

MICROCOPY RESOLUTION TEST CHART  
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FINAL REPORT

SOFTWARE DEVELOPMENT AND WEAPONS SYSTEM TEST SUPPORT

Prepared by:

Laser and Optical Test Group  
Test and Evaluation Directorate  
US Army Missile Laboratory  
US Army Missile Command  
and  
Science Applications, Inc.  
Huntsville, Alabama  
under  
Purchase Order DAAH01-84-P-0339

31 January 1984



**U.S. ARMY MISSILE COMMAND**

*Redstone Arsenal, Alabama 35898*

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PREFACE

The activities and tasks described in this report are the results of work performed by Science Applications, Inc. under Purchase Order DAAH01-84-P-0339 for the US Army Missile Command, Redstone Arsenal, Alabama.

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*Keywords:*  
*video data processing;*  
*FFT/ST (Automated Laser Instrumentation)*  
*Measurement (System)*

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## INTRODUCTION

The task documented herein was performed under Purchase Order DAAH01-84-P-0339 in support of the HELLFIRE and TOW programs. This support included software modifications and development, system maintenance, and weapons system test support in the form of data reduction and processing. → 5.81

## A. MISSILE POSITION-IN-SPACE SOFTWARE SUPPORT

The Laser and Optical Test Group was tasked with determining the potential of using digitized video image analysis to compute the spatial position of missiles in flight. It was felt that the video data could then be combined with range position data recorded from the laser doppler velocimeter to calculate position-in-space of a missile as it travels along its flight path.

The video data was recorded using a silicon vidicon camera and a Sony video cassette recorder. They are typically the devices employed by the group in their video data collection activities during range testing.

### 1. Concept Assumptions

The assumption was that if the camera were aligned in the vertical and horizontal planes of the line-of-sight from the missile launcher to the center of the target, deviations to the left or right and up or down could be readily determined in terms of digitized pixel positions. Down range position could then be acquired by using the laser doppler data.

### 2. Processing Concepts

SAI was tasked to determine the digitized horizontal and vertical (x,y) pixel position of the missile as it flew from the missile launcher to the target. This was accomplished by digitizing the missile beacon or exhaust plume and calculating the weighted x,y centroid of this source.

As a control measure for determining if the camera was shifting or vibrating during missile flight, a reference light source was included in the video scene. The x,y weighted centroid of this reference source was computed prior to missile firing. Its centroid was then computed in each frame of digitized data to detect any change in its position. If a change in the centroid of the reference source did occur, then naturally

provisions would have to be made for corresponding adjustments in the computed missile position. These adjustments were made in the processing phase associated with combining digitized video data with the laser doppler data and were accomplished by Lockheed personnel.

### 3. Video Data Processing

Ten second segments of the analog video tape were stored to the Ampex video disk and analyzed using software program MTAN2. MTAN2 requires manual user interaction on the first frame of a video segment to be processed to define the location of the reference light source and the initial position of the in-flight missile. On each frame thereafter the program tracks the moving missile automatically with no user intervention required.

An actual sample of the software digitizing output file is shown in Table 1 with 556 records encompassing a missile flight time of approximately 20.8 seconds of data. The first line of the data file is descriptive heading information followed by a blank line. After the blank line the data follows.

The following is a column-by-column description of the data contained in the output records.

Data Column 1	Sequential line number for each data record contained in the output file.
Data Column 2	The sequential frame number of the video segment being processed. As shown by the data sample, it begins by counting the first frame as frame 0.
Data Columns 3 - 7	These columns contain the IRIG time of the frame being processed. The time is expressed as days, hours, minutes, seconds, and tens of milliseconds.

- \*Data Column 8 -  
Track XX                      The video disk track number of the current frame as it was processed.
- Data Column 9 -  
X(P):XX                      The computed X pixel position of the weighted centroid of the digitized missile beacon or exhaust plume.
- Data Column 10 -  
Y(P):XX                      The corresponding data for Y as in Data Column 9.
- Data Column 11 -  
XC:XX                      The computed X position of the weighted centroid of the digitized reference light source in each video frame processed.
- Data Column 12 -  
YC:XX                      The corresponding data for Y as in Data Column 11.
- \*Data Column 8 -  
No Shot                      This entry is placed in the data record in those cases where the intensity of the missile beacon or exhaust plume is too low in intensity to be detected by the processing software.

SAI processed three of these test runs. These runs were stored on 9 track, 800 BPI magnetic tape and delivered to Lockheed personnel for combining with the laser doppler velocimeter data for further processing.

TABLE 1. Software Digitizing Output File

THE FOLLOWING  
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PAGES

EFV25H T=00003 IS ON CR00054 USING 00148 BLS R=0000

***+ MIANE DATA REDUCTION -- EFV25H											
0001	1										
0002											
0003	0	209	18:59:53:08	TRACK	40	XCF(1)	179	YCF(1)	384	NO	181
0004	1	209	18:59:53:11	TRACK	41	XCF(1)	190	YCF(1)	390	NO	182
0005	2	209	18:59:53:14	TRACK	42	XCF(1)	184	YCF(1)	380	NO	181
0006	0	209	18:59:53:17	TRACK	43	XCF(1)	181	YCF(1)	359	NO	180
0007	1	209	18:59:53:19	TRACK	44						
0008	2	209	18:59:53:19	TRACK	45	XCF(1)	192	YCF(1)	359	NO	180
0009	3	209	18:59:54:02	TRACK	46	XCF(1)	195	YCF(1)	236	NO	185
0010	0	209	18:59:54:06	TRACK	47	XCF(1)	275	YCF(1)	238	NO	184
0011	1	209	18:59:54:09	TRACK	48	XCF(1)	213	YCF(1)	235	NO	184
0012	2	209	18:59:54:12	TRACK	49	XCF(1)	297	YCF(1)	329	NO	184
0013	0	209	18:59:54:16	TRACK	50	XCF(1)	305	YCF(1)	310	NO	185
0014	1	209	18:59:54:19	TRACK	51	XCF(1)	313	YCF(1)	299	NO	182
0015	2	209	18:59:54:22	TRACK	52	XCF(1)	312	YCF(1)	282	NO	182
0016	0	209	18:59:54:26	TRACK	53	XCF(1)	314	YCF(1)	261	NO	187
0017	1	209	18:59:54:29	TRACK	54	XCF(1)	314	YCF(1)	250	NO	187
0018	0	209	18:59:54:33	TRACK	55	XCF(1)	307	YCF(1)	232	NO	187
0019	1	209	18:59:54:36	TRACK	56	XCF(1)	308	YCF(1)	227	NO	187
0020	0	209	18:59:54:43	TRACK	57	XCF(1)	292	YCF(1)	227	NO	187
0021	1	209	18:59:54:46	TRACK	58	XCF(1)	291	YCF(1)	234	NO	187
0022	2	209	18:59:54:49	TRACK	59	XCF(1)	291	YCF(1)	242	NO	187
0023	3	209	18:59:54:53	TRACK	60						
0024	0	209	18:59:54:53	TRACK	61	XCF(1)	276	YCF(1)	270	NO	200
0025	1	209	18:59:54:56	TRACK	62	XCF(1)	276	YCF(1)	278	NO	200
0026	0	209	18:59:54:56	TRACK	63	XCF(1)	297	YCF(1)	292	NO	200
0027	1	209	18:59:54:54	TRACK	64	XCF(1)	299	YCF(1)	301	NO	200
0028	2	209	18:59:54:57	TRACK	65	XCF(1)	286	YCF(1)	305	NO	200
0029	0	209	18:59:54:57	TRACK	66	XCF(1)	313	YCF(1)	305	NO	197
0030	1	209	18:59:54:10	TRACK	67	XCF(1)	313	YCF(1)	303	NO	197
0031	2	209	18:59:54:13	TRACK	68	XCF(1)	312	YCF(1)	299	NO	197
0032	0	209	18:59:54:16	TRACK	69	XCF(1)	317	YCF(1)	295	NO	199
0033	1	209	18:59:54:11	TRACK	70	XCF(1)	319	YCF(1)	291	NO	199
0034	2	209	18:59:54:14	TRACK	71	XCF(1)	320	YCF(1)	286	NO	199
0035	0	209	18:59:54:16	TRACK	72	XCF(1)	322	YCF(1)	283	NO	200
0036	1	209	18:59:54:19	TRACK	73	XCF(1)	340	YCF(1)	281	NO	200
0037	0	209	18:59:54:19	TRACK	74	XCF(1)	362	YCF(1)	279	NO	201
0038	1	209	18:59:54:19	TRACK	75						
0039	0	209	18:59:55:05	TRACK	76	XCF(1)	401	YCF(1)	274	NO	200
0040	1	209	18:59:55:08	TRACK	77	XCF(1)	426	YCF(1)	271	NO	200
0041	2	209	18:59:55:11	TRACK	78	XCF(1)	436	YCF(1)	262	NO	200
0042	3	209	18:59:55:15	TRACK	79						
0043	4	209	18:59:55:18	TRACK	80	XCF(1)	457	YCF(1)	263	NO	200
0044	5	209	18:59:55:21	TRACK	81	XCF(1)	462	YCF(1)	267	NO	200
0045	6	209	18:59:55:25	TRACK	82						
0046	7	209	18:59:55:28	TRACK	83	XCF(1)	460	YCF(1)	269	NO	200
0047	8	209	18:59:55:31	TRACK	84						
0048	9	209	18:59:55:35	TRACK	85	XCF(1)	463	YCF(1)	250	NO	200
0049	10	209	18:59:55:38	TRACK	86	XCF(1)	462	YCF(1)	257	NO	200
0050	11	209	18:59:55:41	TRACK	87						
0051	12	209	18:59:55:45	TRACK	88	XCF(1)	455	YCF(1)	243	NO	200
0052	13	209	18:59:55:48	TRACK	89	XCF(1)	455	YCF(1)	250	NO	200
0053	14	209	18:59:55:51	TRACK	90						
0054	15	209	18:59:55:55	TRACK	91						
0055	16	209	18:59:55:58	TRACK	92						
0056	17	209	18:59:55:51	TRACK	93	XCF(1)	449	YCF(1)	247	NO	200
0057	18	209	18:59:55:55	TRACK	94	XCF(1)	450	YCF(1)	245	NO	200
0058	19	209	18:59:55:58	TRACK	95						

