety fan. The operator cannot override a safety fan violation, and gun orders are not displayed or transmitted to the gun(s) causing the violation.

15-187. Up to 10 safety fans can be stored in the MFCS. The operator can manually input safety fan data into the system.

15-188. When the Safety Fan button is selected, the Safety Fans screen (Figure 15-30) is displayed. This screen contains the following fields:

- Easting.
- Northing.
- Zone.
- Datum.
- Hemisphere (HemiSphere).
- Left Azimuth.
- Right Azimuth.
- Minimum Range (Min Range).
- Maximum Range (Max Range).
- Minimum Charge (Min Charge).
- Maximum Charge (Max Charge).

15-189. Perform the following steps to enter data for a safety fan:

- (1) Enter the easting and northing of the firing point location. Zone, Datum and HemiSphere fields will auto-fill. You may also utilize the alternate methods of entering a position (as described in 15-92 to 15-93) by clicking the  icon.
- (2) Enter the left and right azimuth (0 to 6399).

NOTE: The interior angle must not exceed 3200 mils.

- (3) Enter the minimum range (0 to 7,999 meters) and the maximum range (1 to 8,000 meters).
- (4) Enter the minimum charge (0 to 9) and the maximum charge (0 to 10) based on the ammunition.
- (5) Select the ammunition to be used inside the safety fan. The choices are high-explosive (HE), illumination (ILL), white phosphorus (WP), or infrared (IR).
- (6) In the upper part of the screen, the safety fan displays the UTM (short coordinates) as seen on the map, units, targets, burst points, and canister points. To obtain information about a particular icon on the plot, place the cursor over the icon.
- (7) To undo entries, click Undo. Click Use All to display the safety fan. To delete the safety fan, click Delete Fan. All of the fields will be cleared, and the Plot screen deleted.

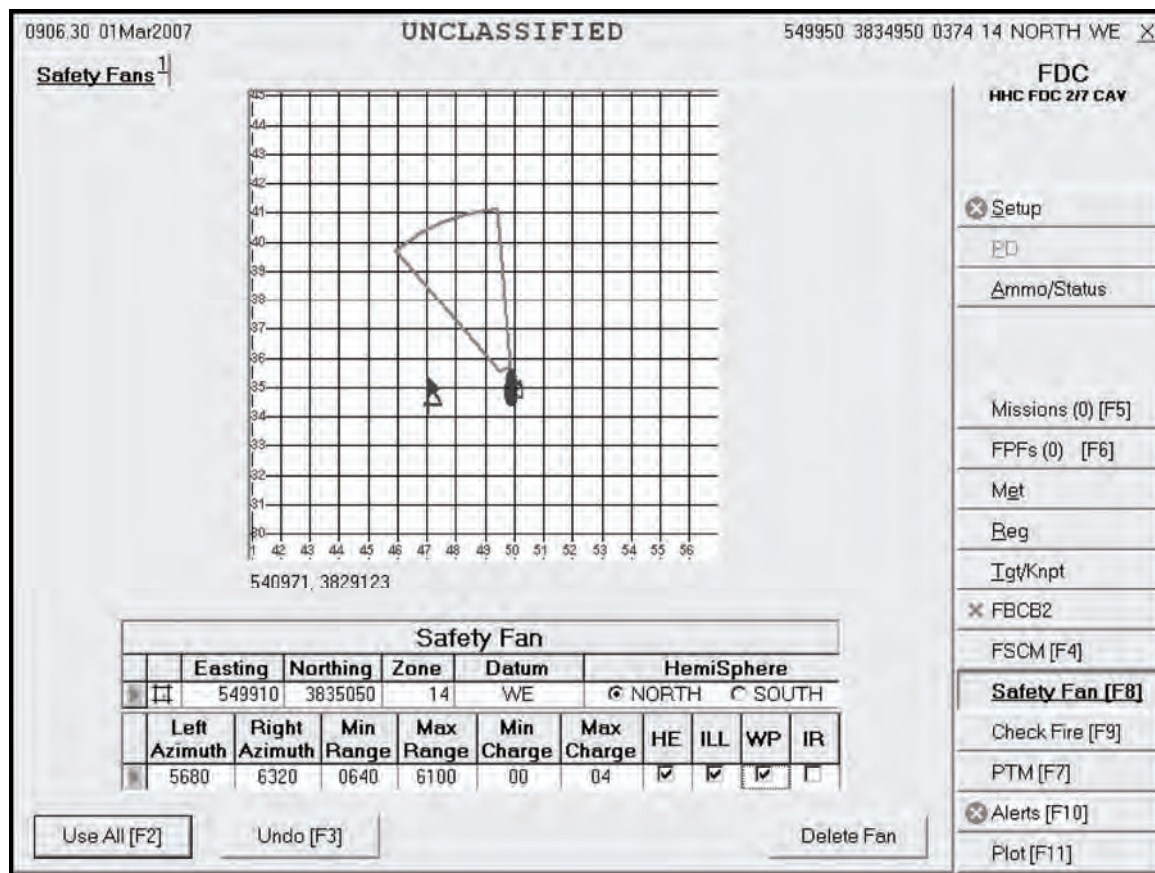


Figure 15-30. Safety Fans screen.

CHECK FIRE

15-190. The Check Fire button lets the FDC send a message to the guns to immediately cease fire and preserve data. When a Check Fire command is received, all active fire missions come to a halt, and inactive fire missions cannot be activated. When a Check Fire by Target Number command is received, the specified fire mission is halted. A Check Fire message from the FC or FO is sent as an alert.

15-191. When the operator receives a Check Fire command from the FC—

- (1) A red “CF” message displays in the control tab area in front of Missions and Check Fire.
- (2) Click the Check Fire button to display the Check Fire screen (Figure 15-31).
- (3) An exclamation point (!) indicator is displayed in the index box.
- (4) Click OpAck to acknowledge the message; the indicator and audio alarm (if set) will be turned off.

15-192. To initiate or transmit a Check Fire message to all guns in the firing unit—

- (1) Click the Check Fire All button on the Check Fire screen.
- (2) This sends a Check Fire banner message to all guns and halts the mission until a valid Cancel Check Fire command is transmitted.

15-193. To initiate a Check Fire Target message—

- (1) Enter the target number.
- (2) Click Check Fire Target.
- (3) This transmits a Check Fire banner to the guns engaged in a mission with the associated target.

15-194. To cancel the Check Fire command—

- (1) Click the indicator for the appropriate Check Fire message.
- (2) Click Cancel Check Fire.
- (3) This forwards the Cancel Check Fire message to all units in the firing unit. Fire missions may then continue.

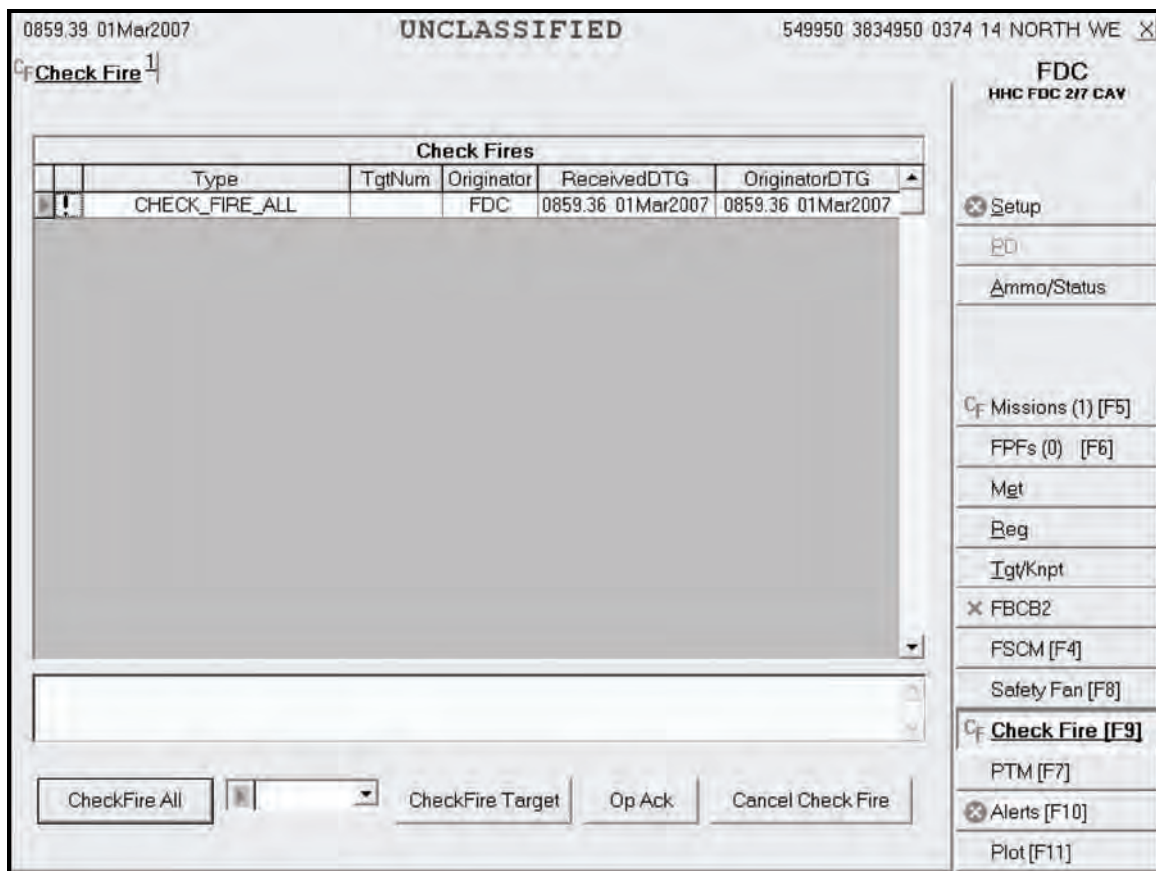


Figure 15-31. Check Fire screen.

PLAIN TEXT MESSAGES

15-195. The plain text messages (PTM) function allows the FDC to send and receive messages concerning supply, administration, or other subjects. When the PTM button is selected, the screen in Figure 15-32 is displayed.

READ SCREEN

15-196. Upon receipt of a PTM, an indicator displays on the PTM button. The operator clicks the PTM button to display the Read screen (Figure 15-32). Messages are listed with—

- Priority.
- From.
- Description.
- Received DTG.
- Originator DTG.

15-197. Messages also have four categories:

- Flash (F).
- Immediate (I).
- Priority (P).
- Routine (R).

15-198. When a message is received, an exclamation point (!) indicator will display in the status box before the priority. The triangle pointer in the index box indicates which message is being read.

15-199. Follow these steps to read a message:

- (1) Access the PTM screen by clicking the PTM button.
- (2) Click the Read tab to read messages.
- (3) Click OpAck to acknowledge receipt of a new message. This will delete the exclamation point (!) indicator from the status box and turn off the alarm, if activated.
- (4) Click Reply to send a reply. The Send screen is displayed.
- (5) To delete a message, highlight it and click Del.

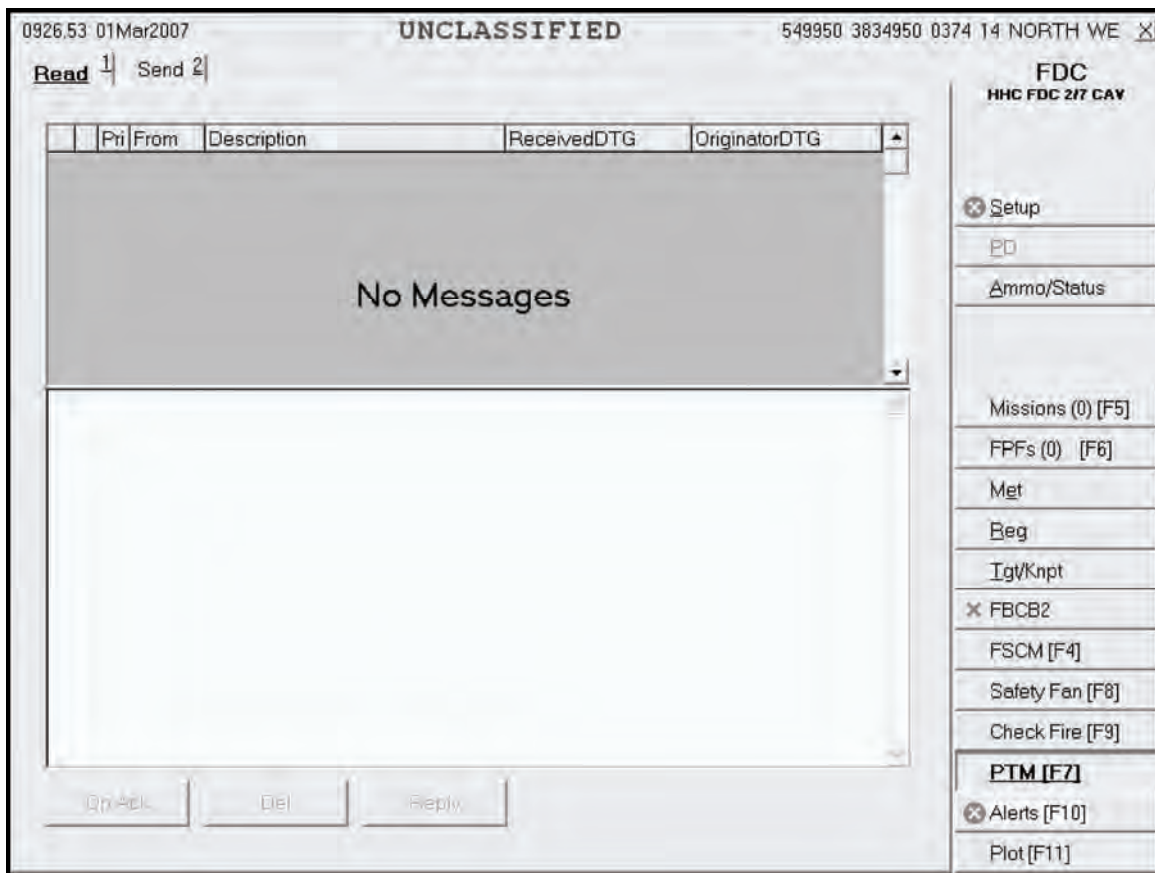


Figure 15-32. Plain Text Message Read screen.

SEND SCREEN

15-200. The operator selects the Send tab to display the Send screen (Figure 15-33). Follow these steps to read a message:

- (1) Either click Sel in Destinations to select the units to which you will send the message, choose Click All to send the message to everyone in Destinations, or select None to deselect all units in Designations.
- (2) Type the message using the keyboard.
- (3) Click Send.
- (4) A Send Status box displays, showing the destination and status. The status options include—
 - Machine Acknowledgement (MAck).
 - Retry (the system is retrying).
 - Failed (the message did not reach the destination).

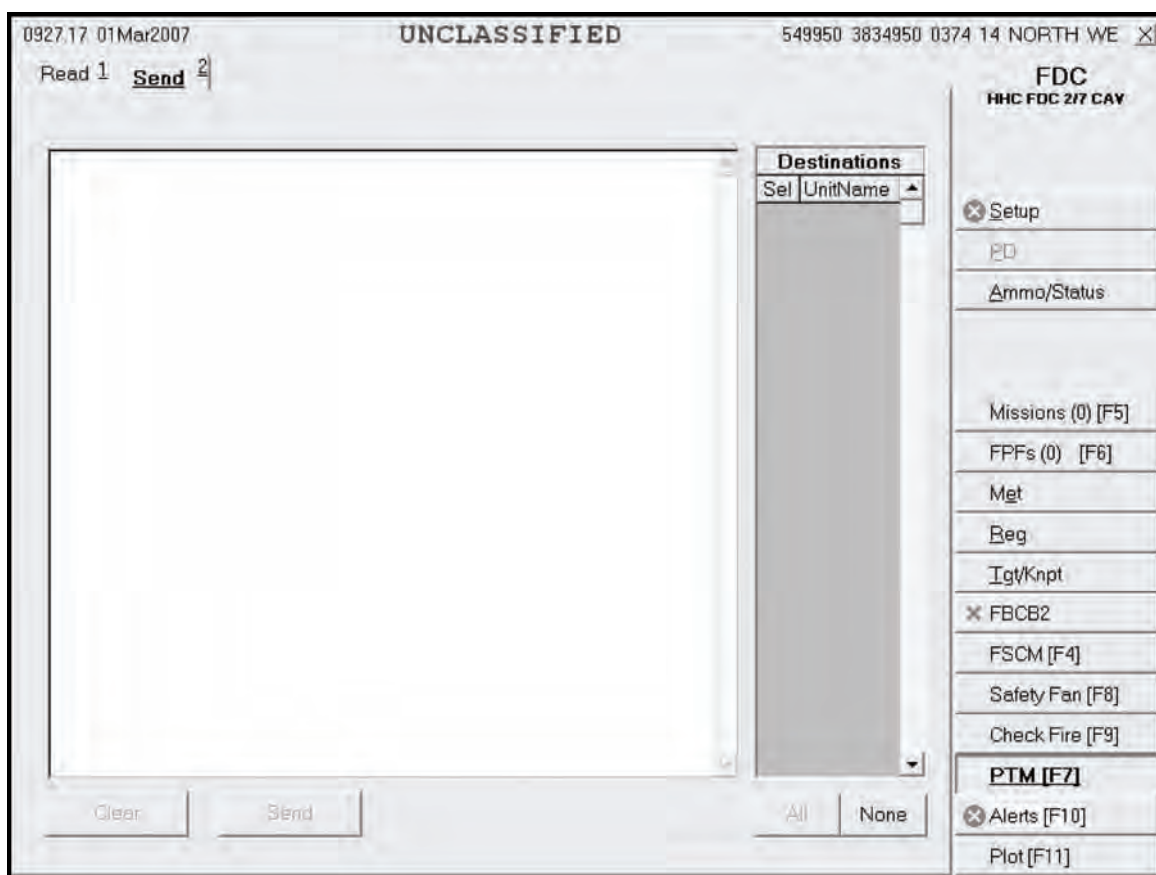


Figure 15-33. Send screen.

ALERTS FUNCTION

15-201. The Alerts function (Figure 15-34) allows the operator to receive automated system messages, such as information, error, and warning alerts.

15-202. When an icon indicating that there are alerts in the queue displays, the operator selects the Alerts button. The Alert screen is displays, showing the—

- Date-time group (DTG).
- Type (TY).
- Description.

15-203. Then, he selects OpAck to deactivate the alarm. To delete an alert, the operator clicks the row to be deleted and clicks Del.

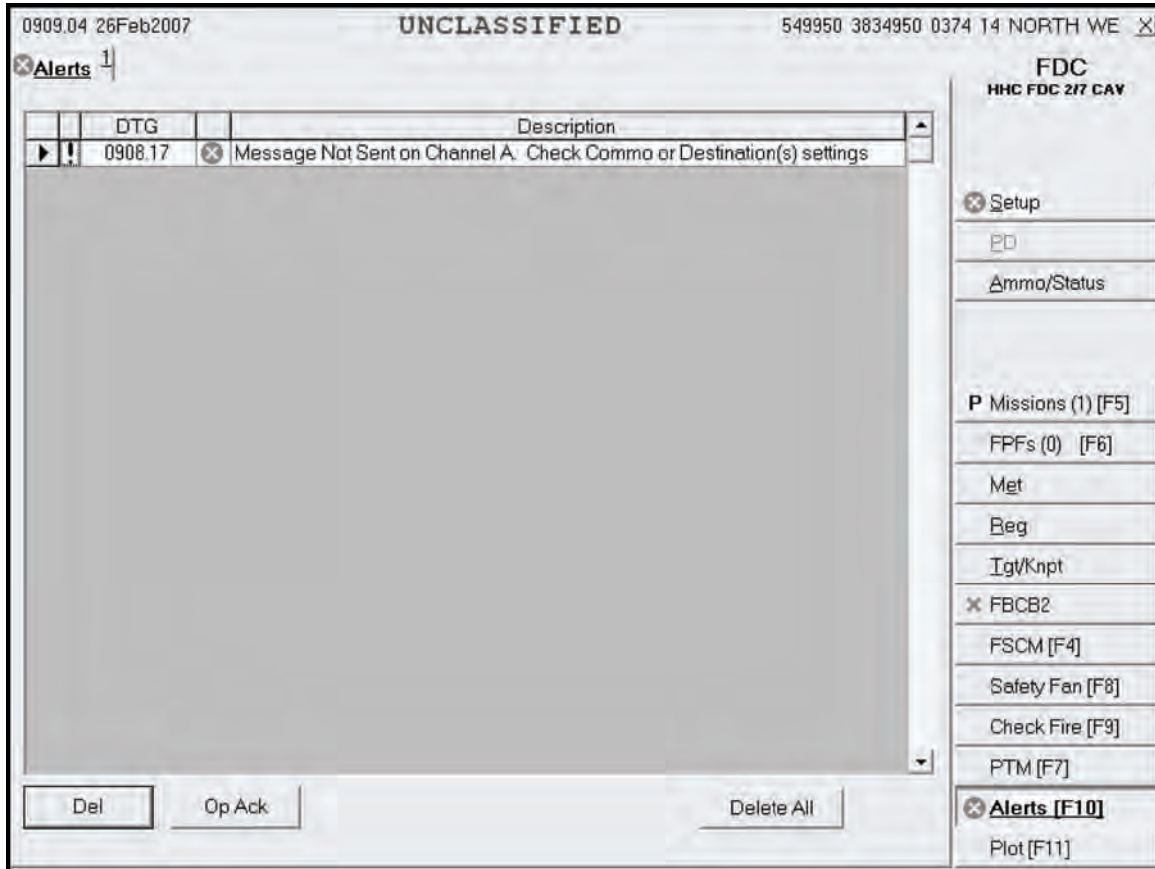


Figure 15-34. Alerts screen.