0064	20	209	18:59:55:71	TRACK	96	NO SPOT				
0065	21	209	18:59:55:75	TRACK	97	XCP):	444	YCP):	247	NO: 209
0066	22	209	18:59:55:78	TRACK	98	XCP):	441	YCP):	247	NO: 209
0067	23	209	18:59:55:81	TRACK	99	XCP):	438	YCP):	246	NO: 199
0068	0	209	18:59:55:85	TRACK	100	XCP):	432	YCP):	250	NO: 200
0069	1	209	18:59:55:88	TRACK	101	NO SPOT				
0070	2	209	18:59:55:91	TRACK	102	XCP):	424	YCP):	253	NO: 199
0071	3	209	18:59:55:95	TRACK	103	NO SPOT				
0072	6	209	18:59:55:98	TRACK	53	XCP):	416	YCP):	253	NO: 211
0073	1	209	18:59:56:01	TRACK	54	XCP):	417	YCP):	255	NO: 211
0074	2	209	18:59:56:04	TRACK	55	XCP):	416	YCP):	256	NO: 211
0075	3	209	18:59:56:08	TRACK	56	XCP):	413	YCP):	254	NO: 211
0076	4	209	18:59:56:11	TRACK	57	XCP):	413	YCP):	254	NO: 211
0077	5	209	18:59:56:14	TRACK	58	XCP):	412	YCP):	254	NO: 211
0078	6	209	18:59:56:18	TRACK	59	XCP):	414	YCP):	254	NO: 211
0079	7	209	18:59:56:21	TRACK	60	XCP):	414	YCP):	251	NO: 211
0080	8	209	18:59:56:24	TRACK	61	XCP):	415	YCP):	248	NO: 211
0081	9	209	18:59:56:28	TRACK	62	XCP):	415	YCP):	245	NO: 211
0082	10	209	18:59:56:31	TRACK	63	XCP):	417	YCP):	243	NO: 211
0083	11	209	18:59:56:34	TRACK	64	XCP):	420	YCP):	240	NO: 211
0084	12	209	18:59:56:38	TRACK	65	XCP):	422	YCP):	238	NO: 211
0085	13	209	18:59:56:41	TRACK	66	XCP):	423	YCP):	238	NO: 211
0086	14	209	18:59:56:44	TRACK	67	NO SPOT				
0087	15	209	18:59:56:48	TRACK	68	XCP):	424	YCP):	237	NO: 211
0088	16	209	18:59:56:51	TRACK	69	XCP):	425	YCP):	236	NO: 211
0089	17	209	18:59:56:54	TRACK	70	XCP):	426	YCP):	234	NO: 211
0090	18	209	18:59:56:58	TRACK	71	NO SPOT				
0091	19	209	18:59:56:61	TRACK	72	XCP):	424	YCP):	230	NO: 211
0092	20	209	18:59:56:64	TRACK	73	XCP):	426	YCP):	228	NO: 211
0093	21	209	18:59:56:68	TRACK	74	XCP):	425	YCP):	226	NO: 211
0094	22	209	18:59:56:71	TRACK	75	XCP):	425	YCP):	228	NO: 211
0095	23	209	18:59:56:74	TRACK	76	XCP):	425	YCP):	229	NO: 211
0096	24	209	18:59:56:78	TRACK	77	NO SPOT				
0097	25	209	18:59:56:81	TRACK	78	XCP):	428	YCP):	229	NO: 211
0098	26	209	18:59:56:84	TRACK	79	XCP):	432	YCP):	230	NO: 211
0099	27	209	18:59:56:88	TRACK	80	XCP):	431	YCP):	230	NO: 211
0100	28	209	18:59:56:91	TRACK	81	XCP):	432	YCP):	230	NO: 211
0101	29	209	18:59:56:94	TRACK	82	XCP):	434	YCP):	229	NO: 211
0102	30	209	18:59:56:98	TRACK	83	XCP):	435	YCP):	229	NO: 211
0103	31	209	18:59:57:01	TRACK	84	XCP):	433	YCP):	226	NO: 211
0104	32	209	18:59:57:04	TRACK	85	XCP):	432	YCP):	229	NO: 211
0105	33	209	18:59:57:08	TRACK	86	XCP):	434	YCP):	227	NO: 211
0106	34	209	18:59:57:11	TRACK	87	XCP):	434	YCP):	228	NO: 211
0107	35	209	18:59:57:14	TRACK	88	XCP):	433	YCP):	226	NO: 211
0108	36	209	18:59:57:18	TRACK	89	XCP):	431	YCP):	227	NO: 211
0109	37	209	18:59:57:21	TRACK	90	XCP):	431	YCP):	228	NO: 211
0110	38	209	18:59:57:24	TRACK	91	XCP):	431	YCP):	230	NO: 211
0111	39	209	18:59:57:28	TRACK	92	XCP):	431	YCP):	230	NO: 211
0112	40	209	18:59:57:31	TRACK	93	XCP):	432	YCP):	229	NO: 211
0113	41	209	18:59:57:34	TRACK	94	NO SPOT				
0114	42	209	18:59:57:38	TRACK	95	XCP):	433	YCP):	227	NO: 211
0115	43	209	18:59:57:41	TRACK	96	XCP):	433	YCP):	227	NO: 211
0116	44	209	18:59:57:44	TRACK	97	XCP):	431	YCP):	226	NO: 211
0117	45	209	18:59:57:48	TRACK	98	NO SPOT				
0118	46	209	18:59:57:51	TRACK	99	XCP):	432	YCP):	225	NO: 211
0119	47	209	18:59:57:54	TRACK	100	XCP):	432	YCP):	226	NO: 211
0120	48	209	18:59:57:58	TRACK	101	XCP):	431	YCP):	225	NO: 211
0121	49	209	18:59:57:61	TRACK	102	XCP):	436	YCP):	225	NO: 211
0122	50	209	18:59:57:64	TRACK	103	XCP):	432	YCP):	223	NO: 211
0123	51	209	18:59:57:68	TRACK	104	XCP):	432	YCP):	223	NO: 211

0119	52	209	18:59:57:71	TRACK 105	NO SPOT				
0120	53	209	18:59:57:74	TRACK 106	X(P): 434	Y(P): 223	NO:	213	YO: 256
0121	54	209	18:59:57:78	TRACK 107	X(P): 435	Y(P): 223	NO:	213	YO: 256
0122	55	209	18:59:57:81	TRACK 108	X(P): 432	Y(P): 222	NO:	213	YO: 256
0123	56	209	18:59:57:84	TRACK 109	X(P): 433	Y(P): 223	NO:	213	YO: 256
0124	57	209	18:59:57:88	TRACK 110	X(P): 434	Y(P): 222	NO:	213	YO: 256
0125	58	209	18:59:57:91	TRACK 111	X(P): 433	Y(P): 222	NO:	213	YO: 256
0126	59	209	18:59:57:94	TRACK 112	X(P): 433	Y(P): 222	NO:	213	YO: 256
0127	60	209	18:59:57:98	TRACK 113	X(P): 433	Y(P): 220	NO:	213	YO: 256
0128	61	209	18:59:58:01	TRACK 114	X(P): 432	Y(P): 221	NO:	213	YO: 256
0129	62	209	18:59:58:04	TRACK 115	X(P): 432	Y(P): 221	NO:	213	YO: 256
0130	63	209	18:59:58:08	TRACK 116	NO SPOT				
0131	64	209	18:59:58:11	TRACK 117	X(P): 431	Y(P): 221	NO:	213	YO: 256
0132	65	209	18:59:58:14	TRACK 118	NO SPOT				
0133	66	209	18:59:58:18	TRACK 119	X(P): 431	Y(P): 222	NO:	213	YO: 256
0134	67	209	18:59:58:21	TRACK 120	NO SPOT				
0135	68	209	18:59:58:24	TRACK 121	X(P): 437	Y(P): 220	NO:	213	YO: 256
0136	69	209	18:59:58:28	TRACK 122	X(P): 439	Y(P): 219	NO:	213	YO: 256
0137	0	209	18:59:58:32	TRACK 123	NO SPOT				
0138	1	209	18:59:58:35	TRACK 124	NO SPOT				
0139	2	209	18:59:58:38	TRACK 125	NO SPOT				
0140	3	209	18:59:58:42	TRACK 126	NO SPOT				
0141	4	209	18:59:58:45	TRACK 127	X(P): 507	Y(P): 219	NO:	231	YO: 252
0142	5	209	18:59:58:48	TRACK 128	NO SPOT				
0143	0	209	18:59:58:52	TRACK 129	X(P): 453	Y(P): 219	NO:	201	YO: 252
0144	1	209	18:59:58:55	TRACK 130	NO SPOT				
0145	2	209	18:59:58:58	TRACK 131	X(P): 454	Y(P): 218	NO:	201	YO: 251
0146	3	209	18:59:58:62	TRACK 132	NO SPOT				
0147	4	209	18:59:58:65	TRACK 133	X(P): 454	Y(P): 218	NO:	201	YO: 251
0148	0	209	18:59:58:69	TRACK 134	X(P): 436	Y(P): 218	NO:	201	YO: 251
0149	6	209	18:59:58:73	TRACK 135	NO SPOT				
0150	0	209	18:59:58:75	TRACK 136	X(P): 436	Y(P): 218	NO:	202	YO: 254
0151	15	209	18:59:59:02	TRACK 144	NO SPOT				
0152	0	209	18:59:59:08	TRACK 137	X(P): 450	Y(P): 220	NO:	201	YO: 254
0153	1	209	18:59:59:11	TRACK 138	X(P): 450	Y(P): 219	NO:	201	YO: 254
0154	2	209	18:59:59:14	TRACK 139	X(P): 447	Y(P): 221	NO:	201	YO: 254
0155	3	209	18:59:59:18	TRACK 140	X(P): 445	Y(P): 221	NO:	200	YO: 254
0156	4	209	18:59:59:21	TRACK 141	X(P): 444	Y(P): 221	NO:	201	YO: 254
0157	5	209	18:59:59:24	TRACK 142	X(P): 444	Y(P): 221	NO:	201	YO: 254
0158	6	209	18:59:59:28	TRACK 143	X(P): 442	Y(P): 221	NO:	200	YO: 254
0159	7	209	18:59:59:31	TRACK 144	X(P): 442	Y(P): 220	NO:	200	YO: 254
0160	16	209	18:59:59:05	TRACK 145	NO SPOT				
0161	0	209	18:59:59:28	TRACK 146	X(P): 434	Y(P): 220	NO:	201	YO: 255
0162	1	209	18:59:59:31	TRACK 147	X(P): 436	Y(P): 221	NO:	201	YO: 255
0163	2	209	18:59:59:34	TRACK 148	X(P): 436	Y(P): 222	NO:	201	YO: 255
0164	3	209	18:59:59:38	TRACK 149	NO SPOT				
0165	4	209	18:59:59:41	TRACK 150	NO SPOT				
0166	5	209	18:59:59:44	TRACK 151	X(P): 438	Y(P): 221	NO:	201	YO: 255
0167	6	209	18:59:59:48	TRACK 152	X(P): 437	Y(P): 221	NO:	201	YO: 255
0168	7	209	18:59:59:51	TRACK 153	NO SPOT				
0169	8	209	18:59:59:54	TRACK 154	NO SPOT				
0170	9	209	18:59:59:58	TRACK 155	X(P): 437	Y(P): 220	NO:	201	YO: 255
0171	10	209	18:59:59:61	TRACK 156	X(P): 442	Y(P): 219	NO:	201	YO: 255
0172	11	209	18:59:59:64	TRACK 157	X(P): 436	Y(P): 220	NO:	201	YO: 255
0173	12	209	18:59:59:68	TRACK 158	X(P): 443	Y(P): 219	NO:	201	YO: 255
0174	13	209	18:59:59:71	TRACK 159	NO SPOT				
0175	14	209	18:59:59:74	TRACK 160	NO SPOT				
0176	15	209	18:59:59:78	TRACK 161	X(P): 437	Y(P): 218	NO:	201	YO: 255
0177	16	209	18:59:59:81	TRACK 162	X(P): 449	Y(P): 219	NO:	201	YO: 255
0178	0	209	18:59:59:84	TRACK 163	X(P): 438	Y(P): 218	NO:	202	YO: 255