Chapter 16

Fire Missions

This chapter consists of three sections: parts of a standard fire mission; basic fire missions, which contains basic digital and manual fire mission procedures; and special missions, which details specific missions such as registration, illumination, coordinated illumination, and FPF.

SECTION I. PARTS OF A STANDARD FIRE MISSION

This section discusses the features of basic digitally and manually generated MFCS fire missions. It includes the sequence of actions and screens used by the MFCS operator during a fire mission, and common actions performed throughout the operation. This section explains the steps common to all digital and manual fire missions.

STANDARD FIRE MISSION PROCEDURES

16-1. The MFCS provides a standard set of steps and screens to view the fire mission data for grid, polar plot, shift from a known point, and quick fire missions, whether the missions are input manually or received digitally. From the initial CFF to the EOM, the sequence of actions is standard, although some steps may be omitted or repeated for all CFF, regardless of the type of equipment supporting the FDC. The MFCS also uses common actions to process fire missions and transmit commands. Special missions (registration, illumination, coordinated illumination, and FPF) also use the standard set of screens, as well as the same common actions.

SEQUENCE OF ACTIONS FROM THE INITIAL CALL FOR FIRE TO THE END OF MISSION

16-2. Fire missions are composed of four basic components: the initial CFF, adjustment to the initial data to move the fire onto the target, an FFE, and an EOM. The sequence can also be stopped at any time with an EOM from the FC or FO. This sequence is as follows:

- (1) The initial fire mission occurs. The initial fire mission can be a new or an established target.
- (2) The fire is adjusted onto the target. This may be omitted if the initial impact hits within the target area or if the mission is an FFE.
- (3) The FO or FC calls for an FFE.
- (4) An EOM is sent from the FC or FO, and the mission is saved or deleted.

DIGITAL AND MANUAL FIRE MISSION TABS AND SCREENS

16-3. Figure 16-1 illustrates the format of all View screens. The control button area, displayed to the right, is used to select the MFCS functions. The tab area, located at the top of the screen, displays the types of missions available to the user (Manual, New CFF, or a previously saved mission). The working button area, located at the bottom of the screen, contains buttons to accept, modify, or refuse the data shown in the working area. The working area can have up to four subareas: the Messages screen, the gun status area, the Fire Command fields, and the View button areas. The View button area provides the operator with the means to select different fields for viewing data.

1607.35 13Mar2007 UNCLASSIFIED 549950 3834950 0374 14 NORTH WE X

Manual 1 | P New CFF 2 | P AB0006 3 |

1606.39 13Mar2007
THIS IS FDC
ADJUST FIRE
GRID 548570 3838330 0350 14 NORTH WE
(I) GUNS AVAIL 4
(I) NEAREST GUN A1 RNG 3474 AOF 5997

Msn Type	MOF	MOA
AREA	ADJ	N/G

MOC	WR	Sheaf	Length	Width	Attitude
		LINEAR			

Gun	Lot-Shell	Fuze	Charge
A2	A-HE M934A1	IMP	AUTO

Volleys	Lot-Shell	Fuze	Charge
3	A-HE M934A1	PRX	AUTO

Use Reg Correction

Use All [F2] Undo [F3] MTO Deny

Gun Select		
Sel	Gun	Status
<input checked="" type="checkbox"/>	A1	OpRdy
<input checked="" type="checkbox"/>	A2	OpRdy
<input checked="" type="checkbox"/>	A3	OpRdy
<input checked="" type="checkbox"/>	A4	OpRdy

All None

Views

Msn Data	Msgs
Solution	Subs Adj
Msn Stat	Adj Sheaf
Safety	EOM
	Plot

FDC
HHC FDC 217 CAV

Setup

BD

Ammo/Status

P Missions (1) [F5]

FPFs (0) [F6]

Met

Reg

Igt/Knpt

x FBCB2

FSCM [F4]

Safety Fan [F8]

Check Fire [F9]

PTM [F7]

Alerts [F10]

Plot [F11]

Figure 16-1. Mission Data screen.

16-4. The MFCS uses tabs and views to display the mission and related data. Table 16-1 lists the tabs and screens typically used during digital, manual, and special fire missions.

NOTE: For more information about special fire missions, see Section III of this chapter.

Table 16-1. Tabs and screens.

TABS OR SCREEN	INFORMATION AND ACTIONS
New Call for Fire Tab	The operator— <ul style="list-style-type: none"> • Receives the new CFF. • Accepts (Process) the fire mission. • Refuses (MTO Deny) the fire mission.
Manual Call for Fire Tab	The operator manually designates and performs grid, polar plot, shift from a known point, or quick fire missions.
Mission Tab	The operator— <ul style="list-style-type: none"> • Receives the CFF for a previously saved mission. • Accepts (Process) the fire mission. • Refuses (MTO Deny) the fire mission.
Mission Data Screen	This screen displays— <ul style="list-style-type: none"> • Target number. • CFF. • Mission data. The operator reviews data and makes adjustments.
Solution Screen	This screen displays— <ul style="list-style-type: none"> • Gun orders. • Errors and warnings. • Selected guns. The operator sends orders to the guns.
Mission Status Screen	The operator monitors the mission.
Safety Data Screen	This screen displays safety data. The operator reviews and records data.
Messages Screen	The operator receives subsequent messages.
Subsequent Adjust Screen	This screen displays adjustment data. The operator reviews and adjusts data.
EOM Screen	This screen houses these features: <ul style="list-style-type: none"> • Not save the mission. • Save as a target. • Save as a known point.
Plot Screen	This screen displays a digital plot of the mission with icons for key data.
Manual Subsequent Adjust Screen	The operator manually performs a subsequent adjustment.
Manual EOM	The operator manually records the mission as a target (known point). This screen houses these features: <ul style="list-style-type: none"> • Not save the mission. • Save as a target. • Save as a known point.

COMMON ACTIONS

16-5. The MFCS operator repeatedly uses commands throughout the fire mission. These commands are usually performed by selecting a button or responding to a query in a message box. Common actions include—

- Acknowledging receipt of the message.
- Accepting or refusing the mission.
- Processing or deleting the mission.
- Selecting the guns to fire the mission.
- Confirming gun orders.
- Accepting or modifying data.

ACKNOWLEDGING RECEIPT

16-6. The operator selects the OpAck button to acknowledge receipt of a message and deactivate the audio alarm, if it is turned on. The phrase “acknowledge receipt by selecting the OpAck button” is used throughout the chapter to indicate this action.

RECORDING DATA

16-7. The operator records data throughout the process to maintain a record and to preserve data should the MFCS fail. He transcribes data onto DA Form 2399-R or DA Form 2188-R. The phrase “record data” is used throughout the chapter to indicate this action.

MESSAGE TO THE OBSERVER ACCEPT OR MESSAGE TO THE OBSERVER DENY

16-8. The MFCS operator selects message to the observer (MTO) Accept to accept the mission and MTO Deny to refuse the mission. If the operator selects MTO Deny, the Delete button becomes visible and, when selected, deletes the mission. If there is an error beyond FDC control, the only choice is MTO Deny. The phrase “select MTO Accept to accept the mission or select MTO Deny to refuse the mission” is used throughout the chapter to indicate this action.

PROCESS OR DELETE

16-9. The operator may select Process to continue with the mission or Delete to stop the mission. The terms “process” and “delete” are used throughout the chapter to indicate this action.

SELECTING THE GUNS TO FIRE THE MISSION

16-10. The software preselects guns for the mission; they are checked in the Sel box in Gun Select. The operator can modify these selections by checking or removing the checkmark in the Sel box beside any OpRdy gun. The operator may also select all or none of the guns listed by selecting All or None. The phrase “select guns” is used throughout the chapter to indicate this action.

ACCEPTING OR MODIFYING DATA

16-11. If required, the operator adjusts the mission data. To undo any changes, he selects Undo Changes, and the data fields display the original data. If any changes were made, he selects Use All to accept all of the changes. If no changes were made, he selects Use All. The phrase “modify data if necessary” is used throughout the chapter to indicate this action.

SECTION II. BASIC FIRE MISSIONS

This section details how the MFCS is used to conduct digital and manual fire missions using each method of target location. It also explains how the MFCS records RPs, targets, and known points.

BASIC DIGITAL MISSIONS

16-12. New basic fire missions are received digitally from the FC or FO. The FC or FO identifies the target's location using grid coordinates, polar plots, or shifts from a known point. Once a mission has been fired, it can be saved and designated as a target or known point.

16-13. The following screen shots provide an example of a new digital CFF using the grid method of target location. The process is the same when using the polar plot or shift from a known point method of target location. Except for the initial CFF screen, the adjustment of fires, FFE, and previously fired missions are conducted in the same manner.

RECEIPT OF A FIRE MISSION

16-14. Upon receipt of a fire mission, the Missions button is highlighted and, if enabled, the audio alarm sounds. The operator selects the Missions button, and the New CFF tab appears (Figure 16-2). The operator can select MTO Deny to deny the mission or Process to display the Mission Data screen.

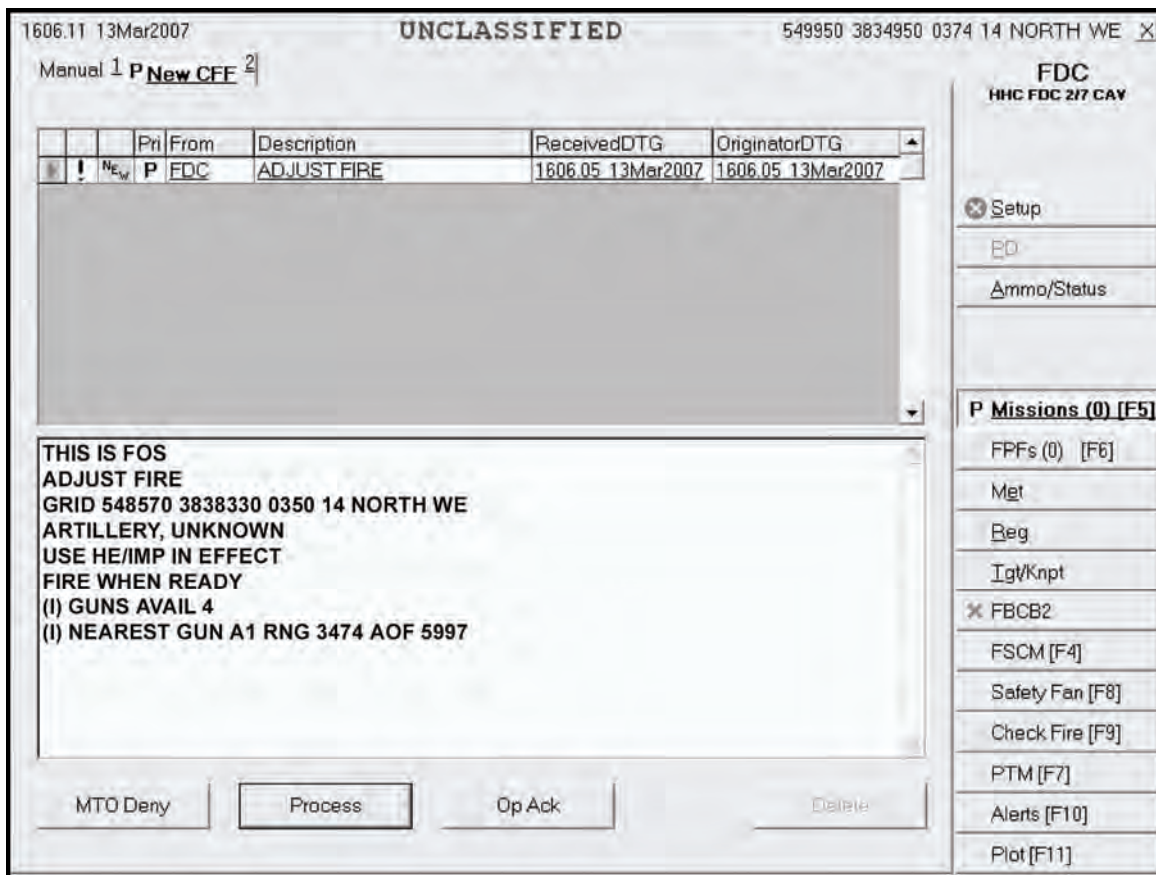


Figure 16-2. New Call for Fire screen.

MISSION DATA SCREEN

16-15. The Mission Data screen (Figure 16-3) automatically generates a new target number and displays the mission data. It allows the operator to review, record, and adjust mission data, such as the guns to fire the mission, method of control (MOC), type of sheaf, and fuze-shell combinations. Once satisfied, the operator selects Use All (if he made any changes) or Solution.

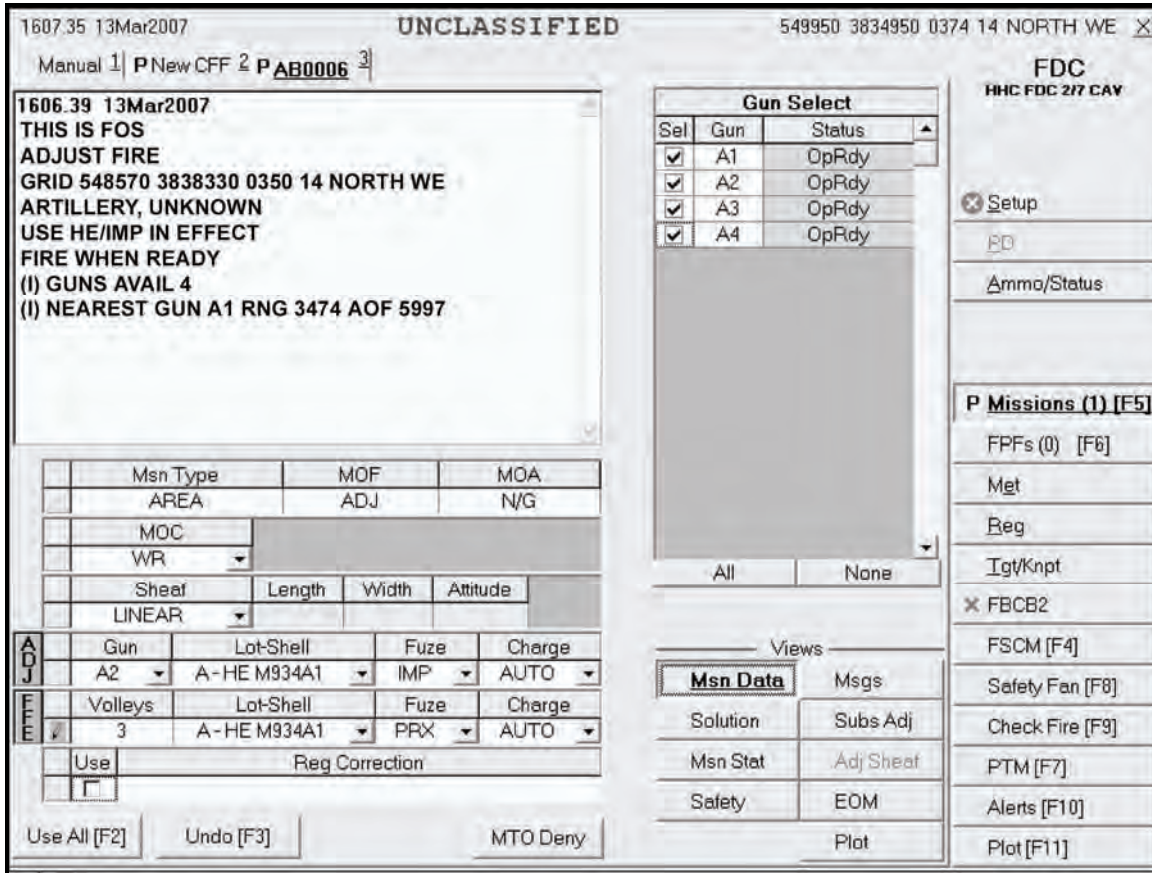


Figure 16-3. Mission Data screen.

SOLUTION SCREEN

16-16. The Solution screen (Figure 16-4) shows the gun orders, the guns selected, and errors and warnings. This screen allows the operator to review the gun status and to change the gun selection based on any errors and warnings received. From this screen, the operator can select MTO Deny (if necessary) and send gun orders.

The screenshot displays the 'Solution' screen with the following components:

- Header:** 1607.51 13Mar2007, UNCLASSIFIED, 549950 3834950 0374 14 NORTH WE
- Manuals:** Manual 1 | P New CFF 2 | P AB0006 3
- Gun Orders Table:**

Gun	MOF	MOC	Lot	Chrg	Azim	Defl	Elev	TOF	FS
A2	ADJ	WR	A	2	6006.4	2794	1095.7	38.0	
A1	ADJ	DNL	A	2	6029.0	2771	1110.8	38.3	
A2	ADJ	DNL	A	2	6016.7	2783	1095.7	38.0	
A3	ADJ	DNL	A	2	6004.6	2795	1080.0	37.7	
A4	ADJ	DNL	A	2	5993.0	2807	1061.5	37.3	
- Gun Select Table:**

Sel	Gun	Status
<input checked="" type="checkbox"/>	A1	OpRdy
<input checked="" type="checkbox"/>	A2	OpRdy
<input checked="" type="checkbox"/>	A3	OpRdy
<input checked="" type="checkbox"/>	A4	OpRdy
- Errors and Warnings:** A table with columns 'Gun' and 'Description'.
- Buttons:** MTO Accept, Send Gun Orders, MTO Deny.
- Views:** Msn Data, Msgs, Solution (selected), Subs Adj, Msn Stat, Adj Sheet, Safety, EOM, Plot.
- Right Panel (FDC HHC FDC 2/7 CAY):**
 - Setup
 - PD
 - Ammo/Status
 - P Missions (1) [F5]
 - FPFs (0) [F6]
 - Met
 - Reg
 - Igt/Knpt
 - FBCB2
 - FSCM [F4]
 - Safety Fan [F8]
 - Check Fire [F9]
 - PTM [F7]
 - Alerts [F10]
 - Plot [F11]

Figure 16-4. Solution screen.

SAFETY DATA SCREEN

16-17. Prior to sending gun orders or at any time, the operator can review and record the safety data using the Safety Data screen (Figure 16-5).

1608.21 13Mar2007 UNCLASSIFIED 549950 3834950 0374 14 NORTH WE X

Manual 1 | P New CFF 2 | P AB0006 3 |

FDC
HHC FDC 217 CAY

Safety Data												
Gun	MOC	AimPt Easting	AimPt Northing	AimPt Alt	Burst Ht	Burn Time	AimPt Range	AimPt Azim	Max Ord	Grid Decl	Canister Easting	Canister Northing
A2	WR	548570	3838330	+0350			3543	6005	02131	-005.5		
A1	DNL	548667	3838369	+0350			3474	6027	02158	-005.5		
A2	DNL	548603	3838343	+0350			3543	6015	02131	-005.5		
A3	DNL	548538	3838316	+0350			3612	6003	02102	-005.5		
A4	DNL	548473	3838290	+0350			3682	5992	02067	-005.5		

Views

Msn Data	Msgs
Solution	Subs Adj
Msn Stat	Adj Sheaf
Safety	EOM
	Plot

P Missions (1) [F5]

FFPs (0) [F6]
Mgt
Reg
Igt/Knpt
<input checked="" type="checkbox"/> FBCB2
FSCM [F4]
Safety Fan [F8]
Check Fire [F9]
PTM [F7]
Alerts [F10]
Plot [F11]

Figure 16-5. Safety Data screen.

PLOT SCREEN

16-18. The Plot screen (Figure 16-6) is available at any time during the mission. This screen displays burst points, canister points, FSCMs, known points, stored targets, units, and waypoints. When connected to FBCB2, it also stores friendly unit locations. The operator can change the items displayed by selecting or deselecting the boxes in the list above the Legends button (the default shows all items checked). To obtain information about an icon on the plot, the operator places the cursor over the icon. To return to the Solution screen, he selects the Solution button.

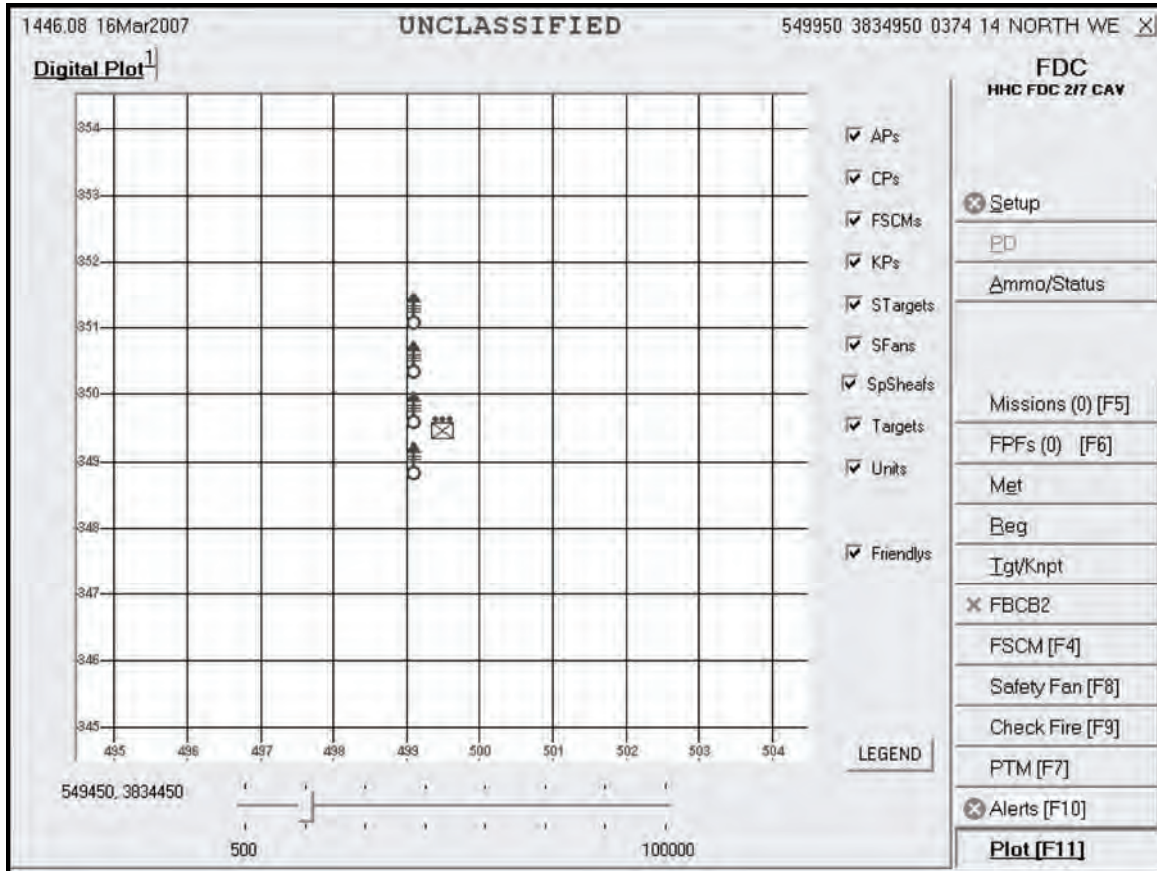


Figure 16-6. Plot screen.

SOLUTION SCREEN

16-19. On the Solution screen (Figure 16-7), the operator reviews the gun orders and other data. Once satisfied with the data, the operator selects the Send Gun Orders button. A message box appears for the operator to confirm the order; the operator selects Yes to confirm. A Send Status box is displayed, showing the destination and status of the message to the guns. The status shows Machine Acknowledgement (MAck), Retry (the system is retrying), or Failed (the message did not reach its destination). The Mission Status Screen is then displayed.

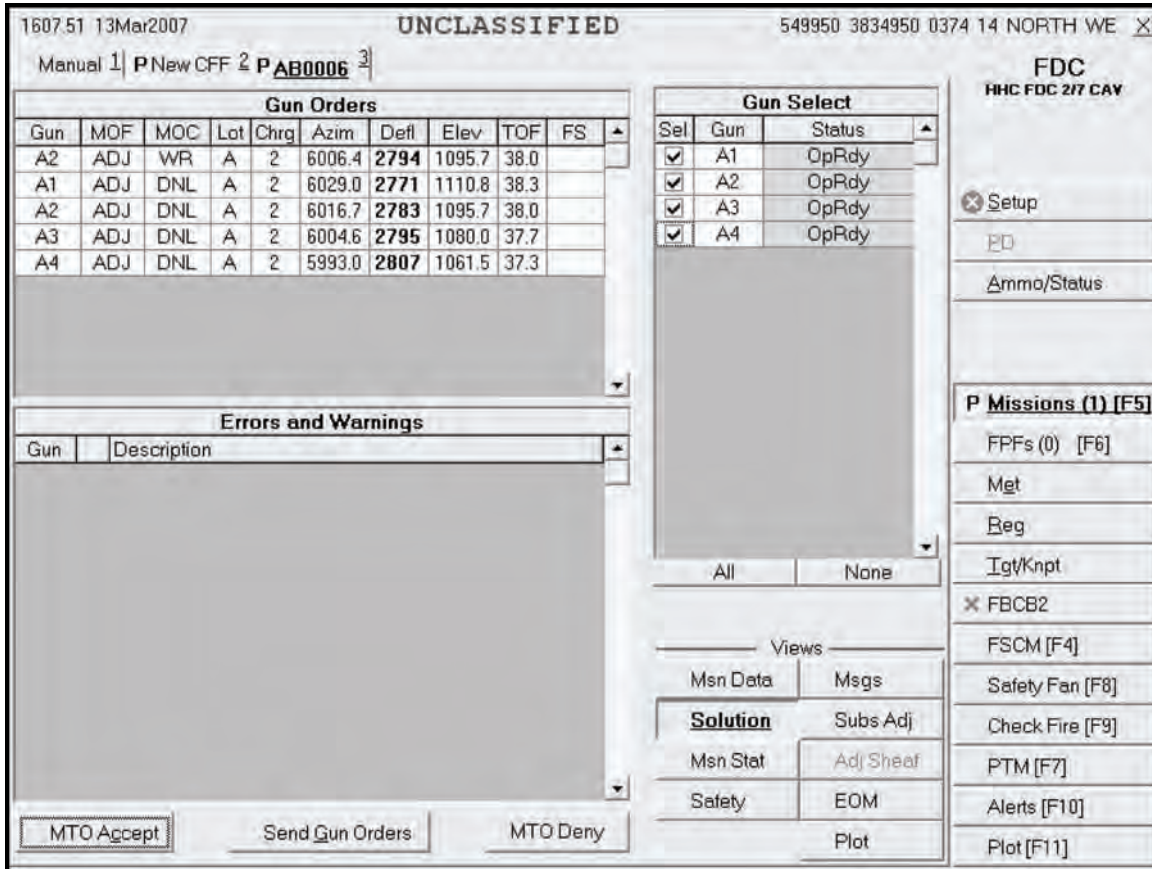


Figure 16-7. Solution screen.

MISSION STATUS SCREEN

16-20. When the operator sends gun orders, the Mission Status screen (Figure 16-8) is shown, and the words “Gun Orders Sent” appear. The operator monitors the mission from this screen. The operator updates the status of the guns (Ready, Shot, Rounds Complete, and Abort) from this screen, and the MFCS automatically sends this information to the FC or FO.

- On receiving “Shot,” a checkmark appears in the checkbox, and the box turns green. The time of flight and a red splash sign are also displayed.
- If a gun aborts the mission, a checkmark appears in the Abort box, and a reason is displayed.

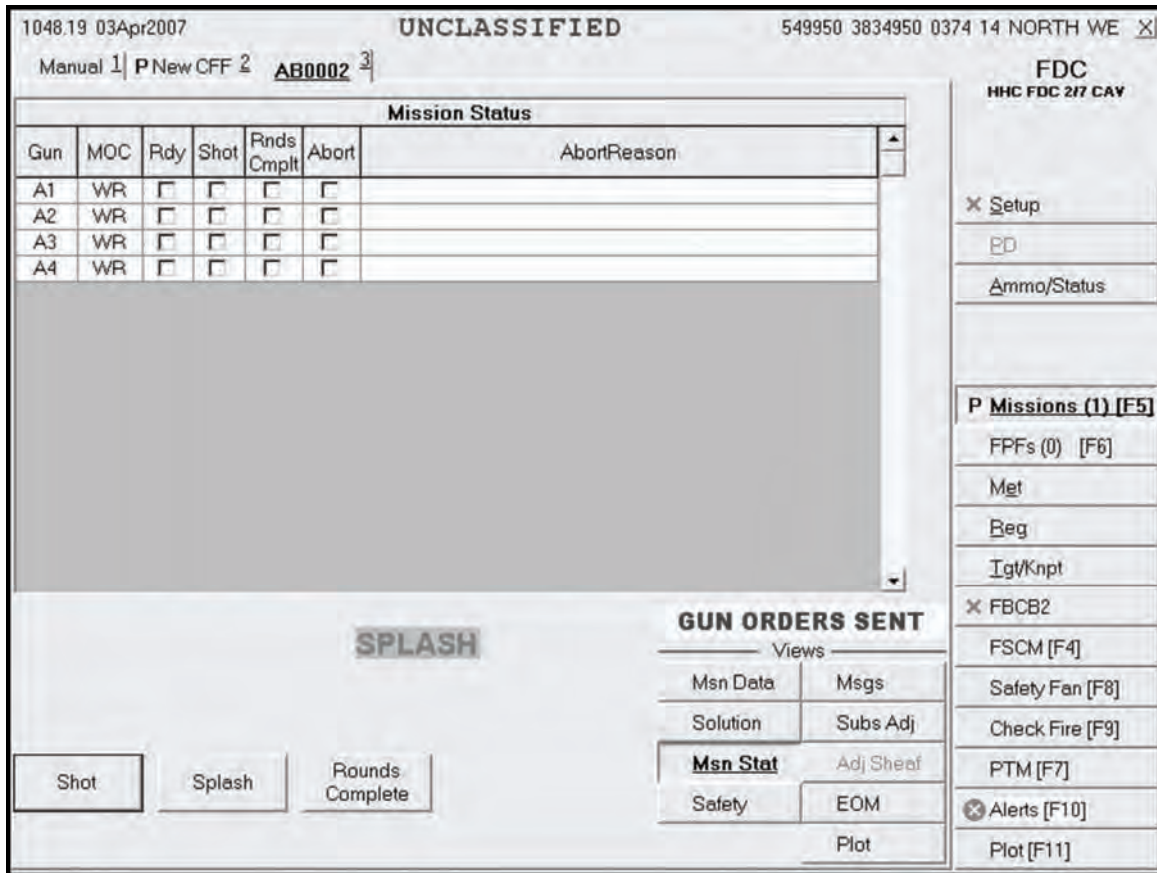


Figure 16-8. Mission Status screen.

SUBSEQUENT ADJUSTMENT, MESSAGES SCREEN

16-21. The operator selects the Messages screen (Figure 16-9) and waits for subsequent messages. There are two main subsequent messages: adjust fire and FFE. The FC or FO can order an FFE or continue to make adjustments. For subsequent adjustments, the operator can choose to process or modify the data, or delete the adjustment. Upon receipt of “Adjust Fire,” the operator records the data and selects OpAck to deactivate the audio alarm. Then, he selects Process to display the Mission Data screen.

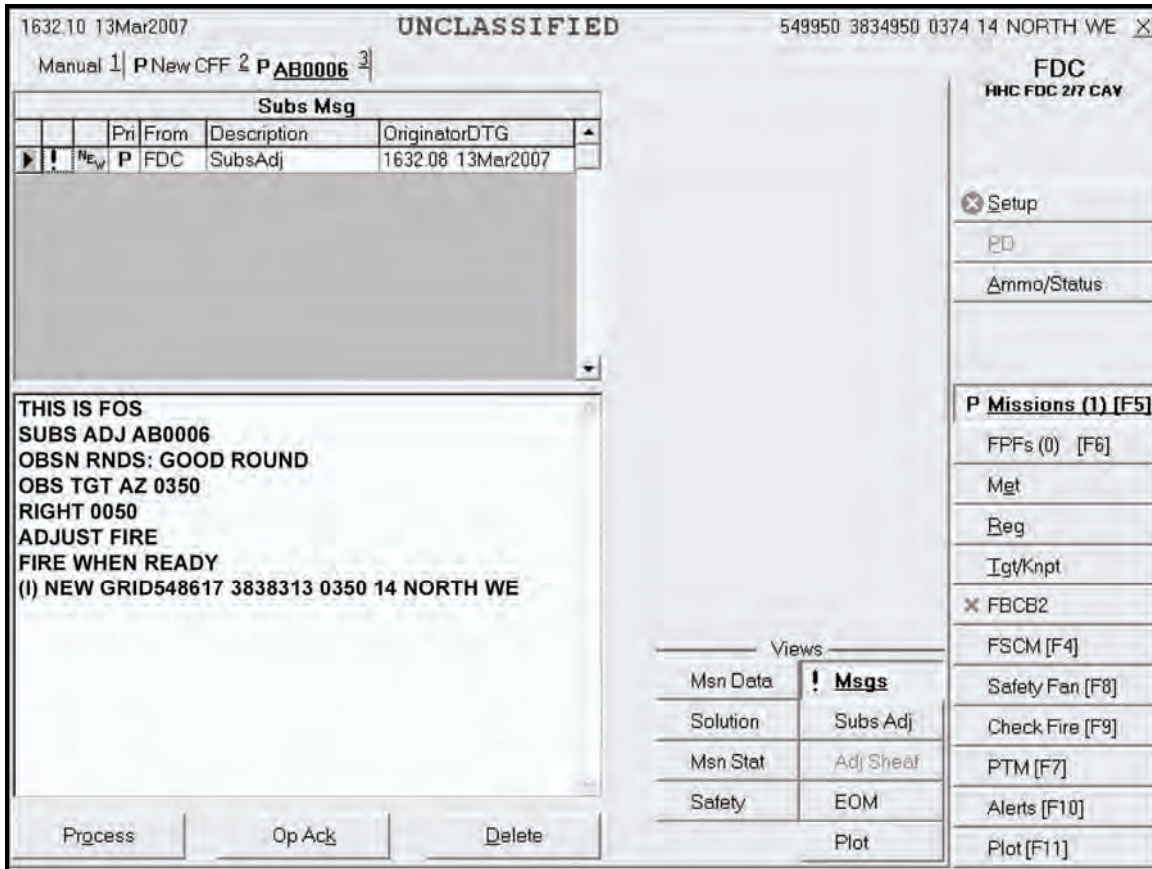


Figure 16-9. Messages screen.

SUBSEQUENT ADJUST-ADJUST FIRE

16-22. Until an FFE or EOM is ordered, the operator can make adjustments using the steps described in paragraphs 16-15 to 16-20. The operator continues to review and modify data on the Mission Data, Solution, and Safety Data screens. He also controls the mission on the Mission Status screen.

SUBSEQUENT ADJUST-FIRE FOR EFFECT

16-23. The Mission Data screen (Figure 16-10) appears when an FFE command is received. The operator records the data and selects OpAck to deactivate the audio alarm. He can choose Process or Delete. If he selects Process, the Mission Data screen appears, and he can change the guns to fire the mission and other mission data, such as MOC, type of sheaf, and fuze-shell combinations. Once satisfied, the operator selects Use All (if he made any changes) or Solution. The Solution screen appears. The operator can also select the Safety Data screen. If the MOC is "at my command" (AMC), the Ready and Fire buttons appear on the Mission Status screen. When the gun sends "Ready," the Ready button becomes shaded, and a green checkmark appears in the Rdy box on the Mission Status screen. The FDC operator then selects the Fire button. A checkmark appears in the Rounds Complete box when the guns send the information. Then, the operator selects the Message button and waits for subsequent messages to appear on the Messages screen.

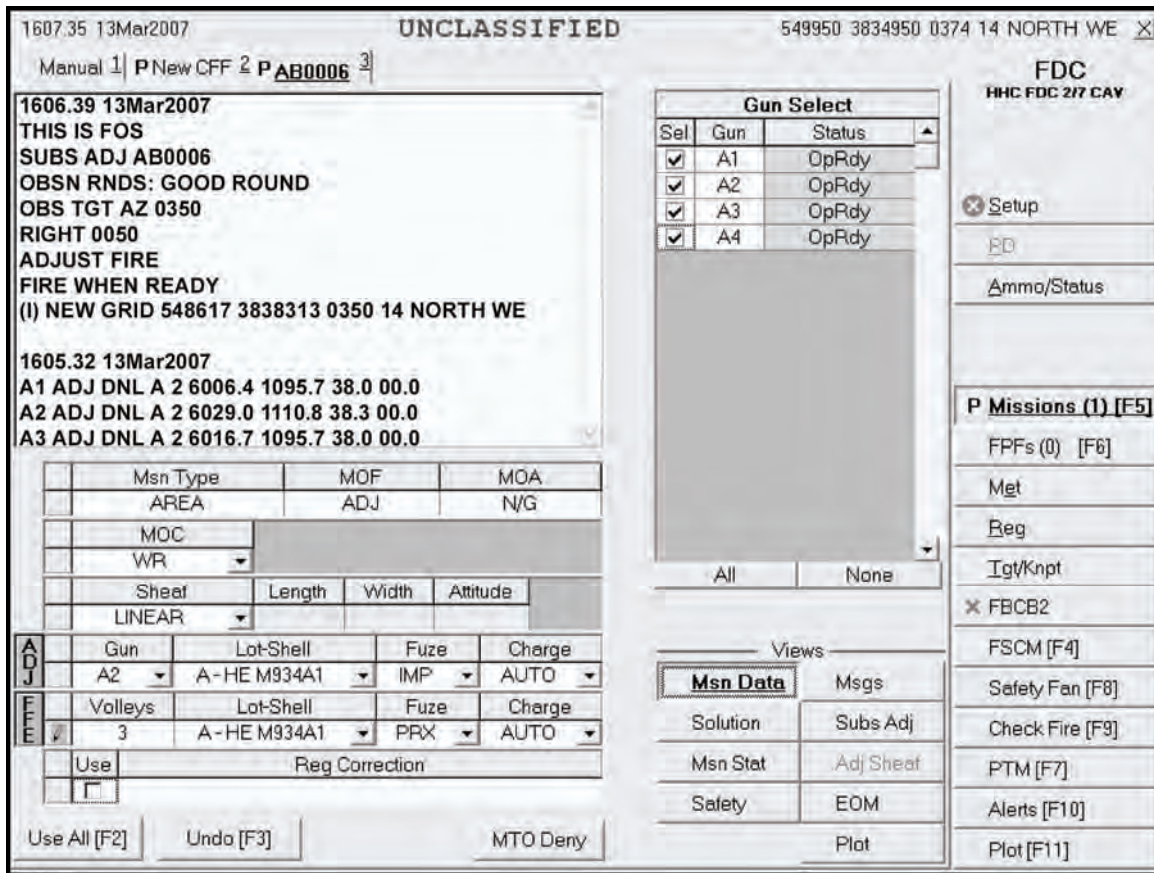


Figure 16-10. Mission Data screen.

END OF MISSION

16-24. The operator can end any active mission or receive an EOM at any point in the mission. The Messages screen displays an EOM message from the FO (Figure 16-11). If the operator does not need to save or record the mission, he selects Process. The New CFF tab for the fired mission appears, and the operator selects Delete.