0179	0	209	18:59:59:88	TRACK 164	XCP): 436	YCP): 218	XC): 201	YC): 254
0180	1	209	18:59:59:91	TRACK 165	XCP): 436	YCP): 219	XC): 201	YC): 254
0181	2	209	18:59:59:94	TRACK 166	XCP): 437	YCP): 220	XC): 201	YC): 254
0182	3	209	18:59:59:98	TRACK 167	XCP): 436	YCP): 219	XC): 201	YC): 254
0183	4	209	19:00:00:01	TRACK 168	XCP): 435	YCP): 219	XC): 201	YC): 254
0184	5	209	19:00:00:04	TRACK 169	XCP): 436	YCP): 219	XC): 201	YC): 254
0185	6	209	19:00:00:08	TRACK 170	XCP): 436	YCP): 219	XC): 201	YC): 254
0186	7	209	19:00:00:11	TRACK 171	XCP): 437	YCP): 219	XC): 201	YC): 254
0187	8	209	19:00:00:14	TRACK 172	NO SPOT			
0188	9	209	19:00:00:18	TRACK 173	XCP): 435	YCP): 219	XC): 201	YC): 254
0189	10	209	19:00:00:21	TRACK 174	XCP): 435	YCP): 219	XC): 201	YC): 254
0190	11	209	19:00:00:24	TRACK 175	XCP): 436	YCP): 219	XC): 201	YC): 254
0191	12	209	19:00:00:28	TRACK 176	NO SPOT			
0192	13	209	19:00:00:31	TRACK 177	XCP): 435	YCP): 219	XC): 201	YC): 254
0193	14	209	19:00:00:34	TRACK 178	XCP): 435	YCP): 219	XC): 201	YC): 254
0194	15	209	19:00:00:38	TRACK 179	NO SPOT			
0195	16	209	19:00:00:41	TRACK 180	XCP): 436	YCP): 220	XC): 201	YC): 254
0196	17	209	19:00:00:44	TRACK 181	XCP): 436	YCP): 220	XC): 201	YC): 254
0197	18	209	19:00:00:48	TRACK 182	XCP): 436	YCP): 220	XC): 201	YC): 254
0198	19	209	19:00:00:51	TRACK 183	XCP): 436	YCP): 219	XC): 201	YC): 254
0199	20	209	19:00:00:54	TRACK 184	XCP): 436	YCP): 220	XC): 201	YC): 254
0200	21	209	19:00:00:58	TRACK 185	XCP): 437	YCP): 220	XC): 201	YC): 254
0201	22	209	19:00:00:61	TRACK 186	XCP): 437	YCP): 219	XC): 201	YC): 254
0202	23	209	19:00:00:64	TRACK 187	XCP): 437	YCP): 219	XC): 201	YC): 254
0203	24	209	19:00:00:68	TRACK 188	XCP): 438	YCP): 220	XC): 201	YC): 254
0204	25	209	19:00:00:71	TRACK 189	XCP): 436	YCP): 219	XC): 201	YC): 254
0205	26	209	19:00:00:74	TRACK 190	XCP): 436	YCP): 219	XC): 201	YC): 254
0206	27	209	19:00:00:78	TRACK 191	XCP): 436	YCP): 219	XC): 201	YC): 254
0207	28	209	19:00:00:81	TRACK 192	XCP): 437	YCP): 219	XC): 201	YC): 254
0208	29	209	19:00:00:84	TRACK 193	XCP): 437	YCP): 220	XC): 201	YC): 254
0209	30	209	19:00:00:88	TRACK 194	XCP): 438	YCP): 220	XC): 201	YC): 254
0210	31	209	19:00:00:91	TRACK 195	NO SPOT			
0211	32	209	19:00:00:94	TRACK 196	XCP): 438	YCP): 220	XC): 201	YC): 254
0212	33	209	19:00:00:98	TRACK 197	XCP): 439	YCP): 219	XC): 201	YC): 254
0213	34	209	19:00:01:01	TRACK 198	XCP): 436	YCP): 219	XC): 201	YC): 254
0214	35	209	19:00:01:04	TRACK 199	XCP): 439	YCP): 219	XC): 201	YC): 254
0215	36	209	19:00:01:08	TRACK 200	XCP): 437	YCP): 220	XC): 201	YC): 254
0216	37	209	19:00:01:11	TRACK 201	NO SPOT			
0217	38	209	19:00:01:14	TRACK 202	NO SPOT			
0218	39	209	19:00:01:18	TRACK 203	NO SPOT			
0219	40	209	19:00:01:21	TRACK 204	XCP): 436	YCP): 220	XC): 201	YC): 254
0220	41	209	19:00:01:24	TRACK 205	XCP): 437	YCP): 219	XC): 201	YC): 254
0221	42	209	19:00:01:28	TRACK 206	XCP): 438	YCP): 219	XC): 201	YC): 254
0222	43	209	19:00:01:31	TRACK 207	NO SPOT			
0223	44	209	19:00:01:34	TRACK 208	XCP): 437	YCP): 220	XC): 201	YC): 254
0224	45	209	19:00:01:38	TRACK 209	XCP): 437	YCP): 218	XC): 201	YC): 254
0225	46	209	19:00:01:41	TRACK 210	NO SPOT			
0226	47	209	19:00:01:44	TRACK 211	XCP): 438	YCP): 218	XC): 201	YC): 254
0227	48	209	19:00:01:48	TRACK 212	XCP): 436	YCP): 218	XC): 201	YC): 254
0228	49	209	19:00:01:51	TRACK 213	XCP): 437	YCP): 218	XC): 201	YC): 254
0229	50	209	19:00:01:54	TRACK 214	XCP): 436	YCP): 218	XC): 201	YC): 254
0230	51	209	19:00:01:58	TRACK 215	XCP): 436	YCP): 218	XC): 201	YC): 254
0231	52	209	19:00:01:61	TRACK 216	XCP): 435	YCP): 218	XC): 201	YC): 254
0232	53	209	19:00:01:64	TRACK 217	XCP): 436	YCP): 219	XC): 201	YC): 254
0233	54	209	19:00:01:68	TRACK 218	XCP): 436	YCP): 219	XC): 201	YC): 254
0234	55	209	19:00:01:71	TRACK 219	XCP): 436	YCP): 218	XC): 201	YC): 254
0235	56	209	19:00:01:74	TRACK 220	XCP): 437	YCP): 217	XC): 201	YC): 254
0236	57	209	19:00:01:78	TRACK 221	XCP): 435	YCP): 219	XC): 201	YC): 254
0237	58	209	19:00:01:81	TRACK 222	XCP): 437	YCP): 219	XC): 201	YC): 254
0238	59	209	19:00:01:84	TRACK 223	XCP): 437	YCP): 219	XC): 201	YC): 254

0239	60	209	19:00:01:88	TRACK 224	XCP): 437	YCP): 219	XC): 201	YC): 254
0240	61	209	19:00:01:91	TRACK 225	XCP): 436	YCP): 219	XC): 201	YC): 254
0241	62	209	19:00:01:94	TRACK 226	XCP): 436	YCP): 220	XC): 201	YC): 254
0242	63	209	19:00:01:98	TRACK 227	XCP): 436	YCP): 220	XC): 201	YC): 254
0243	64	209	19:00:02:01	TRACK 228	XCP): 435	YCP): 219	XC): 201	YC): 254
0244	65	209	19:00:02:04	TRACK 229	XCP): 434	YCP): 219	XC): 201	YC): 254
0245	66	209	19:00:02:08	TRACK 230	XCP): 435	YCP): 218	XC): 201	YC): 254
0246	67	209	19:00:02:11	TRACK 231	XCP): 434	YCP): 219	XC): 201	YC): 254
0247	68	209	19:00:02:14	TRACK 232	XCP): 434	YCP): 219	XC): 201	YC): 254
0248	69	209	19:00:02:18	TRACK 233	NO SPOT			
0249	70	209	19:00:02:21	TRACK 234	XCP): 434	YCP): 219	XC): 201	YC): 254
0250	71	209	19:00:02:24	TRACK 235	NO SPOT			
0251	72	209	19:00:02:28	TRACK 236	NO SPOT			
0252	73	209	19:00:02:31	TRACK 237	XCP): 436	YCP): 218	XC): 201	YC): 254
0253	74	209	19:00:02:34	TRACK 238	XCP): 436	YCP): 218	XC): 201	YC): 254
0254	75	209	19:00:02:38	TRACK 239	XCP): 435	YCP): 219	XC): 201	YC): 254
0255	76	209	19:00:02:41	TRACK 240	XCP): 436	YCP): 220	XC): 201	YC): 254
0256	77	209	19:00:02:44	TRACK 241	XCP): 436	YCP): 219	XC): 201	YC): 254
0257	78	209	19:00:02:48	TRACK 242	NO SPOT			
0258	79	209	19:00:02:51	TRACK 243	XCP): 437	YCP): 218	XC): 201	YC): 254
0259	80	209	19:00:02:54	TRACK 244	XCP): 435	YCP): 218	XC): 201	YC): 254
0260	81	209	19:00:02:58	TRACK 245	XCP): 435	YCP): 217	XC): 201	YC): 254
0261	82	209	19:00:02:61	TRACK 246	NO SPOT			
0262	83	209	19:00:02:64	TRACK 247	NO SPOT			
0263	84	209	19:00:02:68	TRACK 248	XCP): 436	YCP): 217	XC): 201	YC): 254
0264	85	209	19:00:02:71	TRACK 249	XCP): 437	YCP): 216	XC): 201	YC): 254
0265	86	209	19:00:02:74	TRACK 250	XCP): 435	YCP): 218	XC): 201	YC): 254
0266	87	209	19:00:02:78	TRACK 251	XCP): 436	YCP): 217	XC): 201	YC): 254
0267	88	209	19:00:02:81	TRACK 252	XCP): 437	YCP): 217	XC): 201	YC): 254
0268	89	209	19:00:02:84	TRACK 253	XCP): 437	YCP): 218	XC): 201	YC): 254
0269	90	209	19:00:02:88	TRACK 254	XCP): 436	YCP): 218	XC): 201	YC): 254
0270	91	209	19:00:02:91	TRACK 255	XCP): 437	YCP): 218	XC): 201	YC): 254
0271	92	209	19:00:02:94	TRACK 256	NO SPOT			
0272	93	209	19:00:02:98	TRACK 257	XCP): 438	YCP): 217	XC): 201	YC): 254
0273	94	209	19:00:03:01	TRACK 258	XCP): 437	YCP): 216	XC): 201	YC): 254
0274	95	209	19:00:03:04	TRACK 259	XCP): 437	YCP): 216	XC): 201	YC): 254
0275	96	209	19:00:03:08	TRACK 260	XCP): 437	YCP): 216	XC): 201	YC): 254
0276	97	209	19:00:03:11	TRACK 261	NO SPOT			
0277	98	209	19:00:03:14	TRACK 262	XCP): 437	YCP): 217	XC): 201	YC): 254
0278	99	209	19:00:03:18	TRACK 263	XCP): 437	YCP): 217	XC): 201	YC): 254
0279	100	209	19:00:03:21	TRACK 264	XCP): 437	YCP): 216	XC): 201	YC): 254
0280	101	209	19:00:03:24	TRACK 265	NO SPOT			
0281	102	209	19:00:03:28	TRACK 266	XCP): 435	YCP): 218	XC): 201	YC): 254
0282	103	209	19:00:03:31	TRACK 267	NO SPOT			
0283	104	209	19:00:03:34	TRACK 268	NO SPOT			
0284	105	209	19:00:03:38	TRACK 269	XCP): 436	YCP): 217	XC): 201	YC): 254
0285	106	209	19:00:03:41	TRACK 270	NO SPOT			
0286	107	209	19:00:03:44	TRACK 271	XCP): 437	YCP): 217	XC): 201	YC): 254
0287	108	209	19:00:03:48	TRACK 272	XCP): 437	YCP): 217	XC): 201	YC): 254
0288	109	209	19:00:03:51	TRACK 273	XCP): 438	YCP): 217	XC): 201	YC): 254
0289	110	209	19:00:03:54	TRACK 274	NO SPOT			
0290	111	209	19:00:03:58	TRACK 275	NO SPOT			
0291	112	209	19:00:03:61	TRACK 276	XCP): 439	YCP): 221	XC): 201	YC): 254
0292	113	209	19:00:03:64	TRACK 277	XCP): 437	YCP): 217	XC): 201	YC): 254
0293	114	209	19:00:03:68	TRACK 278	XCP): 438	YCP): 216	XC): 201	YC): 254
0294	115	209	19:00:03:71	TRACK 279	NO SPOT			
0295	116	209	19:00:03:74	TRACK 280	NO SPOT			
0296	117	209	19:00:03:78	TRACK 281	XCP): 437	YCP): 217	XC): 201	YC): 254
0297	118	209	19:00:03:81	TRACK 282	XCP): 436	YCP): 217	XC): 201	YC): 254
0298	119	209	19:00:03:84	TRACK 283	XCP): 435	YCP): 217	XC): 201	YC): 254