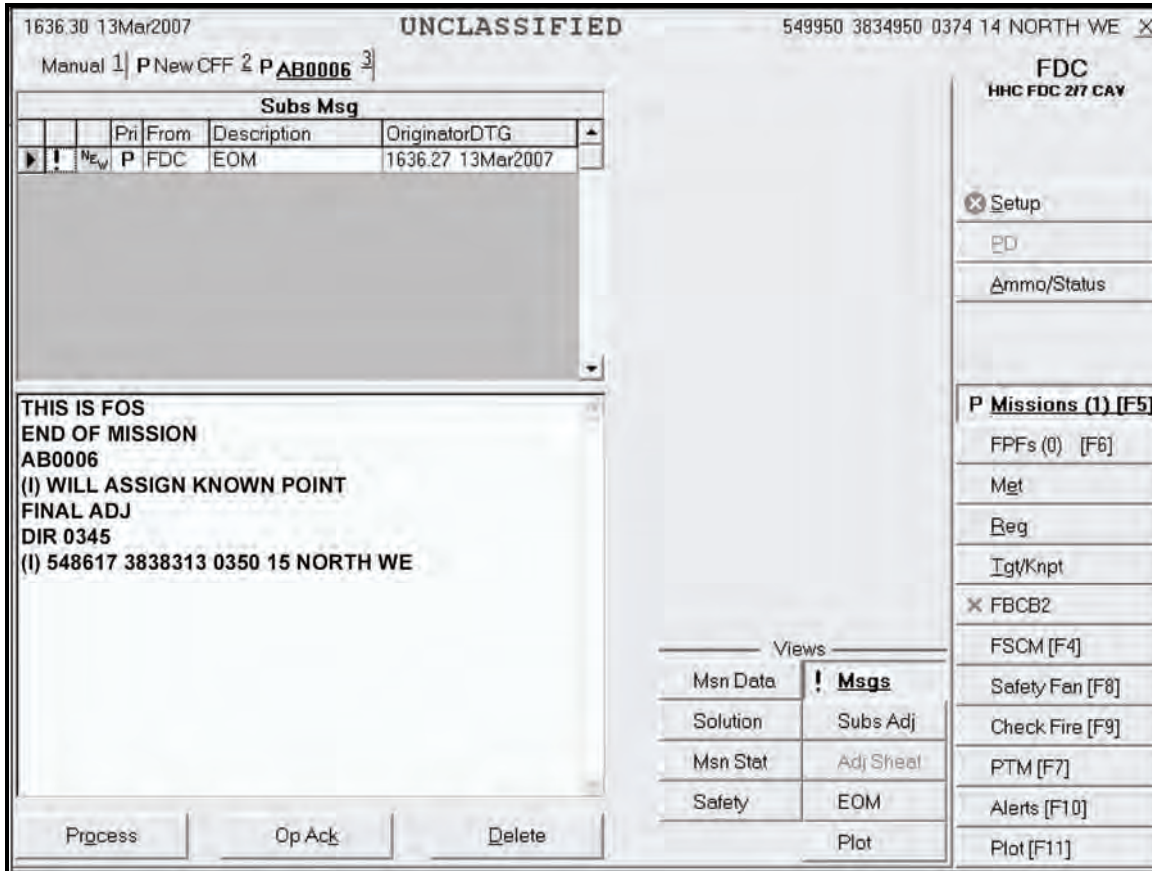


Figure 16-11. End of Mission message.

SAVE DATA

16-25. When the operator receives an EOM message with instructions to record the mission (from the FC or FO), he can save it as a known point or as a target. A box appears on the screen, and the operator completes the information required (Figure 16-12). He then selects Process and deletes the mission. The operator can also use the EOM button to do the same.

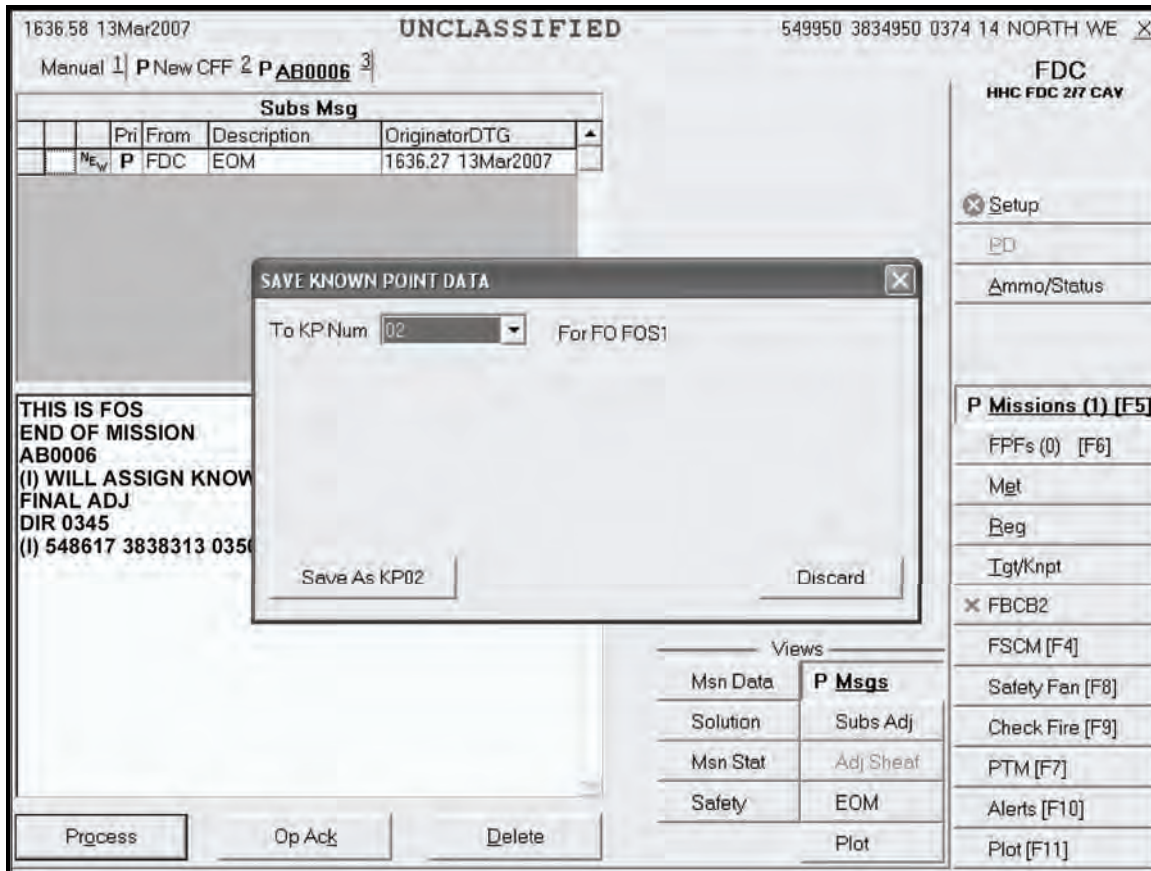


Figure 16-12. Save Data screen.

MANUAL MISSIONS

16-26. During manual fire missions, the FDC receives the data from the FC or FO by radio or some other non-digital means. On the Manual Mission screen, the operator selects the type of mission (grid, polar plot, shift from a known point, or quick fire) and enters the required data into the displayed fields. Once the type of mission and the initial firing data are entered, a manual fire mission is processed in the same manner as a digital mission, except for commands from the FO. The example outlined in the screenshots uses a grid mission to explain the steps involved in a manual mission.

NOTE: For a manual fire mission, commands from the FO have to be entered into the MFCS. After the data have been entered, the operator processes missions using the sequence of screens described in paragraphs 16-13 to 16-25.

MANUAL CALL FOR FIRE

16-27. The operator selects the Missions button and the Manual tab. The Manual CFF screen (Figure 16-13) is displayed. This screen allows the user to select and enter data for one of the four types of missions: grid, polar plot, shift from a known point, and quick fire. After selecting the desired ammunition/mission combination, the New CFF tab is displayed. The operator uses the procedures described in paragraphs 16-15 to 16-24 to process the new CFF.

160526 13Mar2007 UNCLASSIFIED 549950 3834950 0374 14 NORTH WE X

Manual 1 | New CFF 2 |

Grid

	Easting	Northing	Alt	Zone	Datum	HemiSphere	
<input checked="" type="checkbox"/>	548570	3838330	+350	14	WE	<input checked="" type="radio"/> North	<input type="radio"/> South

Polar

Obs	Easting	Northing	Alt	Zone	Datum	HemiSphere	
FOS1	547200	3834700	+0374	14	WE	<input checked="" type="radio"/> North	<input type="radio"/> South
Dir	Dist	VI					

Shift

Tgt KnPt	Easting	Northing	Alt	Zone	Datum	HemiSphere	
AB0002	547437	3840654	+0405	14	WE	<input checked="" type="radio"/> North	<input type="radio"/> South
Dir	Right/Left	Meters	Add/Drop	Meters	Up/Down	Meters	
	<input type="radio"/> Right <input type="radio"/> Left		<input type="radio"/> Add <input type="radio"/> Drop		<input type="radio"/> Up <input type="radio"/> Down		

Quick Fire

Tgt KnPt	Easting	Northing	Alt	Zone	Datum	HemiSphere	
AB0002	547437	3840654	+0405	14	WE	<input checked="" type="radio"/> North	<input type="radio"/> South

HE ADJ | IL ADJ | IMMEDIATE SUPPRESS | REG | ASSIGN FPF

HE FFE | IL FFE | IMMEDIATE SMOKE

FDC
HHC FDC 2/7 CAY

Setup

PD

Ammo/Status

Missions (0) [F5]

FFPs (0) [F6]

Met

Reg

Tgt/Knpt

FBCB2

FSCM [F4]

Safety Fan [F8]

Check Fire [F9]

PTM [F7]

Alerts [F10]

Plot [F11]

Figure 16-13. Manual Call for Fire screen.

Data Common for all Missions

16-28. The operator enters data into the Easting, Northing, and Alt fields. The Zone, Datum, and Hemisphere fields are auto-filled. At the bottom of the screen, he also selects the type of round and the method of fire (HE ADJ is used in the example).

Data for Polar Plot Missions

16-29. In addition to the common data, the operator enters the following data for a polar plot mission:

- Observer (Obs) (from a pick list).
- Direction (Dir) from 0000 to 6399.
- Distance (Dist) from 0000 to 9999.
- Vertical interval (VI) between the observer and the target (a plus sign for up [up is also the default setting] or a minus sign for down, and four digits from 0000 to 9999). The VI is not required.

Data for Shift From a Known Point Missions

16-30. In addition to the common data, the operator enters the following data for a shift from a known point mission:

- Observer (Obs) (from a pick list).
- Known point (KnPt) (from a pick list).
- Direction (Dir) from 0000 to 6399.
- Lateral displacement direction of right or left and a lateral displacement distance from 0000 to 9999.
- Range displacement direction of add or drop and a range displacement distance from 0000 to 9999.
- VI (up/down) between the observer and the target (a plus sign for up [up is also the default setting] or a minus sign for down, and four digits from 0000 to 9999). The VI is not required.

Quick Fire

16-31. In addition to the common data, the operator enters the following data for a quick fire mission:

- Target number (from a pick list).
- HE FFE or IL FFE (from the bottom of the screen).

MANUAL ADJUST FIRE

16-32. The operator waits for subsequent messages by selecting the Messages screen. If the FO requests an adjust fire, the operator enters the data from the message into the MFCS by selecting the Subsequent Adjust button in the Mission Status screen (Figure 16-14). Then, he enters the FO's adjustment, and the MFCS calculates the gun orders.

16-33. Next, the operator processes the manual adjust fire mission as he would a digital adjust fire mission (see paragraph 16-21). He repeats this step until he receives an FFE or an EOM. At the FFE command, the operator uses the procedures described in paragraph 16-23.

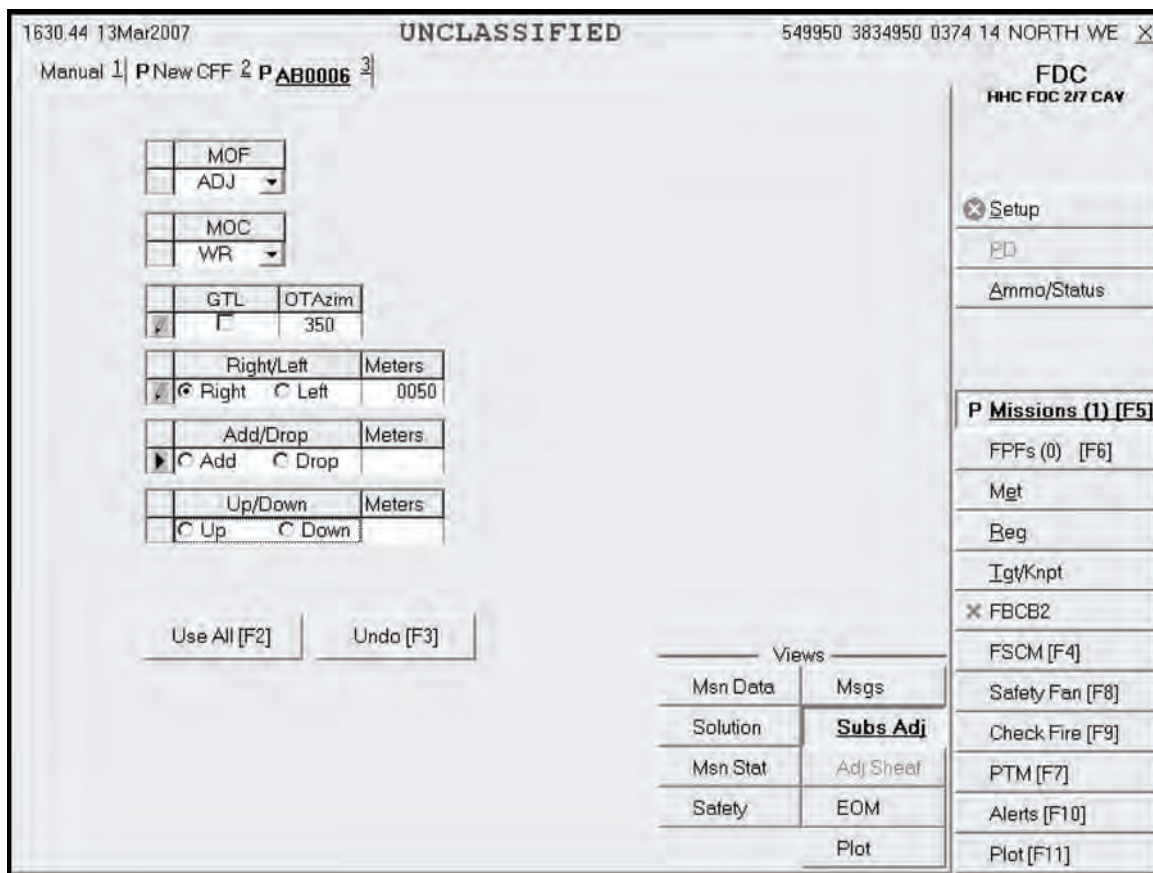


Figure 16-14. Manual Adjust Fire screen.

MANUAL END OF MISSION

16-34. To end the mission, the operator selects the EOM button. The Manual End of Mission screen (Figure 16-15) is displayed. The operator can choose one of the three options: EOM-No Save, EOM-Record as a Target, or EOM-Record as a Known Point.

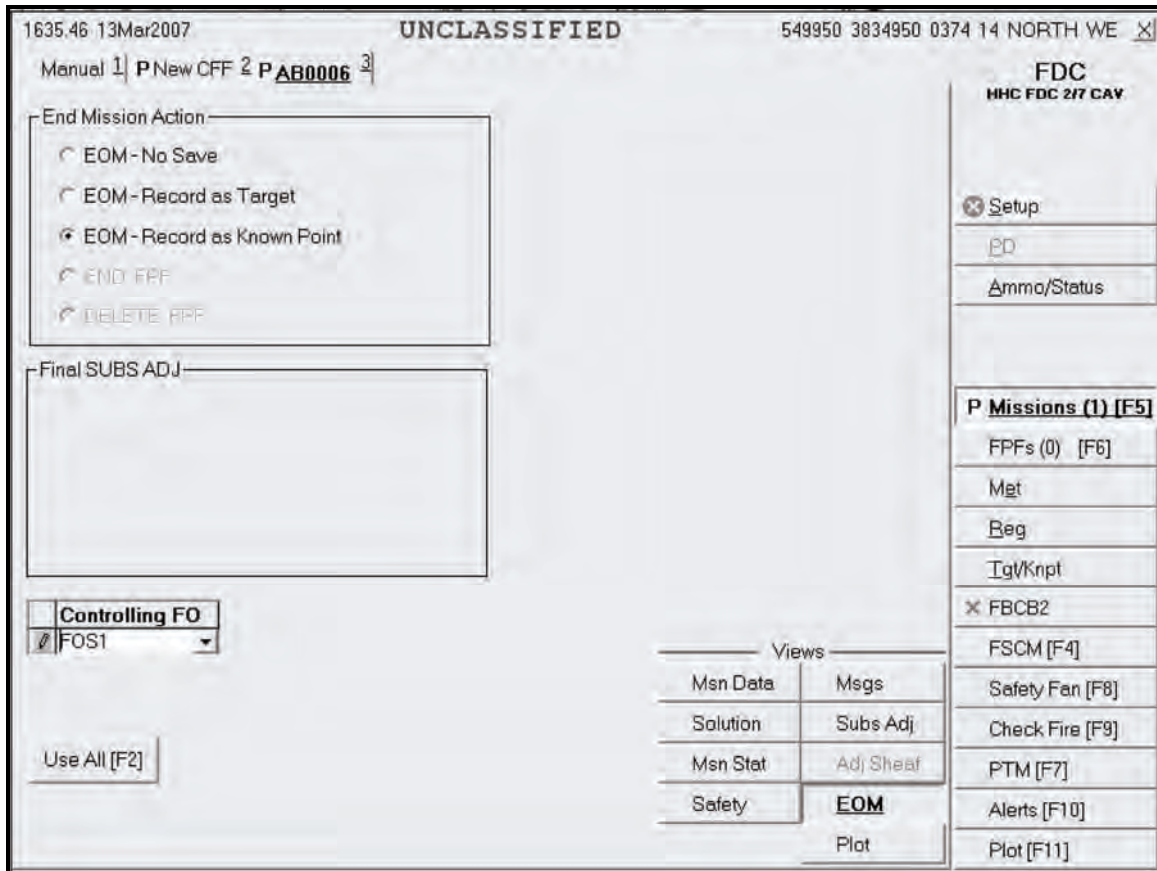


Figure 16-15. Manual End of Mission screen.

End Of Mission-No Save

16-35. If the operator does not need to save or record the mission, he selects Process. The New CFF screen appears, and the operator selects Delete.

End Of Mission -Record as Target

16-36. The Subsequent Message screen is displayed, with the words “End of Mission with Known Point.” The operator selects Process, and the New CFF screen appears. Then, he selects Delete.

End Of Mission -Record as Known Point

16-37. On the EOM screen, the operator selects the controlling FO, and then selects Use All. A message box appears, and the operator selects the known point number and the Save As button.

SECTION III. SPECIAL MISSIONS

In addition to manual and digital fire missions, the MFCS operator can process special fire missions, which include registration, illumination, coordinated illumination, and FPFs. Each special mission has a button in the control button area.

REGISTRATION POINT

16-38. An RP is a surveyed terrain feature or other designated point on which fire is adjusted for the purpose of obtaining corrections to firing data. The MFCS provides procedures for entering, updating, and storing RP data. The FC or FDC determines whether the mission should be saved as an RP.

FIRING THE REGISTRATION

16-39. A registration fire mission is conducted in the same way as a digital or manual fire mission. A grid mission must be fired before it can be saved as an RP.

SAVING THE REGISTRATION AFTER A DIGITAL MISSION

16-40. At the end of a grid mission, the FC or FO sends an EOM.

- To record the RP number, the operator selects the RP number and then selects the Save As RP button when the Save Registration Data box is displayed (Figure 16-16). The range and azimuth correction factors are also displayed.
- The data can also be discarded by pressing the Discard button.