0299	120	209	19:00:03:88	TRACK	284	XCP):	437	YCP):	217	XC):	201	YC):	254
0300	121	209	19:00:03:91	TRACK	285	XCP):	436	YCP):	216	XC):	201	YC):	254
0301	122	209	19:00:03:94	TRACK	286	XCP):	437	YCP):	216	XC):	201	YC):	254
0302	123	209	19:00:03:98	TRACK	287	XCP):	437	YCP):	216	XC):	201	YC):	254
0303	124	209	19:00:04:01	TRACK	288								
0304	125	209	19:00:04:04	TRACK	289								
0305	126	209	19:00:04:08	TRACK	290								
0306	127	209	19:00:04:11	TRACK	291	XCP):	437	YCP):	216	XC):	201	YC):	254
0307	128	209	19:00:04:14	TRACK	292								
0308	129	209	19:00:04:18	TRACK	293								
0309	130	209	19:00:04:21	TRACK	294								
0310	131	209	19:00:04:24	TRACK	295								
0311	132	209	19:00:04:28	TRACK	296								
0312	133	209	19:00:04:31	TRACK	297								
0313	134	209	19:00:04:34	TRACK	298	XCP):	436	YCP):	216	XC):	201	YC):	254
0314	135	209	19:00:04:38	TRACK	299	XCP):	437	YCP):	216	XC):	201	YC):	254
0315	0	209	19:00:04:39	TRACK	13								
0316	1	209	19:00:04:42	TRACK	14								
0317	2	209	19:00:04:45	TRACK	15								
0318	3	209	19:00:04:49	TRACK	16								
0319	4	209	19:00:04:52	TRACK	17	XCP):	436	YCP):	215	XC):	199	YC):	256
0320	0	209	19:00:04:55	TRACK	18	XCP):	436	YCP):	215	XC):	200	YC):	254
0321	1	209	19:00:04:58	TRACK	19								
0322	2	209	19:00:04:61	TRACK	20	XCP):	435	YCP):	215	XC):	200	YC):	254
0323	3	209	19:00:04:65	TRACK	21								
0324	4	209	19:00:04:68	TRACK	22								
0325	5	209	19:00:04:71	TRACK	23								
0326	6	209	19:00:04:75	TRACK	24								
0327	7	209	19:00:04:78	TRACK	25								
0328	8	209	19:00:04:81	TRACK	26								
0329	9	209	19:00:04:85	TRACK	27	XCP):	435	YCP):	213	XC):	200	YC):	254
0330	10	209	19:00:04:88	TRACK	28	XCP):	436	YCP):	214	XC):	200	YC):	254
0331	0	209	19:00:04:91	TRACK	29	XCP):	436	YCP):	213	XC):	200	YC):	253
0332	1	209	19:00:04:94	TRACK	30								
0333	2	209	19:00:04:97	TRACK	31	XCP):	435	YCP):	214	XC):	200	YC):	253
0334	0	209	19:00:05:00	TRACK	32	XCP):	435	YCP):	215	XC):	201	YC):	254
0335	1	209	19:00:05:03	TRACK	33								
0336	2	209	19:00:05:06	TRACK	34	XCP):	435	YCP):	214	XC):	201	YC):	254
0337	3	209	19:00:05:10	TRACK	35	XCP):	435	YCP):	213	XC):	201	YC):	254
0338	4	209	19:00:05:13	TRACK	36	XCP):	435	YCP):	213	XC):	201	YC):	254
0339	5	209	19:00:05:16	TRACK	37								
0340	6	209	19:00:05:20	TRACK	38								
0341	7	209	19:00:05:23	TRACK	39								
0342	8	209	19:00:05:26	TRACK	40	XCP):	436	YCP):	213	XC):	201	YC):	254
0343	9	209	19:00:05:30	TRACK	41								
0344	10	209	19:00:05:33	TRACK	42								
0345	11	209	19:00:05:36	TRACK	43	XCP):	437	YCP):	211	XC):	201	YC):	254
0346	12	209	19:00:05:40	TRACK	44	XCP):	436	YCP):	210	XC):	201	YC):	254
0347	13	209	19:00:05:43	TRACK	45								
0348	14	209	19:00:05:46	TRACK	46								
0349	15	209	19:00:05:50	TRACK	47	XCP):	437	YCP):	209	XC):	201	YC):	254
0350	16	209	19:00:05:53	TRACK	48								
0351	17	209	19:00:05:56	TRACK	49								
0352	18	209	19:00:05:60	TRACK	50	XCP):	435	YCP):	208	XC):	201	YC):	254
0353	19	209	19:00:05:63	TRACK	51	XCP):	436	YCP):	206	XC):	201	YC):	254
0354	20	209	19:00:05:66	TRACK	52	XCP):	437	YCP):	205	XC):	201	YC):	254
0355	21	209	19:00:05:70	TRACK	53	XCP):	436	YCP):	205	XC):	201	YC):	254
0356	22	209	19:00:05:73	TRACK	54								
0357	23	209	19:00:05:76	TRACK	55	XCP):	435	YCP):	204	XC):	201	YC):	254
0358	24	209	19:00:05:80	TRACK	56	XCP):	441	YCP):	202	XC):	201	YC):	254

0359	25	209	19:00:05:83	TRACK	57	XCP):	444	YCP):	211	NO:	201	YO:	254
0360	26	209	19:00:05:86	TRACK	58	XCP):	444	YCP):	199	NO:	201	YO:	254
0361	0	209	19:00:05:94	TRACK	60	XCP):	437	YCP):	209	NO:	199	YO:	254
0362	1	209	19:00:05:97	TRACK	61		NO	SPOT					
0363	2	209	19:00:06:00	TRACK	62		NO	SPOT					
0364	3	209	19:00:06:04	TRACK	63		NO	SPOT					
0365	4	209	19:00:06:07	TRACK	64		NO	SPOT					
0366	5	209	19:00:06:10	TRACK	65		NO	SPOT					
0367	6	209	19:00:06:14	TRACK	66		NO	SPOT					
0368	0	209	19:00:06:16	TRACK	67		NO	SPOT					
0369	1	209	19:00:06:19	TRACK	68		NO	SPOT					
0370	2	209	19:00:06:22	TRACK	69		NO	SPOT					
0371	3	209	19:00:06:26	TRACK	70		NO	SPOT					
0372	4	209	19:00:06:29	TRACK	71		NO	SPOT					
0373	5	209	19:00:06:32	TRACK	72		NO	SPOT					
0374	6	209	19:00:06:36	TRACK	73		NO	SPOT					
0375	7	209	19:00:06:39	TRACK	74	XCP):	438	YCP):	211	NO:	203	YO:	255
0376	8	209	19:00:06:42	TRACK	75		NO	SPOT					
0377	9	209	19:00:06:46	TRACK	76		NO	SPOT					
0378	0	209	19:00:06:51	TRACK	77		NO	SPOT					
0379	1	209	19:00:06:54	TRACK	78		NO	SPOT					
0380	2	209	19:00:06:57	TRACK	79		NO	SPOT					
0381	3	209	19:00:06:61	TRACK	80		NO	SPOT					
0382	0	209	19:00:06:66	TRACK	81	XCP):	437	YCP):	211	NO:	200	YO:	255
0383	1	209	19:00:06:69	TRACK	82		NO	SPOT					
0384	2	209	19:00:06:72	TRACK	83	XCP):	438	YCP):	209	NO:	200	YO:	255
0385	3	209	19:00:06:76	TRACK	84		NO	SPOT					
0386	4	209	19:00:06:79	TRACK	85	XCP):	438	YCP):	210	NO:	200	YO:	255
0387	5	209	19:00:06:82	TRACK	86		NO	SPOT					
0388	6	209	19:00:06:86	TRACK	87	XCP):	437	YCP):	211	NO:	200	YO:	255
0389	7	209	19:00:06:89	TRACK	88		NO	SPOT					
0390	8	209	19:00:06:92	TRACK	89	XCP):	438	YCP):	209	NO:	200	YO:	255
0391	9	209	19:00:06:96	TRACK	90		NO	SPOT					
0392	10	209	19:00:06:99	TRACK	91		NO	SPOT					
0393	11	209	19:00:07:02	TRACK	92		NO	SPOT					
0394	12	209	19:00:07:06	TRACK	93		NO	SPOT					
0395	13	209	19:00:07:09	TRACK	94		NO	SPOT					
0396	14	209	19:00:07:12	TRACK	95	XCP):	437	YCP):	210	NO:	200	YO:	255
0397	15	209	19:00:07:16	TRACK	96	XCP):	438	YCP):	210	NO:	200	YO:	255
0398	16	209	19:00:07:19	TRACK	97	XCP):	438	YCP):	211	NO:	200	YO:	255
0399	17	209	19:00:07:22	TRACK	98		NO	SPOT					
0400	18	209	19:00:07:26	TRACK	99		NO	SPOT					
0401	19	209	19:00:07:29	TRACK	100		NO	SPOT					
0402	20	209	19:00:07:32	TRACK	101		NO	SPOT					
0403	21	209	19:00:07:36	TRACK	102	XCP):	437	YCP):	211	NO:	200	YO:	255
0404	22	209	19:00:07:39	TRACK	103	XCP):	437	YCP):	212	NO:	200	YO:	255
0405	23	209	19:00:07:42	TRACK	104		NO	SPOT					
0406	24	209	19:00:07:46	TRACK	105	XCP):	437	YCP):	211	NO:	200	YO:	255
0407	0	209	19:00:07:49	TRACK	106	XCP):	437	YCP):	211	NO:	203	YO:	255
0408	26	209	19:00:07:52	TRACK	107		NO	SPOT					
0409	27	209	19:00:07:56	TRACK	108		NO	SPOT					
0410	28	209	19:00:07:59	TRACK	109		NO	SPOT					
0411	29	209	19:00:07:62	TRACK	110	XCP):	438	YCP):	211	NO:	200	YO:	255
0412	30	209	19:00:07:66	TRACK	111		NO	SPOT					
0413	31	209	19:00:07:69	TRACK	112	XCP):	437	YCP):	211	NO:	200	YO:	255
0414	32	209	19:00:07:72	TRACK	113	XCP):	438	YCP):	211	NO:	200	YO:	255
0415	3	209	19:00:07:75	TRACK	114	XCP):	438	YCP):	210	NO:	203	YO:	255
0416	34	209	19:00:07:79	TRACK	115		NO	SPOT					
0417	35	209	19:00:07:82	TRACK	116		NO	SPOT					
0418	36	209	19:00:07:86	TRACK	117		NO	SPOT					

0414	37	209	19:00:07:89	TRACK 118	NO SPOT
0420	38	209	19:00:07:92	TRACK 119	X(P): 436 Y(P): 209 XC: 200 YC: 255
0421	39	209	19:00:07:96	TRACK 120	NO SPOT
0422	40	209	19:00:07:99	TRACK 121	X(P): 437 Y(P): 210 XC: 200 YC: 255
0423	41	209	19:00:08:02	TRACK 122	NO SPOT
0424	42	209	19:00:08:06	TRACK 123	NO SPOT
0425	43	209	19:00:08:09	TRACK 124	X(P): 437 Y(P): 209 XC: 200 YC: 255
0426	44	209	19:00:08:12	TRACK 125	NO SPOT
0427	45	209	19:00:08:16	TRACK 126	NO SPOT
0428	46	209	19:00:08:19	TRACK 127	NO SPOT
0429	47	209	19:00:08:22	TRACK 128	X(P): 437 Y(P): 209 XC: 200 YC: 255
0430	48	209	19:00:08:26	TRACK 129	NO SPOT
0431	49	209	19:00:08:29	TRACK 130	NO SPOT
0432	50	209	19:00:08:32	TRACK 131	NO SPOT
0433	51	209	19:00:08:36	TRACK 132	NO SPOT
0434	52	209	19:00:08:39	TRACK 133	NO SPOT
0435	53	209	19:00:08:42	TRACK 134	X(P): 437 Y(P): 211 XC: 203 YC: 255
0436	54	209	19:00:08:49	TRACK 136	NO SPOT
0437	55	209	19:00:08:52	TRACK 137	NO SPOT
0438	56	209	19:00:08:56	TRACK 138	NO SPOT
0439	57	209	19:00:08:59	TRACK 139	NO SPOT
0440	58	209	19:00:08:62	TRACK 140	NO SPOT
0441	59	209	19:00:08:66	TRACK 141	X(P): 438 Y(P): 209 XC: 200 YC: 255
0442	60	209	19:00:08:69	TRACK 142	NO SPOT
0443	61	209	19:00:08:72	TRACK 143	NO SPOT
0444	62	209	19:00:08:76	TRACK 144	X(P): 438 Y(P): 210 XC: 200 YC: 255
0445	63	209	19:00:08:79	TRACK 145	NO SPOT
0446	64	209	19:00:08:82	TRACK 146	X(P): 438 Y(P): 210 XC: 200 YC: 255
0447	65	209	19:00:08:86	TRACK 147	NO SPOT
0448	66	209	19:00:08:92	TRACK 149	NO SPOT
0449	67	209	19:00:08:95	TRACK 150	X(P): 437 Y(P): 210 XC: 203 YC: 255
0450	68	209	19:00:08:99	TRACK 151	X(P): 436 Y(P): 213 XC: 200 YC: 255
0451	69	209	19:00:09:02	TRACK 152	NO SPOT
0452	70	209	19:00:09:06	TRACK 153	X(P): 436 Y(P): 210 XC: 200 YC: 255
0453	71	209	19:00:09:09	TRACK 154	NO SPOT
0454	72	209	19:00:09:12	TRACK 155	NO SPOT
0455	73	209	19:00:09:16	TRACK 156	NO SPOT
0456	74	209	19:00:09:19	TRACK 157	NO SPOT
0457	75	209	19:00:09:22	TRACK 158	NO SPOT
0458	76	209	19:00:09:26	TRACK 159	NO SPOT
0459	77	209	19:00:09:29	TRACK 160	NO SPOT
0460	78	209	19:00:09:32	TRACK 161	NO SPOT
0461	79	209	19:00:09:36	TRACK 162	NO SPOT
0462	80	209	19:00:09:39	TRACK 163	NO SPOT
0463	81	209	19:00:09:42	TRACK 164	NO SPOT
0464	82	209	19:00:09:46	TRACK 165	NO SPOT
0465	83	209	19:00:09:49	TRACK 166	NO SPOT
0466	84	209	19:00:09:52	TRACK 167	NO SPOT
0467	85	209	19:00:09:56	TRACK 168	NO SPOT
0468	86	209	19:00:09:59	TRACK 169	NO SPOT
0469	87	209	19:00:09:52	TRACK 170	X(P): 437 Y(P): 210 XC: 203 YC: 255
0470	88	209	19:00:09:55	TRACK 171	X(P): 437 Y(P): 210 XC: 203 YC: 255
0471	89	209	19:00:09:59	TRACK 172	NO SPOT
0472	90	209	19:00:09:72	TRACK 173	X(P): 437 Y(P): 208 XC: 200 YC: 255
0473	91	209	19:00:09:76	TRACK 174	NO SPOT
0474	92	209	19:00:09:79	TRACK 175	NO SPOT
0475	93	209	19:00:09:82	TRACK 176	X(P): 438 Y(P): 209 XC: 203 YC: 255
0476	94	209	19:00:09:86	TRACK 177	NO SPOT
0477	95	209	19:00:09:89	TRACK 178	NO SPOT
0478	96	209	19:00:09:92	TRACK 179	NO SPOT

0479	99	209	19:00:09:96	TRACK 180	XCP): 436 YCP): 210 XC: 200 YC: 255
0480	100	209	19:00:09:99	TRACK 181	NO SPOT
0481	101	209	19:00:10:02	TRACK 182	NO SPOT
0482	102	209	19:00:10:06	TRACK 183	NO SPOT
0483	103	209	19:00:10:09	TRACK 184	NO SPOT
0484	104	209	19:00:10:12	TRACK 185	NO SPOT
0485	105	209	19:00:10:16	TRACK 186	XCP): 437 YCP): 211 XC: 200 YC: 255
0486	106	209	19:00:10:19	TRACK 187	NO SPOT
0487	107	209	19:00:10:22	TRACK 188	NO SPOT
0488	108	209	19:00:10:26	TRACK 189	XCP): 436 YCP): 212 XC: 200 YC: 255
0489	109	209	19:00:10:29	TRACK 190	NO SPOT
0490	110	209	19:00:10:32	TRACK 191	NO SPOT
0491	111	209	19:00:10:36	TRACK 192	NO SPOT
0492	112	209	19:00:10:39	TRACK 193	NO SPOT
0493	113	209	19:00:10:42	TRACK 194	XCP): 437 YCP): 212 XC: 200 YC: 255
0494	114	209	19:00:10:46	TRACK 195	XCP): 437 YCP): 211 XC: 200 YC: 255
0495	115	209	19:00:10:49	TRACK 196	XCP): 436 YCP): 212 XC: 200 YC: 255
0496	116	209	19:00:10:52	TRACK 197	XCP): 437 YCP): 210 XC: 200 YC: 255
0497	117	209	19:00:10:56	TRACK 198	NO SPOT
0498	118	209	19:00:10:59	TRACK 199	NO SPOT
0499	119	209	19:00:10:62	TRACK 200	NO SPOT
0500	120	209	19:00:10:66	TRACK 201	XCP): 438 YCP): 210 XC: 200 YC: 255
0501	121	209	19:00:10:69	TRACK 202	NO SPOT
0502	122	209	19:00:10:72	TRACK 203	NO SPOT
0503	123	209	19:00:10:76	TRACK 204	XCP): 436 YCP): 210 XC: 200 YC: 255
0504	124	209	19:00:10:79	TRACK 205	NO SPOT
0505	125	209	19:00:10:82	TRACK 206	NO SPOT
0506	126	209	19:00:10:86	TRACK 207	NO SPOT
0507	127	209	19:00:10:89	TRACK 208	NO SPOT
0508	128	209	19:00:10:92	TRACK 209	NO SPOT
0509	129	209	19:00:10:96	TRACK 210	XCP): 436 YCP): 210 XC: 200 YC: 255
0510	130	209	19:00:10:99	TRACK 211	NO SPOT
0511	131	209	19:00:11:02	TRACK 212	XCP): 438 YCP): 210 YC: 200 XC: 255
0512	132	209	19:00:11:06	TRACK 213	NO SPOT
0513	133	209	19:00:11:09	TRACK 214	XCP): 437 YCP): 210 XC: 200 YC: 255
0514	134	209	19:00:11:12	TRACK 215	NO SPOT
0515	135	209	19:00:11:16	TRACK 216	XCP): 438 YCP): 209 XC: 200 YC: 255
0516	136	209	19:00:11:19	TRACK 217	NO SPOT
0517	137	209	19:00:11:22	TRACK 218	XCP): 436 YCP): 210 XC: 200 YC: 255
0518	138	209	19:00:11:26	TRACK 219	NO SPOT
0519	139	209	19:00:11:29	TRACK 220	NO SPOT
0520	140	209	19:00:11:32	TRACK 221	NO SPOT
0521	141	209	19:00:11:36	TRACK 222	NO SPOT
0522	142	209	19:00:11:39	TRACK 223	NO SPOT
0523	143	209	19:00:11:42	TRACK 224	XCP): 436 YCP): 211 XC: 200 YC: 255
0524	144	209	19:00:11:46	TRACK 225	NO SPOT
0525	145	209	19:00:11:49	TRACK 226	XCP): 436 YCP): 211 XC: 200 YC: 255
0526	146	209	19:00:11:52	TRACK 227	NO SPOT
0527	147	209	19:00:11:56	TRACK 228	NO SPOT
0528	148	209	19:00:11:59	TRACK 229	NO SPOT
0529	149	209	19:00:11:62	TRACK 230	NO SPOT
0530	150	209	19:00:11:66	TRACK 231	NO SPOT
0531	151	209	19:00:11:69	TRACK 232	XCP): 436 YCP): 209 XC: 200 YC: 255
0532	152	209	19:00:11:72	TRACK 233	NO SPOT
0533	153	209	19:00:11:76	TRACK 234	XCP): 436 YCP): 209 XC: 200 YC: 255
0534	154	209	19:00:11:79	TRACK 235	NO SPOT
0535	155	209	19:00:11:82	TRACK 236	XCP): 436 YCP): 210 XC: 200 YC: 255
0536	156	209	19:00:11:86	TRACK 237	NO SPOT
0537	157	209	19:00:11:89	TRACK 238	NO SPOT
0538	158	209	19:00:11:92	TRACK 239	XCP): 436 YCP): 209 XC: 200 YC: 255

0539	159	209	19:00:11:86	TRACK 240	X(P): 437 Y(P): 209	NO	200	YD:	255
0540	160	209	19:00:11:99	TRACK 241	NO SPOT				
0541	161	209	19:00:12:02	TRACK 242	X(P): 436 Y(P): 210	NO	200	YD:	255
0542	162	209	19:00:12:06	TRACK 243	NO SPOT				
0543	163	209	19:00:12:09	TRACK 244	X(P): 436 Y(P): 212	NO	200	YD:	255
0544	164	209	19:00:12:12	TRACK 245	NO SPOT				
0545	165	209	19:00:12:16	TRACK 246	X(P): 434 Y(P): 215	NO	200	YD:	255
0546	166	209	19:00:12:19	TRACK 247	NO SPOT				
0547	168	209	19:00:12:26	TRACK 249	X(P): 437 Y(P): 228	NO	200	YD:	255
0548	144	209	19:00:12:29	TRACK 250	X(P): 437 Y(P): 209	NO	203	YD:	255
0549	151	209	19:00:12:52	TRACK 257	X(P): 436 Y(P): 209	NO	207	YD:	255
0550	152	209	19:00:12:55	TRACK 258	X(P): 436 Y(P): 208	NO	203	YD:	255
0551	153	209	19:00:12:75	TRACK 264	X(P): 439 Y(P): 206	NO	203	YD:	255
0552	159	209	19:00:12:79	TRACK 265	X(P): 439 Y(P): 206	NO	203	YD:	255
0553	160	209	19:00:12:82	TRACK 266	X(P): 438 Y(P): 206	NO	203	YD:	255
0554	163	209	19:00:12:92	TRACK 269	X(P): 439 Y(P): 207	NO	203	YD:	255
0555	191	209	19:00:13:85	TRACK 297	X(P): 439 Y(P): 207	NO	203	YD:	255
0556	192	209	19:00:13:89	TRACK 298	X(P): 437 Y(P): 200	NO	203	YD:	255

## B. TOW II ELECTROMAGNETIC PULSE (EMP) VIDEO IMAGE DATA ANALYSIS

During the course of performance on this purchase order, SAI was tasked to process video data recorded at the Line 6 electromagnetic test facility. The video data recorded was of several EMP signals impinging on a TOW II motor selected for EMP testing. Up to five test points within the TOW II motor were instrumented for EMP measurement. These instrumented points were connected by fiber optic links to five transient digitizers housed within one of the mobile data acquisition vans used by the Laser and Optical Test Group for field test data acquisition. A sixth transient digitizer was connected to a field probe which captured the EMP pulse as it propagated through the atmosphere. SAI was tasked to produce plots of the Fast Fourier Transform and the Inverse Transform of the EMP pulses as they impacted the TOW II motor at the selected instrumented test points.