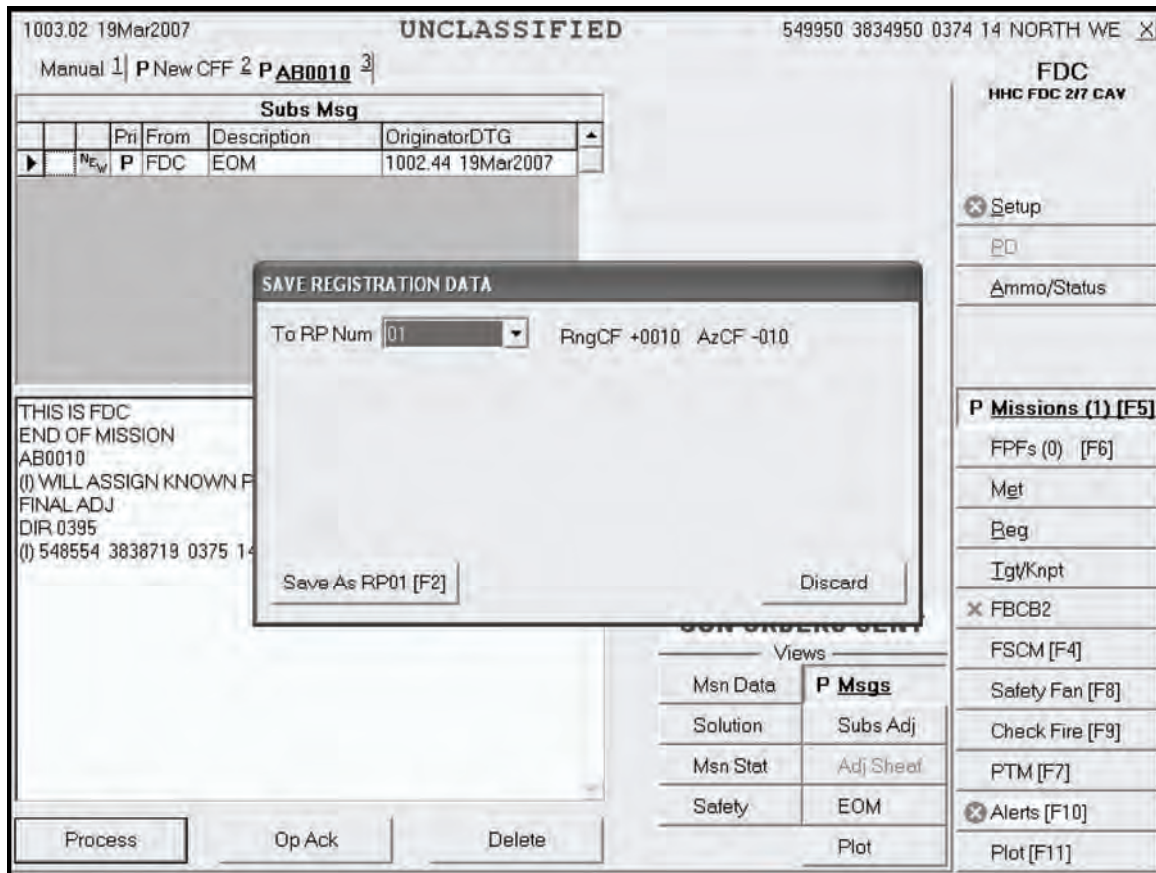


Figure 16-16. Save Registration screen.

SAVING THE REGISTRATION AFTER A MANUAL MISSION

16-41. On the Manual screen, the operator enters the same data as he would during a manual grid mission. He selects Registration (Reg) at the bottom of the screen and processes the mission using the procedures described in paragraphs 16-27 to 16-39. The mission can be saved manually and recorded as a known point by following the instructions in paragraph 16-16.

REGISTRATION SCREEN

16-42. When the Reg button is selected, the Registration screen (Figure 16-17) is displayed. This screen displays the data for up to sixteen stored RPs. The plot portion of the screen includes icons showing RPs, firing points, and units. To view a specific RP, the operator uses the following procedures:

- (1) Select the index box in front of the desired RP at the top left of the screen. Information auto-fills into the fields.
- (2) To zoom in on a point in the plot, move the plot area slider control within a range of 200 to 100,000 meters.

NOTE: If the operator leaves this screen and later returns, the slider control resets to its default position at the center of the slider control. The program does not allow the operator to zoom or recenter beyond the map mod specified in the geographic reference (GeoRef).

- (3) To center on a particular point, double-click on the point.
- (4) To obtain information about a particular icon on the plot, place the cursor over the icon.
- (5) To enter or update data, enter the appropriate information, and select Use All. This also updates the Plot screen.
- (6) To undo changes that have not been committed to the database, select Undo Changes.
- (7) To delete an RP, highlight the RP to be deleted, and select Delete RP. All fields are cleared, and the Plot screen is deleted.

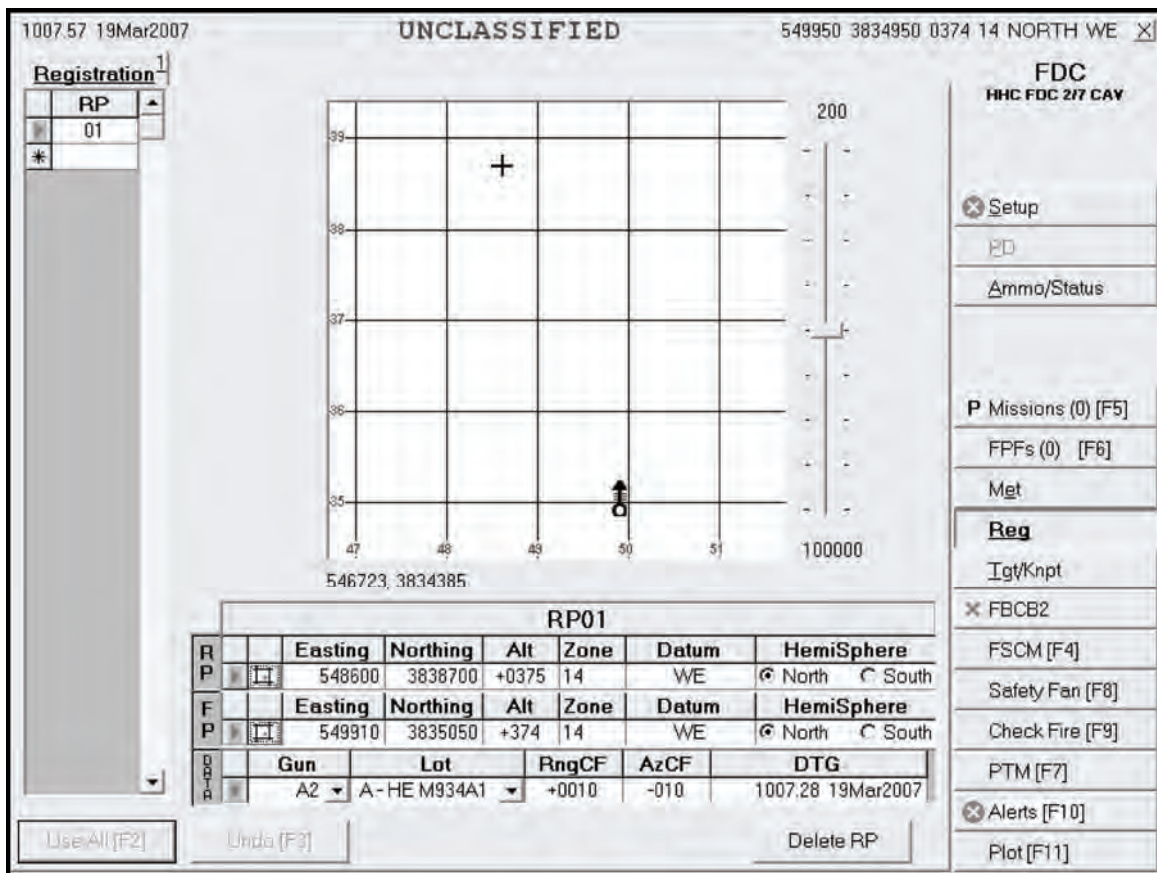


Figure 16-17. Registration screen.

TARGET/KNOWN POINT

16-43. The MFCS provides procedures for viewing and entering up to 50 targets and 50 known points. The procedures for both are essentially the same, except that known points must be assigned to a designated observer. When the Tgt/KnPt button is selected, the operator can choose the Tgts or KnPts tab.

TARGETS SCREEN

16-44. When the operator selects Tgts, the Targets screen (Figure 16-18) appears. All of the targets designated at the EOM are listed. The operator can also manually enter or edit targets. To manually enter or edit a target, use the following procedures:

- (1) Enter the two letters (AA to ZZ) and the target number prefix, followed by a four-digit target number (0000 to 9999) (for example, AA0027).
- (2) Enter the easting, northing, altitude (Alt), zone, and choice of datum and hemisphere.
- (3) Select Use All when completed. Select Undo Changes to undo all changes. Delete a target by highlighting the index box in front of the entry that you want to delete and selecting Del.

1013.18 19Mar2007 UNCLASSIFIED 549950 3834950 0374 14 NORTH WE

Targets 1 Knpts 2

Targets							
	TgtNum	Easting	Northing	Alt	Zone	Datum	HemiSphere
	AB0002	547437	3840654	+0405	14	WE	<input checked="" type="radio"/> North <input type="radio"/> South
*							<input type="radio"/> North <input type="radio"/> South

Buttons: Use All [F4], Undo [F3], Del

Right Panel: FDC HHC FDC 217 CAY

- Setup
- PD
- Ammo/Status
- P Missions (0) [F5]
- FPFs (0) [F6]
- Met
- Reg
- Tgt/Knpt
- FBCB2
- FSCM [F4]
- Safety Fan [F8]
- Check Fire [F9]
- PTM [F7]
- Alerts [F10]
- Plot [F11]

Figure 16-18. Targets screen.

KNOWN POINTS SCREEN

16-45. Known points are received digitally at the EOM, and a dialog box is displayed to enter the required data (Figure 16-19). A known point must be associated with an observer. The operator can also enter known points manually by performing the same actions described above for targets, except that he must fill the KnPt field with a two-digit number from 00 to 99 and choose an observer (Obs) from the pick list. Once the operator has reviewed the data and made the necessary changes, he selects Use All to save the information.

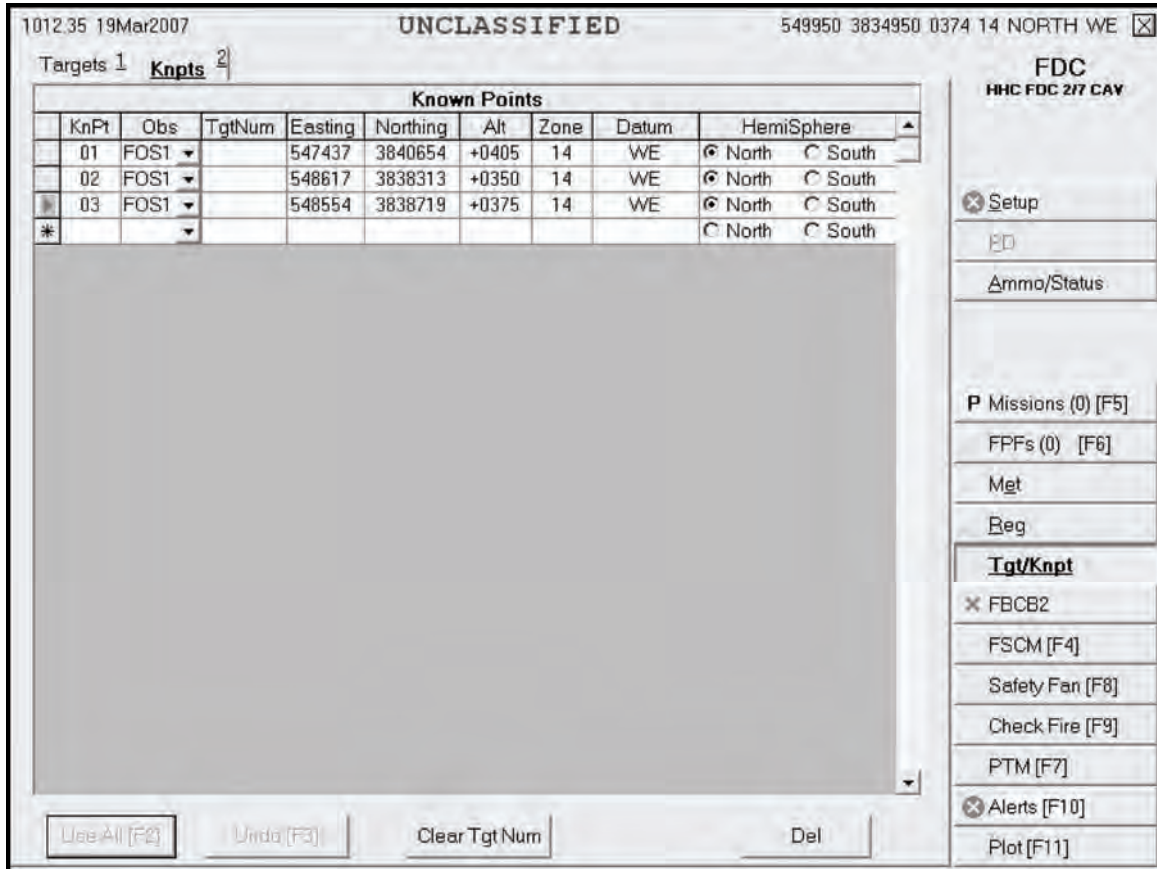


Figure 16-19. Known Points screen.

ILLUMINATION MISSION

16-46. Illumination missions are used to reveal the location of enemy forces hidden by darkness. The following screen captures use the grid method of target location to illustrate the procedures, but the same methods apply to targets located using the polar plot and shift from a known point methods of target location.

16-47. The procedures for an illumination mission are generally the same as the ones described for a digital CFF; therefore, only the general procedures, sequence, and differences in the procedures are described.

NEW CALL FOR FIRE SCREEN

16-48. Upon receipt of a fire mission, the Missions button is highlighted. The operator selects the Missions button to display the mission data on a New CFF screen (Figure 16-20). The operator can accept the mission by selecting the Process button or refuse it by selecting the MTO Deny button.

- If there is an error beyond FDC control, the only choice is MTO Deny.
- The Mission Data screen appears when the Process button is selected.

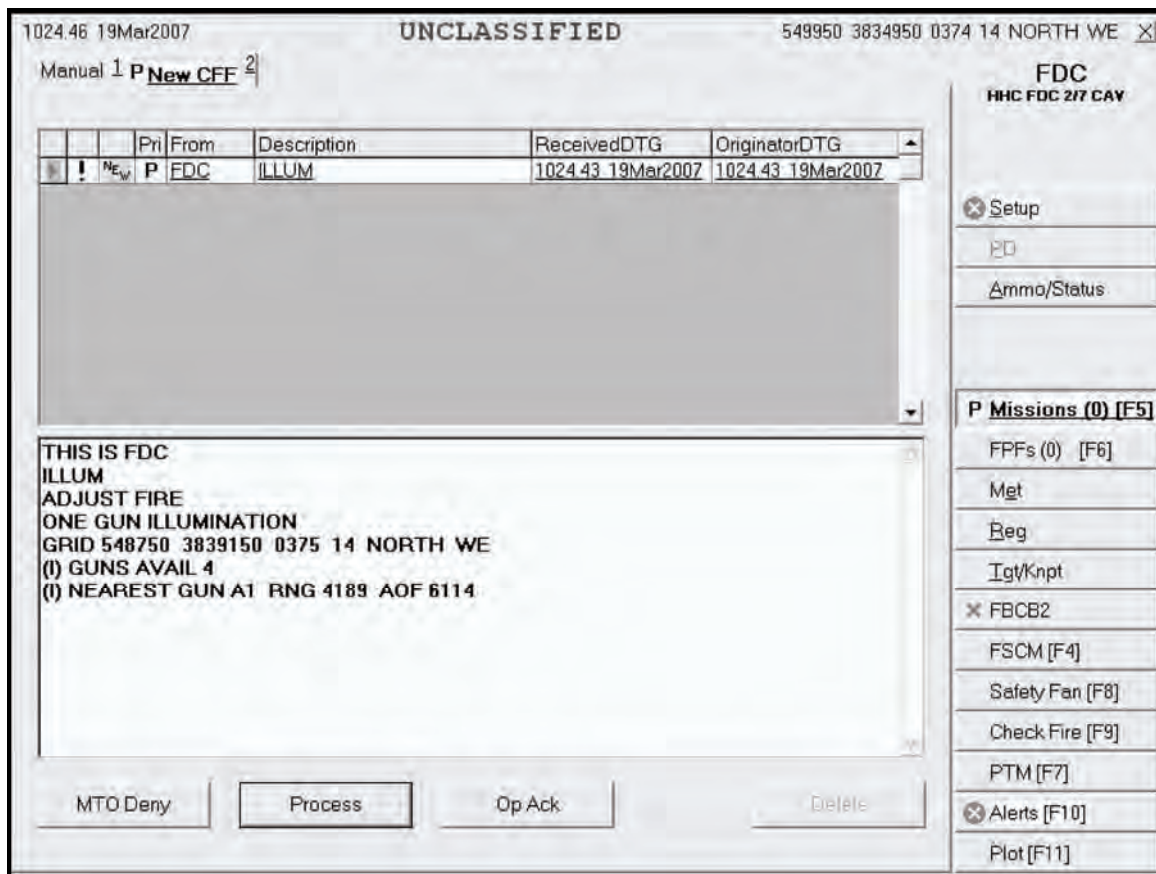


Figure 16-20. New Call for Fire screen.

MISSION DATA SCREEN

16-49. The Mission Data screen (Figure 16-21) presents mission data and a new target number. It allows the operator to review mission data and make any necessary adjustments. Guns for the mission are preselected, but the operator can modify the selection by checking the box beside any OpRdy gun. In a one-gun illumination mission, when deselecting one gun and selecting another, the ammunition and sheaf selections in the Fire Command fields automatically change to an HE round and linear sheaf. The operator must reselect the correct shell, and the sheaf automatically defaults to “1 Gun IL.” If necessary, the operator makes adjustments to the mission data. For example, he may change the MOC from WR to AMC. Then, he selects the Use All button to display the Solution screen.

NOTE: Two-gun lateral sheaves are recommended for area targets, and two-gun illumination sheaves are recommended for point targets. The standard coverage for 120-mm mortar illumination is 1,500 meters.

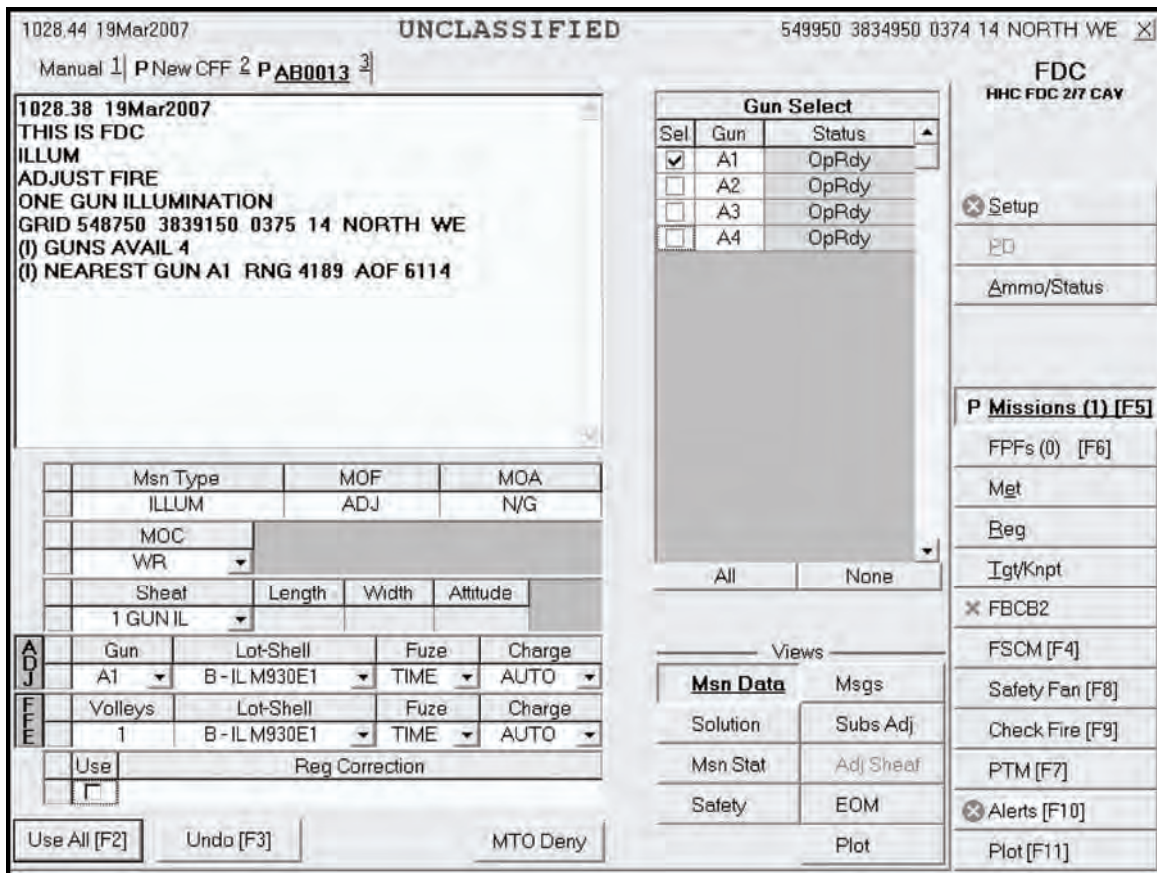


Figure 16-21. Mission Data screen.

SOLUTION SCREEN

16-50. The Solution screen (Figure 16-22) allows the operator to—

- View and send gun orders.
- Review the selected guns, and any errors and warnings.
- Review gun status.
- Change the gun selection based on errors and warnings received.

16-51. The operator uses this screen to review, change, and record the mission data. The operator can either accept (MTO Accept) or refuse (MTO Deny) the mission.

- If the indicated errors cannot be corrected, the operator's only choice is MTO Deny.
- If the indicated warnings cannot be corrected, the operator can continue the mission, if authorized.

16-52. The operator can change the guns selected based on errors and warnings.

The screenshot displays the 'Solution' screen with the following components:

- Header:** 1035.08 19Mar2007, UNCLASSIFIED, 549950 3834950 0374 14 NORTH WE
- Manuals:** Manual 1 | P New CFF 2 | P AB0013 3
- Gun Orders Table:**

Gun	MOF	MOC	Lot	Chrg	Azim	Defl	Elev	TOF	FS
A1	FFE	WR	B	3	6113.2	2687	1198.0	46.1	45.5
- Gun Select Table:**

Sel	Gun	Status
<input checked="" type="checkbox"/>	A1	OpRdy
<input type="checkbox"/>	A2	OpRdy
<input type="checkbox"/>	A3	OpRdy
<input type="checkbox"/>	A4	OpRdy
- Errors and Warnings Table:**

Gun	Description
- Views:** Msn Data, Msgs, **Solution**, Subs Adj, Msn Stat, Adj Sheaf, Safety, EOM, Plot
- Buttons:** MTO Accept, Send Gun Orders, MTO Deny
- Right Panel (FDC HHC FDC 2/7 CAY):**
 - Setup
 - FD
 - Ammo/Status
 - P Missions (1) [F5]
 - FPFs (0) [F6]
 - Met
 - Reg
 - Igt/Knpt
 - FBCB2
 - FSCM [F4]
 - Safety Fan [F8]
 - Check Fire [F9]
 - PTM [F7]
 - Alerts [F10]
 - Plot [F11]

Figure 16-22. Solution screen.

SAFETY DATA SCREEN

16-53. Before sending gun orders or at any time during the mission, the operator can check the safety data by selecting the Safety Data button. This screen (Figure 16-23) includes the location and altitude of burst, and the impact point of the canister. The Plot button is available to review the plot at any time during the mission.

1036.52 19Mar2007 UNCLASSIFIED 549950 3834950 0374 14 NORTH WE X

Manual 1 | P New CFF 2 | P AB0013 3

Safety Data

Gun	MOC	AimPt Easting	AimPt Northing	AimPt Alt	Burst Ht	Burn Time	AimPt Range	AimPt Azim	Max Ord	Grid Decl	Canister Easting	Canister Northing
A1	WR	548750	3839150	+0375	450	50	4189	6114	03219	-005.5	548704	3839310

Views

Msn Data	Msgs
Solution	Subs Adj
Msn Stat	Adj Sheaf
Safety	EOM
	Plot

Setup
 PD
 Ammo/Status
P Missions (1) [F5]
 FPFs (0) [F6]
 Met
 Reg
 Igt/Knpt
 FBCB2
 FSCM [F4]
 Safety Fan [F8]
 Check Fire [F9]
 PTM [F7]
 Alerts [F10]
 Plot [F11]

Figure 16-23. Safety Data screen.

SOLUTION SCREEN

16-54. Once the operator is satisfied with the mission and safety data, he returns to the Solution screen (Figure 16-24) and selects the Send Gun Orders button. He also confirms the order by selecting Yes in the box with the message “Confirm Send Gun Orders Yes/No.” A Send Status box is then displayed, showing the destination and status.

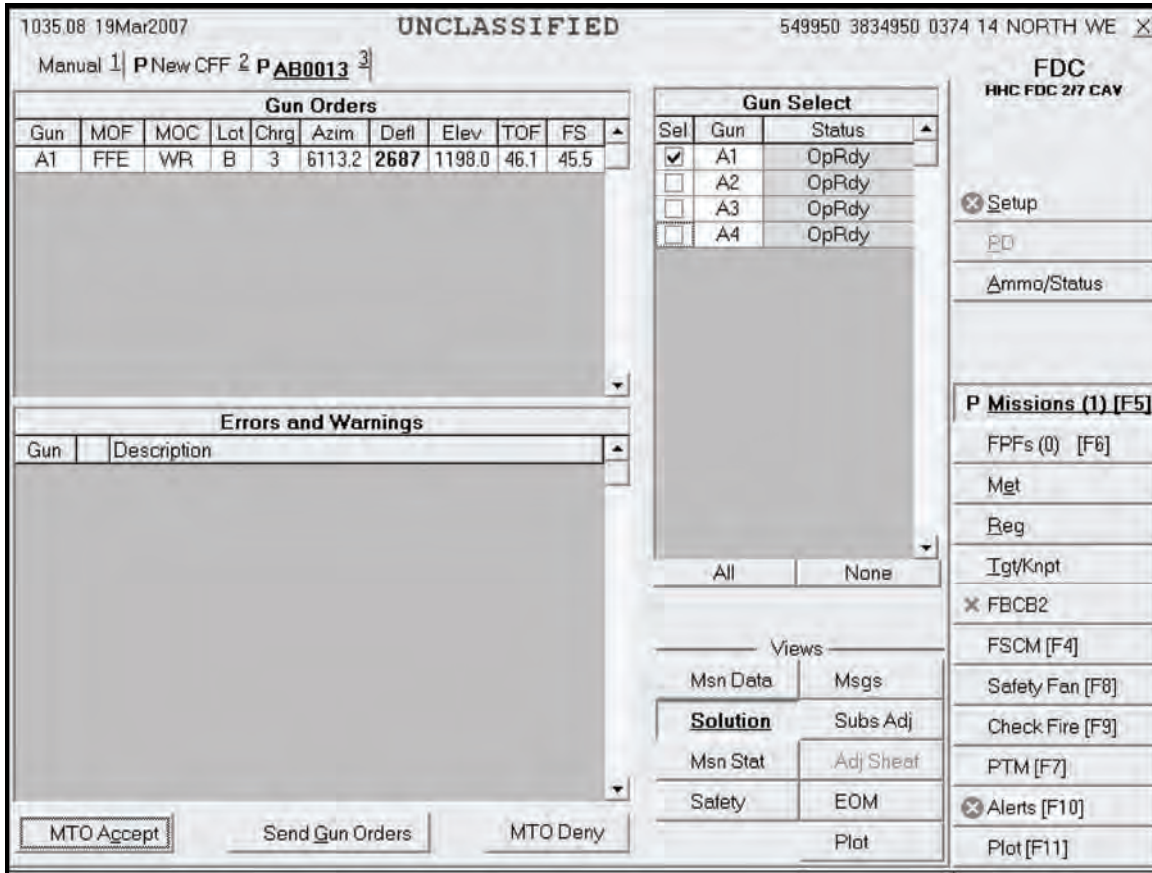


Figure 16-24. Solution screen.

MISSION STATUS SCREEN

16-55. When the operator sends gun orders, the Mission Status screen (Figure 16-25) appears, and the words “Gun Orders Sent” are displayed in the Views section. The Fire button is displayed because the MOC was AMC. When the guns send “Ready,” the Ready button is shaded, and the operator can select the Fire button when required or when ordered by the FO or FC. The mission is monitored from this screen. The operator updates the status of the guns (Ready, Shot, Rounds Complete, and Abort) from this screen, and the MFCS automatically sends this information to the FC or FO.

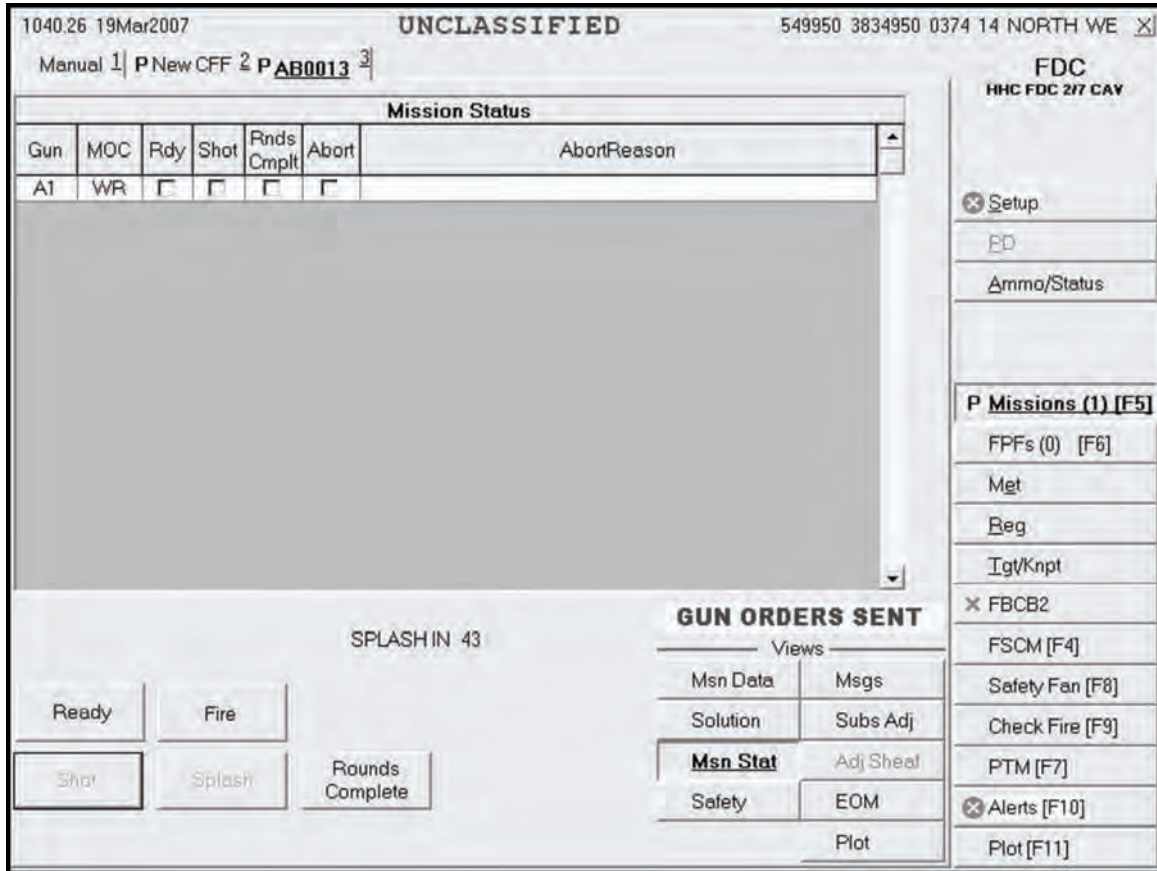


Figure 16-25. Mission Status screen.

SUBSEQUENT MESSAGES ADJUST FIRE

16-56. When the operator selects the Msgs button, the Messages screen (Figure 16-26) appears, and the operator waits for subsequent messages from the FO or FC. Upon receipt of an adjust fire message, data are recorded, and the operator acknowledges receipt. The operator has a choice to Process or Delete the adjustment. When Process is selected, the Mission Data screen is displayed. The operator makes the necessary adjustments to the data and selects the Solution or Use All button.

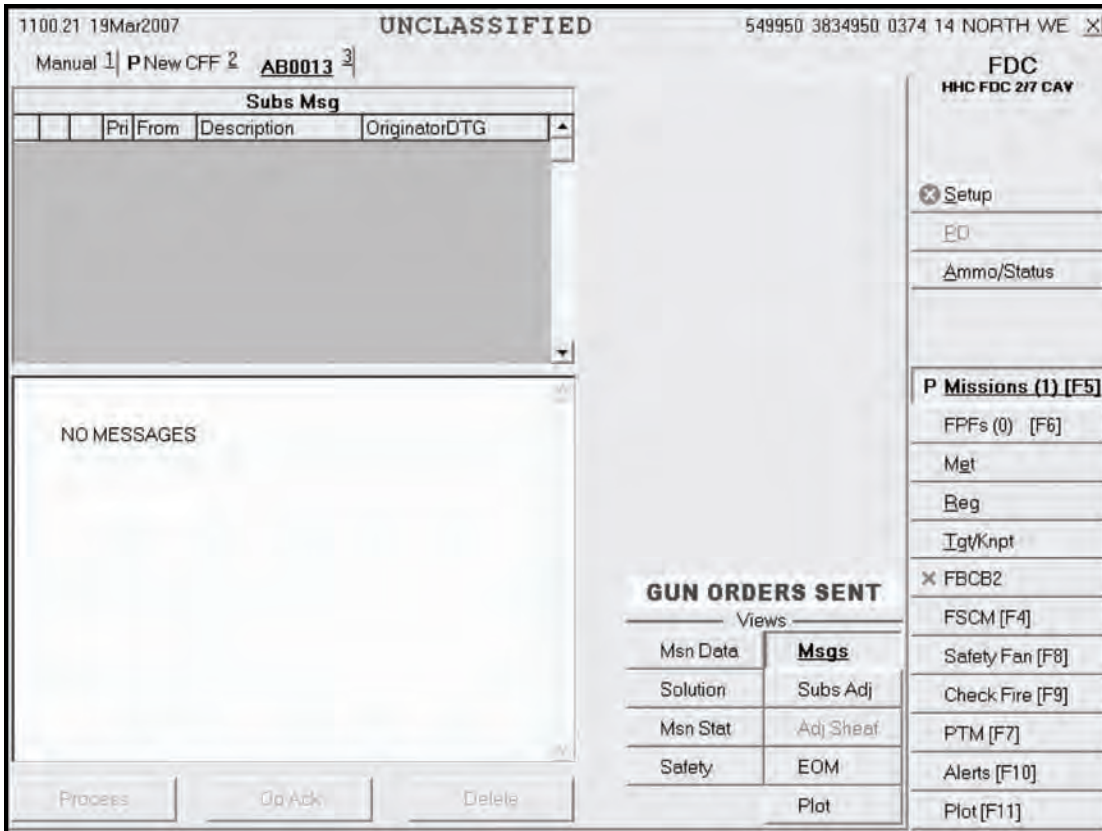


Figure 16-26. Messages screen.

16-57. To complete the illumination mission, the operator continues to make adjustments to the illumination until he receives an EOM message or another mission, such as coordinated illumination, from the FO or FC.

16-58. The FC or FO contacts the FDC to “Mark Illumination,” and the operator records the mark time. The MFCS operator also sends a plain text message to the illumination gun to inform the squad leader that the illumination has been marked and that he needs to maintain a minimum of three to five rounds with the current data. The mission stays open in case corrections are needed later.

COORDINATED ILLUMINATION MISSION

16-59. Illumination fires are often coordinated with HE fires to expose and kill or suppress the enemy. This mission is essentially two separate fire missions, with the operator alternating between the illumination and HE fire missions by clicking the tabs for each mission. The type of round and fuze combination used with illumination depends on the type of target. For example, HE is used for troops in open areas, and WP used for a suspected POL point. There are three parts to a coordinated illumination mission:

- Adjustment of the illumination and ordering its fire during the HE adjustment and FFE.
- The adjustment of the HE.
- The coordination of illumination and HE fires.

ADJUSTMENT AND FIRING OF THE ILLUMINATION

16-60. The adjustment and firing of the illumination mission is similar to that of the digital fire mission. Illumination is fired and, if necessary, adjusted throughout the coordinated illumination mission. Once the illumination is adjusted, the operator receives a subsequent adjust message for FFE for the illumination gun mission and processes it without adjustments using the Mission Status screen. During the HE adjustment and FFE, the operator receives subsequent messages (from the FO) to fire illumination in coordination with the HE. To do this, he alternates between the Illumination Mission tab and the HE Mission tab. After the illumination is adjusted, the method of command for both fires is changed from WR to AMC.

HIGH-EXPLOSIVE ADJUSTMENT

16-61. In illumination missions, the procedures associated with HE adjustment are similar those that occur during the adjustment phase of a basic digital mission.

- (1) Upon receipt of a fire mission, the Missions button is highlighted. The operator selects the Missions button, and a New CFF tab appears.

NOTE: Because of present software limitations, the CFF message states that this is an illumination mission, but it also serves for a coordinated illumination mission.

The operator decides whether to deny or process the mission. If the mission is acceptable, he records the data and selects Process.

- (2) The screen now displays the mission data. The operator processes the mission in the same way and uses the same screens as he would for a regular HE adjustment, except for the MOC. The MOC is changed from WR to AMC. After making any other adjustments to the data, he selects Use All, and the Solution screen appears.
- (3) The Solution screen shows the gun orders, the guns selected, and errors and warnings. This screen allows the operator to review the gun status and to change the gun selection based on errors and warnings received. From this screen, the operator can select MTO Deny (if necessary) or MTO Accept, and send gun orders.
- (4) Before sending the gun orders, the operator checks the safety data by selecting the Safety Data button (he can also check the Plot screen). He reviews and records the safety data and selects the Solution button to return to the Solution screen.
- (5) When ready, the operator selects Send Gun Orders and confirms the order. A Send Status box showing the destination and status now appears.
- (6) The Mission Status screen appears, displaying the words "Gun Orders Sent." The mission is monitored from this screen. Gun status is checked off as completed, and messages are automatically sent to the FO or FC. When the adjusting HE gun sends "Ready," the operator begins coordinating the illumination and HE fires.
- (7) A Subsequent Adjust message is received for the illumination gun mission. The operator processes the mission without adjustment and selects the Fire button.
- (8) The operator waits for the appropriate mark time and clicks the Fire button for the HE mission.
- (9) The operator continues to perform the steps above until the Subsequent Adjust FFE or EOM message is received.

FIRE FOR EFFECT

16-62. Upon receipt of the Subsequent Adjust FFE message, the operator records the data and can either process or delete the mission. Selecting Process displays the Mission Data screen.

- (1) The operator changes the method of command from WR to AMC. When complete, he selects the Use All or Solution button.
- (2) At the Solution screen, the operator reviews and records data. He also checks the Safety Data and Plot screens. Then, he selects the Solution button to return to the Solution screen. When satisfied, the operator selects Send Gun Orders and confirms the order. Then, he waits for all guns to report a "Ready" status.

- (3) A Subsequent Adjust message is received for the illumination gun mission. The operator processes the mission without adjustment and selects the Fire button.
- (4) The operator waits for the splash signal and the appropriate mark time. He then selects Fire for the HE mission.
- (5) When each gun reports "Rounds Complete," a checkmark appears in the Rnds Complt box. The operator then responds to any subsequent messages.
- (6) When the EOM message is received, the HE mission can be saved as a target. The operator discards or saves the mission using the procedures described in paragraphs 16-24 and 16-25. He can save it manually by following the instructions in paragraphs 16-36 to 16-39.
- (7) The operator also ends the illumination mission but does not save it.

**CALL FOR FIRE FROM FIRE SUPPORT ELEMENT OR FORWARD OBSERVER —
ILLUMINATION AND COORDINATED ILLUMINATION POLAR PLOT MISSION**

16-63. These missions are conducted the same way as grid missions, but the New CFF screen has the Polar method checked.

**CALL FOR FIRE FROM FIRE SUPPORT ELEMENT OR FORWARD OBSERVER—ILLUMINATION
AND COORDINATED ILLUMINATION SHIFT FROM A KNOWN POINT MISSION**

16-64. These missions are conducted the same way as grid missions, but the New CFF screen has the Shift method checked. The FO automatically converts a shift from a known point mission to a grid mission before the FDC receives it. The location is not as precise as a regular grid mission since the last digits of the direction, the lateral displacement distance, and the range displacement distance are automatically changed to zero.

MANUAL ILLUMINATION AND COORDINATED ILLUMINATION MISSIONS

16-65. Procedures for a manual mission are similar to those for a digital mission. The only differences are that the operator must manually initiate the CFF, manually select Subs Adj whenever a subsequent adjust is warranted, and manually click EOM to end the mission.

NOTE: See paragraphs 16-13 through 16-25 for details on manual missions.

FINAL PROTECTIVE FIRES

16-66. An FPF is an immediately available, prearranged barrier of fire designed to impede enemy movement across defensive lines or areas. The MFCS can store up to three FPFs at a time. If an active mission is in progress and an FPF order is received, the FPF mission has the higher priority.

NOTE: This paragraph uses a grid mission to illustrate the process of receiving, adjusting, saving, and firing an FPF. Missions using the polar plot or shift from a known point method to locate the FPF are conducted the same way.