### 1. EMP Video Tape Processing

As the EMP pulses impacted on the TOW motor, the transient digitizers were triggered with a corresponding representation of the EMP pulse being displayed on the transient digitizer video monitors. These traces were also recorded on analog video tapes.

The analog video tapes were delivered to SAI at Building 4500 on Redstone Arsenal, Alabama. There the EMP trace data was manually processed using the VDI-200 Image Analysis System in conjunction with the co-located HP 1000 computer.

As a prelude to software processing, the video data was recorded manually on the Ampex MD 600 video disk by the operator. The Ampex video disk then supplied the video input to the VDI-200 Image System. The operator went through the boot up procedures for the VDI-200 which placed it in a state whereby it could be controlled by either commands entered through its own local system console terminal or by software program commands sent over from the Hewlett Packard 1000 computer which then controlled the VDI-200 remotely.

## 2. Manual VDI-200 EMP Pulse Definition

Using an SAI-developed software program, DTRAH, the operator interactively and in a manual mode defined the EMP Pulse as it was displayed on the VDI-200 video monitor. The DTRAH program allowed the operator to define and collect data points of each EMP trace as it was manifested when it was collected at the particular test points within the TOW motor on the test range. By using the VDI-200 system trackball, the operator manually positioned a visible cursor on the VDI-200 system to various points along the trace. When a particular key (these keys having been defined by the software with certain meanings) on the VDI-200 function keyboard was depressed by the operator, the data point was transferred to the HP 1000 computer system. Each point of the trace was defined in the above manner. Thus at the end of a trace the operator had defined points along the EMP trace, and those points had been read by the HP 1000 CPU. As the points of a trace were sent to the HP 1000, they were saved in a data array. At the end of the trace definition the operation depressed a different key on the VDI-200 function keyboard signaling end of trace. At this point, the data defining the trace was written to an HP disk file.

Traces from the other instrumented points were likewise manually reduced and their representative data points recorded in an HP 1000 disk data file.

## 3. Processing the Manually Reduced EMP Pulse Data

Once the EMP pulses had been defined and their data points stored in an HP 1000 disk file, the user could proceed to manipulate these files to produce plots of the Fast Fourier Transform and the Inverse Transform of the EMP data.

In order to process the above data files, it was necessary that SAI modify software previously written to process automatically collected and reduced transient digitizer traces so that the software would now process the manually reduced data records. SAI modified the software to accept the manually processed data.

Figure 1 is an FFT plot of the data from the third transient digitizer in the set of six used to collect the EMP data. As shown on the plot it is the EMP data collected from test point C11 of the TOW motor. Figure 2 is the inverse transform of the EMP pulse collected from the same data point within the TOW motor.

#### 4. FFT Source Software

The modified software used to process the manually reduced EMP data resides in an HP 1000 source disk data file labeled &FFTL. In order to compile, load and run the program, a complementary transfer file was created and stored in a disk file labeled \FFTL. Both of these files are currently located on the HP 1000 Image Analysis System on disk Logical Unit 12. The plot procedure can easily be invoked by the user entering the command ,:\FFTL, at one of the HP 2648 graphics terminals.

TD3 SHIELD TUST PAIR C11  
25 MAY 1983  
IRIG TIME:145:19: 3:50:290  
PULSE 1

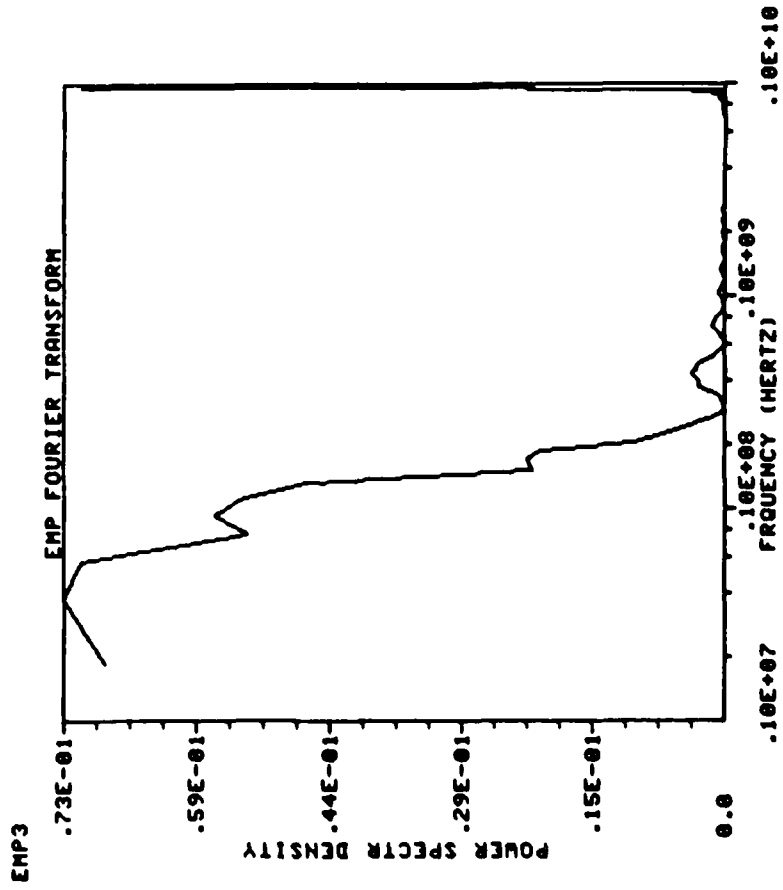


FIGURE 1. FFT Plot

TD3 SHIELD TUST PAIR C11  
25 MAY 1983  
IRIG TIME:145:19: 3:50:290  
PULSE 1

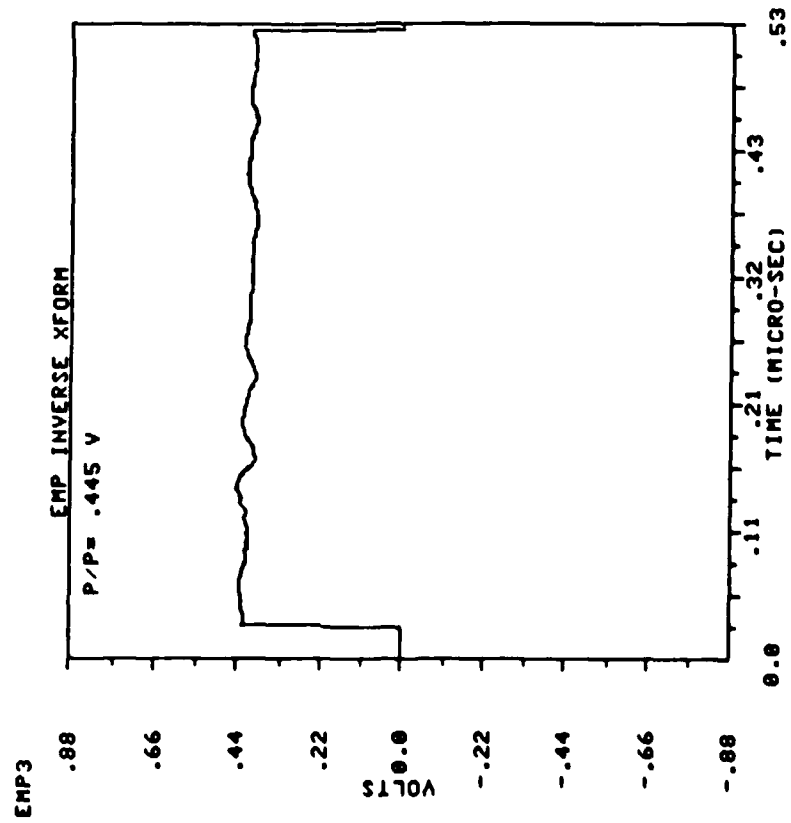


FIGURE 2. Inverse Transform of EMP Pulse

### C. ALIMS SYSTEM MODIFICATION

The Automated Laser Instrumentation Measurement System's (ALIMS) laser baselining subsystem software was modified to incorporate the acquisition of temperature data while laser testing is in progress. For a particular laser being characterized, four temperature probes are now read from instrumented locations within the laser test laboratory. The temperature data collected enables the test engineer to analyze laser performance as a function of temperature. To simulate temperature conditions that might be encountered in actual field use, the laser being tested may be subjected to a wide range of temperature variations. Thus a temperature range in which the laser functions relative to its performance specifications can be established in a laboratory setting.

As noted above, four thermocouples were placed in the laser testing laboratory to capture the temperature readings. The following temperatures are now read by the ALIMS software:

- (1) The ambient air room temperature of the laboratory in which the laser is undergoing testing.

- (2) The Thermotron environmental chamber air temperature within which the laser is housed. Thus the temperature of the air mass surrounding the laser is known.

- (3) The laser heat exchanger exhaust temperature. This is the temperature of the air being fan-forced from inside the operating laser. This gives the test engineer an indication of the actual internal operating temperature of the laser as the laser test progresses.

- (4) The base plate temperature. The base plate mounting fixture is the foundation on which the laser sits as it is being tested.

The above temperature readings provide a means of measuring the environmental effects of temperature on laser performance.

While laser testing is in progress, the temperature data is read every laser pulse. To aid in evaluating the tested laser, the data is stored to computer disk files for future printout or plotting.

#### D. AGA Program

The fourth stipulation of this purchase order concerned the processing of HELLFIRE Missile Flight Data acquired at Eglin Air Force Base, Florida, during the time frame of this purchase order. Each frame of video, taken as the missile proceeds from the launcher to the target, is individually digitized using the Quantex DS 20 Image Analyzer. The objective of this activity is to sum up the pixel intensities of the missile plume, thereby permitting the computation of total radiant energy emitted by the missile as shown in each video frame.

The AGA Program, named for the type of camera used in data acquisition, was developed to reduce thermographic image data. The dialogue for the AGA program, given below, is included as an example of how the video digitization of the data gathered in Eglin was accomplished. Following log-on at the user terminal, the user enters RU,AGA and the following menu is displayed. Where inputs are shown, they are derived from the actual test data.

##### 1. AGA DATA REDUCTION

- 0 - TERMINATE
- 1 - CREATE DATA FILE
- 2 - STORE GENERAL TEST INFORMATION IN DATA FILE
- 3 - STORE AGA CAMERA DATA IN DATA FILE
- 4 - CREATE CONTROL VOLTAGE CALIBRATION TABLE
- 5 - CREATE BLACKBODY CALIBRATION TABLE
- 6 - PROCESS VIDEO DATA TAPE

ENTER OPTION: X

The user may enter 0 to terminate the AGA program. The remaining options allow the user to store test information, create various tables, reuse certain data, and/or change existing data.

OPTION 1: The user enters 1 to create a data file, and the following questions appear to elicit user response:

2. CREATE DATA FILE

ENTER DISC FILE NAME: AGAMS1

The user enters the name (up to six characters) he wishes to assign to this file.

3. ENTER CARTRIDGE NUMBER FOR DISC FILE: 14

The user enters the number of the cartridge on which he wishes the data stored.

4. ENTER SECURITY CODE: XX

The user enters the security code for this file.

5. ENTER FILE SIZE (LENGTH OF TEST IN SEC): 2

The user enters the length of the test in seconds.

6. \*\*\*\*FILE ALREADY EXISTS -- REUSE OR TERMINATE (R or T): R/T

If the file already exists, the user may choose to reuse it by entering R, or he may choose to terminate it by entering T.

OPTIONS 2-6: Before Options 2-6 can be utilized, the user must open a file. This file will henceforth be referred to as file "B." The three questions below will follow the selection of options 2-6:

7. ENTER NAME OF FILE TO OPEN: AGAMS1

ENTER CARTRIDGE NUMBER: 14

ENTER SECURITY CODE: XX

The user assigns a name to the file, selects the cartridge he wishes to

use, and enters the security code. This information is retained and will not be requested again if the user selects subsequent options.

OPTION 2: If the user selects option 2 - STORE GENERAL TEST INFORMATION IN DATA FILE, the following dialogue ensues:

8. GENERAL TEST INFORMATION

- 0 - RETURN TO MAIN MENU
- 1 - ENTER NEW INFORMATION
- 2 - EDIT EXISTING INFORMATION
- 3 - TRANSFER SELECT SUBSET OF INFORMATION FROM ANOTHER FILE
- 4 - TRANSFER ENTIRE SET OF INFORMATION FROM ANOTHER FILE

ENTER OPTION: X

The user may enter 0 to return to the main menu, or 1 through 4 to select the respective function. The selection of OPTION 1 initiates the following:

9. ENTER NEW GENERAL TEST INFORMATION

ENTER TEST DATE (MO:DA:YR): 09:25:83

The user enters the date of the test as shown.

10. ENTER TEST SITE (16 CHAR): EGLIN AFB

The user enters the test site (up to sixteen characters).

11. ENTER TEST PROGRAM (16 CHAR): HF MENS SM MOTOR

The user enters the name (up to sixteen characters) of the test program.

12. ENTER MISSION NUMBER (16 CHAR): MS-3

The user enters the mission number (up to sixteen characters).

When this information has been entered, the program displays the following table showing the values now in the record:

13. GENERAL TEST INFORMATION

ITEM 1 - TEST DATE	XX:XX:XX
ITEM 2 - TEST SITE	XXXXXXXX
ITEM 3 - TEST PROGRAM	XXXXXXXX
ITEM 4 - MISSION NUMBER	XX

The display remains on the screen for ten seconds, after which it returns to the submenu shown above in item 8.

The user may select OPTION 2 to edit existing information. This option prompts the following dialogue:

14. EDIT EXISTING GENERAL TEST INFORMATION

[XX:XX:XX]  
ENTER TEST DATE (MO:DA:YR): XX:XX:XX

[XXXXXX]  
ENTER TEST SITE (16 CHAR): XXXXX

[XXXXXX]  
ENTER TEST PROGRAM (16 CHAR): XXXXX

[XXXXXX]  
ENTER MISSION NUMBER (16 CHAR): XXXXX

The program displays the information currently on the record in brackets above the user input. The user may enter new data, or if satisfied with the current data as shown, hit return to proceed. After all four items have been edited, the information is displayed again, as shown in item 13. After ten seconds the program returns to the submenu shown in item 8.

The selection of OPTION 3 of the submenu General Test Information allows the user to transfer a subset of information from one file ("A") to another ("B"):

15. TRANSFER A SELECT SUBSET OF GENERAL TEST INFORMATION FROM ANOTHER FILE

ENTER FILE NAME CONTAINING DESIRED INFORMATION: XXXXX  
ENTER CARTRIDGE NUMBER: XX  
ENTER SECURITY CODE: XX

The user must open the file from which he wishes to transfer information (file A). The above questions will appear, and the user inputs the file name, cartridge number and security code of that file.

16. ITEM 1 - TEST DATA  
ITEM 2 - TEST SITE  
ITEM 3 - TEST PROGRAM  
ITEM 4 - MISSION NUMBER

ENTER ITEM NUMBERS: X,X,X

The table of items in file A is displayed. The user enters, in numerical order, the number of the item(s) he wishes to transfer. The program automatically transfers those items from file A to file B and then displays the table again as it now appears in file B:

- |     |                          |        |
|-----|--------------------------|--------|
| 17. | ITEM 1 - TEST DATA       | XXXXXX |
|     | ITEM 2 - TEST SITE       | XXXX   |
|     | ITEM 3 - TEST PROGRAM    | XXXXXX |
|     | ITEM 4 - MISSIONS NUMBER | XXXX   |

After ten seconds the program returns to the submenu shown in item 8.

Selecting OPTION 4 of the submenu will transfer an entire set of general test information from another file.

18. TRANSFER ENTIRE SET OF GENERAL TEST INFORMATION FROM ANOTHER FILE

ENTER FILE NAME CONTAINING DESIRED INFORMATION: XXXXX

ENTER CARTRIDGE NUMBER: XX

ENTER SECURITY CODE: XX

The user must open the file from which he wishes to transfer information (file "A") by answering the above questions.

19. ITEM 1 - TEST DATA	XXXXXX
ITEM 2 - TEST SITE	XXXXXX
ITEM 3 - TEST PROGRAM	XXXXXX
ITEM 4 - MISSION NUMBER	XX

At this point the entire set of general test information has been transferred. The table as it now appears in file "B" is displayed for ten seconds. The program then returns to the submenu shown in item 8.

OPTION 3: The third option of the AGA Data Reduction Program allows AGA camera data to be stored in a data file. The selection of option 3 - STORE AGA CAMERA DATA IN DATA FILE initiates the following program-to-user dialogue:

20. AGA CAMERA DATA

- 0 - RETURN TO MAIN MENU
- 1 - ENTER NEW INFORMATION
- 2 - EDIT EXISTING INFORMATION
- 3 - TRANSFER SELECT SUBSET OF INFORMATION FROM ANOTHER FILE
- 4 - TRANSFER ENTIRE SET OF INFORMATION FROM ANOTHER FILE

ENTER OPTION: X

The user may enter 0 to return to the main menu. The user may select OPTION 1 to enter new information into an existing file:

21. ENTER NEW AGA CAMERA DATA

ENTER CAMERA HEAD S/N (16 CHAR): XXXXXX  
ENTER CAMERA CU S/N (16 CHAR): XXXXXX  
ENTER LENS TYPE (FOV) [16 CHAR]: XXXXXX  
ENTER CALIBRATION APERTURE SETTING (16 CHAR): XXXXXX  
ENTER TEST APERTURE SETTING (16 CHAR): XXXXXX  
ENTER CU CAL SENSITIVITY SETTING (16 CHAR): XXXXXX  
ENTER CU TEST SENSITIVITY SETTING (16 CHAR): XXXXXX  
ENTER SCAN CONVERTER MODEL (16 CHAR): XXXXXX  
ENTER BLACKBODY SOURCE MODEL (16 CHAR): XXXXXX  
ENTER CAMERA POS WRT LAUNCHER/TGT LINE (X,Y,Z) [16 CHAR]: X,X,X

The user enters the new information requested. Note that each response is limited to sixteen characters.

22. AGA CAMERA DATA

ITEM 1 - CAMERA HEAD S/N	XXXXXX
ITEM 2 - CAMERA CU S/N	XXXXXX
ITEM 3 - LENS TYPE (FOV)	XXXXXX
ITEM 4 - CALIBRATION APERTURE SETTING	XXXXXX
ITEM 5 - TEST APERTURE SETTING	XXXXXX
ITEM 6 - CU CAL SENSITIVITY SETTING	XXXXXX
ITEM 7 - CU TEST SENSITIVITY SETTING	XXXXXX
ITEM 8 - SCAN CONVERTER MODEL	XXXXXX
ITEM 9 - BLACKBODY SOURCE MODEL	XXXXXX
ITEM 10 - CAMERA POSITION WRT LAUNCHER/ TGT LINE (X,Y,Z)	XXXXXX

The program displays the information as it now exists in the data file. After ten seconds, it returns to the submenu shown in item 20 above.

OPTION 2 - Edit Existing Information allows the user to change or delete any of the ten items in the file. Its selection initiates the following dialogue:

23. EDIT EXISTING AGA CAMERA DATA

[XXXXXX]  
ENTER CAMERA HEAD S/N (16 CHAR): XXXXXX

[XXXXXX]  
ENTER CAMERA CU S/N (16 CHAR): XXXXXX

[XXXXXX]  
ENTER LENS TYPE (FOV) [16 CHAR]: XXXXXX

[XXXXXX]  
ENTER CALIBRATION APERTURE SETTING (16 CHAR): XXXXXX

[XXXXXX]  
ENTER TEST APERTURE SETTING (16 CHAR): XXXXXX

[XXXXXX]  
ENTER CU CAL SENSITIVITY SETTING (16 CHAR): XXXXXX

[XXXXXX]  
ENTER CU TEST SENSITIVITY SETTING (16 CHAR): XXXXXX

[XXXXXX]  
ENTER SCAN CONVERTER MODEL (16 CHAR): XXXXXX

[XXXXXX]  
ENTER BLACKBODY SOURCE MODEL (16 CHAR): XXXXXX

[XXXXXX]  
ENTER CAMERA POS WRT LAUNCHER/TGT LINE (X,Y,Z) [16 CHAR]: X,X,X

One by one, the above questions will appear providing the user the opportunity to edit. The existing data for each question appears in brackets above it. If the user desires no changes to the item dis-

played, he hits return to proceed. When all questions have been considered, the program displays the file again as in item 22 above. After ten seconds it returns to the submenu.

OPTION 3 of the AGA Camera Data submenu allows the user to transfer a select subset of data from one file (A) to another (B):

24. TRANSFER A SELECT SUBSET OF AGA CAMERA DATA FROM ANOTHER FILE

ENTER FILE NAME CONTAINING DESIRED INFORMATION: XXXXXX

ENTER CARTRIDGE NUMBER: XX

ENTER SECURITY CODE: XX

The user must open the file from which he wishes to transfer information (file A). The above questions will appear and are necessary to locate that file. The AGA camera data file will be displayed to the user (see item 22) so that he may select the item number(s) he wishes transferred.

25. ENTER ITEM NUMBERS: X,X,X

The user lists in sequence the numbers of the items he wishes transferred. At this point the program accomplishes the transferral and displays the file (B) as it now exists. After ten seconds it returns to the submenu.

OPTION 4 of this submenu allows the user to transfer an entire set of AGA Camera Data from another file:

26. TRANSFER ENTIRE SET OF INFORMATION FROM ANOTHER FILE

ENTER FILE NAME CONTAINING DESIRED INFORMATION: XXXXXX

ENTER CARTRIDGE NUMBER: XX

ENTER SECURITY CODE: XX

The user must open the file from which he wishes to transfer information

(file "A") by answering the above prompts.

The program accomplishes the transferral, and displays the information as it now exists in file B (see item 22). After ten seconds the program returns to the submenu.

OPTION 4: Option 4 of the AGA Data Reduction Program is used to create a control voltage calibration table. The following submenu appears to offer four options:

27. CREATE CONTROL VOLTAGE CALIBRATION TABLE

- 0 - RETURN TO MAIN MENU
- 1 - CREATE NEW TABLE
- 2 - TRANSFER TABLE FROM ANOTHER FILE
- 3 - MANUALLY ENTER TABLE VALUES IN FILE

ENTER OPTION: X

The user may enter 0 to return to the main menu. OPTION 1 may be selected to create a new table:

28. CREATE NEW CONTROL VOLTAGE CALIBRATION TABLE

ENTER VOLTAGE (XX) [NEG VAL = NO MORE VOLTAGES]: XXX

The user enters the first voltage. Entering a negative value will indicate to the program that there are no more voltages, and the program will advance to item 31 below.