NEW CALL FOR FIRE

16-67. Upon receipt of a fire mission, the Missions button is highlighted, and the audio alarm sounds (if enabled). The operator selects the Missions button, and the New CFF screen (Figure 16-27) appears. The message contains the words “Assign FPF.” The operator selects OpAck to deactivate the audio alarm and acknowledge receipt of the message. If the mission is acceptable, he selects Process.

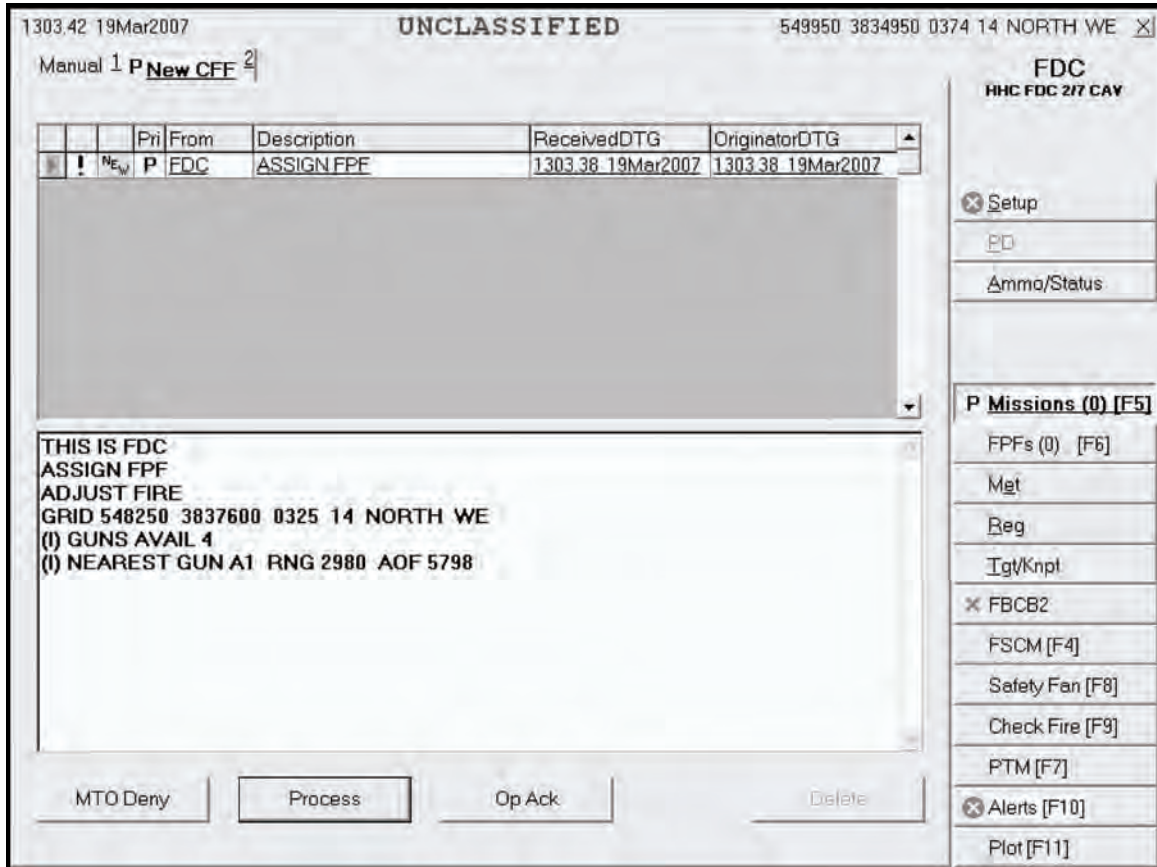


Figure 16-27. New Call for Fire screen.

MISSION DATA SCREEN

16-68. The operator selects Process and the FPF button; the screen displays a New FPF Target Number tab and the Mission Data screen (Figure 16-28). Guns for the mission are preselected by the software, but can be modified by the operator. If necessary, the operator makes adjustments to the mission data. In Figure 16-28, the MOF is ADJ, and the MOA is danger close; these fields are auto-filled and read-only. The MOC is AMC. The sheaf defaults to Linear, but the preferred sheaf for an FPF is Special. For a special sheaf, the system allows the operator to enter the length, width, and attitude. Based on the attitude of the target, the operator ensures that the adjusting gun is the one closest to the FPF. Since the FPF mission is also danger close, the preferred fuze to adjust is Delay. In the ADJ section, the operator chooses DLY for Fuze, if available. The Use box is checked automatically when a registration correction is available. If a registration correction is available, the operator has the option to use Reg Correction. If the operator decides not to use it, he selects the checkmark in the Use box to deselect it. If no changes are made, he selects the Solution button or selects Use All to display the Solution screen.

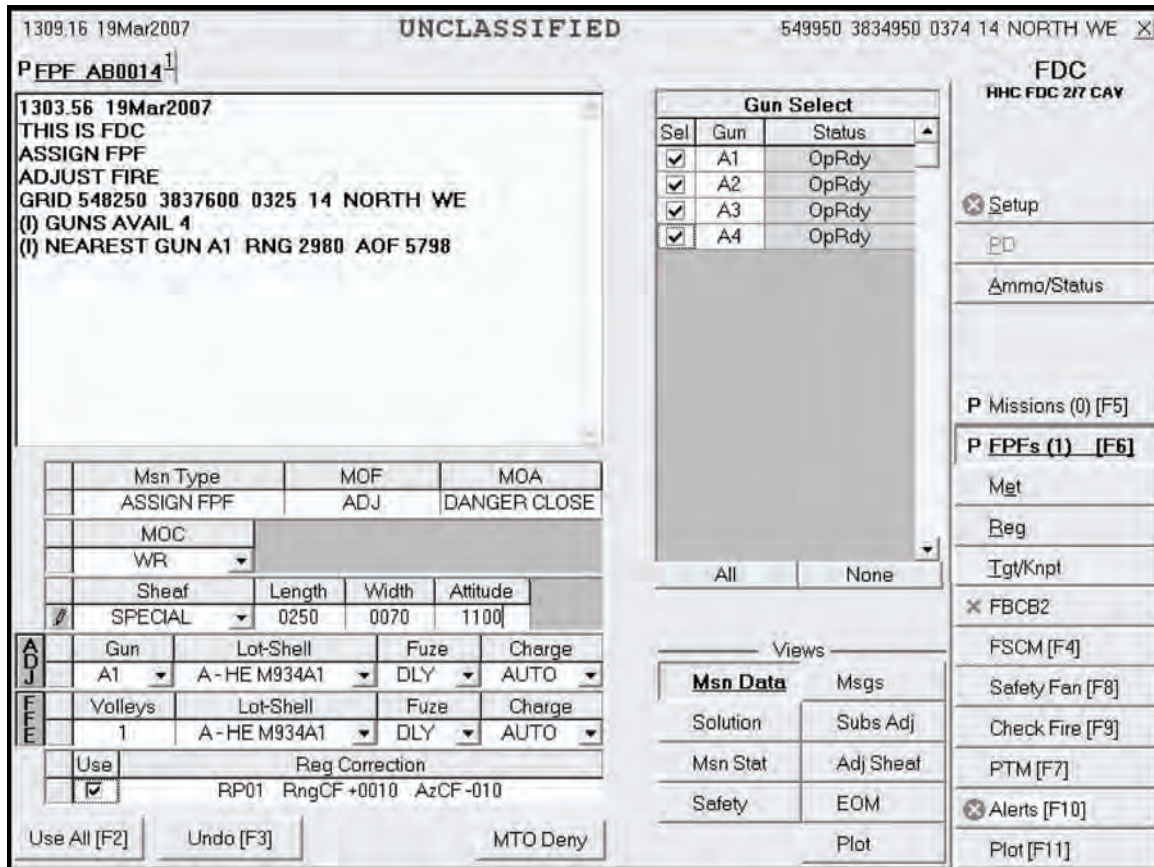


Figure 16-28. Final Protective Fire Mission Data screen.

SOLUTION SCREEN

16-69. In this step, the operator can review the gun status and change the gun selection based on errors and warnings received. He also checks the safety data.

FINAL PROTECTIVE FIRE SOLUTION SCREEN

16-70. The Solution screen (Figure 16-29) shows gun orders, selected guns, and any errors and warnings. It also allows the operator to accept (MTO Accept) or refuse (MTO Deny) a mission, and send gun orders. The operator reviews the screen and records data.

- If any indicated errors cannot be corrected, the operator’s only choice is MTO Deny.
- If any indicated warnings cannot be corrected, the operator can continue the mission, if authorized. If MTO Accept is selected, a green checkmark is displayed before MTO Accept, and MTO Deny is shaded.

16-71. The operator can change the gun selection based on errors and warnings, if necessary.

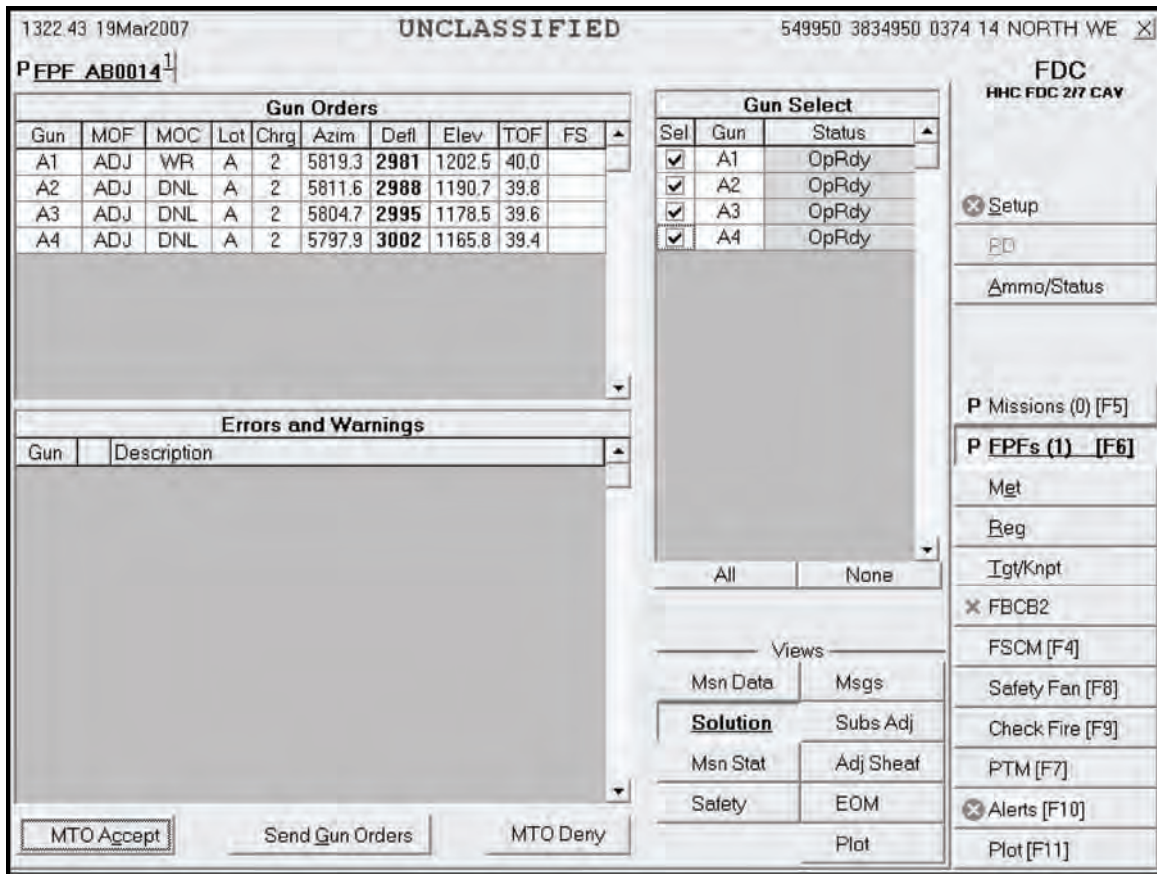


Figure 16-29. Final Protective Fire Solution screen.

SAFETY DATA SCREEN

16-72. Before sending gun orders, the operator checks the safety data by selecting the Safety Data button. The Safety Data screen (Figure 16-30) displays. The operator reviews and records the safety data and, when satisfied, selects the Solution button.

The screenshot shows a software interface for safety data. At the top, it displays '1329.30 23Mar2007', 'UNCLASSIFIED', and '549950 3834950 0374 14 NORTH WE'. Below this is a header 'P FPF AB0015' and a 'Safety Data' table. To the right is a vertical panel labeled 'FDC HHC FDC 217 CAV' with various function buttons. At the bottom right is a 'Views' panel with several options.

Gun	MOC	AimPt Easting	AimPt Northing	AimPt Alt	Burst Ht	Burn Time	AimPt Range	AimPt Azim	Max Ord	Grid Decl	Canister Easting	Canister Northing
A1	WR	548332	3837644	+0325			2972	5830	02309	-005.5		
A2	DNL	548277	3837614	+0325			3040	5822	02291	-005.5		
A3	DNL	548223	3837585	+0325			3108	5815	02272	-005.5		
A4	DNL	548168	3837556	+0325			3176	5809	02251	-005.5		

Views

Msn Data	Msgs
Solution	Subs Adj
Msn Stat	Adj Sheaf
Safety	EOM
	Plot

FDC HHC FDC 217 CAV

- Setup
- PD
- Ammo/Status
- P Missions (0) [F5]
- P FPFs (1) [F6]**
- Met
- Reg
- Igt/Knpt
- × FBCB2
- FSCM [F4]
- Safety Fan [F8]
- Check Fire [F9]
- PTM [F7]
- ⊗ Alerts [F10]
- Plot [F11]

Figure 16-30. Safety Data screen.

NOTE: The Plot screen is available to review the plot at any time during the mission.

SOLUTION SCREEN

16-73. The operator selects Solution to return to the Solution screen (Figure 16-31). In this example, the MOC for the adjusting gun is AMC; do not load (DNL) is the MOC for the other guns. When satisfied that all information is correct, the operator selects Send Gun Orders and confirms them. A Send Status box is displayed, showing the destination and status.

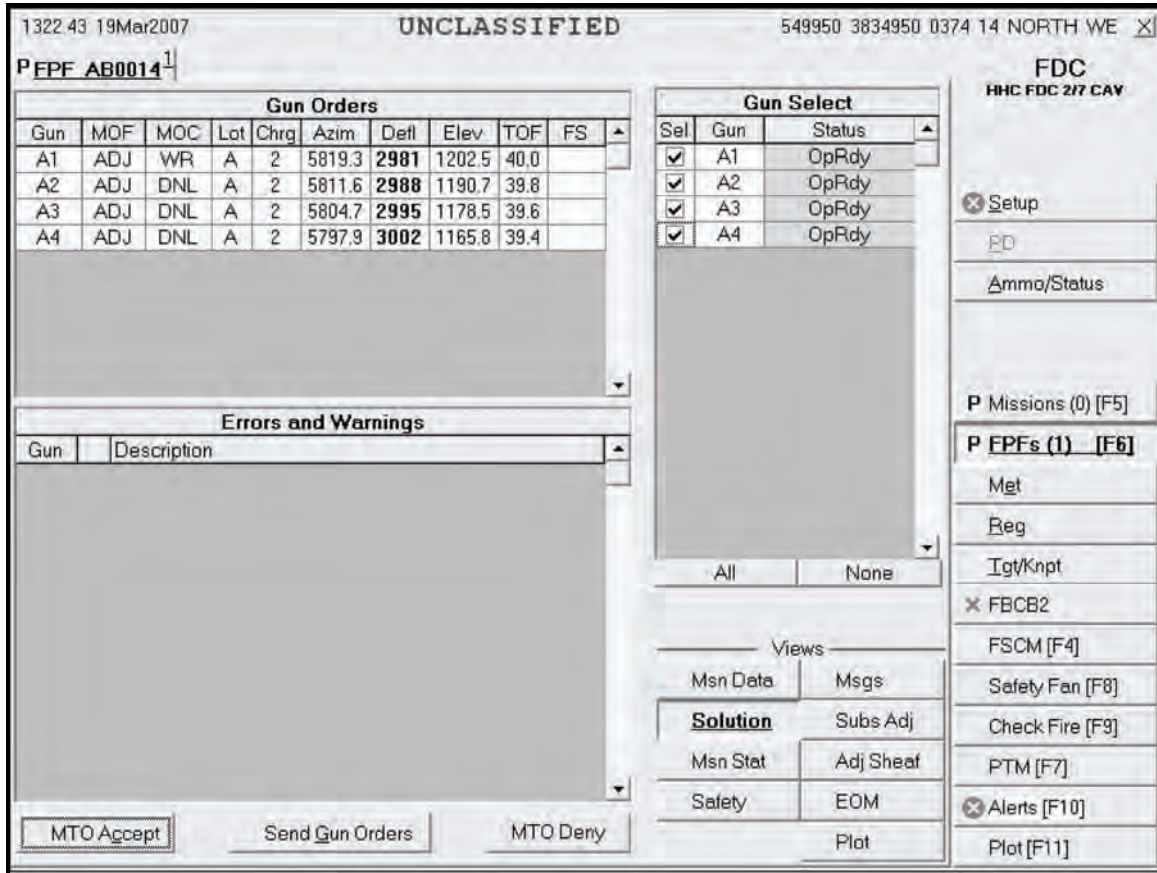


Figure 16-31. Solution screen.

PLOT SCREEN

16-74. The operator may view a graphic depiction of the FPF by choosing the Plot button. The Plot screen (Figure 16-32) displays. The operator may zoom in or out on the image using the slider and may double-click on any point in the image to re-center the image. The operator may place the cursor over any icon to display a description of that icon.

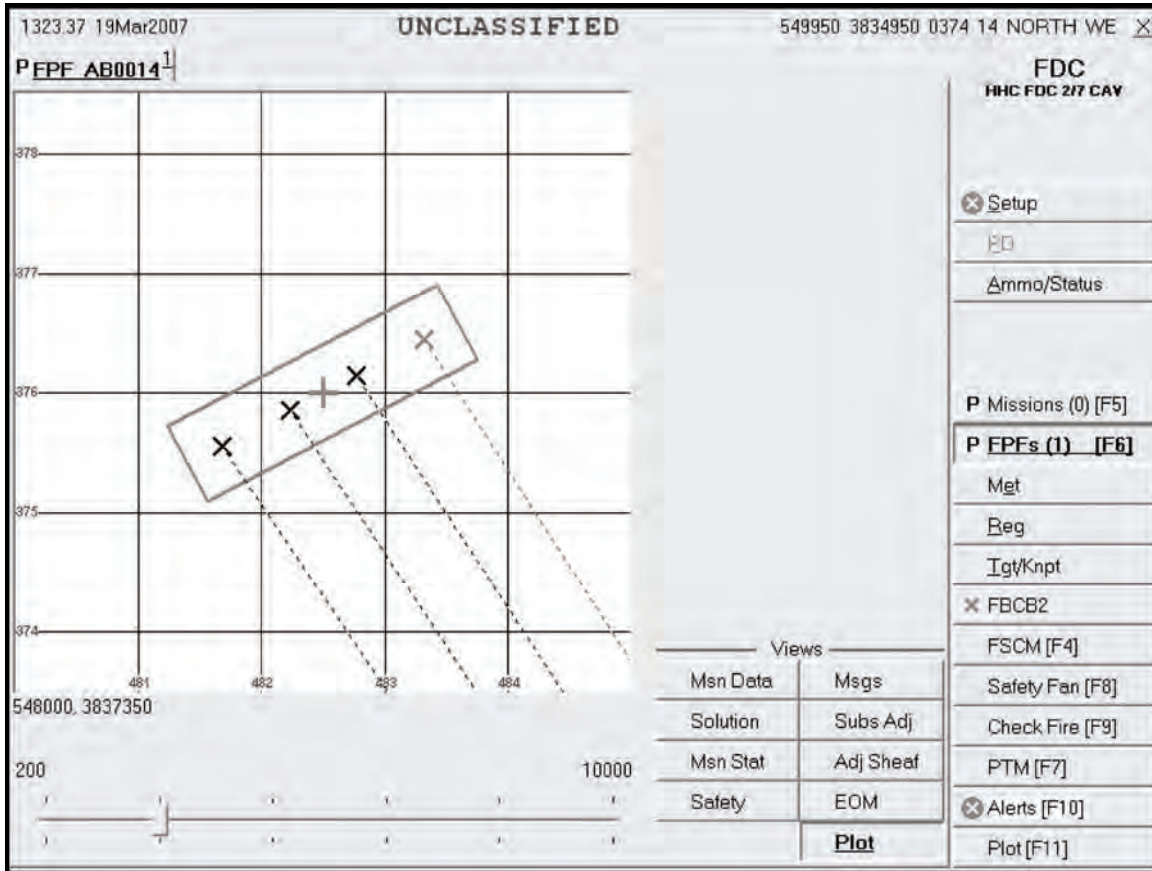


Figure 16-32. Plot screen.