29. ENTER TRACK # FROM FRAME XXX FOR XXXX VOLTS: XXX

The user enters the track number for the frame and voltage given. (There may be as many as ten frames per volt to average.) The program digitizes this frame, and requests the next:

30. ANY MORE FRAMES FOR THIS VOLTAGE? (Y/N) [DEF=N]: Y/N

If the user desires to digitize another frame for this voltage, he enters Y, and the program repeats from item 29 above. If he enters N (the default), the program repeats from item 28 above.

When no more voltages are desired, the program writes the data to the file.

31. CONTROL VOLTAGE CALIBRATION TABLE

<u>INTENSITY</u>	<u>VOLTAGE</u>
11	.100
51	.200
87	.300

The above table is then displayed, showing the values just entered. After ten seconds the program returns to the submenu of item 27.

The selection of OPTION 2 from the submenu allows for the transfer of a control voltage calibration table from another file:

32. TRANSFER CONTROL VOLTAGE CALIBRATION TABLE FROM ANOTHER FILE

ENTER NAME OF FILE TO OPEN: XXXXXX  
ENTER CARTRIDGE NUMBER: XX  
ENTER SECURITY CODE: XX

The user enters the name, cartridge number and security code for the file from which he wishes to transfer the data. The program automatically accomplishes the transferral and displays the table (as shown in item 31 above) of the values in this record. After ten seconds, it returns to the Control Voltage Calibration Table submenu.

OPTION 3 of this submenu allows the user to manually enter Control Voltage Calibration Table values into a file:

33. MANUALLY ENTER CONTROL VOLTAGE CALIBRATION TABLE VALUES IN FILE  
[CR = NO MORE VOLTAGES]

ENTER INTENSITY (XX): XX  
ENTER VOLTAGE (XX): XX

The user enters the intensity and voltage values. (For the user's convenience, the program will keep up with the numerical sequence of each and include it in parentheses with the question.) These questions will repeat until the user hits the carriage return (CR) to indicate that there are no more voltages and intensities. The information is then written to the file, and the newly created table is displayed (see item 3) above) for ten seconds before returning to the submenu.

OPTION 5: Option 5 of the AGA Data Reduction Program is used to create a blackbody calibration table. It contains four options:

34. CREATE BLACKBODY CALIBRATION TABLE

- 0 - RETURN TO MAIN MENU
- 1 - CREATE NEW TABLE
- 2 - TRANSFER TABLE FROM ANOTHER FILE
- 3 - MANUALLY ENTER TABLE VALUES IN FILE

ENTER OPTION: X

The user may enter 0 to return to the main menu, or he may enter 1 to create a new table. The latter will initiate the following dialogue:

35. CREATE NEW BLACKBODY CALIBRATION TABLE

ENTER TRACK # FOR FRAME TO DETERMINE WINDOWS: XXX

The user enters the track number for the frame to be used.

In order to obtain the mean intensity above background, the user must first setup four windows from which the average intensity of the background will be established. This value is then subtracted from the intensity of the spot.

36. ENTER UPPER LEFT WINDOW LIMITS (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX  
ENTER UPPER RIGHT WINDOW LIMITS (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX  
ENTER LOWER LEFT WINDOW LIMITS (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX  
ENTER LOWER RIGHT WINDOW LIMITS (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX  
ENTER WINDOW LIMITS FOR SPOT (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX

The user enters, in the order listed, the four points (in pixels from 1 to 512) to delineate that particular window, where SLIN = Start Line, ELIN = End Line, SCOL = Start Column, and ECOL = End Column.

37. ARE THESE WINDOWS SATISFACTORY? (Y/N) [DEF = Y]: Y/N

The windows as designated above are displayed on the Quantex monitor. If the windows selected are not satisfactory, the user enters N, and the prompts from item 35 above will be repeated. If he enters Y, the program advances.

38. ENTER # OF GREY LEVELS ABOVE BACKGROUND (DEF = 30): XX

The user enters the number of grey levels [from 1 (black) to 255 (white)] above the background which he wishes to be considered part of the spot. This minimizes the number of picture elements to be processed.

39. ENTER TEMP (XX) [NEG VAL = NO MORE TEMPS]: XXXX

The user enters the first blackbody temperature. Entering a negative value will indicate to the program that there are no more temperatures, and the program will advance to item 42 below.

40. ENTER TRACK # FOR FRAME XXX FOR XXX TEMP: XXX

The user enters the track # for the frame and temperature displayed. This frame is digitized, and the program requests the next one:

41. ANY MORE FRAMES FOR THIS TEMPERATURE? (Y/N) [DEF=N]: Y/N

If the user wishes to digitize another frame for this temperature, he enters Y, and the program repeats from item 40 above. If he enters N (the default), the program repeats from item 39 above. This process will continue until the user enters a negative value. At that point the program writes the data to file and displays the newly created table:

42. NEW BLACKBODY CALIBRATION TABLE

<u>INTENSITY</u>	<u>TEMP</u>
X	XXX
X	XXX
X	XXX

The calibration table is displayed for ten seconds, after which the program returns to the submenu.

OPTION 2 of the Blackbody Calibration Table submenu allows for the transferral of one Blackbody Calibration Table to another:

43. ENTER FILE NAME CONTAINING DESIRED INFORMATION: XXXXXX  
ENTER CARTRIDGE NUMBER: XX  
ENTER SECURITY CODE: XX

The user enters the file name, cartridge number and security code of the file containing the data he wishes transferred. The program writes the information into the other file and displays it to the user when complete:

44. BLACKBODY CALIBRATION TABLE

<u>INTENSITY</u>	<u>TEMPERATURE</u>
XX	X.XXX
XX	X.XXX
XX	X.XXX

After ten seconds the program returns to the submenu.

OPTION 3 of this submenu allows the user to manually enter Blackbody Calibration Table values into a file:

45. MANUALLY ENTER BLACKBODY CALIBRATION TABLE VALUES IN FILE  
[CR = NO MORE TEMPERATURES]

ENTER INTENSITY (XX): XXX  
ENTER TEMPERATURE (XX): XXXX

The user enters the intensity and temperature values. (The numerical sequence of each will appear in parentheses with the question for the user's convenience.) These questions will repeat until the user hits the carriage return (CR) to indicate that there are no more temperatures and intensities. The information is then written to the file, and the newly created table is displayed (see item 44 above) for ten seconds before returning to the submenu.

OPTION 6: Option 6 of the AGA Data Reduction Program is used to process video data tape.

46. PROCESS VIDEO DATA TAPE

ENTER TRACK # FOR FRAME TO DETERMINE WINDOWS: XXX

The user enters the track number for the frame to be used.

In order to obtain the mean intensity above background, the user must first setup four windows from which the average intensity of the background will be established. This value is then subtracted from the intensity of the spot.

47. ENTER UPPER LEFT WINDOW LIMITS (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX  
ENTER UPPER RIGHT WINDOW LIMITS (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX  
ENTER LOWER LEFT WINDOW LIMITS (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX  
ENTER LOWER RIGHT WINDOW LIMITS (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX  
ENTER WINDOW LIMITS FOR SPOT (SLIN,ELIN,SCOL,ECOL): XXX,XXX,XXX,XXX

The user enters, in the order listed, the four points (in pixels from 1 to 512) to delineate that particular window, where SLIN = Start Line, ELIN = End Line, SCOL = Start Column and ECOL = End Column.

48. ARE THESE WINDOWS SATISFACTORY? (Y/N) [DEF = Y]: Y/N

The windows as designated above are displayed on the Quantex monitor. If the windows selected are not satisfactory, the user enters N and the prompts from item 47 above will be repeated. If he enters Y, the program advances.

49. ENTER # OF GREY LEVELS ABOVE BACKGROUND (DEF = 30): XX

The user enters the number of grey levels [from 0 (black) to 255 (white)] above the background which he wishes to be considered part of the spot. This minimizes the number of picture elements to be processed.

50. ENTER # OF PIXELS TO AVG FOR PEAK INTENSITY (DEF = 5): XX

Of the pixels meeting the intensity level requirement explained in item 49 above, the user selects a number of them to be averaged together for one average peak intensity. The default is 5.

51. ENTER # OF FRAMES/SEC TO PROCESS (1-30) [DEF = 30]: XX

The user enters the # of frames/second he wishes processed. There is a maximum of 30 frames per second. The default is 30, or every frame.

52. ENTER TEST START TIME (HR:MN:SC:MSC): XX:XX:XX:XXX

ENTER TEST STOP TIME (HR:MN:SC:MSC): XX:XX:XX:XXX

The user enters the start and stop times for the entire test in the order shown. (Note: Milliseconds must appear as a three-digit number.)

53. ENTER START FRAME FOR THIS SEGMENT: XXX

The user enters the number of the frame on which this test start time appears.

The program processes the data until the end of the test or the end of the segment, whichever comes first. (It will repeat this item, 52, until the end of the test.)

54.

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0001	0000 0.000	11	.100	51	.200	87	.300		
0002	IRIG TIME	BG	AVG	PK	#	TGT	TGT	APPRNT	
0003		PIX	TGT	TGT	PIX	CEN-	VOLTS	TGT	
0004		INT	INT	INT	DIFF	TROID		TEMP	
0005									
0006	17:40:12: 30	11	41	63	643	483	389	.233	0.00
0007	17:40:13: 96	12	38	66	600	454	388	.242	0.00
0008	17:40:13:162	9	35	66	544	422	384	.242	0.00
0009	17:40:13:228	9	38	68	338	392	388	.247	0.00
0010	17:40:13:294	10	39	64	187	360	396	.236	0.00
0011	17:40:13:360	8	38	66	167	344	398	.242	0.00

The output of this processing is given as illustrated in the above portion of the results of the Hellfire Missile Flight data reduction. The frame numbers appear in the first column, followed by the IRIG time. The average Background Pixel Intensity is given next, followed by both the average and peak intensities of the spot. The column headed "# Pixel Difference" refers to the number of pixels in the spot. "Target Centroid" is the X and Y coordinates of the center of the spot using line and column location. The "Target Volts" values are obtained by interpolating peak intensity using the Control Voltage Table and finding the corresponding voltage for that peak intensity. The "Apparent Target Temperature" values are obtained by interpolating peak intensity using the Blackbody Calibration Table and finding the corresponding temperature for that peak intensity. This column shows 0.00 because the temperature data was unavailable for processing.

## E. SYSTEM MAINTENANCE ACTIVITIES

System maintenance activities included incorporating the 2326 system updates received from Hewlett Packard. New operating systems were generated and installed on both the ALIMS and Image Analysis HP 1000 computer systems.

A new operating system firmware kit for the RTE-6 V/M operating system was received for both the ALIMS and Image Analysis HP 1000 computer systems. The kits contained Base Set Prom 3, part number 92084-80103. The old Base Set Prom, part number 92084-80003, was removed from the FEM board on both computers and replaced with the new Base Set Prom.

Discussions were held with the HP CSS customer support representative centering primarily on the time-out problems that have been occurring with the DS/1000-IV in CPU to CPU communications. His approach to the problem was to use DSMOD, a DS/1000-IV program, to set the time-out limits to the maximum. This solution prevents the time-out error message from appearing on the system console and increases the length of time for a time-out to occur, but not significantly. It does not eliminate the problem. His opinion is that DS is meant to be an interactive communication with short time periods from one communication to the next. His suggestion that we run DSMOD in the WELCOM file and up the time-out limits is a good one and will be implemented.

Two hardware items were integrated into the Image Analysis System during the time frame of this purchase order. They were the Honeywell Video Image VGR 4000 hardcopy unit and the Harris 630 Frame Synchronizer.

END

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