MISSION STATUS SCREEN

16-75. When the operator sends gun orders, the Mission Status screen (Figure 16-33) is displayed, and the words “FPF Orders Sent” are displayed in the Views section. The mission is monitored from this screen. The operator updates the status of the guns (Ready, Shot, Rounds Complete, and Abort) from this screen, and the MFCS automatically sends this information to the FC or FO.

NOTE: Once gun orders are sent, the operator must process a subsequent adjust before computing and sending a new set of gun orders.

- When the adjusting gun sends “Ready,” the operator selects the Ready button to send the message to the FC or FO.
- If the mission is AMC, the operator receives an order to fire from the FC or FO, and then selects the Fire button. The Fire button is shaded.
- Upon receiving “Shot,” a checkmark appears in the Shot box, the box turns green, and the Shot button is shaded. The time of flight and a red splash are then displayed, and the Splash button is shaded.
- If the gun aborts the mission, a checkmark appears in the Abort box, and the reason for the abort is displayed in the Abort Reason field.

16-76. The operator continues to process the orders until the gun is adjusted.

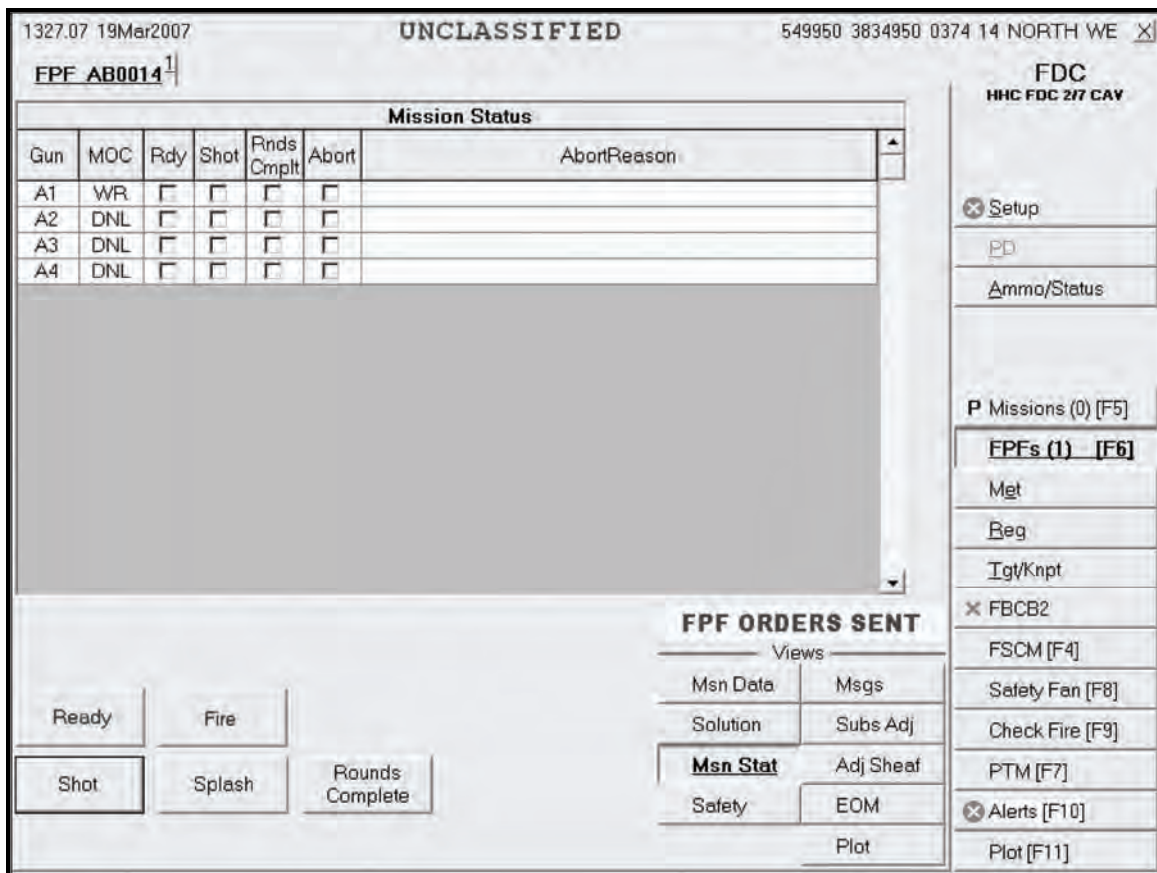


Figure 16-33. Mission Status screen.

SUBSEQUENT MESSAGES TO ADJUST ALL THE GUNS

16-77. Once the first gun is adjusted in the sheaf, the FO may transition to each of the other guns until all are properly adjusted (Figure 16-34). The FDC operator must change the MOF from ADJ to FFE. The Adj Sheaf button becomes active. The operator enters the OT azimuth or, if the OT azimuth is not available or not given, uses the GT azimuth. The operator selects the Adj Sheaf button and enters the correction for each gun by selecting the gun in the Adjustment to Sheaf menu and entering the appropriate correction. Then, he selects the Apply <Gun number> button. The correction displays in relation to the total correction to the easting and the total correction to the northing of the burst point grid for the firing gun.

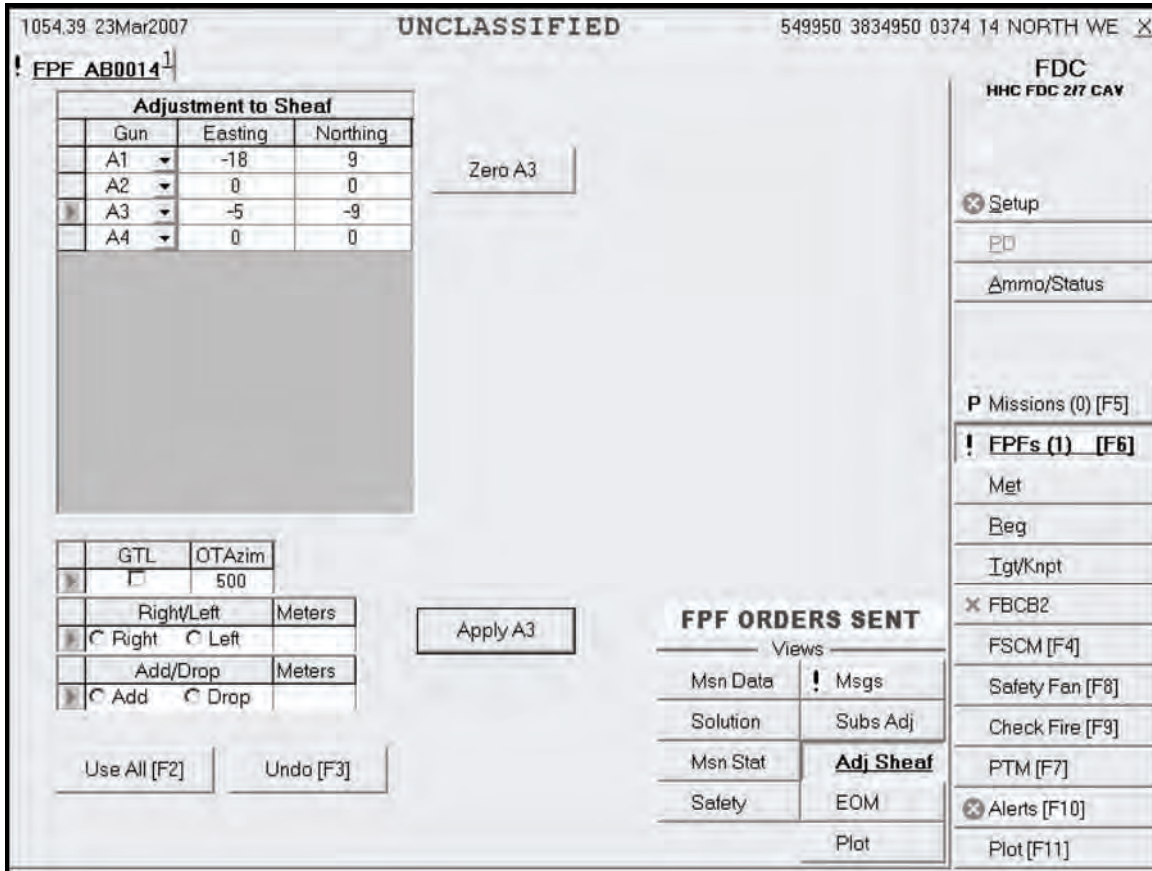


Figure 16-34. Subsequent Adjust screen.

END OF MISSION AND STORE THE FINAL PROTECTIVE FIRE

16-78. When the FO or FC orders an EOM, the operator stores the FPF using the EOM screen (Figure 16-35). The EOM-Store FPF option is the only available selection. The operator selects the down arrow in the Controlling FO field, chooses the correct FO participating in the mission, and then selects Use All. The Subsequent Message screen is displayed, stating “End of Mission” and the target number.

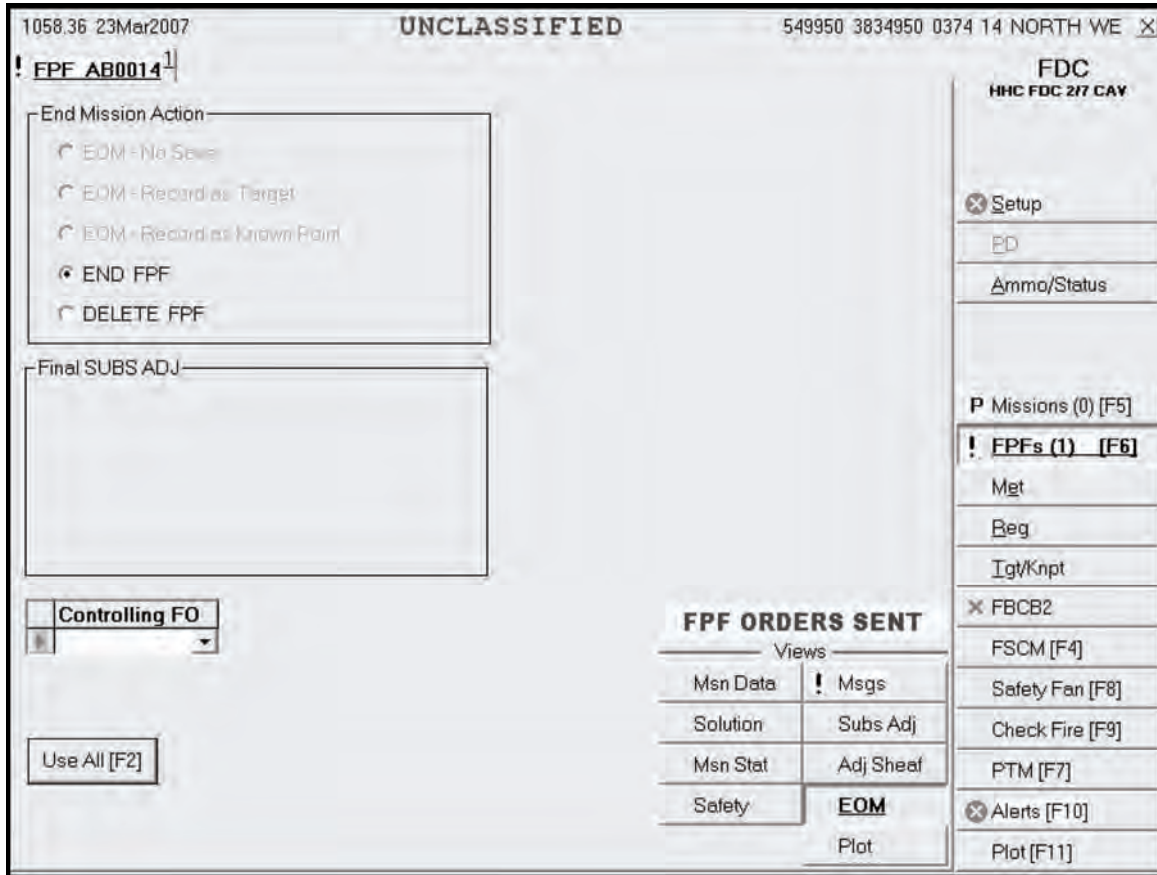


Figure 16-35. Solution End of Mission screen.

Mission Status Screen

16-79. The words "Stored FPF" are displayed in blue letters over the Views section (Figure 16-36). The FPF is stored in the FPF buffer and in the gun FPF buffer until the operator receives a plain text or radio message to fire the FPF.

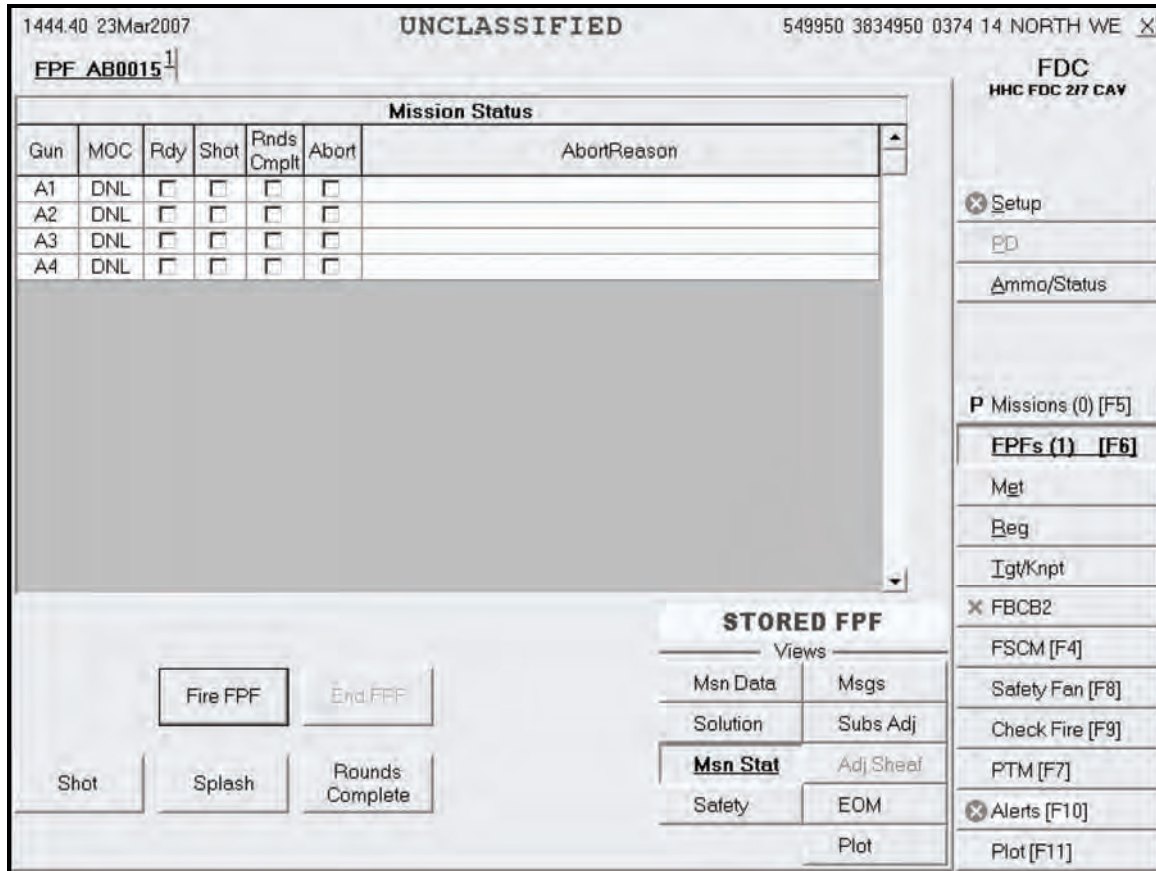


Figure 16-36. Mission Status screen.

CALL FOR FIRE FROM THE FIRE SUPPORT ELEMENT OR FORWARD OBSERVER TO FIRE THE FINAL PROTECTIVE FIRE

16-80. Upon receipt of the fire FPF message, the operator selects FPF to bring up the FPF buffer. He selects the appropriate FPF tab, selects the Msn Stat button in the Views section, and selects Fire FPF. The operator receives a message to "Confirm Send Fire FPF to Guns." He selects OK. The Fire FPF button is shaded, and the End FPF button is displayed. After the guns send "Shot," the Shot and Splash buttons are shaded. When ammunition is exhausted, the Rnds Cmpltd button is shaded, and End FPF becomes available. The operator selects End FPF, receives a message to "Confirm Send End FPF to Guns," and selects OK.

ENDING THE FINAL PROTECTIVE FIRE MISSION

16-81. The operator selects EOM. Delete FPF is the only option. He selects Use All, and the Messages screen (Figure 16-37) appears. The operator selects Process and deletes the active FPF, which sends a “Delete FPF” message to the guns and automatically deletes the FPF from their buffer.

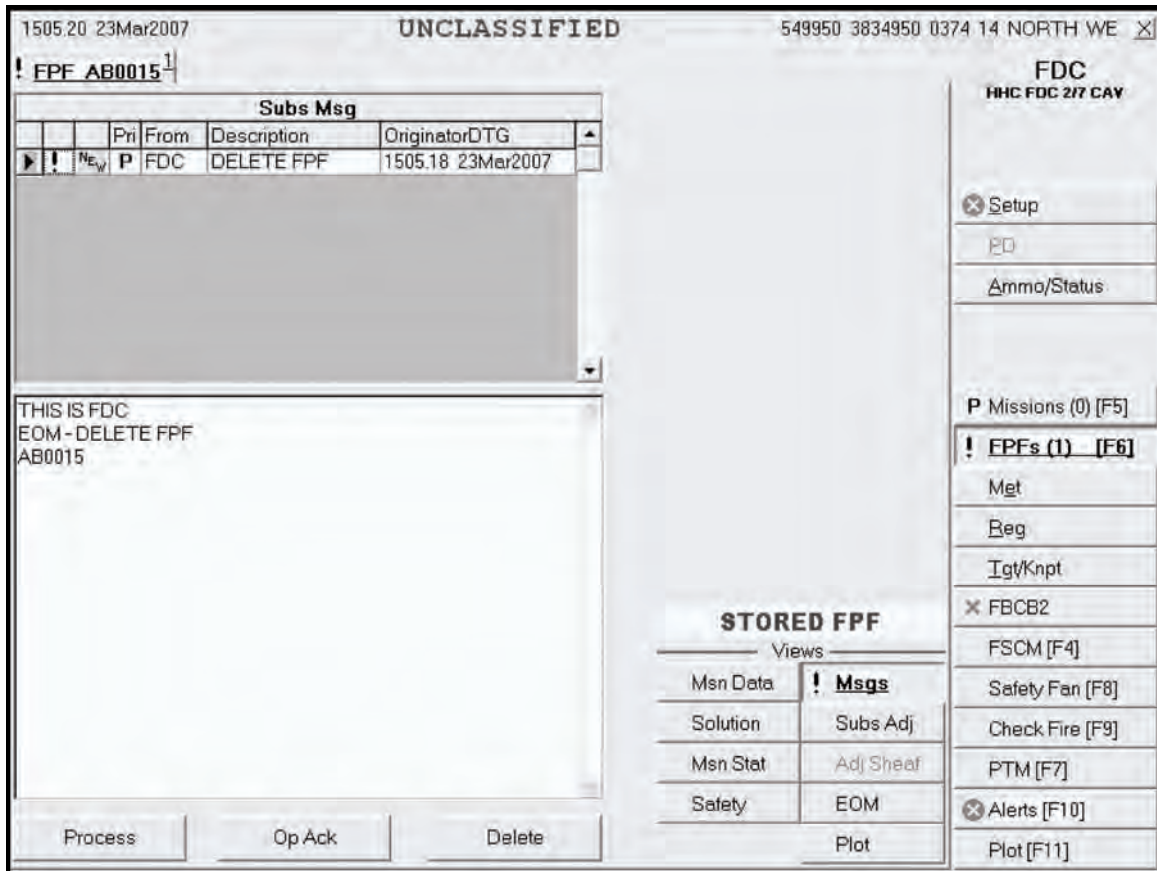


Figure 16-37. Messages screen.

MANUALLY CONDUCTED FINAL PROTECTIVE FIRE MISSIONS

16-82. Procedures for a manual FPF mission are similar to those for a digital mission. The only differences are that the operator must manually initiate the CFF, manually process all adjustments, and manually select EOM to end the mission.

SMOKE MISSIONS

16-83. Smoke missions are used to conceal ground maneuver, obstacle breaching, and recovery operations, as well as key assembly areas, supply routes, and logistical facilities. The two types of smoke missions are quick and immediate.